



Marathon Petroleum Company
1300 South Fort Street
Detroit, MI 48217

**REPORT ON COMPLIANCE AND DIAGNOSTIC PARTICULATE
MATTER TESTING**

Performed for:
MARATHON PETROLEUM COMPANY
PARTICULATE MATTER STUDY – PHASE 10
TEST DATES: APRIL 24-27, 2012

**FCCU REGENERATOR STACK
DETROIT REFINERY**

Client Reference No: CN00076641
CleanAir Project No: 12010
Revision 0: June 12, 2012

To the best of our knowledge, the data presented in this report are accurate, complete, error free, legible and representative of the actual emissions during the test program. Clean Air Engineering operates in conformance with the requirements of ASTM D7036-04 Standard Practice for Competence of Air Emission Testing Bodies.

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REVISION HISTORY

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**REPORT ON COMPLIANCE AND DIAGNOSTIC PARTICULATE MATTER
TESTING*****DRAFT REPORT REVISION HISTORY***

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PROJECT OVERVIEW

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INTRODUCTION

Marathon Petroleum Company (MPC) contracted Clean Air Engineering (CleanAir) to perform particulate matter and ammonia testing at its facility, located in Detroit, Michigan, for compliance and diagnostic purposes. This was the tenth test mobilization for the Fluid Catalytic Cracking Unit (FCCU) particulate matter study.

All testing was conducted in accordance with the regulations set-forth by the United States Environmental Protection Agency (USEPA) and the Michigan Department of Environmental Quality (DEQ). These regulations are referenced in EPA Title 40 of the Code of Federal Regulations, Part 60, (40 CFR 60) Subpart J.

Project Objectives

The primary goal of the test program was to determine if the facility is in compliance with the particulate emission limit for the FCCU specified in the New Source Performance Standard (NSPS), Subpart J, during maximum operating capacity.

The secondary goals were:

- to determine the maximum operating capacity of the FCCU with reduced ESP operation that is compliant with particulate emission limits; and
- to collect additional diagnostic condensable particulate matter (CPM), ammonia (NH₃) and hydrogen cyanide (HCN) data at the FCCU Stack.

Key Project Participants

Individuals responsible for coordinating and conducting the test program were:

Tabetha Daum – MPC
Joe Reidy – MPC
Kevin O'Halloren – CleanAir
Ken Sullivan – CleanAir

PROJECT OVERVIEW**1-2****SCOPE OF WORK*****Test Program Parameters***

Testing was performed at the FCCU Regenerator Stack on Tuesday, April 24 through Friday, April 27, 2012. The primary test parameters were:

- non-sulfate filterable particulate matter (NSFPM)
- flue gas flow rate
- flue gas velocity decay (wall effects)

The following secondary test parameters were also determined at the FCCU Regenerator Stack:

- condensable particulate matter (CPM)
- ammonia (NH₃)
- hydrogen cyanide (HCN)
- flue gas composition and moisture content (O₂, CO₂, H₂O)
- flue gas temperature

Coke burn rates, FCC charge rates, NH₃ injection into the ESP and ESP operation were varied in the following manner during the test program:

- Condition 1, 4/24: Coke burn rate $\approx$ 18,300 lb/hr, FCC charge rate $\approx$ 33,000 barrels per day (bpd), NH₃ injection $\approx$ 8 lb/hr, west ESP bank operational with medium power reduction (MPR)
- Condition 2, 4/25: Coke burn rate $\approx$ 18,100 lb/hr, FCC charge rate $\approx$ 32,500 bpd, NH₃ injection $\approx$ 8 lb/hr, full ESP in operation with medium power reduction (MPR)
- Condition 3, 4/26: Coke burn rate $\approx$ 18,100 lb/hr, FCC charge rate $\approx$ 32,500 bpd, NH₃ injection $\approx$ 8 lb/hr, full ESP in operation with low power reduction (LPR)
- Condition 3, 4/27: Coke burn rate $\approx$ 17,900 lb/hr, FCC charge rate $\approx$ 32,500 bpd, NH₃ injection $\approx$ 8 lb/hr, full ESP in operation with unknown power reduction

PROJECT OVERVIEW**1-3****TEST PROGRAM SYNOPSIS****Test Schedule**

The schedule followed during the test program is outlined in Table 1-1 (organized chronologically) below and Table 1-2 (organized by test method) on page 1-4.

**Table 1-1:
Schedule of Activities – Chronological**

Run Number	Location	Method	Analyte	Date	Start Time	End Time
1	FCCU Regenerator Stack	USEPA Method 2H	Wall Effects	04/24/12	09:30	09:45
1	FCCU Regenerator Stack	USEPA Method 5F/202	NSFPM/CPM	04/24/12	10:33	11:43
1	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/24/12	10:33	11:33
1	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/24/12	10:34	11:34
2	FCCU Regenerator Stack	USEPA Method 5F/202	NSFPM/CPM	04/24/12	12:48	13:53
2	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/24/12	12:48	13:48
2	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/24/12	12:49	13:44
3	FCCU Regenerator Stack	USEPA Method 5F/202	NSFPM/CPM	04/24/12	14:33	15:55
3	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/24/12	14:33	15:33
3	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/24/12	14:37	15:43
2	FCCU Regenerator Stack	USEPA Method 2H	Wall Effects	04/25/12	08:40	08:56
4	FCCU Regenerator Stack	USEPA Method 5F/202	NSFPM/CPM	04/25/12	09:08	10:12
4	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/25/12	09:08	10:08
4	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/25/12	09:09	10:00
5	FCCU Regenerator Stack	USEPA Method 5F/202	NSFPM/CPM	04/25/12	12:07	13:14
5	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/25/12	12:07	13:07
5	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/25/12	12:08	13:02
6	FCCU Regenerator Stack	USEPA Method 5F/202	NSFPM/CPM	04/25/12	14:06	15:23
6	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/25/12	14:06	15:06
6	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/25/12	14:09	15:11
3	FCCU Regenerator Stack	USEPA Method 2H	Wall Effects	04/26/12	08:02	08:12
7	FCCU Regenerator Stack	USEPA Method 5F/202	NSFPM/CPM	04/26/12	08:24	09:31
7	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/26/12	08:24	09:24
7	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/26/12	08:26	09:19
8	FCCU Regenerator Stack	USEPA Method 5F/202	NSFPM/CPM	04/26/12	10:10	11:17
8	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/26/12	10:10	11:10
8	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/26/12	10:11	11:06
9	FCCU Regenerator Stack	USEPA Method 5F/202	NSFPM/CPM	04/26/12	11:58	13:17
9	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/26/12	11:58	12:58
9	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/26/12	12:01	13:06
4	FCCU Regenerator Stack	USEPA Method 2H	Wall Effects	04/27/12	08:52	09:05
10	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/27/12	09:28	10:28
1	FCCU Regenerator Stack	USEPA OTM-29	HCN	04/27/12	09:28	10:34
10	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/27/12	09:36	10:30
11	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/27/12	11:12	12:12
2	FCCU Regenerator Stack	USEPA OTM-29	HCN	04/27/12	11:12	12:17
11	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/27/12	11:18	12:07
12	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/27/12	12:45	13:45
3	FCCU Regenerator Stack	USEPA OTM-29	HCN	04/27/12	12:45	14:00
12	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/27/12	12:49	13:51

MARATHON PETROLEUM COMPANY
DETROIT REFINERYClient Reference No: CN00076641
CleanAir Project No: 12010**PROJECT OVERVIEW****1-4****Table 1-2:
Schedule of Activities – Test Method**

Run Number	Location	Method	Analyte	Date	Start Time	End Time
1	FCCU Regenerator Stack	USEPA Method 5F/202	NSFPM/CPM	04/24/12	10:33	11:43
2	FCCU Regenerator Stack	USEPA Method 5F/202	NSFPM/CPM	04/24/12	12:48	13:53
3	FCCU Regenerator Stack	USEPA Method 5F/202	NSFPM/CPM	04/24/12	14:33	15:55
4	FCCU Regenerator Stack	USEPA Method 5F/202	NSFPM/CPM	04/25/12	09:08	10:12
5	FCCU Regenerator Stack	USEPA Method 5F/202	NSFPM/CPM	04/25/12	12:07	13:14
6	FCCU Regenerator Stack	USEPA Method 5F/202	NSFPM/CPM	04/25/12	14:06	15:23
7	FCCU Regenerator Stack	USEPA Method 5F/202	NSFPM/CPM	04/26/12	08:24	09:31
8	FCCU Regenerator Stack	USEPA Method 5F/202	NSFPM/CPM	04/26/12	10:10	11:17
9	FCCU Regenerator Stack	USEPA Method 5F/202	NSFPM/CPM	04/26/12	11:58	13:17
1	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/24/12	10:33	11:33
2	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/24/12	12:48	13:48
3	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/24/12	14:33	15:33
4	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/25/12	09:08	10:08
5	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/25/12	12:07	13:07
6	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/25/12	14:06	15:06
7	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/26/12	08:24	09:24
8	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/26/12	10:10	11:10
9	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/26/12	11:58	12:58
10	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/27/12	09:28	10:28
11	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/27/12	11:12	12:12
12	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/27/12	12:45	13:45
1	FCCU Regenerator Stack	USEPA OTM-29	HCN	04/27/12	09:28	10:34
2	FCCU Regenerator Stack	USEPA OTM-29	HCN	04/27/12	11:12	12:17
3	FCCU Regenerator Stack	USEPA OTM-29	HCN	04/27/12	12:45	14:00
1	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/24/12	10:34	11:34
2	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/24/12	12:49	13:44
3	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/24/12	14:37	15:43
4	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/25/12	09:09	10:00
5	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/25/12	12:08	13:02
6	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/25/12	14:09	15:11
7	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/26/12	08:26	09:19
8	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/26/12	10:11	11:06
9	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/26/12	12:01	13:06
10	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/27/12	09:36	10:30
11	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/27/12	11:18	12:07
12	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/27/12	12:49	13:51
1	FCCU Regenerator Stack	USEPA Method 2H	Wall Effects	04/24/12	09:30	09:45
2	FCCU Regenerator Stack	USEPA Method 2H	Wall Effects	04/25/12	08:40	08:56
3	FCCU Regenerator Stack	USEPA Method 2H	Wall Effects	04/26/12	08:02	08:12
4	FCCU Regenerator Stack	USEPA Method 2H	Wall Effects	04/27/12	08:52	09:05

PROJECT OVERVIEW**1-5****Results Summary**

Table 1-3 summarizes the NSFPM and CPM results from the Method 5F/202 tests. Table 1-4 (on page 1-6) presents the NH₃ results from the Modified EPA Conditional Test Method (CTM) 027 tests in several different units of measurement. Table 1-5 (on page 1-6) presents the HCN results from the OTM-29 tests in several different units of measurement.

Figures 1-1 and 1-2 (on page 1-7) present the results of the test program graphically.

A more detailed presentation of the test conditions, results and uncertainty analyses are shown in Tables 2-1 through 2-15 on pages 2-1 through 2-15.

**Table 1-3:
Summary of NSFPM and CPM Results (M-5/202)**

FCCU Stack			NSFPM Rate	CPM Rate	Total NSFPM Rate
			(all in lb/Mlb coke)		
Condition 1	4/24/2012				
Coke Burn Rate (Mlb coke/hr)	18.3	Run 1	0.303	0.577	0.881
FCC Rate (bpd)	33,000	Run 2	0.303	0.599	0.902
NH ₃ Injection (lb/hr)	8	Run 3	0.305	0.589	0.894
ESP Operation	West / MPR	Average	0.304	0.588	0.892
Condition 2	4/25/2012				
Coke Burn Rate (Mlb coke/hr)	18.1	Run 4	0.157	0.510	0.666
FCC Rate (bpd)	32,500	Run 5	0.161	0.531	0.692
NH ₃ Injection (lb/hr)	8	Run 6	0.189	0.526	0.715
ESP Operation	Both / MPR	Average	0.169	0.522	0.691
Condition 3	4/26/2012				
Coke Burn Rate (Mlb coke/hr)	18.1	Run 7	0.194	0.490	0.684
FCC Rate (bpd)	32,500	Run 8	0.196	0.530	0.726
NH ₃ Injection (lb/hr)	8	Run 9	0.159	0.536	0.695
ESP Operation	Both / LPR	Average	0.183	0.519	0.702

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PROJECT OVERVIEW**1-6****Table 1-4:
Summary of NH₃ Results (Mod. CTM-027)**

<u>FCCU Stack</u>			NH ₃ Conc. (ppmdv)	NH ₃ Slip (lb/hr)	NH ₃ Slip (lb/Mlb coke)
Condition 1			4/24/2012		
Coke Burn Rate (Mlb coke/hr)	18.3	Run 1	29.0	4.41	0.240
FCC Rate (bpd)	33,000	Run 2	29.1	4.42	0.242
NH ₃ Injection (lb/hr)	8	Run 3	29.1	4.39	0.241
ESP Operation	West / MPR	Average	29.1	4.41	0.241
Condition 2			4/25/2012		
Coke Burn Rate (Mlb coke/hr)	18.1	Run 4	15.4	2.40	0.132
FCC Rate (bpd)	32,500	Run 5	15.2	2.37	0.131
NH ₃ Injection (lb/hr)	8	Run 6	14.5	2.24	0.124
ESP Operation	Both / MPR	Average	15.0	2.34	0.129
Condition 3			4/26/2012		
Coke Burn Rate (Mlb coke/hr)	18.1	Run 7	15.5	2.41	0.133
FCC Rate (bpd)	32,500	Run 8	13.9	2.13	0.118
NH ₃ Injection (lb/hr)	8	Run 9	15.3	2.33	0.129
ESP Operation	Both / LPR	Average	14.9	2.29	0.126
Condition 4			4/27/2012		
Coke Burn Rate (Mlb coke/hr)	17.9	Run 10	15.4	2.33	0.130
FCC Rate (bpd)	32,500	Run 11	16.2	2.51	0.140
NH ₃ Injection (lb/hr)	8	Run 12	16.6	2.49	0.139
ESP Operation	Both	Average	16.1	2.44	0.136

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**Table 1-5:
Summary of HCN Results (OTM-29)**

<u>FCCU Stack</u>			HCN Conc. (ppmdv)	HCN Rate (lb/hr)	HCN Rate (lb/1000 lb coke)
Condition 4			4/27/2012		
Coke Burn Rate (Mlb coke/hr)	17.9	Run 10	16.0	3.82	0.213
FCC Rate (bpd)	32,500	Run 11	15.7	3.85	0.214
NH ₃ Injection (lb/hr)	8	Run 12	16.6	3.95	0.220
ESP Operation	Both	Average	16.1	3.87	0.216

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PROJECT OVERVIEW

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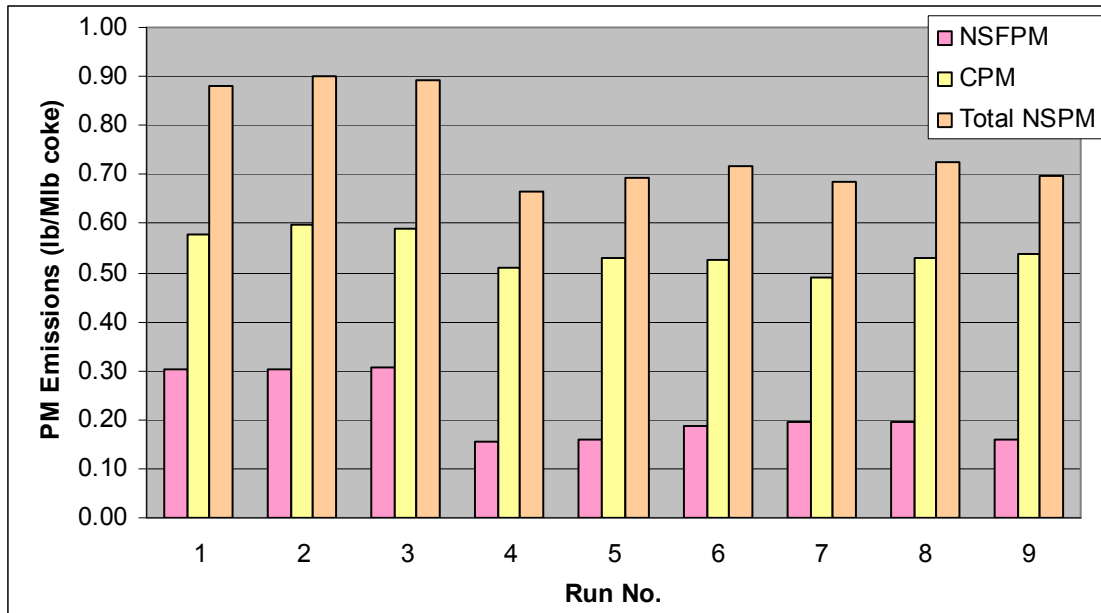
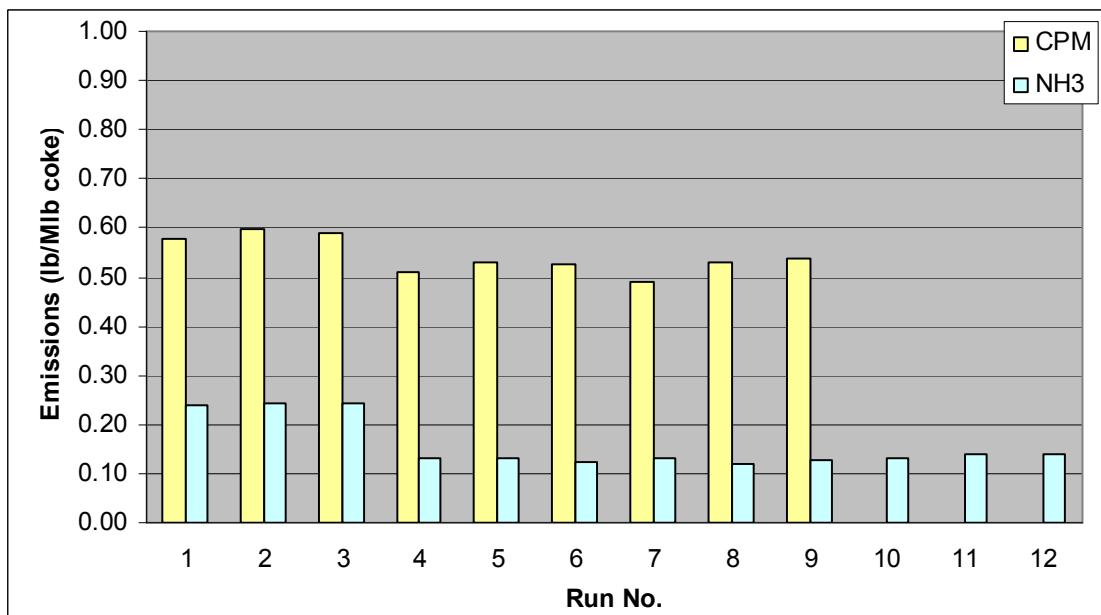


Figure 1-1: NSFPM, CPM and Total Results

Figure 1-2: CPM and NH₃ Results

PROJECT OVERVIEW**1-8****Discussion of Test Program****Flow Rate Measurements**

A wall-effects correction factor (WEF) was determined per Method 2H for each test condition prior to the start of the first run.

A 3-D flow traverse was performed per Method 2F concurrent with the Method 5F/202 and OTM-29 test runs.

As expected, the Method 2F flow results were found to be slightly lower than the Method 2 flow results obtained from each Method 5F/202 and OTM-29 sample train. Table 1-6 compares these results.

**Table 1-6:
Summary of M-2 and M-2F Flow Rate Measurements**

Method (USEPA)	Run	Date (2012)	Start	Flow Rate (dscfm)	Method (USEPA)	Run	Date (2012)	Start	Flow Rate (dscfm)	%Δ
M-5F / 202	1	4/24	10:33	65,328	M-2F / 2H	1	4/24	10:34	57,622	-11.8
M-5F / 202	2	4/24	12:48	65,696	M-2F / 2H	2	4/24	12:49	57,757	-12.1
M-5F / 202	3	4/24	14:33	65,013	M-2F / 2H	3	4/24	14:37	57,124	-12.1
Average				65,346	Average				57,501	-12.0
M-5F / 202	4	4/25	9:08	63,278	M-2F / 2H	4	4/25	9:09	58,845	-7.0
M-5F / 202	5	4/25	12:07	63,411	M-2F / 2H	5	4/25	12:08	58,737	-7.4
M-5F / 202	6	4/25	14:06	63,551	M-2F / 2H	6	4/25	14:09	58,374	-8.1
Average				63,414	Average				58,652	-7.5
M-5F / 202	7	4/26	8:24	63,664	M-2F / 2H	7	4/26	8:26	58,932	-7.4
M-5F / 202	8	4/26	10:10	63,766	M-2F / 2H	8	4/26	10:11	57,654	-9.6
M-5F / 202	9	4/26	11:58	63,277	M-2F / 2H	9	4/26	12:01	57,389	-9.3
Average				63,569	Average				57,992	-8.8
OTM-29	1	4/27	9:28	64,365	M-2F / 2H	10	4/27	9:36	57,410	-10.8
OTM-29	2	4/27	11:12	64,413	M-2F / 2H	11	4/27	11:18	57,326	-11.0
OTM-29	3	4/27	12:45	64,230	M-2F / 2H	12	4/27	12:49	56,878	-11.4
Average				64,336	Average				57,204	-11.1

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While the Method 2 flow data obtained directly from each sample train was used to calculate isokinetic sampling conditions for Method 5F/202, Modified CTM-027, and OTM-29, the Method 2F flow data was used to calculate the mass-based emission results. The WEFs calculated per Method 2H were applied to the Method 2F data.

PROJECT OVERVIEW**1-9***Notable Events – Method 2F*

The Method 2F Run 3 flow traverse (performed during Method 5/202 and Mod. CTM-027, Run 3 on 4/23) mistakenly collected erroneous data at traverse point 1-1 due to operator oversight. The erroneous data was removed from the average results; the effect on data quality appears to be negligible.

Notable Events – Mod. CTM-027

Due to an oversight, the samples were stored at room temperature rather than refrigerated during the time interval between sample delivery to the laboratory and sample receipt by the laboratory (4/28 to 4/30). The samples were logged in by the laboratory at 23°C, rather than 4°C as required by the method.

The theoretical effect of elevating the temperature of the samples would be to bias the results low. This assumes that some of the ammonium ions in solution reformed into ammonia and off-gassed from the samples. It is unknown to what degree this actually occurred, or if it actually occurred at all. It is the analytical laboratory's opinion that the samples should not need refrigeration whatsoever at a pH below 4.5. The impinger train sample fractions (where the majority of the sample was collected) all had measured pH values well below 4.5. The probe liner rinse sample fractions had measured pH values that were acidic, but above 4.5.

Evaluation of Final Results

Emission results were calculated in units of pounds per hour (lb/hr) using the flue gas flow rate determined with a separate 3D probe traverse per EPA Method 2F and corrected for wall effects per EPA Method 2H. The lb/hr emission rate was converted to units of pounds per 1000 pounds of coke burn (lb/Mlb coke) using process data collected by MPC.

Average NSFPM results, as well as all individual NSFPM results, were below 0.8 lb/Mlb coke burn. Average Total NSPM (NSFPM plus CPM) results, as well as all individual Total NSPM results were below 1.1 lb/Mlb coke burn.

NH₃ results obtained during similar test conditions were very consistent from run to run and were of the same order of magnitude as data collected during past test programs with similar process conditions.

HCN results appeared to be consistent from run to run.

PROJECT OVERVIEW**1-10**

QA/QC performed by the analytical laboratories were within method specifications for all samples. All field train blank and reagent blank analyses contained minimal to non-detectable levels of background contamination.

Where applicable in calculating the final results, the analytical method detection limits (MDLs) were utilized as the minimum measurable quantity of each constituent, rather than the laboratory's specified "limit of quantification" (LOQ). The LOQ is calculated by multiplying the calculated MDL by an arbitrary multiplier (3, 5, 7, 10, etc.); the multipliers selected by each laboratory vary and are not selected in consistent fashion.

End of Section 1 – Project Overview

RESULTS**2-1****Table 2-1:
NSFPM, CPM and Total Non-Sulfate PM (M-5F/202) – Condition 1**

Run No.	1	2	3	Average
Date (2012)	Apr 24	Apr 24	Apr 24	
Start Time (approx.)	10:33	12:48	14:33	
Stop Time (approx.)	11:43	13:53	15:55	
Process Conditions				
R _P Coke burn-off rate (Mlb coke/hr)	18.4	18.2	18.2	18.3
P ₁ FCC charge rate (bpd)	33,000	33,000	33,000	33,000
P ₂ ESP operation	West / MPR	West / MPR	West / MPR	
P ₃ NH3 injection (lb/hr)	8	8	8	
Gas Conditions				
O ₂ Oxygen (dry volume %)	2.0	2.0	2.2	2.1
CO ₂ Carbon dioxide (dry volume %)	16.3	16.3	16.2	16.3
T _s Sample temperature (°F)	569	568	566	568
B _w Actual water vapor in gas (% by volume)	9.5	9.3	9.4	9.4
Gas Flow Rate				
Q _a Volumetric flow rate, actual (acfm)	129,000	129,000	127,000	128,000
Q _s Volumetric flow rate, standard (scfm)	63,700	63,700	63,100	63,500
Q _{std} Volumetric flow rate, dry standard (dscfm)	57,600	57,800	57,100	57,500
Q _a Volumetric flow rate, actual (acf/hr)	7,720,000	7,720,000	7,630,000	7,690,000
Q _s Volumetric flow rate, standard (scf/hr)	3,820,000	3,820,000	3,780,000	3,810,000
Q _{std} Volumetric flow rate, dry standard (dscf/hr)	3,460,000	3,470,000	3,430,000	3,450,000
Sampling Data				
V _{mstd} Volume metered, standard (dscf)	36.01	33.86	36.26	35.38
%I Isokinetic sampling (%) ¹	99.5	93.0	100.7	97.7
Laboratory Data				
m _n Total NSFPM (g)	0.02630	0.02447	0.02664	
m _{CPM} Total CPM (g)	0.05004	0.04841	0.05142	
m _{Part} Total non-sulfate particulate matter (g)	0.07634	0.07289	0.07806	
n _{MDL} Number of non-detectable fractions	N/A	N/A	N/A	
DLC Detection level classification	ADL	ADL	ADL	
NSFPM Results				
C _{sd} Particulate Concentration (lb/dscf)	1.61E-06	1.59E-06	1.62E-06	1.61E-06
E _{lb/hr} Particulate Rate (lb/hr)	5.57	5.52	5.55	5.55
E _{Rp} Particulate Rate - Production-based (lb/Mlb coke)	0.303	0.303	0.305	0.304
CPM Results				
C _{sd} Particulate Concentration (lb/dscf)	3.06E-06	3.15E-06	3.13E-06	3.11E-06
E _{lb/hr} Particulate Rate (lb/hr)	10.6	10.9	10.7	10.7
E _{Rp} Particulate Rate - Production-based (lb/Mlb coke)	0.577	0.599	0.589	0.588
Total Non-Sulfate Particulate Matter Results				
C _{sd} Particulate Concentration (lb/dscf)	4.67E-06	4.75E-06	4.75E-06	4.72E-06
E _{lb/hr} Particulate Rate (lb/hr)	16.2	16.4	16.3	16.3
E _{Rp} Particulate Rate - Production-based (lb/Mlb coke)	0.881	0.902	0.894	0.892

Average includes 3 runs.

¹ Sample flow rates as determined by EPA Method 2 were used to calculate isokinetic sampling conditions.

Detection level classifications are defined as follows:

ADL = Above Detection Level - all fractions are above detection limit

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RESULTS**2-2****Table 2-2:
NSFPM, CPM and Total Non-Sulfate PM (M-5F/202) – Condition 2**

Run No.	4	5	6	Average
Date (2012)	Apr 25	Apr 25	Apr 25	
Start Time (approx.)	09:08	12:07	14:06	
Stop Time (approx.)	10:12	13:14	15:23	
Process Conditions				
R _P Coke burn-off rate (Mlb coke/hr)	18.1	18.1	18.1	18.1
P ₁ FCC charge rate (bpd)	32,500	32,500	32,500	32,500
P ₂ ESP operation	Both / MPR	Both / MPR	Both / MPR	
P ₃ NH3 injection (lb/hr)	8	8	8	
Gas Conditions				
O ₂ Oxygen (dry volume %)	2.4	2.5	2.3	2.4
CO ₂ Carbon dioxide (dry volume %)	16.1	16.0	16.2	16.1
T _s Sample temperature (°F)	557	557	557	557
B _w Actual water vapor in gas (% by volume)	9.6	9.9	9.7	9.7
Gas Flow Rate				
Q _a Volumetric flow rate, actual (acfm)	129,000	129,000	128,000	128,000
Q _s Volumetric flow rate, standard (scfm)	65,100	65,200	64,600	65,000
Q _{std} Volumetric flow rate, dry standard (dscfm)	58,800	58,700	58,400	58,700
Q _a Volumetric flow rate, actual (acf/hr)	7,710,000	7,730,000	7,660,000	7,700,000
Q _s Volumetric flow rate, standard (scf/hr)	3,910,000	3,910,000	3,880,000	3,900,000
Q _{std} Volumetric flow rate, dry standard (dscf/hr)	3,530,000	3,520,000	3,500,000	3,520,000
Sampling Data				
V _{mstd} Volume metered, standard (dscf)	35.40	35.60	35.65	35.55
%I Isokinetic sampling (%) ¹	101.0	101.4	101.3	101.2
Laboratory Data				
m _n Total NSFPM (g)	0.01293	0.01333	0.01576	
m _{CPM} Total CPM (g)	0.04205	0.04405	0.04385	
m _{Part} Total non-sulfate particulate matter (g)	0.05498	0.05738	0.05961	
n _{MDL} Number of non-detectable fractions	N/A	N/A	N/A	
DLC Detection level classification	ADL	ADL	ADL	
NSFPM Results				
C _{sd} Particulate Concentration (lb/dscf)	8.05E-07	8.25E-07	9.75E-07	8.69E-07
E _{lb/hr} Particulate Rate (lb/hr)	2.84	2.91	3.41	3.06
E _{Rp} Particulate Rate - Production-based (lb/Mlb coke)	0.157	0.161	0.189	0.169
CPM Results				
C _{sd} Particulate Concentration (lb/dscf)	2.62E-06	2.73E-06	2.71E-06	2.69E-06
E _{lb/hr} Particulate Rate (lb/hr)	9.25	9.61	9.50	9.45
E _{Rp} Particulate Rate - Production-based (lb/Mlb coke)	0.510	0.531	0.526	0.522
Total Non-Sulfate Particulate Matter Results				
C _{sd} Particulate Concentration (lb/dscf)	3.42E-06	3.55E-06	3.69E-06	3.55E-06
E _{lb/hr} Particulate Rate (lb/hr)	12.1	12.5	12.9	12.5
E _{Rp} Particulate Rate - Production-based (lb/Mlb coke)	0.666	0.692	0.715	0.691

Average includes 3 runs.

¹ Sample flow rates as determined by EPA Method 2 were used to calculate isokinetic sampling conditions.

Detection level classifications are defined as follows:

ADL = Above Detection Level - all fractions are above detection limit

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RESULTS**2-3****Table 2-3:
NSFPM, CPM and Total Non-Sulfate PM (M-5F/202) – Condition 3**

Run No.	7	8	9	Average
Date (2012)	Apr 26	Apr 26	Apr 26	
Start Time (approx.)	08:24	10:10	11:58	
Stop Time (approx.)	09:31	11:17	13:17	
Process Conditions				
R _P Coke burn-off rate (Mlb coke/hr)	18.1	18.1	18.1	18.1
P ₁ FCC charge rate (bpd)	32,500	32,500	32,500	32,500
P ₂ ESP operation	Both / LPR	Both / LPR	Both / LPR	
P ₃ NH3 injection (lb/hr)	8	8	8	
Gas Conditions				
O ₂ Oxygen (dry volume %)	2.3	2.3	2.4	2.3
CO ₂ Carbon dioxide (dry volume %)	16.0	16.0	15.8	15.9
T _s Sample temperature (°F)	560	558	556	558
B _w Actual water vapor in gas (% by volume)	10.0	10.1	10.0	10.0
Gas Flow Rate				
Q _a Volumetric flow rate, actual (acfm)	130,000	127,000	126,000	128,000
Q _s Volumetric flow rate, standard (scfm)	65,500	64,100	63,700	64,500
Q _{std} Volumetric flow rate, dry standard (dscfm)	58,900	57,700	57,400	58,000
Q _a Volumetric flow rate, actual (acf/hr)	7,830,000	7,650,000	7,580,000	7,690,000
Q _s Volumetric flow rate, standard (scf/hr)	3,930,000	3,850,000	3,820,000	3,870,000
Q _{std} Volumetric flow rate, dry standard (dscf/hr)	3,540,000	3,460,000	3,440,000	3,480,000
Sampling Data				
V _{mstd} Volume metered, standard (dscf)	36.79	36.53	35.97	36.43
%I Isokinetic sampling (%) ¹	104.3	103.4	102.6	103.5
Laboratory Data				
m _n Total NSFPM (g)	0.01655	0.01699	0.01364	
m _{CPM} Total CPM (g)	0.04177	0.04585	0.04593	
m _{Part} Total non-sulfate particulate matter (g)	0.05832	0.06284	0.05957	
n _{MDL} Number of non-detectable fractions	N/A	N/A	N/A	
DLC Detection level classification	ADL	ADL	ADL	
NSFPM Results				
C _{sd} Particulate Concentration (lb/dscf)	9.92E-07	1.03E-06	8.36E-07	9.51E-07
E _{lb/hr} Particulate Rate (lb/hr)	3.51	3.55	2.88	3.31
E _{Rp} Particulate Rate - Production-based (lb/Mlb coke)	0.194	0.196	0.159	0.183
CPM Results				
C _{sd} Particulate Concentration (lb/dscf)	2.50E-06	2.77E-06	2.82E-06	2.70E-06
E _{lb/hr} Particulate Rate (lb/hr)	8.85	9.57	9.69	9.37
E _{Rp} Particulate Rate - Production-based (lb/Mlb coke)	0.490	0.530	0.536	0.519
Total Non-Sulfate Particulate Matter Results				
C _{sd} Particulate Concentration (lb/dscf)	3.50E-06	3.79E-06	3.65E-06	3.65E-06
E _{lb/hr} Particulate Rate (lb/hr)	12.4	13.1	12.6	12.7
E _{Rp} Particulate Rate - Production-based (lb/Mlb coke)	0.684	0.726	0.695	0.702

Average includes 3 runs.

¹ Sample flow rates as determined by EPA Method 2 were used to calculate isokinetic sampling conditions.

Detection level classifications are defined as follows:

ADL = Above Detection Level - all fractions are above detection limit

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RESULTS**2-4****Table 2-4:
NH₃ (Mod. CTM-027) – Condition 1**

Run No.	1	2	3	Average
Date (2012)	Apr 24	Apr 24	Apr 24	
Start Time (approx.)	10:33	12:48	14:33	
Stop Time (approx.)	11:33	13:48	15:33	
Process Conditions				
R _P Coke burn-off rate (Mlb coke/hr)	18.4	18.2	18.2	18.3
P ₁ FCC charge rate (bpd)	33,000	33,000	33,000	33,000
P ₂ ESP operation	West / MPR	West / MPR	West / MPR	
P ₃ NH ₃ injection (lb/hr)	8	8	8	
Gas Conditions				
O ₂ Oxygen (dry volume %)	2.0	2.0	2.2	2.1
CO ₂ Carbon dioxide (dry volume %)	16.4	16.4	16.2	16.3
T _s Sample temperature (°F)	568	567	567	567
B _w Actual water vapor in gas (% by volume)	9.9	10.1	9.7	9.9
Gas Flow Rate				
Q _a Volumetric flow rate, actual (acfm)	129,000	129,000	127,000	128,000
Q _s Volumetric flow rate, standard (scfm)	63,700	63,800	63,000	63,500
Q _{std} Volumetric flow rate, dry standard (dscfm)	57,400	57,300	56,900	57,200
Q _a Volumetric flow rate, actual (acf/hr)	7,720,000	7,720,000	7,630,000	7,690,000
Q _s Volumetric flow rate, standard (scf/hr)	3,820,000	3,830,000	3,780,000	3,810,000
Q _{std} Volumetric flow rate, dry standard (dscf/hr)	3,440,000	3,440,000	3,410,000	3,430,000
Sampling Data				
V _{mstd} Volume metered, standard (dscf)	34.66	35.47	36.12	35.41
%I Isokinetic sampling (%) ¹	98.9	101.2	100.6	100.2
Laboratory Data				
m _n Total NH ₃ collected (mg)	20.1313	20.6721	21.0722	
Ammonia (NH₃) Results				
C _{sd} Ammonia Concentration (lb/dscf)	1.28E-06	1.29E-06	1.29E-06	1.28E-06
C _{sd} Ammonia Concentration (ppmdv)	29.0	29.1	29.1	29.1
E _{lb/hr} Ammonia Rate (lb/hr)	4.41	4.42	4.39	4.41
E _{Rp} Ammonia Rate - Production-based (lb/Mlb coke)	0.240	0.242	0.241	0.241

Average includes 3 runs.

¹ Sample flow rates as determined by EPA Method 2 were used to calculate isokinetic sampling conditions.

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RESULTS**2-5****Table 2-5:
NH₃ (Mod. CTM-027) – Condition 2**

Run No.	4	5	6	Average
Date (2012)	Apr 25	Apr 25	Apr 25	
Start Time (approx.)	09:08	12:07	14:06	
Stop Time (approx.)	10:08	13:07	15:06	
Process Conditions				
R _P Coke burn-off rate (Mlb coke/hr)	18.1	18.1	18.1	18.1
P ₁ FCC charge rate (bpd)	32,500	32,500	32,500	32,500
P ₂ ESP operation	Both / MPR	Both / MPR	Both / MPR	
P ₃ NH ₃ injection (lb/hr)	8	8	8	
Gas Conditions				
O ₂ Oxygen (dry volume %)	2.7	2.5	2.6	2.6
CO ₂ Carbon dioxide (dry volume %)	15.9	16.0	15.9	15.9
T _s Sample temperature (°F)	555	555	554	555
B _w Actual water vapor in gas (% by volume)	9.7	9.6	9.7	9.7
Gas Flow Rate				
Q _a Volumetric flow rate, actual (acfm)	129,000	129,000	128,000	128,000
Q _s Volumetric flow rate, standard (scfm)	65,200	65,300	64,800	65,100
Q _{std} Volumetric flow rate, dry standard (dscfm)	58,900	59,100	58,500	58,800
Q _a Volumetric flow rate, actual (acf/hr)	7,710,000	7,730,000	7,660,000	7,700,000
Q _s Volumetric flow rate, standard (scf/hr)	3,910,000	3,920,000	3,890,000	3,910,000
Q _{std} Volumetric flow rate, dry standard (dscf/hr)	3,530,000	3,550,000	3,510,000	3,530,000
Sampling Data				
V _{mstd} Volume metered, standard (dscf)	34.28	34.82	33.03	34.04
%I Isokinetic sampling (%) ¹	99.9	101.6	99.6	100.4
Laboratory Data				
m _n Total NH ₃ collected (mg)	10.5610	10.5713	9.5688	
Ammonia (NH₃) Results				
C _{sd} Ammonia Concentration (lb/dscf)	6.79E-07	6.69E-07	6.39E-07	6.63E-07
C _{sd} Ammonia Concentration (ppmdv)	15.4	15.2	14.5	15.0
E _{lb/hr} Ammonia Rate (lb/hr)	2.40	2.37	2.24	2.34
E _{Rp} Ammonia Rate - Production-based (lb/Mlb coke)	0.132	0.131	0.124	0.129

Average includes 3 runs.

¹ Sample flow rates as determined by EPA Method 2 were used to calculate isokinetic sampling conditions.

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RESULTS**2-6****Table 2-6:
NH₃ (Mod. CTM-027) – Condition 3**

Run No.	7	8	9	Average
Date (2012)	Apr 26	Apr 26	Apr 26	
Start Time (approx.)	08:24	10:10	11:58	
Stop Time (approx.)	09:24	11:10	12:58	
Process Conditions				
R _P Coke burn-off rate (Mlb coke/hr)	18.1	18.1	18.1	18.1
P ₁ FCC charge rate (bpd)	32,500	32,500	32,500	32,500
P ₂ ESP operation	Both / LPR	Both / LPR	Both / LPR	
P ₃ NH ₃ injection (lb/hr)	8	8	8	
Gas Conditions				
O ₂ Oxygen (dry volume %)	2.4	2.5	2.5	2.5
CO ₂ Carbon dioxide (dry volume %)	15.9	15.8	15.9	15.9
T _s Sample temperature (°F)	558	556	553	555
B _w Actual water vapor in gas (% by volume)	10.7	9.9	10.3	10.3
Gas Flow Rate				
Q _a Volumetric flow rate, actual (acfm)	130,000	127,000	126,000	128,000
Q _s Volumetric flow rate, standard (scfm)	65,700	64,200	63,900	64,600
Q _{std} Volumetric flow rate, dry standard (dscfm)	58,700	57,900	57,300	58,000
Q _a Volumetric flow rate, actual (acf/hr)	7,830,000	7,650,000	7,580,000	7,690,000
Q _s Volumetric flow rate, standard (scf/hr)	3,940,000	3,850,000	3,840,000	3,880,000
Q _{std} Volumetric flow rate, dry standard (dscf/hr)	3,520,000	3,470,000	3,440,000	3,480,000
Sampling Data				
V _{mstd} Volume metered, standard (dscf)	34.33	35.18	34.08	34.53
%I Isokinetic sampling (%) ¹	100.5	101.1	102.3	101.3
Laboratory Data				
m _n Total NH ₃ collected (mg)	10.6365	9.7750	10.4514	
Ammonia (NH₃) Results				
C _{sd} Ammonia Concentration (lb/dscf)	6.83E-07	6.13E-07	6.76E-07	6.57E-07
C _{sd} Ammonia Concentration (ppmdv)	15.5	13.9	15.3	14.9
E _{lb/hr} Ammonia Rate (lb/hr)	2.41	2.13	2.33	2.29
E _{Rp} Ammonia Rate - Production-based (lb/Mlb coke)	0.133	0.118	0.129	0.126

Average includes 3 runs.

¹ Sample flow rates as determined by EPA Method 2 were used to calculate isokinetic sampling conditions.

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RESULTS**2-7****Table 2-7:
NH₃ (Mod. CTM-027) – Condition 4**

Run No.	10	11	12	Average
Date (2012)	Apr 27	Apr 27	Apr 27	
Start Time (approx.)	09:28	11:12	12:45	
Stop Time (approx.)	10:28	12:12	13:45	
Process Conditions				
R _P Coke burn-off rate (Mlb coke/hr)	17.9	17.9	17.9	17.9
P ₁ FCC charge rate (bpd)	32,500	32,500	32,500	32,500
P ₂ ESP operation	Both	Both	Both	
P ₃ NH ₃ injection (lb/hr)	8	8	8	
Gas Conditions				
O ₂ Oxygen (dry volume %)	3.8	2.8	3.1	3.2
CO ₂ Carbon dioxide (dry volume %)	14.7	15.6	15.4	15.2
T _s Sample temperature (°F)	551	552	552	552
B _w Actual water vapor in gas (% by volume)	9.8	9.7	9.3	9.6
Gas Flow Rate				
Q _a Volumetric flow rate, actual (acfm)	123,000	126,000	121,000	123,000
Q _s Volumetric flow rate, standard (scfm)	63,200	64,800	62,500	63,500
Q _{std} Volumetric flow rate, dry standard (dscfm)	57,100	58,600	56,700	57,400
Q _a Volumetric flow rate, actual (acf/hr)	7,360,000	7,550,000	7,280,000	7,400,000
Q _s Volumetric flow rate, standard (scf/hr)	3,790,000	3,890,000	3,750,000	3,810,000
Q _{std} Volumetric flow rate, dry standard (dscf/hr)	3,420,000	3,510,000	3,400,000	3,450,000
Sampling Data				
V _{mstd} Volume metered, standard (dscf)	34.70	34.61	34.17	34.49
%I Isokinetic sampling (%) ¹	100.7	100.5	99.5	100.2
Laboratory Data				
m _n Total NH ₃ collected (mg)	10.7336	11.1983	11.3417	
Ammonia (NH₃) Results				
C _{sd} Ammonia Concentration (lb/dscf)	6.82E-07	7.14E-07	7.32E-07	7.09E-07
C _{sd} Ammonia Concentration (ppmdv)	15.4	16.2	16.6	16.1
E _{lb/hr} Ammonia Rate (lb/hr)	2.33	2.51	2.49	2.44
E _{Rp} Ammonia Rate - Production-based (lb/Mlb coke)	0.130	0.140	0.139	0.136

Average includes 3 runs.

¹ Sample flow rates as determined by EPA Method 2 were used to calculate isokinetic sampling conditions.

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RESULTS**2-8****Table 2-8:
HCN (OTM-29) – Condition 4**

Run No.	1	2	3	Average
Date (2012)	Apr 27	Apr 27	Apr 27	
Start Time (approx.)	09:28	11:12	12:45	
Stop Time (approx.)	10:34	12:17	14:00	
Process Conditions				
R _P Coke burn-off rate (Mlb coke/hr)	17.9	17.9	17.9	17.9
P ₁ FCC charge rate (bpd)	32,500	32,500	32,500	32,500
P ₂ ESP operation	Both	Both	Both	
P ₃ NH3 injection (lb/hr)	8	8	8	
Gas Conditions				
O ₂ Oxygen (dry volume %)	3.0	2.9	4.9	3.6
CO ₂ Carbon dioxide (dry volume %)	11.6	11.7	12.2	11.8
T _s Sample temperature (°F)	554	554	555	554
B _w Actual water vapor in gas (% by volume)	9.8	9.7	9.3	9.6
Gas Flow Rate				
Q _a Volumetric flow rate, actual (acfm)	123,000	126,000	121,000	123,000
Q _s Volumetric flow rate, standard (scfm)	63,100	64,700	62,300	63,400
Q _{std} Volumetric flow rate, dry standard (dscfm)	56,900	58,400	56,500	57,300
Q _a Volumetric flow rate, actual (acf/hr)	7,360,000	7,550,000	7,280,000	7,400,000
Q _s Volumetric flow rate, standard (scf/hr)	3,780,000	3,880,000	3,740,000	3,800,000
Q _{std} Volumetric flow rate, dry standard (dscf/hr)	3,410,000	3,510,000	3,390,000	3,440,000
Sampling Data				
V _{mstd} Volume metered, standard (dscf)	32.54	33.06	32.13	32.58
%I Isokinetic sampling (%) ¹	104.2	105.7	103.1	104.3
Laboratory Data				
m _n Total HCN collected (µg)	16,533	16,450	16,954	16,646
Hydrogen Cyanide (HCN) Results				
C _{sd} HCN Concentration (lb/dscf)	1.12E-06	1.10E-06	1.16E-06	1.13E-06
C _{sd} HCN Concentration (ppmdv)	16.0	15.7	16.6	16.1
E _{lb/hr} HCN Rate (lb/hr)	3.82	3.85	3.95	3.87
E _{Rp} HCN Rate - Production-based (lb/Mlb coke)	0.213	0.214	0.220	0.216

Average includes 3 runs.

¹ Sample flow rates as determined by EPA Method 2 were used to calculate isokinetic sampling conditions.

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RESULTS**2-9****Table 2-9:
Uncertainty Analysis – NSFPM (M-5F)**

		Condition 1		Condition 2		Condition 3	
		Coke Burn = 18.3 Mlb/hr		Coke Burn = 18.1 Mlb/hr		Coke Burn = 18.1 Mlb/hr	
		Charge = 33,000 bpd		Charge = 32,500 bpd		Charge = 32,500 bpd	
		ESP Operation = West / MPR		ESP Operation = Both / MPR		ESP Operation = Both / LPR	
		NH ₃ Injection = 8 lb/hr		NH ₃ Injection = 8 lb/hr		NH ₃ Injection = 8 lb/hr	
		NSFPM Results		NSFPM Results		NSFPM Results	
		(lb/Mlb coke)		(lb/Mlb coke)		(lb/Mlb coke)	
Method		5F/202		5F/202		5F/202	
Run No.	1	0.303	4	0.157	7	0.194	
	2	0.303	5	0.161	8	0.196	
	3	0.305	6	0.189	9	0.159	
SD		0.001		0.018		0.021	
AVG		0.304		0.169		0.183	
RSD		0.4%		10.5%		11.3%	
N		3		3		3	
SE		0.001		0.010		0.012	
RSE		0.2%		6.0%		6.6%	
P		95.0%		95.0%		95.0%	
TINV		4.303		4.303		4.303	
CI +		0.307		0.213		0.235	
AVG		0.304		0.169		0.183	
CI -		0.301		0.125		0.132	
TB +		0.313		0.304		0.342	

AVG (average) is the mean value of the runs; N is the number of individual runs.

SD (standard deviation) and RSD (relative standard deviation) are measures of the variability of individual runs.

SE (standard error) and RSE (relative standard error) are measures of the variability of the average of the runs.

P (probability) is the confidence level associated with the two-tailed Student's t-distribution.

TINV (t-value) is the value of the Student's t-distribution as a function of P (probability) and N-1 (degrees of freedom).

CI (confidence interval) indicates that if the test is conducted again under the same conditions, the average would be expected to fall within the interval (CI- to CI+) about 95% of the time.

TB+ (upper tolerance bound) is the value below which 95% of future runs are expected to fall (assuming testing at the same conditions).

RESULTS**2-10****Table 2-10:
Uncertainty Analysis – CPM (M-202)**

		Condition 1		Condition 2		Condition 3	
		Coke Burn = 18.3 Mlb/hr Charge = 33,000 bpd ESP Operation = West / MPR NH ₃ Injection = 8 lb/hr		Coke Burn = 18.1 Mlb/hr Charge = 32,500 bpd ESP Operation = Both / MPR NH ₃ Injection = 8 lb/hr		Coke Burn = 18.1 Mlb/hr Charge = 32,500 bpd ESP Operation = Both / LPR NH ₃ Injection = 8 lb/hr	
		CPM Results (lb/Mlb coke)		CPM Results (lb/Mlb coke)		CPM Results (lb/Mlb coke)	
Method		5F/202		5F/202		5F/202	
Run No.	1	0.577	4	0.510	7	0.490	
	2	0.599	5	0.531	8	0.530	
	3	0.589	6	0.526	9	0.536	
SD		0.011		0.011		0.025	
AVG		0.588		0.522		0.519	
RSD		1.8%		2.1%		4.8%	
N		3		3		3	
SE		0.006		0.006		0.014	
RSE		1.1%		1.2%		2.8%	
P		95.0%		95.0%		95.0%	
TINV		4.303		4.303		4.303	
CI +		0.615		0.550		0.580	
AVG		0.588		0.522		0.519	
CI -		0.562		0.494		0.457	
TB +		0.671		0.608		0.709	

AVG (average) is the mean value of the runs; N is the number of individual runs.

SD (standard deviation) and RSD (relative standard deviation) are measures of the variability of individual runs.

SE (standard error) and RSE (relative standard error) are measures of the variability of the average of the runs.

P (probability) is the confidence level associated with the two-tailed Student's t-distribution.

TINV (t-value) is the value of the Student's t-distribution as a function of P (probability) and N-1 (degrees of freedom).

CI (confidence interval) indicates that if the test is conducted again under the same conditions, the average would be expected to fall within the interval (CI- to CI+) about 95% of the time.

TB+ (upper tolerance bound) is the value below which 95% of future runs are expected to fall (assuming testing at the same conditions).

RESULTS**Table 2-11:
Uncertainty Analysis – Total Non-Sulfate PM (M-5F/202)**

		Condition 1		Condition 2		Condition 3	
		Coke Burn = 18.3 Mlb/hr Charge = 33,000 bpd ESP Operation = West / MPR NH ₃ Injection = 8 lb/hr		Coke Burn = 18.1 Mlb/hr Charge = 32,500 bpd ESP Operation = Both / MPR NH ₃ Injection = 8 lb/hr		Coke Burn = 18.1 Mlb/hr Charge = 32,500 bpd ESP Operation = Both / LPR NH ₃ Injection = 8 lb/hr	
		Total NSPM Results (lb/Mlb coke)		Total NSPM Results (lb/Mlb coke)		Total NSPM Results (lb/Mlb coke)	
Method		5F/202		5F/202		5F/202	
Run No.	1	0.881	4	0.666	7	0.684	
	2	0.902	5	0.692	8	0.726	
	3	0.894	6	0.715	9	0.695	
SD		0.011		0.024		0.022	
AVG		0.892		0.691		0.702	
RSD		1.2%		3.5%		3.1%	
N		3		3		3	
SE		0.006		0.014		0.012	
RSE		0.7%		2.0%		1.8%	
P		95.0%		95.0%		95.0%	
TINV		4.303		4.303		4.303	
CI +		0.919		0.752		0.755	
AVG		0.892		0.691		0.702	
CI -		0.866		0.630		0.648	
TB +		0.974		0.878		0.867	

AVG (average) is the mean value of the runs; N is the number of individual runs.

SD (standard deviation) and RSD (relative standard deviation) are measures of the variability of individual runs.

SE (standard error) and RSE (relative standard error) are measures of the variability of the average of the runs.

P (probability) is the confidence level associated with the two-tailed Student's t-distribution.

TINV (t-value) is the value of the Student's t-distribution as a function of P (probability) and N-1 (degrees of freedom).

CI (confidence interval) indicates that if the test is conducted again under the same conditions, the average would be expected to fall within the interval (CI- to CI+) about 95% of the time.

TB+ (upper tolerance bound) is the value below which 95% of future runs are expected to fall (assuming testing at the same conditions).

RESULTS**2-12****Table 2-12:
Uncertainty Analysis – NH₃, ppmdv (Mod. CTM-027)**

Condition 1 Coke Burn = 18.3 Mlb/hr Charge = 33,000 bpd ESP Operation = West / MPR NH ₃ Injection = 8 lb/hr		Condition 2 Coke Burn = 18.1 Mlb/hr Charge = 32,500 bpd ESP Operation = Both / MPR NH ₃ Injection = 8 lb/hr		Condition 3 Coke Burn = 18.1 Mlb/hr Charge = 32,500 bpd ESP Operation = Both / LPR NH ₃ Injection = 8 lb/hr		Condition 4 Coke Burn = 17.9 Mlb/hr Charge = 32,500 bpd ESP Operation = Both NH ₃ Injection = 8 lb/hr	
NH3 Results (ppmdv)		NH3 Results (ppmdv)		NH3 Results (ppmdv)		NH3 Results (ppmdv)	
Method	Mod. CTM-027	Method	Mod. CTM-027	Method	Mod. CTM-027	Method	Mod. CTM-027
Run No. 1	29.0	Run No. 4	15.4	Run No. 7	15.5	Run No. 10	15.4
2	29.1	5	15.2	8	13.9	11	16.2
3	29.1	6	14.5	9	15.3	12	16.6
SD	0.067	SD	0.480	SD	0.879	SD	0.571
AVG	29.1	AVG	15.0	AVG	14.9	AVG	16.1
RSD	0.2%	RSD	3.2%	RSD	5.9%	RSD	3.6%
N	3	N	3	N	3	N	3
SE	0.039	SE	0.277	SE	0.508	SE	0.330
RSE	0.1%	RSE	1.8%	RSE	3.4%	RSE	2.1%
P	95.0%	P	95.0%	P	95.0%	P	95.0%
TINV	4.303	TINV	4.303	TINV	4.303	TINV	4.303
CI +	29.2	CI +	16.2	CI +	17.1	CI +	17.5
AVG	29.1	AVG	15.0	AVG	14.9	AVG	16.1
CI -	28.9	CI -	13.8	CI -	12.7	CI -	14.6
TB +	29.6	TB +	18.7	TB +	21.6	TB +	20.4

AVG (average) is the mean value of the runs; N is the number of individual runs.

SD (standard deviation) and RSD (relative standard deviation) are measures of the variability of individual runs.

SE (standard error) and RSE (relative standard error) are measures of the variability of the average of the runs.

P (probability) is the confidence level associated with the two-tailed Student's t-distribution.

TINV (t-value) is the value of the Student's t-distribution as a function of P (probability) and N-1 (degrees of freedom).

CI (confidence interval) indicates that if the test is conducted again under the same conditions, the average would be expected to fall within the interval (CI- to CI+) about 95% of the time.

TB+ (upper tolerance bound) is the value below which 95% of future runs are expected to fall (assuming testing at the same conditions).

RESULTS**2-13****Table 2-13:
Uncertainty Analysis – NH₃, lb/hr (Mod. CTM-027)**

		Condition 1		Condition 2		Condition 3		Condition 4	
		Coke Burn = 18.3 Mlb/hr Charge = 33,000 bpd ESP Operation = West / MPR NH ₃ Injection = 8 lb/hr		Coke Burn = 18.1 Mlb/hr Charge = 32,500 bpd ESP Operation = Both / MPR NH ₃ Injection = 8 lb/hr		Coke Burn = 18.1 Mlb/hr Charge = 32,500 bpd ESP Operation = Both / LPR NH ₃ Injection = 8 lb/hr		Coke Burn = 17.9 Mlb/hr Charge = 32,500 bpd ESP Operation = Both NH ₃ Injection = 8 lb/hr	
		NH₃ Results (lb/hr)		NH₃ Results (lb/hr)		NH₃ Results (lb/hr)		NH₃ Results (lb/hr)	
Method		Mod. CTM-027		Mod. CTM-027		Mod. CTM-027		Mod. CTM-027	
Run No.		1	4	5	7	8	10	11	12
		4.41	4.42	4.39	2.40	2.37	2.41	2.13	2.33
					2.24	2.24	2.33	2.33	2.49
SD		0.015	0.084	0.143	0.095				
AVG		4.41	2.34	2.29	2.44				
RSD		0.3%	3.6%	6.3%	3.9%				
N		3	3	3	3				
SE		0.009	0.048	0.083	0.055				
RSE		0.2%	2.1%	3.6%	2.2%				
P		95.0%	95.0%	95.0%	95.0%				
TINV		4.303	4.303	4.303	4.303				
CI +		4.45	2.55	2.64	2.68				
AVG		4.41	2.34	2.29	2.44				
CI -		4.37	2.13	1.93	2.21				
TB +		4.53	2.98	3.38	3.17				

AVG (average) is the mean value of the runs; N is the number of individual runs.

SD (standard deviation) and RSD (relative standard deviation) are measures of the variability of individual runs.

SE (standard error) and RSE (relative standard error) are measures of the variability of the average of the runs.

P (probability) is the confidence level associated with the two-tailed Student's t-distribution.

TINV (t-value) is the value of the Student's t-distribution as a function of P (probability) and N-1 (degrees of freedom).

CI (confidence interval) indicates that if the test is conducted again under the same conditions, the average would be expected to fall within the interval (CI- to CI+) about 95% of the time.

TB+ (upper tolerance bound) is the value below which 95% of future runs are expected to fall (assuming testing at the same conditions).

RESULTS**2-14****Table 2-14:
Uncertainty Analysis – NH₃, lb/Mlb coke burn (Mod. CTM-027)**

Method Run No.	Condition 1 Coke Burn = 18.3 Mlb/hr Charge = 33,000 bpd ESP Operation = West / MPR NH ₃ Injection = 8 lb/hr		Condition 2 Coke Burn = 18.1 Mlb/hr Charge = 32,500 bpd ESP Operation = Both / MPR NH ₃ Injection = 8 lb/hr		Condition 3 Coke Burn = 18.1 Mlb/hr Charge = 32,500 bpd ESP Operation = Both / LPR NH ₃ Injection = 8 lb/hr		Condition 4 Coke Burn = 17.9 Mlb/hr Charge = 32,500 bpd ESP Operation = Both NH ₃ Injection = 8 lb/hr	
	NH ₃ Results (lb/Mlb coke)		NH ₃ Results (lb/Mlb coke)		NH ₃ Results (lb/Mlb coke)		NH ₃ Results (lb/Mlb coke)	
	Mod. CTM-027		Mod. CTM-027		Mod. CTM-027		Mod. CTM-027	
1	0.240	4	0.132	7	0.133	10	0.130	
2	0.242	5	0.131	8	0.118	11	0.140	
3	0.241	6	0.124	9	0.129	12	0.139	
SD	0.001		0.004		0.008		0.005	
AVG	0.241		0.129		0.126		0.136	
RSD	0.4%		3.4%		6.3%		3.9%	
N	3		3		3		3	
SE	0.001		0.003		0.005		0.003	
RSE	0.2%		2.0%		3.6%		2.2%	
P	95.0%		95.0%		95.0%		95.0%	
TINV	4.303		4.303		4.303		4.303	
CI +	0.244		0.140		0.146		0.149	
AVG	0.241		0.129		0.126		0.136	
CI -	0.239		0.118		0.107		0.123	
TB +	0.249		0.163		0.187		0.177	

AVG (average) is the mean value of the runs; N is the number of individual runs.

SD (standard deviation) and RSD (relative standard deviation) are measures of the variability of individual runs.

SE (standard error) and RSE (relative standard error) are measures of the variability of the average of the runs.

P (probability) is the confidence level associated with the two-tailed Student's t-distribution.

TINV (t-value) is the value of the Student's t-distribution as a function of P (probability) and N-1 (degrees of freedom).

CI (confidence interval) indicates that if the test is conducted again under the same conditions, the average would be expected to fall within the interval (CI- to CI+) about 95% of the time.

TB+ (upper tolerance bound) is the value below which 95% of future runs are expected to fall (assuming testing at the same conditions).

RESULTS**2-15****Table 2-15:
Uncertainty Analysis – HCN (OTM-29)**

Method Run No.	Condition 4 Coke Burn = 17.9 Mlb/hr Charge = 32,500 bpd ESP Operation = Both NH ₃ Injection = 8 lb/hr		Condition 4 Coke Burn = 17.9 Mlb/hr Charge = 32,500 bpd ESP Operation = Both NH ₃ Injection = 8 lb/hr		Condition 4 Coke Burn = 17.9 Mlb/hr Charge = 32,500 bpd ESP Operation = Both NH ₃ Injection = 8 lb/hr	
	HCN Results (ppmdv)		HCN Results (lb/hr)		HCN Results (lb/Mlb coke)	
	OTM-29		OTM-29		OTM-29	
10	16.0	10	3.82	10	0.213	
11	15.7	11	3.85	11	0.214	
12	16.6	12	3.95	12	0.220	
SD	0.480		0.065		0.004	
AVG	16.1		3.87		0.216	
RSD	3.0%		1.7%		1.7%	
N	3		3		3	
SE	0.277		0.037		0.002	
RSE	1.7%		1.0%		1.0%	
P	95.0%		95.0%		95.0%	
TINV	4.303		4.303		4.303	
CI +	17.3		4.03		0.225	
AVG	16.1		3.87		0.216	
CI -	14.9		3.71		0.207	
TB +	19.7		4.37		0.245	

AVG (average) is the mean value of the runs; N is the number of individual runs.

SD (standard deviation) and RSD (relative standard deviation) are measures of the variability of individual runs.

SE (standard error) and RSE (relative standard error) are measures of the variability of the average of the runs.

P (probability) is the confidence level associated with the two-tailed Student's t-distribution.

TINV (t-value) is the value of the Student's t-distribution as a function of P (probability) and N-1 (degrees of freedom).

CI (confidence interval) indicates that if the test is conducted again under the same conditions, the average would be expected to fall within the interval (CI- to CI+) about 95% of the time.

TB+ (upper tolerance bound) is the value below which 95% of future runs are expected to fall (assuming testing at the same conditions).

End of Section 2 – Results

DESCRIPTION OF INSTALLATION**3-1****PROCESS DESCRIPTION**

MPC's facility in Detroit, Michigan, produces refined petroleum products from crude oil. The Fluid Catalytic Cracking Unit (FCCU) utilizes a primary reactor, a distillation column and a catalyst regeneration unit to continuously generate light hydrocarbon products from heavy crude oil feeds.

The FCCU is equipped with an ESP with two (2) bays and variable aqueous NH_3 injection to control emissions. The testing described in this document was performed at the FCCU Regenerator Stack.

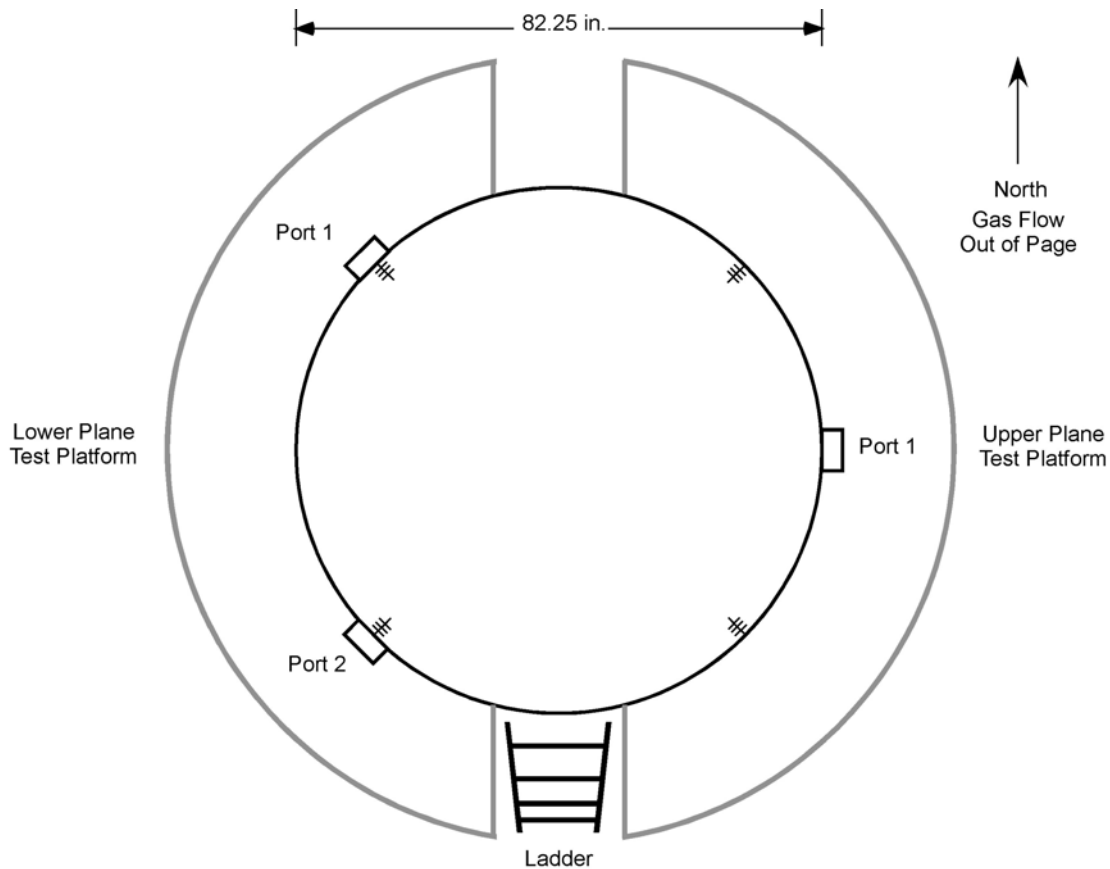
DESCRIPTION OF SAMPLING LOCATIONS

Sampling point locations were determined according to EPA Methods 1 and 2H, where applicable.

Table 3-1 outlines the sampling point configurations. Figures 3-1 through 3-3 (on pages 3-2 through 3-4) illustrate the sampling points and orientation of sampling ports for each of the sources tested in the program.

**Table 3-1:
Sampling Points**

<u>Source</u>				Points per	Minutes	Total	
Constituent	Method (USEPA)	Run No.	Ports	Port	per Point	Minutes	Figure
<u>FCCU Regenerator Stack</u>							
Velocity Decay	2H	1-4	2	6	Varied	Varied	3-1
NSFPM/CPM	M-5F/202	1-9	2	12	2.5	60	3-2
3-D Flow	2F	1-12	2	12	Varied	Varied	3-2
HCN	OTM-29	1-3	2	12	2.5	60	3-2
NH_3	Mod. CTM-027	1-12	1	1	60	60	3-3

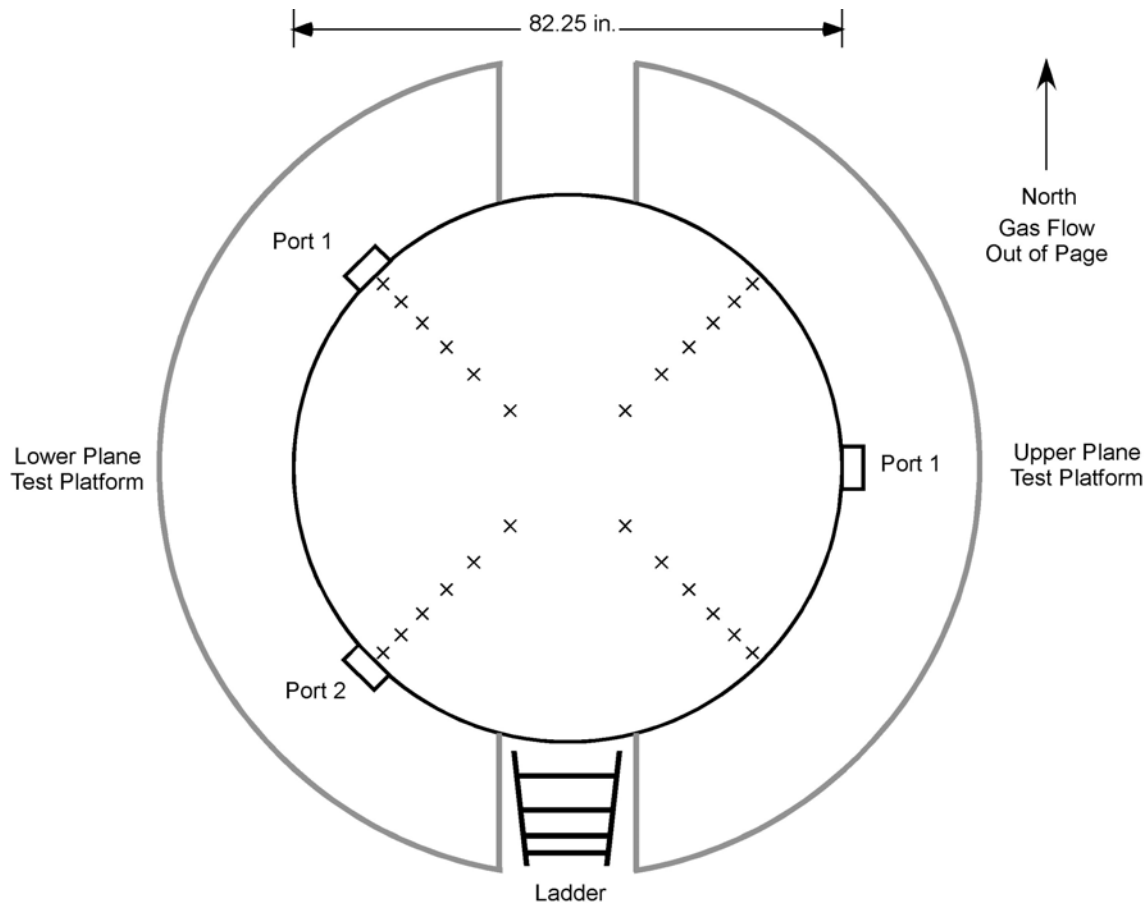
DESCRIPTION OF INSTALLATION**3-2**

Note: Ports on the lower plane were used for these points.

<u>Sampling Point</u>	<u>Port to Point Distance (in.)</u>
1	81.25
2	80.25
3	79.25
4	3.0
5	2.0
6	1.0

Duct diameters upstream from flow disturbance (A):	2.2	Limit: 0.5
Duct diameters downstream from flow disturbance (B):	3.4	Limit: 2.0

Figure 3-1: FCCU Regenerator Stack Sampling Points (EPA M-2H)

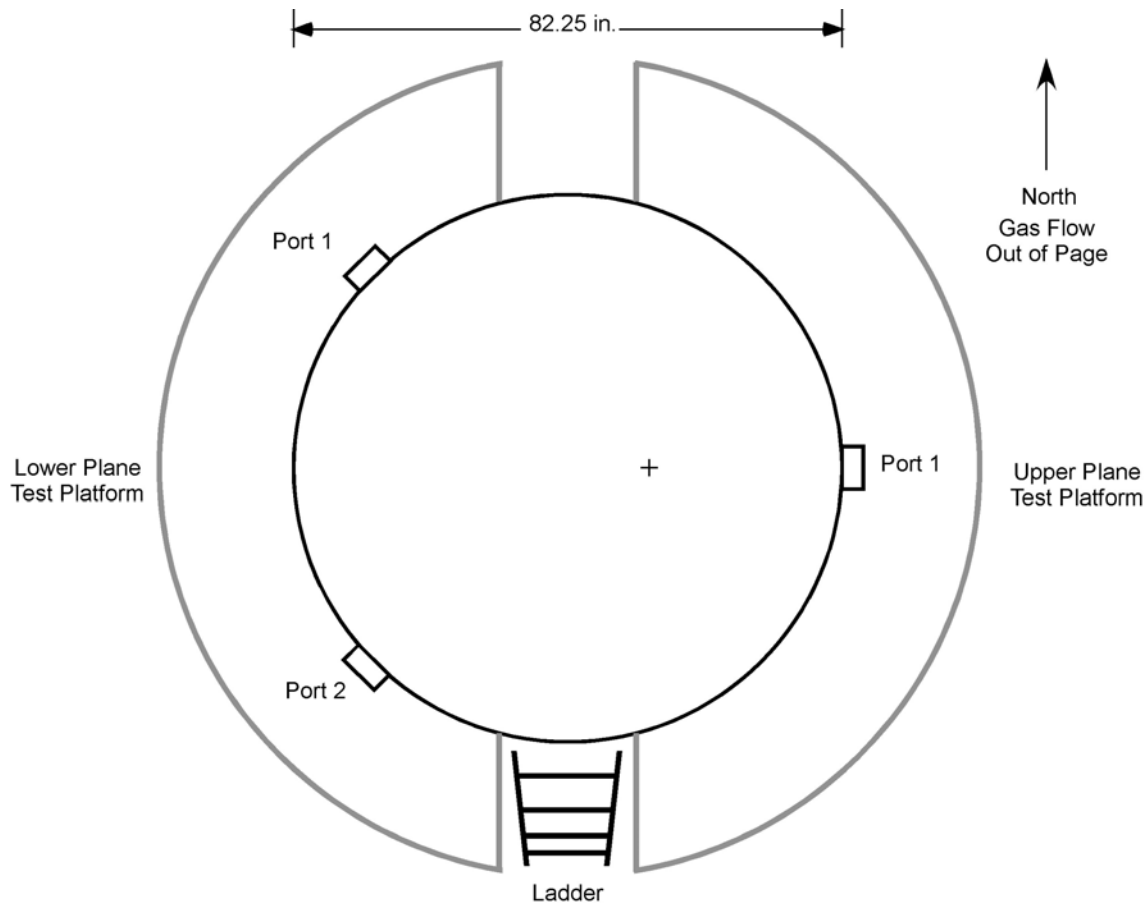
DESCRIPTION OF INSTALLATION**3-3**

Note: Ports on the lower plane will be used for these points.

<u>Sampling Point</u>	<u>Port to Point Distance (in.)</u>
1	80.5
2	76.7
3	72.5
4	67.7
5	61.7
6	53.0
7	29.3
8	20.6
9	14.6
10	9.7
11	5.5
12	1.7

Duct diameters upstream from flow disturbance (A):	2.2	Limit: 0.5
Duct diameters downstream from flow disturbance (B):	3.4	Limit: 2.0

Figure 3-2: FCCU Regenerator Stack Sampling Points (EPA M-5F/202, M-2F, and OTM-29)

DESCRIPTION OF INSTALLATION**3-4**

Note: The port on the upper plane will be used for this point.

<u>Sampling Point</u>	<u>Approximate Port to Point Distance (in.)</u>		
1	36.0		
Duct diameters upstream from flow disturbance (A):	2.2	Limit:	0.5
Duct diameters downstream from flow disturbance (B):	3.4	Limit:	2.0

Figure 3-3: FCCU Regenerator Stack Sampling Points (EPA Mod. CTM-027)

End of Section 3 – Description of Installation

METHODOLOGY**4-1**

Clean Air Engineering followed or referenced procedures as detailed in USEPA Methods 1, 2, 2F, 2H, 3, 3A, 4, 5F, 202, Conditional Test Method (CTM) 027, Alternative Methods (ALT) 009 and 031, and Other Test Method (OTM) 29. The following table summarizes the methods and their respective sources.

**Table 4-1:
Summary of Sampling Procedures**

Title 40 CFR Part 60 Appendix A

Method 1	"Sample and Velocity Traverses for Stationary Sources"
Method 2	"Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)"
Method 2F	"Determination of Stack Gas Velocity And Volumetric Flow Rate with Three-Dimensional Probes"
Method 2H	"Determination of Stack Gas Velocity Taking into Account Velocity Decay near the Stack Wall"
Method 3	"Gas Analysis for the Determination of Dry Molecular Weight"
Method 3A	"Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)"
Method 4	"Determination of Moisture Content in Stack Gases"
Method 5F	"Determination of Nonsulfate Particulate Matter Emissions from Stationary Sources"

Title 40 CFR Part 51 Appendix M

Method 202	"Dry Impinger Method for Determining Condensable Particulate Emissions from Stationary Sources"

Conditional Test Methods (CTM)

CTM-027	"Procedure for Collection and Analysis of Ammonia in Stationary Sources"

Alternative Methods

ALT-009	"Alternative Method 5 Post-Test Calibration"
ALT-031	"Approval of Method 2F, 2G and 2H as alternatives to Method 2 in 40 CFR Part 60, 61, or 63"

Other Test Methods

OTM-29	"Sampling and Analysis for Hydrogen Cyanide Emissions from Stationary Sources"

These methods appear in detail in Title 40 of the Code of Federal Regulations (CFR) and on the World Wide Web at <http://ecfr.gpoaccess.gov>.

Diagrams of the sampling apparatus and major specifications of the sampling, recovery and analytical procedures are summarized for each method in Appendix A.

CleanAir followed specific quality assurance and quality control (QA/QC) procedures as outlined in the individual methods and as prescribed in CleanAir's internal Quality Manual. Results of all QA/QC activities performed by CleanAir are summarized in Appendix D.

METHODOLOGY**4-2****NSFPM/CPM Testing – FCCU Regenerator Stack**

Three (3) 60-minute non-sulfate filterable particulate matter/condensable particulate matter (NSFPM/CPM) test runs were performed per EPA Method 5F/202 at the FCCU Regenerator Stack during each condition. The front-half (Method 5F portion) of the sampling train consisted of a glass nozzle, glass probe liner heated to 320°F, and a quartz filter heated to 320°F. Samples were collected isokinetically; nozzle and probe liner recoveries were performed using de-ionized water (DI H₂O) as the recovery solvent.

Method 202 was used as the back-half of the sample train to determine condensable particulate matter (CPM). Method 202 is typically paired with EPA Method 5 (or equivalent) to remove FPM in the front-half of the sample train prior to measurement in the impinger train.

The method is designed to mimic ambient conditions and collect only the particles that truly form CPM in the atmosphere by minimizing the sulfur dioxide (SO₂) and nitrogen oxide (NO_x) interferences observed with earlier versions of this method, where flue gas containing these compounds was bubbled through cold water and SO₂/NO_x was absorbed and partially oxidized before it could be purged out with nitrogen (N₂).

After passing through the front half (Method 5F) portion of the sample train, the flue gas passed through a coiled condenser and dry impinger system jacketed by water continually circulated at ambient temperature. Moisture was removed from the flue gas without bubbling it through the condensed water. Flue gas then passed through a tetrafluoroethylene (TFE) membrane filter at ambient temperature. The temperature of the flue gas at the exit of the filter was directly measured with an in-line thermocouple and maintained in the temperature range of 65 to 85°F.

After exiting the ambient filter, the flue gas passed through two (2) additional impingers surrounded by ice in a “cold” section of the impinger bucket. The moisture collected in these impingers was not analyzed and was only collected to more accurately determine flue gas moisture and thoroughly dry the gas prior to the metering device.

The front-half portion of the sample train (nozzle, probe and heated filter) was recovered per Method 5F requirements; the back-half of the sample train (heated filter outlet, condenser, dry impingers and TFE membrane filter) were recovered per Method 202 requirements. The impinger train was purged with nitrogen (N₂) at a rate of 14 liters per minute (lpm) for one (1) hour following each test run and prior to recovery.

METHODOLOGY**4-3**

A field train blank was assembled, purged and recovered as if it were an actual test sample. Reagent blanks were collected to quantify background contamination.

Samples and blanks were returned to CleanAir Analytical Services for gravimetric analysis. Method 202 samples were maintained at a temperature <85°F during transport to the laboratory.

NSFPM and CPM emission results were calculated in units of pounds per hour (lb/hr) and pounds per 1000 pounds of coke burn (lb/Mlb coke). The final result for each condition was equivalent to the average of three (3) valid runs.

3-D Flow Testing – FCCU Regenerator Stack

Sample flow rates as determined by EPA Method 2 (performed as part of each Method 5F/202 test) were used to calculate isokinetic sampling conditions. However, sample flow rates used to calculate emission results were obtained by EPA Method 2F traverses. This method is used to correct a high flow bias that occurs in Method 2 in the presence of swirling gas flow.

A three-dimensional (3-D) traverse was performed concurrently with each test at the FCCU Regenerator Stack, and the flow results were compared.

Using flow data from Method 2F in place of Method 2 flow data has been approved by the EPA in Alternative Method 031 for test methods in any subpart to 40 CFR Part 60, 61 or 63, where Method 2 is the specified flow rate measurement method.

Wall Effects Determination – FCCU Regenerator Stack

To account for flue gas velocity decay near the stack walls, a wall-effect adjustment factor was determined per EPA Method 2H at the FCCU Stack prior to the first runs performed at each test condition.

The method contains a calculation procedure, which derives an adjustment factor from velocity measurements, and a default procedure, which assigns a generic adjustment factor based on the construction of the stack or duct. A Type-S pitot tube was used to make velocity measurements. Based on the results, the minimum acceptable wall-effect adjustment factor was used to correct the 3-D flow rate measurements made during the test program.

Velocity correction using Method 2H has also been approved by the EPA in Alternative Method 031 for test methods in any subpart to 40 CFR Part 60, 61 or 63, where Method 2 is the specified flow rate measurement method.

METHODOLOGY**4-4****NH₃ Testing – FCCU Regenerator Stack**

NH₃ emissions were quantified at the FCCU Regenerator Stack for diagnostic purposes by performing three (3) 60-minute test runs of a modified version of CTM-027 during each test condition. These runs were performed at an isokinetic sampling rate at a single point near the center of the stack and concurrent with the other test runs.

The front-half of the sampling train consisted of a glass nozzle and an in-stack glass filter holder assembly packed with quartz wool as a filter media. After passing through the nozzle and the quartz filter media, the flue gas passed through a heated glass lined sample probe, followed by a standard CTM-027 impinger train designed to collect NH₃. Any connecting components between the sample probe and impinger train were composed of glass or TFE.

The front-half assembly was not recovered or analyzed, as gaseous NH₃ should have passed through the assembly without reacting or changing state. The glass liner and connecting components were rinsed and recovered in one (1) sample fraction; the impinger train was rinsed and recovered in a second sample fraction. Results from both fractions were added together for a single analytical result for each run.

A field blank was collected by charging an impinger with reagent for one (1) hour and recovering it as if it were an actual test sample. Reagent blanks were collected to quantify background contamination.

Samples and blanks were returned to CleanAir Analytical Services for ion chromatography (IC) analysis. With the exception of a lapse that occurred interval between sample delivery to the laboratory and sample receipt by the laboratory (4/28 to 4/30), the samples were stored under refrigeration or cold packs prior to analysis.

NH₃ results were expressed in units of dry parts per million (ppmdv), pounds per hour (lb.hr), and lb/Mlb coke.

METHODOLOGY**4-5**

The following is a summary of the deviations that were made from official test methodology and their anticipated effect, if any, on the final results:

- CTM-027 officially requires a traverse of the entire stack with isokinetic sampling; while the modified method involved isokinetic sampling at a single point. Given the gaseous state of NH_3 at flue gas temperatures and the absence of free water droplets in the flue gas, results from a single-point isokinetic sampling at a central point should correlate reasonably well with any future CTM-027 sampling performed while traversing the entire stack.
- Instead of heating the probe to a temperature at or above flue gas temperature, the probe was heated to a temperature sufficient to prevent condensation in the probe liner. The probe liner was rinsed and recovered as part of the combined sample fraction for each run.
- The entire impinger train was recovered and analyzed as one (1) sample fraction rather than analyzing each of the three (3) impingers separately. Previous experience has shown that 0.1 N H_2SO_4 readily absorbs NH_3 , and no significant breakthrough was anticipated at the NH_3 levels measured during this test program.

HCN Testing – FCCU Regenerator Stack

HCN emissions were determined using OTM-29 and an isokinetic, multi-point sample train. The sampling system consisted of a nozzle, heated probe, heated quartz filter, impinger train (for HCN collection and H_2O removal/measurement) and a dry gas meter. The HCN-collecting impingers were charged with 6.0 N sodium hydroxide (NaOH) solution.

The sampling system traversed all of the Method 1 points during each run. A maximum volume of 0.9 dry standard cubic meters (dscm), or 31.8 dry standard cubic feet (dscf), was sampled during each one-hour run. The pH in the final impinger containing absorbing solution was maintained >12.0 throughout the test.

The front-half portion of the sample train (nozzle, probe and heated filter) was not recovered or analyzed. Per the method, the back-half of the heated filter outlet was also not recovered or analyzed. Prior to recovery, the pH of each impinger preceding the final impinger was measured and adjusted to > 12.0 if necessary. The impinger fractions were then recovered per the method (Impingers #1 and #2 recovered together, Impinger #3 recovered separately).

A field train blank was assembled, transported to the location, heated, leak-checked and recovered as if it were an actual test sample. A field spike sample was collected by introducing a spike standard into a single impinger containing absorbing reagent and recovering the impinger following standard procedures. Reagent blanks were collected to quantify background contamination. All samples were stored under refrigeration or cold packs prior to analysis.

METHODOLOGY**4-6**

Samples and blanks were shipped to Enthalpy Analytical in Durham, North Carolina, who performed the analysis. The sample fractions were filtered, pre-concentrated and analyzed for CN⁻ using ion chromatography (IC).

HCN results were expressed in units of dry parts per million (ppmdv), pounds per hour (lb.hr), and lb/Mlb coke.

The following is a summary of the deviations that were made from official test methodology and their anticipated effect, if any, on the final results:

- OTM-29 calls for the use of multiple Greenburg-Smith impingers with the standard (restricted) stems. In practice, the 6.0 N NaOH absorbing solution in the impingers forms a slurry (and occasionally solidifies) as it absorbs carbon dioxide (CO₂) from the flue gas. This can cause complete plugging of the impinger train and severely delay testing. In order to reduce the chance of plugging, all impinger stems instead were of the modified Greenburg-Smith (unrestricted stem) design.
- Per OTM-29, CO₂ concentration in the stack and at the outlet of the dry gas meter must be measured continuously throughout the test runs. Continuous CO₂ measurements were obtained in a simplified manner by collecting two (2) integrated gas samples continuously throughout each run. One (1) sample was collected from the meter exhaust of the OTM-29 sample train (which is known to scrub CO₂); the other sample was collected from the meter exhaust of a nearly-concurrent CTM-027 sample train (which does not scrub CO₂). This data was used to correct the meter volumes when calculating the final results.

Sample Gas Molecular Weight Determination – FCCU Regenerator Stack

Sample gas molecular weight was determined using a hybrid of EPA Method 3 and 3A. A paramagnetic/IR analyzer was used in place of a traditional Orsat analyzer to determine oxygen (O₂) and carbon dioxide (CO₂) concentrations of an integrated gas sample collected during each Method 5F/202, Modified CTM-027, and OTM-29 run. Documentation of preliminary instrument calibrations and post analysis calibration checks are included in Appendix E.

To determine the moisture content of the flue gas, the weight gain of all relevant sample train components (impingers, sample train knock-out jars and purge knock-out jars) were measured gravimetrically.

Since the OTM-29 impinger train contents absorb a significant gravimetric amount of CO₂ as well as H₂O, moisture and flue gas CO₂ data used to calculate HCN results were obtained from concurrent Modified CTM-027 sample runs.

End of Section 4 – Methodology

MARATHON PETROLEUM COMPANY
DETROIT REFINERY

Client Reference No: CN00076641
CleanAir Project No: 12010

APPENDIX

5-1

TEST METHOD SPECIFICATIONS	A
SAMPLE CALCULATIONS	B
PARAMETERS	C
QA/QC DATA	D
FIELD DATA	E
FIELD DATA PRINTOUTS	F
LABORATORY DATA	G
PLANT DATA	H
PROTOCOL	I

MARATHON PETROLEUM COMPANY
DETROIT REFINERY

Client Reference No: CN00076641
CleanAir Project No: 12010

TEST METHOD SPECIFICATIONS

A

I hereby certify that all pages contained within this Appendix have been reviewed and, to the best of my ability, verified as accurate.

QA/QC Initials: KR

Date: 6/12/2012



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Specification Sheet for

EPA Method 5F/202

Source Location Name(s) FCCU Regenerator Stack
Pollutant(s) to be Determined Non-Sulfate Filterable Particulate Matter (NSFPM) and Condensable Particulate Matter (CPM)
Other Parameters to be Determined from Train Gas Density, Moisture, Flow Rate

	Standard Method Specification	Actual Specification Used
Pollutant Sampling Information		
Duration of Run	N/A	60 minutes
No. of Sample Traverse Points	N/A	24
Sample Time per Point	N/A	2.5 minutes
Sampling Rate	Isokinetic (90-110%)	Constant Rate (80-120% of Average Isokinetic Rate)
Sampling Probe		
Nozzle Material	Stainless Steel or Glass	Borosilicate Glass
Nozzle Design	Button-Hook or Elbow	Button-Hook
Probe Liner Material	Glass or Teflon	Borosilicate Glass
Effective Probe Length	N/A	8 feet
Probe Temperature Set-Point	320°F±25°F	320°F±25°F
Velocity Measuring Equipment		
Pitot Tube Design	Type S	Type S
Pitot Tube Coefficient	N/A	0.827
Pitot Tube Calibration by	Geometric or Wind Tunnel	Wind-Tunnel
Pitot Tube Attachment	Attached to Probe	Attached to Probe
Metering System Console		
Meter Type	Dry Gas Meter	Dry Gas Meter
Meter Accuracy	±2%	±1%
Meter Resolution	N/A	0.01 cubic feet
Meter Size	N/A	0.1 dcf/revolution
Meter Calibrated Against	Wet Test Meter or Standard DGM	Wet Test Meter
Pump Type	N/A	Rotary Vane
Temperature Measurements	N/A	Type K Thermocouple/Pyrometer
Temperature Resolution	5.4°F	1.0°F
ΔP Differential Pressure Gauge	Inclined Manometer or Equivalent	Inclined Manometer
ΔH Differential Pressure Gauge	Inclined Manometer or Equivalent	Inclined Manometer
Barometer	Mercury or Aneroid	Digital Barometer calibrated w/Mercury Aneroid
FPM Filter Description		
Filter Location	After Probe	Exit of Probe
Filter Holder Material	Quartz	Borosilicate Glass
Filter Support Material	Glass Frit	Teflon
Cyclone Material	N/A	None
Filter Heater Set-Point	320°F±25°F	320°F±25°F
Filter Material	Glass Fiber	Quartz Fiber
Other Components		
Description	Condenser	Condenser
Location	Before Impinger 1	Before 1st Impinger
Operating Temperature	≤85°F	≤85°F

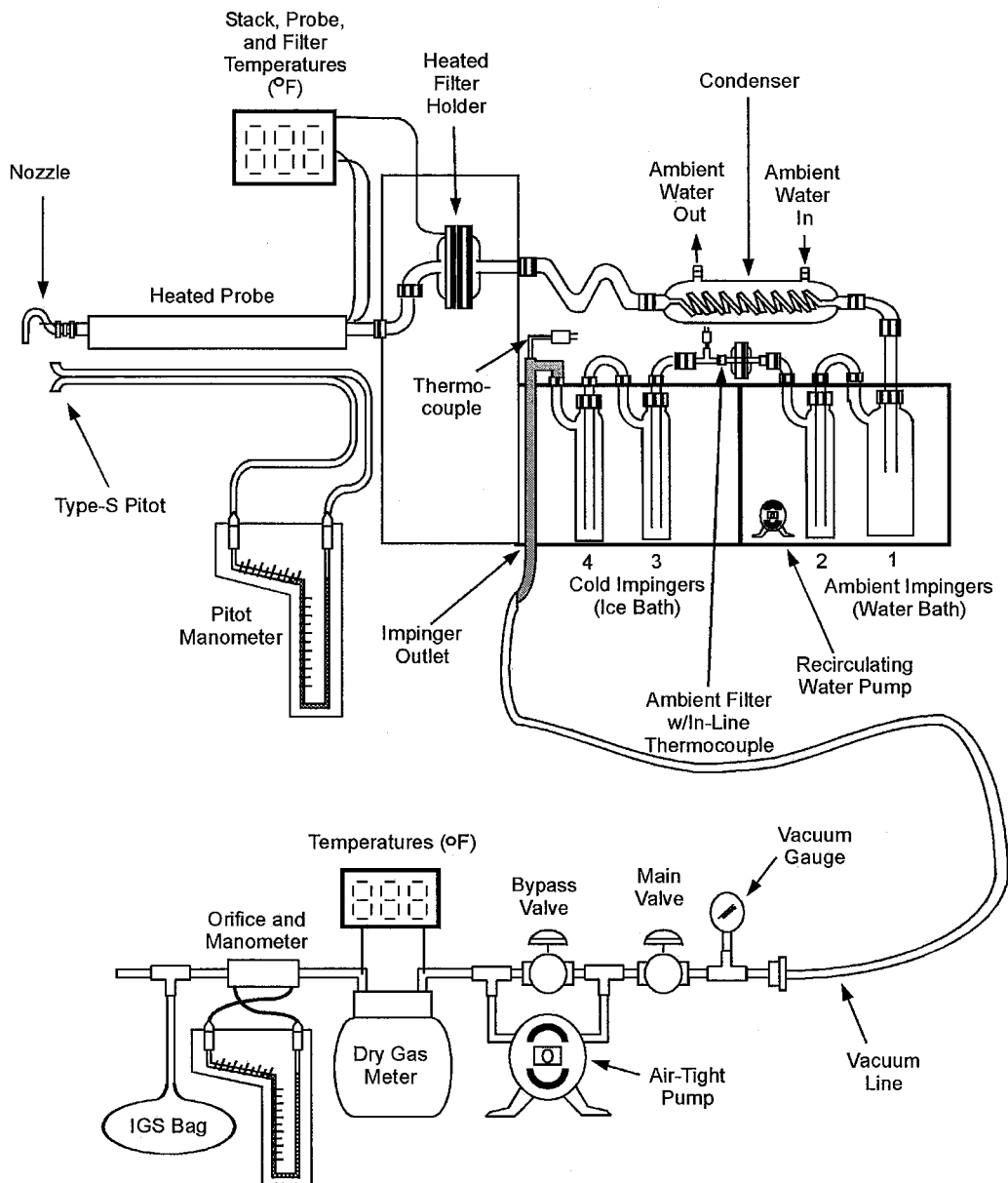
Specification Sheet for

EPA Method 5F/202

	Standard Method Specification	Actual Specification Used
Impinger Train Description		
Type of Glassware Connections	Leak-Free Glass Connectors	Screw Joint with Silicone Gasket
Connection to Probe or Filter by	Direct or Flexible Connection	Direct Glass Connection
Number of Impingers	4	4
Impinger Stem Types		
Impinger 1	Shortened Stem (open tip)	Shortened Stem (open tip)
Impinger 2	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 3	Modified Greenburg-Smith	Shortened Stem (open tip)
Impinger 4	Modified Greenburg-Smith	Shortened Stem (open tip)
Impinger 5		
Impinger 6		
Impinger 7		
Impinger 8		
CPM Filter Description		
Filter Location	Between 2nd and 3rd Impingers	Between 2nd and 3rd Impingers
Filter Holder Material	Glass, Stainless Steel or Teflon	Borosilicate Glass
Filter Support Material	Teflon	Teflon
Cyclone Material	None	None
Filter Heater Set-Point	>65°F but ≤85°F	>65°F but ≤85°F
Filter Material	Teflon Membrane	Teflon Membrane
Gas Density Determination		
Sample Collection	Multi-point integrated	Multi-Point Integrated
Sample Collection Medium	Flexible Gas Bag	Vinyl Bag
Sample Analysis	Orsat or CEM Analyzer	CEM
Sample Recovery Information		
Nozzle Brush Material	Nylon Bristle or Teflon	Nylon Bristle
Nozzle Rinse Reagent	Deionized Distilled Water	Deionized Distilled Water
Nozzle Rinse Wash Bottle Material	Glass or Polyethylene	Inorganic in polyethylene, organic in Teflon
Nozzle Rinse Storage Container	Glass or Polyethylene	Glass
Filter Recovered?	Yes	Yes
Filter Storage Container	FH filter in petri dish, CPM filter in petri dish	FH filter in petri dish, CPM filter in petri dish
Impinger Contents Recovered?	Yes	Yes
Impinger Rinse Reagent	DI Water/Acetone/Hexane	DI Water/Acetone/Hexane
Impinger Wash Bottle	Inorganic in polyethylene, organic in Teflon	Inorganic in polyethylene, organic in Teflon
Impinger Storage Container	Inorganic in polyethylene, organic in glass	Inorganic in amber glass, organic in amber glass
Analytical Information		
Method 4 H ₂ O Determination by	Volumetric or Gravimetric	Gravimetric and Volumetric
Filter Preparation Conditions	Gravimetric per Analytical Flow Chart	See Analytical Flow Chart
Front-Half Rinse Preparation	Gravimetric per Analytical Flow Chart	See Analytical Flow Chart
Back-Half Analysis	Gravimetric per Analytical Flow Chart	See Analytical Flow Chart
Additional Analysis	N/A	None

EPA Method 5F/202

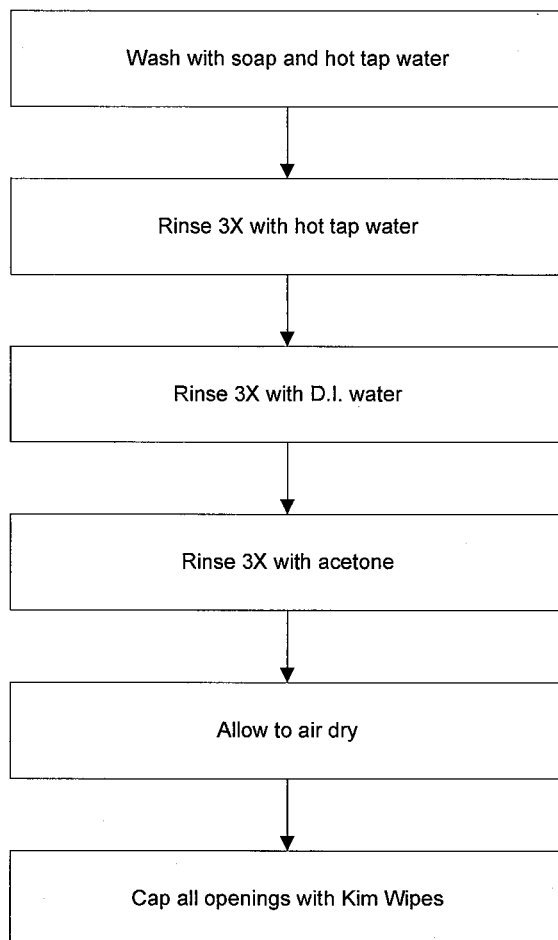
Sampling Train Configuration



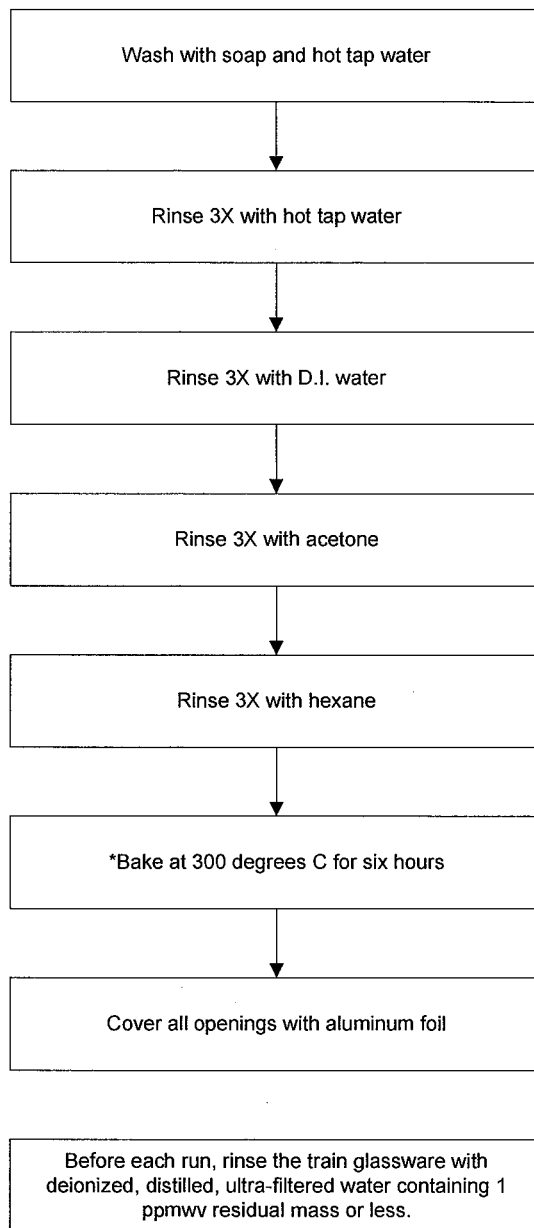
Impinger Contents

Impinger 1	Empty
Impinger 2	Empty
Impinger 3	DI H ₂ O
Impinger 4	Silica Gel

EPA Method 5F Glassware Preparation Procedures



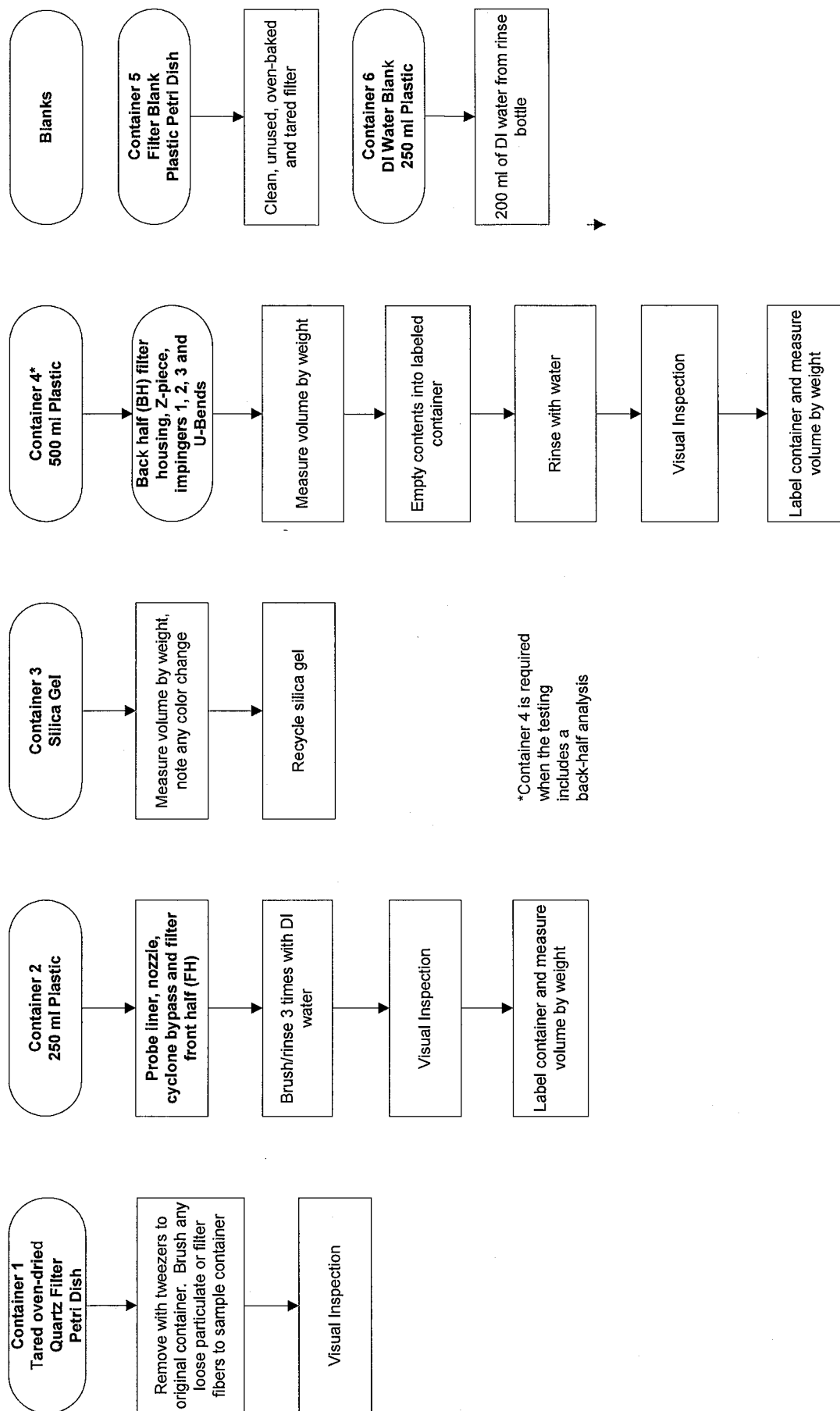
EPA Method 202 Glassware Preparation Procedures



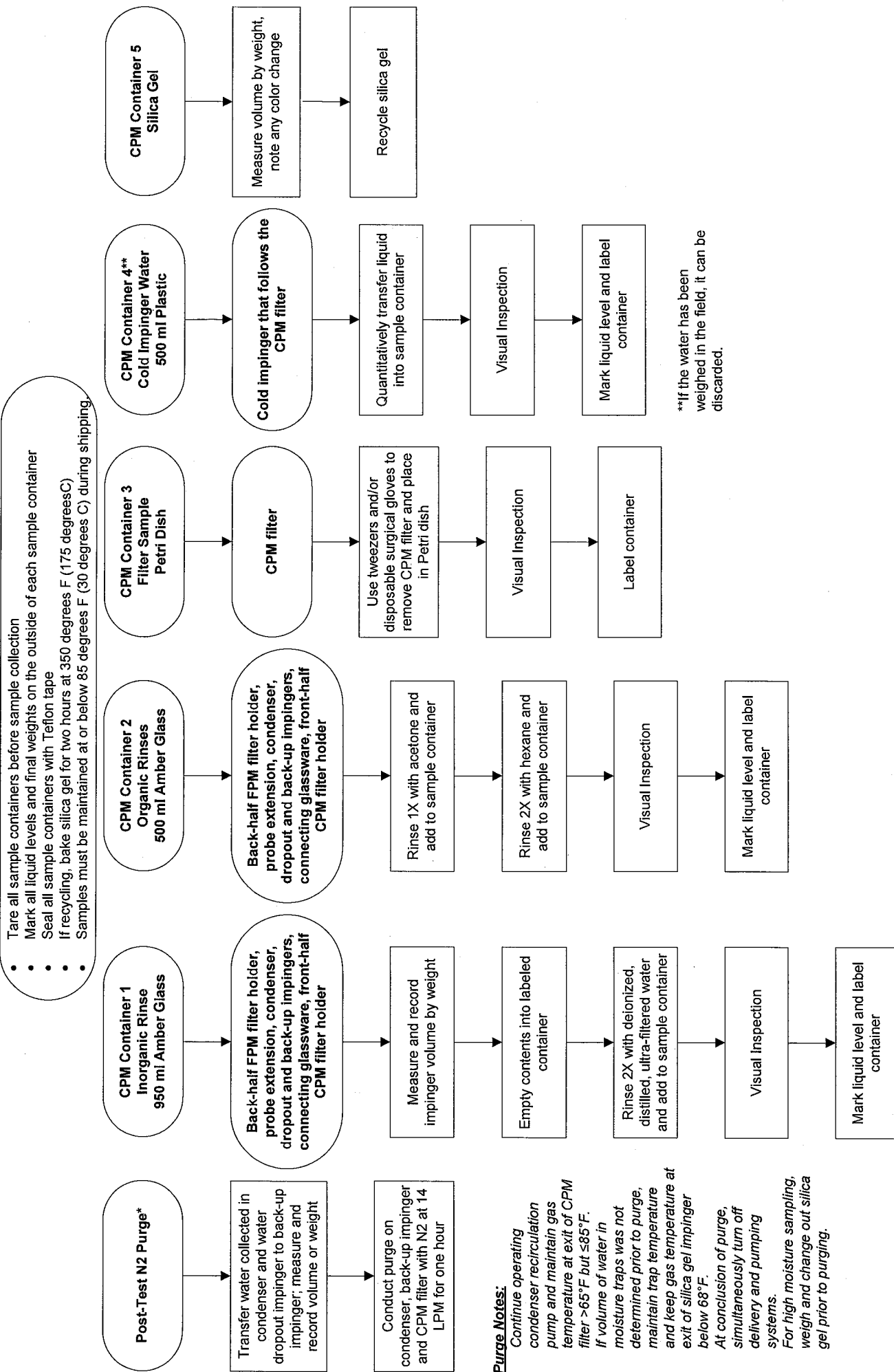
*As an alternative to baking glassware, a field train proof blank can be performed on the sampling train glassware.

EPA Method 5F Sample Recovery Flowchart

- Tare all sample containers before sample collection
- Mark all liquid levels and final weights on the outside of each sample container
- Seal all sample containers with Teflon tape
- If recycling, bake silica gel for two hours at 350 degrees F (175 degrees C)



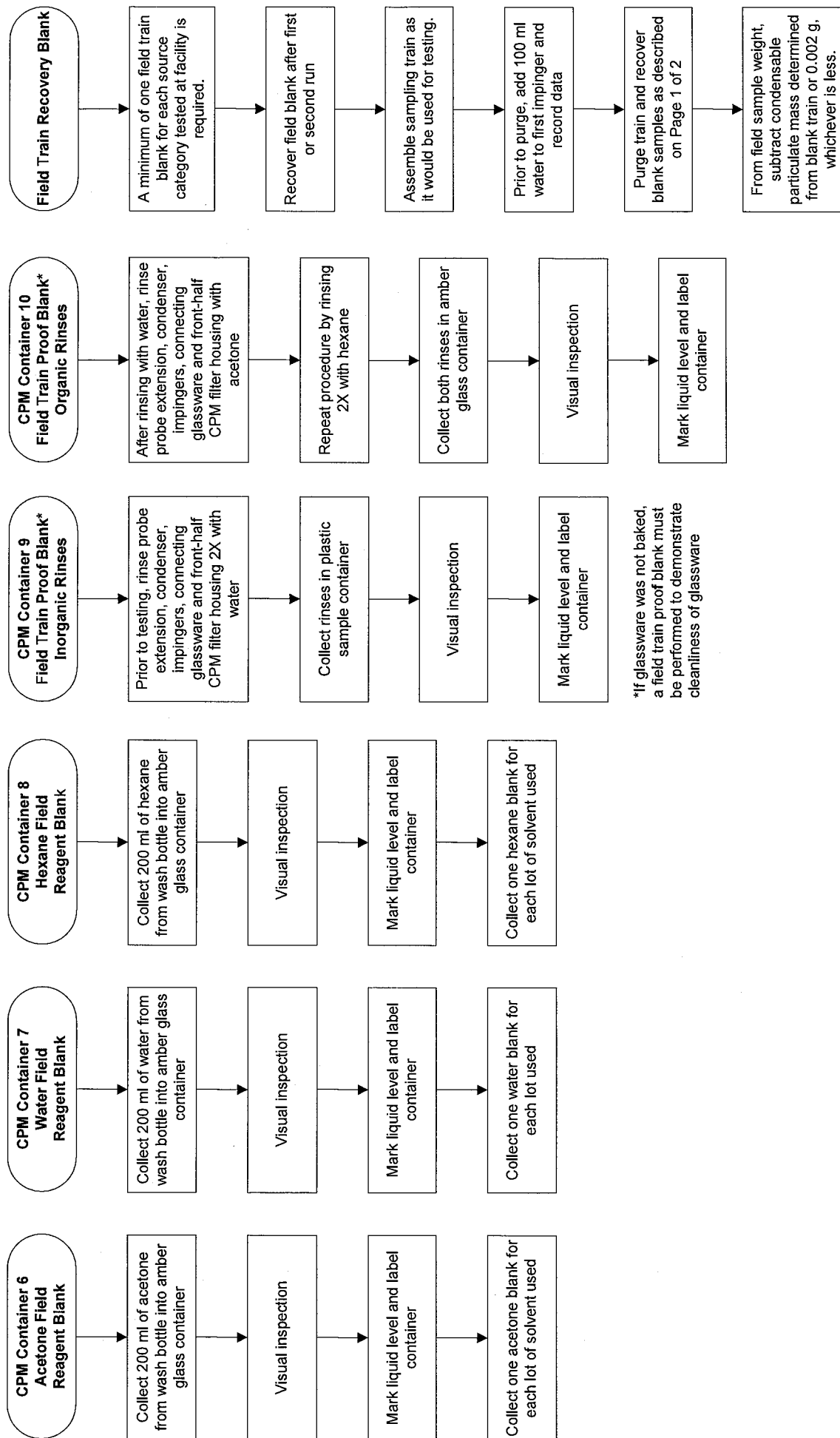
EPA Method 202 Sample Recovery Flowchart (1 of 2)



EPA Method 202

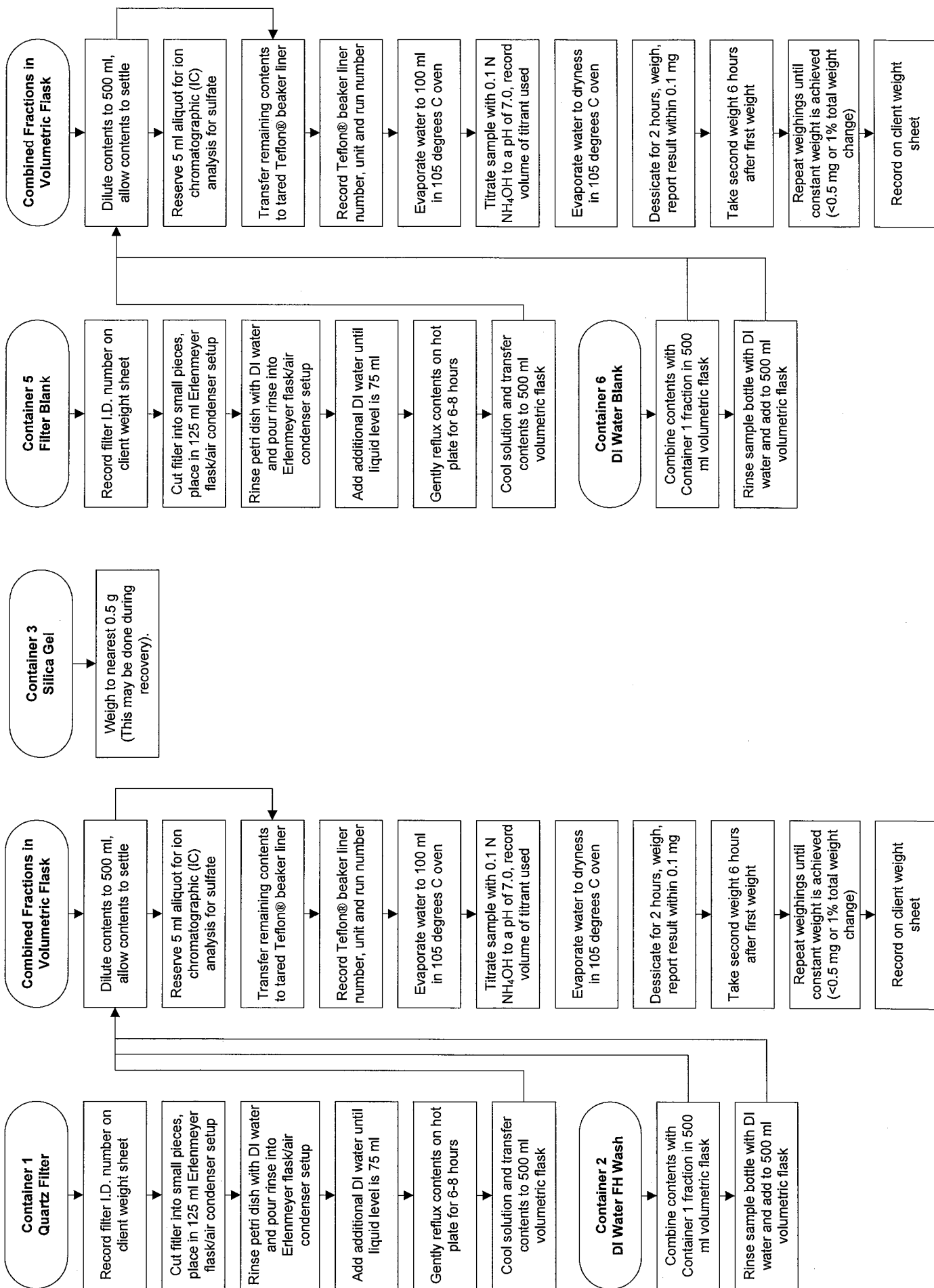
Sample Recovery Flowchart (2 of 2)

- Tare all sample containers before sample collection
- Mark all liquid levels and final weights on the outside of each sample container
- Seal all sample containers with Teflon tape
- If recycling, bake silica gel for two hours at 350 degrees F (175 degrees C)
- Samples must be maintained at or below 85 degrees F (30 degrees C) during shipping.



*If glassware was not baked, a field train proof blank must be performed to demonstrate cleanliness of glassware

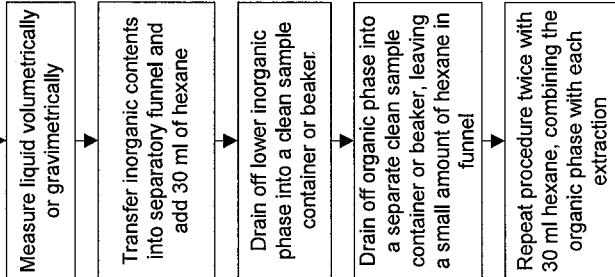
EPA Method 5F Analytical Flowchart



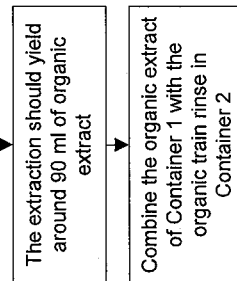
EPA Method 202 Analytical Flowchart (1 of 2)

- Log each sample in shipment and verify against chain-of-custody sheet
- Note liquid levels in the sample containers and confirm on the chain-of-custody sheet condition

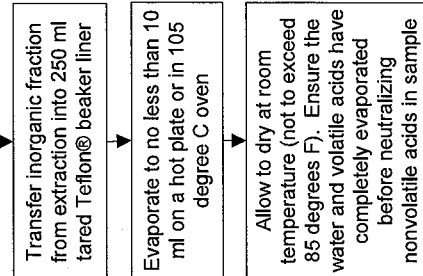
CPM Container 1 Inorganic Rinse



Organic Extraction

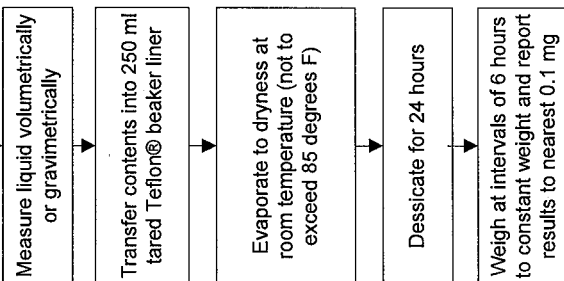


Inorganic Extraction



Weight at intervals of 6 hours to constant weight and report results to nearest 0.1 mg

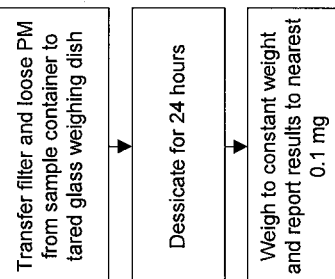
CPM Container 2 Organic Rinses



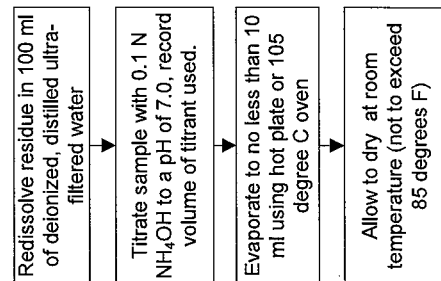
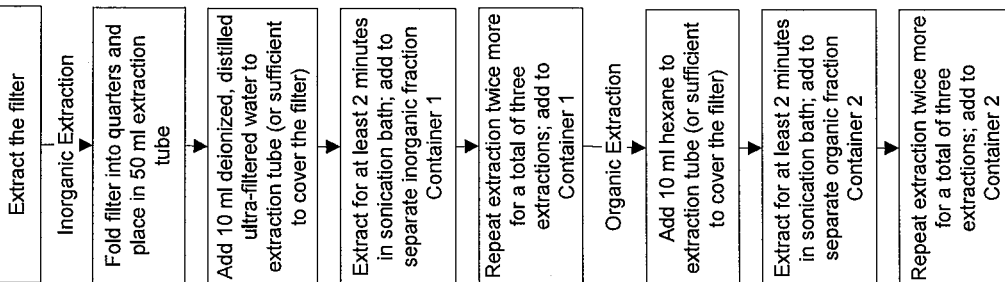
CPM Container 3 Filter Sample

Was sample collected by Method 17 or 201A with a stack temp < 85°F? Can the filter be brought to constant weight?

Yes



No



No constant weight

EPA Method 202

Analytical Flowchart (2 of 2)

- Log each sample in shipment and verify against chain-of-custody sheet
- Note liquid levels in the sample containers and confirm on the chain-of-custody sheet condition

CPM Container 4*
Cold Impinger Water

Measure liquid volumetrically
or gravimetrically

*May have been performed
in the field during sample
recovery

CPM Container 5*
Silica Gel

Weigh to nearest 0.5 g

CPM Container 6
Acetone Field Reagent
Blank

Transfer 150 ml of acetone
to 250 ml tared Teflon®
beaker liner and evaporate
to dryness at room
temperature (not to exceed
85 degrees F)

Dessicate for 24 hours

Weigh at intervals of 6 hours
to constant weight and report
results to nearest 0.1 mg

CPM Container 7
Water Field Reagent Blank

Transfer 150 ml of water to
250 ml tared Teflon® beaker
liner and evaporate to
dryness at room temperature
(not to exceed 85 degrees F)

Dessicate for 24 hours

Weigh at intervals of 6 hours
to constant weight and report
results to nearest 0.1 mg

CPM Container 8
Hexane Field Reagent
Blank

Transfer 150 ml of hexane to
250 ml tared Teflon® beaker
liner and evaporate to
dryness at room temperature
(not to exceed 85 degrees F)

Dessicate for 24 hours

Weigh at intervals of 6 hours
to constant weight and report
results to nearest 0.1 mg

Specification Sheet for

Modified Conditional Test Method (CTM) 027

Source Location Name(s) FCCU Regenerator Stack
 Pollutant(s) to be Determined Ammonia
 Other Parameters to be Determined from Train Gas Density, Moisture, Flow Rate

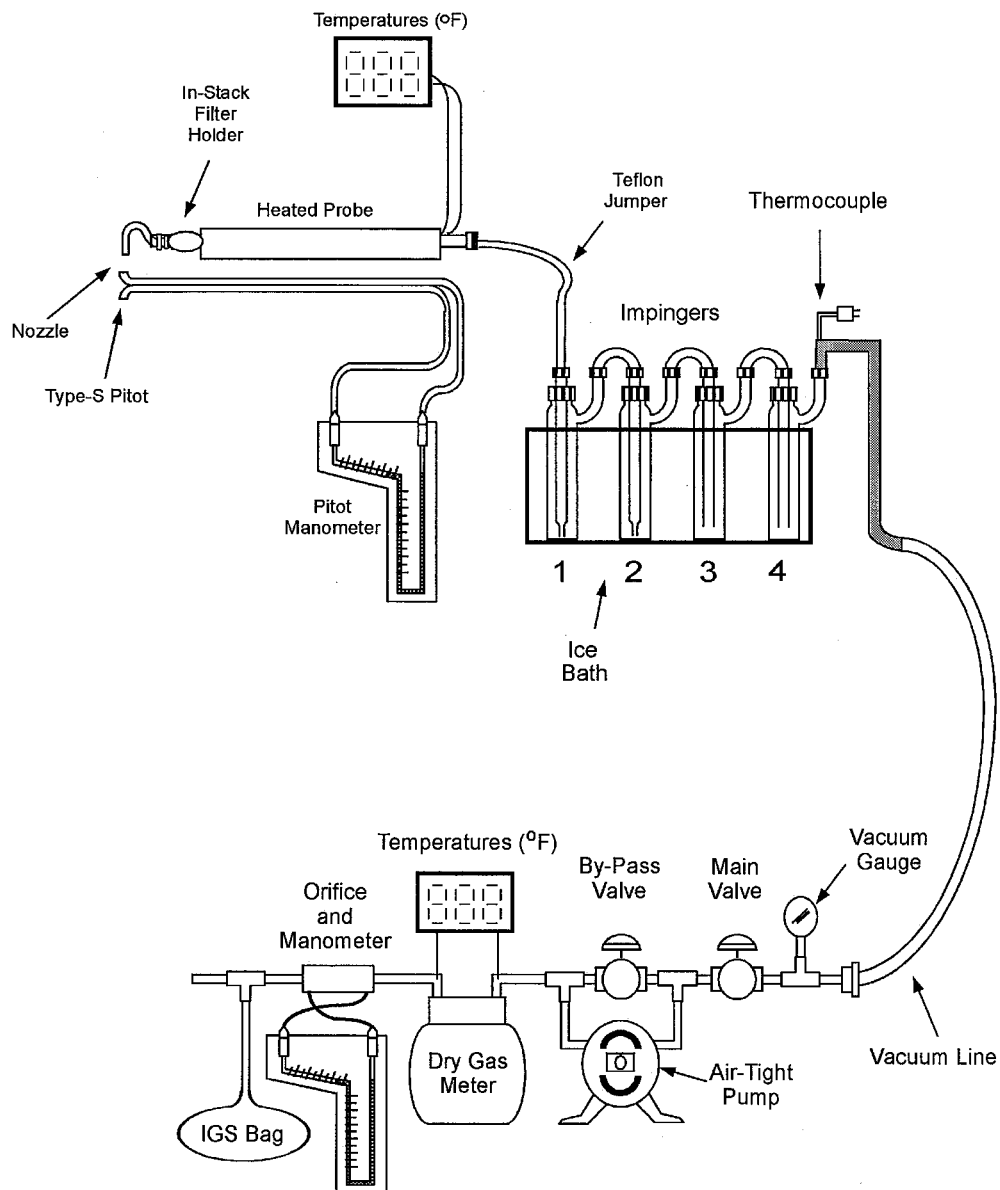
	Standard Method Specification	Actual Specification Used
Pollutant Sampling Information		
Duration of Run	N/A	60 minutes
No. of Sample Traverse Points	N/A	1
Sample Time per Point	N/A	60 minutes
Sampling Rate	Isokinetic (90-110%)	Isokinetic (90-110%)
Sampling Probe		
Nozzle Material	Borosilicate or Quartz Glass	Borosilicate Glass
Nozzle Design	Button-Hook or Elbow	Button-Hook
Probe Liner Material	Borosilicate or Quartz Glass	Borosilicate Glass
Effective Probe Length	N/A	4 feet
Probe Temperature Set-Point	Stack Temperature	Prevent Condensation
Velocity Measuring Equipment		
Pitot Tube Design	Type S	Type S
Pitot Tube Coefficient	N/A	0.818
Pitot Tube Calibration by	Geometric or Wind Tunnel	Geometric
Pitot Tube Attachment	Attached to Probe	Attached to Probe
Metering System Console		
Meter Type	Dry Gas Meter	Dry Gas Meter
Meter Accuracy	±2%	±1%
Meter Resolution	N/A	0.01 cubic feet
Meter Size	N/A	0.1 dcf/revolution
Meter Calibrated Against	Wet Test Meter or Standard DGM	Wet Test Meter
Pump Type	N/A	Rotary Vane
Temperature Measurements	N/A	Type K Thermocouple/Pyrometer
Temperature Resolution	5.4°F	1.0°F
ΔP Differential Pressure Gauge	Inclined Manometer or Equivalent	Inclined Manometer
ΔH Differential Pressure Gauge	Inclined Manometer or Equivalent	Inclined Manometer
Barometer	Mercury or Aneroid	Digital Barometer calibrated w/Mercury Aneroid
Filter Description		
Filter Location	In Stack	In-Stack
Filter Holder Material	Borosilicate Glass or Teflon	Borosilicate Glass
Filter Support Material	Borosilicate Glass or Teflon	Teflon
Thimble Material	N/A	None
Filter Heater Set-Point	N/A	Stack Temp
Filter Material	Glass Fiber	Quartz Fiber
Other Components		
Description	N/A	N/A
Location	N/A	N/A
Operating Temperature	N/A	N/A

Specification Sheet for

Modified Conditional Test Method (CTM) 027

	Standard Method Specification	Actual Specification Used
Impinger Train Description		
Type of Glassware Connections	Leak-Free Glass Connectors	Screw Joint with Silicone Gasket
Connection to Probe or Filter by	Direct or Flexible Tubing	Flexible Teflon Line
Number of Impingers	4	4
Impinger Stem Types		
Impinger 1	Greenburg-Smith	Greenburg-Smith
Impinger 2	Greenburg-Smith	Greenburg-Smith
Impinger 3	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 4	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 5		
Impinger 6		
Impinger 7		
Impinger 8		
Gas Density Determination		
Sample Collection	Multi-point integrated	Multi-Point Integrated
Sample Collection Medium	Flexible Gas Bag	Vinyl Bag
Sample Analysis	Orsat or Fyrite Analyzer	CEM
Sample Recovery Information		
Probe Brush Material	None	None
Probe Rinse Reagent	Deionized Water	Deionized Water
Probe Rinse Wash Bottle Material	Polyethylene	Polyethylene
Probe Rinse Storage Container	Polyethylene	Polyethylene
Filter Recovered?	No	Archived
Filter Storage Container	N/A	Polystyrene
Impinger Contents Recovered?	Yes	Yes
Impinger Rinse Reagent	Deionized Water	Deionized Water
Impinger Wash Bottle	Polyethylene	Polyethylene
Impinger Storage Container	Polyethylene	Polyethylene
Analytical Information		
Method 4 H ₂ O Determination by	Volumetric or Gravimetric	Gravimetric and Volumetric
Filter Preparation Conditions	N/A	N/A
Front-Half Rinse Preparation	Combined with back-half	See Analytical Flow Chart
Back-Half Analysis	Ion Chromatography Analysis	Ion Chromatography
Additional Analysis	N/A	None

EPA Modified CTM-027 Sampling Train Configuration

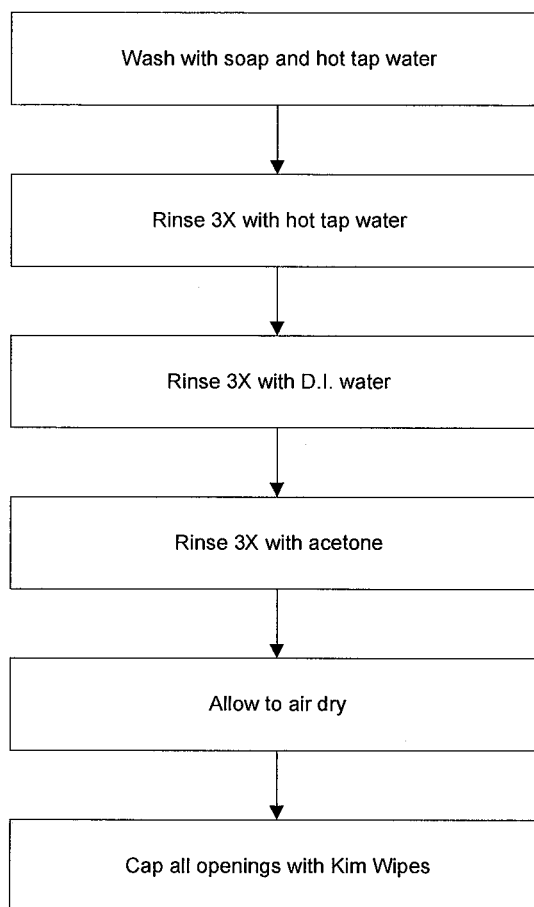


Impinger Contents

Impinger 1	100 mls 0.1 N H ₂ SO ₄
Impinger 2	100 mls 0.1 N H ₂ SO ₄
Impinger 3	100 mls 0.1 N H ₂ SO ₄
Impinger 4	~300 g Silica Gel

CTM-027

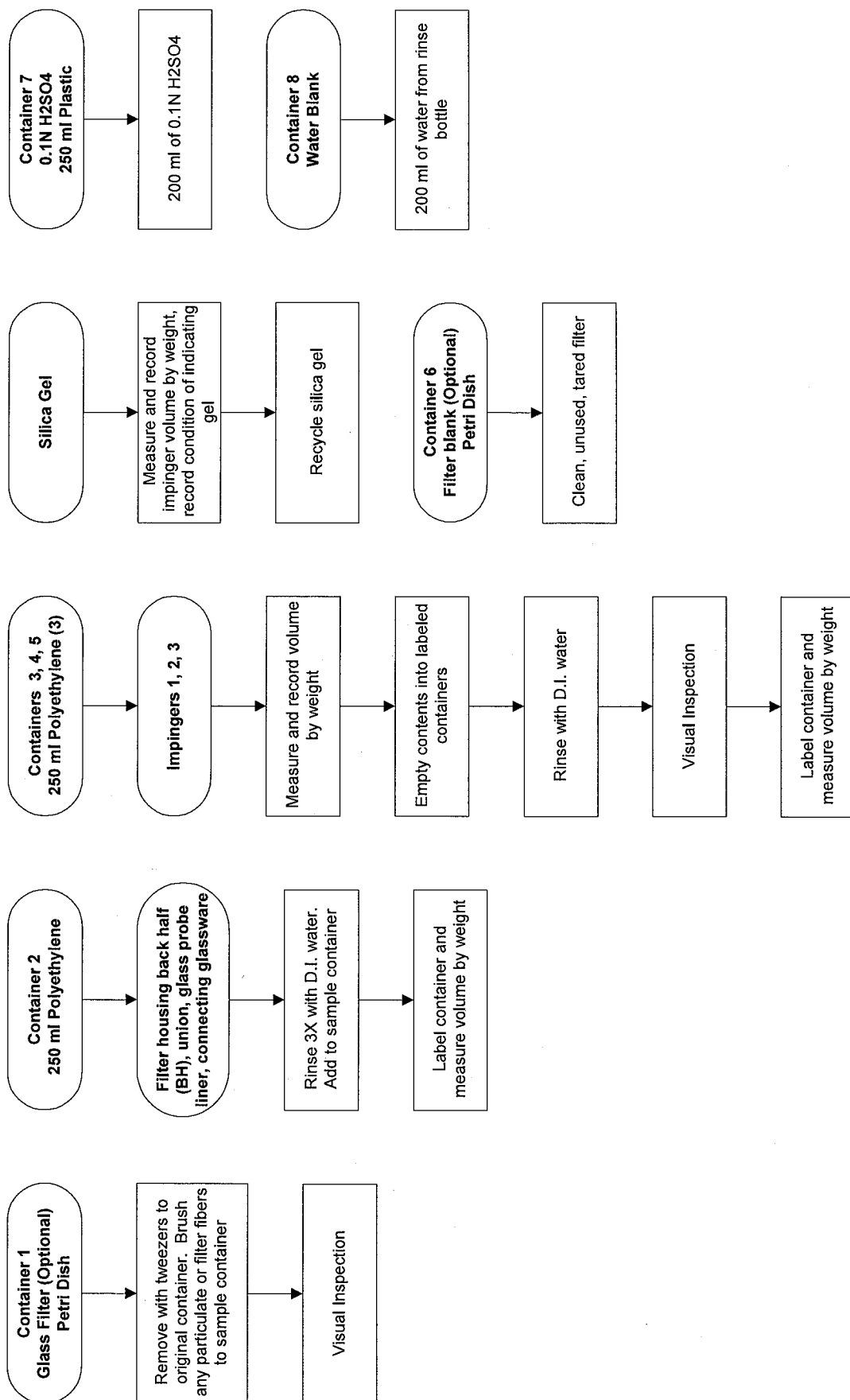
Glassware Preparation Procedures



CTM-027

Sample Recovery Flowchart

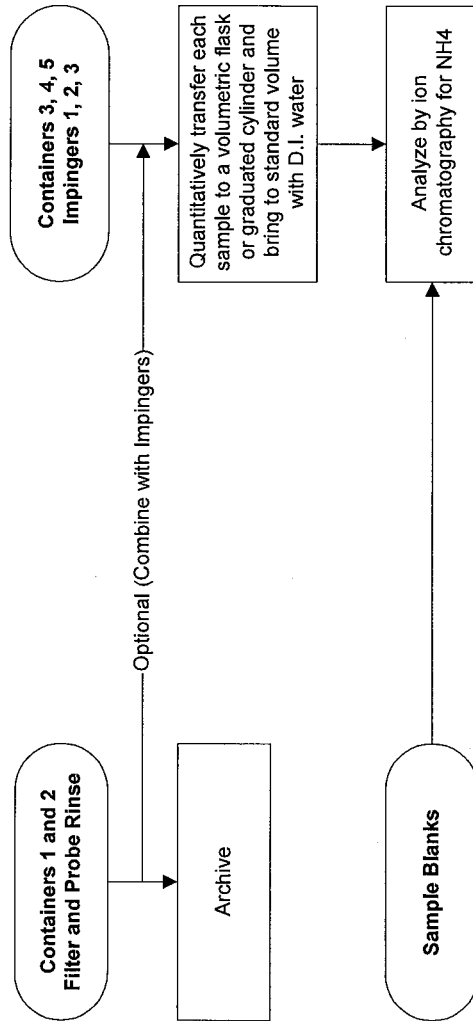
- Tare all sample containers before sample collection
- Mark all liquid levels and final weights on the outside of each sample container
- Seal all sample containers with Teflon tape
- If recycling, bake silica gel for two hours at 350 degrees F (175 degrees C)
- Store and ship all samples at ice temperature.



CTM-027

Analytical Flowchart

- Log each sample in shipment and verify against chain-of-custody sheet
- Note liquid levels in the sample containers and confirm on the chain-of-custody sheet condition



Specification Sheet for

Other Test Method 29

Source Location Name(s) FCCU Regenerator Stack
 Pollutant(s) to be Determined Hydrogen Cyanide
 Other Parameters to be Determined from Train Gas Density, Flow Rate

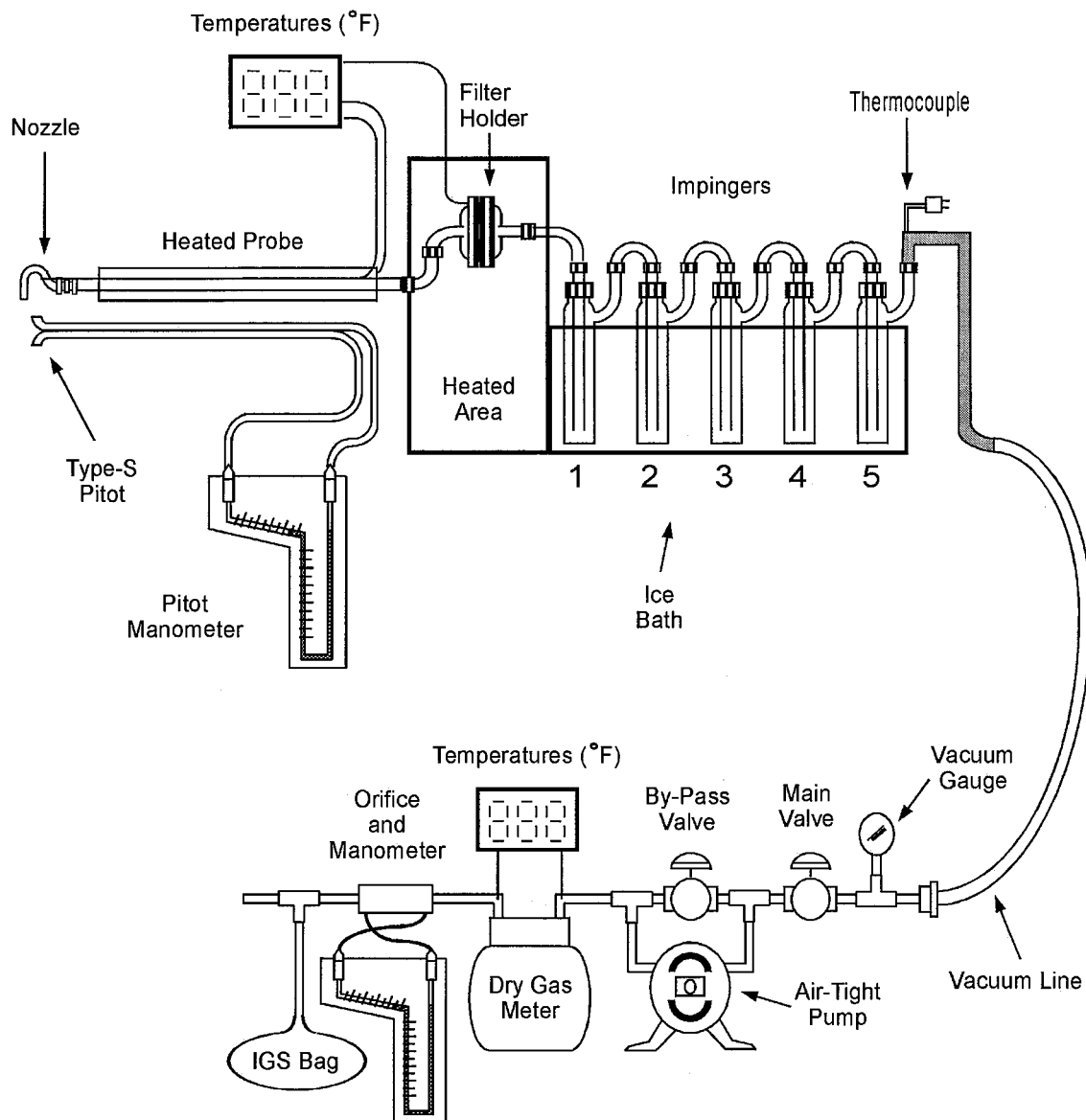
	Standard Method Specification	Actual Specification Used
Pollutant Sampling Information		
Duration of Run	N/A	60 minutes
No. of Sample Traverse Points	N/A	12
Sample Time per Point	N/A	5 minutes
Sampling Rate	Isokinetic (90-110%)	Isokinetic (90-110%)
Sampling Probe		
Nozzle Material	Borosilicate or Quartz Glass	Borosilicate Glass
Nozzle Design	Button-Hook or Elbow	Button-Hook
Probe Liner Material	Borosilicate or Quartz Glass	Borosilicate Glass
Effective Probe Length	N/A	8 feet
Probe Temperature Set-Point	248°F ± 25°F	248°F±25°F
Velocity Measuring Equipment		
Pitot Tube Design	Type S	Type S
Pitot Tube Coefficient	Known coefficient	0.827
Pitot Tube Calibration by	Geometric or Wind Tunnel	Wind-Tunnel
Pitot Tube Attachment	Attached to Probe	Attached to Probe
Metering System Console		
Meter Type	Dry Gas Meter	Dry Gas Meter
Meter Accuracy	±2%	±2%
Meter Resolution	N/A	0.01 cubic feet
Meter Size	N/A	0.1 dcf/revolution
Meter Calibrated Against	Wet Test Meter or Standard DGM	Wet Test Meter
Pump Type	N/A	Rotary Vane
Temperature Measurements	N/A	Type K Thermocouple/Pyrometer
Temperature Resolution	5.4°F	5.4°F
ΔP Differential Pressure Gauge	Inclined Manometer or Equivalent	Inclined Manometer
ΔH Differential Pressure Gauge	Inclined Manometer or Equivalent	Inclined Manometer
Barometer	Mercury or Aneroid	Digital Barometer calibrated w/Mercury Aneroid
Filter Description		
Filter Location	After Probe	Exit of Probe
Filter Holder Material	Borosilicate, Quartz Glass	Borosilicate Glass
Filter Support Material	Teflon	Teflon
Cyclone Material	NA	None
Filter Heater Set-Point	248°F ± 25°F	248°F±25°F
Filter Material	Quartz or Fluoropolymer Coated Fiber Filter	Quartz Fiber
Other Components		
Description	N/A	N/A
Location	N/A	N/A
Operating Temperature	N/A	N/A

Specification Sheet for

Other Test Method 29

	Standard Method Specification	Actual Specification Used
Impinger Train Description		
Type of Glassware Connections	Ground Glass or Equivalent	Ground Glass with Silicone O-Ring
Connection to Probe or Filter by	Direct Glass Connection	Direct Glass Connection
Number of Impingers	4 or 5	5
Impinger Stem Types		
Impinger 1	Greenburg-Smith	Modified Greenburg-Smith
Impinger 2	Greenburg-Smith	Modified Greenburg-Smith
Impinger 3	Greenburg-Smith	Modified Greenburg-Smith
Impinger 4	Greenburg-Smith	Modified Greenburg-Smith
Impinger 5	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 6		
Impinger 7		
Impinger 8		
Gas Density Determination		
Sample Collection	Multi-point integrated	Multi-Point Integrated
Sample Collection Medium	Flexible Gas Bag	Direct Interface
Sample Analysis	Orsat or Fyrite Analyzer	CEM
Sample Recovery Information		
Probe Brush Material	Teflon Bristle	Teflon Bristle
Probe Rinse Reagent	Acetone	Acetone
Probe Rinse Wash Bottle Material	Teflon or glass	Teflon
Probe Rinse Storage Container	N/A	Glass
Filter Recovered?	Yes (for PM analysis only)	No
Filter Storage Container	N/A	Polyethylene
Impinger Contents Recovered?	Yes	Yes
Impinger Rinse Reagent	0.1N NaOH	0.1 N Sodium Hydroxide
Impinger Wash Bottle	Glass or Polyethylene	Polyethylene
Impinger Storage Container	Alkali resistant polyethylene or glass	Polyethylene
Analytical Information		
Method 4 H ₂ O Determination by	Separate EPA Method 4 Sampling Train	Gravimetric
Filter Preparation Conditions	See Analytical Flowchart	See Analytical Flow Chart
Front-Half Rinse Preparation	See Analytical Flowchart	See Analytical Flow Chart
Back-Half Analysis	Ion Chromatography	Ion Chromatography
Additional Analysis	None	None

Other Test Method 29 Sampling Train Configuration

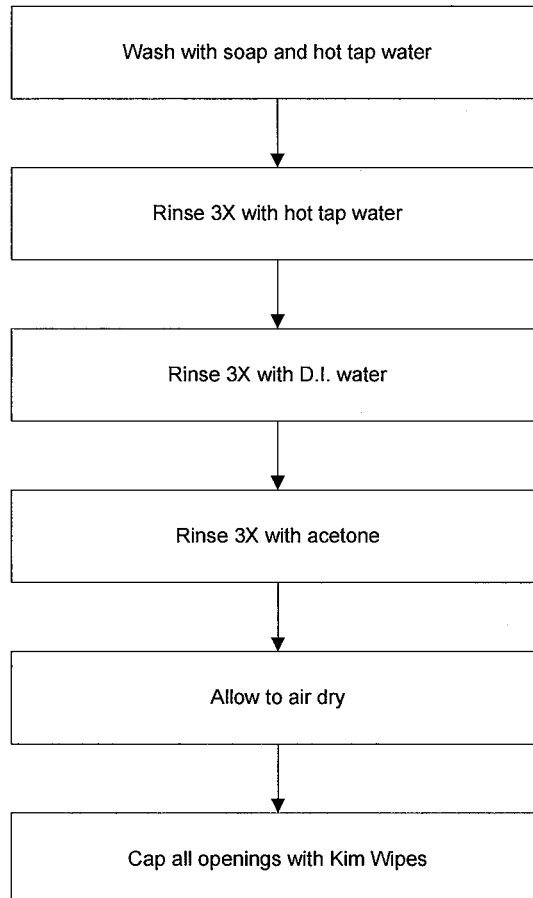


Impinger Contents

Impinger 1	200 mL 6N NaOH
Impinger 2	200 mL 6N NaOH
Impinger 3	200 mL 6N NaOH
Impinger 4	100 mL 6N NaOH
Impinger 5	Silica Gel

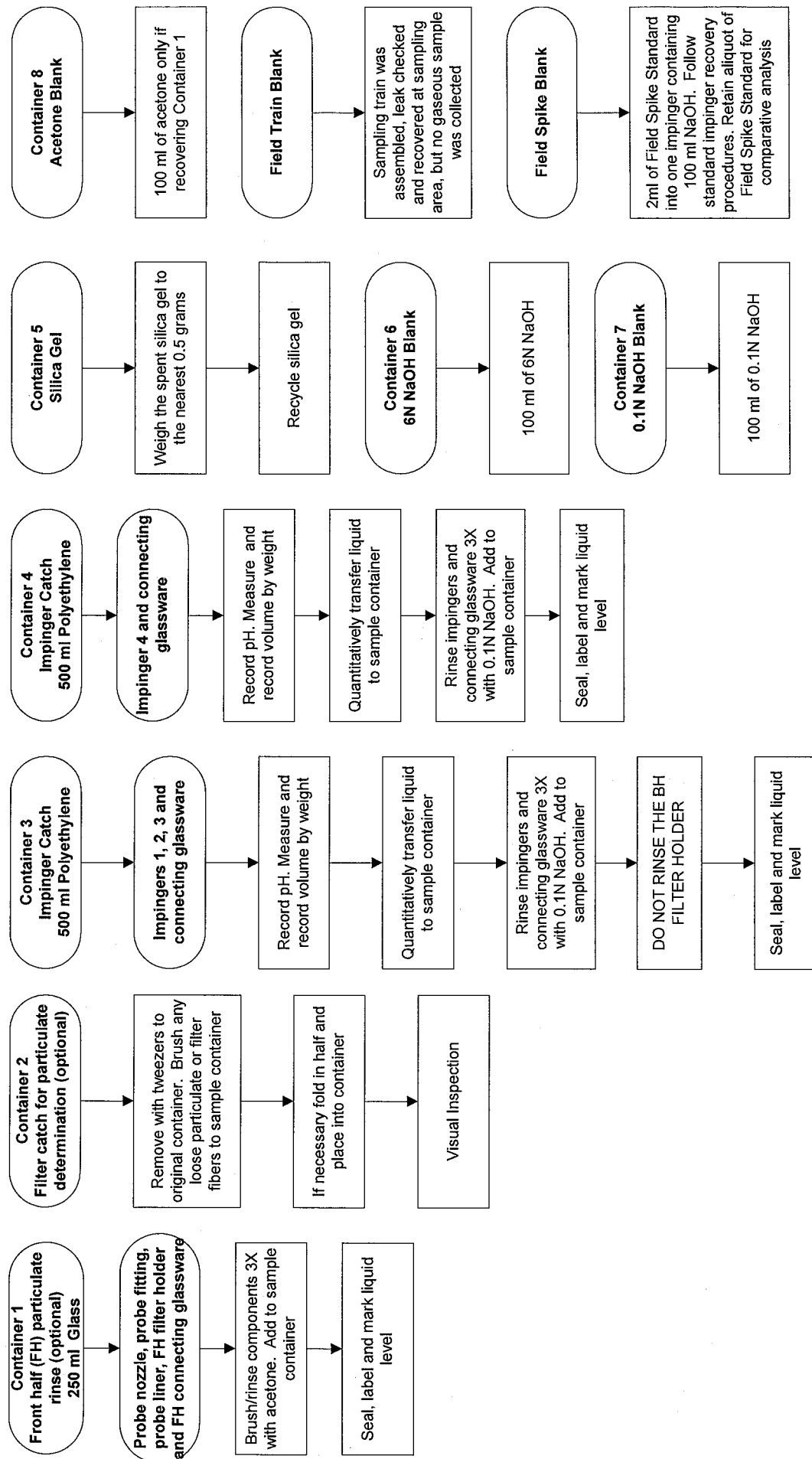
Other Test Method 29

Glassware Preparation Procedures



Other Test Method 29 Sample Recovery Flowchart

- Tare all sample containers before sample collection
- Mark all liquid levels and final weights on the outside of each sample container
- Seal all sample containers with Teflon tape



Other Test Method 29 Analytical Flowchart

- Log each sample in shipment and verify against chain-of-custody sheet
- Note liquid levels in the sample containers and confirm on the chain-of-custody sheet condition

Containers 1 and 2
(Optional particulate analysis)

Follow analytical procedures outlined in EPA Method 5

Containers 3 and 4

Measure the sample volume. Sample dilution with 0.1N or 0.6N NaOH is recommended. The pH should not drop below 12 as a result of dilution

Analysis by ion chromatography for HCN

Each sample injected for analysis must have duplicate injection.

Perform a matrix spike at least once per set of sample or once per 10 samples analyzed. The amount of HCN recovered must be 20% of spiked value

If the response from cyanide in any sample is greater than the highest calibration standard, dilute with 0.1N or 0.6N NaOH and repeat analysis until response falls within calibration curve

Container 5
Silica Gel

Weigh to nearest 0.5 g. This can be done in the field

Reagent Blanks

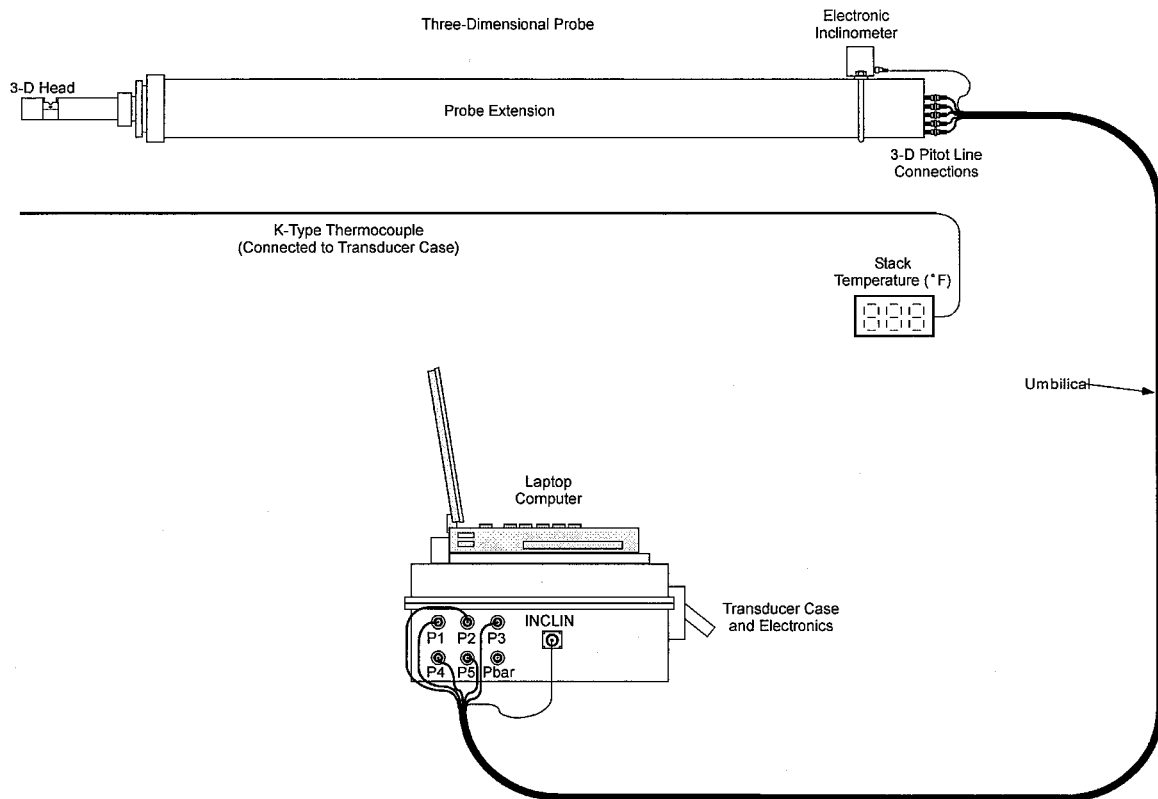
Analyze by ion chromatography for HCN

Specification Sheet for EPA Method 2F

Source Location Name(s) FCCU Regenerator Stack
 Pollutant(s) to be Determined None
 Other Parameters to be Determined from Train Flow Rate

	Standard Method Specification	Actual Specification Used
Pollutant Sampling Information		
Duration of Run	N/A	Varied
No. of Sample Traverse Points	N/A	24
Sample Time per Point	N/A	Varied
Sampling Rate	N/A	N/A
Sampling Probe		
Nozzle Material	N/A	N/A
Nozzle Design	N/A	N/A
Probe Liner Material	N/A	N/A
Effective Probe Length	Sufficient to Traverse Points	8 feet
Probe Temperature Set-Point	N/A	N/A
Velocity Measuring Equipment		
Pitot Tube Design	3-D Probe	3-D Probe
Pitot Tube Coefficient	See Data Sheets	See Data Sheets
Pitot Tube Calibration by	Geometric or Wind Tunnel	Wind-Tunnel
Pitot Tube Attachment	Attached to Probe	Attached to Probe
Metering System Console		
Meter Type	Dry Gas Meter	ASC 3DDAS
Meter Accuracy	N/A	N/A
Meter Resolution	N/A	N/A
Meter Size	N/A	N/A
Meter Calibrated Against	N/A	N/A
Pump Type	N/A	N/A
Temperature Measurements	N/A	Type K Thermocouple/Pyrometer
Temperature Resolution	5.4°F	1.0°F
ΔP Differential Pressure Gauge	Inclined Manometer or Equivalent	Digital Manometer
ΔH Differential Pressure Gauge	N/A	N/A
Barometer	Mercury or Aneroid	Digital Barometer calibrated w/Mercury Aneroid
Filter Description		
Filter Location	N/A	N/A
Filter Holder Material	N/A	N/A
Filter Support Material	N/A	N/A
Cyclone Material	N/A	N/A
Filter Heater Set-Point	N/A	N/A
Filter Material	N/A	N/A
Other Components		
Description	N/A	N/A
Location	N/A	N/A
Operating Temperature	N/A	N/A

EPA Method 2F Sampling Train Configuration



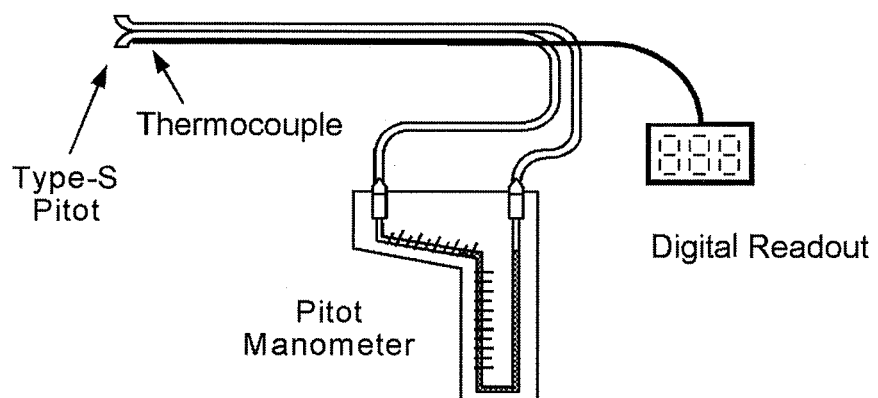
Specification Sheet for

EPA Method 2H

Source Location Name(s) FCCU Regenerator Stack
 Pollutant(s) to be Determined None
 Other Parameters to be Determined from Train Velocity Decay due to Wall Effects

	Standard Method Specification	Actual Specification Used
Pollutant Sampling Information		
Duration of Run	N/A	Varied
No. of Sample Traverse Points	N/A	12
Sample Time per Point	N/A	Varied
Sampling Rate	N/A	N/A
Sampling Probe		
Nozzle Material	N/A	N/A
Nozzle Design	N/A	N/A
Probe Liner Material	N/A	N/A
Effective Probe Length	Sufficient to Traverse Points	8 feet
Probe Temperature Set-Point	N/A	N/A
Velocity Measuring Equipment		
Pitot Tube Design	Type S	Type S
Pitot Tube Coefficient	N/A	0.827
Pitot Tube Calibration by	Geometric or Wind Tunnel	Wind-Tunnel
Pitot Tube Attachment	Attached to Probe	Attached to Probe
Metering System Console		
Meter Type	Dry Gas Meter	Dry Gas Meter
Meter Accuracy	N/A	N/A
Meter Resolution	N/A	N/A
Meter Size	N/A	N/A
Meter Calibrated Against	N/A	N/A
Pump Type	N/A	N/A
Temperature Measurements	N/A	Type K Thermocouple/Pyrometer
Temperature Resolution	5.4°F	1.0°F
ΔP Differential Pressure Gauge	Inclined Manometer or Equivalent	Inclined Manometer
ΔH Differential Pressure Gauge	Inclined Manometer or Equivalent	Inclined Manometer
Barometer	Mercury or Aneroid	Digital Barometer calibrated w/Mercury Aneroid
Filter Description		
Filter Location	N/A	N/A
Filter Holder Material	N/A	N/A
Filter Support Material	N/A	N/A
Cyclone Material	N/A	N/A
Filter Heater Set-Point	N/A	N/A
Filter Material	N/A	N/A
Other Components		
Description	N/A	N/A
Location	N/A	N/A
Operating Temperature	N/A	N/A

EPA Method 2H Sampling Train Configuration



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SAMPLE CALCULATIONS

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I hereby certify that all pages contained within this Appendix have been reviewed and, to the best of my ability, verified as accurate.

QA/QC Initials: KRO

Date: 6/12/2012



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USEPA Method 5F/202 (NSFPM/CPM) Sampling, Velocity and Moisture Sample Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

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1. Volume of water collected (wscf)

$$V_{wstd} = (0.04706)(V_{lc})$$

Where:

V_{lc}	= total volume of liquid collected in impingers and silica gel (ml)	=	80.1	ml
0.04706	= ideal gas conversion factor (ft ³ water vapor/ml or gm)	=	0.04706	ft ³ /ml
V_{wstd}	= volume of water vapor collected at standard conditions (ft ³)	=	3.77	ft ³

2. Volume of gas metered, standard conditions (dscf)

$$V_{mstd} = \frac{(17.64)(V_m) \left(P_{bar} + \frac{\Delta H}{13.6} \right) (Y_d)}{(460 + T_m)}$$

Where:

P_{bar}	= barometric pressure (in. Hg)	=	28.85	in. Hg
T_m	= average dry gas meter temperature (°F)	=	74.31	°F
V_m	= volume of gas sample through the dry gas meter at meter conditions (dcf)	=	37.80	dcf
Y_d	= gas meter correction factor (dimensionless)	=	0.9970	
ΔH	= average pressure drop across meter box orifice (in. H ₂ O)	=	1.23	in. H ₂ O
17.64	= standard temperature to pressure ratio (°R/in. Hg)	=	17.64	°R/in. Hg
13.6	= conversion factor (in. H ₂ O/in. Hg)	=	13.6	in. H ₂ O/in. Hg
460	= °F to °R conversion constant	=	460	
V_{mstd}	= volume of gas sampled through the dry gas meter at standard conditions (dscf)	=	36.008	dscf

3. Sample gas pressure (in. Hg)

$$P_s = P_{bar} + \left(\frac{P_g}{13.6} \right)$$

Where:

P_{bar}	= barometric pressure (in. Hg)	=	28.85	in. Hg
P_g	= sample gas static pressure (in. H ₂ O)	=	-0.10	in. H ₂ O
13.6	= conversion factor (in. H ₂ O/in. Hg)	=	13.6	in. H ₂ O/in. Hg
P_s	= absolute sample gas pressure (in. Hg)	=	28.84	in. Hg

4. Actual water vapor pressure at sample gas temperature less than 212°F (in. Hg)

$$P_v = \frac{e^{\left(\frac{18.3036 - \frac{3816.44}{\frac{5}{9}(T_s - 32) + 273.15 - 46.13}}{25.4} \right)}}{25.4}$$

Where:

T_s	= average sample gas temperature (°F)	=	569.08	°F
18.3036	= Antoine coefficient	=	18.3036	°K
3816.44	= Antoine coefficient	=	3816.44	°K
273.15	= temperature conversion factor	=	273.15	°K
46.13	= Antoine coefficient	=	46.13	°K
25.4	= conversion factor	=	25.4	mm Hg/in. Hg
5/9	= Fahrenheit to Celsius conversion factor	=	5/9	°C/°F
32	= temperature conversion (°F)	=	32	°F
P_v	= vapor pressure, actual (in. Hg)	=	28.84	in. Hg

5. Water vapor pressure at gas temperature greater than 212°F (in. Hg)

$$P_v = P_s$$

Where:

P_s	= absolute sample gas pressure (in. Hg)	=	28.84	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	28.84	in. Hg

6. Moisture measured in sample (% by volume)

$$B_{wo} = \frac{V_{wstd}}{(V_{mstd} + V_{wstd})}$$

Where:

V_{mstd}	= volume of gas sampled through the dry gas meter at standard conditions (dscf)	=	36.008	dscf
V_{wstd}	= volume of water collected at standard conditions (scf)	=	3.77	scf
B_{wo}	= proportion of water measured in the gas stream by volume	=	0.0948	
		=	9.48	%

7. Saturated moisture content (% by volume)

$$B_{ws} = \frac{P_v}{P_s}$$

Where:

P_s	= absolute sample gas pressure (in. Hg)	=	28.84	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	28.84	in. Hg
B_{ws}	= proportion of water vapor in the gas stream by volume at saturated conditions	=	1.0000	
		=	100.00	%

8. Actual water vapor in gas (% by volume)

$$B_w = \text{MINIMUM} [B_{wo}, B_{ws}]$$

Where:

B_{ws}	= proportion of water vapor in the gas stream by volume at saturated conditions	=	1.0000	
B_{wo}	= proportion of water measured in the gas stream by volume	=	0.0948	
B_w	= actual water vapor in gas	=	0.0948	
		=	9.48	%

9. Nitrogen (plus carbon monoxide) in gas stream (% by volume, dry)

$$N_2 + CO = 100 - CO_2 - O_2$$

Where:

CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	16.3	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	2.0	%
100	= conversion factor (%)	=	100	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	81.70	%

10. Molecular weight of dry gas stream (lb/lb-mole)

$$M_d = (M_{CO_2}) \frac{(CO_2)}{(100)} + (M_{O_2}) \frac{(O_2)}{(100)} + (M_{N_2+CO}) \frac{(N_2+CO)}{(100)}$$

Where:

M_{CO_2}	= molecular weight of carbon dioxide (lb/lb-mole)	=	44.00	lb/lb-mole
M_{O_2}	= molecular weight of oxygen (lb/lb-mole)	=	32.00	lb/lb-mole
M_{N_2+CO}	= molecular weight of nitrogen and carbon monoxide (lb/lb-mole)	=	28.00	lb/lb-mole
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	16.3	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	2.0	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	81.7	%
100	= conversion factor (%)	=	100	%
M_d	= dry molecular weight of sample gas (lb/lb-mole)	=	30.69	lb/lb-mole

11. Molecular weight of sample gas (lb/lb-mole)

$$M_s = (M_d)(1 - B_w) + (M_{H_2O})(B_w)$$

Where:

B_w	= proportion of water vapor in the gas stream by volume	=	0.0948	
M_d	= dry molecular weight of sample gas (lb/lb-mole)	=	30.69	lb/lb-mole
M_{H_2O}	= molecular weight of water (lb/lb-mole)	=	18.00	lb/lb-mole
M_s	= molecular weight of sample gas, wet basis (lb/lb-mole)	=	29.49	lb/lb-mole

12. Velocity of sample gas per Method 2 (ft/sec)

$$V_s = (K_p)(C_p)(\sqrt{\Delta P}) \left(\sqrt{\frac{(T_s + 460)}{(M_s)(P_s)}} \right)$$

Where:

K_p	= velocity pressure constant	=	85.49	
C_p	= pitot tube coefficient	=	0.83	
M_s	= wet molecular weight of sample gas, wet basis (lb/lb-mole)	=	29.49	lb/lb-mole
P_s	= absolute sample gas pressure (in. Hg)	=	28.84	in. Hg
T_s	= average sample gas temperature (°F)	=	569.08	°F
$\sqrt{\Delta P}$	= average square roots of velocity heads of sample gas (in. H ₂ O)	=	0.847	√in. H ₂ O
460	= °F to °R conversion constant	=	460	
V_s	= sample gas velocity (ft/sec)	=	65.91	ft/sec

13. Percent isokinetic (%)

$$I = \frac{(0.09450)(T_s + 460)(V_{mstd})}{(P_s)(V_s) \left(\frac{(D_n)^2 (\pi)}{(144)(4)} \right) (\Theta)(1 - B_w)}$$

Where:

D_n	= diameter of nozzle (in)	=	0.250	in.
B_w	= proportion of water vapor in the gas stream by volume	=	0.0948	
P_s	= absolute sample gas pressure (in. Hg)	=	28.84	in. Hg
T_s	= average sample gas temperature (°F)	=	569.1	°F
V_{mstd}	= volume of gas sample through the dry gas meter at standard conditions (dscf)	=	36.008	dscf
V_s	= sample gas velocity (ft/sec)	=	65.91	ft/sec
Θ	= total sampling time (min)	=	60	min
0.0945	= conversion constant	=	0.0945	
460	= °F to °R conversion constant	=	460	
I	= percent of isokinetic sampling (%)	=	99.49	%

14. Alternative Method 5 Post-Test Meter Calibration Factor

$$Y_{qa} = \frac{\Theta}{V_m} \sqrt{\frac{(0.0319)(T_m + 460)(28.96)}{(\Delta H_{@})(P_{bar} + \frac{\Delta H}{13.6})(M_d)}} (\sqrt{\Delta H})_{avg}$$

Where:

Θ	= total sampling time (min)	=	60	min
V_m	= volume of gas sample through the dry gas meter at meter conditions (dcf)	=	37.80	dcf
T_m	= average dry gas meter temperature (°F)	=	74.31	°F
$\Delta H_{@}$	= dry gas meter orifice coefficient	=	1.7816	
P_{bar}	= barometric pressure (in. Hg)	=	28.85	in. Hg
ΔH	= average pressure drop across meter box orifice (in. H ₂ O)	=	1.231	in. H ₂ O
M_d	= dry molecular weight of sample gas (lb/lb-mole)	=	30.69	lb/lb-mole
$\sqrt{\Delta H}_{avg}$	= average of square root of pressure drop across meter orifice	=	1.104	$\sqrt{\text{in. H}_2\text{O}}$
0.0319	= conversion constant	=	0.0319	
28.96	= molecular weight of ambient air (lb/lb-mole)	=	28.96	lb/lb-mole
13.6	= conversion factor (in. H ₂ O/in. Hg)	=	13.6	in. H ₂ O/in. Hg
460	= °F to °R conversion constant	=	460	
Y_{qa}	= alternative Method 5 post-test meter calibration factor	=	0.9789	

15. Sample gas velocity of sample gas per Method 2F and Method 2H (ft/sec)

$$V_s = (V_{s=sub})(WAF)$$

Where:

V_{s-sub}	= sample gas velocity from substitute Method 2F traverse (ft/sec)	=	59.51	ft/sec
WAF	= wall-effects adjustment factor	=	0.98	

V_s	= sample gas velocity (ft/sec)	=	58.13	ft/sec

16. Volumetric flow rate of sample gas at actual gas conditions (acfm)

$$Q_a = (60)(A_s)(V_s)$$

Where:

A_s	= cross sectional area of sampling location (ft ²)	=	36.90	ft ²
V_s	= sample gas velocity (ft/sec)	=	58.13	ft/sec
60	conversion factor (sec/min)	=	60	sec/min

Q_a	= volumetric flow rate at actual conditions (acfm)	=	128,697	acfm

17. Total flow of sample gas (scfm)

$$Q_s = (Q_a) \left(\frac{P_s}{29.92} \right) \left(\frac{68 + 460}{T_s + 460} \right)$$

Where:

Q_a	= volumetric flow rate at actual conditions (acfm)	=	128,697	acfm
P_s	= absolute sample gas pressure (in. Hg)	=	28.84	in. Hg
29.92	= standard pressure (in. Hg)	=	29.92	in. Hg
T_s	= average sample gas temperature (°F)	=	569.1	°F
68	= standard temperature (°F)	=	68	°F
460	= °F to °R conversion constant	=	460	

Q_s	= volumetric flow rate at standard conditions, wet basis (scfm)	=	63,654	scfm

18. Dry flow of sample gas (dscfm)

$$Q_{std} = (Q_s)(1 - B_w)$$

Where:

B_w	= proportion of water vapor in the gas stream by volume	=	0.0948	
Q_s	= volumetric flow rate at standard conditions, wet basis (scfm)	=	63,654	scfm
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	57,622	dscfm

19. Hourly time basis conversion of volumetric flow rate (Q_{std} example)

$$Q_{std-hr} = (Q_{std-min})(60)$$

Where

$Q_{std-min}$ = volumetric flow rate, english units (ft^3/min)

= 57,622 dscfm

60 = conversion factor (min/hr)

= 60 min/hr

Q_{std-hr} = volumetric flow rate, hourly basis (dscf/hr)

= 3,457,306 dscf/hr

USEPA Method 5F/202 (NSFPM/CPM) Sample Laboratory Analysis Calculations for NSFPM

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

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1. Aliquot residue mass of blank sample used in calculation (g)

$$\begin{aligned} r_{a-blank-calc} &= r_{a-blank} && \text{if } r_{a-blank} \geq MDL_d \\ r_{a-blank-calc} &= (MDL_d)(F_b) && \text{if } r_{a-blank} < MDL_d \end{aligned}$$

Where:

$r_{a-blank}$	= aliquot residue mass of blank sample (g)	= 0.00093 g
MDL_d	= reported minimum gravimetric detection limit for front half digestion (g)	= 0.00043 g
F_b	= fraction of MDL applied to non-detectable blank or sulfate correction sample (g)	= 0.00
$r_{a-blank-calc}$	= aliquot residue mass of blank sample used in calculation (g)	= 0.00093 g

2. Aliquot residue mass of run sample used in calculation (g)

$$\begin{aligned} r_{a-calc} &= r_a && \text{if } r_a \geq MDL_d \\ r_{a-calc} &= (MDL_d)(F_r) && \text{if } r_a < MDL_d \end{aligned}$$

Where:

r_a	= aliquot residue mass of run sample (g)	= 0.02762 g
MDL_d	= reported minimum gravimetric detection limit for front half digestions (g)	= 0.00043 g
F_r	= fraction of MDL applied to non-detectable run sample (g)	= 1.00
r_{a-calc}	= aliquot residue mass of run sample used in calculation (g)	= 0.02762 g

3. Residue mass of dried run sample (g)

$$r = (r_{a-calc}) \left(\frac{v_s}{v_a} \right)$$

Where:

r_{a-calc}	= aliquot residue mass of run sample used in calculation (g)	= 0.02762 g
v_s	= liquid volume of run sample (mL)	= 500.0 mL
v_a	= aliquot volume of run sample used in gravimetric analysis (mL)	= 490.0 mL
r	= residue mass of dried run sample (g)	= 0.02818 g

4. Sulfate concentration in run sample used in calculation (mg/L)

$$\begin{aligned} C_{SO4-calc} &= C_{SO4} && \text{if } C_{SO4} \geq MDL_{IC} \\ C_{SO4-calc} &= (MDL_{IC})(F_b) && \text{if } C_{SO4} < MDL_{IC} \end{aligned}$$

Where:

C_{SO4}	= sulfate concentration measured in run sample (mg/L)	= 1.3600 mg/L
MDL_{IC}	= reported minimum sulfate detection limit for IC analysis (mg/L)	= 0.0004 mg/L
F_b	= fraction of MDL applied to non-detectable blank or sulfate correction sample (g)	= 0.00
$C_{SO4-calc}$	= sulfate concentration in run sample used in calculation (mg/L)	= 1.3600 mg/L

5. Mass of sulfate in run sample (g)

$$m_{SO4} = \left(\frac{C_{SO4-calc}}{1000} \right) \left(\frac{v_s}{1000} \right)$$

Where:

$C_{SO4-calc}$	= sulfate concentration in the run sample used in calculation (mg/L)	= 1.3600	mg/L
1000	= conversion factor (mg/g)	= 1000	mg/g
v_s	= liquid volume of run sample (mL)	= 500.0	mL
1000	= conversion factor (mL/l)	= 1000	mL/l
m_{SO4}	= mass of sulfate in run sample (g)	= 0.00068	g

6. Mass of sulfate in run sample expressed as ammonium sulfate (g)

$$m_s = (m_{SO4}) \left(\frac{132.13}{96.062} \right)$$

Where:

m_{SO4}	= mass of sulfate in run sample (g)	= 0.00068	g
132.13	= molecular weight of ammonium sulfate (g/mol)	= 132.13	g/mol
96.062	= molecular weight of sulfate ion (g/mol)	= 96.062	g/mol
m_s	= mass of sulfate in run sample expressed as ammonium sulfate (g)	= 0.00094	g

7. Maximum allowable blank correction (g)

$$m_b = \text{MINIMUM} \left[\left(\frac{(r_{a-blank-calc})(v_s)}{v_{a-blank}} \right) \text{ or } (0.00001)(\rho)(v_s) \text{ or } (r - m_s) \right]$$

Where:

$r_{a-blank-calc}$	= blank aliquot residue mass used in calculation (g)	= 0.00093	g
v_s	= liquid volume of run sample (mL)	= 500	mL
$v_{a-blank}$	= liquid volume of blank sample (mL)	= 490	mL
0.00001	= EPA M-5 fraction of total rinse that can be subtracted (g)	= 0.00001	
ρ	= density of water (g/mL)	= 1.0000	g/mL
$r - m_s$	= residue mass of dried run sample, less mass of sulfate (g)	= 0.02725	g
m_b	= maximum allowable blank correction (g)	= 0.00095	g

The first part of the expression is used; the blank is the concentration of the blank, times the size of the sample

8. Net residue mass of run sample after ammonium sulfate and blank correction (g)

$$m_r = r - m_s - m_b$$

Where:

r	= residue mass of dried run sample (g)	= 0.02818	g
m_s	= mass of sulfate in run sample expressed as ammonium sulfate (g)	= 0.00094	g
m_b	= maximum allowable blank correction (g)	= 0.00095	g
m_r	= net residue mass of run sample after ammonium sulfate and blank correction (g)	= 0.02630	g

9. Total gravimetric detection limit (g)

$$m_D = (MDL_d)$$

Where:

MDL_d = reported minimum gravimetric detection limit for front half digestion (g) = 0.00043 g

m_D = total gravimetric detection limit (g) = 0.00043 g

10. Total non-sulfate filterable particulate matter (g)

$$m_n = \text{MAXIMUM}[m_r \text{ or } m_D]$$

Where:

m_r = net residue mass of sample after blank and ammonium sulfate correction (g) = 0.02630 g

m_D = total gravimetric detection limit (g) = 0.00043 g

m_n = total non-sulfate filterable particulate matter (g) = 0.02630 g

USEPA Method 5F/202 (NSFPM/CPM) Sample Laboratory Analysis Calculations for CPM

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

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1. Aliquot residue mass of inorganic blank sample used in calculation (g)

$$\begin{aligned} r_{ai-blank-calc} &= r_{ai-blank} && \text{if } r_{ai-blank} \geq MDL_i \\ r_{ai-blank-calc} &= (MDL_i)(F_b) && \text{if } r_{ai-blank} < MDL_i \end{aligned}$$

Where:

$r_{ai-blank}$	= aliquot residue mass of inorganic blank sample (g)	=	0.00132	g
MDL_i	= reported minimum gravimetric detection limit for inorganic fraction (g)	=	0.00026	g
F_b	= fraction of MDL applied to non-detectable blank samples (g)	=	0.00	
$r_{ai-blank-calc}$	= aliquot residue mass of inorganic blank sample used in calculation (g)	=	0.00132	g

2. Aliquot residue mass of inorganic run sample used in calculation (g)

$$\begin{aligned} r_{ai-calc} &= r_{ai} && \text{if } r_{ai} \geq MDL_i \\ r_{ai-calc} &= (MDL_i)(F_r) && \text{if } r_{ai} < MDL_i \end{aligned}$$

Where:

r_{ai}	= aliquot residue mass of inorganic run sample (g)	=	0.05089	g
MDL_i	= reported minimum gravimetric detection limit for inorganic fraction (g)	=	0.00026	g
F_r	= fraction of MDL applied to non-detectable run samples (g)	=	1.00	
$r_{ai-calc}$	= aliquot residue mass of inorganic run sample used in calculation (g)	=	0.05089	g

3. Residue mass of inorganic run sample (g)

$$r_i = (r_{ai-calc}) \left(\frac{v_{si}}{v_{ai}} \right)$$

Where:

$r_{ai-calc}$	= aliquot residue mass of inorganic run sample used in calculation (g)	=	0.05089	g
v_{si}	= liquid volume of inorganic run sample (mL)	=	531	mL
v_{ai}	= aliquot volume of inorganic run sample used in gravimetric analysis (mL)	=	531	mL
r_i	= residue mass of inorganic run sample (g)	=	0.05089	g

4. Mass of NH₃ added to form ammonium sulfate during titration of inorganic fraction (g)

$$\begin{aligned} m_c &= (17.03)(N)(v_t)(0.001) && \text{if } pH < 7.00 \\ m_c &= 0 && \text{if } pH \geq 7.00 \end{aligned}$$

Where:

17.03	= conversion constant for NH ₃ (equation 12.2.1 of EPA M-202)	=	17.03	
N	= normality of titrant (meq/mL)	=	0.054100	mg/L
v_t	= volume of titrant added (mL)	=	0.15	mL
0.001	= conversion factor, (g/mg)	=	0.001	g/mg
pH	= pH of the inorganic fraction	=	4.92	

$$m_c = \text{mass of NH}_3 \text{ added to form ammonium sulfate during titration of inorganic fraction (g)} = 0.00014 \text{ g}$$

For Run 1, this correction was made due to a sample pH less than 7.0 and the addition of NH₄OH to the sample.

5. Aliquot residue mass of organic blank sample used in calculation (g)

$$\begin{aligned} r_{ao-blank-calc} &= r_{ao-blank} && \text{if } r_{ao-blank} \geq MDL_o \\ r_{ao-blank-calc} &= (MDL_o)(F_b) && \text{if } r_{ao-blank} < MDL_o \end{aligned}$$

Where:

$r_{ao-blank}$	= aliquot residue mass of organic blank sample (g)	= 0.00096 g
MDL_o	= reported minimum gravimetric detection limit for organic fraction (g)	= 0.00030 g
F_b	= fraction of MDL applied to non-detectable blank samples (g)	= 0.00
$r_{ao-blank-calc}$	= aliquot residue mass of organic blank sample used in calculation (g)	= 0.00096 g

6. Aliquot residue mass of organic run sample used in calculation (g)

$$\begin{aligned} r_{ao-calc} &= r_{ao} && \text{if } r_{ao} \geq MDL_o \\ r_{ao-calc} &= (MDL_o)(F_r) && \text{if } r_{ao} < MDL_o \end{aligned}$$

Where:

r_{ao}	= aliquot residue mass of organic run sample (g)	= 0.00129 g
MDL_o	= reported minimum gravimetric detection limit for organic fraction (g)	= 0.00030 g
F_r	= fraction of MDL applied to non-detectable run samples (g)	= 1.00
$r_{ao-calc}$	= organic sample aliquot residue mass used in calculation (g)	= 0.00129 g

7. Residue mass of organic sample (g)

$$r_o = (r_{ao-calc}) \left(\frac{v_{so}}{v_{ao}} \right)$$

Where:

$r_{ao-calc}$	= aliquot residue mass of organic run sample used in calculation (g)	= 0.00129 g
v_{so}	= liquid volume of organic run sample (mL)	= 498 mL
v_{ao}	= aliquot volume of organic run sample used in gravimetric analysis (mL)	= 498 mL
r_o	= residue mass of organic sample (g)	= 0.00129 g

8. Maximum allowable inorganic blank correction (g)

$$\begin{aligned} m_{bi} &= \text{MINIMUM} \left[\left(\frac{(r_{ai-blank-calc} - m_{c-blank})(v_{si})}{v_{ai-blank}} \right) \text{ or } (0.002) \left(\frac{(r_{ai-blank-calc} - m_{c-blank})}{(r_{ai-blank-calc} - m_{c-blank}) + r_{ao-blank-calc}} \right) \text{ or } (r_i - m_c) \right] \\ &\quad \text{if } (r_{ai-blank-calc} - m_{c-blank}) + r_{ao-blank-calc} > 0 \\ m_{bi} &= 0 && \text{if } (r_{ai-blank-calc} - m_{c-blank}) + r_{ao-blank-calc} \leq 0 \end{aligned}$$

Where:

$r_{ai-blank-calc}$	= aliquot residue mass of inorganic blank sample used in calculation (g)	= 0.00132 g
$m_{c-blank}$	= mass of NH_3 added to form ammonium sulfate during titration of inorganic blank (g)	= 0.00000 g
v_{si}	= liquid volume of inorganic run sample (mL)	= 531 mL
$v_{ai-blank}$	= aliquot volume of inorganic blank sample used in gravimetric analysis (mL)	= 511 mL
0.002	= maximum total blank correction (equation 12.2.2 of EPA M-202) (g)	= 0.002 g
$r_{ao-blank-calc}$	= aliquot residue mass of organic blank sample used in calculation (g)	= 0.00096 g
r_i	= residue mass of inorganic run sample (g)	= 0.05089 g
m_c	= mass of NH_3 added to form ammonium sulfate during titration of inorganic fraction (g)	= 0.00014 g
m_{bi}	= maximum allowable inorganic blank correction (g)	= 0.00116 g

The second part of the first expression is used; the blank exceeds the maximum inorganic blank correction

9. Net residue mass of inorganic run sample after NH₃ and blank correction (g)

$$m_{ri} = r_i - m_c - m_{bi}$$

Where:

r_i	= residue mass of inorganic run sample (g)	= 0.05089 g
m_c	= mass of NH ₃ added to form ammonium sulfate during titration of inorganic fraction (g)	= 0.00014 g
m_{bi}	= maximum allowable inorganic blank correction (g)	= 0.00116 g
m_{ri}	= net residue mass of inorganic run sample after NH ₃ and blank correction (g)	= 0.04959 g

10. Total inorganic condensable particulate matter (g)

$$m_{CPMi} = \text{MAXIMUM}[m_{ri} \text{ or } MDL_i]$$

Where:

m_{ri}	= net inorganic residue mass of sample after NH ₃ and blank correction (g)	= 0.04959 g
MDL_i	= reported minimum gravimetric detection limit for inorganic fraction (g)	= 0.00026 g
m_{CPMi}	= total inorganic condensable particulate matter (g)	= 0.04959 g

11. Maximum allowable organic blank correction (g)

$$m_{bo} = \text{MINIMUM} \left[\left(\frac{(r_{ao-blank-calc})(v_{so})}{v_{ao-blank}} \right) \text{ or } (0.002) \left(\frac{r_{ao-blank-calc}}{(r_{ai-blank-calc} - m_{c-blank}) + r_{ao-blank-calc}} \right) \text{ or } (r_o) \right]$$

if $(r_{ai-blank-calc} - m_{c-blank}) + r_{ao-blank-calc} > 0$

$$m_{bo} = 0 \quad \text{if } (r_{ai-blank-calc} - m_{c-blank}) + r_{ao-blank-calc} \leq 0$$

Where:

$r_{ao-blank-calc}$	= aliquot residue mass of organic blank sample used in calculation (g)	= 0.00096 g
v_{so}	= liquid volume of organic run sample (mL)	= 498 mL
$v_{ao-blank}$	= aliquot volume of organic blank sample used in gravimetric analysis (mL)	= 493 mL
0.002	= maximum total blank correction (equation 12.2.2 of EPA M-202) (g)	= 0.002 g
$r_{ai-blank-calc}$	= aliquot residue mass of inorganic blank sample used in calculation (g)	= 0.00132 g
$m_{c-blank}$	= mass of NH ₃ added to form ammonium sulfate during titration of inorganic blank (g)	= 0.00000 g
r_o	= residue mass of organic run sample (g)	= 0.00129 g
m_{bo}	= maximum allowable organic blank correction (g)	= 0.00084 g

The second part of the expression is used; the blank exceeds the maximum organic blank correction

12. Net organic residue mass of sample after blank correction (g)

$$m_{ro} = r_o - m_{bo}$$

Where:

r_o	= residue mass of organic run sample (g)	= 0.00129 g
m_{bo}	= maximum allowable organic blank correction (g)	= 0.00084 g
m_{ro}	= net organic residue mass of sample after blank correction (g)	= 0.00045 g

13. Total organic condensable particulate matter (g)

$$m_{CPMo} = \text{MAXIMUM}[m_{ro} \text{ or } MDL_o]$$

Where:

m_{ro}	= net organic residue mass of sample after blank correction (g)	=	0.00045	g
MDL_o	= reported minimum gravimetric detection limit for organic fraction (g)	=	0.00030	g
m_{CPMo}	= total organic condensable particulate matter (g)	=	0.00045	g

14. Total gravimetric result (g)

$$m_T = m_{CPMi} + m_{CPMo}$$

Where:

m_{CPMi}	= total inorganic condensable particulate matter (g)	=	0.04959	g
m_{CPMo}	= total organic condensable particulate matter (g)	=	0.00045	g
m_T	= total gravimetric result (g)	=	0.05004	g

15. Minimum detection limit for combined fractions (g)

$$MDL_c = MDL_i + MDL_o$$

Where:

MDL_i	= reported minimum gravimetric detection limit for inorganic fraction (g)	=	0.00026	g
MDL_o	= reported minimum gravimetric detection limit for organic fraction (g)	=	0.00030	g
MDL_c	= minimum detection limit for combined fractions (g)	=	0.00056	g

16. Total condensable particulate matter (g)

$$m_{CPM} = \text{MAXIMUM}[m_T \text{ or } MDL_c]$$

Where:

m_T	= total gravimetric result (g)	=	0.05004	g
MDL_c	= minimum detection limit for combined fractions (g)	=	0.00056	g
m_{CPM}	= total condensable particulate matter (g)	=	0.05004	g

USEPA Method 5F/202 (NSFPM/CPM) Sample Emission Calculations for NSFPM

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

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1. Non-sulfate filterable particulate matter concentration (lb/dscf)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}} \right) (2.205 \times 10^{-3})$$

Where:

m_n	= total non-sulfate filterable particulate matter (g)	=	0.02630	g
V_{mstd}	= volume metered, standard (dscf)	=	36.0078	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
C_{sd}	= non-sulfate filterable particulate matter concentration (lb/dscf)	=	1.6105E-06	lb/dscf

2. Non-sulfate filterable particulate matter concentration (gr/dscf)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}} \right) (15.43)$$

Where:

m_n	= total non-sulfate filterable particulate matter (g)	=	0.02630	g
V_{mstd}	= volume metered, standard (dscf)	=	36.0078	dscf
15.43	= conversion factor (gr/g)	=	15.43	gr/g
C_{sd}	= non-sulfate filterable particulate matter concentration (gr/dscf)	=	0.0113	gr/dscf

3. Non-sulfate filterable particulate matter concentration (mg/dscm)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}} \right) (1000)(35.31)$$

Where:

m_n	= total non-sulfate filterable particulate matter (g)	=	0.02630	g
V_{mstd}	= volume metered, standard (dscf)	=	36.0078	dscf
1,000	= conversion factor (mg/g)	=	1,000	mg/g
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
C_{sd}	= non-sulfate filterable particulate matter concentration (mg/dscm)	=	25.7896	mg/dscm

4. Non-sulfate filterable particulate matter rate (lb/hr)

$$E_{lb/hr} = \left(\frac{m_n}{V_{mstd}} \right) (2.205 \times 10^{-3}) (Q_{std}) (60)$$

Where:

m_n	= total non-sulfate filterable particulate matter (g)	=	0.02630	g
V_{mstd}	= volume metered, standard (dscf)	=	36.0078	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	57,622	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
$E_{lb/hr}$	= non-sulfate filterable particulate matter rate (lb/hr)	=	5.5679	lb/hr

5. Non-sulfate filterable particulate matter rate - Production-based (lb/Mlb coke)

$$E_{Rp} = \left(\frac{m_n}{V_{mstd}} \right) \left(2.205 \times 10^{-3} \right) \left(\frac{(Q_{std})(60)}{R_p} \right)$$

Where:

m_n	= total non-sulfate filterable particulate matter (g)	=	0.02630	g
V_{mstd}	= volume metered, standard (dscf)	=	36.0078	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	57,622	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
R_p	= production rate (Mlb coke/hr)	=	18.351	Mlb coke/hr
E_{Rp}	= non-sulfate filterable particulate matter rate - production-based (lb/Mlb coke)	=	0.3034	lb/Mlb coke

USEPA Method 5F/202 (NSFPM/CPM) Sample Emission Calculations for CPM

Sample data taken from Run 1

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1. Condensable particulate matter concentration (lb/dscf)

$$C_{sd} = \left(\frac{m_{CPM}}{V_{mstd}} \right) (2.205 \times 10^{-3})$$

Where:

m_{CPM}	= total condensable particulate matter (g)	= 0.05004	g
V_{mstd}	= volume metered, standard (dscf)	= 36.0078	dscf
2.205×10^{-3}	= conversion factor (lb/g)	= 2.205E-03	lb/g
C_{sd}	= condensable particulate matter concentration (lb/dscf)	= 3.0644E-06	lb/dscf

2. Condensable particulate matter concentration (gr/dscf)

$$C_{sd} = \left(\frac{m_{CPM}}{V_{mstd}} \right) (15.43)$$

Where:

m_{CPM}	= total condensable particulate matter (g)	= 0.05004	g
V_{mstd}	= volume metered, standard (dscf)	= 36.0078	dscf
15.43	= conversion factor (gr/g)	= 15.43	gr/g
C_{sd}	= condensable particulate matter concentration (gr/dscf)	= 0.0214	gr/dscf

3. Condensable particulate matter concentration (mg/dscm)

$$C_{sd} = \left(\frac{m_{CPM}}{V_{mstd}} \right) (1000)(35.31)$$

Where:

m_{CPM}	= total condensable particulate matter (g)	= 0.05004	g
V_{mstd}	= volume metered, standard (dscf)	= 36.0078	dscf
1000	= conversion factor (mg/g)	= 1,000	mg/g
35.31	= conversion factor (dscf/dscm)	= 35.31	dscf/dscm
C_{sd}	= condensable particulate matter concentration (mg/dscm)	= 49.0720	mg/dscm

4. Condensable particulate matter rate (lb/hr)

$$E_{lb/hr} = \left(\frac{m_{CPM}}{V_{mstd}} \right) (2.205 \times 10^{-3}) (Q_{std}) (60)$$

Where:

m_{CPM}	= total condensable particulate matter (g)	= 0.05004	g
V_{mstd}	= volume metered, standard (dscf)	= 36.0078	dscf
2.205×10^{-3}	= conversion factor (lb/g)	= 2.205E-03	lb/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	= 57,622	dscfm
60	= conversion factor (min/hr)	= 60	min/hr
$E_{lb/hr}$	= condensable particulate matter rate (lb/hr)	= 10.5946	lb/hr

5. Condensable particulate matter rate - Production-based (lb/Mlb coke)

$$E_{Rp} = \left(\frac{m_{CPM}}{V_{mstd}} \right) \left(2.205 \times 10^{-3} \right) \left(\frac{(Q_{std})(60)}{R_p} \right)$$

Where:

m_{CPM}	= total condensable particulate matter (g)	= 0.05004	g
V_{mstd}	= volume metered, standard (dscf)	= 36.0078	dscf
2.205×10^{-3}	= conversion factor (lb/g)	= 2.205E-03	lb/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	= 57,622	dscfm
60	= conversion factor (min/hr)	= 60	min/hr
R_p	= production rate (Mlb coke/hr)	= 18.351	Mlb coke/hr
E_{Rp}	= condensable particulate matter rate - production-based (lb/Mlb coke)	= 0.5773	lb/Mlb coke

USEPA Method 5F/202 (NSFPM/CPM) Sample Emission Calculations for Total Non-Sulfate Particulate Matter

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

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1. Total non-sulfate particulate matter

$$m_{Part} = m_n + m_{CPM}$$

Where:

$$m_n = \text{total non-sulfate filterable particulate matter from 5F (g)} = 0.02630$$

$$m_{CPM} = \text{total condensable particulate matter from 202 (g)} = 0.05004$$

$$m_{Part} = \text{total non-sulfate particulate matter (g)} = 0.07634$$

2. Total non-sulfate particulate matter concentration (lb/dscf)

$$C_{sd} = \left(\frac{m_{Part}}{V_{mstd}} \right) (2.205 \times 10^{-3})$$

Where:

$$m_{Part} = \text{total non-sulfate particulate matter (g)} = 0.07634 \text{ g}$$

$$V_{mstd} = \text{volume metered, standard (dscf)} = 36.0078 \text{ dscf}$$

$$2.205 \times 10^{-3} = \text{conversion factor (lb/g)} = 2.205\text{E-}03 \text{ lb/g}$$

$$C_{sd} = \text{total non-sulfate particulate matter concentration (lb/dscf)} = 4.6749\text{E-}06 \text{ lb/dscf}$$

3. Total non-sulfate particulate matter concentration (gr/dscf)

$$C_{sd} = \left(\frac{m_{Part}}{V_{mstd}} \right) (15.43)$$

Where:

$$m_{Part} = \text{total non-sulfate particulate matter (g)} = 0.07634 \text{ g}$$

$$V_{mstd} = \text{volume metered, standard (dscf)} = 36.0078 \text{ dscf}$$

$$15.43 = \text{conversion factor (gr/g)} = 15.43 \text{ gr/g}$$

$$C_{sd} = \text{total non-sulfate particulate matter concentration (gr/dscf)} = 0.0327 \text{ gr/dscf}$$

4. Total non-sulfate particulate matter concentration (mg/dscm)

$$C_{sd} = \left(\frac{m_{Part}}{V_{mstd}} \right) (1000)(35.31)$$

Where:

$$m_{Part} = \text{total non-sulfate particulate matter (g)} = 0.07634 \text{ g}$$

$$V_{mstd} = \text{volume metered, standard (dscf)} = 36.0078 \text{ dscf}$$

$$1000 = \text{conversion factor (mg/g)} = 1000 \text{ mg/g}$$

$$35.31 = \text{conversion factor (dscf/dscm)} = 35.31 \text{ dscf/dscm}$$

$$C_{sd} = \text{total non-sulfate particulate matter concentration (mg/dscm)} = 74.8617 \text{ mg/dscm}$$

5. Total non-sulfate particulate matter rate (lb/hr)

$$E_{lb/hr} = \left(\frac{m_{Part}}{V_{mstd}} \right) (2.205 \times 10^{-3}) (Q_{std}) (60)$$

Where:

m_{Part}	= total non-sulfate particulate matter (g)	=	0.07634	g
V_{mstd}	= volume metered, standard (dscf)	=	36.0078	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	57,622	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
$E_{lb/hr}$	= total non-sulfate particulate matter rate (lb/hr)	=	16.1625	lb/hr

6. Total non-sulfate particulate matter rate - Production-based (lb/Mlb coke)

$$E_{Rp} = \left(\frac{m_{Part}}{V_{mstd}} \right) (2.205 \times 10^{-3}) \left(\frac{(Q_{std})(60)}{R_p} \right)$$

Where:

m_{Part}	= total non-sulfate particulate matter (g)	=	0.07634	g
V_{mstd}	= volume metered, standard (dscf)	=	36.0078	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	57,622	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
R_p	= production rate (Mlb coke/hr)	=	18.351	Mlb coke/hr
E_{Rp}	= total non-sulfate particulate matter rate - production-based (lb/Mlb coke)	=	0.8807	lb/Mlb coke

USEPA Mod. CTM-027 (NH3) Sampling, Velocity and Moisture Sample Calculations

Sample data taken from Run 1

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1. Volume of water collected (wscf)

$$V_{wstd} = (0.04706)(V_{lc})$$

Where:

V_{lc}	= total volume of liquid collected in impingers and silica gel (ml)	=	80.9	ml
0.04706	= ideal gas conversion factor (ft ³ water vapor/ml or gm)	=	0.04706	ft ³ /ml
V_{wstd}	= volume of water vapor collected at standard conditions (ft ³)	=	3.81	ft ³

2. Volume of gas metered, standard conditions (dscf)

$$V_{mstd} = \frac{(17.64)(V_m) \left(P_{bar} + \frac{\Delta H}{13.6} \right) (Y_d)}{(460 + T_m)}$$

Where:

P_{bar}	= barometric pressure (in. Hg)	=	28.85	in. Hg
T_m	= average dry gas meter temperature (°F)	=	71.08	°F
V_m	= volume of gas sample through the dry gas meter at meter conditions (dcf)	=	35.99	dcf
Y_d	= gas meter correction factor (dimensionless)	=	1.0020	
ΔH	= average pressure drop across meter box orifice (in. H ₂ O)	=	1.21	in. H ₂ O
17.64	= standard temperature to pressure ratio (°R/in. Hg)	=	17.64	°R/in. Hg
13.6	= conversion factor (in. H ₂ O/in. Hg)	=	13.6	in. H ₂ O/in. Hg
460	= °F to °R conversion constant	=	460	
V_{mstd}	= volume of gas sampled through the dry gas meter at standard conditions (dscf)	=	34.658	dscf

3. Sample gas pressure (in. Hg)

$$P_s = P_{bar} + \left(\frac{P_g}{13.6} \right)$$

Where:

P_{bar}	= barometric pressure (in. Hg)	=	28.85	in. Hg
P_g	= sample gas static pressure (in. H ₂ O)	=	-0.10	in. H ₂ O
13.6	= conversion factor (in. H ₂ O/in. Hg)	=	13.6	in. H ₂ O/in. Hg
P_s	= absolute sample gas pressure (in. Hg)	=	28.84	in. Hg

4. Actual water vapor pressure at sample gas temperature less than 212°F (in. Hg)

$$P_v = \frac{e^{\left(\frac{18.3036 - \frac{3816.44}{\frac{5}{9}(T_s - 32) + 273.15 - 46.13}}{25.4} \right)}}{25.4}$$

Where:

T_s	= average sample gas temperature (°F)	=	568.08	°F
18.3036	= Antoine coefficient	=	18.3036	°K
3816.44	= Antoine coefficient	=	3816.44	°K
273.15	= temperature conversion factor	=	273.15	°K
46.13	= Antoine coefficient	=	46.13	°K
25.4	= conversion factor	=	25.4	mm Hg/in. Hg
5/9	= Fahrenheit to Celsius conversion factor	=	5/9	°C/°F
32	= temperature conversion (°F)	=	32	°F
P_v	= vapor pressure, actual (in. Hg)	=	28.84	in. Hg

5. Water vapor pressure at gas temperature greater than 212°F (in. Hg)

$$P_v = P_s$$

Where:

P_s	= absolute sample gas pressure (in. Hg)	=	28.84	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	28.84	in. Hg

6. Moisture measured in sample (% by volume)

$$B_{wo} = \frac{V_{wstd}}{(V_{mstd} + V_{wstd})}$$

Where:

V_{mstd}	= volume of gas sampled through the dry gas meter at standard conditions (dscf)	=	34.658	dscf
V_{wstd}	= volume of water collected at standard conditions (scf)	=	3.81	scf
B_{wo}	= proportion of water measured in the gas stream by volume	=	0.0990	
		=	9.90	%

7. Saturated moisture content (% by volume)

$$B_{ws} = \frac{P_v}{P_s}$$

Where:

P_s	= absolute sample gas pressure (in. Hg)	=	28.84	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	28.84	in. Hg
B_{ws}	= proportion of water vapor in the gas stream by volume at saturated conditions	=	1.0000	
		=	100.00	%

8. Actual water vapor in gas (% by volume)

$$B_w = \text{MINIMUM} [B_{wo}, B_{ws}]$$

Where:

B_{ws}	= proportion of water vapor in the gas stream by volume at saturated conditions	=	1.0000	
B_{wo}	= proportion of water measured in the gas stream by volume	=	0.0990	
B_w	= actual water vapor in gas	=	0.0990	
		=	9.90	%

9. Nitrogen (plus carbon monoxide) in gas stream (% by volume, dry)

$$N_2 + CO = 100 - CO_2 - O_2$$

Where:

CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	16.4	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	2.0	%
100	= conversion factor (%)	=	100	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	81.60	%

10. Molecular weight of dry gas stream (lb/lb·mole)

$$M_d = (M_{CO_2}) \frac{(CO_2)}{(100)} + (M_{O_2}) \frac{(O_2)}{(100)} + (M_{N_2+CO}) \frac{(N_2 + CO)}{(100)}$$

Where:

M_{CO_2}	= molecular weight of carbon dioxide (lb/lb·mole)	=	44.00	lb/lb·mole
M_{O_2}	= molecular weight of oxygen (lb/lb·mole)	=	32.00	lb/lb·mole
M_{N_2+CO}	= molecular weight of nitrogen and carbon monoxide (lb/lb·mole)	=	28.00	lb/lb·mole
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	16.4	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	2.0	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	81.6	%
100	= conversion factor (%)	=	100	%
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	30.70	lb/lb·mole

11. Molecular weight of sample gas (lb/lb·mole)

$$M_s = (M_d)(1 - B_w) + (M_{H_2O})(B_w)$$

Where:

B_w	= proportion of water vapor in the gas stream by volume	=	0.0990	
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	30.70	lb/lb·mole
M_{H_2O}	= molecular weight of water (lb/lb·mole)	=	18.00	lb/lb·mole
M_s	= molecular weight of sample gas, wet basis (lb/lb·mole)	=	29.45	lb/lb·mole

12. Velocity of sample gas per Method 2 (ft/sec)

$$V_s = (K_p)(C_p)\left(\sqrt{\Delta P}\right)\left(\sqrt{\frac{(T_s + 460)}{(M_s)(P_s)}}\right)$$

Where:

K_p	= velocity pressure constant	=	85.49	
C_p	= pitot tube coefficient	=	0.82	
M_s	= wet molecular weight of sample gas, wet basis (lb/lb-mole)	=	29.45	lb/lb-mole
P_s	= absolute sample gas pressure (in. Hg)	=	28.84	in. Hg
T_s	= average sample gas temperature (°F)	=	568.08	°F
$\sqrt{\Delta P}$	= average square roots of velocity heads of sample gas (in. H ₂ O)	=	0.819	√in. H ₂ O
460	= °F to °R conversion constant	=	460	
V_s	= sample gas velocity (ft/sec)	=	63.01	ft/sec

13. Percent isokinetic (%)

$$I = \frac{(0.09450)(T_s + 460)(V_{mstd})}{(P_s)(V_s)\left(\frac{(D_n)^2(\pi)}{(144)(4)}\right)(\Theta)(1 - B_w)}$$

Where:

D_n	= diameter of nozzle (in)	=	0.252	in.
B_w	= proportion of water vapor in the gas stream by volume	=	0.0990	
P_s	= absolute sample gas pressure (in. Hg)	=	28.84	in. Hg
T_s	= average sample gas temperature (°F)	=	568.1	°F
V_{mstd}	= volume of gas sample through the dry gas meter at standard conditions (dscf)	=	34.658	dscf
V_s	= sample gas velocity (ft/sec)	=	63.01	ft/sec
Θ	= total sampling time (min)	=	60	min
0.0945	= conversion constant	=	0.0945	
460	= °F to °R conversion constant	=	460	
I	= percent of isokinetic sampling (%)	=	98.94	%

14. Alternative Method 5 Post-Test Meter Calibration Factor

$$Y_{qa} = \frac{\Theta}{V_m} \sqrt{\frac{(0.0319)(T_m + 460)(28.96)}{(\Delta H_{@})(P_{bar} + \frac{\Delta H}{13.6})(M_d)}} (\sqrt{\Delta H})_{avg}$$

Where:

Θ	= total sampling time (min)	=	60	min
V_m	= volume of gas sample through the dry gas meter at meter conditions (dcf)	=	35.99	dcf
T_m	= average dry gas meter temperature (°F)	=	71.08	°F
$\Delta H_{@}$	= dry gas meter orifice coefficient	=	1.8819	
P_{bar}	= barometric pressure (in. Hg)	=	28.85	in. Hg
ΔH	= average pressure drop across meter box orifice (in. H ₂ O)	=	1.208	in. H ₂ O
M_d	= dry molecular weight of sample gas (lb/lb-mole)	=	30.70	lb/lb-mole
$\sqrt{\Delta H}_{avg}$	= average of square root of pressure drop across meter orifice	=	1.099	$\sqrt{\text{in. H}_2\text{O}}$
0.0319	= conversion constant	=	0.0319	
28.96	= molecular weight of ambient air (lb/lb-mole)	=	28.96	lb/lb-mole
13.6	= conversion factor (in. H ₂ O/in. Hg)	=	13.6	in.H ₂ O/in. Hg
460	= °F to °R conversion constant	=	460	
Y_{qa}	= alternative Method 5 post-test meter calibration factor	=	0.9927	

15. Sample gas velocity of sample gas per Method 2F and Method 2H (ft/sec)

$$V_s = (V_{s=sub})(WAF)$$

Where:

V_{s-sub}	= sample gas velocity from substitute Method 2F traverse (ft/sec)	=	59.51	ft/sec
WAF	= wall-effects adjustment factor	=	0.98	
V_s	= sample gas velocity (ft/sec)	=	58.13	ft/sec

16. Volumetric flow rate of sample gas at actual gas conditions (acfm)

$$Q_a = (60)(A_s)(V_s)$$

Where:

A_s	= cross sectional area of sampling location (ft ²)	=	36.90	ft ²
V_s	= sample gas velocity (ft/sec)	=	58.13	ft/sec
60	conversion factor (sec/min)	=	60	sec/min
Q_a	= volumetric flow rate at actual conditions (acfm)	=	128,697	acfm

17. Total flow of sample gas (scfm)

$$Q_s = (Q_a) \left(\frac{P_s}{29.92} \right) \left(\frac{68 + 460}{T_s + 460} \right)$$

Where:

Q_a	= volumetric flow rate at actual conditions (acfm)	=	128,697	acfm
P_s	= absolute sample gas pressure (in. Hg)	=	28.84	in. Hg
29.92	= standard pressure (in. Hg)	=	29.92	in. Hg
T_s	= average sample gas temperature (°F)	=	568.1	°F
68	= standard temperature (°F)	=	68	°F
460	= °F to °R conversion constant	=	460	
Q_s	= volumetric flow rate at standard conditions, wet basis (scfm)	=	63,716	scfm

18. Dry flow of sample gas (dscfm)

$$Q_{std} = (Q_s)(1 - B_w)$$

Where:

B_w	= proportion of water vapor in the gas stream by volume	=	0.0990	
Q_s	= volumetric flow rate at standard conditions, wet basis (scfm)	=	63,716	scfm
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	57,410	dscfm

19. Hourly time basis conversion of volumetric flow rate (Q_{std} example)

$$Q_{std-hr} = (Q_{std-min})(60)$$

Where

$Q_{std-min}$	= volumetric flow rate, english units (ft ³ /min)	=	57,410	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
Q_{std-hr}	= volumetric flow rate, hourly basis (dscf/hr)	=	3,444,571	dscf/hr

USEPA Mod. CTM-027 NH₃ Analyte Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

053012 101140
Q

1. Ammonium to NH₃ conversion factor

$$K_{NH_3} = \frac{MW_{NH_3}}{n \times MW_{NH_4^+}}$$

Where:

MW _{NH3}	= molecular weight of NH ₃ (mg/mg-mole)	=	17.030	mg/mg-mole
MW _{NH4+}	= molecular weight of ammonium ion (mg/mg-mole)	=	18.040	mg/mg-mole
n	= molar ratio of ammonium to NH ₃	=	1.0	mole NH ₄ /mole NH ₃
K _{NH3}	= conversion factor to convert mass NH ₄ ⁺ to mass NH ₃	=	0.944	

2. Total NH₃ collected (mg)

$$m_{NH_3} = K_{NH_3} \times \frac{(S_{NH_4} v_1 + S_{NH_4} v_2)}{1000}$$

Where:

K _{NH3}	= conversion factor to convert mass NH ₄ ⁺ to mass NH ₃	=	0.944	
S _{NH4-1}	= ammonium concentration of sample fraction 1 (mg/liter)	=	13.5700	mg/liter
v ₁	= liquid volume of sample fraction 1 (ml)	=	166.0	ml
S _{NH4-2}	= ammonium concentration of sample fraction 2 (mg/liter)	=	33.5200	mg/liter
v ₂	= liquid volume of sample fraction 2 (ml)	=	569.0	ml
1000	= conversion factor (ml/liter)	=	1000	ml/liter
m _{NH3}	= total NH ₃ collected in sample (mg)	=	20.1313	mg

3. Allowable blank subtraction (mg)

$$m_b = K_{NH_3} \times B_{NH_4} \times \frac{(v_1 + v_2)}{1000}$$

$$m_b = 0 \text{ if } B_{NH_4} < MDL$$

Where:

K _{NH3}	= conversion factor to convert mass NH ₄ ⁺ to mass NH ₃	=	0.944	
B _{NH4}	= ammonium concentration of blank (mg/liter)	=	<0.1000	mg/liter
v ₁	= liquid volume of sample fraction 1 (ml)	=	166.0	ml
v ₂	= liquid volume of sample fraction 2 (ml)	=	569.0	ml
1000	= conversion factor (ml/liter)	=	1000	ml/liter
m _b	= allowable blank subtraction (mg)	=	0.0000	mg

4. Total NH3 collected, corrected for blank (mg)

$$m_{nb} = m_{NH_3} - m_b$$

Where:

m_{NH_3}	= total NH ₃ collected in sample (mg)	=	20.1313	mg
m_b	= allowable blank subtraction (mg)	=	0.0000	mg
m_{nb}	= total NH ₃ collected, corrected for blank (mg)	=	20.1313	mg

5. Minimum detectable NH3 (mg)

$$m_{MDL} = K_{NH_3} \times MDL \times \frac{(v_1 + v_2)}{1000}$$

Where:

K_{NH_3}	= conversion factor to convert mass NH ₄ ⁺ to mass NH ₃	=	0.944	
MDL	= minimum detectable ammonium concentration	=	0.011	mg/liter
v_1	= liquid volume of sample fraction 1 (ml)	=	166.0	ml
v_2	= liquid volume of sample fraction 2 (ml)	=	569.0	ml
1000	= conversion factor (ml/liter)	=	1000	ml/liter
m_{MDL}	= minimum detectable NH ₃ (mg)	=	0.0076	mg

6. Total NH3 value used in emission calculations (mg)

$$m_n = \text{MAXIMUM} [m_{nb} \text{ or } < m_{MDL}]$$

Where:

m_{nb}	= total NH ₃ collected, corrected for blank (mg)	=	20.1313	mg
m_{MDL}	= minimum detectable NH ₃ (mg)	=	0.0076	mg
m_n	= total NH ₃ value used in emission calculations (mg)	=	20.1313	mg

USEPA Mod. CTM-027 NH₃ Sample Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

053012 101140
J_Q

1. NH₃ concentration (lb/dscf)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}} \right) \left(\frac{2.205 \times 10^{-3}}{1000} \right)$$

Where:

m_n	= total NH ₃ collected, corrected for applicable blank (mg)	=	20.1313	mg
V_{mstd}	= volume metered, standard (dscf)	=	34.6582	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
1000	= conversion factor (mg/g)	=	1,000	mg/g
C_{sd}	= NH ₃ concentration (lb/dscf)	=	1.2808E-06	lb/dscf

2. NH₃ concentration (ppmdv)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}} \right) \left(\frac{0.850}{1000} \right) \left(\frac{10^6}{MW} \right)$$

Where:

m_n	= total NH ₃ collected, corrected for applicable blank (mg)	=	20.1313	mg
V_{mstd}	= volume metered, standard (dscf)	=	34.6582	dscf
MW	= molecular weight of NH ₃ (g/g-mole)	=	17.030	g/g-mole
0.850	= conversion factor (dscf/g-mole)	=	0.850	dscf/g-mole
1000	= conversion factor (mg/g)	=	1,000	mg/g
10^6	= conversion factor (ppm)	=	10^6	ppm
C_{sd}	= NH ₃ concentration (ppmdv)	=	28.9914	ppmdv

3. NH₃ concentration (mg/dscm)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}} \right) (35.31)$$

Where:

m_n	= total NH ₃ collected, corrected for applicable blank (mg)	=	20.1313	mg
V_{mstd}	= volume metered, standard (dscf)	=	34.6582	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
C_{sd}	= NH ₃ concentration (mg/dscm)	=	20.5099	mg/dscm

4. NH₃ rate (lb/hr)

$$E_{lb/hr} = \left(\frac{m_n}{V_{mstd}} \right) \left(\frac{2.205 \times 10^{-3}}{1000} \right) (Q_{std}) (60)$$

Where:

m_n	= total NH ₃ collected, corrected for applicable blank (mg)	=	20.1313	mg
V_{mstd}	= volume metered, standard (dscf)	=	34.6582	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
1000	= conversion factor (mg/g)	=	1,000	mg/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	57,410	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
$E_{lb/hr}$	= NH ₃ rate (lb/hr)	=	4.4117	lb/hr

5. NH₃ rate - Production-based (lb/Mlb coke)

$$E_{RP} = \left(\frac{m_n}{V_{mstd}} \right) \left(2.205 \times 10^{-3} \right) \left(\frac{Q_{std} \times 60}{1000 \times R_p} \right)$$

Where:

m_n	= total NH ₃ collected, corrected for applicable blank (mg)	=	20.1313	mg
V_{mstd}	= volume metered, standard (dscf)	=	34.6582	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	57,410	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
1000	= conversion factor (mg/g)	=	1000	mg/g
R_p	= production rate (Mlb coke/hr)	=	18.4	Mlb coke/hr
E_{RP}	= NH ₃ rate - production based (lb/Mlb coke)	=	2.4040E-01	lb/Mlb coke

USEPA OTM-29 (HCN) Sampling, Velocity and Moisture Sample Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

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N

1. Volume of water collected (wscf)

$$V_{wstd} = (0.04706)(V_{lc})$$

Where:

V_{lc}	= total volume of liquid collected in impingers and silica gel (ml)	=	154.9	ml
0.04706	= ideal gas conversion factor (ft ³ water vapor/ml or gm)	=	0.04706	ft ³ /ml
V_{wstd}	= volume of water vapor collected at standard conditions (ft ³)	=	7.29	ft ³

2. Volume of gas metered, standard conditions (dscf)

$$V_{mstd} = \frac{(17.64)(V_m) \left(P_{bar} + \frac{\Delta H}{13.6} \right) (Y_d) \left(1 - \frac{CO_{2,out}}{100} \right)}{(460 + T_m) \left(1 - \frac{CO_{2,in}}{100} \right)}$$

Where:

P_{bar}	= barometric pressure (in. Hg)	=	29.50	in. Hg
T_m	= average dry gas meter temperature (°F)	=	78.58	°F
V_m	= volume of gas sample through the dry gas meter at meter conditions (dcf)	=	32.53	dcf
Y_d	= gas meter correction factor (dimensionless)	=	0.9970	
$CO_{2,out}$	= proportion of carbon dioxide in the sample train outlet (%)	=	11.6	%
$CO_{2,in}$	= proportion of carbon dioxide in the flue gas stream (%)	=	14.7	%
ΔH	= average pressure drop across meter box orifice (in. H ₂ O)	=	0.90	in. H ₂ O
17.64	= standard temperature to pressure ratio (°R/in. Hg)	=	17.64	°R/in. Hg
13.6	= conversion factor (in. H ₂ O/in. Hg)	=	13.6	in. H ₂ O/in. Hg
460	= °F to °R conversion constant	=	460	
V_{mstd}	= volume of gas sampled through the dry gas meter at standard conditions (dscf)	=	32.543	dscf

3. Sample gas pressure (in. Hg)

$$P_s = P_{bar} + \left(\frac{P_g}{13.6} \right)$$

Where:

P_{bar}	= barometric pressure (in. Hg)	=	29.50	in. Hg
P_g	= sample gas static pressure (in. H ₂ O)	=	0.50	in. H ₂ O
13.6	= conversion factor (in. H ₂ O/in. Hg)	=	13.6	in. H ₂ O/in. Hg
P_s	= absolute sample gas pressure (in. Hg)	=	29.54	in. Hg

4. Actual water vapor pressure at sample gas temperature less than 212°F (in. Hg)

$$P_v = \frac{e^{\left(\frac{18.3036 - \frac{3816.44}{\frac{5}{9}(T_s - 32) + 273.15 - 46.13}}{25.4} \right)}}{25.4}$$

Where:

T_s	= average sample gas temperature (°F)	=	553.75	°F
18.3036	= Antoine coefficient	=	18.3036	°K
3816.44	= Antoine coefficient	=	3816.44	°K
273.15	= temperature conversion factor	=	273.15	°K
46.13	= Antoine coefficient	=	46.13	°K
25.4	= conversion factor	=	25.4	mm Hg/in. Hg
5/9	= Fahrenheit to Celsius conversion factor	=	5/9	°C/°F
32	= temperature conversion (°F)	=	32	°F
P_v	= vapor pressure, actual (in. Hg)	=	29.54	in. Hg

5. Water vapor pressure at gas temperature greater than 212°F (in. Hg)

$$P_v = P_s$$

Where:

P_s	= absolute sample gas pressure (in. Hg)	=	29.54	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	29.54	in. Hg

6. Nitrogen (plus carbon monoxide) in gas stream (% by volume, dry)

$$N_2 + CO = 100 - CO_{2,in} - O_2$$

Where:

$CO_{2,in}$	= proportion of carbon dioxide in the flue gas stream (%)	=	14.7	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	3.0	%
100	= conversion factor (%)	=	100	%
$N_2 + CO$	= proportion of nitrogen and CO in the gas stream by volume (%)	=	82.30	%

7. Molecular weight of dry gas stream (lb/lb-mole)

$$M_d = (M_{CO_2}) \frac{(CO_{2,in})}{(100)} + (M_{O_2}) \frac{(O_2)}{(100)} + (M_{N_2+CO}) \frac{(N_2 + CO)}{(100)}$$

Where:

M_{CO_2}	= molecular weight of carbon dioxide (lb/lb-mole)	=	44.00	lb/lb-mole
M_{O_2}	= molecular weight of oxygen (lb/lb-mole)	=	32.00	lb/lb-mole
M_{N_2+CO}	= molecular weight of nitrogen and carbon monoxide (lb/lb-mole)	=	28.00	lb/lb-mole
$CO_{2,in}$	= proportion of carbon dioxide in the flue gas stream (%)	=	14.7	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	3.0	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	82.3	%
100	= conversion factor (%)	=	100	%
M_d	= dry molecular weight of sample gas (lb/lb-mole)	=	30.47	lb/lb-mole

8. Molecular weight of sample gas (lb/lb-mole)

$$M_s = (M_d)(1 - B_w) + (M_{H_2O})(B_w)$$

Where:

B_w	= proportion of water vapor in the gas stream by volume	=	0.0975	
M_d	= dry molecular weight of sample gas (lb/lb-mole)	=	30.47	lb/lb-mole
M_{H_2O}	= molecular weight of water (lb/lb-mole)	=	18.00	lb/lb-mole
M_s	= molecular weight of sample gas, wet basis (lb/lb-mole)	=	29.26	lb/lb-mole

9. Velocity of sample gas per Method 2 (ft/sec)

$$V_s = (K_p)(C_p)(\sqrt{\Delta P}) \left(\sqrt{\frac{(T_s + 460)}{(M_s)(P_s)}} \right)$$

Where:

K_p	= velocity pressure constant	=	85.49	
C_p	= pitot tube coefficient	=	0.83	
M_s	= wet molecular weight of sample gas, wet basis (lb/lb-mole)	=	29.26	lb/lb-mole
P_s	= absolute sample gas pressure (in. Hg)	=	29.54	in. Hg
T_s	= average sample gas temperature (°F)	=	553.75	°F
$\sqrt{\Delta P}$	= average square roots of velocity heads of sample gas (in. H ₂ O)	=	0.818	√in. H ₂ O
460	=	=	460	
V_s	= sample gas velocity (ft/sec)	=	62.66	ft/sec

10. Percent isokinetic (%)

$$I = \frac{(0.09450)(T_s + 460)(V_{mstd})}{(P_s)(V_s)\left(\frac{(D_n)^2(\pi)}{(144)(4)}\right)(\theta)(1 - B_w)}$$

Where:

D_n	= diameter of nozzle (in)	=	0.234	in.
B_w	= proportion of water vapor in the gas stream by volume	=	0.0975	
P_s	= absolute sample gas pressure (in. Hg)	=	29.54	in. Hg
T_s	= average sample gas temperature (°F)	=	553.8	°F
V_{mstd}	= volume of gas sample through the dry gas meter at standard conditions (dscf)	=	32.543	dscf
V_s	= sample gas velocity (ft/sec)	=	62.66	ft/sec
θ	= total sampling time (min)	=	60	min
0.0945	= conversion constant	=	0.0945	
460	= °F to °R conversion constant	=	460	
I	= percent of isokinetic sampling (%)	=	104.17	%

11. Alternative Method 5 Post-Test Meter Calibration Factor

$$Y_{qa} = \frac{\Theta}{V_m} \sqrt{\frac{(0.0319)(T_m + 460)(28.96)}{(\Delta H_{@})(P_{bar} + \frac{\Delta H}{13.6})(M_d)}} (\sqrt{\Delta H})_{avg}$$

Where:

θ	= total sampling time (min)	=	60	min
V_m	= volume of gas sample through the dry gas meter at meter conditions (dcf)	=	32.53	dcf
T_m	= average dry gas meter temperature (°F)	=	78.58	°F
$\Delta H_{@}$	= dry gas meter orifice coefficient	=	1.7816	
P_{bar}	= barometric pressure (in. Hg)	=	29.50	in. Hg
ΔH	= average pressure drop across meter box orifice (in. H ₂ O)	=	0.900	in. H ₂ O
M_d	= dry molecular weight of sample gas (lb/lb-mole)	=	30.47	lb/lb-mole
$\sqrt{\Delta H}_{avg}$	= average of square root of pressure drop across meter orifice	=	0.948	$\sqrt{\text{in. H}_2\text{O}}$
0.0319	= conversion constant	=	0.0319	
28.96	= molecular weight of ambient air (lb/lb-mole)	=	28.96	lb/lb-mole
13.6	= conversion factor (in. H ₂ O/in. Hg)	=	13.6	in. H ₂ O/in. Hg
460	= °F to °R conversion constant	=	460	
Y_{qa}	= alternative Method 5 post-test meter calibration factor	=	0.9733	

12. Sample gas velocity of sample gas per Method 2F and Method 2H (ft/sec)

$$V_s = (V_{s=sub})(WAF)$$

Where:

V_{s-sub}	= sample gas velocity from substitute Method 2F traverse (ft/sec)	=	56.60	ft/sec
WAF	= wall-effects adjustment factor	=	0.98	
V_s	= sample gas velocity (ft/sec)	=	55.40	ft/sec

13. Volumetric flow rate of sample gas at actual gas conditions (acfm)

$$Q_a = (60)(A_s)(V_s)$$

Where:

A_s	= cross sectional area of sampling location (ft ²)	=	36.90	ft ²
V_s	= sample gas velocity (ft/sec)	=	55.40	ft/sec
60	conversion factor (sec/min)	=	60	sec/min
Q_a	= volumetric flow rate at actual conditions (acfm)	=	122,641	acfm

14. Total flow of sample gas (scfm)

$$Q_s = (Q_a) \left(\frac{P_s}{29.92} \right) \left(\frac{68 + 460}{T_s + 460} \right)$$

Where:

Q_a	= volumetric flow rate at actual conditions (acfm)	=	122,641	acfm
P_s	= absolute sample gas pressure (in. Hg)	=	29.54	in. Hg
29.92	= standard pressure (in. Hg)	=	29.92	in. Hg
T_s	= average sample gas temperature (°F)	=	553.8	°F
68	= standard temperature (°F)	=	68	°F
460	= °F to °R conversion constant	=	460	
Q_s	= volumetric flow rate at standard conditions, wet basis (scfm)	=	63,058	scfm

15. Dry flow of sample gas (dscfm)

$$Q_{std} = (Q_s)(1 - B_w)$$

Where:

B_w	= proportion of water vapor in the gas stream by volume	=	0.0975	
Q_s	= volumetric flow rate at standard conditions, wet basis (scfm)	=	63,058	scfm
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	56,907	dscfm

16. Hourly time basis conversion of volumetric flow rate (Q_{std} example)

$$Q_{std-hr} = (Q_{std-min})(60)$$

Where

$Q_{std-min}$ = volumetric flow rate, english units (ft^3/min)

= 56,907 dscfm

60 = conversion factor (min/hr)

= 60 min/hr

Q_{std-hr} = volumetric flow rate, hourly basis (dscf/hr)

= 3,414,423 dscf/hr

USEPA OTM-29 HCN Analyte Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

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1. Cyanide to HCN conversion factor

$$K_a = \frac{MW_a}{n \times MW_{ion}}$$

Where:

MW_a	= molecular weight of HCN (mg/mg-mole)	=	27.026	mg/mg-mole
MW_{ion}	= molecular weight of Cyanide ion (mg/mg-mole)	=	27.026	mg/mg-mole
n	= molar ratio of Cyanide to HCN	=	1.0	mole HCN/mole HCN
K_a	= conversion factor to convert mass HCN to mass HCN	=	1.000	

2. Total HCN collected (µg)

$$m_a = K_a \times (S_{i-1} DF_1 v_1 + S_{i-2} DF_2 v_2)$$

Where:

K_a	= conversion factor to convert mass HCN to mass HCN	=	1.000	
S_{i-1}	= Cyanide concentration of sample fraction 1 (µg/mL)	=	1.6700	µg/mL
DF_1	= dilution factor for sample fraction 1 (dimensionless)	=	10.0	
v_1	= liquid volume of sample fraction 1 (mL)	=	990	mL
S_{i-2}	= Cyanide concentration of sample fraction 2 (µg/mL)	=	<0.0145	µg/mL
DF_2	= dilution factor for sample fraction 2 (dimensionless)	=	5	
v_2	= liquid volume of sample fraction 2 (mL)	=	270	mL
m_a	= total HCN collected in sample (µg)	=	16533	µg

Note: CN- to HCN conversion was made by analytical laboratory when reporting results.

Note: Non-detects are treated as zero in summations.

DEFINITION

Fraction 1 = entire sample except last impinger containing applicable absorbing reagent.

Fraction 2 = last impinger containing applicable absorbing reagent, analyzed separately to evaluate collection efficiency.

If entire sample is analyzed as a single fraction, then data is included as Fraction 1 (Fraction 2 = 0).

3. Allowable blank subtraction (μg)

$$m_b = K_a \times B_i \times (v_1 + v_2)$$

$$m_b = 0 \text{ if } B_i < MDL$$

Where:

K_a = conversion factor to convert mass HCN to mass HCN

B_i = Cyanide concentration of blank ($\mu\text{g/mL}$)

v_1 = liquid volume of sample fraction 1 (mL)

v_2 = liquid volume of sample fraction 2 (mL)

m_b = allowable blank subtraction (μg)

Note: CN- to HCN conversion was made by analytical laboratory when reporting results.

=	1.000	
=	<0.0145	$\mu\text{g/mL}$
=	990	mL
=	270	mL
=	0	μg

4. Total HCN collected, corrected for blank (μg)

$$m_{nb} = m_a - m_b$$

Where:

m_a = total HCN collected in sample (μg)

m_b = allowable blank subtraction (μg)

m_{nb} = total HCN collected, corrected for blank (μg)

=	16533	μg
=	0	μg
=	16533	μg

5. Minimum detectable HCN (μg)

$$m_{MDL} = K_a \times MDL \times (v_1 + v_2)$$

Where:

K_a = conversion factor to convert mass HCN to mass HCN

MDL = minimum detectable Cyanide concentration ($\mu\text{g/mL}$)

v_1 = liquid volume of sample fraction 1 (mL)

v_2 = liquid volume of sample fraction 2 (mL)

m_{MDL} = minimum detectable HCN (μg)

Note: CN- to HCN conversion was made by analytical laboratory when reporting results.

=	1.000	
=	0.0145	$\mu\text{g/mL}$
=	990	mL
=	270	mL
=	18	μg

6. Total HCN value used in emission calculations (μg)

$$m_n = \text{MAXIMUM} [m_{nb} \text{ or } < m_{MDL}]$$

Where:

m_{nb} = total HCN collected, corrected for blank (μg)

m_{MDL} = minimum detectable HCN (μg)

m_n = total HCN value used in emission calculations (μg)

=	16533	μg
=	18	μg
=	16533	μg

7. Collection QC check (% mass collected in second fraction)

$$EFF = 100 \times \frac{K_a \times S_{i-2} \times DF_2 \times v_2}{m_a}$$

Where:

K_a	= conversion factor to convert mass HCN to mass HCN
S_{i-2}	= Cyanide concentration of sample fraction 2 (µg/mL)
DF_2	= dilution factor for sample fraction 2 (dimensionless)
v_2	= liquid volume of sample fraction 2 (mL)
m_a	= total HCN collected in sample (µg)
100	= conversion factor
EFF	= Collection QC check (% mass collected in second fraction)

Note: CN- to HCN conversion was made by analytical laboratory when reporting results.

=	1	
=	<0.0145	µg/mL
=	5	
=	270	mL
=	16533	µg
=	100	%
=	<0.12	%

USEPA OTM-29 HCN Sample Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

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1. HCN concentration (lb/dscf)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}} \right) \left(\frac{2.205 \times 10^{-3}}{10^6} \right)$$

Where:

m_n	= total HCN collected, corrected for applicable blank (µg)	=	16533	µg
V_{mstd}	= volume metered, standard (dscf)	=	32.5429	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	10^6	µg/g
C_{sd}	= HCN concentration (lb/dscf)	=	1.1202E-06	lb/dscf

2. HCN concentration (ppmdv)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}} \right) \left(\frac{0.850}{10^6} \right) \left(\frac{10^6}{MW} \right)$$

Where:

m_n	= total HCN collected, corrected for applicable blank (µg)	=	16533	µg
V_{mstd}	= volume metered, standard (dscf)	=	32.5429	dscf
MW	= molecular weight of HCN (g/g-mole)	=	27.026	g/g-mole
0.850	= conversion factor (dscf/g-mole)	=	0.850	dscf/g-mole
10^6	= conversion factor (µg/g)	=	10^6	µg/g
10^6	= conversion factor (ppm)	=	10^6	ppm
C_{sd}	= HCN concentration (ppmdv)	=	15.9786	ppmdv

3. HCN concentration (mg/dscm)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}} \right) \left(\frac{35.31}{1000} \right)$$

Where:

m_n	= total HCN collected, corrected for applicable blank (µg)	=	16533	µg
V_{mstd}	= volume metered, standard (dscf)	=	32.5429	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
1000	= conversion factor (µg/mg)	=	1000	µg/mg
C_{sd}	= HCN concentration (mg/dscm)	=	17.9388	mg/dscm

4. HCN rate (lb/hr)

$$E_{lb/hr} = \left(\frac{m_n}{V_{mstd}} \right) \left(\frac{2.205 \times 10^{-3}}{10^6} \right) (Q_{std}) (60)$$

Where:

m_n	= total HCN collected, corrected for applicable blank (µg)	=	16533	µg
V_{mstd}	= volume metered, standard (dscf)	=	32.5429	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	10^6	µg/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	56,907	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
$E_{lb/hr}$	= HCN rate (lb/hr)	=	3.8249	lb/hr

5. HCN rate - Production-based (lb/Mlb coke)

$$E_{RP} = \left(\frac{m_n}{V_{mstd}} \right) (2.205 \times 10^{-3}) \left(\frac{Q_{std} \times 60}{10^6 \times R_p} \right)$$

Where:

m_n	= total HCN collected, corrected for applicable blank (µg)	=	16533	µg
V_{mstd}	= volume metered, standard (dscf)	=	32.5429	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	56,907	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
10^6	= conversion factor (µg/g)	=	10^6	µg/g
R_p	= production rate (Mlb coke/hr)	=	17.932	Mlb coke/hr
E_{RP}	= HCN rate - production based (lb/Mlb coke)	=	2.1330E-01	lb/Mlb coke

PARAMETERS

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I hereby certify that all pages contained within this Appendix have been reviewed and, to the best of my ability, verified as accurate.

QA/QC Initials: KRo

Date: 6/12/2012



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Marathon Petroleum Company
Clean Air Project No: 12010
FCCU Regenerator Stack

**USEPA Method 2F and Method 2H
Substitute 3-D Velocity / Flow Rate and Velocity Decay Parameters**

Run No.	1	2	3	Average
Date (2012)	Apr 24	Apr 24	Apr 24	
Start Time (approx.)	10:33	12:48	14:33	
Stop Time (approx.)	11:43	13:53	15:55	
Substitute Method 2F Flow Traverse Data				
V _s Velocity of sample (ft/sec)	59.5130	59.5131	58.7836	59.2699
Method 2H Wall Effects Data				
WAF Wall Effects Adjustment Factor	0.9768	0.9768	0.9768	0.9768

Comments:

Average includes 3 runs.

Bold, italicized data is used in place of or applied to the data as follows:

V_s: All data is used in place of the co-located M-2 data.

WAF: All data is applied to the substitute flow data.

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Marathon Petroleum Company
Clean Air Project No: 12010
FCCU Regenerator Stack

**USEPA Method 2F and Method 2H
Substitute 3-D Velocity / Flow Rate and Velocity Decay Parameters**

Run No.	4	5	6	Average
Date (2012)	Apr 25	Apr 25	Apr 25	
Start Time (approx.)	09:08	12:07	14:06	
Stop Time (approx.)	10:12	13:14	15:23	
Substitute Method 2F Flow Traverse Data				
V _s Velocity of sample (ft/sec)	59.5933	59.6917	59.1904	59.4918
Method 2H Wall Effects Data				
WAF Wall Effects Adjustment Factor	0.9746	0.9746	0.9746	0.9746

Comments:

Average includes 3 runs.

Bold, italicized data is used in place of or applied to the data as follows:

V_s: All data is used in place of the co-located M-2 data.

WAF: All data is applied to the substitute flow data.

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Marathon Petroleum Company
Clean Air Project No: 12010
FCCU Regenerator Stack

**USEPA Method 2F and Method 2H
Substitute 3-D Velocity / Flow Rate and Velocity Decay Parameters**

Run No.	7	8	9	Average
Date (2012)	Apr 26	Apr 26	Apr 26	
Start Time (approx.)	08:24	10:10	11:58	
Stop Time (approx.)	09:31	11:17	13:17	
Substitute Method 2F Flow Traverse Data				
V _s Velocity of sample (ft/sec)	60.3463	58.9308	58.4415	59.2395
Method 2H Wall Effects Data				
WAF Wall Effects Adjustment Factor	0.9768	0.9768	0.9768	0.9768

Comments:

Average includes 3 runs.

Bold, italicized data is used in place of or applied to the data as follows:

V_s: All data is used in place of the co-located M-2 data.

WAF: All data is applied to the substitute flow data.

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Marathon Petroleum Company
Clean Air Project No: 12010
FCCU Regenerator Stack

**USEPA Method 2F and Method 2H
Substitute 3-D Velocity / Flow Rate and Velocity Decay Parameters**

Run No.	10	11	12	Average
Date (2012)	Apr 27	Apr 27	Apr 27	
Start Time (approx.)	09:28	11:12	12:45	
Stop Time (approx.)	10:28	12:12	13:45	
Substitute Method 2F Flow Traverse Data				
V _s Velocity of sample (ft/sec)	56.6006	58.0964	56.0190	56.9054
Method 2H Wall Effects Data				
WAF Wall Effects Adjustment Factor	0.9787	0.9787	0.9787	0.9787

Comments:

Average includes 3 runs.

Bold, italicized data is used in place of or applied to the data as follows:

V_s: All data is used in place of the co-located M-2 data.

WAF: All data is applied to the substitute flow data.

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Marathon Petroleum Company
Clean Air Project No: 12010
FCCU Regenerator Stack

USEPA Method 5F/202 (NSFPM/CPM) Sampling, Velocity and Moisture Parameters

Run No.	1	2	3	Average
Date (2012)	Apr 24	Apr 24	Apr 24	
Start Time (approx.)	10:33	12:48	14:33	
Stop Time (approx.)	11:43	13:53	15:55	
Sampling Conditions				
Y _d Dry gas meter correction factor	0.9970	0.9970	0.9970	
C _p Pitot tube coefficient	0.8270	0.8270	0.8270	
P _g Static pressure (in. H ₂ O)	-0.1000	-0.1000	-0.1000	
A _s Sample location area (ft ²)	36.8977	36.8977	36.8977	
P _{bar} Barometric pressure (in. Hg)	28.85	28.85	28.85	28.8500
D _n Nozzle diameter (in.)	0.2500	0.2500	0.2500	
O ₂ Oxygen (dry volume %)	2.0000	2.0000	2.2000	2.0667
CO _{2,out} Carbon dioxide (dry volume %)	16.3000	16.3000	16.2000	16.2667
N ₂ +CO Nitrogen plus carbon monoxide (dry volume %)	81.7000	81.7000	81.6000	81.6667
V _{lc} Total Liquid collected (ml)	80.10	74.20	80.00	
V _m Volume metered, meter conditions (ft ³)	37.8000	35.8150	38.5900	
T _m Dry gas meter temperature (°F)	74.3125	78.1667	81.7500	
T _s Sample temperature (°F)	569.0833	568.1250	566.1250	567.7778
ΔH Meter box orifice pressure drop (in. H ₂ O)	1.2313	1.0975	1.2488	
θ Total sampling time (min)	60.0	60.0	60.0	
Flow Results				
V _{wstd} Volume of water collected (ft ³)	3.7695	3.4919	3.7648	3.6754
V _{mstd} Volume metered, standard (dscf)	36.0078	33.8611	36.2573	35.3754
P _s Sample gas pressure, absolute (in. Hg)	28.8426	28.8426	28.8426	28.8426
P _v Vapor pressure, actual (in. Hg)	28.8426	28.8426	28.8426	28.8426
B _{w0} Moisture measured in sample (% by volume)	9.4765	9.3483	9.4068	9.4105
B _{ws} Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	100.0000
B _w Actual water vapor in gas (% by volume)	9.4765	9.3483	9.4068	9.4105
√ΔP Velocity head (√in. H ₂ O)	0.8474	0.8508	0.8415	0.8466
M _d MW of sample gas, dry (lb/lb-mole)	30.6880	30.6880	30.6800	30.6853
M _s MW of sample gas, wet (lb/lb-mole)	29.4856	29.5019	29.4872	29.4916
V _s Velocity of sample (ft/sec)	65.9071	66.1229	65.3502	65.7934
%I Isokinetic sampling (%) ¹	99.4928	93.0373	100.6680	97.7327

Comments:

Average includes 3 runs.

¹ Sample flow rates as determined by EPA Method 2 were used to calculate isokinetic sampling conditions.

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USEPA Method 5F/202 (NSFPM/CPM) Emission Parameters for NSFPM

Run No.		1	2	3	Average
Date (2012)		Apr 24	Apr 24	Apr 24	
Start Time (approx.)		10:33	12:48	14:33	
Stop Time (approx.)		11:43	13:53	15:55	
Process Conditions					
R _P	Coke burn-off rate (Mlb coke/hr)	18.351	18.240	18.196	18.262
P ₁	FCC charge rate (bpd)	33,012	33,018	32,988	33,006
P ₂	ESP operation	West / MPR	West / MPR	West / MPR	
P ₃	NH3 injection (lb/hr)	8	8	8	
Gas Conditions					
O ₂	Oxygen (dry volume %)	2.0000	2.0000	2.2000	2.0667
CO ₂	Carbon dioxide (dry volume %)	16.3000	16.3000	16.2000	16.2667
T _s	Sample temperature (°F)	569.0833	568.1250	566.1250	567.7778
B _w	Actual water vapor in gas (% by volume)	9.4765	9.3483	9.4068	9.4105
Gas Flow Rate					
Q _a	Volumetric flow rate, actual (acfm)	128,697	128,697	127,120	128,171
Q _s	Volumetric flow rate, standard (scfm)	63,654	63,713	63,055	63,474
Q _{std}	Volumetric flow rate, dry standard (dscfm)	57,622	57,757	57,124	57,501
Q _a	Volumetric flow rate, actual (acf/hr)	7,721,821	7,721,834	7,627,174	7,690,276
Q _s	Volumetric flow rate, standard (scf/hr)	3,819,237	3,822,804	3,783,300	3,808,447
Q _{std}	Volumetric flow rate, dry standard (dscf/hr)	3,457,306	3,465,438	3,427,413	3,450,052
Sampling Data					
V _{mstd}	Volume metered, standard (dscf)	36.0078	33.8611	36.2573	35.3754
%I	Isokinetic sampling (%) ¹	99.4928	93.0373	100.6680	97.7327
Laboratory Data					
m _n	Total Non-Sulfate FPM (g)	0.02630	0.02447	0.02664	
n _{MDL}	Number of non-detectable fractions	N/A	N/A	N/A	
DLC	Detection level classification	ADL	ADL	ADL	
Non-Sulfate FPM Results					
C _{sd}	Particulate Concentration (lb/dscf)	1.6105E-06	1.5937E-06	1.6201E-06	1.6081E-06
C _{sd}	Particulate Concentration (gr/dscf)	0.0113	0.0112	0.0113	0.0113
C _{sd}	Particulate Concentration (mg/dscm)	25.7896	25.5207	25.9438	25.7514
E _{lb/hr}	Particulate Rate (lb/hr)	5.5679	5.5228	5.5528	5.5478
E _{Rp}	Particulate Rate - Production-based (lb/Mlb coke)	0.3034	0.3028	0.3052	0.3038

Comments:

Average includes 3 runs.

¹ Sample flow rates as determined by EPA Method 2 were used to calculate isokinetic sampling conditions.

Detection level classifications are defined as follows:

ADL = Above Detection Level - all fractions are above detection limit

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**USEPA Method 5F/202 (NSFPM/CPM)
Emission Parameters for CPM**

Run No.		1	2	3	Average
Date (2012)		Apr 24	Apr 24	Apr 24	
Start Time (approx.)		10:33	12:48	14:33	
Stop Time (approx.)		11:43	13:53	15:55	
Process Conditions					
R _P	Coke burn-off rate (Mlb coke/hr)	18.351	18.240	18.196	18.262
P ₁	FCC charge rate (bpd)	33,012	33,018	32,988	33,006
P ₂	ESP operation	West / MPR	West / MPR	West / MPR	
P ₃	NH3 injection (lb/hr)	8	8	8	
Gas Conditions					
O ₂	Oxygen (dry volume %)	2.0000	2.0000	2.2000	2.0667
CO ₂	Carbon dioxide (dry volume %)	16.3000	16.3000	16.2000	16.2667
T _s	Sample temperature (°F)	569.0833	568.1250	566.1250	567.7778
B _w	Actual water vapor in gas (% by volume)	9.4765	9.3483	9.4068	9.4105
Gas Flow Rate					
Q _a	Volumetric flow rate, actual (acfm)	128,697	128,697	127,120	128,171
Q _s	Volumetric flow rate, standard (scfm)	63,654	63,713	63,055	63,474
Q _{std}	Volumetric flow rate, dry standard (dscfm)	57,622	57,757	57,124	57,501
Q _a	Volumetric flow rate, actual (acf/hr)	7,721,821	7,721,834	7,627,174	7,690,276
Q _s	Volumetric flow rate, standard (scf/hr)	3,819,237	3,822,804	3,783,300	3,808,447
Q _{std}	Volumetric flow rate, dry standard (dscf/hr)	3,457,306	3,465,438	3,427,413	3,450,052
Sampling Data					
V _{mstd}	Volume metered, standard (dscf)	36.0078	33.8611	36.2573	35.3754
%I	Isokinetic sampling (%) ¹	99.4928	93.0373	100.6680	97.7327
Laboratory Data					
m _{CPMi}	Total Inorganic CPM Result (g)	0.04959	0.04802	0.05092	
m _{CPMo}	Total Organic CPM Result (g)	0.00045	0.00039	0.00050	
m _{CPM}	Total CPM (g)	0.05004	0.04841	0.05142	
n _{MDL}	Number of non-detectable fractions	N/A	N/A	N/A	
DLC	Detection level classification	ADL	ADL	ADL	
Condensable Particulate Matter Results					
C _{sd}	Particulate Concentration (lb/dscf)	3.0644E-06	3.1525E-06	3.1272E-06	3.1147E-06
C _{sd}	Particulate Concentration (gr/dscf)	0.0214	0.0221	0.0219	0.0218
C _{sd}	Particulate Concentration (mg/dscm)	49.0720	50.4833	50.0783	49.8779
E _{lb/hr}	Particulate Rate (lb/hr)	10.5946	10.9249	10.7183	10.7459
E _{RP}	Particulate Rate - Production-based (lb/Mlb coke)	0.5773	0.5990	0.5891	0.5884

Comments:

Average includes 3 runs.

¹ Sample flow rates as determined by EPA Method 2 were used to calculate isokinetic sampling conditions.

Detection level classifications are defined as follows:

ADL = Above Detection Level - all fractions are above detection limit

**USEPA Method 5F/202 (NSFPM/CPM)
Emission Parameters for CPM
Separate Inorganic and Organic Results**

Run No.	1	2	3	Average
Date (2012)	Apr 24	Apr 24	Apr 24	
Start Time (approx.)	10:33	12:48	14:33	
Stop Time (approx.)	11:43	13:53	15:55	

Condensable Particulate Matter Results - Inorganic Fraction

C _{sd}	Particulate Concentration (lb/dscf)	3.0370E-06	3.1273E-06	3.0970E-06	3.0871E-06
C _{sd}	Particulate Concentration (gr/dscf)	0.0213	0.0219	0.0217	0.0216
C _{sd}	Particulate Concentration (mg/dscm)	48.6328	50.0789	49.5934	49.4350
E _{lb/hr}	Particulate Rate (lb/hr)	10.4997	10.8374	10.6145	10.6505
E _{RP}	Particulate Rate - Production-based (lb/Mlb coke)	0.5722	0.5942	0.5834	0.5832

Condensable Particulate Matter Results - Organic Fraction

C _{sd}	Particulate Concentration (lb/dscf)	2.7428E-08	2.5259E-08	3.0280E-08	2.7656E-08
C _{sd}	Particulate Concentration (gr/dscf)	0.0002	0.0002	0.0002	0.0002
C _{sd}	Particulate Concentration (mg/dscm)	0.4392	0.4045	0.4849	0.4429
E _{lb/hr}	Particulate Rate (lb/hr)	0.0948	0.0875	0.1038	0.0954
E _{RP}	Particulate Rate - Production-based (lb/Mlb coke)	0.0052	0.0048	0.0057	0.0052

Comments:

Average includes 3 runs.

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USEPA Method 5F/202 (NSFPM/CPM) Emission Parameters for Total Non-Sulfate Particulate Matter

Run No.		1	2	3	Average
Date (2012)		Apr 24	Apr 24	Apr 24	
Start Time (approx.)		10:33	12:48	14:33	
Stop Time (approx.)		11:43	13:53	15:55	
Process Conditions					
R _P	Coke burn-off rate (Mlb coke/hr)	18.351	18.240	18.196	18.262
P ₁	FCC charge rate (bpd)	33,012	33,018	32,988	33,006
P ₂	ESP operation	West / MPR	West / MPR	West / MPR	
P ₃	NH3 injection (lb/hr)	8	8	8	
Gas Conditions					
O ₂	Oxygen (dry volume %)	2.0000	2.0000	2.2000	2.0667
CO ₂	Carbon dioxide (dry volume %)	16.3000	16.3000	16.2000	16.2667
T _s	Sample temperature (°F)	569.0833	568.1250	566.1250	567.7778
B _w	Actual water vapor in gas (% by volume)	9.4765	9.3483	9.4068	9.4105
Gas Flow Rate					
Q _a	Volumetric flow rate, actual (acfm)	128,697	128,697	127,120	128,171
Q _s	Volumetric flow rate, standard (scfm)	63,654	63,713	63,055	63,474
Q _{std}	Volumetric flow rate, dry standard (dscfm)	57,622	57,757	57,124	57,501
Q _a	Volumetric flow rate, actual (acf/hr)	7,721,821	7,721,834	7,627,174	7,690,276
Q _s	Volumetric flow rate, standard (scf/hr)	3,819,237	3,822,804	3,783,300	3,808,447
Q _{std}	Volumetric flow rate, dry standard (dscf/hr)	3,457,306	3,465,438	3,427,413	3,450,052
Sampling Data					
V _{mstd}	Volume metered, standard (dscf)	36.0078	33.8611	36.2573	35.3754
%I	Isokinetic sampling (%) ¹	99.4928	93.0373	100.6680	97.7327
Laboratory Data					
m _n	Total non-sulfate filterable particulate matter (g)	0.02630	0.02447	0.02664	
m _{CPM}	Total condensable particulate matter (g)	0.05004	0.04841	0.05142	
m _{Part}	Total non-sulfate particulate matter (g)	0.07634	0.07289	0.07806	
n _{MDL}	Number of non-detectable fractions	N/A	N/A	N/A	
DLC	Detection level classification	ADL	ADL	ADL	
Total Non-Sulfate Particulate Matter Results					
C _{sd}	Particulate Concentration (lb/dscf)	4.6749E-06	4.7462E-06	4.7473E-06	4.7228E-06
C _{sd}	Particulate Concentration (gr/dscf)	0.0327	0.0332	0.0332	0.0330
C _{sd}	Particulate Concentration (mg/dscm)	74.8617	76.0040	76.0221	75.6293
E _{lb/hr}	Particulate Rate (lb/hr)	16.1625	16.4477	16.2711	16.2938
E _{Rp}	Particulate Rate - Production-based (lb/Mlb coke)	0.8807	0.9018	0.8942	0.8922

Comments:

Average includes 3 runs.

¹ Sample flow rates as determined by EPA Method 2 were used to calculate isokinetic sampling conditions.

Detection level classifications are defined as follows:

ADL = Above Detection Level - all fractions are above detection limit

Marathon Petroleum Company
Clean Air Project No: 12010
FCCU Regenerator Stack

USEPA Method 5F/202 (NSFPM/CPM) Sampling, Velocity and Moisture Parameters

Run No.		4	5	6	Average
Date (2012)		Apr 25	Apr 25	Apr 25	
Start Time (approx.)		09:08	12:07	14:06	
Stop Time (approx.)		10:12	13:14	15:23	
Sampling Conditions					
Y _d	Dry gas meter correction factor	0.9970	0.9970	0.9970	
C _p	Pitot tube coefficient	0.8270	0.8270	0.8270	
P _g	Static pressure (in. H ₂ O)	0.4000	0.4000	0.4000	
A _s	Sample location area (ft ²)	36.8977	36.8977	36.8977	
P _{bar}	Barometric pressure (in. Hg)	29.15	29.15	29.15	29.1500
D _n	Nozzle diameter (in.)	0.2500	0.2500	0.2500	
O ₂	Oxygen (dry volume %)	2.4000	2.5000	2.3000	2.4000
CO ₂	Carbon dioxide (dry volume %)	16.1000	16.0000	16.2000	16.1000
N ₂ +CO	Nitrogen plus carbon monoxide (dry volume %)	81.5000	81.5000	81.5000	81.5000
V _{lc}	Total Liquid collected (ml)	79.90	83.10	81.40	
V _m	Volume metered, meter conditions (ft ³)	37.5850	37.5850	37.4050	
T _m	Dry gas meter temperature (°F)	85.8958	82.8125	79.5208	
T _s	Sample temperature (°F)	557.1250	557.3333	557.2500	557.2361
ΔH	Meter box orifice pressure drop (in. H ₂ O)	1.1875	1.1917	1.1958	
θ	Total sampling time (min)	60.0	60.0	60.0	
Flow Results					
V _{wstd}	Volume of water collected (ft ³)	3.7601	3.9107	3.8307	3.8338
V _{mstd}	Volume metered, standard (dscf)	35.4027	35.6041	35.6502	35.5523
P _s	Sample gas pressure, absolute (in. Hg)	29.1794	29.1794	29.1794	29.1794
P _v	Vapor pressure, actual (in. Hg)	29.1794	29.1794	29.1794	29.1794
B _{wo}	Moisture measured in sample (% by volume)	9.6012	9.8968	9.7026	9.7335
B _{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	100.0000
B _w	Actual water vapor in gas (% by volume)	9.6012	9.8968	9.7026	9.7335
√ΔP	Velocity head (√in. H ₂ O)	0.8120	0.8158	0.8165	0.8148
M _d	MW of sample gas, dry (lb/lb-mole)	30.6720	30.6600	30.6840	30.6720
M _s	MW of sample gas, wet (lb/lb-mole)	29.4553	29.4071	29.4533	29.4386
V _s	Velocity of sample (ft/sec)	62.4551	62.8045	62.8022	62.6873
%I	Isokinetic sampling (%) ¹	100.9896	101.3513	101.2595	101.2002

Comments:

Average includes 3 runs.

¹ Sample flow rates as determined by EPA Method 2 were used to calculate isokinetic sampling conditions.

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USEPA Method 5F/202 (NSFPM/CPM) Emission Parameters for NSFPM

Run No.		4	5	6	Average
Date (2012)		Apr 25	Apr 25	Apr 25	
Start Time (approx.)		09:08	12:07	14:06	
Stop Time (approx.)		10:12	13:14	15:23	
Process Conditions					
R _P	Coke burn-off rate (Mlb coke/hr)	18.143	18.106	18.053	18.101
P ₁	FCC charge rate (bpd)	32,512	32,478	32,476	32,489
P ₂	ESP operation	Both / MPR	Both / MPR	Both / MPR	
P ₃	NH3 injection (lb/hr)	8	8	8	
Gas Conditions					
O ₂	Oxygen (dry volume %)	2.4000	2.5000	2.3000	2.4000
CO ₂	Carbon dioxide (dry volume %)	16.1000	16.0000	16.2000	16.1000
T _s	Sample temperature (°F)	557.1250	557.3333	557.2500	557.2361
B _w	Actual water vapor in gas (% by volume)	9.6012	9.8968	9.7026	9.7335
Gas Flow Rate					
Q _a	Volumetric flow rate, actual (acfm)	128,580	128,792	127,711	128,361
Q _s	Volumetric flow rate, standard (scfm)	65,095	65,189	64,647	64,977
Q _{std}	Volumetric flow rate, dry standard (dscfm)	58,845	58,737	58,374	58,652
Q _a	Volumetric flow rate, actual (acf/hr)	7,714,789	7,727,526	7,662,631	7,701,649
Q _s	Volumetric flow rate, standard (scf/hr)	3,905,698	3,911,345	3,878,815	3,898,619
Q _{std}	Volumetric flow rate, dry standard (dscf/hr)	3,530,704	3,524,248	3,502,468	3,519,140
Sampling Data					
V _{mstd}	Volume metered, standard (dscf)	35.4027	35.6041	35.6502	35.5523
%I	Isokinetic sampling (%) ¹	100.9896	101.3513	101.2595	101.2002
Laboratory Data					
m _n	Total Non-Sulfate FPM (g)	0.01293	0.01333	0.01576	
n _{MDL}	Number of non-detectable fractions	N/A	N/A	N/A	
DLC	Detection level classification	ADL	ADL	ADL	
Non-Sulfate FPM Results					
C _{sd}	Particulate Concentration (lb/dscf)	8.0541E-07	8.2547E-07	9.7479E-07	8.6856E-07
C _{sd}	Particulate Concentration (gr/dscf)	0.0056	0.0058	0.0068	0.0061
C _{sd}	Particulate Concentration (mg/dscm)	12.8975	13.2187	15.6099	13.9087
E _{lb/hr}	Particulate Rate (lb/hr)	2.8437	2.9092	3.4142	3.0557
E _{Rp}	Particulate Rate - Production-based (lb/Mlb coke)	0.1567	0.1607	0.1891	0.1688

Comments:

Average includes 3 runs.

¹ Sample flow rates as determined by EPA Method 2 were used to calculate isokinetic sampling conditions.

Detection level classifications are defined as follows:

ADL = Above Detection Level - all fractions are above detection limit

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USEPA Method 5F/202 (NSFPM/CPM) Emission Parameters for CPM

Run No.	4	5	6	Average
Date (2012)	Apr 25	Apr 25	Apr 25	
Start Time (approx.)	09:08	12:07	14:06	
Stop Time (approx.)	10:12	13:14	15:23	
Process Conditions				
R _P Coke burn-off rate (Mlb coke/hr)	18.143	18.106	18.053	18.101
P ₁ FCC charge rate (bpd)	32,512	32,478	32,476	32,489
P ₂ ESP operation	Both / MPR	Both / MPR	Both / MPR	
P ₃ NH3 injection (lb/hr)	8	8	8	
Gas Conditions				
O ₂ Oxygen (dry volume %)	2.4000	2.5000	2.3000	2.4000
CO ₂ Carbon dioxide (dry volume %)	16.1000	16.0000	16.2000	16.1000
T _s Sample temperature (°F)	557.1250	557.3333	557.2500	557.2361
B _w Actual water vapor in gas (% by volume)	9.6012	9.8968	9.7026	9.7335
Gas Flow Rate				
Q _a Volumetric flow rate, actual (acfm)	128,580	128,792	127,711	128,361
Q _s Volumetric flow rate, standard (scfm)	65,095	65,189	64,647	64,977
Q _{std} Volumetric flow rate, dry standard (dscfm)	58,845	58,737	58,374	58,652
Q _a Volumetric flow rate, actual (acf/hr)	7,714,789	7,727,526	7,662,631	7,701,649
Q _s Volumetric flow rate, standard (scf/hr)	3,905,698	3,911,345	3,878,815	3,898,619
Q _{std} Volumetric flow rate, dry standard (dscf/hr)	3,530,704	3,524,248	3,502,468	3,519,140
Sampling Data				
V _{mstd} Volume metered, standard (dscf)	35.4027	35.6041	35.6502	35.5523
%I Isokinetic sampling (%) ¹	100.9896	101.3513	101.2595	101.2002
Laboratory Data				
m _{CPMI} Total Inorganic CPM Result (g)	0.04175	0.04359	0.04345	
m _{CPMo} Total Organic CPM Result (g)	0.00030	0.00046	0.00040	
m _{CPM} Total CPM (g)	0.04205	0.04405	0.04385	
n _{MDL} Number of non-detectable fractions	N/A	N/A	N/A	
DLC Detection level classification	ADL	ADL	ADL	
Condensable Particulate Matter Results				
C _{sd} Particulate Concentration (lb/dscf)	2.6189E-06	2.7282E-06	2.7120E-06	2.6864E-06
C _{sd} Particulate Concentration (gr/dscf)	0.0183	0.0191	0.0190	0.0188
C _{sd} Particulate Concentration (mg/dscm)	41.9378	43.6875	43.4294	43.0182
E _{lb/hr} Particulate Rate (lb/hr)	9.2465	9.6147	9.4988	9.4533
E _{RP} Particulate Rate - Production-based (lb/Mlb coke)	0.5096	0.5310	0.5262	0.5223

Comments:

Average includes 3 runs.

Detection level classifications are defined as follows:

¹ Sample flow rates as determined by EPA Method 2 were used to calculate isokinetic sampling conditions.

ADL = Above Detection Level - all fractions are above detection limit

**USEPA Method 5F/202 (NSFPM/CPM)
Emission Parameters for CPM
Separate Inorganic and Organic Results**

Run No.	4	5	6	Average
Date (2012)	Apr 25	Apr 25	Apr 25	
Start Time (approx.)	09:08	12:07	14:06	
Stop Time (approx.)	10:12	13:14	15:23	

Condensable Particulate Matter Results - Inorganic Fraction

C _{sd}	Particulate Concentration (lb/dscf)	2.6002E-06	2.6998E-06	2.6875E-06	2.6625E-06
C _{sd}	Particulate Concentration (gr/dscf)	0.0182	0.0189	0.0188	0.0186
C _{sd}	Particulate Concentration (mg/dscm)	41.6386	43.2334	43.0371	42.6364
E _{lb/hr}	Particulate Rate (lb/hr)	9.1805	9.5147	9.4130	9.3694
E _{RP}	Particulate Rate - Production-based (lb/Mlb coke)	0.5060	0.5255	0.5214	0.5176

Condensable Particulate Matter Results - Organic Fraction

C _{sd}	Particulate Concentration (lb/dscf)	1.8685E-08	2.8358E-08	2.4496E-08	2.3846E-08
C _{sd}	Particulate Concentration (gr/dscf)	0.0001	0.0002	0.0002	0.0002
C _{sd}	Particulate Concentration (mg/dscm)	0.2992	0.4541	0.3923	0.3819
E _{lb/hr}	Particulate Rate (lb/hr)	0.0660	0.0999	0.0858	0.0839
E _{RP}	Particulate Rate - Production-based (lb/Mlb coke)	0.0036	0.0055	0.0048	0.0046

Comments:

Average includes 3 runs.

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USEPA Method 5F/202 (NSFPM/CPM) Emission Parameters for Total Non-Sulfate Particulate Matter

Run No.		4	5	6	Average
Date (2012)		Apr 25	Apr 25	Apr 25	
Start Time (approx.)		09:08	12:07	14:06	
Stop Time (approx.)		10:12	13:14	15:23	
Process Conditions					
R _P	Coke burn-off rate (Mlb coke/hr)	18.143	18.106	18.053	18.101
P ₁	FCC charge rate (bpd)	32,512	32,478	32,476	32,489
P ₂	ESP operation	Both / MPR	Both / MPR	Both / MPR	
P ₃	NH3 injection (lb/hr)	8	8	8	
Gas Conditions					
O ₂	Oxygen (dry volume %)	2.4000	2.5000	2.3000	2.4000
CO ₂	Carbon dioxide (dry volume %)	16.1000	16.0000	16.2000	16.1000
T _s	Sample temperature (°F)	557.1250	557.3333	557.2500	557.2361
B _w	Actual water vapor in gas (% by volume)	9.6012	9.8968	9.7026	9.7335
Gas Flow Rate					
Q _a	Volumetric flow rate, actual (acfm)	128,580	128,792	127,711	128,361
Q _s	Volumetric flow rate, standard (scfm)	65,095	65,189	64,647	64,977
Q _{std}	Volumetric flow rate, dry standard (dscfm)	58,845	58,737	58,374	58,652
Q _a	Volumetric flow rate, actual (acf/hr)	7,714,789	7,727,526	7,662,631	7,701,649
Q _s	Volumetric flow rate, standard (scf/hr)	3,905,698	3,911,345	3,878,815	3,898,619
Q _{std}	Volumetric flow rate, dry standard (dscf/hr)	3,530,704	3,524,248	3,502,468	3,519,140
Sampling Data					
V _{mstd}	Volume metered, standard (dscf)	35.4027	35.6041	35.6502	35.5523
%I	Isokinetic sampling (%) ¹	100.9896	101.3513	101.2595	101.2002
Laboratory Data					
m _n	Total non-sulfate filterable particulate matter (g)	0.01293	0.01333	0.01576	
m _{CPM}	Total condensable particulate matter (g)	0.04205	0.04405	0.04385	
m _{Part}	Total non-sulfate particulate matter (g)	0.05498	0.05738	0.05961	
n _{MDL}	Number of non-detectable fractions	N/A	N/A	N/A	
DLC	Detection level classification	ADL	ADL	ADL	
Total Non-Sulfate Particulate Matter Results					
C _{sd}	Particulate Concentration (lb/dscf)	3.4243E-06	3.5536E-06	3.6868E-06	3.5549E-06
C _{sd}	Particulate Concentration (gr/dscf)	0.0240	0.0249	0.0258	0.0249
C _{sd}	Particulate Concentration (mg/dscm)	54.8353	56.9063	59.0393	56.9270
E _{lb/hr}	Particulate Rate (lb/hr)	12.0902	12.5238	12.9130	12.5090
E _{Rp}	Particulate Rate - Production-based (lb/Mlb coke)	0.6664	0.6917	0.7153	0.6911

Comments:

Average includes 3 runs.

¹ Sample flow rates as determined by EPA Method 2 were used to calculate isokinetic sampling conditions.

Detection level classifications are defined as follows:

ADL = Above Detection Level - all fractions are above detection limit

Marathon Petroleum Company
Clean Air Project No: 12010
FCCU Regenerator Stack

USEPA Method 5F/202 (NSFPM/CPM) Sampling, Velocity and Moisture Parameters

Run No.		7	8	9	Average
Date (2012)		Apr 26	Apr 26	Apr 26	
Start Time (approx.)		08:24	10:10	11:58	
Stop Time (approx.)		09:31	11:17	13:17	
Sampling Conditions					
Y _d	Dry gas meter correction factor	0.9970	0.9970	0.9970	
C _p	Pitot tube coefficient	0.8270	0.8270	0.8270	
P _g	Static pressure (in. H ₂ O)	0.4000	0.4000	0.4000	
A _s	Sample location area (ft ²)	36.8977	36.8977	36.8977	
P _{bar}	Barometric pressure (in. Hg)	29.00	29.00	29.00	29.0000
D _n	Nozzle diameter (in.)	0.2500	0.2500	0.2500	
O ₂	Oxygen (dry volume %)	2.3000	2.3000	2.4000	2.3333
CO ₂	Carbon dioxide (dry volume %)	16.0000	16.0000	15.8000	15.9333
N ₂ +CO	Nitrogen plus carbon monoxide (dry volume %)	81.7000	81.7000	81.8000	81.7333
V _{lc}	Total Liquid collected (ml)	87.30	86.80	84.70	
V _m	Volume metered, meter conditions (ft ³)	38.5500	38.6150	38.1950	
T _m	Dry gas meter temperature (°F)	76.0625	80.7917	83.2500	
T _s	Sample temperature (°F)	560.4167	558.4167	555.5417	558.1250
ΔH	Meter box orifice pressure drop (in. H ₂ O)	1.2500	1.2458	1.2208	
θ	Total sampling time (min)	60.0	60.0	60.0	
Flow Results					
V _{wstd}	Volume of water collected (ft ³)	4.1083	4.0848	3.9860	4.0597
V _{mstd}	Volume metered, standard (dscf)	36.7938	36.5332	35.9700	36.4323
P _s	Sample gas pressure, absolute (in. Hg)	29.0294	29.0294	29.0294	29.0294
P _v	Vapor pressure, actual (in. Hg)	29.0294	29.0294	29.0294	29.0294
B _{w0}	Moisture measured in sample (% by volume)	10.0443	10.0566	9.9759	10.0256
B _{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	100.0000
B _w	Actual water vapor in gas (% by volume)	10.0443	10.0566	9.9759	10.0256
√ΔP	Velocity head (√in. H ₂ O)	0.8234	0.8240	0.8156	0.8210
M _d	MW of sample gas, dry (lb/lb-mole)	30.6520	30.6520	30.6240	30.6427
M _s	MW of sample gas, wet (lb/lb-mole)	29.3812	29.3796	29.3646	29.3752
V _s	Velocity of sample (ft/sec)	63.6767	63.6628	62.9395	63.4264
%I	Isokinetic sampling (%) ¹	104.3226	103.4172	102.6103	103.4501

Comments:

Average includes 3 runs.

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¹ Sample flow rates as determined by EPA Method 2 were used to calculate isokinetic sampling conditions.

USEPA Method 5F/202 (NSFPM/CPM) Emission Parameters for NSFPM

Run No.	7	8	9	Average
Date (2012)	Apr 26	Apr 26	Apr 26	
Start Time (approx.)	08:24	10:10	11:58	
Stop Time (approx.)	09:31	11:17	13:17	
Process Conditions				
R _P Coke burn-off rate (Mlb coke/hr)	18.063	18.077	18.084	18.075
P ₁ FCC charge rate (bpd)	32,503	32,506	32,518	32,509
P ₂ ESP operation	Both / LPR	Both / LPR	Both / LPR	
P ₃ NH3 injection (lb/hr)	8	8	8	
Gas Conditions				
O ₂ Oxygen (dry volume %)	2.3000	2.3000	2.4000	2.3333
CO ₂ Carbon dioxide (dry volume %)	16.0000	16.0000	15.8000	15.9333
T _s Sample temperature (°F)	560.4167	558.4167	555.5417	558.1250
B _w Actual water vapor in gas (% by volume)	10.0443	10.0566	9.9759	10.0256
Gas Flow Rate				
Q _a Volumetric flow rate, actual (acfm)	130,493	127,432	126,374	128,099
Q _s Volumetric flow rate, standard (scfm)	65,512	64,101	63,749	64,454
Q _{std} Volumetric flow rate, dry standard (dscfm)	58,932	57,654	57,389	57,992
Q _a Volumetric flow rate, actual (acf/hr)	7,829,562	7,645,905	7,582,430	7,685,966
Q _s Volumetric flow rate, standard (scf/hr)	3,930,705	3,846,041	3,824,910	3,867,219
Q _{std} Volumetric flow rate, dry standard (dscf/hr)	3,535,893	3,459,259	3,443,340	3,479,497
Sampling Data				
V _{mstd} Volume metered, standard (dscf)	36.7938	36.5332	35.9700	36.4323
%I Isokinetic sampling (%) ¹	104.3226	103.4172	102.6103	103.4501
Laboratory Data				
m _n Total Non-Sulfate FPM (g)	0.01655	0.01699	0.01364	
n _{MDL} Number of non-detectable fractions	N/A	N/A	N/A	
DLC Detection level classification	ADL	ADL	ADL	
Non-Sulfate FPM Results				
C _{sd} Particulate Concentration (lb/dscf)	9.9192E-07	1.0254E-06	8.3622E-07	9.5118E-07
C _{sd} Particulate Concentration (gr/dscf)	0.0069	0.0072	0.0059	0.0067
C _{sd} Particulate Concentration (mg/dscm)	15.8843	16.4204	13.3909	15.2318
E _{lb/hr} Particulate Rate (lb/hr)	3.5073	3.5471	2.8794	3.3113
E _{Rp} Particulate Rate - Production-based (lb/Mlb coke)	0.1942	0.1962	0.1592	0.1832

Comments:

Average includes 3 runs.

¹ Sample flow rates as determined by EPA Method 2 were used to calculate isokinetic sampling conditions.

Detection level classifications are defined as follows:

ADL = Above Detection Level - all fractions are above detection limit

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USEPA Method 5F/202 (NSFPM/CPM) Emission Parameters for CPM

Run No.	7	8	9	Average
Date (2012)	Apr 26	Apr 26	Apr 26	
Start Time (approx.)	08:24	10:10	11:58	
Stop Time (approx.)	09:31	11:17	13:17	
Process Conditions				
R _P Coke burn-off rate (Mlb coke/hr)	18.063	18.077	18.084	18.075
P ₁ FCC charge rate (bpd)	32,503	32,506	32,518	32,509
P ₂ ESP operation	Both / LPR	Both / LPR	Both / LPR	
P ₃ NH3 injection (lb/hr)	8	8	8	
Gas Conditions				
O ₂ Oxygen (dry volume %)	2.3000	2.3000	2.4000	2.3333
CO ₂ Carbon dioxide (dry volume %)	16.0000	16.0000	15.8000	15.9333
T _s Sample temperature (°F)	560.4167	558.4167	555.5417	558.1250
B _w Actual water vapor in gas (% by volume)	10.0443	10.0566	9.9759	10.0256
Gas Flow Rate				
Q _a Volumetric flow rate, actual (acfm)	130,493	127,432	126,374	128,099
Q _s Volumetric flow rate, standard (scfm)	65,512	64,101	63,749	64,454
Q _{std} Volumetric flow rate, dry standard (dscfm)	58,932	57,654	57,389	57,992
Q _a Volumetric flow rate, actual (acf/hr)	7,829,562	7,645,905	7,582,430	7,685,966
Q _s Volumetric flow rate, standard (scf/hr)	3,930,705	3,846,041	3,824,910	3,867,219
Q _{std} Volumetric flow rate, dry standard (dscf/hr)	3,535,893	3,459,259	3,443,340	3,479,497
Sampling Data				
V _{mstd} Volume metered, standard (dscf)	36.7938	36.5332	35.9700	36.4323
%I Isokinetic sampling (%) ¹	104.3226	103.4172	102.6103	103.4501
Laboratory Data				
m _{CPMI} Total Inorganic CPM Result (g)	0.04091	0.04552	0.04539	
m _{CPMo} Total Organic CPM Result (g)	0.00087	0.00033	0.00053	
m _{CPM} Total CPM (g)	0.04177	0.04585	0.04593	
n _{MDL} Number of non-detectable fractions	N/A	N/A	N/A	
DLC Detection level classification	ADL	ADL	ADL	
Condensable Particulate Matter Results				
C _{sd} Particulate Concentration (lb/dscf)	2.5033E-06	2.7676E-06	2.8153E-06	2.6954E-06
C _{sd} Particulate Concentration (gr/dscf)	0.0175	0.0194	0.0197	0.0189
C _{sd} Particulate Concentration (mg/dscm)	40.0874	44.3191	45.0830	43.1632
E _{lb/hr} Particulate Rate (lb/hr)	8.8515	9.5738	9.6940	9.3731
E _{RP} Particulate Rate - Production-based (lb/Mlb coke)	0.4900	0.5296	0.5361	0.5186

Comments:

Average includes 3 runs.

¹ Sample flow rates as determined by EPA Method 2 were used to calculate isokinetic sampling conditions.

Detection level classifications are defined as follows:

ADL = Above Detection Level - all fractions are above detection limit

**USEPA Method 5F/202 (NSFPM/CPM)
Emission Parameters for CPM
Separate Inorganic and Organic Results**

Run No.	7	8	9	Average
Date (2012)	Apr 26	Apr 26	Apr 26	
Start Time (approx.)	08:24	10:10	11:58	
Stop Time (approx.)	09:31	11:17	13:17	

Condensable Particulate Matter Results - Inorganic Fraction

C _{sd}	Particulate Concentration (lb/dscf)	2.4514E-06	2.7476E-06	2.7827E-06	2.6606E-06
C _{sd}	Particulate Concentration (gr/dscf)	0.0172	0.0192	0.0195	0.0186
C _{sd}	Particulate Concentration (mg/dscm)	39.2561	43.9991	44.5606	42.6053
E _{lb/hr}	Particulate Rate (lb/hr)	8.6680	9.5047	9.5817	9.2514
E _{RP}	Particulate Rate - Production-based (lb/Mlb coke)	0.4799	0.5258	0.5299	0.5118

Condensable Particulate Matter Results - Organic Fraction

C _{sd}	Particulate Concentration (lb/dscf)	5.1917E-08	1.9984E-08	3.2621E-08	3.4841E-08
C _{sd}	Particulate Concentration (gr/dscf)	0.0004	0.0001	0.0002	0.0002
C _{sd}	Particulate Concentration (mg/dscm)	0.8314	0.3200	0.5224	0.5579
E _{lb/hr}	Particulate Rate (lb/hr)	0.1836	0.0691	0.1123	0.1217
E _{RP}	Particulate Rate - Production-based (lb/Mlb coke)	0.0102	0.0038	0.0062	0.0067

Comments:

Average includes 3 runs.

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USEPA Method 5F/202 (NSFPM/CPM) Emission Parameters for Total Non-Sulfate Particulate Matter

Run No.		7	8	9	Average
Date (2012)		Apr 26	Apr 26	Apr 26	
Start Time (approx.)		08:24	10:10	11:58	
Stop Time (approx.)		09:31	11:17	13:17	
Process Conditions					
R _p	Coke burn-off rate (Mlb coke/hr)	18.063	18.077	18.084	18.075
P ₁	FCC charge rate (bpd)	32,503	32,506	32,518	32,509
P ₂	ESP operation	Both / LPR	Both / LPR	Both / LPR	
P ₃	NH3 injection (lb/hr)	8	8	8	
Gas Conditions					
O ₂	Oxygen (dry volume %)	2.3000	2.3000	2.4000	2.3333
CO ₂	Carbon dioxide (dry volume %)	16.0000	16.0000	15.8000	15.9333
T _s	Sample temperature (°F)	560.4167	558.4167	555.5417	558.1250
B _w	Actual water vapor in gas (% by volume)	10.0443	10.0566	9.9759	10.0256
Gas Flow Rate					
Q _a	Volumetric flow rate, actual (acfm)	130,493	127,432	126,374	128,099
Q _s	Volumetric flow rate, standard (scfm)	65,512	64,101	63,749	64,454
Q _{std}	Volumetric flow rate, dry standard (dscfm)	58,932	57,654	57,389	57,992
Q _a	Volumetric flow rate, actual (acf/hr)	7,829,562	7,645,905	7,582,430	7,685,966
Q _s	Volumetric flow rate, standard (scf/hr)	3,930,705	3,846,041	3,824,910	3,867,219
Q _{std}	Volumetric flow rate, dry standard (dscf/hr)	3,535,893	3,459,259	3,443,340	3,479,497
Sampling Data					
V _{mstd}	Volume metered, standard (dscf)	36.7938	36.5332	35.9700	36.4323
%I	Isokinetic sampling (%) ¹	104.3226	103.4172	102.6103	103.4501
Laboratory Data					
m _n	Total non-sulfate filterable particulate matter (g)	0.01655	0.01699	0.01364	
m _{CPM}	Total condensable particulate matter (g)	0.04177	0.04585	0.04593	
m _{Part}	Total non-sulfate particulate matter (g)	0.05832	0.06284	0.05957	
n _{MDL}	Number of non-detectable fractions	N/A	N/A	N/A	
DLC	Detection level classification	ADL	ADL	ADL	
Total Non-Sulfate Particulate Matter Results					
C _{sd}	Particulate Concentration (lb/dscf)	3.4953E-06	3.7930E-06	3.6515E-06	3.6466E-06
C _{sd}	Particulate Concentration (gr/dscf)	0.0245	0.0265	0.0256	0.0255
C _{sd}	Particulate Concentration (mg/dscm)	55.9717	60.7394	58.4739	58.3950
E _{lb/hr}	Particulate Rate (lb/hr)	12.3589	13.1209	12.5734	12.6844
E _{Rp}	Particulate Rate - Production-based (lb/Mlb coke)	0.6842	0.7258	0.6953	0.7018

Comments:

Average includes 3 runs.

¹ Sample flow rates as determined by EPA Method 2 were used to calculate isokinetic sampling conditions.

Detection level classifications are defined as follows:

ADL = Above Detection Level - all fractions are above detection limit

Marathon Petroleum Company
Clean Air Project No: 12010
FCCU Regenerator Stack

USEPA Mod. CTM-027 (NH3) Sampling, Velocity and Moisture Parameters

Run No.	1	2	3	Average
Date (2012)	Apr 24	Apr 24	Apr 24	
Start Time (approx.)	10:33	12:48	14:33	
Stop Time (approx.)	11:33	13:48	15:33	
Sampling Conditions				
Y _d Dry gas meter correction factor	1.0020	1.0020	1.0020	
C _p Pitot tube coefficient	0.8180	0.8180	0.8180	
P _g Static pressure (in. H ₂ O)	-0.1000	-0.1000	-0.1000	
A _s Sample location area (ft ²)	36.8977	36.8977	36.8977	
P _{bar} Barometric pressure (in. Hg)	28.85	28.85	28.85	28.8500
D _n Nozzle diameter (in.)	0.2520	0.2520	0.2520	
O ₂ Oxygen (dry volume %)	2.0000	2.0000	2.2000	2.0667
CO ₂ Carbon dioxide (dry volume %)	16.4000	16.4000	16.2000	16.3333
N ₂ +CO Nitrogen plus carbon monoxide (dry volume %)	81.6000	81.6000	81.6000	81.6000
V _{lc} Total Liquid collected (ml)	80.90	84.90	82.90	
V _m Volume metered, meter conditions (ft ³)	35.9850	37.0450	37.9800	
T _m Dry gas meter temperature (°F)	71.0833	74.3333	78.0417	
T _s Sample temperature (°F)	568.0833	567.0000	566.6667	567.2500
ΔH Meter box orifice pressure drop (in. H ₂ O)	1.2083	1.2833	1.3250	
θ Total sampling time (min)	60.0	60.0	60.0	
Flow Results				
V _{wstd} Volume of water collected (ft ³)	3.8072	3.9954	3.9013	3.9013
V _{mstd} Volume metered, standard (dscf)	34.6582	35.4689	36.1173	35.4148
P _s Sample gas pressure, absolute (in. Hg)	28.8426	28.8426	28.8426	28.8426
P _v Vapor pressure, actual (in. Hg)	28.8426	28.8426	28.8426	28.8426
B _{wv} Moisture measured in sample (% by volume)	9.8976	10.1241	9.7487	9.9234
B _{ws} Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	100.0000
B _w Actual water vapor in gas (% by volume)	9.8976	10.1241	9.7487	9.9234
√ΔP Velocity head (√in. H ₂ O)	0.8190	0.8210	0.8376	0.8259
M _d MW of sample gas, dry (lb/lb-mole)	30.7040	30.7040	30.6800	30.6960
M _s MW of sample gas, wet (lb/lb-mole)	29.4466	29.4178	29.4439	29.4361
V _s Velocity of sample (ft/sec)	63.0124	63.1658	64.4025	63.5269
%I Isokinetic sampling (%)	98.9440	101.1602	100.5785	100.2276

Comments:

Average includes 3 runs.

Sample flow rates as determined by EPA Method 2 were used to calculate isokinetic sampling conditions.

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USEPA Mod. CTM-027 NH₃ Parameters

Run No.	1	2	3	Average
Date (2012)	Apr 24	Apr 24	Apr 24	
Start Time (approx.)	10:33	12:48	14:33	
Stop Time (approx.)	11:33	13:48	15:33	
Process Conditions				
R _p Coke burn-off rate (Mlb coke/hr)	18.352	18.245	18.192	18.263
P ₁ FCC charge rate (bpd)	33,016	33,014	32,998	33,009
P ₂ ESP operation	West / MPR	West / MPR	West / MPR	
P ₃ NH3 injection (lb/hr)	8	8	8	
Gas Conditions				
O ₂ Oxygen (dry volume %)	2.0000	2.0000	2.2000	2.0667
CO ₂ Carbon dioxide (dry volume %)	16.4000	16.4000	16.2000	16.3333
T _s Sample temperature (°F)	568.0833	567.0000	566.6667	567.2500
B _w Actual water vapor in gas (% by volume)	9.8976	10.1241	9.7487	9.9234
Gas Flow Rate				
Q _a Volumetric flow rate, actual (acfm)	128,697	128,697	127,120	128,171
Q _s Volumetric flow rate, standard (scfm)	63,716	63,783	63,022	63,507
Q _{std} Volumetric flow rate, dry standard (dscfm)	57,410	57,326	56,878	57,204
Q _a Volumetric flow rate, actual (acf/hr)	7,721,821	7,721,834	7,627,174	7,690,276
Q _s Volumetric flow rate, standard (scf/hr)	3,822,952	3,826,991	3,781,304	3,810,416
Q _{std} Volumetric flow rate, dry standard (dscf/hr)	3,444,571	3,439,544	3,412,678	3,432,264
Sampling Data				
V _{mstd} Volume metered, standard (dscf)	34.6582	35.4689	36.1173	35.4148
%I Isokinetic sampling (%) ¹	98.9440	101.1602	100.5785	100.2276
Laboratory Data				
m _n Total NH ₃ collected (mg)	20.1313	20.6721	21.0722	20.6252
Ammonia (NH₃) Results				
C _{sd} Ammonia Concentration (lb/dscf)	1.2808E-06	1.2851E-06	1.2865E-06	1.2841E-06
C _{sd} Ammonia Concentration (ppmdv)	28.9914	29.0899	29.1205	29.0673
C _{sd} Ammonia Concentration (mg/dscm)	20.5099	20.5795	20.6012	20.5635
E _{lb/hr} Ammonia Rate (lb/hr)	4.4117	4.4203	4.3903	4.4074
E _{Rp} Ammonia Rate - Production-based (lb/Mlb coke)	0.2404	0.2423	0.2413	0.2413

Comments:

Average includes 3 runs.

¹ Sample flow rates as determined by EPA Method 2 were used to calculate isokinetic sampling conditions.

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Marathon Petroleum Company
Clean Air Project No: 12010
FCCU Regenerator Stack

USEPA Mod. CTM-027 (NH3) Sampling, Velocity and Moisture Parameters

Run No.	4	5	6	Average
Date (2012)	Apr 25	Apr 25	Apr 25	
Start Time (approx.)	09:08	12:07	14:06	
Stop Time (approx.)	10:08	13:07	15:06	
Sampling Conditions				
Y _d Dry gas meter correction factor	1.0020	1.0020	1.0020	
C _p Pitot tube coefficient	0.8180	0.8180	0.8180	
P _g Static pressure (in. H ₂ O)	0.4000	0.4000	0.4000	
A _s Sample location area (ft ²)	36.8977	36.8977	36.8977	
P _{bar} Barometric pressure (in. Hg)	29.15	29.15	29.15	29.1500
D _n Nozzle diameter (in.)	0.2520	0.2520	0.2520	
O ₂ Oxygen (dry volume %)	2.7000	2.5000	2.6000	2.6000
CO ₂ Carbon dioxide (dry volume %)	15.9000	16.0000	15.9000	15.9333
N ₂ +CO Nitrogen plus carbon monoxide (dry volume %)	81.4000	81.5000	81.5000	81.4667
V _{lc} Total Liquid collected (ml)	78.50	78.30	75.50	
V _m Volume metered, meter conditions (ft ³)	35.8700	35.9350	34.1900	
T _m Dry gas meter temperature (°F)	80.7917	73.3333	74.7083	
T _s Sample temperature (°F)	555.0000	555.0000	554.3333	554.7778
ΔH Meter box orifice pressure drop (in. H ₂ O)	1.1917	1.2000	1.0667	
θ Total sampling time (min)	60.0	60.0	60.0	
Flow Results				
V _{wstd} Volume of water collected (ft ³)	3.6942	3.6848	3.5530	3.6440
V _{mstd} Volume metered, standard (dscf)	34.2775	34.8206	33.0335	34.0439
P _s Sample gas pressure, absolute (in. Hg)	29.1794	29.1794	29.1794	29.1794
P _v Vapor pressure, actual (in. Hg)	29.1794	29.1794	29.1794	29.1794
B _{w0} Moisture measured in sample (% by volume)	9.7288	9.5696	9.7113	9.6699
B _{ws} Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	100.0000
B _w Actual water vapor in gas (% by volume)	9.7288	9.5696	9.7113	9.6699
√ΔP Velocity head (√in. H ₂ O)	0.7905	0.7889	0.7637	0.7811
M _d MW of sample gas, dry (lb/lb-mole)	30.6520	30.6600	30.6480	30.6533
M _s MW of sample gas, wet (lb/lb-mole)	29.4211	29.4485	29.4197	29.4298
V _s Velocity of sample (ft/sec)	60.1100	59.9619	58.0530	59.3750
%I Isokinetic sampling (%)	99.9207	101.5752	99.6213	100.3724

Comments:

Average includes 3 runs.

Sample flow rates as determined by EPA Method 2 were used to calculate isokinetic sampling conditions.

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USEPA Mod. CTM-027 NH₃ Parameters

Run No.	4	5	6	Average
Date (2012)	Apr 25	Apr 25	Apr 25	
Start Time (approx.)	09:08	12:07	14:06	
Stop Time (approx.)	10:08	13:07	15:06	
Process Conditions				
R _P Coke burn-off rate (Mlb coke/hr)	18.143	18.096	18.060	18.100
P ₁ FCC charge rate (bpd)	32,512	32,483	32,468	32,487
P ₂ ESP operation	Both / MPR	Both / MPR	Both / MPR	
P ₃ NH ₃ injection (lb/hr)	8	8	8	
Gas Conditions				
O ₂ Oxygen (dry volume %)	2.7000	2.5000	2.6000	2.6000
CO ₂ Carbon dioxide (dry volume %)	15.9000	16.0000	15.9000	15.9333
T _s Sample temperature (°F)	555.0000	555.0000	554.3333	554.7778
B _w Actual water vapor in gas (% by volume)	9.7288	9.5696	9.7113	9.6699
Gas Flow Rate				
Q _a Volumetric flow rate, actual (acfm)	128,580	128,792	127,711	128,361
Q _s Volumetric flow rate, standard (scfm)	65,231	65,339	64,833	65,134
Q _{std} Volumetric flow rate, dry standard (dscfm)	58,885	59,086	58,537	58,836
Q _a Volumetric flow rate, actual (acf/hr)	7,714,789	7,727,526	7,662,631	7,701,649
Q _s Volumetric flow rate, standard (scf/hr)	3,913,875	3,920,336	3,889,968	3,908,060
Q _{std} Volumetric flow rate, dry standard (dscf/hr)	3,533,100	3,545,177	3,512,201	3,530,160
Sampling Data				
V _{mstd} Volume metered, standard (dscf)	34.2775	34.8206	33.0335	34.0439
%I Isokinetic sampling (%) ¹	99.9207	101.5752	99.6213	100.3724
Laboratory Data				
m _n Total NH ₃ collected (mg)	10.5610	10.5713	9.5688	10.2337
Ammonia (NH₃) Results				
C _{sd} Ammonia Concentration (lb/dscf)	6.7936E-07	6.6942E-07	6.3872E-07	6.6250E-07
C _{sd} Ammonia Concentration (ppmdv)	15.3779	15.1529	14.4580	14.9963
C _{sd} Ammonia Concentration (mg/dscm)	10.8791	10.7199	10.2283	10.6091
E _{lb/hr} Ammonia Rate (lb/hr)	2.4003	2.3732	2.2433	2.3389
E _{Rp} Ammonia Rate - Production-based (lb/Mlb coke)	0.1323	0.1311	0.1242	0.1292

Comments:

Average includes 3 runs.

¹ Sample flow rates as determined by EPA Method 2 were used to calculate isokinetic sampling conditions.

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Marathon Petroleum Company
Clean Air Project No: 12010
FCCU Regenerator Stack

USEPA Mod. CTM-027 (NH3) Sampling, Velocity and Moisture Parameters

Run No.		7	8	9	Average
Date (2012)		Apr 26	Apr 26	Apr 26	
Start Time (approx.)		08:24	10:10	11:58	
Stop Time (approx.)		09:24	11:10	12:58	
Sampling Conditions					
Y _d	Dry gas meter correction factor	1.0020	1.0020	1.0020	
C _p	Pitot tube coefficient	0.8180	0.8180	0.8180	
P _g	Static pressure (in. H ₂ O)	0.4000	0.4000	0.4000	
A _s	Sample location area (ft ²)	36.8977	36.8977	36.8977	
P _{bar}	Barometric pressure (in. Hg)	29.00	29.00	29.00	29.0000
D _n	Nozzle diameter (in.)	0.2520	0.2520	0.2520	
O ₂	Oxygen (dry volume %)	2.4000	2.5000	2.5000	2.4667
CO ₂	Carbon dioxide (dry volume %)	15.9000	15.8000	15.9000	15.8667
N ₂ +CO	Nitrogen plus carbon monoxide (dry volume %)	81.7000	81.7000	81.6000	81.6667
V _{lc}	Total Liquid collected (ml)	87.10	82.30	83.40	
V _m	Volume metered, meter conditions (ft ³)	35.5850	36.9500	35.9900	
T _m	Dry gas meter temperature (°F)	72.9583	80.0833	83.0000	
T _s	Sample temperature (°F)	557.6667	556.0833	552.5833	555.4444
ΔH	Meter box orifice pressure drop (in. H ₂ O)	1.2500	1.2583	1.1917	
θ	Total sampling time (min)	60.0	60.0	60.0	
Flow Results					
V _{wstd}	Volume of water collected (ft ³)	4.0989	3.8730	3.9248	3.9656
V _{mstd}	Volume metered, standard (dscf)	34.3330	35.1804	34.0766	34.5300
P _s	Sample gas pressure, absolute (in. Hg)	29.0294	29.0294	29.0294	29.0294
P _v	Vapor pressure, actual (in. Hg)	29.0294	29.0294	29.0294	29.0294
B _{w/o}	Moisture measured in sample (% by volume)	10.6654	9.9173	10.3280	10.3036
B _{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	100.0000
B _w	Actual water vapor in gas (% by volume)	10.6654	9.9173	10.3280	10.3036
√ΔP	Velocity head (√in. H ₂ O)	0.7968	0.8051	0.7728	0.7916
M _d	MW of sample gas, dry (lb/lb-mole)	30.6400	30.6280	30.6440	30.6373
M _s	MW of sample gas, wet (lb/lb-mole)	29.2919	29.3756	29.3381	29.3352
V _s	Velocity of sample (ft/sec)	60.9545	61.4584	58.9292	60.4474
%I	Isokinetic sampling (%)	100.5093	101.1397	102.2855	101.3115

Comments:

Average includes 3 runs.

Sample flow rates as determined by EPA Method 2 were used to calculate isokinetic sampling conditions.

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USEPA Mod. CTM-027 NH₃ Parameters

Run No.		7	8	9	Average
Date (2012)		Apr 26	Apr 26	Apr 26	
Start Time (approx.)		08:24	10:10	11:58	
Stop Time (approx.)		09:24	11:10	12:58	
Process Conditions					
R _p	Coke burn-off rate (Mlb coke/hr)	18.067	18.080	18.077	18.075
P ₁	FCC charge rate (bpd)	32,506	32,515	32,518	32,513
P ₂	ESP operation	Both / LPR	Both / LPR	Both / LPR	
P ₃	NH ₃ injection (lb/hr)	8	8	8	
Gas Conditions					
O ₂	Oxygen (dry volume %)	2.4000	2.5000	2.5000	2.4667
CO ₂	Carbon dioxide (dry volume %)	15.9000	15.8000	15.9000	15.8667
T _s	Sample temperature (°F)	557.6667	556.0833	552.5833	555.4444
B _w	Actual water vapor in gas (% by volume)	10.6654	9.9173	10.3280	10.3036
Gas Flow Rate					
Q _a	Volumetric flow rate, actual (acfm)	130,493	127,432	126,374	128,099
Q _s	Volumetric flow rate, standard (scfm)	65,689	64,248	63,935	64,624
Q _{std}	Volumetric flow rate, dry standard (dscfm)	58,683	57,876	57,332	57,964
Q _a	Volumetric flow rate, actual (acf/hr)	7,829,562	7,645,905	7,582,430	7,685,966
Q _s	Volumetric flow rate, standard (scf/hr)	3,941,327	3,854,873	3,836,085	3,877,428
Q _{std}	Volumetric flow rate, dry standard (dscf/hr)	3,520,969	3,472,575	3,439,892	3,477,812
Sampling Data					
V _{mstd}	Volume metered, standard (dscf)	34.3330	35.1804	34.0766	34.5300
%I	Isokinetic sampling (%) ¹	100.5093	101.1397	102.2855	101.3115
Laboratory Data					
m _n	Total NH ₃ collected (mg)	10.6365	9.7750	10.4514	10.2876
Ammonia (NH₃) Results					
C _{sd}	Ammonia Concentration (lb/dscf)	6.8311E-07	6.1267E-07	6.7628E-07	6.5735E-07
C _{sd}	Ammonia Concentration (ppmdv)	15.4628	13.8682	15.3082	14.8798
C _{sd}	Ammonia Concentration (mg/dscm)	10.9391	9.8110	10.8297	10.5266
E _{lb/hr}	Ammonia Rate (lb/hr)	2.4052	2.1275	2.3263	2.2864
E _{Rp}	Ammonia Rate - Production-based (lb/Mlb coke)	0.1331	0.1177	0.1287	0.1265

Comments:

Average includes 3 runs.

¹ Sample flow rates as determined by EPA Method 2 were used to calculate isokinetic sampling conditions.

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Marathon Petroleum Company
Clean Air Project No: 12010
FCCU Regenerator Stack

USEPA Mod. CTM-027 (NH3) Sampling, Velocity and Moisture Parameters

Run No.		10	11	12	Average
Date (2012)		Apr 27	Apr 27	Apr 27	
Start Time (approx.)		09:28	11:12	12:45	
Stop Time (approx.)		10:28	12:12	13:45	
Sampling Conditions					
Y _d	Dry gas meter correction factor	1.0020	1.0020	1.0020	
C _p	Pitot tube coefficient	0.8180	0.8180	0.8180	
P _g	Static pressure (in. H ₂ O)	0.5000	0.4000	0.4000	
A _s	Sample location area (ft ²)	36.8977	36.8977	36.8977	
P _{bar}	Barometric pressure (in. Hg)	29.50	29.50	29.50	29.5000
D _n	Nozzle diameter (in.)	0.2520	0.2520	0.2520	
O ₂	Oxygen (dry volume %)	3.8000	2.8000	3.1000	3.2333
CO ₂	Carbon dioxide (dry volume %)	14.7000	15.6000	15.4000	15.2333
N ₂ +CO	Nitrogen plus carbon monoxide (dry volume %)	81.5000	81.6000	81.5000	81.5333
V _{lc}	Total Liquid collected (ml)	79.70	78.60	74.20	
V _m	Volume metered, meter conditions (ft ³)	35.4950	35.7700	35.4800	
T _m	Dry gas meter temperature (°F)	74.9583	80.5833	83.0833	
T _s	Sample temperature (°F)	551.1667	552.0000	552.0000	551.7222
ΔH	Meter box orifice pressure drop (in. H ₂ O)	1.2000	1.2083	1.1833	
θ	Total sampling time (min)	60.0	60.0	60.0	
Flow Results					
V _{wstd}	Volume of water collected (ft ³)	3.7507	3.6989	3.4919	3.6472
V _{mstd}	Volume metered, standard (dscf)	34.7002	34.6059	34.1652	34.4905
P _s	Sample gas pressure, absolute (in. Hg)	29.5368	29.5294	29.5294	29.5319
P _v	Vapor pressure, actual (in. Hg)	29.5368	29.5294	29.5294	29.5319
B _{wo}	Moisture measured in sample (% by volume)	9.7545	9.6565	9.2728	9.5612
B _{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	100.0000
B _w	Actual water vapor in gas (% by volume)	9.7545	9.6565	9.2728	9.5612
√ΔP	Velocity head (√in. H ₂ O)	0.7858	0.7868	0.7815	0.7847
M _d	MW of sample gas, dry (lb/lb-mole)	30.5040	30.6080	30.5880	30.5667
M _s	MW of sample gas, wet (lb/lb-mole)	29.2843	29.3905	29.4207	29.3652
V _s	Velocity of sample (ft/sec)	59.4122	59.4168	58.9832	59.2707
%I	Isokinetic sampling (%)	100.7496	100.4667	99.4939	100.2367

Comments:

Average includes 3 runs.

Sample flow rates as determined by EPA Method 2 were used to calculate isokinetic sampling conditions.

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**USEPA Mod. CTM-027
NH₃ Parameters**

Run No.		10	11	12	Average
Date (2012)		Apr 27	Apr 27	Apr 27	
Start Time (approx.)		09:28	11:12	12:45	
Stop Time (approx.)		10:28	12:12	13:45	
Process Conditions					
R _P	Coke burn-off rate (Mlb coke/hr)	17.932	17.949	17.927	17.936
P ₁	FCC charge rate (bpd)	32,504	32,482	32,488	32,491
P ₂	ESP operation	Both	Both	Both	
P ₃	NH ₃ injection (lb/hr)	8	8	8	
Gas Conditions					
O ₂	Oxygen (dry volume %)	3.8000	2.8000	3.1000	3.2333
CO ₂	Carbon dioxide (dry volume %)	14.7000	15.6000	15.4000	15.2333
T _s	Sample temperature (°F)	551.1667	552.0000	552.0000	551.7222
B _w	Actual water vapor in gas (% by volume)	9.7545	9.6565	9.2728	9.5612
Gas Flow Rate					
Q _a	Volumetric flow rate, actual (acfm)	122,641	125,882	121,381	123,301
Q _s	Volumetric flow rate, standard (scfm)	63,219	64,820	62,502	63,514
Q _{std}	Volumetric flow rate, dry standard (dscfm)	57,052	58,561	56,707	57,440
Q _a	Volumetric flow rate, actual (acf/hr)	7,358,466	7,552,923	7,282,855	7,398,081
Q _s	Volumetric flow rate, standard (scf/hr)	3,793,148	3,889,212	3,750,147	3,810,836
Q _{std}	Volumetric flow rate, dry standard (dscf/hr)	3,423,147	3,513,650	3,402,405	3,446,400
Sampling Data					
V _{mstd}	Volume metered, standard (dscf)	34.7002	34.6059	34.1652	34.4905
%I	Isokinetic sampling (%) ¹	100.7496	100.4667	99.4939	100.2367
Laboratory Data					
m _n	Total NH ₃ collected (mg)	10.7336	11.1983	11.3417	11.0912
Ammonia (NH₃) Results					
C _{sd}	Ammonia Concentration (lb/dscf)	6.8206E-07	7.1353E-07	7.3199E-07	7.0919E-07
C _{sd}	Ammonia Concentration (ppmdv)	15.4389	16.1512	16.5691	16.0531
C _{sd}	Ammonia Concentration (mg/dscm)	10.9222	11.4261	11.7217	11.3567
E _{lb/hr}	Ammonia Rate (lb/hr)	2.3348	2.5071	2.4905	2.4441
E _{Rp}	Ammonia Rate - Production-based (lb/Mlb coke)	0.1302	0.1397	0.1389	0.1363

Comments:

Average includes 3 runs.

¹ Sample flow rates as determined by EPA Method 2 were used to calculate isokinetic sampling conditions.

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Marathon Petroleum Company
Clean Air Project No: 12010
FCCU Regenerator Stack

USEPA OTM-29 (HCN) Sampling, Velocity and Moisture Parameters

Run No.	1	2	3	Average
Date (2012)	Apr 27	Apr 27	Apr 27	
Start Time (approx.)	09:28	11:12	12:45	
Stop Time (approx.)	10:34	12:17	14:00	
Sampling Conditions				
Y _d Dry gas meter correction factor	0.9970	0.9970	0.9970	
C _p Pitot tube coefficient	0.8270	0.8270	0.8270	
P _g Static pressure (in. H ₂ O)	0.5000	0.5000	0.5000	
A _s Sample location area (ft ²)	36.8977	36.8977	36.8977	
P _{bar} Barometric pressure (in. Hg)	29.50	29.50	29.50	29.5000
D _n Nozzle diameter (in.)	0.2340	0.2340	0.2340	
O ₂ Oxygen (dry volume %)	3.0000	2.9000	4.9000	3.6000
CO _{2,out} Carbon dioxide, sample train outlet (dry volume %)	11.6000	11.7000	12.2000	11.8333
CO _{2,in} Carbon dioxide, flue gas (dry volume %) ¹	14.7000	15.6000	15.4000	15.2333
N ₂ +CO Nitrogen plus carbon monoxide (dry volume %)	82.3000	81.5000	79.7000	81.1667
V _{lc} Total Liquid collected (ml)	154.90	156.60	149.10	
V _m Volume metered, meter conditions (ft ³)	32.5250	32.8900	32.4700	
T _m Dry gas meter temperature (°F)	78.5833	81.2708	85.3125	
T _s Sample temperature (°F)	553.7500	554.2083	555.1667	554.3750
ΔH Meter box orifice pressure drop (in. H ₂ O)	0.9000	0.9296	0.8946	
θ Total sampling time (min)	60.0	60.0	60.0	
Flow Results				
V _{wstd} Volume of water collected (ft ³)	7.2896	7.3696	7.0166	7.2253
V _{mstd} Volume metered, standard (dscf)	32.5429	33.0589	32.1325	32.5781
P _s Sample gas pressure, absolute (in. Hg)	29.5368	29.5368	29.5368	29.5368
P _v Vapor pressure, actual (in. Hg)	29.5368	29.5368	29.5368	29.5368
B _{wo} Moisture measured in sample (% by volume) ¹	9.7545	9.6565	9.2728	9.5612
B _{ws} Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	100.0000
B _w Actual water vapor in gas (% by volume)	9.7545	9.6565	9.2728	9.5612
√ΔP Velocity head (√in. H ₂ O)	0.8182	0.8201	0.8159	0.8181
M _d MW of sample gas, dry (lb/lb-mole)	30.4720	30.6120	30.6600	30.5813
M _s MW of sample gas, wet (lb/lb-mole)	29.2554	29.3941	29.4861	29.3785
V _s Velocity of sample (ft/sec)	62.6565	62.6639	62.2801	62.5335
%I Isokinetic sampling (%)	104.1727	105.7449	103.0748	104.3308

Comments:

Average includes 3 runs.

Sample flow rates as determined by EPA Method 2 were used to calculate isokinetic sampling conditions.

¹ Flue gas carbon dioxide and moisture data were obtained from concurrent EPA Modified CTM-027 runs.

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USEPA OTM-29 HCN Parameters

Run No.		1	2	3	Average
Date (2012)		Apr 27	Apr 27	Apr 27	
Start Time (approx.)		09:28	11:12	12:45	
Stop Time (approx.)		10:34	12:17	14:00	
Process Conditions					
R _P	Coke burn-off rate (Mlb coke/hr)	17.932	17.948	17.915	17.932
P ₁	FCC charge rate (bpd)	32,508	32,483	32,528	32,507
P ₂	ESP operation	Both	Both	Both	
P ₃	NH3 injection (lb/hr)	8	8	8	
Gas Conditions					
O ₂	Oxygen (dry volume %)	3.0000	2.9000	4.9000	3.6000
CO ₂	Carbon dioxide (dry volume %)	11.6000	11.7000	12.2000	11.8333
T _s	Sample temperature (°F)	553.7500	554.2083	555.1667	554.3750
B _w	Actual water vapor in gas (% by volume)	9.7545	9.6565	9.2728	9.5612
Gas Flow Rate					
Q _a	Volumetric flow rate, actual (acfm)	122,641	125,882	121,381	123,301
Q _s	Volumetric flow rate, standard (scfm)	63,058	64,695	62,323	63,359
Q _{std}	Volumetric flow rate, dry standard (dscfm)	56,907	58,448	56,544	57,300
Q _a	Volumetric flow rate, actual (acf/hr)	7,358,466	7,552,923	7,282,855	7,398,081
Q _s	Volumetric flow rate, standard (scf/hr)	3,783,482	3,881,710	3,739,380	3,801,524
Q _{std}	Volumetric flow rate, dry standard (dscf/hr)	3,414,423	3,506,872	3,392,636	3,437,977
Sampling Data					
V _{mstd}	Volume metered, standard (dscf)	32.5429	33.0589	32.1325	32.5781
%I	Isokinetic sampling (%) ¹	104.1727	105.7449	103.0748	104.3308
Laboratory Data					
m _n	Total HCN collected (µg)	16,533	16,450	16,954	16,646
Hydrogen Cyanide (HCN) Results					
C _{sd}	HCN Concentration (lb/dscf)	1.1202E-06	1.0972E-06	1.1634E-06	1.1269E-06
C _{sd}	HCN Concentration (ppmdv)	15.9786	15.6502	16.5948	16.0745
C _{sd}	HCN Concentration (mg/dscm)	17.9388	17.5701	18.6306	18.0465
E _{lb/hr}	HCN Rate (lb/hr)	3.8249	3.8477	3.9471	3.8732
E _{Rp}	HCN Rate - Production-based (lb/Mlb coke)	0.2133	0.2144	0.2203	0.2160

Comments:

Average includes 3 runs.

¹ Sample flow rates as determined by EPA Method 2 were used to calculate isokinetic sampling conditions.

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MARATHON PETROLEUM COMPANY
DETROIT REFINERY

Client Reference No: CN00076641
CleanAir Project No: 12010

QA/QC DATA

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I hereby certify that all pages contained within this Appendix have been reviewed and, to the best of my ability, verified as accurate.

QA/QC Initials: KPO

Date: 6/12/2012



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Marathon Petroleum Company
Clean Air Project No: 12010
FCCU Regenerator Stack

USEPA Method 5F/202 (NSFPM/CPM) QA/QC Results

Run No.	1	2	3
Date (2012)	Apr 24	Apr 24	Apr 24
Start Time (approx.)	10:33	12:48	14:33
Stop Time (approx.)	11:43	13:53	15:55
Total Duration of Test Run (min.)	70	65	82
Net Sampling Time (min.)	60	60	60

Sampling System Calibration Summary

	Nozzle ID No:	250-1	250-1	250-1
D _n	Nozzle Diameter (in):	0.250	0.250	0.250
	Probe ID No:	67-8-19	67-8-19	67-8-19
C _p	Pitot Coefficient:	0.8270	0.8270	0.8270
	Meter Box ID. No:	66-24	66-24	66-24
Y _d	Meter Box Yd - Field Sheet	0.9970	0.9970	0.9970
	Meter Box Yd - Database	0.9970	0.9970	0.9970
	Meter Box ΔH@ - Field Sheet	1.7816	1.7816	1.7816
	Meter Box ΔH@ - Database	1.7816	1.7816	1.7816

QA/QC

Final Leak Check

(a) 4% of Sampling Rate (cfm)	0.0252	0.0239	0.0257
(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200
Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200
Actual Final Leak Rate (cfm)	0.0020	0.0020	0.0030

Sample Volume

	Minimum Volume Required (dscf)	30.00	30.00	30.00
V _{mstd}	Actual Sample Volume (dscf)	36.008	33.861	36.257

Alternative Method 5 Post-Test Calibration (EPA ALT-009)

√ΔH _{avg}	Average of Square Root of ΔH (in. W.C.)	1.1042	1.0432	1.1115	
Y _{qa}	Alternative Meter Calibration Factor	0.9789	0.9798	0.9720	Average
	Variation from full-test Y _d (average ≤ ±5%)	-1.8%	-1.7%	-2.5%	-2.0%

Mean Isokinetic Sampling Rate Variation

	Minimum Allowable (%)	90	90	90
	Maximum Allowable (%)	110	110	110
%I	Actual Variation (%)	99.49	93.04	100.67

Point-by-Point Isokinetic Variation

	Number of points <90%	0	1	0
	Number of points >110%	0	0	0
	Number of points <80%	0	0	0
	Number of points >120%	0	0	0

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Marathon Petroleum Company
Clean Air Project No: 12010
FCCU Regenerator Stack

USEPA Method 5F/202 (NSFPM/CPM) QA/QC Results

Run No.	4	5	6
Date (2012)	Apr 25	Apr 25	Apr 25
Start Time (approx.)	09:08	12:07	14:06
Stop Time (approx.)	10:12	13:14	15:23
Total Duration of Test Run (min.)	64	67	77
Net Sampling Time (min.)	60	60	60

Sampling System Calibration Summary

	Nozzle ID No:	250-1	250-1	250-1
D _n	Nozzle Diameter (in):	0.250	0.250	0.250
	Probe ID No:	67-8-19	67-8-19	67-8-19
C _p	Pitot Coefficient:	0.8270	0.8270	0.8270
	Meter Box ID. No:	66-24	66-24	66-24
Y _d	Meter Box Yd - Field Sheet	0.9970	0.9970	0.9970
	Meter Box Yd - Database	0.9970	0.9970	0.9970
	Meter Box ΔH@ - Field Sheet	1.7816	1.7816	1.7816
	Meter Box ΔH@ - Database	1.7816	1.7816	1.7816

QA/QC

Final Leak Check

(a) 4% of Sampling Rate (cfm)	0.0251	0.0251	0.0249
(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200
Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200
Actual Final Leak Rate (cfm)	0.0020	0.0040	0.0020

Sample Volume

	Minimum Volume Required (dscf)	30.00	30.00	30.00
V _{mstd}	Actual Sample Volume (dscf)	35.403	35.604	35.650

Alternative Method 5 Post-Test Calibration (EPA ALT-009)

√ΔH _{avg}	Average of Square Root of ΔH (in. W.C.)	1.0880	1.0899	1.0922
Y _{qa}	Alternative Meter Calibration Factor	0.9758	0.9750	0.9783
	Variation from full-test Y _d (average ≤ ±5%)	-2.1%	-2.2%	-1.9%
				Average -2.1%

Mean Isokinetic Sampling Rate Variation

	Minimum Allowable (%)	90	90	90
	Maximum Allowable (%)	110	110	110
%I	Actual Variation (%)	100.99	101.35	101.26

Point-by-Point Isokinetic Variation

	Number of points <90%	1	0	0
	Number of points >110%	1	0	0
	Number of points <80%	1	0	0
	Number of points >120%	0	0	0

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Marathon Petroleum Company
Clean Air Project No: 12010
FCCU Regenerator Stack

USEPA Method 5F/202 (NSFPM/CPM) QA/QC Results

Run No.	7	8	9
Date (2012)	Apr 26	Apr 26	Apr 26
Start Time (approx.)	08:24	10:10	11:58
Stop Time (approx.)	09:31	11:17	13:17
Total Duration of Test Run (min.)	67	67	79
Net Sampling Time (min.)	60	60	60

Sampling System Calibration Summary

	Nozzle ID No:	250-1	250-1	250-1
D _n	Nozzle Diameter (in):	0.250	0.250	0.250
	Probe ID No:	67-8-19	67-8-19	67-8-19
C _p	Pitot Coefficient:	0.8270	0.8270	0.8270
	Meter Box ID. No:	66-24	66-24	66-24
Y _d	Meter Box Yd - Field Sheet	0.9970	0.9970	0.9970
	Meter Box Yd - Database	0.9970	0.9970	0.9970
	Meter Box ΔH@ - Field Sheet	1.7816	1.7816	1.7816
	Meter Box ΔH@ - Database	1.7816	1.7816	1.7816

QA/QC

Final Leak Check

(a) 4% of Sampling Rate (cfm)	0.0257	0.0257	0.0255
(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200
Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200
Actual Final Leak Rate (cfm)	0.0020	0.0020	0.0020

Sample Volume

	Minimum Volume Required (dscf)	30.00	30.00	30.00
V _{mstd}	Actual Sample Volume (dscf)	36.794	36.533	35.970

Alternative Method 5 Post-Test Calibration (EPA ALT-009)

√ΔH _{avg}	Average of Square Root of ΔH (in. W.C.)	1.1159	1.1144	1.1030
Y _{qa}	Alternative Meter Calibration Factor	0.9696	0.9710	0.9743
	Variation from full-test Y _d (average ≤ ±5%)	-2.7%	-2.6%	-2.3%
				Average -2.5%

Mean Isokinetic Sampling Rate Variation

	Minimum Allowable (%)	90	90	90
	Maximum Allowable (%)	110	110	110
%I	Actual Variation (%)	104.32	103.42	102.61

Point-by-Point Isokinetic Variation

	Number of points <90%	1	1	1
	Number of points >110%	2	2	1
	Number of points <80%	0	0	0
	Number of points >120%	1	1	1

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Clean Air Project No: 12010
FCCU Regenerator Stack

USEPA Mod. CTM-027 (NH3) QA/QC Results

Run No.	1	2	3
Date (2012)	Apr 24	Apr 24	Apr 24
Start Time (approx.)	10:33	12:48	14:33
Stop Time (approx.)	11:33	13:48	15:33
Total Duration of Test Run (min.)	60	60	60
Net Sampling Time (min.)	60	60	60

Sampling System Calibration Summary

	Nozzle ID No:	252-1	252-1	252-1
D _n	Nozzle Diameter (in):	0.252	0.252	0.252
	Probe ID No:	67-4-1	67-4-1	67-4-1
C _p	Pitot Coefficient:	0.8180	0.8180	0.8180
	Meter Box ID. No:	66-22	66-22	66-22
Y _d	Meter Box Yd - Field Sheet	1.0020	1.0020	1.0020
	Meter Box Yd - Database	1.0020	1.0020	1.0020
	Meter Box ΔH@ - Field Sheet	1.8819	1.8819	1.8819
	Meter Box ΔH@ - Database	1.8819	1.8819	1.8819

QA/QC

Final Leak Check

(a) 4% of Sampling Rate (cfm)	0.0240	0.0247	0.0253
(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200
Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200
Actual Final Leak Rate (cfm)	0.0020	0.0010	0.0010

Sample Volume

	Minimum Volume Required (dscf)	30.00	30.00	30.00
V _{mstd}	Actual Sample Volume (dscf)	34.658	35.469	36.117

Alternative Method 5 Post-Test Calibration (EPA ALT-009)

√ΔH _{avg}	Average of Square Root of ΔH (in. W.C.)	1.0992	1.1327	1.1509	
Y _{qa}	Alternative Meter Calibration Factor	0.9927	0.9967	0.9916	Average
	Variation from full-test Y _d (average ≤ ±5%)	-0.9%	-0.5%	-1.0%	-0.8%

Mean Isokinetic Sampling Rate Variation

	Minimum Allowable (%)	90	90	90
	Maximum Allowable (%)	110	110	110
%I	Actual Variation (%)	98.94	101.16	100.58

Point-by-Point Isokinetic Variation

	Number of points <90%	0	0	0
	Number of points >110%	0	0	0
	Number of points <80%	0	0	0
	Number of points >120%	0	0	0

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Marathon Petroleum Company
Clean Air Project No: 12010
FCCU Regenerator Stack

USEPA Mod. CTM-027 (NH3) QA/QC Results

Run No.	4	5	6
Date (2012)	Apr 25	Apr 25	Apr 25
Start Time (approx.)	09:08	12:07	14:06
Stop Time (approx.)	10:08	13:07	15:06
Total Duration of Test Run (min.)	60	60	60
Net Sampling Time (min.)	60	60	60

Sampling System Calibration Summary

	Nozzle ID No:	252-1	252-1	252-1
D _n	Nozzle Diameter (in):	0.252	0.252	0.252
	Probe ID No:	67-4-1	67-4-1	67-4-1
C _p	Pitot Coefficient:	0.8180	0.8180	0.8180
	Meter Box ID. No:	66-22	66-22	66-22
Y _d	Meter Box Yd - Field Sheet	1.0020	1.0020	1.0020
	Meter Box Yd - Database	1.0020	1.0020	1.0020
	Meter Box ΔH@ - Field Sheet	1.8819	1.8819	1.8819
	Meter Box ΔH@ - Database	1.8819	1.8819	1.8819

QA/QC

Final Leak Check

(a) 4% of Sampling Rate (cfm)	0.0239	0.0240	0.0228
(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200
Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200
Actual Final Leak Rate (cfm)	0.0010	0.0020	0.0020

Sample Volume

	Minimum Volume Required (dscf)	30.00	30.00	30.00
V _{mstd}	Actual Sample Volume (dscf)	34.278	34.821	33.033

Alternative Method 5 Post-Test Calibration (EPA ALT-009)

√ΔH _{avg}	Average of Square Root of ΔH (in. W.C.)	1.0916	1.0954	1.0322	
Y _{qa}	Alternative Meter Calibration Factor	0.9938	0.9885	0.9805	Average
	Variation from full-test Y _d (average ≤ ±5%)	-0.8%	-1.4%	-2.1%	-1.4%

Mean Isokinetic Sampling Rate Variation

	Minimum Allowable (%)	90	90	90
	Maximum Allowable (%)	110	110	110
%I	Actual Variation (%)	99.92	101.58	99.62

Point-by-Point Isokinetic Variation

	Number of points <90%	0	0	0
	Number of points >110%	0	0	0
	Number of points <80%	0	0	0
	Number of points >120%	0	0	0

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USEPA Mod. CTM-027 (NH3) QA/QC Results

Run No.	7	8	9
Date (2012)	Apr 26	Apr 26	Apr 26
Start Time (approx.)	08:24	10:10	11:58
Stop Time (approx.)	09:24	11:10	12:58
Total Duration of Test Run (min.)	60	60	60
Net Sampling Time (min.)	60	60	60

Sampling System Calibration Summary

	Nozzle ID No:	252-1	252-1	252-1
D _n	Nozzle Diameter (in):	0.252	0.252	0.252
	Probe ID No:	67-4-1	67-4-1	67-4-1
C _p	Pitot Coefficient:	0.8180	0.8180	0.8180
	Meter Box ID. No:	66-22	66-22	66-22
Y _d	Meter Box Yd - Field Sheet	1.0020	1.0020	1.0020
	Meter Box Yd - Database	1.0020	1.0020	1.0020
	Meter Box ΔH@ - Field Sheet	1.8819	1.8819	1.8819
	Meter Box ΔH@ - Database	1.8819	1.8819	1.8819

QA/QC

Final Leak Check

(a) 4% of Sampling Rate (cfm)	0.0237	0.0246	0.0240
(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200
Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200
Actual Final Leak Rate (cfm)	0.0010	0.0010	0.0010

Sample Volume

	Minimum Volume Required (dscf)	30.00	30.00	30.00
V _{mstd}	Actual Sample Volume (dscf)	34.333	35.180	34.077

Alternative Method 5 Post-Test Calibration (EPA ALT-009)

√ΔH _{avg}	Average of Square Root of ΔH (in. W.C.)	1.1178	1.1215	1.0916	
Y _{qa}	Alternative Meter Calibration Factor	1.0211	0.9934	0.9951	Average
	Variation from full-test Y _d (average ≤ ±5%)	1.9%	-0.9%	-0.7%	0.1%

Mean Isokinetic Sampling Rate Variation

	Minimum Allowable (%)	90	90	90
	Maximum Allowable (%)	110	110	110
%I	Actual Variation (%)	100.51	101.14	102.29

Point-by-Point Isokinetic Variation

	Number of points <90%	1	0	0
	Number of points >110%	0	0	0
	Number of points <80%	1	0	0
	Number of points >120%	0	0	0

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FCCU Regenerator Stack

USEPA Mod. CTM-027 (NH3) QA/QC Results

Run No.	10	11	12
Date (2012)	Apr 27	Apr 27	Apr 27
Start Time (approx.)	09:28	11:12	12:45
Stop Time (approx.)	10:28	12:12	13:45
Total Duration of Test Run (min.)	60	60	60
Net Sampling Time (min.)	60	60	60

Sampling System Calibration Summary

	Nozzle ID No:	252-1	252-1	252-1
D _n	Nozzle Diameter (in):	0.252	0.252	0.252
	Probe ID No:	67-4-1	67-4-1	67-4-1
C _p	Pitot Coefficient:	0.8180	0.8180	0.8180
	Meter Box ID. No:	66-22	66-22	66-22
Y _d	Meter Box Yd - Field Sheet	1.0020	1.0020	1.0020
	Meter Box Yd - Database	1.0020	1.0020	1.0020
	Meter Box ΔH@ - Field Sheet	1.8819	1.8819	1.8819
	Meter Box ΔH@ - Database	1.8819	1.8819	1.8819

QA/QC

Final Leak Check

(a) 4% of Sampling Rate (cfm)	0.0237	0.0238	0.0237
(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200
Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200
Actual Final Leak Rate (cfm)	0.0010	0.0020	0.0010

Sample Volume

	Minimum Volume Required (dscf)	30.00	30.00	30.00
V _{mstd}	Actual Sample Volume (dscf)	34.700	34.606	34.165

Alternative Method 5 Post-Test Calibration (EPA ALT-009)

√ΔH _{avg}	Average of Square Root of ΔH (in. W.C.)	1.0954	1.0992	1.0877
Y _{qa}	Alternative Meter Calibration Factor	0.9988	0.9980	0.9983
	Variation from full-test Y _d (average ≤ ±5%)	-0.3%	-0.4%	-0.4%
				Average -0.4%

Mean Isokinetic Sampling Rate Variation

	Minimum Allowable (%)	90	90	90
	Maximum Allowable (%)	110	110	110
%I	Actual Variation (%)	100.75	100.47	99.49

Point-by-Point Isokinetic Variation

	Number of points <90%	0	0	0
	Number of points >110%	0	0	0
	Number of points <80%	0	0	0
	Number of points >120%	0	0	0

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Clean Air Project No: 12010
FCCU Regenerator Stack

USEPA OTM-29 (HCN) QA/QC Results

Run No.	1	2	3
Date (2012)	Apr 27	Apr 27	Apr 27
Start Time (approx.)	09:28	11:12	12:45
Stop Time (approx.)	10:34	12:17	14:00
Total Duration of Test Run (min.)	66	65	75
Net Sampling Time (min.)	60	60	60

Sampling System Calibration Summary

	Nozzle ID No:	234-1	234-1	234-1
D _n	Nozzle Diameter (in):	0.234	0.234	0.234
	Probe ID No:	67-8-19	67-8-19	67-8-19
C _p	Pitot Coefficient:	0.8270	0.8270	0.8270
	Meter Box ID. No:	66-24	66-24	66-24
Y _d	Meter Box Yd - Field Sheet	0.9970	0.9970	0.9970
	Meter Box Yd - Database	0.9970	0.9970	0.9970
	Meter Box ΔH@ - Field Sheet	1.7816	1.7816	1.7816
	Meter Box ΔH@ - Database	1.7816	1.7816	1.7816

QA/QC

Final Leak Check

(a) 4% of Sampling Rate (cfm)	0.0217	0.0219	0.0216
(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200
Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200
Actual Final Leak Rate (cfm)	0.0020	0.0020	0.0020

Sample Volume

	Minimum Volume Required (dscf)	30.00	30.00	30.00
V _{mstd}	Actual Sample Volume (dscf)	32.543	33.059	32.132

Alternative Method 5 Post-Test Calibration (EPA ALT-009)

√ΔH _{avg}	Average of Square Root of ΔH (in. W.C.)	0.9476	0.9624	0.9439
Y _{qa}	Alternative Meter Calibration Factor	0.9733	0.9777	0.9742
	Variation from full-test Y _d (average ≤ ±5%)	-2.4%	-1.9%	-2.3%
				Average -2.2%

Mean Isokinetic Sampling Rate Variation

	Minimum Allowable (%)	90	90	90
	Maximum Allowable (%)	110	110	110
%I	Actual Variation (%)	104.17	105.74	103.07

Point-by-Point Isokinetic Variation

	Number of points <90%	1	0	0
	Number of points >110%	1	0	0
	Number of points <80%	0	0	0
	Number of points >120%	1	0	0

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Nozzle Calibration Sheet

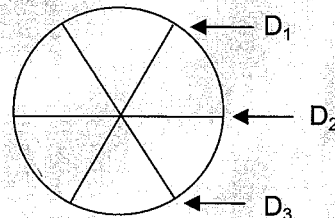
Client	MFC	Project Number	12010
Calibrated by	K. Sullivan	Caliper ID	1131495
Date	4/24/12	Unit / Runs	FCCU Stack

Nozzle Identification	D ₁ (inches)	D ₂ (inches)	D ₃ (inches)	ΔD (inches)	D _{ave} (inches)
252-1	0.252	0.252	0.253	0.001	0.252
250-1	0.250	0.250	0.249	0.001	0.250
0.234-1	0.233	0.234	0.234	0.001	0.234
234-2	0.234	0.233	0.234	0.001	0.234

D₁, D₂, D₃ = three nozzle diameter measurements

ΔD = maximum difference between any two diameters
ΔD ≤ 0.004 inches*

D_{ave} = average of D₁, D₂, D₃



* (40 CFR 60, Appendix A, Method 5, Section 5.1)

Sample Probe Calibration

Probe Type: M5 with S-Type Pitot

I.D. Number: 67-4-1

Project Number: 12610

Thermocouple Calibration

Reference Type: Thermocouple Reference I.D. No: 15-078-39 Pyrometer I.D. No: 80512890 Units: °F

Point No.	Target Temp.	Reference Temp.	Indicated Temp.	Temp. Difference	% Difference*	Specification
1	Ambient	72	71	1	0.19%	% Difference ≤ 1.5
2	200°F-250°F	231	233	-2	0.29%	

* Based on Absolute Temperature (Rankine)

Does thermocouple assembly meet specifications? YES

Pitot Tube Calibration (Wind Tunnel Method @ 50 ft/sec)

Reference Pitot I.D. No: Wind Tunnel

Reference Pitot Cp: 0.99

Pitot Side 'A' :

Trial No.	Reference ΔP	Probe ΔP	Probe C _{p(S)} *	Abs. Deviation from Avg. C _{p(A)} **
1	0.548	0.804	0.817	0.000
2	0.543	0.800	0.816	0.002
3	0.546	0.797	0.820	0.002
Side 'A' Average Probe C _{p(A)} =			0.8175	0.0015

Specification
Avg. C_p Deviations ≤ 0.01

Pitot Side 'B' :

Trial No.	Reference ΔP	Probe ΔP	Probe C _{p(S)} *	Abs. Deviation from Avg. C _{p(B)} **
1	0.548	0.803	0.818	0.001
2	0.551	0.805	0.819	0.000
3	0.549	0.804	0.818	0.000
Side 'B' Average Probe C _{p(B)} =			0.8181	0.0003

Specification
Avg. C_p Deviations ≤ 0.01

'A' Average C_p

0.818

'B' Average C_p

0.818

Difference

0.000

Specification

|Difference| ≤ 0.01

Does assembly meet specifications?

YES

If "Yes", C_p = Average of Side 'A' and 'B' C_p values. If "No", Pitot must be replaced.

$$* C_{P(S)} = C_{P(STD)} \sqrt{\frac{\Delta p_{(STD)}}{\Delta p_{(S)}}}$$

$$** Deviation = |C_{P(S)} - \overline{C_{P(A \text{ or } B)}}|$$

All specifications are from EPA-600/9-76-005, section 3.1

Probe Cp= 0.818

Calibrated by: B ARNOLD

Date: 04/20/2012

Sample Probe Calibration

Probe Type: M5 with S-Type Pitot

I.D. Number: 67-8P-3

Project Number: 12010

Thermocouple Calibration

Reference Type: Thermocouple Reference I.D. No: 15-078-39 Pyrometer I.D. No: 80512890 Units: °F

Point No.	Target Temp.	Reference Temp.	Indicated Temp.	Temp. Difference	% Difference*	Specification
1	Ambient	72	72	0	0.00%	%Difference ≤ 1.5
2	200°F-250°F	241	244	-3	0.43%	

* Based on Absolute Temperature (Rankine)

Does thermocouple assembly meet specifications? YES

Pitot Tube Calibration (Wind Tunnel Method @ 50 ft/sec)

Reference Pitot I.D. No: Wind Tunnel

Reference Pitot Cp: 0.99

Pitot Side 'A':

Trial No.	Reference ΔP	Probe ΔP	Probe C _{p(S)} *	Abs. Deviation from Avg. C _{p(A)} **
1	0.552	0.788	0.828	0.000
2	0.548	0.782	0.829	0.000
3	0.546	0.779	0.829	0.000
Side 'A' Average Probe C _{p(A)} =			0.8286	0.0002

Specification
Avg. C_p Deviations ≤ 0.01

Pitot Side 'B':

Trial No.	Reference ΔP	Probe ΔP	Probe C _{p(S)} *	Abs. Deviation from Avg. C _{p(B)} **
1	0.546	0.784	0.826	0.000
2	0.549	0.785	0.828	0.002
3	0.542	0.785	0.823	0.003
Side 'B' Average Probe C _{p(B)} =			0.8253	0.0019

Specification
Avg. C_p Deviations ≤ 0.01

'A' Average C _p	'B' Average C _p	Difference
0.829	0.825	0.004

Specification
|Difference| ≤ 0.01

Does assembly meet specifications?

YES

If "Yes", C_p = Average of Side 'A' and 'B' C_p values. If "No", Pitot must be replaced.

$$*C_{P(S)} = C_{P(STD)} \sqrt{\frac{\Delta P_{(STD)}}{\Delta P_{(S)}}}$$

$$**Deviation = |C_{P(S)} - \overline{C_{P(A \text{ or } B)}}|$$

All specifications are from EPA-600/9-76-005, section 3.1

Probe Cp= 0.827

Calibrated by: BARNOLD

Date: 04/20/2012

Sample Probe Calibration

Probe Type: M5 with S-Type Pitot

I.D. Number: 67-8-19

Project Number: 12010

Thermocouple Calibration

Reference Type: Thermocouple Reference I.D. No: 15-078-39 Pyrometer I.D. No: 80512890 Units: °F

Point No.	Target Temp.	Reference Temp.	Indicated Temp.	Temp. Difference	% Difference*	Specification
1	Ambient	73	72	1	0.19%	%Difference ≤ 1.5
2	200°F-250°F	253	256	-3	0.42%	

* Based on Absolute Temperature (Rankine)

Does thermocouple assembly meet specifications? YES

Pitot Tube Calibration (Wind Tunnel Method @ 50 ft/sec)

Reference Pitot I.D. No: Wind Tunnel

Reference Pitot Cp: 0.99

Pitot Side 'A':

Trial No.	Reference ΔP	Probe ΔP	Probe C _{p(S)} *	Abs. Deviation from Avg. C _{p(A)} **
1	0.557	0.790	0.831	0.003
2	0.549	0.791	0.825	0.003
3	0.553	0.788	0.829	0.001
Side 'A' Average Probe C _{p(A)} =			0.8286	0.0023

Specification
Avg. C_p Deviations ≤ 0.01

Pitot Side 'B':

Trial No.	Reference ΔP	Probe ΔP	Probe C _{p(S)} *	Abs. Deviation from Avg. C _{p(B)} **
1	0.544	0.783	0.825	0.000
2	0.543	0.781	0.825	0.000
3	0.547	0.788	0.824	0.000
Side 'B' Average Probe C _{p(B)} =			0.8248	0.0003

Specification
Avg. C_p Deviations ≤ 0.01

'A' Average C _p	'B' Average C _p	Difference
0.829	0.825	0.004

Specification
|Difference| ≤ 0.01

Does assembly meet specifications?

YES

If "Yes", C_p = Average of Side 'A' and 'B' Cp values. If "No", Pitot must be replaced.

$$* C_{P(S)} = C_{P(STD)} \sqrt{\frac{\Delta p_{(STD)}}{\Delta p_{(S)}}}$$

$$** Deviation = |C_{P(S)} - \overline{C_{P(A \text{ or } B)}}|$$

All specifications are from EPA-600/9-76-005, section 3.1

Probe Cp= 0.827

Calibrated by: B ARNOLD

Date: 04/20/2012

Clean Air Engineering - Meter Box Full Test Calibration

Client: source

Reviewed By: R.Redel

Calibration Signature: [Signature]

ID No: 66

Calibrated By: O.Lavrov

Meter Box Yd: 1.0020

Dept No: 66-22

Date of Calibration: 10/14/11

Meter Box ΔH@: 1.8819

Meter Box Serial No: 66-22

Due Date of Calibration: 10/14/12

Barometer Serial No: W12637

Manufacturer Part No: 0028

Meter Box Vacuum: 1.0 in. H₂O

Barometric Pressure: 28.82 in. Hg

Q	ΔH	ΔP	Y _{as}	Standard Meter Gas Volume (ft ³)			Meter Box Gas Volume (ft ³)			Std. Meter Temperature (°F)			Meter Box Temperature (°F)			Time (min.)			Calibration Results	
				Initial	Final	Net	V _{as}	Initial	Final	Net	V _d	T _{is}	T _{os}	T _{as}	Avg.	T _i	T _o	T _d	Y _d	ΔH@
0.378	0.50	-1.00	1.0000	0.000	5.000	5.000	5.000	444.804	449.845	5.041	5.041	73.0	73.0	73.00	73.00	81.0	81.0	81.00	1.0029	1.8514
0.377	0.50	-1.00	1.0000	0.000	5.000	5.000	5.000	449.845	454.885	5.040	5.040	73.0	73.0	73.00	73.00	82.0	81.0	81.50	1.0040	1.8602
0.644	1.50	-1.30	1.0000	0.000	10.000	10.000	10.000	462.914	473.030	10.116	10.116	73.0	73.0	73.00	73.00	90.0	80.0	85.00	1.0036	1.9184
0.843	1.50	-1.30	1.0000	0.000	10.000	10.000	10.000	473.030	483.173	10.143	10.143	73.0	73.0	73.00	73.00	91.0	81.0	86.00	1.0028	1.9175
0.918	3.00	-1.70	1.0000	0.000	10.000	10.000	10.000	503.392	513.576	10.184	10.184	73.0	73.0	73.00	73.00	96.0	83.0	89.50	1.0003	1.8754
0.920	3.00	-1.70	1.0000	0.000	10.000	10.000	10.000	513.576	523.770	10.194	10.194	73.0	73.0	73.00	73.00	95.0	83.0	89.00	0.9984	1.8682
Averages																			1.00200	1.88187

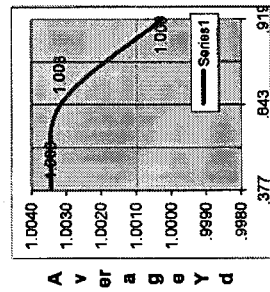
Nomenclature		Equations	
P _b	Barometric Pressure (in. Hg)		
Q	Flow Rate (cfm)		
ΔH	Orifice Pressure Differential (in. H ₂ O)		
ΔP	Inlet Pressure Differential (in. H ₂ O)		
V _d	Gas Meter Volume - Dry (ft ³)		
V _{as}	Standard Meter Volume - Dry (ft ³)		
T _d	Average Meter Box Temperature (°F)		
T _o	Outlet Meter Box Temperature (°F)		
T _{as}	Average Standard Meter Temperature (°F)		
Y _d	Meter Correction Factor (unitless), Y _d = 1 ± 0.02		
Y _{as}	Standard Meter Correction Factor (unitless)		
ΔH@	Orifice Pressure Differential giving 0.75 cfm of air at 68°F and 29.92 in. Hg (in. H ₂ O)		
ΔH@ _{68°F}	ΔH@ _{68°F} ± 0.2		
θ	Duration of Run (minutes)		

$$Y_d = \left(\frac{V_{as}}{V_d} \right) \left[\frac{T_d + 460}{T_{as} + 460} \right] \left[\frac{P_b + \Delta P / 13.6}{P_b + \Delta H / 13.6} \right]$$

$$\Delta H@ = \frac{(0.0319)(\Delta H)}{P_b(T_o + 460)} \left[\frac{(T_{as} + 460)(\theta)^2}{(V_{as})(Y_{as})} \right]$$

$$Q = \frac{17.64(Y_{as})(P_b)}{(T_{as} + 460)(\theta)}$$

Average YD vs. Average CFM



Vacuum Gauge Standard (in. Hg)	Gauge (in. Hg)
5.4	5.0
10.2	10.0
15.0	15.0
20.2	20.0
25.7	25.0

Calibration Reference Information (Standard Meter)	
Reference Used: <u>Wet Test Meter</u>	Serial No: <u>11AH6</u>
Calibrated By: <u>Martin Vacuero</u>	Date Calibrated: <u>10/26/2010</u>
Percent Error: <u>0.196%</u>	Calibration Due Date: <u>10/27/2011</u>

Meter Box Pre-Calibration Inspection	
Positive Leak Check: <u>Pass</u>	Electrical Check: <u>Pass</u>
Negative Leak Check: <u>Pass</u>	Pyrometer Check: <u>Pass</u>
Vacuum Gauge Check: <u>Pass</u>	YD Tolerance: <u>± 2% of 1.0000</u>



Meter Box - Pyrometer Calibration Sheet

Meter Box No: 66-22

Office:

Calibrated by: O.Lavrov

Client:

Date: 10/14/11

Job No:

Temperature Scale Used: Fahrenheit

Type of Calibration: Full-Test

Calibration Reference Settings (°F)	Pyrometer Reading for each Channel (°F)						
	1 Stack	2 Probe	3 Filter	4 Imp Out	5 Aux	6 DGM In	7 DGM Out
50	49	49	49				
100	99	99	99				
150	149	149	149				
200	199	199	199				
250	249	249	249				
300	299	299	299				
350	349	349	349				
400	399	399	399				
450	449	450	449				
500	499	500	499				
550	549	550	549				
600	599	600	599				

Tolerance = $\pm 2^{\circ}\text{F}$ difference from reference setting.

Calibration Reference Information

Reference Used: <u>Omega CL23A</u>	Serial No: <u>T-279500</u>
Calibrated By: <u>JH Metrology</u>	Date Calibrated: <u>8/18/2011</u>
Calibration Report No: <u>1000157180</u>	Calibration Due Date: <u>8/18/2012</u>

Calibration Signature: 

Reviewed By: M. Vaquero

Reviewed By: M. Vaquero

Client: Source

Meter Box Yd: 0.9970

Calibrated By: Oleg Lavrov

ID No: 66-24

Meter Box ΔH@: 1.7816

Date of Calibration: 08/16/11

Dept No: 66

Barometer Serial No: W12637

Due Date of Calibration: 08/16/12

Meter Box Serial No: 0028-082807-1

Barometric Pressure: 29.36 in. Hg

Meter Box Vacuum: 1.0 in. H₂O

Manufacturer Part No: 0028

				Standard Meter Gas Volume (ft³)			Meter Box Gas Volume (ft³)			Std. Meter Temperature (°F)				Meter Box Temperature (°F)				Time (min.)	Calibration Results					
Q	ΔH	ΔP	Y _{ds}	Initial	Final	Net	V _{ds}	Initial	Final	Net	V _d	T _{is}	T _{os}	T _{dis}	T _i	T _o	T _o	Avg.	T _d	Θ	Y _d	ΔH@		
0.377	0.50	-1.20	1.0000	0.000	5.000	5.000	92.488	97.531	5.043	5.043	80.0	80.0	80.0	80.0	88.0	85.0	85.0	86.50	86.50	12.72	0.9991	1.8812		
0.377	0.50	-1.20	1.0000	0.000	5.000	5.000	97.531	102.582	5.051	5.051	80.0	80.0	80.0	80.0	88.0	85.0	85.0	86.50	86.50	12.72	0.9976	1.8812		
0.680	1.50	-1.40	1.0000	0.000	10.000	10.000	108.522	118.652	10.130	10.130	80.0	80.0	80.0	80.0	94.0	86.0	86.0	90.00	90.00	14.10	0.9982	1.7304		
0.680	1.50	-1.40	1.0000	0.000	10.000	10.000	118.652	128.792	10.140	10.140	80.0	80.0	80.0	80.0	95.0	87.0	87.0	91.00	91.00	14.10	0.9990	1.7273		
0.967	3.00	-1.80	1.0000	0.000	10.000	10.000	58.188	68.271	10.083	10.083	80.0	80.0	80.0	80.0	92.0	82.0	82.0	87.00	87.00	9.92	0.9925	1.7257		
0.960	3.00	-1.80	1.0000	0.000	10.000	10.000	68.271	78.372	10.101	10.101	80.0	80.0	80.0	80.0	95.0	84.0	84.0	89.50	89.50	9.99	0.9954	1.7437		
Averages																					0.99688		1.78159	

Equations

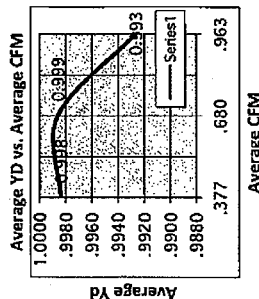
$$Y_d = (Y_{ds}) \left[\frac{V_{ds}}{V_d} \right] \left[\frac{T_{ds} + 460}{T_{ds} + 460} \right] \left[\frac{P_b + \Delta P / 13.6}{P_b + \Delta H / 13.6} \right]$$

$$\Delta H @ = \frac{(0.0319)(\Delta H)}{P_b (T_{ds} + 460)} \left[\frac{(T_{ds} + 460)(\Theta)^2}{(V_{ds})(Y_{ds})} \right]$$

$$Q = \frac{17.64(Y_{ds})(P_b)}{(T_{ds} + 460)(\Theta)}$$

Nomenclature

P_b Barometric Pressure (in. Hg)
 Q Flow Rate (cfm)
 ΔH Inlet Pressure Differential (in. H₂O)
 ΔP Inlet Pressure Differential (in. H₂O)
 V_d Gas Meter Volume - Dry (ft³)
 V_{ds} Standard Meter Volume - Dry (ft³)
 T_{is} Average Meter Box Temperature (°F)
 T_{os} Outlet Meter Box Temperature (°F)
 T_{is} Average Standard Meter Temperature (°F)
 Y_d Meter Correction Factor (unitless), Y_{is} ±0.02
 Y_{ds} Standard Meter Correction Factor (unitless)
 ΔH@ Office Pressure Differential giving 0.75 cfm of air at 68°F and 29.92 in. Hg (in. H₂O)
 ΔH@ ±0.2
 Θ Duration of Run (minutes)



Standard	Gauge
(in.Hg)	(in.Hg)
5.7	5.0
10.7	10.0
14.6	15.0
18.1	20.0
24.1	25.0

Calibration Reference Information (Standard Meter)

Reference Used: Wet Test Meter
 Calibrated By: Martin Vaquero
 Percent Error: 0.196%

Serial No: 11A/H6
 Date Calibrated: 10/26/10
 Calibration Due Date: 10/27/11

Meter Box Pre-Calibration Inspection

Positive Leak Check: Pass
 Negative Leak Check: Pass
 Vacuum Gauge Check: Pass
 Electrical Check: Pass
 Pyrometer Check: Pass
 YD Tolerance: ± 2% of 1.0000



Meter Box - Pyrometer Calibration Sheet

Meter Box No: 66-24

Office: _____

Calibrated by: Oleg Lavrov

Client: SOURCE 66

Date: 8/16/11

Job No: _____

Temperature Scale Used: Fahrenheit

Type of Calibration: Full-Test

Calibration Reference Settings (°F)	Pyrometer Reading for each Channel (°F)						
	1 Stack	2 Probe	3 Filter	4 Imp Out	5 Aux	6 DGM In	7 DGM Out
50	50	52	51	50	50		
100	100	102	101	100	100		
150	150	151	151	150	150		
200	200	202	201	200	200		
250	250	252	251	250	250		
300	300	302	301	300	300		
350	350	352	351	350	350		
400	400	402	401	400	400		
450	450	452	451	450	450		
500	500	502	501	500	500		
550	550	552	551	550	550		
600	600	601	601	600	600		

Tolerance = $\pm 2^{\circ}\text{F}$ difference from reference setting.

Calibration Reference Information

Reference Used: Omega CL23A

Serial No: T-279500

Calibrated By: JH Metrology

Date Calibrated: 10/5/2010

Calibration Report No: R044791

Calibration Due Date: 10/5/2011

FIELD DATA

E

I hereby certify that all pages contained within this Appendix have been reviewed and, to the best of my ability, verified as accurate.

QA/QC Initials: KPO

Date: 6/12/2012



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INSTRUMENTAL O₂ / CO₂ DATA

TEST LOCATION: FCCU Stack

PAGE 1 OF 4

Client	Marathon Petroleum Company	Project Number	12010	$F_o = \frac{20.9 - \%O_2}{\%CO_2}$
Plant	Detroit, MI	Unit	Complex 3	
Asset No(s)	66-01 66-01	Fuel Type	N/A	Leak Check Passed ☒

Gas	Cylinder ID No.	Gas Concentration (%dv)	Expiration Date
Zero	AEH883	0.00 / 0.00	n/a
O ₂ / CO ₂	ALM035171	20.10 / 3.97	May 31, 2012
O ₂ / CO ₂	ALM040209	3.95 / 20.10	May 31, 2012

Pre-Test Calibration Response

	Oxygen		Carbon dioxide	
	(%, dv)	Cal Error	(%, dv)	Cal Error
Zero	0.0	0.0%	0.0	0.0%
High	20.1	0.0%	20.1	0.0%
Mid	3.9	-0.2%	4.0	0.1%

Note: Pre-test instrument response criteria is based on Method 3A, calibration error. Response to zero, high, and mid gases must be $\pm 2\%$ of scale. Instrument scale is considered to be the highest calibration gas value.

Field Data

Run Number	Method Number		Percent O ₂	Percent CO ₂	F _o	Analyst	Analysis		Md lb/lb-mole
							Date	Time	
1	5F/202		2.0	16.3	N/A	K. Sullivan	04/24/12	12:00	30.69
2	5F/202		2.0	16.3	N/A	K. Sullivan	04/24/12	14:16	30.69
3	5F/202		2.2	16.2	N/A	K. Sullivan	04/24/12	16:29	30.68
1	CTM-027		2.0	16.4	N/A	K. Sullivan	04/24/12	12:00	30.70
2	CTM-027		2.0	16.4	N/A	K. Sullivan	04/24/12	14:15	30.70
3	CTM-027		2.2	16.2	N/A	K. Sullivan	04/24/12	16:28	30.68

Post-Test Calibration Response

	Oxygen			Carbon dioxide		
	(%, dv)	Cal Error	Drift	(%, dv)	Cal Error	Drift
Zero	0.1	0.5%	0.5%	0.0	0.0%	0.0%
High	20.0	-0.5%	-0.5%	20.0	-0.5%	-0.5%
Mid	4.0	0.2%	0.5%	4.0	0.1%	0.0%

Note: Post-test instrument response criteria is based on Method 3A, drift. Response to zero, high, and mid gases must not drift more than $\pm 3\%$ of scale. Instrument scale is considered to be the highest calibration gas value.

Calculate F_o to verify results. Acceptable ranges for F_o:

Coal: Anthracite and Lignite	1.016-1.130	Gas: Natural	1.600-1.836
Bituminous	1.083-1.230	Propane	1.434-1.586
Oil: Distillate	1.260-1.413	Butane	1.405-1.553
Residual	1.210-1.370	Wood	1.000-1.120
Municipal Solid Waste	1.030-1.300	Wood Bark	1.003-1.130

INSTRUMENTAL O₂ / CO₂ DATA

TEST LOCATION: FCCU Stack

PAGE 2 OF 4

Client	Marathon Petroleum Company	Project Number	12010	$F_o = \frac{20.9 - \%O_2}{\%CO_2}$
Plant	Detroit, MI	Unit	Complex 3	
Asset No(s)	66-01 66-01	Fuel Type	N/A	Leak Check Passed ☒

Gas	Cylinder ID No.	Gas Concentration (%dv)	Expiration Date
Zero	AEH883	0.00 / 0.00	n/a
O ₂ / CO ₂	ALM035171	20.10 / 3.97	May 31, 2012
O ₂ / CO ₂	ALM040209	3.95 / 20.10	May 31, 2012

Pre-Test Calibration Response

	Oxygen		Carbon dioxide	
	(%, dv)	Cal Error	(%, dv)	Cal Error
Zero	0.0	0.0%	0.0	0.0%
High	20.1	0.0%	20.1	0.0%
Mid	3.9	-0.2%	4.0	0.1%

Note: Pre-test instrument response criteria is based on Method 3A, calibration error. Response to zero, high, and mid gases must be $\pm 2\%$ of scale. Instrument scale is considered to be the highest calibration gas value.

Field Data

Run Number	Method Number		Percent O ₂	Percent CO ₂	Fo	Analyst	Analysis		Md lb/lb-mole
							Date	Time	
4	5F/202		2.4	16.1	N/A	K. Sullivan	04/25/12	10:51	30.67
5	5F/202		2.5	16.0	N/A	K. Sullivan	04/25/12	13:46	30.66
6	5F/202		2.3	16.2	N/A	K. Sullivan	04/25/12	15:57	30.68
4	CTM-027		2.7	15.9	N/A	K. Sullivan	04/25/12	10:33	30.65
5	CTM-027		2.5	16.0	N/A	K. Sullivan	04/25/12	13:41	30.66
6	CTM-027		2.6	15.9	N/A	K. Sullivan	04/25/12	15:26	30.65

Post-Test Calibration Response

	Oxygen			Carbon dioxide		
	(%, dv)	Cal Error	Drift	(%, dv)	Cal Error	Drift
Zero	0.0	0.0%	0.0%	0.0	0.0%	0.0%
High	20.1	0.0%	0.0%	20.2	0.5%	0.5%
Mid	3.9	-0.2%	0.0%	4.0	0.1%	0.0%

Note: Post-test instrument response criteria is based on Method 3A, drift. Response to zero, high, and mid gases must not drift more than $\pm 3\%$ of scale. Instrument scale is considered to be the highest calibration gas value.

Calculate Fo to verify results. Acceptable ranges for Fo:

Coal: Anthracite and Lignite	1.016-1.130	Gas: Natural	1.600-1.836
Bituminous	1.083-1.230	Propane	1.434-1.586
Oil: Distillate	1.260-1.413	Butane	1.405-1.553
Residual	1.210-1.370	Wood	1.000-1.120
Municipal Solid Waste	1.030-1.300	Wood Bark	1.003-1.130

INSTRUMENTAL O₂ / CO₂ DATA

TEST LOCATION: FCCU Stack

PAGE 3 OF 4

Client	Marathon Petroleum Company	Project Number	12010	$F_o = \frac{20.9 - \%O_2}{\%CO_2}$
Plant	Detroit, MI	Unit	Complex 3	
Asset No(s)	66-01 66-01	Fuel Type	N/A	Leak Check Passed ☒

Gas	Cylinder ID No.	Gas Concentration (%dv)	Expiration Date
Zero	AEH883	0.00 / 0.00	n/a
O ₂ / CO ₂	ALM035171	20.10 / 3.97	May 31, 2012
O ₂ / CO ₂	ALM040209	3.95 / 20.10	May 31, 2012

Pre-Test Calibration Response

	Oxygen		Carbon dioxide	
	(%, dv)	Cal Error	(%, dv)	Cal Error
Zero	0.0	0.0%	0.0	0.0%
High	20.1	0.0%	20.1	0.0%
Mid	3.9	-0.2%	4.0	0.1%

Note: Pre-test instrument response criteria is based on Method 3A, calibration error. Response to zero, high, and mid gases must be $\pm 2\%$ of scale. Instrument scale is considered to be the highest calibration gas value.

Field Data

Run Number	Method Number		Percent O ₂	Percent CO ₂	F _o	Analyst	Analysis		Md lb/lb-mole
							Date	Time	
7	5F/202		2.3	16.0	N/A	K. Sullivan	04/26/12	10:11	30.65
8	5F/202		2.3	16.0	N/A	K. Sullivan	04/26/12	11:53	30.65
9	5F/202		2.4	15.8	N/A	K. Sullivan	04/26/12	13:36	30.62
7	CTM-027		2.4	15.9	N/A	K. Sullivan	04/26/12	09:56	30.64
8	CTM-027		2.5	15.8	N/A	K. Sullivan	04/26/12	11:41	30.63
9	CTM-027		2.5	15.9	N/A	K. Sullivan	04/26/12	13:11	30.64

Post-Test Calibration Response

	Oxygen			Carbon dioxide		
	(%, dv)	Cal Error	Drift	(%, dv)	Cal Error	Drift
Zero	0.0	0.0%	0.0%	0.0	0.0%	0.0%
High	20.1	0.0%	0.0%	20.1	0.0%	0.0%
Mid	3.9	-0.2%	0.0%	4.0	0.1%	0.0%

Note: Post-test instrument response criteria is based on Method 3A, drift. Response to zero, high, and mid gases must not drift more than $\pm 3\%$ of scale. Instrument scale is considered to be the highest calibration gas value.

Calculate F_o to verify results. Acceptable ranges for F_o:

Coal: Anthracite and Lignite	1.016-1.130	Gas: Natural	1.600-1.836
Bituminous	1.083-1.230	Propane	1.434-1.586
Oil: Distillate	1.260-1.413	Butane	1.405-1.553
Residual	1.210-1.370	Wood	1.000-1.120
Municipal Solid Waste	1.030-1.300	Wood Bark	1.003-1.130

INSTRUMENTAL O₂ / CO₂ DATA

TEST LOCATION: FCCU Stack

PAGE 4 OF 4

Client	Marathon Petroleum Company	Project Number	12010	$F_o = \frac{20.9 - \%O_2}{\%CO_2}$
Plant	Detroit, MI	Unit	Complex 3	
Asset No(s)	66-01 66-01	Fuel Type	N/A	Leak Check Passed ☒

Gas	Cylinder ID No.	Gas Concentration (%dv)	Expiration Date
Zero	AEH883	0.00 / 0.00	n/a
O ₂ / CO ₂	ALM035171	20.10 / 3.97	May 31, 2012
O ₂ / CO ₂	ALM040209	3.95 / 20.10	May 31, 2012

Pre-Test Calibration Response

	Oxygen		Carbon dioxide	
	(%, dv)	Cal Error	(%, dv)	Cal Error
Zero	0.0	0.0%	0.0	0.0%
High	20.1	0.0%	20.1	0.0%
Mid	4.0	0.2%	4.0	0.1%

Note: Pre-test instrument response criteria is based on Method 3A, calibration error. Response to zero, high, and mid gases must be $\pm 2\%$ of scale. Instrument scale is considered to be the highest calibration gas value.

Field Data

Run Number	Method Number		Percent O ₂	Percent CO ₂	F _o	Analyst	Analysis		Md lb/lb-mole
							Date	Time	
1	OTM-29		3.0	11.6	N/A	K. Sullivan	04/27/12	11:00	29.98
2	OTM-29		2.9	11.7	N/A	K. Sullivan	04/27/12	12:34	29.99
3	OTM-29		4.9	12.2	N/A	K. Sullivan	04/27/12	14:10	30.15
10	CTM-027		3.8	14.7	N/A	K. Sullivan	04/27/12	11:03	30.50
11	CTM-027		2.8	15.6	N/A	K. Sullivan	04/27/12	12:36	30.61
12	CTM-027		3.1	15.4	N/A	K. Sullivan	04/27/12	14:15	30.59

Post-Test Calibration Response

	Oxygen			Carbon dioxide		
	(%, dv)	Cal Error	Drift	(%, dv)	Cal Error	Drift
Zero	0.0	0.0%	0.0%	0.0	0.0%	0.0%
High	20.1	0.0%	0.0%	20.1	0.0%	0.0%
Mid	3.9	-0.2%	-0.5%	4.0	0.1%	0.0%

Note: Post-test instrument response criteria is based on Method 3A, drift. Response to zero, high, and mid gases must not drift more than $\pm 3\%$ of scale. Instrument scale is considered to be the highest calibration gas value.

Calculate F_o to verify results. Acceptable ranges for F_o:

Coal: Anthracite and Lignite	1.016-1.130	Gas: Natural	1.600-1.836
Bituminous	1.083-1.230	Propane	1.434-1.586
Oil: Distillate	1.260-1.413	Butane	1.405-1.553
Residual	1.210-1.370	Wood	1.000-1.120
Municipal Solid Waste	1.030-1.300	Wood Bark	1.003-1.130

File stack

UNIT: Complex 3

VELOCITY DETERMINATION FIELD DATA SHEET

PAGE 1 OF 1

Client	MALAYSON	Project No.	12010
Plant	DECEIT	Date	4/24/12
Meter Operator D. LUCAS			
Probe Operator P. BLOK			
Source of Moisture and Molecular Weight Data			

A3/M4

Cross-Section of Test Location

Amb. Temp. (°F)	55	Bar. Press. 28.25 [in. Hg] [inbar]
Pilot Cp	0.827	Probe I.D. No. 67-883
Duct Diameters from Disturbance		
Downstream	3.4	Upstream 2.2
First point all the way [in] [Out]		Port Len. (in.) 0
Gas Flow [in] [Out] of page 80		
Duct Dimensions (in.)		32.25

Run	1	2	3	4	5	6	7	8	9	10	11	12	Total	Average
Load	130	130	130	130	130	130	130	130	130	130	130	130	13676	13676
Stop Time	1:30	1:30	1:30	1:30	1:30	1:30	1:30	1:30	1:30	1:30	1:30	1:30	19.899	19.899
Static Press. (in. H ₂ O)	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
Post-Test Leak Check:	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Stack Temp. T _s (°F)	572	573	573	573	574	573	571	570	569	567	562	561	561	561
Velocity Head ΔP (in. H ₂ O)	0.74	0.77	0.68	0.65	0.57	0.56	0.65	0.68	0.74	0.73	0.73	0.76	0.76	0.76
Notes														
Traverse Point Number	1-1	2	3	4	5	6	7	8	9	10	11	12		
Stack Temp. T _s (°F)	568	569	570	571	571	572	572	571	572	572	565	565		
Velocity Head ΔP (in. H ₂ O)	0.77	0.87	0.88	0.84	0.79	0.86	0.47	0.49	0.59	0.64	0.66	0.56		
Notes														
Traverse Point Number	2-1	2	3	4	5	6	7	8	9	10	11	12		
Stack Temp. T _s (°F)														
Velocity Head ΔP (in. H ₂ O)														
Notes														
Traverse Point Number														
Stack Temp. T _s (°F)														
Velocity Head ΔP (in. H ₂ O)														
Notes														
Traverse Point Number														
Stack Temp. T _s (°F)														
Velocity Head ΔP (in. H ₂ O)														
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Stack Temp. T _s (°F)														
Velocity Head ΔP (in. H ₂ O)														
Notes														
Traverse Point Number														
Stack Temp. T _s (°F)														
Velocity Head ΔP (in. H ₂ O)														
Notes														
Traverse Point Number														
Stack Temp. T _s (°F)														
Velocity Head ΔP (in. H ₂ O)														
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Traverse Point Number														
Stack Temp. T _s (°F)														
Velocity Head ΔP (in. H ₂ O)														
Notes														
Traverse Point Number														
Stack Temp. T _s (°F)														

Circle correct bracketed units on data sheet.

Sum of square roots.



QA/QC $\frac{17}{12}$

VELOCITY DETERMINATION FIELD DATA SHEET

FIELD DATA SHEET

FO-

Amb. Temp. (°F)	55	Bar. Press.	23.25 [in. Hg] (mbar)
Pitot Cp	0.827	Probe I.D. No.	675P-3
Duct Diameters from Disturbance			
Downstream	3.4	Upstream	2.2
First point all the way [in] [Out]		Port Len. (in.) 3	
Gas Flow [in] [out] of page			
Duct Dimensions (in.)			

Cross-Section of Test Location

Client	Mara+G	Project No.	2010
Plant	Detrit	Date	4/24/12
Meter Operator	D. Luckard		
Probe Operator	P. B. H. A.		
Source of Moisture and Molecular Weight Data			

[illegible]

Sum of square roots.

Circle correct bracketed units on data sheet.



FCC v. StacK

VELOCITY DETERMINATION FIELD DATA SHEET

PAGE 1 OF 1

UNIT: Complex 3

Client	Marathon	Project No.	12010
Plant	Detroit	Date	4/25/12
Meter Operator	P. Luckhart		
Probe Operator	P. Richon		
Source of Moisture and Molecular Weight Data M3 m4			

Cross-Section of Test Location

IN[UP]

Amb. Temp. (°F)	68	Bar. Press. 29.5 [in. Hg] [mbar]
Pilot Cp	0.827	Probe I.D. No. 67-2P-3
Duct Diameters from Disturbance		
Downstream	3-4	Upstream
First point all the way (In)		[Out]
Gas Flow [In]	[Out]	Port Len. (in.) 8
Duct Dimensions (in.)		22.25

Run	Load	Run	Load	Run	Load	Run	Load
Start Time	Stop Time	Start Time	Stop Time	Start Time	Stop Time	Start Time	Stop Time
Static Press. (in. H ₂ O)		Static Press. (in. H ₂ O)		Static Press. (in. H ₂ O)		Static Press. (in. H ₂ O)	
Post-Test Leak Check:		Post-Test Leak Check:		Post-Test Leak Check:		Post-Test Leak Check:	
Traverse Point Number	Stack Temp. T _s (°F)	Velocity Head ΔP (in. H ₂ O)	Notes	Traverse Point Number	Stack Temp. T _s (°F)	Velocity Head ΔP (in. H ₂ O)	Notes
2-1	555	0.59		1-1	548	0.57	
2	554	0.62		2	551	0.71	
3	555	0.61		3	552	0.73	
4	556	0.59		4	552	0.74	
5	558	0.57		5	555	0.73	
6	558	0.58		6	556	0.68	
7	558	0.62		7	557	0.61	
8	558	0.63		8	558	0.57	
9	558	0.61		9	559	0.65	
10	558	0.63		10	558	0.72	
11	552	0.61		11	554	0.86	
12	552	0.62		12	551	0.95	
Total	13323	19.4026				*	
Average	555.1250	0.58084				*	

Sum of square roots. Circle correct bracketed units on data sheet.



TEST LOCATION: FCCU Stack

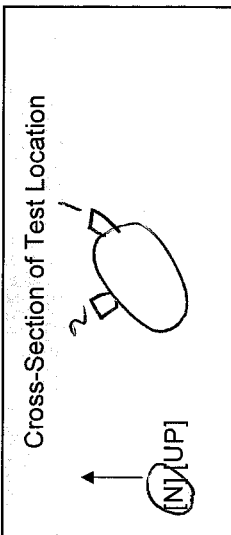
UNIT: Complex 3

UNIT: Complex

VELOCITY DETERMINATION FIELD DATA SHEET

PAGE 1 OF 1

Client	Marathon	Project No.	12010
Plant	Detrol	Date	4/25/12
Meter Operator	D. LucKhard		
Probe Operator	B. Arnold		
Source of Moisture and Molecular Weight Data M3/mg			



Amb. Temp. (°F)	65	Bar. Press. 29.1	[in] Hg. [mbar]
Pilot Cp	0.877	Probe I.D. No.	67-84-3
Duct Diameters from Disturbance			
Downstream	3.4	Upstream	2.2
First point all the way [in] Out		Port Len. (in.) 2	
Gas Flow [in]	[Out]	of page	
Duct Dimensions (in.)	21.2		

Run					
Run	Load	Stop Time	Pass	Fail	Notes
Start Time	8:40	8:56			
Static Press. (in. H ₂ O)	0.1				
Post-Test Leak Check:					
Traverse Point Number	Stack Temp. T _s (°F)	Velocity Head ΔP (in. H ₂ O)	Notes	Fail	Pass
Traverse Point Number	Stack Temp. T _s (°F)	Velocity Head ΔP (in. H ₂ O)	Notes	Fail	Pass
2-1	559	0.55			
2	554	0.57			
3	554	0.61			
4	556	0.61			
5	554	0.59			
6	552	0.62			
1-1	548	0.55			
2	549	0.58			
3	550	0.63			
4	558	0.77			
5	554	0.86			
6	551	0.89			
Total	6638	9.6593			
Average	(553.167)	(0.8049)			

Circle correct bracketed units on data sheet.

FDS002-Velocity.xls, August 2004

QA/QC_ Date



FCC V Stack

UNIT: complex 3

VELOCITY DETERMINATION FIELD DATA SHEET

PAGE 1 OF 1

Client	Marathon	Project No.	12010
Plant	Petrol	Date	4/26/12
Meter Operator	D. Luckhard		
Probe Operator	P. B'han		
Source of Moisture and Molecular Weight Data			
			MS/mg

Cross-Section of Test Location



②UP

Bar. Press. 29.00	Bar. [in] [Hg] [mbart]
Pilot Cp 0.227	Probe I.D. No. 63-ep-3
Duct Diameters from Disturbance	
Downstream 10 3.2	Upstream 4 2.2
First point all the way [in] [out]	
Gas Flow [in] [out]	Port Len. (in.) 8
Duct Dimensions (in.) 87.25	

Run	043	Load	Run	043	Load	Run	Load	Run	Load						
Start Time	0602	Stop Time	0812	Start Time	0812	Start Time	Stop Time	Start Time	Stop Time						
Static Press. (in. H ₂ O)		0.4	Static Press. (in. H ₂ O)		0.4	Static Press. (in. H ₂ O)		Static Press. (in. H ₂ O)							
Post-Test Leak Check:		Pass ☒ Fail ☐	Post-Test Leak Check:		Pass ☐ Fail ☐	Post-Test Leak Check:		Pass ☐ Fail ☐	Post-Test Leak Check:		Pass ☐ Fail ☐				
Traverse Point Number	Stack Temp. T _s (°F)	Velocity Head ΔP (in. H ₂ O)	Notes	Traverse Point Number	Stack Temp. T _s (°F)	Velocity Head ΔP (in. H ₂ O)	Notes	Traverse Point Number	Stack Temp. T _s (°F)	Velocity Head ΔP (in. H ₂ O)	Notes	Traverse Point Number	Stack Temp. T _s (°F)	Velocity Head ΔP (in. H ₂ O)	Notes
2-1	557	0.55		1-1	553	0.52									
2	558	0.63		2	555	0.72									
3	558	0.63		3	556	0.79									
4	559	0.61		4	558	0.74									
5	566	0.59		5	559	0.77									
6	561	0.62		6	559	0.74									
7	561	0.64		7	561	0.66									
8	562	0.65		8	562	0.66									
9	562	0.65		9	563	0.64									
10	562	0.71		10	562	0.70									
11	557	0.98		11	558	0.98									
12	556	0.99		12	556	1.0									
Total		13415	26.1631												
Average		555.958	0.8401												

Sum of square roots.

Circle correct bracketed units on data sheet.



FCCU Stack

UNIT: Complex

VELOCITY DETERMINATION FIELD DATA SHEET

PAGE / OF

Client	Merrifield	Project No.	12010
Plant	Detroit	Date	4/26/12
Meter Operator	D. Luckhard		
Probe Operator	P. B. Hanna		
Source of Moisture and Molecular Weight Data			

Cross-Section of Test Location



Amb. Temp. (°F)	55	Bar. Press.	29.4	in. Hg	[inbar]
Pilot Cp	0.222	Probe I.D. No.	67-403		
Duct Diameters from Disturbance					
Downstream	3.2	Upstream	2.2		
First point all the way [In]		[Out]	Port Len. (in.)	0	
Gas Flow [In] [Out] of page					
Duct Dimensions (in.)					
22-25					

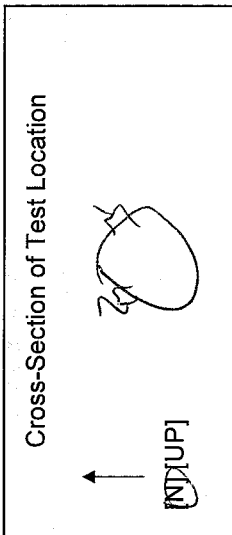
[illegible]

Sum of square roots.

Circle correct bracketed units on data sheet.

UNIT: Exhaust 3

Client <u>Machol</u>	Project No. <u>12010</u>
Plant <u>Boiler</u>	Date <u>4-24-12</u>
Meter Operator <u>B. Akmal</u>	
Probe Operator <u>B. Akmal</u>	
Source of Moisture and Molecular Weight Data <u>M51 M4</u>	



Amb. Temp. (°F) <u>41</u>	Bar. Press. <u>29.5</u> [in. Hg] [mbar]
Pitot Cp <u>0.827</u>	Probe I.D. No. <u>67-01-3</u>
Duct Diameters from Disturbance	
Downstream <u>3.2</u>	Upstream <u>2.2</u>
First point all the way [In] [Out] of page <u>8</u>	
Gas Flow [In] [Out] of page	
Duct Dimensions (in.) <u>82.25</u>	

Run	4	Load	Run	Load	Run	Load	Run	Load			
Start Time	6:52	Stop Time	4:05	Start Time	Stop Time	Start Time	Stop Time	Start Time	Stop Time		
Static Press. (in. H ₂ O)	0.5	Static Press. (in. H ₂ O)		Static Press. (in. H ₂ O)		Static Press. (in. H ₂ O)		Static Press. (in. H ₂ O)			
Post-Test Leak Check:	Pass ☒	Fail ☐	Post-Test Leak Check:	Pass ☐	Fail ☐	Post-Test Leak Check:	Pass ☐	Fail ☐	Post-Test Leak Check:	Pass ☐	Fail ☐
Traverse Point Number	Stack Temp. T _s (°F)	Velocity Head ΔP (in. H ₂ O)	Notes	Traverse Point Number	Stack Temp. T _s (°F)	Velocity Head ΔP (in. H ₂ O)	Notes	Traverse Point Number	Stack Temp. T _s (°F)	Velocity Head ΔP (in. H ₂ O)	Notes
1-1	550	0.54		1-1	548	0.56					
2	552	0.60		2	550	0.70					
3	553	0.59		3	552	0.74					
4	555	0.58		4	553	0.71					
5	556	0.55		5	554	0.68					
6	556	0.57		6	555	0.68					
7	555	0.61		7	556	0.57					
8	556	0.64		8	557	0.57					
9	556	0.67		9	557	0.61					
10	556	0.73		10	556	0.62					
11	555	0.86		11	554	0.65					
12	557	0.81		12	551	0.62					

Circle correct bracketed units on data sheet.



QA/QC BA
Date 4/29/12

ECU Stock

VELOCITY DETERMINATION FIELD DATA SHEET

PAGE OF

40

Client	MPC	Project No.	14205
Plant	Deoria	Date	11/27/12
Meter Operator	BA		
Probe Operator	DL		
Source of Moisture and Molecular Weight Data			
M3/M4			

Cross-Section of Test Location

[N] [UP]

Amb. Temp. (°F)	41	Bar. Press. 29.5 [in. Hg] [mbar]
Pilot Cp	0.027	Probe I.D. No. 67-89-3
Duct Diameters from Disturbance		
Downstream	3.2	Upstream 2.2
First point all the way [In] [Out]		Port Len. (in.) 8
Gas Flow [In] [Out] of page		
Duct Dimensions (in.)		8.2 x 5

Run	Load	Run	Load	Run	Load	Run	Load
Start Time	Stop Time	Start Time	Stop Time	Start Time	Stop Time	Start Time	Stop Time
Static Press. (in. H ₂ O)		Static Press. (in. H ₂ O)		Static Press. (in. H ₂ O)		Static Press. (in. H ₂ O)	
Post-Test Leak Check:		Post-Test Leak Check:		Post-Test Leak Check:		Post-Test Leak Check:	
Traverse Point Number	Stack Temp. T _s (°F)	Velocity Head ΔP (in. H ₂ O)	Notes	Traverse Point Number	Stack Temp. T _s (°F)	Velocity Head ΔP (in. H ₂ O)	Notes
2-1	551	0.52					
2	550	0.57					
3	551	0.60					
4	552	0.61					
5	550	0.62					
6	550	0.61					
1-1	555	0.73					
2	548	0.59					
3	548	0.64					
4	547	0.63					
5	547	0.60					
6	550	0.57					
Total							
Average	549	0.62					

Circle correct bracketed units on data sheet.

Sum of square roots.



QA/QC 62
Date 5/24/20

Impinger Weight Sheet

Client Marathon Petroleum Company		Unit Name/Location FCCU Stack	
Plant Detroit Refinery	Job No. 12010	Method USEPA M-5F/202	

Balance Calibration Check			
Balance ID	CAETL05-2	Reference Weight Mass	500.0
Reference Weight ID	22549	Reference Weight Reading	500.0
Check must be performed at least Once per Method per Job		Reference Weight Mass must agree with Reference Weight Reading to within ± 0.5 g.	

Run No. 1	Filter Type Tared Quartz Fiber	TFE Membrane	Sample Box No. 202-3
Date 4/24/12	Lot No. N/A	6602-27	pH N/A
Analyst R. Vicere	Filter No. 44308	N/A	Rinse

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	Empty	461.4	413.3	48.1	
Impinger 2	Empty	446.5	437.3	32.2	
Impinger 3	100 mL DI H ₂ O	546.6	534.7	11.9	
Impinger 4	Silica Gel	715.3	698.4	16.9	
					Total Weight (gm)
					63.2
					80.1

QA/QC RV
Date 4/24/12

Run No. 2	Filter Type Tared Quartz Fiber	TFE Membrane	Sample Box No. 202-5
Date 4/24/12	Lot No. N/A	6602-28	pH N/A
Analyst R. Vicere	Filter No. 44309	N/A	Rinse

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	Empty	451.4	415.5	35.9	
Impinger 2	Empty	446.3	442.6	3.7	
Impinger 3	100 mL DI H ₂ O	556.6	544.1	12.5	
Impinger 4	Silica Gel	740.4	718.3	22.1	
					Total Weight (gm)
					52.1
					74.2

QA/QC RV
Date 4/24/12

Run No. 3	Filter Type Tared Quartz Fiber	TFE Membrane	Sample Box No. 202-7
Date 4/25/12	Lot No. N/A	6602-29	pH N/A
Analyst R. Vicere	Filter No. 44307	N/A	Rinse

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	Empty	456.8	412.4	44.4	
Impinger 2	Empty	449.5	446.4	3.1	
Impinger 3	100 mL DI H ₂ O	548.8	537.2	11.6	
Impinger 4	Silica Gel	754.8	733.9	20.9	
					Total Weight (gm)
					59.1
					80.0

QA/QC RV
Date 4/25/12

Impinger Weight Sheet

Client Marathon Petroleum Company		Unit Name/Location FCCU Stack	
Plant Detroit Refinery	Job No. 12010	Method USEPA M-5F/202	

Balance Calibration Check			
Balance ID	CAETL07-2	Reference Weight Mass	500.0
Reference Weight ID	22549	Reference Weight Reading	500.0

Check must be performed at least Once per Method per Job Reference Weight Mass must agree with Reference Weight Reading to within ±0.5 g.

Run No. 4	Filter Type Tared Quartz Fiber	TFE Membrane	Sample Box No. 202-3
Date 4/25/12	Lot No.	6602-31	pH N/A
Analyst R. Vicere	Filter No. 44305	N/A	Rinse

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	Empty	424.5	414.4 ^{RV}	403.1/21.4	QA/QC RV Date 4/25/12
Impinger 2	Empty	442.4	438.1	4.3	
Impinger 3	100 mL DI H ₂ O	565.1	537.3	27.8	
Impinger 4	Silica Gel	741.6	715.2	26.4	
					Total Weight (gm)
					53.5
					79.9

RV

Run No. 6 ^{RV}	Filter Type Tared Quartz Fiber	TFE Membrane RV	Sample Box No. 202-5
Date 4/25/12 4/26/12	Lot No. 44303	6602-32	pH N/A
Analyst R. Vicere	Filter No. 44304 ^{RV}	N/A 6602-34	Rinse

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	Empty	445.4	416.1	29.3	QA/QC RV Date 4/25/12 4/26/12
Impinger 2	Empty	465.8	443.3 ^{RV}	463.4/22.52 ^{RV}	
Impinger 3	100 mL DI H ₂ O	562.8	541.4	21.4	
Impinger 4	Silica Gel	768.7	740.4	28.3	
					Total Weight (gm)
					53.1
					81.4

RV

Run No. 5	Filter Type Tared Quartz Fiber	TFE Membrane	Sample Box No. 202-7
Date 4/25/12	Lot No. 44304	6602-33	pH N/A
Analyst R. Vicere	Filter No. 44303 ^{RV}	N/A	Rinse

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	Empty	450.6	413.0	37.6	QA/QC RV Date 4/26/12
Impinger 2	Empty	448.4	447.3	1.1	
Impinger 3	100 mL DI H ₂ O	564.0	539.6	24.4	
Impinger 4	Silica Gel	774.7	754.7	20.0	
					Total Weight (gm)
					63.1
					83.1

Impinger Weight Sheet

Client Marathon Petroleum Company		Unit Name/Location FCCU Stack	
Plant Detroit Refinery	Job No. 12010	Method USEPA M-5F/202	

Balance Calibration Check			
Balance ID	CAETL07-2	Reference Weight Mass	500.0
Reference Weight ID	22549	Reference Weight Reading	500.0
Check must be performed at least Once per Method per Job		Reference Weight Mass must agree with Reference Weight Reading to within ± 0.5 g.	

Run No. 7	Filter Type Tared Quartz Fiber	TFE Membrane	Sample Box No. 202-3
Date 4/26/12	Lot No.	6602-35	pH N/A
Analyst R. Vicer	Filter No. 44302	N/A	Rinse

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	Empty	437.8	403.9	33.9	QA/QC RV Date 4/24/12
Impinger 2	Empty	441.5	438.1	3.4	
Impinger 3	100 mL DI H ₂ O	560.8	535.8	25.0	
Impinger 4	Silica Gel	733.7	708.7	25.0	
					Total Weight (gm)
					62.3
					87.3

Run No. 8	Filter Type Tared Quartz Fiber	TFE Membrane	Sample Box No. 202-7
Date 4/26/12	Lot No.	6602-32	pH N/A
Analyst R. Vicer	Filter No. 44301	N/A	Rinse

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	Empty	455.3	413.8	41.5	QA/QC RV Date 4/26/12
Impinger 2	Empty	451.4	448.3	3.1	
Impinger 3	100 mL DI H ₂ O	566.1	547.7	18.4	
Impinger 4	Silica Gel	720.5	696.7	23.8	
					Total Weight (gm)
					63.0
					86.8

Run No. 9	Filter Type Tared Quartz Fiber	TFE Membrane	Sample Box No. 202-5
Date 4/27/12	Lot No.	6602-36	pH N/A
Analyst R. Vicer	Filter No. 44300	N/A	Rinse

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	Empty	456.2	416.5	39.7	QA/QC RV Date 4/27/12
Impinger 2	Empty	466.8	464.7	2.1	
Impinger 3	100 mL DI H ₂ O	564.5	541.4	23.1	
Impinger 4	Silica Gel	723.8	704.0	19.8	
					Total Weight (gm)
					64.9
					84.7

TEST LOCATION: FCCU StackUNIT: Complex 3 RUN: 1

TESTING

METHOD: 5F/201 PAGE 1 OF 2

Client	Marathon	Project No.	12010
Plant	Detroit	Date	4/24/12
Meter Operator	D. Luckner		
Probe Operator	P. Bihun		

Meter Box	66-24	Sample Box No.	
Meter Y ₀	0.9970	Meter ΔH ₀	1.7816
K Factor	1.69	Pilot C _p	0.827
Leak Rate Before	0.60 [Lpm]	@	15 (in. Hg)
Leak Rate After	0.60 [Lpm]	@	5 (in. Hg)
Pilot Leak Check Before:	☒	After: Good	☐ Bad

FIELD DATA SHEET

Cross-Section of Test Location

Duct Dimensions (in.) 82.25

Static Pres. (in. H₂O) ~0.1

Port Len. (in.) 8

Gas Flow (in) [Out] of page

First point all the way (in) [Out]

Traverse Point Number	Min/pt Elapsed Time	Velocity Head ΔP (in. H ₂ O)	Orifice Setting ΔH (in. H ₂ O)	Gas Sample Volume V _m Init: Vol. (L)	Stack Temp. T _s (°F)	Probe T _p (°F)	Filter T _f (°F)	Cond. Temp. T _c (°F)	DGM Inlet T _{m in} (°F)	DGM Outlet T _{m out} (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator, approx (%dv)	Amb Filter ☒ Dioxin Trap ☐	Notes
2-1	2.5	0.80	1.4	337.100	570	318	320	48	66	66	2	2.0	69	
2	5	0.80	1.4	340.45	570	320	311	49	66	66	2	2.1	69	
3	7.5	0.74	1.3	342.10	570	319	325	49	67	66	2	1.9	70	
4	10	0.65	1.1	343.64	570	315	322	49	69	67	1	1.9	70	
5	12.5	0.61	1.0	345.05	570	314	321	48	71	67	1	1.9	71	
6	15	0.66	1.1	346.52	571	324	326	48	72	67	1	1.9	71	
7	17.5	0.66	1.1	348.01	571	314	319	48	73	67	1	1.8	71	
8	20	0.67	1.1	349.49	570	316	312	48	74	67	1	1.8	71	
9	22.5	0.72	1.2	351.00	569	316	317	48	75	68	1	1.9	72	
10	25	0.71	1.2	352.55	568	315	326	48	77	68	1	1.9	72	
11	27.5	0.72	1.2	354.12	567	316	315	49	78	69	1	1.8	72	
12	30	0.71	1.2	355.665	564	314	319	49	79	69	1	1.9	72	
Total	20.35	29.55		37.8000	13658				1883	1684				
Average	0.5474	1.2313		569.0833					74.3125					

Sum of square roots.

Circle correct bracketed units on data sheet.

TEST LOCATION: FCCV Stack

UNIT: Compl 43 RUN: 1

Particulate **TESTING**
FIELD DATA SHEET

METHOD: 5/5/202 PAGE 2 OF 2

Client	Mar 4th	Project No.	12010
Plant	Petroit	Date	4/24/12
Meter Operator	D. Luckhard		
Probe Operator	P. B. hun		

Meter Box	Sample Box No.
Meter Y_d	Meter ΔH @
K Factor	Pitot C_p
Leak Rate Before	[cfm] [Lpm] @ (in. Hg)
Leak Rate After	[cfm] [Lpm] @ (in. Hg)
Pitot Leak Check Before: ☐ After: Good ☐ Bad ☐	

Filter No.		
Thimble No.		
Nozzle Diameter	Nozzle I.D.	

Amb. Temp. (°F)	Bat. Press.	[in. Hg] [mbar]
Probe I.D. No.		
Liner Material		

Start Time:	Stop Time:

[illegible]

Sum of square roots.

Circle correct bracketed units on data sheet.

QA/QC 160
Date 5/24

TEST LOCATION: FCCU Stack
UNIT: Complex 3 RUN: 2

TESTING FIELD DATA SHEET

METHOD: SF/202 PAGE 1 OF 2

Client	Marathon	Project No.	12010
Plant	Detroit	Date	4/24/12
Meter Operator	D. Luckhart		
Probe Operator	P. Bihon		

Meter Box	66-24	Sample Box No.	
Meter Y ₀	0.9970	Meter ΔH ₀	1.7816
K Factor	1.75	Pilot C _p	0.827
Leak Rate Before	0.062 [Lpm]	@	15 (in. Hg)
Leak Rate After	0.062 [Lpm]	@	5 (in. Hg)
Pilot Leak Check Before:	☒ Good	After:	☒ Bad

Cross-Section of Test Location			
Duct Dimensions (in.)	82.25	Gas Flow	[In] [Out] of page
Static Pres (in. H ₂ O)	-0.1	Port Len. (in.)	8
Stack Temp. (°F)	567	Filter T _p (°F)	320
Probe T _p (°F)	312	Set Points	320 320
Cond. Temp. (°F)	55	Filter T _r (°F)	324
First point all the way			

Traverse Point Number	Min/pt	Velocity Head ΔP (in. H ₂ O)	Orifice Setting ΔH (in. H ₂ O)	Gas Sample Volume V _m (L)	Stack Temp. T _s (°F)	Probe T _p (°F)	Filter T _r (°F)	Cond. Temp. T _c (°F)	DGM Inlet T _{m in} (°F)	DGM Outlet T _{m out} (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator approx (%dv)	Amb Filter	Dioxin Trap	Notes
1-1	2.5	0.95	1.4	375.100	567	312	324	55	71	71	2	2.1	☒	☐	
2	5	0.96	1.4	376.86	566	317	322	56	71	72	2	2.0	☐	☐	
3	7.5	0.88	1.3	380.21	566	314	323	57	72	72	2	2.0	☐	☐	
4	10	0.89	1.3	381.85	567	318	314	58	74	71	2	2.0	☐	☐	
5	12.5	0.88	1.3	383.46	568	319	314	57	76	72	2	2.0	☐	☐	
6	15	0.95	1.4	385.14	569	317	321	56	77	72	2	1.9	☐	☐	
7	17.5	0.64	0.96	386.57	569	315	313	57	80	72	2	2.0	☐	☐	
8	20	0.65	0.98	387.94	570	317	321	57	80	72	2	2.0	☐	☐	
9	22.5	0.46	0.69	389.20	571	318	316	58	81	72	2	2.0	☐	☐	
10	25	0.55	0.83	396.49	571	319	315	59	82	73	2	1.8	☐	☐	
11	27.5	0.58	0.87	391.80	570	314	316	59	82	73	2	1.8	☐	☐	
12	30	0.59	0.89	393.150	569	312	314	59	83	73	2	1.9	☐	☐	
			26.34 x3							1782					
Total		26.42	26.04	35.8150	5635				1970	1906					
Average		0.508	0.950	568.1250					78.1667						

Circle correct bracketed units on data sheet.

Sum of square roots: 1.0915



QA/QC: [Signature]
Date: 4/24/12

TEST LOCATION: FCCU Stack Particulate **TESTING**
 UNIT: complex 3 RUN: 2 **FIELD DATA SHEET**

METHOD: 5F/202 PAGE 2 OF 2

Client	Marathon	Project No.	12010
Plant	Detroit	Date	4/24/12
Meter Operator	D. Luc Khair		
Probe Operator	P. B. h-n		

Meter Box	Sample Box No.	
Meter Y _d	Meter ΔH _@	
K Factor	Pilot C _p	
Leak Rate Before	[cfm] [Lpm] @	(in. Hg)
Leak Rate After	[cfm] [Lpm] @	(in. Hg)
Pilot Leak Check Before:	☐ After: Good ☐ Bad ☐	

Cross-Section of Test Location

↑ [N] [UP]

Duct Dimensions (in.)	Static Pres. (in. H ₂ O)	Port Len. (in.)	Gas Flow [In] [Out] of page	First point all the way [In] [Out]

Traverse Point Number	Min/pt Elapsed Time	Velocity Head ΔP (in. H ₂ O)	Orifice Setting ΔH (in. H ₂ O)	Gas Sample Volume V _m (ft ³ L)	Stack Temp. T _s (°F)	Probe T _p (°F)	Filter T _f (°F)	Cond. Temp. T _c (°F)	DGM Inlet T _{m in} (°F)	DGM Outlet T _{m out} (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator, approx (% dv)	☒ Amb Filter ☐ Dioxin Trap	Notes
2-1	32.5	0.84	1.3	394.76	569	314	332	59	81	74	2	1.9	72	
2	35	0.84	1.3	396.35	576	318	319	59	83	75	2	1.9	72	
3	37.5	0.78	1.2	397.92	569	315	324	60	84	75	2	1.9	72	
4	40	0.66	0.99	399.37	569	314	322	60	85	75	2	1.9	72	
5	42.5	0.62	0.93	400.76	576	320	326	60	86	76	2	1.8	72	
6	45	0.61	0.92	402.13	569	322	321	61	86	76	2	1.9	73	
7	47.5	0.67	1.0	403.53	569	323	314	61	87	76	2	1.8	73	
8	50	0.71	1.1	405.03	567	316	313	62	88	77	2	1.9	73	
9	52.5	0.65	0.98	406.47	567	307	312	62	89	77	2	1.9	73	
10	55	0.74	1.1	407.94	566	312	310	63	90	78	2	2.0	73	
11	57.5	0.71	1.1	409.42	566	314	321	64	90	79	2	1.9	73	
12	60	0.72	1.1	416.915	561	317	326	64	92	79	2	2.0	74	
Total	*													
Average														

* Sum of square roots.

Circle correct bracketed units on data sheet.

TEST LOCATION: FCCU Stack
UNIT: Complex 3 RUN: 3

TESTING
FIELD DATA SHEET

METHOD: SF/202 PAGE 1 OF 2

Client	Marathon	Project No.	12010
Plant	Detroit	Date	4/24/12
Meter Operator	D. Luckhard		
Probe Operator	P. Bihun		
Meter Box	66-24	Sample Box No.	
Meter Yd	0.9970	Meter ΔH@	1.7816
K Factor	1.75	Pitot Cp	0.827
Leak Rate Before	0.004 (m) [Lpm]	@	15 (in. Hg)
Leak Rate After	0.03 (m) [Lpm]	@	5 (in. Hg)
Pitot Leak Check Before	☒	After: Good	☒ Bad ☐

Cross-Section of Test Location				
Duct Dimensions (in.)	Port Len. (in.)	Gas Flow		First point all the way
		[In] [Out]	of page	
Static Pres (in. H ₂ O)	8	82.25		
~ 0.1				

Amb. Temp. (°F)	54	Bar. Press.	28.85	[in. Hg] [mbar]
Probe I.D. No.	67-8-19			
Liner Material	Class			

Filter No.	4437		
Thimble No.			
Nozzle Diameter	250	Nozzle I.D.	250-1

Start Time:	1433	Stop Time:	1555

Traverse Point Number	Min/pt Elapsed Time	Velocity Head ΔP (in. H ₂ O)	Office Setting ΔH (in. H ₂ O)	Gas Sample Volume V _m (ft ³ ft ³ L)	Stack Temp. T _s (°F)	Probe T _p (°F)	Filter T _f (°F)		Cond. Temp. T _c (°F)	DGM Inlet T _{m in} (°F)	DGM Outlet T _{m out} (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator, approx (%dv)	☒ Amb Filter ☐ Dioxin Trap ☐	Notes
							Set Points	320 320							
2-1	2.5	0.83	1.5	413.03	570	310	313	55	76	77	2.3	69			
2	5	0.84	1.5	414.82	570	313	323	57	76	76	2.1	69			
3	7.5	0.78	1.4	416.54	569	311	318	57	77	77	2.1	69			
4	10	0.65	1.1	418.06	570	310	321	57	79	77	2.0	69			
5	12.5	0.64	1.1	419.58	570	309	318	57	80	76	1.9	69			
6	15	0.62	1.1	421.06	570	315	325	56	81	76	2.0	70			
7	17.5	0.70	1.2	422.64	570	313	319	56	83	76	1.8	70			
8	20	0.69	1.2	424.20	568	318	316	56	84	76	1.8	70			
9	22.5	0.71	1.2	425.79	567	320	319	57	86	77	1.8	70			
10	25	0.69	1.2	427.37	566	321	324	57	86	77	1.8	70			
11	27.5	0.69	1.2	428.97	567	318	326	57	87	77	1.9	71			
12	30	0.70	1.2	430.525	564	316	325	58	88	77	1.8	71			
Total		*20.194	29.97	38.5900											
Average		0.8415	1.2489												

Sum of square roots.

Circle-correct bracketed units on data sheet.



QA/QC by
Date 4/24/12

TEST LOCATION: FCCU Stack
 UNIT: Complex 3 RUN: 3

TESTING
 FIELD DATA SHEET

METHOD: 5f/202 PAGE 2 OF 2

Client	Marathon	Project No.	12010
Plant	Detroit	Date	4/24/10
Meter Operator	D. Luckhart		
Probe Operator	T. Bihun		

↑ [N] [UP]

Cross-Section of Test Location			
Duct Dimensions (in.)	Static Pres (in. H ₂ O)	Port Len. (in.)	Gas Flow
			[In] [Out] of page
First point all the way		[In] [Out]	

Meter Box	Sample Box No.
Meter Y _d	Meter ΔH _@
K Factor	Pilot C _p
Leak Rate Before	[cfm] [Lpm] @ (in. Hg)
Leak Rate After	[cfm] [Lpm] @ (in. Hg)
Pilot Leak Check Before:	☐ After: Good ☐ Bad ☐

Traverse Point Number	Min/pt Elapsed Time	Velocity Head ΔP (in. H ₂ O)	Orifice Setting ΔH (in. H ₂ O)	Gas Sample Volume V _m Init. Vol. (ft ³) [L]	Stack Temp. T _s (°F)	Probe T _p (°F)	Filter T _f (°F)	Cond. Temp. T _c (°F)	DGM Inlet T _{m in} (°F)	DGM Outlet T _{m out} (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator, approx. (% dv)	Amb Filter ☒ Dioxin Trap ☐	Notes
1-1	32.5	0.87	1.6	432.32	567	310	316	60	85	78	3.0	1.9	☒	
2	35	0.94	1.6	434.15	567	312	318	60	85	78	3.0	1.9	☒	
3	37.5	0.96	1.7	435.99	561	315	312	59	84	79	3	2.0	☒	
4	40	0.92	1.6	437.82	562	312	311	60	86	79	3	2.0	☒	
5	42.5	0.82	1.4	439.59	563	309	320	60	88	80	3	2.1	☒	
6	45	0.85	1.5	441.35	563	312	325	60	90	80	3	2.0	☒	
7	47.5	0.67	1.2	442.99	564	307	319	60	91	80	3	2.0	☒	
8	50	0.49	0.86	444.37	564	311	324	61	91	80	2	2.1	☒	
9	52.5	0.47	0.82	445.66	564	314	323	61	91	81	2	2.0	☒	
10	55	0.45	0.79	446.93	564	312	321	62	91	81	2	2.0	☒	
11	57.5	0.58	1.0	448.37	565	313	325	63	91	81	2	2.1	☒	
12	60	0.59	1.0	449.79	562	317	326	63	91	81	2	2.1	☒	
Total	*													
Average														

* Sum of square roots.

Circle correct bracketed units on data sheet.

TEST LOCATION: FCCU Stack
UNIT: complex 3 RUN: 4

TESTING
FIELD DATA SHEET

METHOD: 5F/202 PAGE 1 OF 2

Client	Marathon	Project No.	12-010
Plant	Detroit	Date	4/25/12
Meter Operator	D. Luckard		
Probe Operator	P. Bihon		

Meter Box	66-24	Sample Box No.	
Meter Y ₆	0.9970	Meter ΔH ₆	1.7816
K Factor	1.78	Pilot C _p	0.827
Leak Rate Before	0.001 (Lpm)	@	15 (in. Hg)
Leak Rate After	0.002 (Lpm)	@	5 (in. Hg)
Pilot Leak Check Before:	☒	After:	Good ☒ Bad ☐

Cross-Section of Test Location			
	Duct Dimensions (in.)	Port Len. (in.)	Gas Flow (in. Hg) [Out] of page
	Static Pres (in. H ₂ O)	0.4	82.25
First point all the way			

Traverse Point Number	Min/pt Elapsed Time	Velocity Head ΔP (in. H ₂ O)	Orifice Setting ΔH (in. H ₂ O)	Gas Sample Volume V _m Init. Vol. (ft ³) [L]	Stack Temp. T _s (°F)	Probe T _p (°F)	Filter T _f (°F)	Cond. Temp. T _c (°F)				
							Set Points					
1-1	2.5	0.76	1.4	452.320	553	315	323	55	DGM Inlet T _{m in} (°F)	DGM Outlet T _{m out} (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator, approx (% dv)
2	5	0.78	1.4	454.07	553	320	322	53	81	79	2	2.5
3	7.5	0.84	1.5	455.78	553	317	322	54	80	79	2	2.3
4	10	0.81	1.4	457.54	554	319	321	55	81	79	2	2.3
5	12.5	0.79	1.4	459.25	555	314	321	56	82	79	2	2.4
6	15	0.75	1.3	460.95	556	319	320	56	83	79	2	2.4
7	17.5	0.60	1.1	462.60	557	315	322	56	84	79	2	2.3
8	20	0.59	1.1	464.11	559	312	320	57	85	78	2	2.3
9	22.5	0.61	1.1	465.59	559	316	320	57	85	79	2	2.4
10	25	0.62	1.1	467.08	559	314	321	58	86	78	2	2.3
11	27.5	0.61	1.1	468.57	559	316	321	59	88	79	2	2.3
12	30	0.61	1.1	469.04	559	318	320	60	89	79	2	2.2
			15.6	471.530	558	318	320	60	90	79	2	2.2
Total		19.489	28.5	37.5850	6675				1014	945		
Average		0.8120	1.1875		557.1250				2113	1950		

Sum of square roots:

Circle correct bracketed units on data sheet.

TEST LOCATION: FCCU Stack
UNIT: Complex 3 RUN: L1

TESTING FIELD DATA SHEET

METHOD: 5-F/202 PAGE 2 OF 2

Client	Marathon	Project No.	12010
Plant	Detroit	Date	4/25/12
Meter Operator	D. Luckhard		
Probe Operator	P. Bihon		

Meter Box	Sample Box No.
Meter Y ₀	Meter ΔH ₀
K Factor	Pitot C _p
Leak Rate Before	[cfm] [Lpm] @ (in. Hg)
Leak Rate After	[cfm] [Lpm] @ (in. Hg)
Pitot Leak Check Before:	After: Good ☐ Bad ☐

Cross-Section of Test Location			
↑	[N] [UP]	Static Pres. (in. H ₂ O)	Gas Flow [In] [Out] of page
		Port Len. (in.)	First point all the way
Duct Dimensions (in.)		[In] [Out]	[In] [Out]

Traverse Point Number	Min/pt Elapsed Time	Velocity Head ΔP (in. H ₂ O)	Orifice Setting ΔH (in. H ₂ O)	Gas Sample Volume V _m Init. Vol. (ft ³) [L]	Stack Temp. T _s (°F)	Probe T _p (°F)	Filter T _f (°F)	Cond. Temp. T _c (°F)	DGM Inlet T _{m in} (°F)	DGM Outlet T _{m out} (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator, approx (% div)	Amb Filter ☒ Dioxin Trap ☐	Notes
2-1	32.5	0.65	1.2	473.13	556	315	313	60	92	81	2	2.3	72	
2	35	0.66	1.2	474.69	556	316	318	60	93	81	2	2.3	72	
3	37.5	0.65	1.2	476.27	556	314	319	60	93	82	2	2.3	72	
4	40	0.64	1.1	477.49	557	319	322	61	95	82	2	2.4	73	
5	42.5	0.63	1.1	479.30	558	315	325	61	96	83	2	2.4	73	
6	45	0.63	1.1	480.82	558	316	327	62	97	83	2	2.4	74	
7	47.5	0.66	1.2	482.46	559	314	326	62	98	84	2	2.4	74	
8	50	0.66	1.2	483.98	559	316	323	63	99	85	2	2.3	75	
9	52.5	0.61	1.1	485.51	559	313	321	63	99	85	2	2.2	75	
10	55	0.59	1.1	487.03	560	314	320	64	99	86	2	2.3	76	
11	57.5	0.57	1.0	488.47	559	315	320	64	99	86	2	2.3	76	
12	60	0.56	1.0	489.905	559	317	321	65	99	87	2	2.3	77	
		*	13.8		6696									
Total														
Average														

Circle correct bracketed units on data sheet.

Sum of square roots.

TEST LOCATION: FCCU Stack
UNIT: Complex 3 RUN: 5

particulate TESTING
FIELD DATA SHEET

METHOD: SF/202 PAGE 1 OF 2

Client	Marathon	Project No.	12010
Plant	Detroit	Date	4/25/12
Meter Operator	D. Lockhard		
Probe Operator	P. B. Hon		

Meter Box	66-24	Sample Box No.	
Meter Yd	6,9970	Meter ΔH@	1-7816
K Factor	1.78	Pilot Cp	0.827
Leak Rate Before	0.004 (gpm)	[Lpm]	@ 15 (in. Hg)
Leak Rate After	0.004 (gpm)	[Lpm]	@ 5 (in. Hg)
Pilot Leak Check Before	✓	After: Good	✓ Bad ☐

Cross-Section of Test Location			
	Static Pres (in. H ₂ O)	Port Len. (in.)	First point all the way
	0.4	8	(In) [Out] of page
Duct Dimensions (in.)	82.25		

Traverse Point Number	Min/pt	Velocity Head ΔP (in. H ₂ O)	Orifice Setting ΔH (in. H ₂ O)	Gas Sample Volume V _m (ft ³)	Stack Temp. T _s (°F)	Probe T _p (°F)	Filter T _f (°F)	Cond. Temp. T _c (°F)	DGM Inlet T _{m in} (°F)	DGM Outlet T _{m out} (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator, approx (% dv)	Amb Filter ☒ Dioxin Trap ☐	Notes
1-1	2.5	0.68	1.2	495.600	556	320	320	60	77	76	2	2.4	☒	
2	5	0.67	1.2	498.83	556	318	323	61	77	76	2	2.3	☒	
3	7.5	0.67	1.2	500.42	556	319	325	61	79	76	2	2.3	☒	
4	10	0.64	1.1	501.90	557	323	328	60	81	76	2	2.3	☒	
5	12.5	0.63	1.1	503.39	558	326	327	58	84	76	2	2.2	☒	
6	15	0.66	1.2	504.98	558	320	318	58	85	76	2	2.3	☒	
7	17.5	0.69	1.2	506.56	559	319	317	57	87	76	2	2.2	☒	
8	20	0.66	1.2	508.15	560	318	323	57	89	77	2	2.2	☒	
9	22.5	0.64	1.1	509.65	560	318	313	58	90	78	2	2.3	☒	
10	25	0.62	1.1	511.14	560	312	318	58	90	78	2	2.4	☒	
11	27.5	0.58	1.0	512.57	560	314	317	58	91	79	2	2.4	☒	
12	30	0.57	1.0	514.020	559	316	317	58	91	79	2	2.4	☒	
			13.6		6699				1021	923				
Total	19.58	28.6		37.5850	12876	13316			2090	1885				
Average	0.8158	1.1917		536.500					82.8125					

Sum of square roots.

Circle correct bracketed units on data sheet.



QA/QC
Date 4/25/12

TEST LOCATION: FCCU Stack
UNIT: Complex 2

TESTING FIELD DATA SHEET

METHOD: 5F/202 PAGE 2 OF 2

Client	Marathon	Project No.	12016
Plant	Detroit	Date	4/25/12
Meter Operator	D. Luckhard		
Probe Operator	P. B. Hen		

Meter Box		Sample Box No.	
Meter Y ₀		Meter ΔH ₀	
K Factor		Plot C _p	
Leak Rate Before	[cfm] [Lpm]	@	(in. Hg)
Leak Rate After	[cfm] [Lpm]	@	(in. Hg)
Pilot Leak Check Before:	☐ After: Good ☐ Bad ☐		

Cross-Section of Test Location			
↑		[N] [UP]	
Duct Dimensions (in.)			
Static Pres (in. H ₂ O)	Port Len. (in.)	Gas Flow [In] [Out] of page	First point: all the way [In] [Out]

Amb. Temp. (°F)	Bar. Press.	[in. Hg] [mbar]
Probe I.D. No.		
Liner Material		

Filter No.		
Thimble No.		
Nozzle Diameter	Nozzle I.D.	

Start Time:	Stop Time:

Traverse Point Number	Min/pt	Velocity Head ΔP (in. H ₂ O)	Orifice Setting ΔH (in. H ₂ O)	Gas Sample Volume V _m Init. Vol. (L)	Stack Temp. T _s (°F)	Probe T _p (°F)	Filter T _f (°F)	Cond. Temp. T _c (°F)	DGM Inlet T _{m in} (°F)	DGM Outlet T _{m out} (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator, approx (%dv)	Amb Filter ☒ Floxin Trap ☐	Notes
2-1	32.5	0.78	1.4	515.70	552	313	318	61	83	79	2	2.1	69	
2	35	0.78	1.4	517.39	553	313	317	58	85	79	2	2.4	69	
3	37.5	0.80	1.4	519.07	552	315	326	57	86	86	2	2.3	69	
4	40	0.82	1.5	520.82	555	311	327	56	88	80	2	2.2	70	
5	42.5	0.78	1.4	522.54	556	318	326	55	89	80	2	2.3	71	
6	45	0.71	1.3	524.19	556	312	322	55	90	80	2	2.3	72	
7	47.5	0.61	1.1	525.69	557	313	321	55	90	80	2	2.3	74	
8	50	0.59	1.1	527.19	559	317	321	55	90	80	2	2.3	76	
9	52.5	0.59	1.1	528.68	560	321	321	56	91	80	2	2.2	77	
10	55	0.62	1.1	530.18	560	319	320	57	92	81	2	2.2	78	
11	57.5	0.61	1.1	531.68	559	316	322	58	92	81	2	2.3	78	
12	60	0.62	1.1	533.185	558	317	320	58	93	82	2	2.2	79	
			15.0		6177				1069	962				
Total	*													
Average														

* Sum of square roots.

Circle correct bracketed units on data sheet.



QA/QC 120
Date 5/24

TEST LOCATION: FCCU Stack

UNIT: Complex 3

RUN: 6

Client	Martinez	Project No.	12010
Plant	Detroit	Date	4/25/12
Meter Operator	D. Luckhart		
Probe Operator	R. Dignon		

Meter Box	66-24	Sample Box No.	
Meter Y ₀	0.9970	Meter ΔH ₀	1.7816
K Factor	1.78	Pilot C ₀	0.827
Leak Rate Before	0.0016 [Lpm]	@ 15 (in. Hg)	
Leak Rate After	0.002 [Lpm]	@ 5 (in. Hg)	
Pilot Leak Check Before	☒	After: Good	☒ Bad ☐

Traverse Point Number	Min/pt Elapsed Time	Velocity Head ΔP (in. H ₂ O)	Orifice Setting ΔH (in. H ₂ O)	Gas Sample Volume V _m (L)	Initial Vol. (L)
1	2.5	0.778	1.4	533.500	533.500
2	5	0.777	1.4	536.94	535.23
3	7.5	0.777	1.4	538.65	536.94
4	10	0.81	1.4	540.37	538.65
5	12.5	0.79	1.4	542.05	540.37
6	15	0.73	1.3	543.70	542.05
7	17.5	0.63	1.1	545.18	543.70
8	20	0.60	1.1	546.66	545.18
9	22.5	0.61	1.1	548.14	546.66
10	25	0.63	1.1	549.61	548.14
11	27.5	0.62	1.1	551.06	549.61
12	30	0.61	1.1	552.530	551.06
			14.9		552.530
Total	19.595	28.7		57.4050	57.4050
Average	0.9165	1.1958		557.2500	557.2500

Sum of square roots.

Particulate TESTING FIELD DATA SHEET

Cross-Section of Test Location



Duct Dimensions (in.)	82.25	Gas Flow	First point all the way
Static Pres (in. H ₂ O)	0.4	[In] [Out]	[In] [Out]
Port Len. (in.)	8	of page	

Amb. Temp. (°F)	60	Bar. Press.	29.15	[in. Hg] [mmbar]
Probe I.D. No.	67-8-19			
Liner Material	Glass			

Filter No.	44303			
Thimble No.				
Nozzle Diameter	0.25	Nozzle I.D.	0.25	-1

Start Time:	1406	Stop Time:	1523

DGM Inlet T _{m in} (°F)	DGM Outlet T _{m out} (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator, approx (% div)	Amb Filter	Dioxin Trap	Notes
74	76	2	2.4	☒	☐	
74	76	2	2.4	☒	☐	
74	76	2	2.3	☒	☐	
76	76	2	2.3	☒	☐	
77	76	2	2.4	☒	☐	
78	76	2	2.4	☒	☐	
80	76	2	2.3	☒	☐	
81	76	2	2.2	☒	☐	
81	76	2	2.2	☒	☐	
83	76	2	2.3	☒	☐	
83	76	2	2.4	☒	☐	
83	76	2	2.3	☒	☐	
944	912					
1963	1854					
79.5208						

Circle correct bracketed units on data sheet.

QA/QC D^L
Date 4/25/12

TEST LOCATION: Flcu Stack
 UNIT: Complex 3 RUN: 6

particulate
TESTING
FIELD DATA SHEET

METHOD: 5F/202 PAGE 2 OF 2

Client	<u>Marathon</u>	Project No.	<u>12010</u>
Plant	<u>Detroit</u>	Date	<u>4/25/12</u>
Meter Operator	<u>D. Lucke</u>		
Probe Operator	<u>P. Bihou</u>		

Meter Box	Sample Box No.		
Meter Y _d	Meter ΔH _@		
K Factor	Pilot C _p		
Leak Rate Before	[cfm] [Lpm]	@	(in. Hg)
Leak Rate After	[cfm] [Lpm]	@	(in. Hg)
Pilot Leak Check Before:	☐ After: Good	☐ Bad	☐

↑ [N] [UP]

Cross-Section of Test Location			
Static Pres. (in. H ₂ O)	Port Len. (in.)	Gas Flow [In] [Out] of page	First point all the way [In] [Out]

Amb. Temp. (°F)	Bar. Press.	[in. Hg] [mbar]
Probe I.D. No.		
Liner Material		

Filter No.	
Thimble No.	
Nozzle Diameter	Nozzle I.D.

Start Time:	Stop Time:

Traverse Point Number	Min/pt	2. k	Velocity Head ΔP (in. H ₂ O)	Orifice Setting ΔH (in. H ₂ O)	Gas Sample Volume V _m Init. Vol. (L)	Stack Temp. T _s (°F)	Probe T _p (°F)	Filter T _f (°F)	Cond. Temp. T _c (°F)	DGM Inlet T _{m in} (°F)	DGM Outlet T _{m out} (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator, approx (%dv)	☒ Amb Filter ☐ Dioxin Trap	Notes
1	32.5	0.65	1.2	1.2	554.07	555	320	320	66	82	77	2	2.5	77	
2	35	0.66	1.2	1.2	555.63	555	314	318	65	83	77	2	2.4	77	
3	37.5	0.65	1.2	1.2	557.19	554	319	321	65	82	78	2	2.2	78	
4	40	0.65	1.2	1.2	558.77	556	321	322	64	83	78	2	2.2	78	
5	42.5	0.62	1.1	1.1	560.27	557	314	320	64	84	78	2	2.3	78	
6	45	0.66	1.2	1.2	561.82	558	315	318	64	86	78	2	2.1	78	
7	47.5	0.70	1.2	1.2	563.40	558	313	316	65	85	79	2	2.3	79	
8	50	0.69	1.2	1.2	564.98	559	315	318	65	86	79	2	2.2	79	
9	52.5	0.61	1.1	1.1	566.48	560	317	326	65	87	79	2	2.3	80	
10	55	0.62	1.1	1.1	567.97	560	317	327	66	87	79	2	2.2	81	
11	57.5	0.61	1.1	1.1	569.47	560	316	325	66	87	80	2	2.2	81	
12	60	0.57	1.0	1.0	570.905	560	314	322	66	87	80	2	2.3	80	
				13.8		6692				1019	942				
Total	*														
Average															

* Sum of square roots.

Circle correct bracketed units on data sheet.



QA/QC PL
 Date 4/25/12

TEST LOCATION: FCCU Stack
 UNIT: Complex 3 RUN: 7

Particulate TESTING
 FIELD DATA SHEET

METHOD: 5F/202 PAGE 1 OF 2

Client	Margathon	Project No.	12010
Plant	Petroit	Date	4/26/12
Meter Operator	D. Luckhurst		
Probe Operator	P. Bihon		

Meter Box	66-24	Sample Box No.	
Meter Y ₀	0.9976	Meter ΔH ₀	1.7816
K Factor	1.83	Pilot C ₀	0.827
Leak Rate Before	0.002 [cfm]	[Lpm]	@ 15 (in. Hg)
Leak Rate After	0.002 [cfm]	[Lpm]	@ 5 (in. Hg)
Pilot Leak Check Before	☒	After: Good ☒ Bad ☐	

Cross-Section of Test Location			
Duct Dimensions (in.)	82.25	Gas Flow	[In] <u>Out</u> of page
Static Pres (in. H ₂ O)	6.4	Port Len. (in.)	8
First point all the way			

Traverse Point Number	Min/pt Elapsed Time	Velocity Head ΔP (in. H ₂ O)	Orifice Setting ΔH (in. H ₂ O)	Gas Sample Volume V _m (ft ³)	Stack Temp. T _s (°F)	Probe T _p (°F)	Filter T _f (°F)	Cond. Temp. T _c (°F)	DGM Inlet T _{m in} (°F)	DGM Outlet T _{m out} (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator, approx (% dv)	Amb Filter ☒ Dioxin Trap ☐	Notes
1	2.5	0.80	1.5	571.035	556	316	320	66	67	67	2.0	2.5	73	
2	5	0.81	1.5	572.91	556	311	313	63	67	67	2	2.3	72	
3	7.5	0.83	1.5	576.39	556	313	311	60	68	67	2	2.2	73	
4	10	0.82	1.5	578.13	558	315	314	59	70	67	2	2.2	73	
5	12.5	0.80	1.5	579.86	559	313	317	58	71	67	2	2.2	75	
6	15	0.80	1.5	581.61	560	316	319	59	75	68	2	2.1	75	
7	17.5	0.65	1.2	583.18	562	317	318	61	76	69	2	2.2	78	
8	20	0.61	1.1	584.38	562	316	320	62	77	69	2	2.3	76	
9	22.5	0.59	1.1	586.15	563	317	316	62	78	70	2	2.3	77	
10	25	0.64	1.2	587.73	562	314	319	63	79	70	2	2.2	77	
11	27.5	0.63	1.2	589.29	562	317	313	63	81	71	2	2.1	78	
12	30	0.62	1.1	590.88	561	320	315	63	81	71	2	2.1	78	
			15.9		6717				890	823				
Total		19.7622	36	58.5500	13450				1917	1734				
Average		6.8239	1.2500	560.417					76.6625					

* Sum of square roots.

Circle correct bracketed units on data sheet.

TEST LOCATION: FCCU stack

TESTING

METHOD: SF/202

PAGE 2 OF 2

UNIT: complex RUN: 7

FIELD DATA SHEET

Cross-Section of Test Location

Client	Marathon	Project No.	12010
Plant	Detroit	Date	4/26/12
Meter Operator	D. Luckhurst		
Probe Operator	P. B. Kuhn		

Meter Box	Sample Box No.
Meter Y _d	Meter ΔH _@
K Factor	Pitot C _p
Leak Rate Before	[cfm] [Lpm] @ (in. Hg)
Leak Rate After	[cfm] [Lpm] @ (in. Hg)
Pitot Leak Check Before:	☐ After: Good ☐ Bad ☐

Amb. Temp. (°F)	Bar. Press.	[in. Hg] [mbar]
Probe I.D. No.		
Liner Material		

Filter No.	
Thimble No.	
Nozzle Diameter	Nozzle I.D.

Start Time:	Stop Time:

Traverse Point Number	Min/pt Elapsed Time	Velocity Head ΔP (in. H ₂ O)	Orifice Setting ΔH (in. H ₂ O)	Gas Sample Volume V _m		Stack Temp. T _s (°F)	Probe T _p (°F)	Filter T _f (°F)	Cond. Temp. T _c (°F)	DGM Inlet T _{m in} (°F)	DGM Outlet T _{m out} (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator, approx (% dv)	Amb Filter	Notes
				Init. Vol.	 [L]		Set Points	☐ Dioxin Trap							
							320	320						☐	
2-1	32.5	6.67	1.2	592.44		559	323	316	59	81	73	2	2.3	☒ 76	
2	35	6.67	1.2	594.00		559	321	315	59	81	74	2	2.3	☐ 76	
3	37.5	6.66	1.2	595.54		559	316	319	58	82	74	2	2.2	☐ 77	
4	40	6.67	1.2	597.12		560	315	316	58	83	75	2	2.3	☐ 77	
5	42.5	6.63	1.2	598.66		561	313	317	58	84	75	2	2.3	☐ 78	
6	45	6.65	1.2	600.23		561	312	313	58	86	75	2	2.3	☐ 79	
7	47.5	6.71	1.3	601.87		562	317	314	59	87	76	2	2.3	☐ 79	
8	50	6.65	1.2	603.47		562	314	319	60	88	77	2	2.3	☐ 79	
9	52.5	6.64	1.2	605.07		563	314	321	60	88	77	2	2.2	☐ 80	
10	55	6.66	1.2	606.67		563	317	324	62	89	78	2	2.2	☐ 80	
11	57.5	6.56	1.0	608.14		562	317	328	62	89	78	2	2.2	☐ 80	
12	60	6.56	1.0	609.585		562	315	322	62	89	79	2	2.3	☐ 80	
			14.1			673.5				1627911					
	Total	*													
	Average														

* Sum of square roots.

Circle correct bracketed units on data sheet.


CleanAir
ENGINEERING
QA/QC PL
Date 4/26/12

TEST LOCATION: FCCU Stack

UNIT: Complex 3 RUN: 8

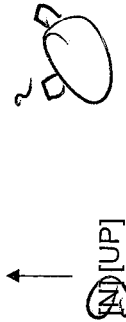
Particulate TESTING
FIELD DATA SHEET

METHOD: SF/202 PAGE 1 OF 2

Client	Martinez	Project No.	12010
Plant	Petroref	Date	4/26/12
Meter Operator	D. Luckard		
Probe Operator	P. Bihun		

Meter Box	66-24	Sample Box No.	
Meter Yd	0.9976	Meter $\Delta H_{@}$	1.7816
K Factor	1.83	Pitot Cp	0.827
Leak Rate Before	0.002 (m) [Lpm]	@ 15 (in. Hg)	
Leak Rate After	0.002 (m) [Lpm]	@ 5 (in. Hg)	
Pitot Leak Check Before:	☒ After: Good	☒ Bad	☐

Cross-Section of Test Location



Duct Dimensions (in.)	82.25	Gas Flow [In] [Out] of page	First point all the way (In) [Out]
Static Pres (in. H ₂ O)	0.4	Port Len. (in.)	8

Traverse Point Number	Min/pt Elapsed Time	Velocity Head ΔP (in. H ₂ O)	Orifice Setting ΔH (in. H ₂ O)	Gas Sample Volume V _m Init. Vol. (ft ³ /L) 609.775	Stack Temp. T _s (°F)	Probe T _p (°F)		Filter T _f (°F)	Cond. Temp. T _c (°F)	DGM Inlet T _{m in} (°F)	DGM Outlet T _{m out} (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator, approx (%dv)	☒ Amb Filter ☐ Dioxin Trap ☐	Notes
						320	Set Points 320								
2-1	2.5	0.69	1.3	611.48	556	319	321	58	72	74	2	2.5	69		
2	5	0.68	1.2	613.04	556	317	325	58	72	74	2	2.3	69		
3	7.5	0.68	1.2	614.62	555	316	326	58	74	74	2	2.2	69		
4	10	0.66	1.2	616.18	556	318	321	59	75	74	2	2.3	69		
5	12.5	0.68	1.2	617.73	556	315	324	66	77	74	2	2.3	69		
6	15	0.66	1.2	619.29	559	313	322	58	78	74	2	2.2	69		
7	17.5	0.67	1.2	620.54	560	321	321	58	79	74	2	2.2	69		
8	20	0.66	1.2	622.43	560	317	320	58	81	74	2	2.1	69		
9	22.5	0.63	1.2	624.00	561	314	320	59	82	74	2	2.2	69		
10	25	0.60	1.1	625.51	561	313	321	59	84	74	2	2.1	69		
11	27.5	0.57	1.0	626.94	561	314	319	58	84	74	2	2.2	69		
12	30	0.58	1.1	628.42	560	313	322	58	85	74	2	2.2	69		
			14.1		6701				943	888					
	Total	19.76	29.9	38.6150	13402					2036	1942				
	Average	0.6240	1.2458	558.4167						180.7917					

Sum of square roots.

Circle correct bracketed units on data sheet.

CleanAir®

ENGINEERING
QA/QC: JLV

Date: 4/26/12

TEST LOCATION: FCCU Stack
 UNIT: Complex 3 RUN: 8

Particulate TESTING FIELD DATA SHEET

METHOD: 5F/202 PAGE 2 OF 2

Cross-Section of Test Location

Client <u>Martell</u>	Project No. <u>12010</u>
Plant <u>Detroit</u>	Date <u>4/26/12</u>
Meter Operator <u>D. Luckhaus</u>	
Probe Operator <u>B. Bickel</u>	

Amb. Temp. (°F)	Bar. Press.	[in. Hg] [mbar]
Probe I.D. No.		
Liner Material		

Meter Box	Sample Box No.
Meter Y_d	Meter $\Delta H_{d@}$
K Factor	Pilot C_p
Leak Rate Before [cfm] [Lpm] @ (in. Hg)	
Leak Rate After [cfm] [Lpm] @ (in. Hg)	
Pilot Leak Check Before: ☐ After: Good ☐ Bad ☐	

Filter No. <u>44</u>	
Thimble No.	
Nozzle Diameter <u>0.25</u>	Nozzle I.D.

Start Time:	Stop Time:

Traverse Point Number	Min/pt Elapsed Time	Velocity Head ΔP (in. H ₂ O)	Orifice Setting ΔH (in. H ₂ O)	Gas Sample Volume V_m (ft ³) [L]	Stack Temp. T_s (°F)	Probe T_p (°F)	Filter T_f (°F)	Cond. Temp. T_c (°F)	DGM Inlet $T_{m in}$ (°F)	DGM Outlet $T_{m out}$ (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator, approx (% dv)	Amb Filter ☒ Dioxin Trap ☐	Notes
1-1	32.5	0.80	1.5	630.17	555	309	320	56	85	77	2.0	2.4	69	
2	35	0.79	1.4	631.89	555	311	321	56	86	77	2	2.3	69	
3	37.5	0.82	1.5	633.65	555	316	320	57	89	78	2	2.2	69	
4	40	0.87	1.6	635.50	557	319	322	56	90	78	2	2.2	69	
5	42.5	0.78	1.4	637.30	558	317	319	56	91	79	2	2.3	69	
6	45	0.77	1.4	639.05	558	314	319	56	92	79	2	2.2	69	
7	47.5	0.63	1.2	640.66	560	317	320	56	93	80	2	2.2	69	
8	50	0.62	1.1	642.16	561	313	320	55	93	80	3	2.2	69	
9	52.5	0.60	1.1	643.66	561	311	318	56	93	81	2	2.2	69	
10	55	0.64	1.2	645.22	561	315	317	56	93	81	2	2.2	69	
11	57.5	0.63	1.2	646.78	561	317	320	56	94	82	2	2.2	69	
12	60	0.64	1.2	648.396	559	316	321	56	94	82	2	2.2	69	
					6761				1093	954				
Total	*		15.8											
Average														

* Sum of square roots.

Circle correct bracketed units on data sheet.



QA/QC PL
 Date 4/26/12

TEST LOCATION: FCCU Stack **TESTING** Particulate **FIELD DATA SHEET** **Cross-Section of Test Location** 2 8 1 UP

UNIT: Complex D **RUN:** 9 **METHOD:** 5F/202 **PAGE** 1 **OF** 2

Client	Marathon	Project No.	12010
Plant	Detroit	Date	4/26/12
Meter Operator	D. Luckward		
Probe Operator	P. Bihun		
Meter Box	66-24	Sample Box No.	
Meter Y ₀	0.9970	Meter ΔH@	1.7816
K Factor	1.83	Pitot C _p	0.827
Leak Rate Before	0.003 [Lpm]	@	15 (in. Hg)
Leak Rate After	0.002 [Lpm]	@	5 (in. Hg)
Pitot Leak Check Before:	☒ After: Good	☒ Bad	☐

↑

2

8

1

UP

Duct Dimensions (in.) 82.15

Static Pres (in. H₂O) 0.4

Port Len. (in.) 8

Gas Flow [In] [Out] of page

First point all the way [In] [Out]

Amb. Temp. (°F)	58	Bar. Press.	29.0	[in. Hg] [mbar]
Probe I.D. No.	67-8-19			
Liner Material	Glass			

Filter No.	44306		
Thimble No.			
Nozzle Diameter	0.250	Nozzle I.D.	250-1

Start Time:	1158	Stop Time:	1317

Traverse Point Number	Min/pt Elapsed Time	Velocity Head ΔP (in. H ₂ O)	Orifice Setting ΔH (in. H ₂ O)	Gas Sample Volume V _m Init. Vol. (L)	Stack Temp. T _s (°F)	Probe T _p (°F)	Filter T _f (°F)	Cond. Temp. T _c (°F)	DGM Inlet T _{m in} (°F)	DGM Outlet T _{m out} (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator, approx (%dv)	Amb Filter ☒ Dioxin Trap ☐	Notes
1-1	2.5	0.80	1.5	650.39	553	310	321	56	79	82	3	2.3	☒	
2	5	0.79	1.4	652.13	555	312	324	56	79	82	3	2.3	☒	
3	7.5	0.81	1.5	653.88	555	313	326	57	80	81	3	2.3	☒	
4	10	0.82	1.5	655.25	554	314	325	58	82	81	3	2.4	☒	
5	12.5	0.82	1.3	657.39	555	315	325	58	83	81	3	2.3	☒	
6	15	0.71	1.3	659.07	556	315	320	58	85	81	3	2.3	☒	
7	17.5	0.62	1.1	660.64	558	314	318	56	85	81	3	2.3	☒	
8	20	0.58	1.1	662.15	559	318	321	58	85	81	3	2.2	☒	
9	22.5	0.62	1.1	663.66	559	320	321	58	85	81	3	2.2	☒	
10	25	0.61	1.1	665.15	558	319	321	61	86	81	3	2.2	☒	
11	27.5	0.61	1.1	666.66	556	314	319	60	87	81	3	2.2	☒	
12	30	0.62	1.1	668.14	556	321	318	61	88	81	3	2.2	☒	
			15.3		667				100-1	97				
Total		19.575	29.3	38.1950	13333				2039	1957				
Average		0.8156	1.2208	555.5417					83.2500					

Sum of square roots.



QA/QC: DL
Date 4/26/12

TEST LOCATION: FCCU Stack
 UNIT: Complex 3 RUN: 9

Particulate TESTING FIELD DATA SHEET

METHOD: 5F/2012

PAGE 2 OF 2

Cross-Section of Test Location

Client	<u>Karathena</u>	Project No.	<u>12016</u>
Plant	<u>Detroit</u>	Date	<u>4/26/12</u>
Meter Operator	<u>D. Luckard</u>		
Probe Operator	<u>P. B. Hoa</u>		

Amb. Temp. (°F)		Bar. Press.	[in. Hg] [mbar]
Probe I.D. No.			
Liner Material			

Meter Box		Sample Box No.	
Meter Y _a		Meter ΔH _@	
K Factor		Pitot C _p	

Filter No.			
Thimble No.			
Nozzle Diameter		Nozzle I.D.	

Leak Rate Before	[cfm] [Lpm]	@	(in. Hg)
Leak Rate After	[cfm] [Lpm]	@	(in. Hg)
Pitot Leak Check Before:	☐ After: Good ☐ Bad ☐		

Static Pres (in. H ₂ O)	Port Len. (in.)	Gas Flow [In] [Out] of page	First point all the way [In] [Out]

Traverse Point Number	Min/pt Elapsed Time	Velocity Head ΔP (in. H ₂ O)	Orifice Setting ΔH (in. H ₂ O)	Gas Sample Volume V _m Init. Vol. (L)	Stack Temp. T _s (°F)	Probe T _p (°F)	Filter T _f (°F)	Cond. Temp. T _c (°F)	DGM Inlet T _{m in} (°F)	DGM Outlet T _{m out} (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator, approx (%dv)	Amb Filter ☒ Dioxin Trap ☐	Notes
2-1	32.5	0.65	1.2	668.14	555	320	323	59	84	81	3	2.3	☒	70 min paused
2	35	0.66	1.2	669.76	552	314	315	57	85	82	3	2.3	☒	
3	37.5	0.64	1.2	672.85	554	316	317	57	85	82	3	2.3	☒	Paused 12:44
4	40	0.65	1.2	674.45	555	319	323	57	86	82	3	2.3	☒	Resumed 12:54
5	42.5	0.62	1.1	675.96	555	320	322	56	83	82	3	2.2	☒	
6	45	0.65	1.2	677.53	556	322	322	56	85	82	3	2.2	☒	
7	47.5	0.67	1.2	679.15	555	319	321	55	86	82	3	2.2	☒	
8	50	0.70	1.3	680.71	556	317	320	56	87	82	3	2.2	☒	
9	52.5	0.62	1.1	682.27	556	317	321	55	88	82	3	2.2	☒	
10	55	0.60	1.1	683.74	556	319	319	55	88	82	3	2.2	☒	
11	57.5	0.58	1.1	685.24	556	318	319	55	89	82	3	2.3	☒	
12	60	0.59	1.1	686.755	555	318	318	56	89	82	3	2.3	☒	
			14		6661				1035	983				
Total														
Average														

Sum of square roots. Circle correct bracketed units on data sheet.



QA/QC DL
 Date 4/26/12

Impinger Weight Sheet

Client Marathon Petroleum Company		Unit Name/Location FCCU Stack	
Plant Detroit Refinery	Job No. 12010	Method USEPA Mod. CTM-027	

Balance Calibration Check			
Balance ID	CAETL07-2	Reference Weight Mass	500.0
Reference Weight ID	22549	Reference Weight Reading	500.0
Check must be performed at least Once per Method per Job		Reference Weight Mass must agree with Reference Weight Reading to within ±0.5 g.	

Run No. 1	Filter Type Quartz Fiber	Sample Box No. B16
Date 4/24/12	Lot No.	pH N/A
Analyst R. Vicere	Filter No. N/A	Rinse

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	QA/QC RV Date 4/24/12
Impinger 1	100 mL 0.1N H ₂ SO ₄	607.9	541.6	66.3	
Impinger 2	100 mL 0.1N H ₂ SO ₄	543.5	541.4	2.1	
Impinger 3	100 mL 0.1N H ₂ SO ₄	539.3	539.0	0.3	
Impinger 4	Silica Gel	731.5	719.3	12.2	
					Total Weight (gm)
					68.7
					80.9

Run No. 2	Filter Type Quartz Fiber	Sample Box No. B24
Date 4/24/12	Lot No.	pH N/A
Analyst R. Vicere	Filter No. N/A	Rinse

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	QA/QC PV Date 4/24/12
Impinger 1	100 mL 0.1N H ₂ SO ₄	630.3	560.2	70.1	
Impinger 2	100 mL 0.1N H ₂ SO ₄	546.4	543.4	3.0	
Impinger 3	100 mL 0.1N H ₂ SO ₄	552.4	552.0	0.4	
Impinger 4	Silica Gel	801.4	790.0	11.4	
					Total Weight (gm)
					73.5
					84.9

Run No. 3	Filter Type Quartz Fiber	Sample Box No. B16
Date 4/24/12	Lot No.	pH N/A
Analyst R. Vicere	Filter No. N/A	Rinse

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	QA/QC <i>RV</i> Date <i>4/24/12</i>
Impinger 1	100 mL 0.1N H ₂ SO ₄	<i>613.5</i>	<i>542.6</i>	<i>70.9</i>	
Impinger 2	100 mL 0.1N H ₂ SO ₄	<i>545.7</i>	<i>543.1</i>	<i>2.6</i>	
Impinger 3	100 mL 0.1N H ₂ SO ₄	<i>540.8</i>	<i>540.3</i>	<i>0.5</i>	
Impinger 4	Silica Gel	<i>740.2</i>	<i>731.3</i>	<i>8.9</i>	
					Total Weight (gm)
					<i>74.0</i>
					<i>82.9</i>

Impinger Weight Sheet

Client Marathon Petroleum Company		Unit Name/Location FCCU Stack	
Plant Detroit Refinery	Job No. 12010	Method USEPA Mod. CTM-027	

Balance Calibration Check			
Balance ID	CAE TL 07-2	Reference Weight Mass	500.0
Reference Weight ID	27544	Reference Weight Reading	500.0

Check must be performed at least Once per Method per Job Reference Weight Mass must agree with Reference Weight Reading to within ±0.5 g.

Run No. 4	Filter Type Quartz Fiber	Sample Box No. 1324
Date 4/25/12	Lot No.	pH N/A
Analyst R. Viere	Filter No. N/A	Rinse

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	100 mL 0.1N H ₂ SO ₄	629.3	562.9	66.4	QA/QC RV Date 4/25/12
Impinger 2	100 mL 0.1N H ₂ SO ₄	550.3	547.4	2.9	
Impinger 3	100 mL 0.1N H ₂ SO ₄	557.8	557.5	0.3	
Impinger 4	Silica Gel	810.2	801.3	8.9	
				Total Weight (gm)	69.6
					78.5

Run No. ^{RV} 5	Filter Type Quartz Fiber	Sample Box No. B16
Date 4/25/12	Lot No.	pH N/A
Analyst R. Viere	Filter No. N/A	Rinse

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	100 mL 0.1N H ₂ SO ₄	611.4	544.0	~~67.4~~	QA/QC RV Date 4/25/12
Impinger 2	100 mL 0.1N H ₂ SO ₄	547.2	545.0	2.2	
Impinger 3	100 mL 0.1N H ₂ SO ₄	541.0	540.2	0.8	
Impinger 4	Silica Gel	747.8	739.9	7.9	
				Total Weight (gm)	67.4
					~~60.4~~ 70.4
					~~68.3~~ 78.3

Run No. ^{RV} ~~5~~ ^{RV} 6	Filter Type Quartz Fiber	Sample Box No. B24
Date 4/25/12	Lot No.	pH N/A
Analyst R. Viere	Filter No. N/A	Rinse

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	100 mL 0.1N H ₂ SO ₄	628.0	563.8	64.2	QA/QC RV Date 4/25/12
Impinger 2	100 mL 0.1N H ₂ SO ₄	553.0	549.5	3.5	
Impinger 3	100 mL 0.1N H ₂ SO ₄	552.4	552.5	-0.1	
Impinger 4	Silica Gel	817.8	809.9	7.9	
				Total Weight (gm)	67.6
					75.5

Impinger Weight Sheet

Client Marathon Petroleum Company		Unit Name/Location FCCU Stack	
Plant Detroit Refinery	Job No. 12010	Method USEPA Mod. CTM-027	

Balance Calibration Check			
Balance ID	CAETL07-2	Reference Weight Mass	500.0
Reference Weight ID	22549	Reference Weight Reading	500.0
Check must be performed at least Once per Method per Job		Reference Weight Mass must agree with Reference Weight Reading to within ± 0.5 g.	

Run No. 7	Filter Type Quartz Fiber	Sample Box No. B16
Date 4/26/12	Lot No.	pH N/A
Analyst R.V. cere	Filter No. N/A	Rinse

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	100 mL 0.1N H ₂ SO ₄	613.9	543.1	70.8	
Impinger 2	100 mL 0.1N H ₂ SO ₄	548.1	543.7	4.4	
Impinger 3	100 mL 0.1N H ₂ SO ₄	539.8	539.4	0.4	
Impinger 4	Silica Gel	718.5	707.0	11.5	
					Total Weight (gm)
					75.6
					87.1

QA/QC RV
Date 4/26/12

Run No. 8	Filter Type Quartz Fiber	Sample Box No. B24
Date 4/26/12	Lot No.	pH N/A
Analyst R.V. cere	Filter No. N/A	Rinse

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	100 mL 0.1N H ₂ SO ₄	629.2	562.1	67.1	
Impinger 2	100 mL 0.1N H ₂ SO ₄	550.3	545.4	4.9	
Impinger 3	100 mL 0.1N H ₂ SO ₄	556.9	556.1	0.8	
Impinger 4	Silica Gel	826.9	817.4	9.5	
					Total Weight (gm)
					72.8
					82.3

QA/QC RV
Date 4/26/12

Run No. 9	Filter Type Quartz Fiber	Sample Box No. B16
Date 4/26/12	Lot No.	pH N/A
Analyst R.V. cere	Filter No. N/A	Rinse

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	100 mL 0.1N H ₂ SO ₄	614.2	542.9	71.3	
Impinger 2	100 mL 0.1N H ₂ SO ₄	544.8	541.9	2.9	
Impinger 3	100 mL 0.1N H ₂ SO ₄	543.2	542.3	0.9	
Impinger 4	Silica Gel	726.6	718.3	8.3	
					Total Weight (gm)
					75.1
					83.4

QA/QC RV
Date 4/26/12

Impinger Weight Sheet

Client Marathon Petroleum Company		Unit Name/Location FCCU Stack	
Plant Detroit Refinery	Job No. 12010	Method USEPA Mod. CTM-027	

Balance Calibration Check			
Balance ID	CAETL07-2	Reference Weight Mass	500.0
Reference Weight ID	22549	Reference Weight Reading	500.0

Check must be performed at least Once per Method per Job Reference Weight Mass must agree with Reference Weight Reading to within ±0.5 g.

Run No. 10	Filter Type Quartz Fiber	Sample Box No. 824
Date 4/27/12	Lot No.	pH N/A
Analyst R. Vicens	Filter No. N/A	Rinse

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	100 mL 0.1N H ₂ SO ₄	631.6	564.2	67.4	QA/QC RV Date 4/27/12
Impinger 2	100 mL 0.1N H ₂ SO ₄	549.5	548.0	1.5	
Impinger 3	100 mL 0.1N H ₂ SO ₄	553.5	552.9	0.6	
Impinger 4	Silica Gel	803.9	793.7	10.2	
					Total Weight (gm)
					69.5
					79.7

Run No. 11	Filter Type Quartz Fiber	Sample Box No. 821
Date 4/27/12	Lot No.	pH N/A
Analyst R. Vicens	Filter No. N/A	Rinse

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	100 mL 0.1N H ₂ SO ₄	611.8	542.6	69.2	QA/QC RV Date 4/27/12
Impinger 2	100 mL 0.1N H ₂ SO ₄	541.8	540.6	1.2	
Impinger 3	100 mL 0.1N H ₂ SO ₄	542.0	541.0	1.0	
Impinger 4	Silica Gel	732.9	725.7	7.2	
					Total Weight (gm)
					71.4
					78.6

Run No. 12	Filter Type Quartz Fiber	Sample Box No.
Date 4/27/12	Lot No.	pH N/A
Analyst R. Vicens	Filter No. N/A	Rinse

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	100 mL 0.1N H ₂ SO ₄	614.1	548.9		QA/QC RV Date 4/27/12
Impinger 2	100 mL 0.1N H ₂ SO ₄	562.0	561.3		
Impinger 3	100 mL 0.1N H ₂ SO ₄	562.2	560.7		
Impinger 4	Silica Gel	810.6	803.8		
					Total Weight (gm)
					67.4
					74.2

TEST LOCATION:

FCC

Amor, A

TESTING

METHOD: CTM 027 **PAGE**

OF

UNIT: Complex 3

RUN:

FIELD DATA SHEET

THE

Client	MAFATHEN	Project No.	12010
Plant	DETROIT	Date	4-24-72
Meter Operator	B. ARNOLD		
Probe Operator	_____		

Meter Box	66-22	Sample Box No.	11/12
Meter Y _d	1.0020	Meter ΔH _g	1.8819
K Factor	1.8	Pitot C _p	0.818
Leak Rate Before	0.003 (lpm)	@	15 (in. Hg)
Leak Rate After	0.001 (lpm)	@	4 (in. Hg)
Pitot Leak Check Before:	☒	After:	Good ☒ Bad ☐

Cross-Section of Test Location			
	Duct Dimensions (in.)	8.2 x 5	
Static Pres (in. H ₂ O)	Port Len. (in.)	Gas Flow [In] [Out] of page	First point all the way [In] [Out]
-0.1	2.0		

Amb. Temp. (°F)	54	Bar. Press.	28.85	(in. Hg) [mbar]
Probe I.D. No.	607-4-1			
Liner Material	GLASS			

Filter No.	—	
Thimble No.	—	
Nozzle Diameter	0.252	Nozzle I.D. 252-1

Start Time: 10:38	Stop Time: 11:33

Traverse Point Number	Min/pt Elapsed Time	Velocity Head ΔP (in. H ₂ O)	Orifice Setting ΔH (in. H ₂ O)	Gas Sample Volume V_m		Stack Temp. T_s (°F)	Probe T_p (°F)	Filter T_f (°F)	Cond. Temp. T_c (°F)	DGM Inlet T_{min} (°F)	DGM Outlet T_{mout} (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator, approx (% div)	Notes	
				Init. Vol.	[ft ³] [L]		Set Points	Amb Filter						Dioxin Trap	
1-1	5	0.65	1.2	~~349.54~~ 957.35	954.290	569	253	N/A	63	65	65	2.5	2.4		
	10	0.69	1.2	960.32		564	255		60	68	64	2.5	1.9		
	15	0.65	1.2	963.27		568	252		56	67	66	2.5	1.8		
	20	0.67	1.2	966.25		569	250		55	70	67	2.5	1.8		
	25	0.67	1.2	969.23		569	251		54	72	67	2.5	1.8		
	30	0.65	1.2	972.18		569	252		57	74	68	2.5	1.9		
	35	0.70	1.3	975.26		569	250		58	75	69	2.5	1.8		
	40	0.67	1.2	978.26		569	252		60	75	70	3.0	1.8		
	45	0.69	1.2	981.27		569	250	✓	60	77	70	3.0	1.9		
	50	0.67	1.2	984.27		565	252		60	80	70	3.0	2.0		
	55	0.67	1.2	987.26		566	251		60	82	71	3.0	2.0		
	60	0.67	1.2	990.275		566	250		40	83	71	3.0	1.8		
Total	9.8299			35.9850											
Average	0.8190	1.083				578.0533				71.0833					

Sum of square roots.

Circle correct bracketed units on data sheet.



TEST LOCATION: FCCU STACK
UNIT: Complex 3 RUN: 2

Ammonia TESTING FIELD DATA SHEET

METHOD: CTM 024 PAGE 1 OF 1

Client	MAFATHAN	Project No.	12010
Plant	2401	Date	4-24-12
Meter Operator	B. ARNOLD		
Probe Operator			

Meter Box	66-22	Sample Box No.	N/A
Meter Yd	1.0020	Meter ΔH@	1.8819
K Factor	1.84	Pilot Cp	0.818
Leak Rate Before	0.0210 [Lpm]	@ 15" (in. Hg)	
Leak Rate After	0.0210 [Lpm]	@ 15" (in. Hg)	
Pilot Leak Check Before:	☒	After: Good	☒ Bad

Cross-Section of Test Location

Duct Dimensions (in.)

Static Pres (in. H ₂ O)	-0.1	Port Len. (in.)	2.0	Gas Flow (in. Hg)	52.25	First point all the way

Traverse Point Number	Min/pt Elapsed Time	Velocity Head ΔP (in. H ₂ O)	Orifice Setting ΔH (in. H ₂ O)	Gas Sample Volume V _m (ft ³ [L])	Stack Temp. T _s (°F)	Probe T _p (°F)	Set Points		Filter T _f (°F)	Cond. Temp. T _c (°F)	DGM Inlet T _{m in} (°F)	DGM Outlet T _{m out} (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator, approx (% dv)	Amb Filter	Dioxin Trap	Notes
							250	N/A									
1-1	5	0.67	1.3	993.69	567	250				60	67	67	4.0	2.0			
	10	0.70	1.3	996.81	567	252				53	70	68	3.0	2.0			
	15	0.67	1.3	999.89	567	254				50	72	69	3.0	1.9			
	20	0.67	1.3	1002.01	567	252				49	74	69	3.0	2.0			
	25	0.65	1.2	1005.00	567	250				51	77	70	3.0	1.8			
	30	0.67	1.3	1009.12	567	250				54	80	71	3.0	1.9			
	35	0.70	1.3	1012.23	567	251				55	80	72	3.0	1.8			
	40	0.67	1.3	1015.35	567	250				55	80	72	3.0	1.8			
	45	0.67	1.3	1018.46	567	250				57	81	74	3.0	1.8			
	50	0.67	1.3	1021.56	567	250				59	83	74	3.0	1.7			
	55	0.65	1.2	1024.58	567	250				61	83	74	3.0	1.8			
	60	0.70	1.3	1027.585	567	250				61	83	74	3.0	1.9			
Total				37.0450													
Average				1.833	567.000						71.3333						

Circle correct bracketed units on data sheet.



QA/QC BP
Date 4-24-12

TEST LOCATION:	FEW STACK
UNIT:	Complex 3
RUN:	4

Amorin TESTING
FIELD DATA SHEET

METHOD: CTM 027 PAGE (OF

Client	MAFAR Flow	Project No.	12010
Plant	Detroit	Date	4-25-12
Meter Operator	B. Alvarez		
Probe Operator	_____		

Meter Box	66-22	Sample Box No.	NA
Meter Y_d	1.000	Meter ΔH_{20}	1.8819
K Factor	1.9	Pilot C_p	0.878
Leak Rate Before	0.00 [cfm]	@	15 (in. Hg)
Leak Rate After	0.04 [cfm]	@	4 (in. Hg)
Pilot Leak Check Before:	☒	After:	Good ☒ Bad ☐

Cross-Section of Test Location			
	Duct Dimensions (in.)	8.2.25	
Static Pres (in. H ₂ O)	Port Len. (in.)	Gas Flow (in ³ /min) [Out] of page	First point all the way (in ³ /min) [Out]
0.4	20		

Amb. Temp. (°F)	60	Bar. Press.	29.15	(In. Hg) [mbar]
Probe I.D. No.	67-4-1			
Liner Material	GLASS			

Filter No.	—	
Thimble No.	—	
Nozzle Diameter	1.252	Nozzle I.D. 752-1

Start Time: 9:08	Stop Time: 10:08

[illegible]

Sum of square roots.

Circle correct bracketed units on data sheet.

TEST LOCATION: Face StackUNIT: Complex 3 RUN: 5

APRON 1A

TESTING

METHOD: CTM 027 PAGE 1 OF 1

Client	MARATHON	Project No.	12010
Plant	Detroit	Date	4-25-12
Meter Operator	B. ARNOLD		
Probe Operator			

Meter Box	66-22	Sample Box No.	—
Meter Y _d	1.0020	Meter ΔH _g	1.8819
K Factor	1.9	Pilot C _p	0.88
Leak Rate Before	0.003 (cfm) [Lpm]	@ 15" (in. Hg)	
Leak Rate After	0.002 (cfm) [Lpm]	@ 10" (in. Hg)	
Pilot Leak Check Before	☒	After: Good ☒ Bad ☐	

Cross-Section of Test Location

		Duct Dimensions (in.)	82.25	Gas Flow	[In] [Out]	First point all the way
		Static Pres (in. H ₂ O)	+0.1	Port Len. (in.)	20	of page

Amb. Temp. (°F)	60	Bar. Press.	29.15	(in. Hg) [mbar]
Probe I.D. No.	6741			
Liner Material	GLASS			

Filter No.	—			
Thimble No.	—			
Nozzle Diameter	.250	Nozzle I.D.	.2542-1	

Start Time	12:07	Stop Time	13:07

Traverse Point Number	Min/pt Elapsed Time	Velocity Head ΔP (in. H ₂ O)	Orifice Setting ΔH (in. H ₂ O)	Gas Sample Volume V _m		Stack Temp. T _s (°F)	Probe T _p (°F)		Filter T _f (°F)	Cond. Temp. T _c (°F)	DGM Inlet T _{m in} (°F)	DGM Outlet T _{m out} (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator, approx (% dv)	☐ Amb Filter ☐ Dioxin Trap ☐	Notes
				Init. Vol.	[ft ³] [L]		Set Points									
								250								
1-1	5	0.61	1.2	102.635		555	250		n/a	65	68	68	3.0	2.3		
	10	0.61	1.2	105.64		555	252			60	69	68	3.0	2.3		
	15	0.61	1.2	111.63		555	252			57	72	71	3.5	2.3		
	20	0.61	1.2	114.62		555	251			58	75	71	3.5	2.2		
	25	0.64	1.2	117.62		555	250			59	76	71	3.0	2.3		
	30	0.61	1.2	120.63		555	250			60	78	72	3.0	2.5		
	35	0.62	1.2	123.62		555	251			59	78	72	3.0	2.3		
	40	0.64	1.2	126.62		555	251			59	77	71	3.0	2.4		
	45	0.64	1.2	129.61		555	251		✓	59	78	72	3.0	2.3		
	50	0.63	1.2	132.60		555	252			59	79	72	3.0	2.2		
	55	0.64	1.2	135.58		555	250			59	79	72	3.0	2.3		
	60	0.61	1.2	138.570		555	250			59	79	72	3.0	2.3		
Total	9.4623			35.9350												
Average	0.789	1.2000				555 (avg)					73.3333					(CAN)

Sum of square roots.

Circle correct bracketed units on data sheet

QA/QC SA
Date 4-25-12

TEST LOCATION: FCU StackUNIT: Complex 3 RUN: 6

Amonik

TESTING
FIELD DATA SHEETMETHOD: OTM 027 PAGE 1 OF 1

Client	MAFASHION	Project No.	12010
Plant	Detroit	Date	4-25-12
Meter Operator	B. Alvarez		
Probe Operator			

Meter Box	66-22	Sample Box No.	—
Meter Y _d	1.0020	Meter ΔH _@	1.8819
K Factor	1.9	Pilot C _p	0.818
Leak Rate Before	0.003 [cfm]	[Lpm]	@ 15 (in. Hg)
Leak Rate After	0.004 [cfm]	[Lpm]	@ 15 (in. Hg)
Pilot Leak Check Before	☒	After: Good ☒ Bad ☐	

Cross-Section of Test Location				
Duct Dimensions (in.)	82.25	Gas Flow	[In] [Out]	First point all the way
Static Pres. (in. H ₂ O)	0.4	Port Len. (in.)	20	of page

Amb. Temp. (°F)	60	Bar. Press.	29.15	[in. Hg] [mbar]
Probe I.D. No.	67-4-1			
Liner Material	GLASS			

Filter No.	—			
Thimble No.	—			
Nozzle Diameter	0.252	Nozzle I.D.	0.252-1	

Start Time:	1/106	Stop Time:	15:06	

Traverse Point Number	Min/pt	Velocity Head ΔP (in. H ₂ O)	Orifice Setting ΔH (in. H ₂ O)	Gas Sample Volume V _m	Stack Temp. T _s (°F)	Probe T _p (°F)	Filter T _f (°F)	Cond. Temp. T _c (°F)	DGM Inlet T _{m in} (°F)	DGM Outlet T _{m out} (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator, approx (% dv)	Amb Filter ☐	Dioxin Trap ☐	Notes
1-1	5	0.61	1.2	138.680	555	250	N/A	63	67	67	3.0	2.3			
1	10	0.61	1.2	141.70	555	252		57	68	68	3.0	2.3			
15	15	0.59	1.1	147.54	554	252		54	71	68	3.0	2.3			
20	20	0.59	1.1	150.39	555	251		57	71	69	3.0	2.2			
25	25	0.59	1.1	153.25	554	250		58	76	70	3.0	2.2			
30	30	0.57	1.0	156.03	554	250		60	78	71	3.0	2.3			
35	35	0.59	1.1	158.90	555	250		60	80	72	3.0	2.2			
40	40	0.57	1.0	161.69	554	251		62	80	73	3.0	2.2			
45	45	0.57	1.0	164.48	554	250		62	83	74	3.0	2.2			
50	50	0.57	1.0	167.26	554	250		62	84	75	3.0	2.1			
55	55	0.57	1.0	170.06	554	250		62	84	76	3.0	2.1			
60	60	0.57	1.0	172.870	554	251		62	86	77	3.0	2.2			
Total		9.1644		34.1700											
Average		0.7637	1.0667	554.3333											

Sum of square roots.

Circle correct bracketed units on data sheet.

CleanAir
ENGINEERING
QA/QC BR
Date 4-25-12

TEST LOCATION: FCCU STACK
UNIT: Complex 3 RUN: 8

AMONIK TESTING FIELD DATA SHEET

METHOD: CSM 027

PAGE 1

OF 1

Client	Martinez	Project No.	1610
Plant	Detroit	Date	4-26-12
Meter Operator	B. Alvarez		
Probe Operator			

Meter Box	66-22	Sample Box No.	
Meter Yd	1.0020	Meter ΔH ₀	1.8519
K Factor	1.95	Pilot C _p	0.818
Leak Rate Before	0.003 [cfm]	@	15 (in. Hg)
Leak Rate After	0.011 [cfm]	@	7 (in. Hg)
Pilot Leak Check Before	☒	After: Good	☒ Bad ☐

Cross-Section of Test Location

↑ (N) [UP]

Duct Dimensions (in.)	82.25
Static Pres (in. H ₂ O)	0.4
Port Len. (in.)	20
Gas Flow (in. H ₂ O)	82.25
First point all the way	(In) [Out]

Traverse Point Number	Min/pt Elapsed Time	Velocity Head ΔP (in. H ₂ O)	Orifice Setting ΔH (in. H ₂ O)	Gas Sample Volume V _m Init. Vol. (ft ³) [L]	Stack Temp. T _s (°F)	Probe T _p (°F)	Filter T _f (°F)	Cond. Temp. T _c (°F)	DGM Inlet T _{m in} (°F)	DGM Outlet T _{m out} (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator, approx (% dv)	Amb Filter	Dioxin Trap	Notes
1-1	5	0.63	1.2	209.680	553	250	252	66	72	74	3.0	2.3			
	10	0.63	1.2	212.67	557	253	253	62	74	74	3.0	2.2			
	15	0.63	1.2	218.67	557	252	252	57	77	74	3.0	2.2			
	20	0.65	1.3	221.77	552	251	251	56	79	74	3.0	2.1			
	25	0.65	1.3	224.88	556	251	251	61	81	74	3.0	2.1			
	30	0.63	1.2	227.87	556	250	250	63	84	75	3.0	2.3			
	35	0.63	1.2	230.89	556	250	250	64	86	76	3.0	2.2			
	40	0.67	1.3	233.02	556	249	249	64	87	76	3.0	2.2			
	45	0.67	1.3	237.17	556	250	250	60	90	78	3.0	2.2			
	50	0.67	1.3	240.31	556	250	250	59	91	79	3.5	2.2			
	55	0.67	1.3	243.47	556	250	250	59	92	81	3.5	2.2			
	60	0.65	1.3	246.630	556	250	250	60	93	81	3.5	2.1			
Total				36.9500											
Average				6.645 (1.258)	556.0833				86.0833						

Sum of square roots.
0.8051

Circle correct bracketed units on data sheet.

TEST LOCATION: FCCU STACK
 UNIT: Complex 3 RUN: 9

AMONIA TESTING FIELD DATA SHEET

METHOD: CTR 0027 PAGE 1 OF 1

Client	MARATHON	Project No.	12010
Plant	Detroit	Date	4-26-12
Meter Operator	K. A. NORD		
Probe Operator	—		

Meter Box	166-22	Sample Box No.	—
Meter Yd	1.0020	Meter ΔH@	1.819
K Factor	1.95	Pitot Cp	0.818
Leak Rate Before	0.02 [Lpm]	@ 15" (in. Hg)	
Leak Rate After	0.00 [Lpm]	@ 6" (in. Hg)	
Pitot Leak Check Before:	☒ After: Good	☒ Bad	☐

Cross-Section of Test Location

Duct Dimensions (in.) 82.25

Static Pres (in. H ₂ O)	Port Len. (in.)	Gas Flow [In] [Out] of page	First point all the way [In] [Out]
0.4	20	[In] [Out]	[In] [Out]

Amb. Temp. (°F)	58	Bar. Press.	29.00 [in. Hg]
Probe I.D. No.	67-4-1		
Liner Material	GLASS		

Filter No.	—		
Thimble No.	—		
Nozzle Diameter	0.152	Nozzle I.D.	252-7

Start Time: 11:58 Stop Time: 12:58

Traverse Point Number	Min/pt Elapsed Time	Velocity Head ΔP (in. H ₂ O)	Orifice Setting ΔH (in. H ₂ O)	Gas Sample Volume V _m Init. Vol. [ft³] [L]	Stack Temp. Ts (°F)	Probe T _p (°F)	Filter T _f (°F)	Cond. Temp. T _c (°F)	DGM Inlet T _{m in} (°F)	DGM Outlet T _{m out} (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator, approx (% dv)	Amb Filter ☐ Dioxin Trap ☐	Notes
1-1	5	0.62	1.2	246.740	554	254		65	80	80	3.0	2.2		
	10	0.62	1.2	252.80	554	251		59	80	81	3.0	2.2		
	15	0.62	1.2	255.80	554	252		56	82	81	3.0	2.2		
	20	0.62	1.2	258.80	553	250		55	83	80	3.0	2.2		
	25	0.58	1.2	261.78	552	251		56	85	80	3.0	2.1		
	30	0.62	1.2	264.77	553	250		58	86	80	3.0	2.2		
	35	0.62	1.2	267.79	553	250		59	87	80	3.0	2.1		
	40	0.58	1.2	270.81	552	251		60	88	80	3.0	2.1		
	45	0.55	1.1	273.73	552	257		61	89	81	3.0	2.2		
	50	0.58	1.2	276.73	552	250		62	88	81	3.0	2.2		
	55	0.58	1.2	279.73	551	251		64	88	81	3.0	2.1		
	60	0.58	1.2	282.730	551	252		64	89	82	3.0	2.2		
Total		9.239		35.990										
Average		0.775	0.197		552.583				83.6000					

Sum of square roots.

Circle correct bracketed units on data sheet.

TEST LOCATION: FCCU STACK
UNIT: Complex 3 RUN: 10

AM06N1A

TESTING FIELD DATA SHEET

METHOD: CTM027 PAGE 1 OF 1

Client	MARATHON	Project No.	12010
Plant	DETROIT	Date	4-27-12
Meter Operator	RAPHAEL		
Probe Operator			

Meter Box	66-22	Sample Box No.	—
Meter Yd	1.0020	Meter ΔH@	1.8819
K Factor	1.92	Pitot Cp	0.818
Leak Rate Before	0.002 (in) [L-pm]	@ 15 (in. Hg)	
Leak Rate After	0.001 (in) [L-pm]	@ 6 (in. Hg)	
Pitot Leak Check Before:	☒ After: Good	☐ Bad	☐

Cross-Section of Test Location

↑ (N) [U] P

3

2012

Duct Dimensions (in.)	82.25	Gas Flow [In] [Out] of page	
Static Pres (in. H ₂ O)	0.5	Port Len. (in.)	20
First point all the way	(N) [Out]		

Traverse Point Number	Min/pt Elapsed Time	Velocity Head ΔP (in. H ₂ O)	Orifice Setting ΔH (in. H ₂ O)	Gas Sample Volume V _m Init. Vol. (ft ³) [L]	Stack Temp. Ts (°F)	Probe T _p (°F)	Filter T _f (°F)	Cond. Temp. T _c (°F)	DGM Inlet T _{m in} (°F)	DGM Outlet T _{m out} (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator, approx (%.dv)	Amb Filter	Dioxin Trap	Notes
1-1	5	0.60	1.2	282.840	551	250	N/A	49	67	66	3.5	2.7			
	10	0.60	1.2	288.76	551	251		47	68	66	3.0	2.6			
	15	0.61	1.2	291.71	551	253		44	70	67	3.0	2.5			
	20	0.61	1.2	294.64	551	251		43	72	67	3.0	2.5			
	25	0.63	1.2	297.60	551	251		45	76	69	3.0	2.5			
	30	0.63	1.2	300.55	551	250		46	80	70	3.0	2.6			
	35	0.63	1.2	303.51	551	252		48	81	71	3.0	2.8			
	40	0.62	1.2	306.45	551	250		48	84	73	3.0	2.7			
	45	0.64	1.2	309.42	552	251		49	86	74	3.0	2.6			
	50	0.62	1.2	312.39	551	250		49	87	75	3.0	2.5			
	55	0.62	1.2	315.37	552	250		50	89	76	3.0	2.5			
	60	0.60	1.2	318.335	551	250		57	89	76	3.0	2.5			
Total				35.4950											
Average				551.664											

Sum of square roots.
0.7356
0.7353



TEST LOCATION: FCCU STACK
UNIT: Complex 3 RUN: 11

AMONIA TESTING
FIELD DATA SHEET

METHOD: Ctm 027 PAGE 1 OF 1

Client	MARATHON	Project No.	12010
Plant	DETROIT	Date	4-24-12
Meter Operator	B. ARNOLD		
Probe Operator			

Meter Box	66-22	Sample Box No.	
Meter Yd	1.0020	Meter ΔH@	1.8819
K Factor	0.92	Pilot Cp	0.818
Leak Rate Before	0.031 [cfm]	[Lpm]	@ 15 (in. Hg)
Leak Rate After	0.002 [cfm]	[Lpm]	@ 20 (in. Hg)
Pilot Leak Check Before:	☒ [After: Good] ☐ Bad		

Cross-Section of Test Location

↑ (N) [UP]

2 1/2" 5027

Duct Dimensions (in.)	82.25
Static Pres (in. H ₂ O)	0.4
Port Len. (in.)	20
Gas Flow [in] [out] of page	82.25
First point all the way	(in) [out]

Traverse Point Number	Min/pt Elapsed Time	Velocity Head ΔP (in. H ₂ O)	Orifice Setting ΔH (in. H ₂ O)	Gas Sample Volume V _m Init. Vol. [ft ³] [L]	Stack Temp. T _s (°F)	Probe T _p (°F)	Filter T _f (°F)	Cond. Temp. T _c (°F)	DGM Inlet T _{m in} (°F)	DGM Outlet T _{m out} (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator, approx (% dv)	Amb Filter	Dioxin Trap	Notes
1-1	5	0.65	1.3	318.420	552	253	NA	47	74	74	3.0	2.4			
	10	0.62	1.2	324.50	552	253		44	75	75	3.0	2.6			
	15	0.62	1.2	327.42	552	255		45	77	76	3.0	2.7			
	20	0.63	1.2	330.41	552	250		45	80	76	3.0	2.7			
	25	0.62	1.2	333.40	552	250		44	83	76	3.0	2.5			
	30	0.62	1.2	336.38	552	252		45	86	77	3.0	2.5			
	35	0.62	1.2	339.35	552	251		44	87	78	3.0	2.5			
	40	0.60	1.2	342.31	552	250		46	87	79	3.0	2.6			
	45	0.62	1.2	345.28	552	250		46	87	80	3.0	2.7			
	50	0.61	1.2	348.25	552	250		46	89	80	3.0	2.5			
	55	0.62	1.2	351.23	552	252		48	88	81	3.0	2.7			
	60	0.60	1.2	354.190	552	250		49	88	81	3.0	2.7			
Total				35.7700											
Average				0.788											
				1.1083											
				35.7700											
				80.5833											

Sum of square roots.

Circle correct bracketed units on data sheet.

TEST LOCATION: FCCU STACK
UNIT: COMPLEX 3 RUN: 12

AMONIA TESTING FIELD DATA SHEET

METHOD: C_{TM}-027 PAGE 1 OF 1

Client	MARATHON	Project No.	12010
Plant	DETROIT	Date	4-27-12
Meter Operator	B. ARNOLD		
Probe Operator			

Meter Box	46-22	Sample Box No.	
Meter Y _d	1.020	Meter ΔH _@	1.8819
K Factor	1.94	Pitot C _p	0.818
Leak Rate Before	0.02 [in] [L-pm]	@ 15" (in. Hg)	
Leak Rate After	0.00 [in] [L-pm]	@ 8" (in. Hg)	
Pitot Leak Check Before:	☒ After: Good	☒ Bad	☐

Cross-Section of Test Location

Duct Dimensions (in.)	82.25	First point all the way
Static Pres (in. H ₂ O)	0.4	Gas Flow [In] [Out] of page
Port Len. (in.)	20	

Amb. Temp. (°F)	50	Bar. Press.	29.50	(in. Hg) [mbar]
Probe I.D. No.	67-4-1			
Liner Material	GLASS			

Filter No.		
Thimble No.		
Nozzle Diameter	0.252	Nozzle I.D.

Start Time:	12:45	Stop Time:	13:45

Traverse Point Number	Min/pt Elapsed Time	Velocity Head ΔP (in. H ₂ O)	Orifice Setting ΔH (in. H ₂ O)	Gas Sample Volume V _m Init. Vol. (ft ³) [L]	Stack Temp. T _s (°F)	Probe T _p (°F)	Filter T _f (°F)	Cond. Temp. T _c (°F)	DGM Inlet T _{m in} (°F)	DGM Outlet T _{m out} (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator, approx (%dv)	Amb Filter	Dioxin Trap	Notes
1-1	5	0.58	1.1	354.385	552	250	NA	56	46	46	3.0	2.6			
	10	0.58	1.1	360.06	552	252		49	79	78	3.0	2.6			
	15	0.62	1.2	363.02	552	252		48	79	79	3.0	2.7			
	20	0.62	1.2	366.01	552	250		48	82	79	3.0	2.5			
	25	0.60	1.2	368.97	552	250		49	84	79	3.0	2.7			
	30	0.62	1.2	371.90	552	252		50	86	80	3.0	2.6			
	35	0.62	1.2	374.89	552	253		52	88	80	3.0	2.5			
	40	0.62	1.2	377.89	552	250		52	89	81	3.0	2.4			
	45	0.62	1.2	380.89	552	250		52	91	82	3.0	2.5			
	50	0.63	1.2	383.89	552	251		53	91	83	3.0	2.6			
	55	0.60	1.2	386.88	552	250		53	93	83	3.0	2.5			
	60	0.62	1.2	389.865	552	251		54	93	83	3.0	2.5			
Total				35.4800											
Average				1.1833											
Sum of square roots.															
Circle-correct bracketed units on data sheet.															



QA/QC SA
Date 4-27-12

Impinger Weight Sheet

Client Marathon Petroleum Company		Unit Name/Location FCCU Stack	
Plant Detroit Refinery	Job No. 12010	Method USEPA OTM-29	

CAETL07-2 22549 500.0/500.0

Run No. 1	Filter Type Quartz Fiber	Sample Box No. B16
Date 4/27/12	Lot No.	pH
Analyst R. Vicer	Filter No. N/A	Rinse

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	200 mL 6N NaOH	703.6	639.8	63.8	
Impinger 2	200 mL 6N NaOH	685.6	643.0	42.6	
Impinger 3	200 mL 6N NaOH	658.9	633.5	25.4	
Impinger 4	100 mL 6N NaOH	558.9	546.4	12.5	
Impinger 5	Silica Gel	724.8	714.2	10.6	Total Weight (gm)
					144.3
					154.9

QA/QC RV
Date 4/27/12

Run No. 2	Filter Type Quartz Fiber	Sample Box No. B3
Date 4/27/12	Lot No.	pH
Analyst R. Vicer	Filter No. N/A	Rinse

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	200 mL 6N NaOH	706.6	641.7	64.9	
Impinger 2	200 mL 6N NaOH	695.9	655.7	40.2	
Impinger 3	200 mL 6N NaOH	669.7	643.9	25.8	
Impinger 4	100 mL 6N NaOH	544.8	531.1	13.7	
Impinger 5	Silica Gel	710.3	698.3	12.0	Total Weight (gm)
					144.6
					156.6

QA/QC RV
Date 4/27/12

Run No. 3	Filter Type Quartz Fiber	Sample Box No. B6
Date 4/27/12	Lot No.	pH
Analyst R. Vicer	Filter No. N/A	Rinse

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	200 mL 6N NaOH	746.2	677.0		
Impinger 2	200 mL 6N NaOH	688.3	652.9		
Impinger 3	200 mL 6N NaOH	673.6	651.5		
Impinger 4	100 mL 6N NaOH	572.5	561.2		
Impinger 5	Silica Gel	749.8	738.7		Total Weight (gm)
					138
					149.1

QA/QC RV
Date 4/27/12

0312-97
Sp: K2
HCN @ 4011.0 ug
4/13/12 KTB sp: K2-14 pg 81
QA/QC RV
Date 4/27/12

TEST LOCATION: FCCU Stack
UNIT: Complex 3 RUN: 1

H C N

TESTING
FIELD DATA SHEET

METHOD: O₂ M₂g PAGE 1 OF 2

Client	Marathon	Project No.	12010
Plant	Petroit	Date	4/27/12
Meter Operator	D. Vecchi		
Probe Operator	N. Hitchens		

Meter Box	66-24	Sample Box No.	
Meter Y _d	0.9970	Meter ΔH ₀	1.7816
K Factor	1.34	Pilot C _p	0.827
Leak Rate Before	0.03 (Lpm)	@ 15 (in. Hg)	
Leak Rate After	0.602 (Lpm)	@ 5 (in. Hg)	
Pitot Leak Check Before:	☒ After: Good	Bad	☐

Cross-Section of Test Location

↑ (N) [UP]

Duct Dimensions (in.) 82-25

Static Pres (in. H ₂ O)	Port Len. (in.)	Gas Flow (in) (Out) of page	First point all the way
0.5	8		(In) [Out]

Amb. Temp. (°F)	41	Bar. Press.	29.5	(in. Hg) [mbar]
Probe I.D. No.	07-8-19			
Liner Material	Glass			

Filter No.			
Thimble No.			
Nozzle Diameter	0.234	Nozzle I.D.	250-172 234-1

Start Time:	928	Stop Time:	1034

Traverse Point Number	Min/pt Elapsed Time	Velocity Head ΔP (in. H ₂ O)	Orifice Setting ΔH (in. H ₂ O)	Gas Sample Volume V _m (ft ³)	Stack Temp. T _s (°F)	Probe T _p (°F)	Filter T _f (°F)	Cond. Temp. T _c (°F)	DGM Inlet T _{m in} (°F)	DGM Outlet T _{m out} (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator, approx (%dv)	Amb Filter	Dioxin Trap	Notes
2-1	2.5	0.70	0.94	687.136	555	243	253	44	71	70	1	3.3			
2	5	0.70	0.94	688.45	554	245	253	44	71	70	1	3.1			
3	7.5	0.61	0.82	689.587	553	248	249	42	71	70	1	3.0			
4	10	0.66	0.88	692.44	554	250	249	42	72	70	1	3.1			
5	12.5	0.64	0.86	693.86	554	249	251	42	73	70	1	2.9			
6	15	0.67	0.90	695.14	555	250	249	43	75	71	1	2.9			
7	17.5	0.69	0.92	696.52	555	249	249	42	77	71	1	2.8			
8	20	0.65	0.84	697.83	555	248	252	43	78	71	1	2.7			
9	22.5	0.63	0.84	699.15	555	245	250	44	80	72	1	2.7			
10	25	0.59	0.79	700.42	556	247	250	43	81	73	1	2.8			
11	27.5	0.72	0.96	701.82	556	244	250	44	82	73	1	2.8			
12	30	0.70	0.94	703.220	555	247	250	44	83	74	1	2.9			
			10.63		6657				914	855					
Total		19.6370	21.6	32.5250	13290				1968	1904					
Average		0.6182	0.900	653.7500					78.5833						

Sum of square roots.

Circle correct bracketed units on data sheet.

TEST LOCATION: FCCU Stack
UNIT: Complex 3 RUN: 1

HCM

TESTING
FIELD DATA SHEET

METHOD: OT 29 PAGE 2 OF 2

Client	Marathon	Project No.	12010
Plant	Detroit	Date	4/27/12
Meter Operator	P. Luckhard		
Probe Operator	N. Hitchens		

Meter Box		Sample Box No.	
Meter Y _d		Meter ΔH _@	
K Factor		Pitot C _p	
Leak Rate Before	[cfm] [Lpm] @ (in. Hg)		
Leak Rate After	[cfm] [Lpm] @ (in. Hg)		
Pitot Leak Check Before:	☐ After: Good ☐ Bad ☐		

Cross-Section of Test Location			
↑ [N] [UP]			
Duct Dimensions (in.)			
Static Pres (in. H ₂ O)	Port Len. (in.)	Gas Flow [In] [Out] of page	First point all the way [In] [Out]

Amb. Temp. (°F)	Bar. Press.	[in. Hg] [mbar]
Probe I.D. No.		
Liner Material		

Filter No.	
Thimble No.	
Nozzle Diameter	Nozzle I.D.

Start Time:	Stop Time:

Traverse Point Number	Min/pt 2.5 Elapsed Time	Velocity Head ΔP (in. H ₂ O)	Orifice Setting ΔH (in. H ₂ O)	Gas Sample Volume V _m Init. Vol. (ft ³) [L]	Stack Temp. T _s (°F)	Probe T _p (°F)		Filter T _f (°F)	Cond. Temp. T _c (°F)	DGM Inlet T _{m in} (°F)	DGM Outlet T _{m out} (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator, approx (%dv)	Amb Filter		Notes
1-1	32.8	0.70	0.94	764.59	543	249	251	250	48	81	76	1	3.3	☐	☐	
2	38	0.68	0.91	765.96	546	249	251	250	49	85	77	1	2.8	☐	☐	
3	27.5	0.80	1.1	707.44	550	250	251	250	49	86	77	1	2.9	☐	☐	
4	40	0.77	1.0	708.88	552	247	251	250	49	87	78	1	2.8	☐	☐	
5	42.5	0.79	1.1	710.37	552	243	251	250	51	88	78	1	2.7	☐	☐	
6	45	0.74	0.99	711.88	554	244	250	249	51	88	79	1	2.8	☐	☐	
7	47.5	0.59	0.79	713.15	556	243	249	249	51	90	80	1	2.7	☐	☐	
8	50	0.59	0.79	714.40	556	245	251	250	53	90	80	1	2.8	☐	☐	
9	52.5	0.59	0.79	715.67	557	250	251	250	52	89	81	1	2.7	☐	☐	
10	55	0.63	0.84	716.99	557	245	252	250	53	90	81	1	2.8	☐	☐	
11	57.5	0.64	0.86	718.31	556	247	250	250	53	90	81	1	2.7	☐	☐	
12	60	0.64	0.86	719.655	554	249	250	250	52	90	81	1	2.8	☐	☐	
			6.91		6633					1054	949					
Total		*														
Average																

Sum of square roots.

Circle correct bracketed units on data sheet.

TEST LOCATION: FCCU Stack
UNIT: sample 3 RUN: 2

HCA

TESTING FIELD DATA SHEET

METHOD: 07M29 PAGE 1 OF 2

Client	Murphy	Project No.	12010
Plant	Detroit	Date	4/27/12
Meter Operator	D. L. Vachard		
Probe Operator	M. H. Itchen		
Meter Box	66-24	Sample Box No.	133
Meter Yd	0.9970	Meter ΔH@	1.7816
K Factor	1.38	Pitot Cp	0.827
Leak Rate Before	0.004 [Lpm]	@ 15	(in. Hg)
Leak Rate After	0.002 [Lpm]	@ 5	(in. Hg)
Pitot Leak Check Before	After: Good	Bad	☐

Cross-Section of Test Location

Duct Dimensions (in.) 82.25

Static Pres (in. H₂O) 0.5

Port Len. (in.) 8

Gas Flow [In] [Out] of page

First point all the way [In] [Out]

Traverse Point Number	Min/pt Elapsed Time	Velocity Head ΔP (in. H ₂ O)	Orifice Setting ΔH (in. H ₂ O)	Gas Sample Volume V _m Init. Vol. (ft ³)	Stack Temp. Ts (°F)	Probe T _p (°F)	Filter T _f (°F)	Cond. Temp. T _c (°F)	DGM Inlet T _{m in} (°F)	DGM Outlet T _{m out} (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator, approx (%dv)	Amb Filter	Dioxin Trap	Notes
1-1	2.5	0.82	1.1	721.59	551	244	254	48	75	77	1	3.4			
2	5	0.81	1.1	723.16	550	247	253	47	76	77	1	3.0			
3	7.5	0.82	1.1	724.53	551	243	253	47	78	77	1	2.8			
4	10	0.84	1.2	726.09	552	245	251	47	78	77	1	2.8			
5	12.5	0.80	1.1	727.57	553	243	251	46	78	77	1	2.9			
6	15	0.74	1.0	729.02	553	244	251	46	80	77	1	2.9			
7	17.5	0.63	0.87	730.36	555	247	252	46	81	77	1	2.9			
8	20	0.58	0.80	731.64	556	249	250	46	82	77	1	2.8			
9	22.5	0.62	0.86	732.96	557	247	250	46	84	77	1	2.8			
10	25	0.63	0.87	734.29	557	244	253	46	85	77	1	2.7			
11	27.5	0.63	0.87	735.63	556	242	251	47	86	78	1	2.7			
12	30	0.62	0.86	736.9150	557	245	250	47	86	78	1	2.8			
			11.73		6648										
Total		19.6814	22.31	32.8100	13301				969	926					
Average		0.8201	0.9296	554.2083					2006	1895					

Sum of square roots.

Circle correct bracketed units on data sheet.

TEST LOCATION: FCCU Stack
UNIT: Complex 5 RUN: 2

TESTING
FIELD DATA SHEET

METHOD: OTH 29 PAGE 2 OF 2

Cross-Section of Test Location

↑
[N] [UP]

Duct Dimensions (in.)		Port Len. (in.)	Gas Flow [In] [Out] of page		First point all the way [In] [Out]
Static Pres (in. H ₂ O)	Port Len. (in.)				

Amb. Temp. (°F)	Bar. Press.	[in. Hg] [mbar]
Probe I.D. No.		
Liner Material		

Filter No.	
Thimble No.	
Nozzle Diameter	Nozzle I.D.

Start Time:	Stop Time:

Traverse Point Number	Min/pt Elapsed Time	Velocity Head ΔP (in. H ₂ O)	Orifice Setting ΔH (in. H ₂ O)	Gas Sample Volume V _m Init. Vol. (ft ³) [L]	Stack Temp. T _s (°F)	Probe T _p (°F) Set Points	Filter T _f (°F)	Cond. Temp. T _c (°F)	DGM Inlet T _{m in} (°F)	DGM Outlet T _{m out} (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator, approx (% dv)	Amb Filter	Dioxin Trap	Notes
2-1	32.5	0.66	0.91	738.31	552	241	248	49	84	80	1	3.0			
2	35	0.68	0.94	739.67	553	243	250	48	85	80	1	2.8			
3	37.5	0.65	0.90	741.03	553	243	250	48	85	80	1	2.8			
4	40	0.62	0.86	742.35	553	244	250	47	86	81	1	2.8			
5	42.5	0.66	0.91	743.71	555	245	251	48	87	81	1	2.8			
6	45	0.66	0.94	745.09	555	248	261	48	88	81	1	2.8			
7	47.5	0.71	0.98	746.52	556	248	252	48	87	81	1	2.8			
8	50	0.65	0.90	747.86	555	245	249	48	87	81	1	2.8			
9	52.5	0.62	0.86	749.17	555	241	250	48	87	81	1	2.8			
10	55	0.61	0.84	750.49	556	241	252	48	86	81	1	2.8			
11	57.5	0.56	0.77	751.74	555	240	250	48	87	81	1	2.8			
12	60	0.56	0.77	752.990	555	246	251	48	88	81	1	2.7			
	Total *		60.58		6653				1037	969					
	Average														

* Sum of square roots.

Circle correct bracketed units on data sheet.

Client <u>Marathon</u>	Project No. <u>12010</u>
Plant <u>Detroit</u>	Date <u>4/27/12</u>
Meter Operator <u>D. Leckhard</u>	
Probe Operator <u>N. Hixson</u>	

Meter Box <u>66-24</u>	Sample Box No.
Meter <u>Yd 0.9970</u>	Meter ΔH @ <u>1.7816</u>
K Factor <u>1.33</u>	Pilot C_p @ <u>0.827</u>
Leak Rate Before <u>0.002</u> [Lpm]	@ <u>15</u> (in. Hg)
Leak Rate After <u>0.002</u> [Lpm]	@ <u>5</u> (in. Hg)
Pilot Leak Check Before: ☒ After: Good ☒ Bad ☐	

Duct Dimensions (in.)	Static Pres (in. H ₂ O)	Port Len. (in.)	Gas Flow (in) [Out] of page	First point all the way
<u>8</u>	<u>0.5</u>	<u>8</u>	<u>82.25</u>	<u>100</u> [Out]

Traverse Point Number	Min/pt Elapsed Time	Velocity Head ΔP (in. H ₂ O)	Orifice Setting ΔH (in. H ₂ O)	Gas Sample Volume V_m (L)	Stack Temp. T_s (°F)	Probe T_p (°F)	Filter T_f (°F)	Cond. Temp. T_c (°F)	DGM Inlet $T_{m in}$ (°F)	DGM Outlet $T_{m out}$ (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator, approx (%dv)	Amb Filter	Dioxin Trap	Notes
2-1	2.5	0.668	0.90	754.55	553	241	253	52	78	80	1	3.3			
2	5	0.67	0.89	755.92	553	243	256	51	79	80	1	3.0			
3	7.5	0.64	0.85	757.26	553	242	254	51	80	80	1	2.8			
4	10	0.65	0.86	758.58	555	241	251	50	81	80	1	2.9			
5	12.5	0.64	0.85	759.90	555	246	252	49	81	80	1	3.0			
6	15	0.65	0.86	761.24	555	246	251	48	82	80	1	2.9			
7	17.5	0.70	0.93	762.62	556	244	251	48	84	80	1	2.9			
8	20	0.64	0.85	763.93	556	242	249	48	85	80	1	2.8			
9	22.5	0.62	0.82	765.25	556	243	250	49	86	80	1	2.9			
10	25	0.58	0.77	766.51	557	249	251	51	86	82	1	2.8			
11	27.5	0.57	0.76	767.76	557	242	251	51	85	82	1	2.7			
12	30	0.57	0.76	769.026	556	241	252	51	86	82	1	2.6			
			16.1		6662				993	966					
Total				92.470	13324				2104	1991					
Average				0.9159	0.9446				85.3125						

TEST LOCATION: FCCU Stack
UNIT: complex 3 RUN: 3

TESTING FIELD DATA SHEET

METHOD: otm 29

PAGE 2

OF 2

Client	Marathon	Project No.	12010
Plant	Petroref	Date	4/27/12
Meter Operator	D. Luckhard		
Probe Operator	N. Hittins		

Meter Box		Sample Box No.	
Meter Yd		Meter ΔH@	
K Factor	1.33	Pitot Cp	
Leak Rate Before	[cfm] [Lpm]	@	(in. Hg)
Leak Rate After	[cfm] [Lpm]	@	(in. Hg)
Pitot Leak Check Before:	☐ After: Good ☐ Bad ☐		

Cross-Section of Test Location			
[N] [UP]			
Duct Dimensions (in.)		Gas Flow	First point all the way
Static Pres (in. H ₂ O)	Port Len. (in.)	[In] [Out]	[In] [Out]
		of page	

Amb. Temp. (°F)	Bar. Press.	[in. Hg] [mbar]
Probe I.D. No.		
Liner Material		

Filter No.	
Thimble No.	
Nozzle Diameter	Nozzle I.D.

Start Time:	Stop Time:

Traverse Point Number	Min/pt Elapsed Time	Velocity Head ΔP (in. H ₂ O)	Orifice Setting ΔH (in. H ₂ O)	Gas Sample Volume V _m (ft ³) [L]	Stack Temp. T _s (°F)	Probe T _p (°F)	Filter T _f (°F)	Cond. Temp. T _c (°F)	DGM Inlet T _{m in} (°F)	DGM Outlet T _{m out} (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator, approx (% dv)	Amb Filter	Dioxin Trap	Notes
1-1	32.5	0.79	1.1	770.51	553	247	247	53	89	84	1	2.8			
2	35	0.82	1.1	771.99	553	243	250	52	89	84	1	2.8			
3	37.5	0.81	1.1	773.49	553	241	251	52	91	84	1	2.7			
4	40	0.79	1.1	774.99	553	244	251	51	93	84	1	2.7			
5	42.5	0.79	1.1	776.49	554	243	250	52	93	85	1	2.7			
6	45	0.74	0.98	777.91	555	239	251	52	95	85	1	2.7			
7	47.5	0.60	0.80	779.25	555	240	250	52	95	86	1	2.7			
8	50	0.60	0.80	780.48	557	242	250	53	95	86	1	2.7			
9	52.5	0.61	0.81	781.77	558	244	250	53	95	86	1	2.7			
10	55	0.62	0.82	783.06	558	246	251	52	94	87	1	2.7			
11	57.5	0.62	0.82	784.37	557	241	250	53	91	87	1	2.7			
12	60	0.63	0.84	785.670	556	244	250	53	91	87	1	2.7			
			11.37		6662				1111	1025					
Total	*														
Average															

Sum of square roots.

Circle correct bracketed units on data sheet.

MARATHON PETROLEUM COMPANY
DETROIT REFINERY

Client Reference No: CN00076641
CleanAir Project No: 12010

FIELD DATA PRINTOUTS

F

I hereby certify that all pages contained within this Appendix have been reviewed and, to the best of my ability, verified as accurate.

QA/QC Initials: KP20

Date: 6/12/2012



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TEST LOG

Client: Marathon Petroleum Company
Project No: 12010

Run Number	Location	Method	Analyte	Date	Start Time	End Time	Notes
1	FCCU Regenerator Stack	USEPA Method 5F/202	NSFPM/CPM	04/24/12	10:33	11:43	
2	FCCU Regenerator Stack	USEPA Method 5F/202	NSFPM/CPM	04/24/12	12:48	13:53	
3	FCCU Regenerator Stack	USEPA Method 5F/202	NSFPM/CPM	04/24/12	14:33	15:55	

Notes:

None

053012 103806

USEPA Method 3 Laboratory Data

Location: FCCU Regenerator Stack
Client: Marathon Petroleum Company

Test Method: USEPA Method 5F/202
Analyte: NSFPM/CPM

Project No: 12010

Method: EPA Method 3

Fuel Type: Non-Combustion

F_o for Fuel: N/A

Analyst: K. Sullivan

Analyst Emp No: 579

Run Number	Trial	Percent CO ₂	Percent O ₂ +CO ₂	Percent O ₂	Percent N ₂	Dry Mol. Weight	F _o	Method of Analysis: CEM
1	1							
	2							
	3							
	Avg.							
CEM or Other Avg:		16.30000		2.00000	81.70000	30.68800	1.15951	☐ Fo value within expected range.
2	1							
	2							
	3							
	Avg.							
CEM or Other Avg:		16.30000		2.00000	81.70000	30.68800	1.15951	☐ Fo value within expected range.
3	1							
	2							
	3							
	Avg.							
CEM or Other Avg:		16.20000		2.20000	81.60000	30.68000	1.15432	☐ Fo value within expected range.
	1							
	2							
	3							
	Avg.							
CEM or Other Avg:								☐ Fo value within expected range.

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USEPA Method 4 Laboratory Data

Location: FCCU Regenerator Stack
 Client: Marathon Petroleum Company
 Project No: 12010

Test Method: USEPA Method 5F/202
 Analyte: NSFPM/CPM
 Analyst: R. Vicere
 Analyst Emp No: 563

Test Run: 1

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	Empty	461.4	413.3	48.1
Impinger 2	Empty	440.5	437.3	3.2
Impinger 3	100 ml DI H2O	546.6	534.7	11.9
Impinger 4	Silica Gel	715.3	698.4	16.9
Impinger 5				
Impinger 6				
Impinger 7				
Impinger 8				

63.2 Liquid (gm)	Field Data Check
0.0 less rinse (gm)	
63.2 Net Liquid (gm)	63.2 ☒ QA/QC OK
+ 16.9 Silica Gel (gm)	16.9 ☒ QA/QC OK
80.1 Total Vlc (gm)	80.1 ☒ QA/QC OK

Rinse: (ml or gm)

Test Run: 2

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	Empty	451.4	415.5	35.9
Impinger 2	Empty	446.3	442.6	3.7
Impinger 3	100 ml DI H2O	556.6	544.1	12.5
Impinger 4	Silica Gel	740.4	718.3	22.1
Impinger 5				
Impinger 6				
Impinger 7				
Impinger 8				

52.1 Liquid (gm)	Field Data Check
0.0 less rinse (gm)	
52.1 Net Liquid (gm)	52.1 ☒ QA/QC OK
+ 22.1 Silica Gel (gm)	22.1 ☒ QA/QC OK
74.2 Total Vlc (gm)	74.2 ☒ QA/QC OK

Rinse: (ml or gm)

Test Run: 3

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	Empty	456.8	412.4	44.4
Impinger 2	Empty	449.5	446.4	3.1
Impinger 3	100 ml DI H2O	548.8	537.2	11.6
Impinger 4	Silica Gel	754.8	733.9	20.9
Impinger 5				
Impinger 6				
Impinger 7				
Impinger 8				

59.1 Liquid (gm)	Field Data Check
0.0 less rinse (gm)	
59.1 Net Liquid (gm)	59.1 ☒ QA/QC OK
+ 20.9 Silica Gel (gm)	20.9 ☒ QA/QC OK
80.0 Total Vlc (gm)	80.0 ☒ QA/QC OK

Rinse: (ml or gm)

Test Run:

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1				
Impinger 2				
Impinger 3				
Impinger 4				
Impinger 5				
Impinger 6				
Impinger 7				
Impinger 8				

Liquid (gm)	Field Data Check
less rinse (gm)	
Net Liquid (gm)	☐ QA/QC OK
Silica Gel (gm)	☐ QA/QC OK
Total Vlc (gm)	☐ QA/QC OK

Rinse: (ml or gm)

053012 103806
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Field Data Printout

Test Method: USEPA Method 5F/202
Analyte: NSFPM/CPM

Location: FCCU Regenerator Stack

Test Run: 1

Client: Marathon Petroleum Company

Project No: 12010

Source Area (ft²): 36.89769

Meter Operator: D. Luckhard 568

Probe Operator: P. Bihun 505

Test Date: 4/24/12

Start Time: 10:33

Stop Time: 11:43

Leak Rate Before: 0.002

Leak Rate After: 0.002

cfm @ 15 "Hg

cfm @ 5 "Hg

Bar. Press. (in. Hg): 28.85

Static P: -0.1

O₂ (dry volume %): 2.00

CO₂ (dry volume %): 16.30

N₂+CO (dry volume %): 81.70

H₂O (condensate, ml or gm): 63.2

H₂O (silica, g): 16.9

Actual Moisture (%): 9.48

Nozzle ID No: 250-1

Nozzle Diameter (D_n): 0.250

Probe ID No: 67-8-19

Pitot C_p: 0.827

Pitot Leak Check: ☒ Pass ☐ Fail

Meter Box ID. No: 66-24

Meter ΔH@: 1.78160

Meter Y_d: 0.99700

Traverse Point	Run Time 2.5 min/read	Pitot ΔP _s (in. H ₂ O)	Sample ΔH (in. H ₂ O)	Metered (dcf)	Stack T _s (°F)	Dry Gas Meter		√ΔP _s (calculated) (√in. H ₂ O)	Volume (calculated) (ft ³)	Isokinetics (calculated) (%)
	0.0					T _{m-in} (°F)	T _{m-out} (°F)			
2-01	2.5	0.80	1.40	338.780	570	66	66	0.89	1.68	102.2
2-02	5.0	0.80	1.40	340.450	570	66	66	0.89	1.67	101.6
2-03	7.5	0.74	1.30	342.100	570	67	66	0.86	1.65	104.3
2-04	10.0	0.65	1.10	343.640	570	69	67	0.81	1.54	103.5
2-05	12.5	0.61	1.00	345.050	570	71	67	0.78	1.41	97.6
2-06	15.0	0.66	1.10	346.520	571	72	67	0.81	1.47	97.8
2-07	17.5	0.68	1.10	348.010	571	73	67	0.82	1.49	97.6
2-08	20.0	0.67	1.10	349.490	570	74	67	0.82	1.48	97.5
2-09	22.5	0.72	1.20	351.000	569	75	68	0.85	1.51	95.8
2-10	25.0	0.71	1.20	352.550	568	77	68	0.84	1.55	98.7
2-11	27.5	0.72	1.20	354.120	567	78	69	0.85	1.57	99.1
2-12	30.0	0.71	1.20	355.665	564	79	69	0.84	1.55	98.0
1-01	32.5	0.93	1.60	357.480	568	75	70	0.96	1.82	101.1
1-02	35.0	0.98	1.70	359.310	567	79	71	0.99	1.83	98.8
1-03	37.5	0.92	1.60	361.140	567	80	71	0.96	1.83	101.9
1-04	40.0	0.94	1.60	362.930	568	82	71	0.97	1.79	98.5
1-05	42.5	0.89	1.50	364.710	569	84	72	0.94	1.78	100.4
1-06	45.0	0.88	1.50	366.480	569	86	73	0.94	1.77	100.1
1-07	47.5	0.63	1.10	367.940	569	88	73	0.79	1.46	97.3
1-08	50.0	0.54	0.91	369.370	569	88	74	0.73	1.43	102.8
1-09	52.5	0.49	0.83	370.698	570	88	75	0.70	1.33	100.2
1-10	55.0	0.55	0.93	372.030	571	88	75	0.74	1.33	94.9
1-11	57.5	0.59	1.00	373.470	571	89	76	0.77	1.44	98.9
1-12	60.0	0.58	0.98	374.900	570	89	76	0.76	1.43	99.0
Final	60.0		1.23125	37.80000	569.08333	74.31250		0.84744	37.80000	

24 points sampled

Sq. RL ΔP

QC-Check: Field Averages

0.8474 1.2313 37.8000 569.0833 74.3125

☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK

053012 103806

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Field Data Printout

Test Method: USEPA Method 5F/202
Analyte: NSFPM/CPM

Location: FCCU Regenerator Stack

Test Run: 2

Client: Marathon Petroleum Company

Project No: 12010

Source Area (ft²): 36.89769

Meter Operator: D. Luckhard 568

Probe Operator: P. Bihun 505

Test Date: 4/24/12

Start Time: 12:48

Stop Time: 13:53

Leak Rate Before: 0.003 cfm @ 15 "Hg

Leak Rate After: 0.002 cfm @ 5 "Hg

Bar. Press. (in. Hg): 28.85

Static P: -0.1

O₂ (dry volume %): 2.00

CO₂ (dry volume %): 16.30

N₂+CO (dry volume %): 81.70

H₂O (condensate, ml or gm): 52.1

H₂O (silica, g): 22.1

Actual Moisture (%): 9.35

Nozzle ID No: 250-1

Nozzle Diameter (D_n): 0.250

Probe ID No: 67-8-19

Pitot C_p: 0.827

Pitot Leak Check: ☒ Pass ☐ Fail

Meter Box ID. No: 66-24

Meter ΔH@: 1.78160

Meter Y_d: 0.99700

Traverse Point	Run Time 2.5 min/read	Pitot ΔP _s (in. H ₂ O)	Sample ΔH (in. H ₂ O)	Metered (dcf)	Stack T _s (°F)	Dry Gas Meter		√ΔP _s (calculated) (√in. H ₂ O)	Volume (calculated) (ft ³)	Isokinetics (calculated) (%)
	0.0					T _{m-in} (°F)	T _{m-out} (°F)			
1-01	2.5	0.95	1.40	376.860	567	71	71	0.97	1.76	97.1
1-02	5.0	0.96	1.40	378.560	566	71	72	0.98	1.70	93.2
1-03	7.5	0.88	1.30	380.210	566	72	72	0.94	1.65	94.3
1-04	10.0	0.89	1.30	381.850	567	74	71	0.94	1.64	93.2
1-05	12.5	0.88	1.30	383.460	568	76	72	0.94	1.61	91.8
1-06	15.0	0.95	1.40	385.140	569	77	72	0.97	1.68	92.2
1-07	17.5	0.64	0.96	386.570	569	80	72	0.80	1.43	95.2
1-08	20.0	0.65	0.98	387.940	570	80	72	0.81	1.37	90.6
1-09	22.5	0.46	0.69	389.200	571	81	72	0.68	1.26	98.9
1-10	25.0	0.55	0.83	390.490	571	82	73	0.74	1.29	92.5
1-11	27.5	0.58	0.87	391.800	570	82	73	0.76	1.31	91.4
1-12	30.0	0.59	0.89	393.150	569	83	73	0.77	1.35	93.3
2-01	32.5	0.84	1.30	394.760	569	81	74	0.92	1.61	93.4
2-02	35.0	0.84	1.30	396.350	570	83	75	0.92	1.59	92.0
2-03	37.5	0.78	1.20	397.920	569	84	75	0.88	1.57	94.1
2-04	40.0	0.66	0.99	399.370	569	85	75	0.81	1.45	94.4
2-05	42.5	0.62	0.93	400.760	570	86	76	0.79	1.39	93.2
2-06	45.0	0.61	0.92	402.130	569	86	76	0.78	1.37	92.6
2-07	47.5	0.67	1.00	403.530	569	87	76	0.82	1.40	90.2
2-08	50.0	0.71	1.10	405.030	567	88	77	0.84	1.50	93.6
2-09	52.5	0.65	0.98	406.547	567	89	77	0.81	1.52	98.8
2-10	55.0	0.74	1.10	407.940	566	90	78	0.86	1.39	84.9*
2-11	57.5	0.71	1.10	409.420	566	90	79	0.84	1.48	92.0
2-12	60.0	0.72	1.10	410.915	561	92	79	0.85	1.50	91.9
Final	60.0		1.09750	35.81500	568.12500	78.16667		0.85084	35.81500	

24 points sampled

Sq.Rt.ΔP

QC-Check: Field Averages

0.8508 1.0975 35.8150 568.1250 78.1667

☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK

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Field Data Printout

Test Method: USEPA Method 5F/202
Analyte: NSFPM/CPM

Location: FCCU Regenerator Stack

Test Run: 3

Client: Marathon Petroleum Company

Project No: 12010

Source Area (ft²): 36.89769

Meter Operator: D. Luckhard 568

Probe Operator: P. Bihun 505

Test Date: 4/24/12

Start Time: 14:33

Stop Time: 15:55

Leak Rate Before: 0.004

Leak Rate After: 0.003

cfm @ 15 "Hg

cfm @ 5 "Hg

Bar. Press. (in. Hg): 28.85

Static P: -0.1

O₂ (dry volume %): 2.20

CO₂ (dry volume %): 16.20

N₂+CO (dry volume %): 81.60

H₂O (condensate, ml or gm): 59.1

H₂O (silica, g): 20.9

Actual Moisture (%): 9.41

Nozzle ID No: 250-1

Nozzle Diameter (D_n): 0.250

Probe ID No: 67-8-19

Pitot C_p: 0.827

Pitot Leak Check: ☒ Pass ☐ Fail

Meter Box ID. No: 66-24

Meter ΔH@: 1.78160

Meter Y_d: 0.99700

Traverse Point	Run Time 2.5 min/read	Pitot ΔP _s (in. H ₂ O)	Sample ΔH (in. H ₂ O)	Metered (dcf)	Stack T _s (°F)	Dry Gas Meter		√ΔP _s (calculated) (√in. H ₂ O)	Volume (calculated) (ft ³)	Isokinetics (calculated) (%)
	0.0			411.200		T _{m-in} (°F)	T _{m-out} (°F)			
2-01	2.5	0.83	1.50	413.030	570	76	77	0.91	1.83	107.1
2-02	5.0	0.84	1.50	414.820	570	76	76	0.92	1.79	104.3
2-03	7.5	0.78	1.40	416.540	569	77	77	0.88	1.72	103.7
2-04	10.0	0.65	1.10	418.060	570	79	77	0.81	1.52	100.2
2-05	12.5	0.64	1.10	419.580	570	80	76	0.80	1.52	101.0
2-06	15.0	0.62	1.10	421.060	570	81	76	0.79	1.48	99.8
2-07	17.5	0.70	1.20	422.640	570	83	76	0.84	1.58	100.1
2-08	20.0	0.69	1.20	424.200	568	84	76	0.83	1.56	99.3
2-09	22.5	0.71	1.20	425.780	567	86	77	0.84	1.58	98.9
2-10	25.0	0.69	1.20	427.370	566	86	77	0.83	1.59	100.9
2-11	27.5	0.69	1.20	428.970	567	87	77	0.83	1.60	101.5
2-12	30.0	0.70	1.20	430.525	564	88	77	0.84	1.55	97.7
1-01	32.5	0.89	1.60	432.320	567	85	78	0.94	1.80	100.4
1-02	35.0	0.94	1.60	434.150	567	85	78	0.97	1.83	99.6
1-03	37.5	0.96	1.70	435.990	561	84	79	0.98	1.84	98.9
1-04	40.0	0.92	1.60	437.820	562	86	79	0.96	1.83	100.3
1-05	42.5	0.82	1.40	439.590	563	88	80	0.91	1.77	102.4
1-06	45.0	0.85	1.50	441.350	563	90	80	0.92	1.76	99.9
1-07	47.5	0.67	1.20	442.990	564	91	80	0.82	1.64	104.7
1-08	50.0	0.49	0.86	444.370	564	91	80	0.70	1.38	102.9
1-09	52.5	0.47	0.82	445.660	564	91	81	0.69	1.29	98.2
1-10	55.0	0.45	0.79	446.930	564	91	81	0.67	1.27	98.7
1-11	57.5	0.58	1.00	448.370	565	91	81	0.76	1.44	98.7
1-12	60.0	0.59	1.00	449.790	562	91	81	0.77	1.42	96.4
Final	60.0		1.24875	38.59000	566.12500	81.75000		0.84151	38.59000	

24 points sampled

Sq.Rt.ΔP

QC-Check: Field Averages

0.8415 1.2488 38.5900 566.1250 81.7500

☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK

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TEST LOG

Client: Marathon Petroleum Company
Project No: 12010

Run Number	Location	Method	Analyte	Date	Start Time	End Time	Notes
4	FCCU Regenerator Stack	USEPA Method 5F/202	NSFPM/CPM	04/25/12	09:08	10:12	
5	FCCU Regenerator Stack	USEPA Method 5F/202	NSFPM/CPM	04/25/12	12:07	13:14	
6	FCCU Regenerator Stack	USEPA Method 5F/202	NSFPM/CPM	04/25/12	14:06	15:23	

Notes:

None

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USEPA Method 3 Laboratory Data

Location: FCCU Regenerator Stack
Client: Marathon Petroleum Company

Test Method: USEPA Method 5F/202
Analyte: NSFPM/CPM

Project No: 12010

Method: EPA Method 3

Fuel Type: Non-Combustion

F_o for Fuel: N/A

Analyst: K. Sullivan

Analyst Emp No: 579

Run Number	Trial	Percent CO ₂	Percent O ₂ +CO ₂	Percent O ₂	Percent N ₂	Dry Mol. Weight	F _o	Method of Analysis: CEM
4	1							
	2							
	3							
Avg.								
CEM or Other Avg:		16.10000		2.40000	81.50000	30.67200	1.14907	☐ Fo value within expected range.

Run Number	Trial	Percent CO ₂	Percent O ₂ +CO ₂	Percent O ₂	Percent N ₂	Dry Mol. Weight	F _o	Method of Analysis: CEM
5	1							
	2							
	3							
Avg.								
CEM or Other Avg:		16.00000		2.50000	81.50000	30.66000	1.15000	☐ Fo value within expected range.

Run Number	Trial	Percent CO ₂	Percent O ₂ +CO ₂	Percent O ₂	Percent N ₂	Dry Mol. Weight	F _o	Method of Analysis: CEM
6	1							
	2							
	3							
Avg.								
CEM or Other Avg:		16.20000		2.30000	81.50000	30.68400	1.14815	☐ Fo value within expected range.

Run Number	Trial	Percent CO ₂	Percent O ₂ +CO ₂	Percent O ₂	Percent N ₂	Dry Mol. Weight	F _o	Method of Analysis:
	1							
	2							
	3							
Avg.								
CEM or Other Avg:								☐ Fo value within expected range.

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USEPA Method 4 Laboratory Data

Location: FCCU Regenerator Stack
 Client: Marathon Petroleum Company
 Project No: 12010

Test Method: USEPA Method 5F/202

Analyte: NSFPM/CPM

Analyst: R. Vicere

Analyst Emp No: 563

Test Run: 4

	Contents	Gross (gm)	Tare (gm)	Net (gm)		
Impinger 1	Empty	424.5	403.1	21.4		
Impinger 2	Empty	442.4	438.1	4.3		
Impinger 3	100 ml DI H2O	565.1	537.3	27.8		
Impinger 4	Silica Gel	741.6	715.2	26.4		
Impinger 5						
Impinger 6					53.5 Liquid (gm)	Field Data Check
Impinger 7					0.0 less rinse (gm)	
Impinger 8					53.5 Net Liquid (gm)	53.5 ☒ QA/QC OK
					+ 26.4 Silica Gel (gm)	26.4 ☒ QA/QC OK
					79.9 Total Vlc (gm)	79.9 ☒ QA/QC OK
	Rinse:		(ml or gm)			

Test Run: 5

	Contents	Gross (gm)	Tare (gm)	Net (gm)		
Impinger 1	Empty	450.6	413.0	37.6		
Impinger 2	Empty	448.4	447.3	1.1		
Impinger 3	100 ml DI H2O	564.0	539.6	24.4		
Impinger 4	Silica Gel	774.7	754.7	20.0		
Impinger 5						
Impinger 6					63.1 Liquid (gm)	Field Data Check
Impinger 7					0.0 less rinse (gm)	
Impinger 8					63.1 Net Liquid (gm)	63.1 ☒ QA/QC OK
					+ 20.0 Silica Gel (gm)	20.0 ☒ QA/QC OK
					83.1 Total Vlc (gm)	83.1 ☒ QA/QC OK
	Rinse:		(ml or gm)			

Test Run: 6

	Contents	Gross (gm)	Tare (gm)	Net (gm)		
Impinger 1	Empty	445.4	416.1	29.3		
Impinger 2	Empty	465.8	463.4	2.4		
Impinger 3	100 ml DI H2O	562.8	541.4	21.4		
Impinger 4	Silica Gel	768.7	740.4	28.3		
Impinger 5						
Impinger 6					53.1 Liquid (gm)	Field Data Check
Impinger 7					0.0 less rinse (gm)	
Impinger 8					53.1 Net Liquid (gm)	53.1 ☒ QA/QC OK
					+ 28.3 Silica Gel (gm)	28.3 ☒ QA/QC OK
					81.4 Total Vlc (gm)	81.4 ☒ QA/QC OK
	Rinse:		(ml or gm)			

Test Run:

	Contents	Gross (gm)	Tare (gm)	Net (gm)		
Impinger 1						
Impinger 2						
Impinger 3						
Impinger 4						
Impinger 5						
Impinger 6						
Impinger 7						
Impinger 8						
					Liquid (gm)	Field Data Check
					less rinse (gm)	
					Net Liquid (gm)	☐ QA/QC OK
					Silica Gel (gm)	☐ QA/QC OK
					Total Vlc (gm)	☐ QA/QC OK
	Rinse:		(ml or gm)			

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Field Data Printout

Test Method: USEPA Method 5F/202
Analyte: NSFPM/CPM

Location: FCCU Regenerator Stack

Test Run: 4

Client: Marathon Petroleum Company

Project No: 12010

Source Area (ft²): 36.89769

Meter Operator: D. Luckhard 568

Probe Operator: P. Bihun 505

Test Date: 4/25/12

Start Time: 09:08

Stop Time: 10:12

Leak Rate Before: 0.002

Leak Rate After: 0.002

cfm @ 15 "Hg

cfm @ 5 "Hg

Bar. Press. (in. Hg): 29.15

Static P: 0.4

O₂ (dry volume %): 2.40

CO₂ (dry volume %): 16.10

N₂+CO (dry volume %): 81.50

H₂O (condensate, ml or gm): 53.5

H₂O (silica, g): 26.4

Actual Moisture (%): 9.60

Nozzle ID No: 250-1

Nozzle Diameter (D_n): 0.250

Probe ID No: 67-8-19

Pitot C_p: 0.827

Pitot Leak Check: ☒ Pass ☐ Fail

Meter Box ID. No: 66-24

Meter ΔH@: 1.78160

Meter Y_d: 0.99700

Traverse Point	Run Time 2.5 min/read	Pitot ΔP _s (in. H ₂ O)	Sample ΔH (in. H ₂ O)	Metered (dcf)	Stack T _s (°F)	Dry Gas Meter		√ΔP _s (calculated) (√in. H ₂ O)	Volume (calculated) (ft ³)	Isokinetics (calculated) (%)
	0.0					T _{m-in} (°F)	T _{m-out} (°F)			
1-01	2.5	0.76	1.40	454.070	553	81	79	0.87	1.75	106.1
1-02	5.0	0.78	1.40	455.780	553	80	79	0.88	1.71	102.4
1-03	7.5	0.84	1.50	457.540	553	81	79	0.92	1.76	101.5
1-04	10.0	0.81	1.40	459.250	554	82	79	0.90	1.71	100.4
1-05	12.5	0.79	1.40	460.950	555	83	79	0.89	1.70	101.0
1-06	15.0	0.75	1.30	462.600	556	84	79	0.87	1.65	100.6
1-07	17.5	0.60	1.10	464.110	557	85	78	0.77	1.51	102.9
1-08	20.0	0.59	1.10	465.590	559	85	78	0.77	1.48	101.8
1-09	22.5	0.61	1.10	467.080	559	86	78	0.78	1.49	100.7
1-10	25.0	0.62	1.10	468.570	559	88	79	0.79	1.49	99.6
1-11	27.5	0.61	1.10	470.040	559	89	79	0.78	1.47	99.0
1-12	30.0	0.61	1.10	471.530	558	90	79	0.78	1.49	100.2
2-01	32.5	0.65	1.20	473.130	556	92	81	0.81	1.60	103.8
2-02	35.0	0.66	1.20	474.690	556	93	81	0.81	1.56	100.3
2-03	37.5	0.65	1.20	476.270	556	93	82	0.81	1.58	102.3
2-04	40.0	0.64	1.10	477.490	557	95	82	0.80	1.22	79.5*
2-05	42.5	0.63	1.10	479.300	558	96	83	0.79	1.81	118.7*
2-06	45.0	0.63	1.10	480.820	558	97	83	0.79	1.52	99.6
2-07	47.5	0.66	1.20	482.400	559	98	84	0.81	1.58	101.0
2-08	50.0	0.66	1.20	483.980	559	99	85	0.81	1.58	100.8
2-09	52.5	0.61	1.10	485.510	559	99	85	0.78	1.53	101.5
2-10	55.0	0.59	1.10	487.030	560	99	86	0.77	1.52	102.5
2-11	57.5	0.57	1.00	488.470	559	99	86	0.75	1.44	98.7
2-12	60.0	0.56	1.00	489.905	559	99	87	0.75	1.43	99.2
Final	60.0		1.18750	37.58500	557.12500	85.89583		0.81204	37.58500	

24 points sampled

Sq. Rt. ΔP

QC-Check: Field Averages

0.8120 1.1875 37.5850 557.1250 85.8958

☒ Avg. OK

☒ Avg. OK

☒ Avg. OK

☒ Avg. OK

☒ Avg. OK

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Field Data Printout

Test Method: USEPA Method 5F/202
Analyte: NSFPM/CPM

Location: FCCU Regenerator Stack

Test Run: 5

Client: Marathon Petroleum Company

Project No: 12010

Source Area (ft²): 36.89769

Meter Operator: D. Luckhard 568

Probe Operator: P. Bihun 505

Test Date: 4/25/12

Start Time: 12:07

Stop Time: 13:14

Leak Rate Before: 0.003

Leak Rate After: 0.004

cfm @ 15 "Hg

cfm @ 5 "Hg

Bar. Press. (in. Hg): 29.15

Static P: 0.4

O₂ (dry volume %): 2.50

CO₂ (dry volume %): 16.00

N₂+CO (dry volume %): 81.50

Nozzle ID No: 250-1

Nozzle Diameter (D_n): 0.250

Probe ID No: 67-8-19

Pitot C_p: 0.827

Pitot Leak Check: ☒ Pass ☐ Fail

H₂O (condensate, ml or gm): 63.1

H₂O (silica, g): 20.0

Actual Moisture (%): 9.90

Meter Box ID. No: 66-24

Meter ΔH@: 1.78160

Meter Y_d: 0.99700

Traverse Point	Run Time 2.5 min/read	Pitot ΔP _s (in. H ₂ O)	Sample ΔH (in. H ₂ O)	Metered (dcf)	Stack T _s (°F)	Dry Gas Meter T _{m-in} (°F)	T _{m-out} (°F)	√ΔP _s (calculated) (√in. H ₂ O)	Volume (calculated) (ft³)	Isokinetics (calculated) (%)
	0.0			495.600						
1-01	2.5	0.68	1.20	497.230	556	77	76	0.82	1.63	105.5
1-02	5.0	0.67	1.20	498.830	556	77	76	0.82	1.60	104.4
1-03	7.5	0.67	1.20	500.420	556	79	76	0.82	1.59	103.5
1-04	10.0	0.64	1.10	501.900	557	81	76	0.80	1.48	98.4
1-05	12.5	0.63	1.10	503.390	558	84	76	0.79	1.49	99.6
1-06	15.0	0.66	1.20	504.980	558	85	76	0.81	1.59	103.8
1-07	17.5	0.69	1.20	506.560	559	87	76	0.83	1.58	100.8
1-08	20.0	0.66	1.20	508.150	560	89	77	0.81	1.59	103.4
1-09	22.5	0.64	1.10	509.650	560	90	78	0.80	1.50	98.9
1-10	25.0	0.62	1.10	511.140	560	90	78	0.79	1.49	99.8
1-11	27.5	0.58	1.00	512.570	560	91	79	0.76	1.43	98.8
1-12	30.0	0.57	1.00	514.020	559	91	79	0.75	1.45	101.0
2-01	32.5	0.78	1.40	515.700	552	83	79	0.88	1.68	100.6
2-02	35.0	0.78	1.40	517.390	553	85	79	0.88	1.69	101.0
2-03	37.5	0.80	1.40	519.070	552	86	80	0.89	1.68	98.9
2-04	40.0	0.82	1.50	520.820	555	88	80	0.91	1.75	101.8
2-05	42.5	0.78	1.40	522.540	556	89	80	0.88	1.72	102.5
2-06	45.0	0.71	1.30	524.190	556	90	80	0.84	1.65	102.9
2-07	47.5	0.61	1.10	525.690	557	90	80	0.78	1.50	101.0
2-08	50.0	0.59	1.10	527.190	559	90	80	0.77	1.50	102.8
2-09	52.5	0.59	1.10	528.680	560	91	80	0.77	1.49	102.0
2-10	55.0	0.62	1.10	530.180	560	92	81	0.79	1.50	100.0
2-11	57.5	0.61	1.10	531.680	559	92	81	0.78	1.50	100.8
2-12	60.0	0.62	1.10	533.185	558	93	82	0.79	1.51	100.1
Final	60.0		1.19167	37.58500	557.33333	82.81250		0.81583	37.58500	

24 points sampled

Sq.Rt.ΔP

QC-Check: Field Averages

0.8158 1.1917 37.5850 557.3333 82.8125

☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK

053012 103806

K

Field Data Printout

Test Method: USEPA Method 5F/202
Analyte: NSFPM/CPM

Location: FCCU Regenerator Stack

Test Run: 6

Client: Marathon Petroleum Company

Project No: 12010

Source Area (ft²): 36.89769

Meter Operator: D. Luckhard 568

Probe Operator: P. Bihun 505

Test Date: 4/25/12

Start Time: 14:06

Stop Time: 15:23

Leak Rate Before: 0.003

Leak Rate After: 0.002

cfm @ 15 "Hg

cfm @ 5 "Hg

Bar. Press. (in. Hg): 29.15

Static P: 0.4

O₂ (dry volume %): 2.30

CO₂ (dry volume %): 16.20

N₂+CO (dry volume %): 81.50

Nozzle ID No: 250-1

Nozzle Diameter (D_n): 0.250

Probe ID No: 67-8-19

Pitot C_p: 0.827

Pitot Leak Check: ☒ Pass ☐ Fail

H₂O (condensate, ml or gm): 53.1

H₂O (silica, g): 28.3

Actual Moisture (%): 9.70

Meter Box ID. No: 66-24

Meter ΔH@: 1.78160

Meter Y_d: 0.99700

Traverse Point	Run Time 2.5 min/read	Pitot ΔP _s (in. H ₂ O)	Sample ΔH (in. H ₂ O)	Metered (dcf)	Stack T _s (°F)	Dry Gas Meter T _{m-in} (°F)	T _{m-out} (°F)	√ΔP _s (calculated) (√in. H ₂ O)	Volume (calculated) (ft³)	Isokinetics (calculated) (%)
	0.0			533.500						
1-01	2.5	0.78	1.40	535.230	552	74	76	0.88	1.73	104.6
1-02	5.0	0.77	1.40	536.940	553	74	76	0.88	1.71	104.1
1-03	7.5	0.77	1.40	538.650	553	74	76	0.88	1.71	104.1
1-04	10.0	0.81	1.40	540.370	553	76	76	0.90	1.72	101.9
1-05	12.5	0.79	1.40	542.050	556	77	76	0.89	1.68	100.8
1-06	15.0	0.73	1.30	543.700	557	78	76	0.85	1.65	102.9
1-07	17.5	0.63	1.10	545.180	558	80	76	0.79	1.48	99.2
1-08	20.0	0.60	1.10	546.660	560	81	76	0.77	1.48	101.7
1-09	22.5	0.61	1.10	548.140	560	81	76	0.78	1.48	100.8
1-10	25.0	0.63	1.10	549.610	560	83	76	0.79	1.47	98.4
1-11	27.5	0.62	1.10	551.060	560	83	76	0.79	1.45	97.8
1-12	30.0	0.61	1.10	552.530	560	83	76	0.78	1.47	100.0
2-01	32.5	0.65	1.20	554.070	555	82	77	0.81	1.54	101.2
2-02	35.0	0.66	1.20	555.630	555	83	77	0.81	1.56	101.7
2-03	37.5	0.65	1.20	557.190	554	82	78	0.81	1.56	102.4
2-04	40.0	0.65	1.20	558.770	556	83	78	0.81	1.58	103.7
2-05	42.5	0.62	1.10	560.270	557	84	78	0.79	1.50	100.7
2-06	45.0	0.66	1.20	561.820	558	86	78	0.81	1.55	100.8
2-07	47.5	0.70	1.20	563.400	558	85	79	0.84	1.58	99.8
2-08	50.0	0.69	1.20	564.980	559	86	79	0.83	1.58	100.4
2-09	52.5	0.61	1.10	566.480	560	87	79	0.78	1.50	101.3
2-10	55.0	0.62	1.10	567.970	560	87	79	0.79	1.49	99.8
2-11	57.5	0.61	1.10	569.470	560	87	80	0.78	1.50	101.2
2-12	60.0	0.57	1.00	570.905	560	87	80	0.75	1.43	100.2
Final	60.0		1.19583	37.40500	557.25000	79.52083		0.81648	37.40500	

24 points sampled

Sq. Rt. ΔP

QC-Check: Field Averages

0.8165 1.1958 37.4050 557.2500 79.5208

☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK

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TEST LOG

Client: Marathon Petroleum Company
Project No: 12010

Run Number	Location	Method	Analyte	Date	Start Time	End Time	Notes
7	FCCU Regenerator Stack	USEPA Method 5F/202	NSFPM/CPM	04/26/12	08:24	09:31	
8	FCCU Regenerator Stack	USEPA Method 5F/202	NSFPM/CPM	04/26/12	10:10	11:17	
9	FCCU Regenerator Stack	USEPA Method 5F/202	NSFPM/CPM	04/26/12	11:58	13:17	

Notes:

None

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USEPA Method 3 Laboratory Data

Location: FCCU Regenerator Stack
 Client: Marathon Petroleum Company
 Project No: 12010
 Method: EPA Method 3
 Fuel Type: Non-Combustion
 F_o for Fuel: N/A

Test Method: USEPA Method 5F/202
 Analyte: NSFPM/CPM

Analyst: K. Sullivan
 Analyst Emp No: 579

Run Number	Trial	Percent CO ₂	Percent O ₂ +CO ₂	Percent O ₂	Percent N ₂	Dry Mol. Weight	F _o	Method of Analysis: CEM
7	1							
	2							
	3							
Avg.								
CEM or Other Avg:		16.00000		2.30000	81.70000	30.65200	1.16250	☐ Fo value within expected range.

Run Number	Trial	Percent CO ₂	Percent O ₂ +CO ₂	Percent O ₂	Percent N ₂	Dry Mol. Weight	F _o	Method of Analysis: CEM
8	1							
	2							
	3							
Avg.								
CEM or Other Avg:		16.00000		2.30000	81.70000	30.65200	1.16250	☐ Fo value within expected range.

Run Number	Trial	Percent CO ₂	Percent O ₂ +CO ₂	Percent O ₂	Percent N ₂	Dry Mol. Weight	F _o	Method of Analysis: CEM
9	1							
	2							
	3							
Avg.								
CEM or Other Avg:		15.80000		2.40000	81.80000	30.62400	1.17089	☐ Fo value within expected range.

Run Number	Trial	Percent CO ₂	Percent O ₂ +CO ₂	Percent O ₂	Percent N ₂	Dry Mol. Weight	F _o	Method of Analysis:
	1							
	2							
	3							
Avg.								
CEM or Other Avg:								☐ Fo value within expected range.

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USEPA Method 4 Laboratory Data

Location: FCCU Regenerator Stack
Client: Marathon Petroleum Company
Project No: 12010

Test Method: USEPA Method 5F/202

Analyte: NSFPM/CPM

Analyst: R. Vicere

Analyst Emp No: 563

Test Run: 7

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	Empty	437.8	403.9	33.9
Impinger 2	Empty	441.5	438.1	3.4
Impinger 3	100 ml DI H2O	560.8	535.8	25.0
Impinger 4	Silica Gel	733.7	708.7	25.0
Impinger 5				
Impinger 6				
Impinger 7				
Impinger 8				

62.3 Liquid (gm)

0.0 less rinse (gm)

62.3 Net Liquid (gm)

+ 25.0 Silica Gel (gm)

87.3 Total Vlc (gm)

Field Data Check

62.3

25.0

87.3

☒ QA/QC OK

☒ QA/QC OK

☒ QA/QC OK

Rinse: (ml or gm)

Test Run: 8

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	Empty	455.3	413.8	41.5
Impinger 2	Empty	451.4	448.3	3.1
Impinger 3	100 ml DI H2O	566.1	547.7	18.4
Impinger 4	Silica Gel	720.5	696.7	23.8
Impinger 5				
Impinger 6				
Impinger 7				
Impinger 8				

63.0 Liquid (gm)

0.0 less rinse (gm)

63.0 Net Liquid (gm)

+ 23.8 Silica Gel (gm)

86.8 Total Vlc (gm)

Field Data Check

63.0

23.8

86.8

☒ QA/QC OK

☒ QA/QC OK

☒ QA/QC OK

Rinse: (ml or gm)

Test Run: 9

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	Empty	456.2	416.5	39.7
Impinger 2	Empty	466.8	464.7	2.1
Impinger 3	100 ml DI H2O	564.5	541.4	23.1
Impinger 4	Silica Gel	723.8	704.0	19.8
Impinger 5				
Impinger 6				
Impinger 7				
Impinger 8				

64.9 Liquid (gm)

0.0 less rinse (gm)

64.9 Net Liquid (gm)

+ 19.8 Silica Gel (gm)

84.7 Total Vlc (gm)

Field Data Check

64.9

19.8

84.7

☒ QA/QC OK

☒ QA/QC OK

☒ QA/QC OK

Rinse: (ml or gm)

Test Run:

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1				
Impinger 2				
Impinger 3				
Impinger 4				
Impinger 5				
Impinger 6				
Impinger 7				
Impinger 8				

Liquid (gm)

less rinse (gm)

Net Liquid (gm)

Silica Gel (gm)

Total Vlc (gm)

Field Data Check

☐ QA/QC OK

☐ QA/QC OK

☐ QA/QC OK

Rinse: (ml or gm)

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Field Data Printout

Test Method: USEPA Method 5F/202
Analyte: NSFPM/CPM

Location: FCCU Regenerator Stack

Test Run: 7

Client: Marathon Petroleum Company

Project No: 12010

Source Area (ft²): 36.89769

Meter Operator: D. Luckhard 568

Probe Operator: P. Bihun 505

Test Date: 4/26/12

Start Time: 08:24

Stop Time: 09:31

Leak Rate Before: 0.002

Leak Rate After: 0.002

cfm @ 15 "Hg

cfm @ 5 "Hg

Bar. Press. (in. Hg): 29.00

Static P: 0.4

O₂ (dry volume %): 2.30

CO₂ (dry volume %): 16.00

N₂+CO (dry volume %): 81.70

H₂O (condensate, ml or gm): 62.3

H₂O (silica, g): 25.0

Actual Moisture (%): 10.04

Nozzle ID No: 250-1

Nozzle Diameter (D_n): 0.250

Probe ID No: 67-8-19

Pitot C_p: 0.827

Pitot Leak Check: ☒ Pass ☐ Fail

Meter Box ID. No: 66-24

Meter ΔH@: 1.78160

Meter Y_d: 0.99700

Traverse Point	Run Time 2.5 min/read	Pitot ΔP _s (in. H ₂ O)	Sample ΔH (in. H ₂ O)	Metered (dcf)	Stack T _s (°F)	Dry Gas Meter T _{m-in} (°F)	T _{m-out} (°F)	√ΔP _s (calculated) (√in. H ₂ O)	Volume (calculated) (ft ³)	Isokinetics (calculated) (%)
	0.0			571.035						
1-01	2.5	0.80	1.50	572.910	556	67	67	0.89	1.88	113.9*
1-02	5.0	0.81	1.50	574.650	556	67	67	0.90	1.74	105.0
1-03	7.5	0.83	1.50	576.390	556	68	67	0.91	1.74	103.6
1-04	10.0	0.82	1.50	578.130	558	70	67	0.91	1.74	104.2
1-05	12.5	0.80	1.50	579.860	559	71	67	0.89	1.73	104.8
1-06	15.0	0.80	1.50	581.610	560	75	68	0.89	1.75	105.6
1-07	17.5	0.65	1.20	583.180	562	76	69	0.81	1.57	104.9
1-08	20.0	0.61	1.10	584.380	562	77	69	0.78	1.20	82.7*
1-09	22.5	0.59	1.10	586.150	563	78	70	0.77	1.77	123.8*
1-10	25.0	0.64	1.20	587.730	562	79	70	0.80	1.58	106.0
1-11	27.5	0.63	1.20	589.290	562	81	71	0.79	1.56	105.2
1-12	30.0	0.62	1.10	590.880	561	81	71	0.79	1.59	108.0
2-01	32.5	0.67	1.20	592.440	559	81	73	0.82	1.56	101.7
2-02	35.0	0.67	1.20	594.000	559	81	74	0.82	1.56	101.6
2-03	37.5	0.66	1.20	595.540	559	82	74	0.81	1.54	100.9
2-04	40.0	0.67	1.20	597.120	560	83	75	0.82	1.58	102.6
2-05	42.5	0.63	1.20	598.660	561	84	75	0.79	1.54	103.1
2-06	45.0	0.65	1.20	600.230	561	86	75	0.81	1.57	103.3
2-07	47.5	0.71	1.30	601.870	562	87	76	0.84	1.64	103.1
2-08	50.0	0.65	1.20	603.470	562	88	77	0.81	1.60	104.9
2-09	52.5	0.64	1.20	605.070	563	88	77	0.80	1.60	105.8
2-10	55.0	0.66	1.20	606.670	563	89	78	0.81	1.60	104.0
2-11	57.5	0.56	1.00	608.140	562	89	78	0.75	1.47	103.6
2-12	60.0	0.56	1.00	609.585	562	89	79	0.75	1.45	101.8
Final	60.0		1.25000	38.55000	560.41667	76.06250		0.82343	38.55000	

24 points sampled

Sq.Rt.ΔP

QC-Check: Field Averages

0.8234 1.2500 38.5500 560.4167 76.0625

☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK

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Field Data Printout

Test Method: USEPA Method 5F/202
Analyte: NSFPM/CPM

Location: FCCU Regenerator Stack

Test Run: 8

Client: Marathon Petroleum Company

Project No: 12010

Source Area (ft²): 36.89769

Meter Operator: D. Luckhard 568

Probe Operator: P. Bihun 505

Test Date: 4/26/12

Start Time: 10:10

Stop Time: 11:17

Leak Rate Before: 0.003 cfm @ 15 "Hg

Leak Rate After: 0.002 cfm @ 5 "Hg

Bar. Press. (in. Hg): 29.00

Static P: 0.4

O₂ (dry volume %): 2.30

CO₂ (dry volume %): 16.00

N₂+CO (dry volume %): 81.70

H₂O (condensate, ml or gm): 63.0

H₂O (silica, g): 23.8

Actual Moisture (%): 10.06

Nozzle ID No: 250-1

Nozzle Diameter (D_n): 0.250

Probe ID No: 67-8-19

Pitot C_p: 0.827

Pitot Leak Check: ☒ Pass ☐ Fail

Meter Box ID. No: 66-24

Meter ΔH@: 1.78160

Meter Y_d: 0.99700

Traverse Point	Run Time 2.5 min/read	Pitot ΔP _s (in. H ₂ O)	Sample ΔH (in. H ₂ O)	Metered (dcf)	Stack T _s (°F)	Dry Gas Meter T _{m-in} (°F)	T _{m-out} (°F)	√ΔP _s (calculated) (√in. H ₂ O)	Volume (calculated) (ft ³)	Isokinetics (calculated) (%)
	0.0			609.775						
2-01	2.5	0.69	1.30	611.480	556	72	74	0.83	1.71	110.2*
2-02	5.0	0.68	1.20	613.040	556	72	74	0.82	1.56	101.5
2-03	7.5	0.68	1.20	614.620	555	74	74	0.82	1.58	102.6
2-04	10.0	0.66	1.20	616.180	556	75	74	0.81	1.56	102.8
2-05	12.5	0.68	1.20	617.750	556	77	74	0.82	1.57	101.7
2-06	15.0	0.66	1.20	619.290	559	78	74	0.81	1.54	101.3
2-07	17.5	0.67	1.20	620.540	560	79	74	0.82	1.25	81.6*
2-08	20.0	0.66	1.20	622.430	560	81	74	0.81	1.89	124.1*
2-09	22.5	0.63	1.20	624.000	561	82	74	0.79	1.57	105.4
2-10	25.0	0.60	1.10	625.510	561	84	74	0.77	1.51	103.7
2-11	27.5	0.57	1.00	626.940	561	84	74	0.75	1.43	100.7
2-12	30.0	0.58	1.10	628.420	560	85	74	0.76	1.48	103.2
1-01	32.5	0.80	1.50	630.170	555	85	77	0.89	1.75	103.5
1-02	35.0	0.79	1.40	631.890	555	86	77	0.89	1.72	102.2
1-03	37.5	0.82	1.50	633.650	555	89	78	0.91	1.76	102.3
1-04	40.0	0.87	1.60	635.500	557	90	78	0.93	1.85	104.5
1-05	42.5	0.78	1.40	637.300	558	91	79	0.88	1.80	107.1
1-06	45.0	0.77	1.40	639.050	558	92	79	0.88	1.75	104.7
1-07	47.5	0.63	1.20	640.660	560	93	80	0.79	1.61	106.4
1-08	50.0	0.62	1.10	642.160	561	93	80	0.79	1.50	99.9
1-09	52.5	0.60	1.10	643.660	561	93	81	0.77	1.50	101.5
1-10	55.0	0.64	1.20	645.220	561	93	81	0.80	1.56	102.2
1-11	57.5	0.63	1.20	646.780	561	94	82	0.79	1.56	102.8
1-12	60.0	0.64	1.20	648.390	559	94	82	0.80	1.61	105.2
Final	60.0		1.24583	38.61500	558.41667	80.79167		0.82403	38.61500	

24 points sampled

Sq.Rt.ΔP

QC-Check: Field Averages

0.8240 1.2458 38.6150 558.4167 80.7917

☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK

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Field Data Printout

Test Method: USEPA Method 5F/202
Analyte: NSFPM/CPM

Location: FCCU Regenerator Stack

Test Run: 9

Client: Marathon Petroleum Company

Project No: 12010

Source Area (ft²): 36.89769

Meter Operator: D. Luckhard 568

Probe Operator: P. Bihun 505

Test Date: 4/26/12

Start Time: 11:58

Stop Time: 13:17

Leak Rate Before: 0.003

Leak Rate After: 0.002

cfm @ 15 "Hg

cfm @ 5 "Hg

Bar. Press. (in. Hg): 29.00

Static P: 0.4

O₂ (dry volume %): 2.40

CO₂ (dry volume %): 15.80

N₂+CO (dry volume %): 81.80

H₂O (condensate, ml or gm): 64.9

H₂O (silica, g): 19.8

Actual Moisture (%): 9.98

Nozzle ID No: 250-1

Nozzle Diameter (D_n): 0.250

Probe ID No: 67-8-19

Pitot C_p: 0.827

Pitot Leak Check: ☒ Pass ☐ Fail

Meter Box ID. No: 66-24

Meter ΔH@: 1.78160

Meter Y_d: 0.99700

Traverse Point	Run Time 2.5 min/read	Pitot ΔP _s (in. H ₂ O)	Sample ΔH (in. H ₂ O)	Metered (dcf)	Stack T _s (°F)	Dry Gas Meter T _{m-in} (°F)	T _{m-out} (°F)	√ΔP _s (calculated) (√in. H ₂ O)	Volume (calculated) (ft³)	Isokinetics (calculated) (%)
	0.0			648.560						
1-01	2.5	0.80	1.50	650.390	553	79	82	0.89	1.83	108.1
1-02	5.0	0.79	1.40	652.130	553	79	82	0.89	1.74	103.5
1-03	7.5	0.81	1.50	653.880	555	80	81	0.90	1.75	102.8
1-04	10.0	0.82	1.50	655.260	554	82	81	0.91	1.38	80.4*
1-05	12.5	0.82	1.50	657.390	555	83	81	0.91	2.13	124.0*
1-06	15.0	0.71	1.30	659.070	556	85	81	0.84	1.68	104.9
1-07	17.5	0.62	1.10	660.640	558	85	81	0.79	1.57	105.0
1-08	20.0	0.58	1.10	662.150	559	85	81	0.76	1.51	104.5
1-09	22.5	0.62	1.10	663.660	559	85	81	0.79	1.51	101.0
1-10	25.0	0.61	1.10	665.150	558	86	81	0.78	1.49	100.4
1-11	27.5	0.61	1.10	666.660	556	87	81	0.78	1.51	101.5
1-12	30.0	0.62	1.10	668.140	556	88	81	0.79	1.48	98.6
2-01	32.5	0.65	1.20	669.760	555	84	81	0.81	1.62	105.8
2-02	35.0	0.66	1.20	671.260	552	85	82	0.81	1.50	96.9
2-03	37.5	0.64	1.20	672.850	554	85	82	0.80	1.59	104.4
2-04	40.0	0.65	1.20	674.450	555	86	82	0.81	1.60	104.2
2-05	42.5	0.60	1.10	675.960	555	83	82	0.77	1.51	102.6
2-06	45.0	0.65	1.20	677.530	556	85	82	0.81	1.57	102.4
2-07	47.5	0.67	1.20	679.150	555	86	82	0.82	1.62	103.9
2-08	50.0	0.70	1.30	680.710	556	87	82	0.84	1.56	97.9
2-09	52.5	0.62	1.10	682.270	556	88	82	0.79	1.56	103.8
2-10	55.0	0.60	1.10	683.740	556	88	82	0.77	1.47	99.5
2-11	57.5	0.58	1.10	685.240	556	89	82	0.76	1.50	103.1
2-12	60.0	0.59	1.10	686.755	555	89	82	0.77	1.51	103.2
Final	60.0		1.22083	38.19500	555.54167	83.25000		0.81562	38.19500	

24 points sampled

Sq.Rt.ΔP

QC-Check: Field Averages

0.8156 1.2208 38.1950 555.5417 83.2500

☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK

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TEST LOG

Client: Marathon Petroleum Company
Project No: 12010

Run Number	Location	Method	Analyte	Date	Start Time	End Time	Notes
1	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/24/12	10:33	11:33	
2	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/24/12	12:48	13:48	
3	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/24/12	14:33	15:33	

Notes:

None

053012 103806

USEPA Method 3 Laboratory Data

Test Method: USEPA Mod. CTM-027
Analyte: NH3

Location: FCCU Regenerator Stack
Client: Marathon Petroleum Company
Project No: 12010
Method: EPA Method 3
Fuel Type: Non-Combustion
F_o for Fuel: N/A

Analyst: K. Sullivan
Analyst Emp No: 579

Run Number	Trial	Percent CO ₂	Percent O ₂ +CO ₂	Percent O ₂	Percent N ₂	Dry Mol. Weight	F _o	Method of Analysis: CEM
1	1							
	2							
	3							
Avg.								
CEM or Other Avg:		16.40000		2.00000	81.60000	30.70400	1.15244	☐ Fo value within expected range.
2	1							
	2							
	3							
Avg.								
CEM or Other Avg:		16.40000		2.00000	81.60000	30.70400	1.15244	☐ Fo value within expected range.
3	1							
	2							
	3							
Avg.								
CEM or Other Avg:		16.20000		2.20000	81.60000	30.68000	1.15432	☐ Fo value within expected range.
	1							
	2							
	3							
Avg.								
CEM or Other Avg:								☐ Fo value within expected range.

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USEPA Method 4 Laboratory Data

Location: FCCU Regenerator Stack
Client: Marathon Petroleum Company
Project No: 12010

Test Method: USEPA Mod. CTM-027

Analyte: NH3

Analyst: R. Vicere

Analyst Emp No: 563

Test Run: 1

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	100 ml 0.1N H2SO4	607.9	541.6	66.3
Impinger 2	100 ml 0.1N H2SO4	543.5	541.4	2.1
Impinger 3	100 ml 0.1N H2SO4	539.3	539.0	0.3
Impinger 4	Silica Gel	731.5	719.3	12.2
Impinger 5				
Impinger 6				
Impinger 7				
Impinger 8				

68.7 Liquid (gm)

0.0 less rinse (gm)

68.7 Net Liquid (gm)

+ 12.2 Silica Gel (gm)

80.9 Total Vlc (gm)

Field Data Check

68.7

☒ QA/QC OK

12.2

☒ QA/QC OK

80.9

☒ QA/QC OK

Rinse: (ml or gm)

Test Run: 2

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	100 ml 0.1N H2SO4	630.3	560.2	70.1
Impinger 2	100 ml 0.1N H2SO4	546.4	543.4	3.0
Impinger 3	100 ml 0.1N H2SO4	552.4	552.0	0.4
Impinger 4	Silica Gel	801.4	790.0	11.4
Impinger 5				
Impinger 6				
Impinger 7				
Impinger 8				

73.5 Liquid (gm)

0.0 less rinse (gm)

73.5 Net Liquid (gm)

+ 11.4 Silica Gel (gm)

84.9 Total Vlc (gm)

Field Data Check

73.5

☒ QA/QC OK

11.4

☒ QA/QC OK

84.9

☒ QA/QC OK

Rinse: (ml or gm)

Test Run: 3

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	100 ml 0.1N H2SO4	613.5	542.6	70.9
Impinger 2	100 ml 0.1N H2SO4	545.7	543.1	2.6
Impinger 3	100 ml 0.1N H2SO4	540.8	540.3	0.5
Impinger 4	Silica Gel	740.2	731.3	8.9
Impinger 5				
Impinger 6				
Impinger 7				
Impinger 8				

74.0 Liquid (gm)

0.0 less rinse (gm)

74.0 Net Liquid (gm)

+ 8.9 Silica Gel (gm)

82.9 Total Vlc (gm)

Field Data Check

74.0

☒ QA/QC OK

8.9

☒ QA/QC OK

82.9

☒ QA/QC OK

Rinse: (ml or gm)

Test Run:

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1				
Impinger 2				
Impinger 3				
Impinger 4				
Impinger 5				
Impinger 6				
Impinger 7				
Impinger 8				

Liquid (gm)

less rinse (gm)

Net Liquid (gm)

Silica Gel (gm)

Total Vlc (gm)

Field Data Check

☐ QA/QC OK

☐ QA/QC OK

☐ QA/QC OK

Rinse: (ml or gm)

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Field Data Printout

Test Method: USEPA Mod. CTM-027
Analyte: NH3

Location: FCCU Regenerator Stack

Test Run: 1

Client: Marathon Petroleum Company

Project No: 12010

Source Area (ft²): 36.89769

Meter Operator: B. Arnold 770

Probe Operator: B. Arnold 770

Test Date: 4/24/12

Start Time: 10:33

Stop Time: 11:33

Leak Rate Before: 0.003 cfm @ 15 "Hg

Leak Rate After: 0.002 cfm @ 7 "Hg

Bar. Press. (in. Hg): 28.85

Static P: -0.1

O₂ (dry volume %): 2.00

CO₂ (dry volume %): 16.40

N₂+CO (dry volume %): 81.60

Nozzle ID No: 252-1

Nozzle Diameter (D_n): 0.252

Probe ID No: 67-4-1

Pitot C_p: 0.818

Pitot Leak Check: ☒ Pass ☐ Fail

H₂O (condensate, ml or gm): 68.7

H₂O (silica, g): 12.2

Actual Moisture (%): 9.90

Meter Box ID. No: 66-22

Meter ΔH@: 1.88190

Meter Y_d: 1.00200

Traverse Point	Run Time 5.0 min/read	Pitot ΔP _s (in. H ₂ O)	Sample ΔH (in. H ₂ O)	Metered (dcf)	Stack T _s (°F)	Dry Gas Meter		√ΔP _s (calculated) (√in. H ₂ O)	Volume (calculated) (ft ³)	Isokinetics (calculated) (%)
	0.0					T _{m-in} (°F)	T _{m-out} (°F)			
1-01	5.0	0.65	1.20	957.350	569	65	65	0.81	3.06	103.8
1-01	10.0	0.69	1.20	960.320	569	68	64	0.83	2.97	97.6
1-01	15.0	0.65	1.20	963.270	568	67	66	0.81	2.95	99.7
1-01	20.0	0.67	1.20	966.250	569	70	67	0.82	2.98	98.9
1-01	25.0	0.67	1.20	969.230	569	72	67	0.82	2.98	98.7
1-01	30.0	0.65	1.20	972.180	569	74	68	0.81	2.95	98.9
1-01	35.0	0.70	1.30	975.260	569	75	69	0.84	3.08	99.4
1-01	40.0	0.67	1.20	978.260	569	75	70	0.82	3.00	98.8
1-01	45.0	0.69	1.20	981.270	569	77	70	0.83	3.01	97.5
1-01	50.0	0.67	1.20	984.270	565	80	70	0.82	3.00	98.2
1-01	55.0	0.67	1.20	987.260	566	82	71	0.82	2.99	97.6
1-01	60.0	0.67	1.20	990.275	566	83	71	0.82	3.01	98.3
Final	60.0		1.20833	35.98500	568.08333	71.08333		0.81899	35.98500	

1 points sampled

Sq.Rt.ΔP

QC-Check: Field Averages

0.8190 1.2083 35.9850 568.0833 71.0833

☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK

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Field Data Printout

Test Method: USEPA Mod. CTM-027
Analyte: NH3

Location: FCCU Regenerator Stack

Test Run: 2

Client: Marathon Petroleum Company

Project No: 12010

Source Area (ft²): 36.89769

Meter Operator: B. Arnold 770

Probe Operator: B. Arnold 770

Test Date: 4/24/12

Start Time: 12:48

Stop Time: 13:48

Leak Rate Before: 0.002 cfm @ 15 "Hg

Leak Rate After: 0.001 cfm @ 2 "Hg

Bar. Press. (in. Hg): 28.85

Static P: -0.1

O₂ (dry volume %): 2.00

CO₂ (dry volume %): 16.40

N₂+CO (dry volume %): 81.60

H₂O (condensate, ml or gm): 73.5

H₂O (silica, g): 11.4

Actual Moisture (%): 10.12

Nozzle ID No: 252-1

Nozzle Diameter (D_n): 0.252

Probe ID No: 67-4-1

Pitot C_p: 0.818

Pitot Leak Check: ☒ Pass ☐ Fail

Meter Box ID. No: 66-22

Meter ΔH@: 1.88190

Meter Y_d: 1.00200

Traverse Point	Run Time 5.0 min/read	Pitot ΔP _s (in. H ₂ O)	Sample ΔH (in. H ₂ O)	Metered (dcf)	Stack T _s (°F)	Dry Gas Meter T _{m-in} (°F)	T _{m-out} (°F)	√ΔP _s (calculated) (√in. H ₂ O)	Volume (calculated) (ft ³)	Isokinetics (calculated) (%)
	0.0			990.540						
1-01	5.0	0.67	1.30	993.690	567	67	67	0.82	3.15	105.0
1-01	10.0	0.70	1.30	996.810	567	70	68	0.84	3.12	101.3
1-01	15.0	0.67	1.30	999.890	567	72	69	0.82	3.08	102.0
1-01	20.0	0.67	1.30	1003.010	567	74	69	0.82	3.12	103.1
1-01	25.0	0.65	1.20	1006.000	567	77	70	0.81	2.99	99.9
1-01	30.0	0.67	1.30	1009.120	567	80	71	0.82	3.12	102.3
1-01	35.0	0.70	1.30	1012.230	567	80	72	0.84	3.11	99.7
1-01	40.0	0.67	1.30	1015.350	567	80	72	0.82	3.12	102.2
1-01	45.0	0.67	1.30	1018.460	567	81	74	0.82	3.11	101.6
1-01	50.0	0.67	1.30	1021.560	567	83	74	0.82	3.10	101.1
1-01	55.0	0.65	1.20	1024.580	567	83	74	0.81	3.02	100.0
1-01	60.0	0.70	1.30	1027.585	567	83	74	0.84	3.01	95.9
Final	60.0		1.28333	37.04500	567.00000	74.33333		0.82101	37.04500	

1 points sampled

Sq.Rt.ΔP

QC-Check: Field Averages

0.8210 1.2833 37.0450 567.0000 74.3333

☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK

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Field Data Printout

Test Method: USEPA Mod. CTM-027
Analyte: NH3

Location: FCCU Regenerator Stack

Test Run: 3

Client: Marathon Petroleum Company

Project No: 12010

Source Area (ft²): 36.89769

Meter Operator: B. Arnold 770

Probe Operator: B. Arnold 770

Test Date: 4/24/12

Start Time: 14:33

Stop Time: 15:33

Leak Rate Before: 0.003 cfm @ 15 "Hg

Leak Rate After: 0.001 cfm @ 5 "Hg

Bar. Press. (in. Hg): 28.85

Static P: -0.1

O₂ (dry volume %): 2.20

CO₂ (dry volume %): 16.20

N₂+CO (dry volume %): 81.60

H₂O (condensate, ml or gm): 74.0

H₂O (silica, g): 8.9

Actual Moisture (%): 9.75

Nozzle ID No: 252-1

Nozzle Diameter (D_n): 0.252

Probe ID No: 67-4-1

Pitot C_p: 0.818

Pitot Leak Check: ☒ Pass ☐ Fail

Meter Box ID. No: 66-22

Meter ΔH@: 1.88190

Meter Y_d: 1.00200

Traverse Point	Run Time 5.0 min/read	Pitot ΔP _s (in. H ₂ O)	Sample ΔH (in. H ₂ O)	Metered (dcf)	Stack T _s (°F)	Dry Gas Meter		√ΔP _s (calculated) (√in. H ₂ O)	Volume (calculated) (ft ³)	Isokinetics (calculated) (%)
	0.0			27.675		T _{m-in} (°F)	T _{m-out} (°F)			
1-01	5.0	0.68	1.30	30.880	571	72	72	0.82	3.21	104.8
1-01	10.0	0.68	1.30	33.990	566	73	72	0.82	3.11	101.4
1-01	15.0	0.68	1.30	37.110	572	77	72	0.82	3.12	101.6
1-01	20.0	0.70	1.30	40.240	571	79	73	0.84	3.13	100.2
1-01	25.0	0.70	1.30	43.350	567	81	74	0.84	3.11	99.1
1-01	30.0	0.73	1.40	46.610	567	84	74	0.85	3.26	101.4
1-01	35.0	0.72	1.40	49.880	567	85	75	0.85	3.27	102.2
1-01	40.0	0.70	1.30	53.020	567	85	76	0.84	3.14	99.5
1-01	45.0	0.70	1.30	56.170	565	85	76	0.84	3.15	99.7
1-01	50.0	0.70	1.30	59.310	563	85	77	0.84	3.14	99.2
1-01	55.0	0.70	1.30	62.470	563	86	77	0.84	3.16	99.7
1-01	60.0	0.73	1.40	65.655	561	86	77	0.85	3.19	98.3
Final	60.0		1.32500	37.98000	566.66667	78.04167		0.83760	37.98000	

1 points sampled

Sq.Rt.ΔP

QC-Check: Field Averages

0.8381 1.3250 37.9800 566.6667 78.0417

☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK

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TEST LOG

Client: Marathon Petroleum Company
Project No: 12010

Run Number	Location	Method	Analyte	Date	Start Time	End Time	Notes
4	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/25/12	09:08	10:08	
5	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/25/12	12:07	13:07	
6	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/25/12	14:06	15:06	

Notes:

None

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USEPA Method 3 Laboratory Data

Location: FCCU Regenerator Stack

Client: Marathon Petroleum Company

Project No: 12010

Method: EPA Method 3

Fuel Type: Non-Combustion

F_o for Fuel: N/ATest Method: USEPA Mod. CTM-027
Analyte: NH₃Analyst: K. Sullivan
Analyst Emp No: 579

Run Number	Trial	Percent CO ₂	Percent O ₂ +CO ₂	Percent O ₂	Percent N ₂	Dry Mol. Weight	F _o	Method of Analysis: CEM
4	1							
	2							
	3							
Avg.								
CEM or Other Avg:		15.90000		2.70000	81.40000	30.65200	1.14465	☐ Fo value within expected range.

Run Number	Trial	Percent CO ₂	Percent O ₂ +CO ₂	Percent O ₂	Percent N ₂	Dry Mol. Weight	F _o	Method of Analysis: CEM
5	1							
	2							
	3							
Avg.								
CEM or Other Avg:		16.00000		2.50000	81.50000	30.66000	1.15000	☐ Fo value within expected range.

Run Number	Trial	Percent CO ₂	Percent O ₂ +CO ₂	Percent O ₂	Percent N ₂	Dry Mol. Weight	F _o	Method of Analysis: CEM
6	1							
	2							
	3							
Avg.								
CEM or Other Avg:		15.90000		2.60000	81.50000	30.64800	1.15094	☐ Fo value within expected range.

Run Number	Trial	Percent CO ₂	Percent O ₂ +CO ₂	Percent O ₂	Percent N ₂	Dry Mol. Weight	F _o	Method of Analysis:
	1							
	2							
	3							
Avg.								
CEM or Other Avg:								☐ Fo value within expected range.

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USEPA Method 4 Laboratory Data

Location: FCCU Regenerator Stack
 Client: Marathon Petroleum Company
 Project No: 12010

Test Method: USEPA Mod. CTM-027

Analyte: NH3

Analyst: R. Vicere

Analyst Emp No: 563

Test Run: 4

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	100 ml 0.1N H2SO4	629.3	562.9	66.4
Impinger 2	100 ml 0.1N H2SO4	550.3	547.4	2.9
Impinger 3	100 ml 0.1N H2SO4	557.8	557.5	0.3
Impinger 4	Silica Gel	810.2	801.3	8.9
Impinger 5				
Impinger 6				
Impinger 7				
Impinger 8				

69.6 Liquid (gm)

0.0 less rinse (gm)

69.6 Net Liquid (gm)

+ 8.9 Silica Gel (gm)

78.5 Total Vlc (gm)

Field Data Check

69.6

8.9

78.5

☒ QA/QC OK

☒ QA/QC OK

☒ QA/QC OK

Rinse: (ml or gm)

Test Run: 5

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	100 ml 0.1N H2SO4	611.4	544.0	67.4
Impinger 2	100 ml 0.1N H2SO4	547.2	545.0	2.2
Impinger 3	100 ml 0.1N H2SO4	541.0	540.2	0.8
Impinger 4	Silica Gel	747.8	739.9	7.9
Impinger 5				
Impinger 6				
Impinger 7				
Impinger 8				

70.4 Liquid (gm)

0.0 less rinse (gm)

70.4 Net Liquid (gm)

+ 7.9 Silica Gel (gm)

78.3 Total Vlc (gm)

Field Data Check

70.4

7.9

78.3

☒ QA/QC OK

☒ QA/QC OK

☒ QA/QC OK

Rinse: (ml or gm)

Test Run: 6

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	100 ml 0.1N H2SO4	628.0	563.8	64.2
Impinger 2	100 ml 0.1N H2SO4	553.0	549.5	3.5
Impinger 3	100 ml 0.1N H2SO4	552.4	552.5	-0.1
Impinger 4	Silica Gel	817.8	809.9	7.9
Impinger 5				
Impinger 6				
Impinger 7				
Impinger 8				

67.6 Liquid (gm)

0.0 less rinse (gm)

67.6 Net Liquid (gm)

+ 7.9 Silica Gel (gm)

75.5 Total Vlc (gm)

Field Data Check

67.6

7.9

75.5

☒ QA/QC OK

☒ QA/QC OK

☒ QA/QC OK

Rinse: (ml or gm)

Test Run:

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1				
Impinger 2				
Impinger 3				
Impinger 4				
Impinger 5				
Impinger 6				
Impinger 7				
Impinger 8				

Liquid (gm)

less rinse (gm)

Net Liquid (gm)

Silica Gel (gm)

Total Vlc (gm)

Field Data Check

☐ QA/QC OK

☐ QA/QC OK

☐ QA/QC OK

Rinse: (ml or gm)

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Field Data Printout

Test Method: USEPA Mod. CTM-027
Analyte: NH3

Location: FCCU Regenerator Stack

Test Run: 4

Client: Marathon Petroleum Company

Project No: 12010

Source Area (ft²): 36.89769

Meter Operator: B. Arnold 770

Probe Operator: B. Arnold 770

Test Date: 4/25/12

Start Time: 09:08

Stop Time: 10:08

Leak Rate Before: 0.002 cfm @ 15 "Hg

Leak Rate After: 0.001 cfm @ 4 "Hg

Bar. Press. (in. Hg): 29.15

Static P: 0.4

O₂ (dry volume %): 2.70

CO₂ (dry volume %): 15.90

N₂+CO (dry volume %): 81.40

Nozzle ID No: 252-1

Nozzle Diameter (D_n): 0.252

Probe ID No: 67-4-1

Pitot C_p: 0.818

Pitot Leak Check: ☒ Pass ☐ Fail

H₂O (condensate, ml or gm): 69.6

H₂O (silica, g): 8.9

Actual Moisture (%): 9.73

Meter Box ID. No: 66-22

Meter ΔH@: 1.88190

Meter Y_d: 1.00200

Traverse Point	Run Time 5.0 min/read	Pitot ΔP _s (in. H ₂ O)	Sample ΔH (in. H ₂ O)	Metered (dcf)	Stack T _s (°F)	Dry Gas Meter		√ΔP _s (calculated) (√in. H ₂ O)	Volume (calculated) (ft ³)	Isokinetics (calculated) (%)
	0.0					T _{m-in} (°F)	T _{m-out} (°F)			
1-01	5.0	0.63	1.20	69.550	555	75	78	0.79	2.94	98.7
1-01	10.0	0.63	1.20	72.560	555	74	78	0.79	3.01	101.1
1-01	15.0	0.63	1.20	75.520	555	74	76	0.79	2.96	99.6
1-01	20.0	0.64	1.20	78.510	555	76	75	0.80	2.99	99.7
1-01	25.0	0.64	1.20	81.500	555	79	75	0.80	2.99	99.5
1-01	30.0	0.63	1.20	84.500	555	81	76	0.79	3.00	100.3
1-01	35.0	0.63	1.20	87.510	555	84	77	0.79	3.01	100.3
1-01	40.0	0.61	1.20	90.510	555	87	78	0.78	3.00	101.2
1-01	45.0	0.59	1.10	93.400	555	90	80	0.77	2.89	98.6
1-01	50.0	0.61	1.20	96.400	555	91	81	0.78	3.00	100.5
1-01	55.0	0.63	1.20	99.470	555	93	83	0.79	3.07	100.9
1-01	60.0	0.63	1.20	102.480	555	94	84	0.79	3.01	98.7
Final	60.0		1.19167	35.87000	555.00000	80.79167		0.79052	35.87000	

1 points sampled

Sq.Rt.ΔP

QC-Check: Field Averages

0.7905 1.1917 35.8700 555.0000 80.7917

☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK

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Field Data Printout

Test Method: USEPA Mod. CTM-027
Analyte: NH3

Location: FCCU Regenerator Stack

Test Run: 5

Client: Marathon Petroleum Company

Project No: 12010

Source Area (ft²): 36.89769

Meter Operator: B. Arnold 770

Probe Operator: B. Arnold 770

Test Date: 4/25/12

Start Time: 12:07

Stop Time: 13:07

Leak Rate Before: 0.003 cfm @ 15 "Hg

Leak Rate After: 0.002 cfm @ 10 "Hg

Bar. Press. (in. Hg): 29.15

Static P: 0.4

O₂ (dry volume %): 2.50

CO₂ (dry volume %): 16.00

N₂+CO (dry volume %): 81.50

Nozzle ID No: 252-1

Nozzle Diameter (D_n): 0.252

Probe ID No: 67-4-1

Pitot C_p: 0.818

Pitot Leak Check: ☒ Pass ☐ Fail

H₂O (condensate, ml or gm): 70.4

H₂O (silica, g): 7.9

Actual Moisture (%): 9.57

Meter Box ID. No: 66-22

Meter ΔH@: 1.88190

Meter Y_d: 1.00200

Traverse Point	Run Time 5.0 min/read	Pitot ΔP _s (in. H ₂ O)	Sample ΔH (in. H ₂ O)	Metered (dcf)	Stack T _s (°F)	Dry Gas Meter		√ΔP _s (calculated) (√in. H ₂ O)	Volume (calculated) (ft ³)	Isokinetics (calculated) (%)
	0.0					T _{m-in} (°F)	T _{m-out} (°F)			
1-01	5.0	0.61	1.20	105.640	555	68	68	0.78	3.01	104.0
1-01	10.0	0.61	1.20	108.640	555	69	68	0.78	3.00	103.7
1-01	15.0	0.61	1.20	111.630	555	72	71	0.78	2.99	102.8
1-01	20.0	0.61	1.20	114.620	555	75	71	0.78	2.99	102.5
1-01	25.0	0.64	1.20	117.620	555	76	71	0.80	3.00	100.3
1-01	30.0	0.61	1.20	120.630	555	78	72	0.78	3.01	102.8
1-01	35.0	0.62	1.20	123.620	555	78	72	0.79	2.99	101.3
1-01	40.0	0.64	1.20	126.620	555	77	71	0.80	3.00	100.2
1-01	45.0	0.64	1.20	129.610	555	78	72	0.80	2.99	99.7
1-01	50.0	0.63	1.20	132.600	555	79	72	0.79	2.99	100.4
1-01	55.0	0.64	1.20	135.580	555	79	72	0.80	2.98	99.3
1-01	60.0	0.61	1.20	138.570	555	79	72	0.78	2.99	102.0
Final	60.0		1.20000	35.93500	555.00000	73.33333		0.78894	35.93500	

1 points sampled

Sq.Rt.ΔP

QC-Check: Field Averages

0.7889 1.2000 35.9350 555.0000 73.3330

☒ Avg. OK

☒ Avg. OK

☒ Avg. OK

☒ Avg. OK

☒ Avg. OK

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Field Data Printout

Test Method: USEPA Mod. CTM-027
Analyte: NH3

Location: FCCU Regenerator Stack

Test Run: 6

Client: Marathon Petroleum Company

Project No: 12010

Source Area (ft²): 36.89769

Meter Operator: B. Arnold 770

Probe Operator: B. Arnold 770

Test Date: 4/25/12

Start Time: 14:06

Stop Time: 15:06

Leak Rate Before: 0.003 cfm @ 15 "Hg

Leak Rate After: 0.002 cfm @ 8 "Hg

Bar. Press. (in. Hg): 29.15

Static P: 0.4

O₂ (dry volume %): 2.60

CO₂ (dry volume %): 15.90

N₂+CO (dry volume %): 81.50

Nozzle ID No: 252-1

Nozzle Diameter (D_n): 0.252

Probe ID No: 67-4-1

Pitot C_p: 0.818

Pitot Leak Check: ☒ Pass ☐ Fail

H₂O (condensate, ml or gm): 67.6

H₂O (silica, g): 7.9

Actual Moisture (%): 9.71

Meter Box ID. No: 66-22

Meter ΔH@: 1.88190

Meter Y_d: 1.00200

Traverse Point	Run Time 5.0 min/read	Pitot ΔP _s (in. H ₂ O)	Sample ΔH (in. H ₂ O)	Metered (dcf)	Stack T _s (°F)	Dry Gas Meter		√ΔP _s (calculated) (√in. H ₂ O)	Volume (calculated) (ft ³)	Isokinetics (calculated) (%)
	0.0					T _{m-in} (°F)	T _{m-out} (°F)			
1-01	5.0	0.61	1.20	141.700	555	67	67	0.78	3.02	104.8
1-01	10.0	0.61	1.20	144.670	555	68	68	0.78	2.97	102.9
1-01	15.0	0.59	1.10	147.540	554	71	68	0.77	2.87	100.7
1-01	20.0	0.59	1.10	150.390	555	74	69	0.77	2.85	99.7
1-01	25.0	0.59	1.10	153.250	554	76	70	0.77	2.86	99.7
1-01	30.0	0.57	1.00	156.030	554	78	71	0.75	2.78	98.3
1-01	35.0	0.59	1.10	158.900	555	80	72	0.77	2.87	99.6
1-01	40.0	0.57	1.00	161.690	554	82	73	0.75	2.79	98.1
1-01	45.0	0.57	1.00	164.480	554	83	74	0.75	2.79	98.0
1-01	50.0	0.57	1.00	167.260	554	84	75	0.75	2.78	97.4
1-01	55.0	0.57	1.00	170.060	554	84	76	0.75	2.80	98.0
1-01	60.0	0.57	1.00	172.870	554	86	77	0.75	2.81	98.1
Final	60.0		1.06667	34.19000	554.33333	74.70833		0.76370	34.19000	

1 points sampled

Sq.Rt.ΔP

QC-Check: Field Averages

0.7637 1.0667 34.1900 554.3333 74.7083

☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK

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TEST LOG

Client: Marathon Petroleum Company
Project No: 12010

Run Number	Location	Method	Analyte	Date	Start Time	End Time	Notes
7	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/26/12	08:24	09:24	
8	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/26/12	10:10	11:10	
9	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/26/12	11:58	12:58	

Notes:

None

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USEPA Method 3 Laboratory Data

Test Method: USEPA Mod. CTM-027
Analyte: NH3

Location: FCCU Regenerator Stack
Client: Marathon Petroleum Company
Project No: 12010
Method: EPA Method 3
Fuel Type: Non-Combustion
F_o for Fuel: N/A

Analyst: K. Sullivan
Analyst Emp No: 579

Run Number	Trial	Percent CO ₂	Percent O ₂ +CO ₂	Percent O ₂	Percent N ₂	Dry Mol. Weight	F _o	Method of Analysis: CEM
7	1							
	2							
	3							
	Avg.							
CEM or Other Avg:		15.90000		2.40000	81.70000	30.64000	1.16352	☐ Fo value within expected range.
8	1							
	2							
	3							
	Avg.							
CEM or Other Avg:		15.80000		2.50000	81.70000	30.62800	1.16456	☐ Fo value within expected range.
9	1							
	2							
	3							
	Avg.							
CEM or Other Avg:		15.90000		2.50000	81.60000	30.64400	1.15723	☐ Fo value within expected range.
	1							
	2							
	3							
	Avg.							
CEM or Other Avg:								☐ Fo value within expected range.

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USEPA Method 4 Laboratory Data

Location: FCCU Regenerator Stack
 Client: Marathon Petroleum Company
 Project No: 12010

Test Method: USEPA Mod. CTM-027

Analyte: NH3

Analyst: R. Vicere

Analyst Emp No: 563

Test Run: 7

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	100 ml 0.1N H2SO4	613.9	543.1	70.8
Impinger 2	100 ml 0.1N H2SO4	548.1	543.7	4.4
Impinger 3	100 ml 0.1N H2SO4	539.8	539.4	0.4
Impinger 4	Silica Gel	718.5	707.0	11.5
Impinger 5				
Impinger 6				
Impinger 7				
Impinger 8				

75.6 Liquid (gm)

Field Data Check

0.0 less rinse (gm)

75.6 Net Liquid (gm)

75.6

☒ QA/QC OK

+ 11.5 Silica Gel (gm)

11.5

☒ QA/QC OK

87.1 Total Vlc (gm)

87.1

☒ QA/QC OK

Rinse: (ml or gm)

Test Run: 8

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	100 ml 0.1N H2SO4	629.2	562.1	67.1
Impinger 2	100 ml 0.1N H2SO4	550.3	545.4	4.9
Impinger 3	100 ml 0.1N H2SO4	556.9	556.1	0.8
Impinger 4	Silica Gel	826.9	817.4	9.5
Impinger 5				
Impinger 6				
Impinger 7				
Impinger 8				

72.8 Liquid (gm)

Field Data Check

0.0 less rinse (gm)

72.8 Net Liquid (gm)

72.8

☒ QA/QC OK

+ 9.5 Silica Gel (gm)

9.5

☒ QA/QC OK

82.3 Total Vlc (gm)

82.3

☒ QA/QC OK

Rinse: (ml or gm)

Test Run: 9

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	100 ml 0.1N H2SO4	614.2	542.9	71.3
Impinger 2	100 ml 0.1N H2SO4	544.8	541.9	2.9
Impinger 3	100 ml 0.1N H2SO4	543.2	542.3	0.9
Impinger 4	Silica Gel	726.6	718.3	8.3
Impinger 5				
Impinger 6				
Impinger 7				
Impinger 8				

75.1 Liquid (gm)

Field Data Check

0.0 less rinse (gm)

75.1 Net Liquid (gm)

75.1

☒ QA/QC OK

+ 8.3 Silica Gel (gm)

8.3

☒ QA/QC OK

83.4 Total Vlc (gm)

83.4

☒ QA/QC OK

Rinse: (ml or gm)

Test Run:

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1				
Impinger 2				
Impinger 3				
Impinger 4				
Impinger 5				
Impinger 6				
Impinger 7				
Impinger 8				

Liquid (gm)

Field Data Check

less rinse (gm)

Net Liquid (gm)

☐ QA/QC OK

Silica Gel (gm)

☐ QA/QC OK

Total Vlc (gm)

☐ QA/QC OK

Rinse: (ml or gm)

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Field Data Printout

Test Method: USEPA Mod. CTM-027
Analyte: NH3

Location: FCCU Regenerator Stack

Test Run: 7

Client: Marathon Petroleum Company

Project No: 12010

Source Area (ft²): 36.89769

Meter Operator: B. Arnold 770

Probe Operator: B. Arnold 770

Test Date: 4/26/12

Start Time: 08:24

Stop Time: 09:24

Leak Rate Before: 0.003 cfm @ 15 "Hg

Leak Rate After: 0.001 cfm @ 6 "Hg

Bar. Press. (in. Hg): 29.00

Static P: 0.4

O₂ (dry volume %): 2.40

CO₂ (dry volume %): 15.90

N₂+CO (dry volume %): 81.70

Nozzle ID No: 252-1

Nozzle Diameter (D_n): 0.252

Probe ID No: 67-4-1

Pitot C_p: 0.818

Pitot Leak Check: ☒ Pass ☐ Fail

H₂O (condensate, ml or gm): 75.6

H₂O (silica, g): 11.5

Actual Moisture (%): 10.67

Meter Box ID. No: 66-22

Meter ΔH@: 1.88190

Meter Y_d: 1.00200

Traverse Point	Run Time 5.0 min/read	Pitot ΔP _s (in. H ₂ O)	Sample ΔH (in. H ₂ O)	Metered (dcf)	Stack T _s (°F)	Dry Gas Meter		√ΔP _s (calculated) (√in. H ₂ O)	Volume (calculated) (ft ³)	Isokinetics (calculated) (%)
	0.0					T _{m-in} (°F)	T _{m-out} (°F)			
1-01	5.0	0.65	1.30	173.980	556	63	63	0.81	2.12	72.3*
1-01	10.0	0.67	1.30	179.170	557	64	64	0.82	3.07	103.0
1-01	15.0	0.65	1.30	182.250	557	67	64	0.81	3.08	104.6
1-01	20.0	0.65	1.30	185.310	558	71	66	0.81	3.06	103.4
1-01	25.0	0.62	1.20	188.300	558	75	67	0.79	2.99	102.9
1-01	30.0	0.65	1.30	191.420	558	78	69	0.81	3.12	104.4
1-01	35.0	0.65	1.30	194.540	558	79	70	0.81	3.12	104.2
1-01	40.0	0.62	1.20	197.540	558	82	71	0.79	3.00	102.2
1-01	45.0	0.60	1.20	200.530	558	83	73	0.77	2.99	103.3
1-01	50.0	0.60	1.20	203.540	558	85	74	0.77	3.01	103.7
1-01	55.0	0.63	1.20	206.540	558	86	75	0.79	3.00	100.6
1-01	60.0	0.63	1.20	209.565	558	87	75	0.79	3.03	101.4
Final	60.0		1.25000	35.58500	557.66667	72.95833		0.79676	35.58500	

1 points sampled

Sq.Rt.ΔP

QC-Check: Field Averages

0.7968 1.2500 35.5850 557.6667 72.9583

☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK

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Field Data Printout

Test Method: USEPA Mod. CTM-027
Analyte: NH3

Location: FCCU Regenerator Stack

Test Run: 8

Client: Marathon Petroleum Company

Project No: 12010

Source Area (ft²): 36.89769

Meter Operator: B. Arnold 770

Probe Operator: B. Arnold 770

Test Date: 4/26/12

Start Time: 10:10

Stop Time: 11:10

Leak Rate Before: 0.003 cfm @ 15 "Hg

Leak Rate After: 0.001 cfm @ 7 "Hg

Bar. Press. (in. Hg): 29.00

Static P: 0.4

O₂ (dry volume %): 2.50

CO₂ (dry volume %): 15.80

N₂+CO (dry volume %): 81.70

Nozzle ID No: 252-1

Nozzle Diameter (D_n): 0.252

Probe ID No: 67-4-1

Pitot C_p: 0.818

Pitot Leak Check: ☒ Pass ☐ Fail

H₂O (condensate, ml or gm): 72.8

H₂O (silica, g): 9.5

Actual Moisture (%): 9.92

Meter Box ID. No: 66-22

Meter ΔH@: 1.88190

Meter Y_d: 1.00200

Traverse Point	Run Time 5.0 min/read	Pitot ΔP _s (in. H ₂ O)	Sample ΔH (in. H ₂ O)	Metered (dcf)	Stack T _s (°F)	Dry Gas Meter		√ΔP _s (calculated) (√in. H ₂ O)	Volume (calculated) (ft ³)	Isokinetics (calculated) (%)
	0.0					T _{m-in} (°F)	T _{m-out} (°F)			
1-01	5.0	0.63	1.20	212.670	555	72	74	0.79	2.99	100.9
1-01	10.0	0.63	1.20	215.680	557	74	74	0.79	3.01	101.5
1-01	15.0	0.63	1.20	218.670	557	77	74	0.79	2.99	100.5
1-01	20.0	0.65	1.30	221.770	556	79	74	0.81	3.10	102.4
1-01	25.0	0.65	1.30	224.880	556	81	74	0.81	3.11	102.5
1-01	30.0	0.63	1.20	227.870	556	84	75	0.79	2.99	99.7
1-01	35.0	0.63	1.20	230.890	556	86	76	0.79	3.02	100.4
1-01	40.0	0.67	1.30	234.020	556	87	76	0.82	3.13	100.9
1-01	45.0	0.67	1.30	237.170	556	90	78	0.82	3.15	101.0
1-01	50.0	0.67	1.30	240.310	556	91	79	0.82	3.14	100.5
1-01	55.0	0.67	1.30	243.470	556	92	81	0.82	3.16	100.9
1-01	60.0	0.65	1.30	246.630	556	93	81	0.81	3.16	102.3
Final	60.0		1.25833	36.95000	556.08333	80.08333		0.80512	36.95000	

1 points sampled

Sq.Rt.ΔP

QC-Check: Field Averages

0.8051 1.2583 36.9500 556.0833 80.0833

☒ Avg. OK

☒ Avg. OK

☒ Avg. OK

☒ Avg. OK

☒ Avg. OK

053012 103806

0

Field Data Printout

Test Method: USEPA Mod. CTM-027
Analyte: NH3

Location: FCCU Regenerator Stack

Test Run: 9

Client: Marathon Petroleum Company

Project No: 12010

Source Area (ft²): 36.89769

Meter Operator: B. Arnold 770

Probe Operator: B. Arnold 770

Test Date: 4/26/12

Start Time: 11:58

Stop Time: 12:58

Leak Rate Before: 0.002

Leak Rate After: 0.001

cfm @ 15 "Hg

cfm @ 8 "Hg

Bar. Press. (in. Hg): 29.00

Static P: 0.4

O₂ (dry volume %): 2.50

CO₂ (dry volume %): 15.90

N₂+CO (dry volume %): 81.60

H₂O (condensate, ml or gm): 75.1

H₂O (silica, g): 8.3

Actual Moisture (%): 10.33

Nozzle ID No: 252-1

Nozzle Diameter (D_n): 0.252

Probe ID No: 67-4-1

Pitot C_p: 0.818

Pitot Leak Check: ☒ Pass ☐ Fail

Meter Box ID. No: 66-22

Meter ΔH@: 1.88190

Meter Y_d: 1.00200

Traverse Point	Run Time 5.0 min/read	Pitot ΔP _s (in. H ₂ O)	Sample ΔH (in. H ₂ O)	Metered (dcf)	Stack T _s (°F)	Dry Gas Meter		√ΔP _s (calculated) (√in. H ₂ O)	Volume (calculated) (ft ³)	Isokinetics (calculated) (%)
	0.0					T _{m-in} (°F)	T _{m-out} (°F)			
1-01	5.0	0.62	1.20	246.740	554	80	80	0.79	3.04	102.4
1-01	10.0	0.62	1.20	249.780	554	80	81	0.79	3.02	101.6
1-01	15.0	0.62	1.20	252.800	554	82	81	0.79	3.00	100.8
1-01	20.0	0.62	1.20	255.800	553	83	80	0.79	3.00	100.7
1-01	25.0	0.58	1.20	258.800	552	85	80	0.76	2.98	103.2
1-01	30.0	0.62	1.20	261.780	553	86	80	0.79	2.99	100.1
1-01	35.0	0.62	1.20	264.770	553	87	80	0.79	3.02	101.0
1-01	40.0	0.58	1.20	267.790	552	88	80	0.76	3.02	104.3
1-01	45.0	0.55	1.10	270.810	552	89	81	0.74	2.92	103.3
1-01	50.0	0.58	1.20	273.730	552	88	81	0.76	3.00	103.5
1-01	55.0	0.58	1.20	276.730	551	88	81	0.76	3.00	103.5
1-01	60.0	0.58	1.20	279.730	551	89	82	0.76	3.00	103.3
Final	60.0		1.19167	35.99000	552.58333	83.00000		0.77283	35.99000	

1 points sampled

Sq.Rt.ΔP

QC-Check: Field Averages

0.7728 1.1917 35.9900 552.5833 83.0000

☒ Avg. OK

☒ Avg. OK

☒ Avg. OK

☒ Avg. OK

☒ Avg. OK

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TEST LOG

Client: Marathon Petroleum Company
Project No: 12010

Run Number	Location	Method	Analyte	Date	Start Time	End Time	Notes
10	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/27/12	09:28	10:28	
11	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/27/12	11:12	12:12	
12	FCCU Regenerator Stack	USEPA Mod. CTM-027	NH3	04/27/12	12:45	13:45	

Notes:

None

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USEPA Method 3 Laboratory Data

Location: FCCU Regenerator Stack
Client: Marathon Petroleum Company

Project No: 12010

Method: EPA Method 3

Fuel Type: Non-Combustion

F_o for Fuel: N/A

Test Method: USEPA Mod. CTM-027
Analyte: NH₃

Analyst: K. Sullivan
Analyst Emp No: 579

Run Number	Trial	Percent CO ₂	Percent O ₂ +CO ₂	Percent O ₂	Percent N ₂	Dry Mol. Weight	F _o	Method of Analysis: CEM
10	1							
	2							
	3							
	Avg.							
CEM or Other Avg:		14.70000		3.80000	81.50000	30.50400	1.16327	☐ Fo value within expected range.
11	1							
	2							
	3							
	Avg.							
CEM or Other Avg:		15.60000		2.80000	81.60000	30.60800	1.16026	☐ Fo value within expected range.
12	1							
	2							
	3							
	Avg.							
CEM or Other Avg:		15.40000		3.10000	81.50000	30.58800	1.15584	☐ Fo value within expected range.
	1							
	2							
	3							
	Avg.							
CEM or Other Avg:								☐ Fo value within expected range.

053012 103805
M N M @

USEPA Method 4 Laboratory Data

Location: FCCU Regenerator Stack
Client: Marathon Petroleum Company
Project No: 12010

Test Method: USEPA Mod. CTM-027

Analyte: NH3

Analyst: R. Vicere

Analyst Emp No: 563

Test Run: 10

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	100 ml 0.1N H2SO4	631.6	564.2	67.4
Impinger 2	100 ml 0.1N H2SO4	549.5	548.0	1.5
Impinger 3	100 ml 0.1N H2SO4	553.5	552.9	0.6
Impinger 4	Silica Gel	803.9	793.7	10.2
Impinger 5				
Impinger 6				
Impinger 7				
Impinger 8				

69.5 Liquid (gm)

Field Data Check

0.0 less rinse (gm)

69.5 Net Liquid (gm)

69.5 ☒ QA/QC OK

+ 10.2 Silica Gel (gm)

10.2 ☒ QA/QC OK

79.7 Total Vlc (gm)

79.7 ☒ QA/QC OK

Rinse: (ml or gm)

Test Run: 11

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	100 ml 0.1N H2SO4	611.8	542.6	69.2
Impinger 2	100 ml 0.1N H2SO4	541.8	540.6	1.2
Impinger 3	100 ml 0.1N H2SO4	542.0	541.0	1.0
Impinger 4	Silica Gel	732.9	725.7	7.2
Impinger 5				
Impinger 6				
Impinger 7				
Impinger 8				

71.4 Liquid (gm)

Field Data Check

0.0 less rinse (gm)

71.4 Net Liquid (gm)

71.4 ☒ QA/QC OK

+ 7.2 Silica Gel (gm)

7.2 ☒ QA/QC OK

78.6 Total Vlc (gm)

78.6 ☒ QA/QC OK

Rinse: (ml or gm)

Test Run: 12

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	100 ml 0.1N H2SO4	614.1	548.9	65.2
Impinger 2	100 ml 0.1N H2SO4	562.0	561.3	0.7
Impinger 3	100 ml 0.1N H2SO4	562.2	560.7	1.5
Impinger 4	Silica Gel	810.6	803.8	6.8
Impinger 5				
Impinger 6				
Impinger 7				
Impinger 8				

67.4 Liquid (gm)

Field Data Check

0.0 less rinse (gm)

67.4 Net Liquid (gm)

67.4 ☒ QA/QC OK

+ 6.8 Silica Gel (gm)

6.8 ☒ QA/QC OK

74.2 Total Vlc (gm)

74.2 ☒ QA/QC OK

Rinse: (ml or gm)

Test Run:

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1				
Impinger 2				
Impinger 3				
Impinger 4				
Impinger 5				
Impinger 6				
Impinger 7				
Impinger 8				

Liquid (gm)

Field Data Check

less rinse (gm)

Net Liquid (gm)

☐ QA/QC OK

Silica Gel (gm)

☐ QA/QC OK

Total Vlc (gm)

☐ QA/QC OK

Rinse: (ml or gm)

053012 103806
MNM@

Field Data Printout

Test Method: USEPA Mod. CTM-027
Analyte: NH3

Location: FCCU Regenerator Stack

Test Run: 10

Client: Marathon Petroleum Company

Project No: 12010

Source Area (ft²): 36.89769

Meter Operator: B. Arnold 770

Probe Operator: B. Arnold 770

Test Date: 4/27/12

Start Time: 09:28

Stop Time: 10:28

Leak Rate Before: 0.002 cfm @ 15 "Hg

Leak Rate After: 0.001 cfm @ 6 "Hg

Bar. Press. (in. Hg): 29.50

Static P: 0.5

O₂ (dry volume %): 3.80

CO₂ (dry volume %): 14.70

N₂+CO (dry volume %): 81.50

Nozzle ID No: 252-1

Nozzle Diameter (D_n): 0.252

Probe ID No: 67-4-1

Pitot C_p: 0.818

Pitot Leak Check: ☒ Pass ☐ Fail

H₂O (condensate, ml or gm): 69.5

H₂O (silica, g): 10.2

Actual Moisture (%): 9.75

Meter Box ID. No: 66-22

Meter ΔH@: 1.88190

Meter Y_d: 1.00200

Traverse Point	Run Time 5.0 min/read	Pitot ΔP _s (in. H ₂ O)	Sample ΔH (in. H ₂ O)	Metered (dcf)	Stack T _s (°F)	Dry Gas Meter		√ΔP _s (calculated) (√in. H ₂ O)	Volume (calculated) (ft ³)	Isokinetics (calculated) (%)
	0.0					T _{m-in} (°F)	T _{m-out} (°F)			
1-01	5.0	0.60	1.20	285.820	551	67	66	0.77	2.98	104.6
1-01	10.0	0.60	1.20	288.760	551	68	66	0.77	2.94	103.1
1-01	15.0	0.61	1.20	291.710	551	70	67	0.78	2.95	102.3
1-01	20.0	0.61	1.20	294.640	551	72	67	0.78	2.93	101.4
1-01	25.0	0.63	1.20	297.600	551	76	69	0.79	2.96	100.3
1-01	30.0	0.63	1.20	300.550	551	80	70	0.79	2.95	99.5
1-01	35.0	0.63	1.20	303.510	551	81	71	0.79	2.96	99.6
1-01	40.0	0.62	1.20	306.450	551	84	73	0.79	2.94	99.3
1-01	45.0	0.64	1.20	309.420	552	86	74	0.80	2.97	98.5
1-01	50.0	0.62	1.20	312.390	551	87	75	0.79	2.97	99.8
1-01	55.0	0.62	1.20	315.370	552	89	76	0.79	2.98	99.9
1-01	60.0	0.60	1.20	318.335	551	89	76	0.77	2.96	101.0
Final	60.0		1.20000	35.49500	551.16667	74.95833		0.78577	35.49500	

1 points sampled

Sq.Rt.ΔP

QC-Check: Field Averages

0.7858 1.2000 35.4950 551.1667 74.9583

☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK

053012 103806

M

Field Data Printout

Test Method: USEPA Mod. CTM-027
Analyte: NH3

Location: FCCU Regenerator Stack

Test Run: 11

Client: Marathon Petroleum Company

Project No: 12010

Source Area (ft²): 36.89769

Meter Operator: B. Arnold 770

Probe Operator: B. Arnold 770

Test Date: 4/27/12

Start Time: 11:12

Stop Time: 12:12

Leak Rate Before: 0.003 cfm @ 15 "Hg

Leak Rate After: 0.002 cfm @ 10 "Hg

Bar. Press. (in. Hg): 29.50

Static P: 0.4

O₂ (dry volume %): 2.80

CO₂ (dry volume %): 15.60

N₂+CO (dry volume %): 81.60

Nozzle ID No: 252-1

Nozzle Diameter (D_n): 0.252

Probe ID No: 67-4-1

Pitot C_p: 0.818

Pitot Leak Check: ☒ Pass ☐ Fail

H₂O (condensate, ml or gm): 71.4

H₂O (silica, g): 7.2

Actual Moisture (%): 9.66

Meter Box ID. No: 66-22

Meter ΔH@: 1.88190

Meter Y_d: 1.00200

Traverse Point	Run Time 5.0 min/read	Pitot ΔP _s (in. H ₂ O)	Sample ΔH (in. H ₂ O)	Metered (dcf)	Stack T _s (°F)	Dry Gas Meter		√ΔP _s (calculated) (√in. H ₂ O)	Volume (calculated) (ft ³)	Isokinetics (calculated) (%)
	0.0					T _{m-in} (°F)	T _{m-out} (°F)			
1-01	5.0	0.65	1.30	321.530	552	74	74	0.81	3.11	103.6
1-01	10.0	0.62	1.20	324.500	552	75	75	0.79	2.97	101.1
1-01	15.0	0.62	1.20	327.420	552	77	76	0.79	2.92	99.1
1-01	20.0	0.63	1.20	330.410	552	80	76	0.79	2.99	100.4
1-01	25.0	0.62	1.20	333.400	552	83	76	0.79	2.99	100.9
1-01	30.0	0.62	1.20	336.380	552	86	77	0.79	2.98	100.2
1-01	35.0	0.62	1.20	339.350	552	87	78	0.79	2.97	99.7
1-01	40.0	0.60	1.20	342.310	552	87	79	0.77	2.96	100.9
1-01	45.0	0.62	1.20	345.280	552	87	80	0.79	2.97	99.5
1-01	50.0	0.61	1.20	348.250	552	89	80	0.78	2.97	100.1
1-01	55.0	0.62	1.20	351.230	552	88	81	0.79	2.98	99.6
1-01	60.0	0.60	1.20	354.190	552	88	81	0.77	2.96	100.6
Final	60.0		1.20833	35.77000	552.00000	80.58333		0.78683	35.77000	

1 points sampled

Sq.Rt. ΔP

QC-Check: Field Averages

0.7868 1.2083 35.7700 552.0000 80.5833

☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK

053012 103806
N

Field Data Printout

Test Method: USEPA Mod. CTM-027
Analyte: NH3

Location: FCCU Regenerator Stack

Test Run: 12

Client: Marathon Petroleum Company

Project No: 12010

Source Area (ft²): 36.89769

Meter Operator: B. Arnold 770

Probe Operator: B. Arnold 770

Test Date: 4/27/12

Start Time: 12:45

Stop Time: 13:45

Leak Rate Before: 0.002 cfm @ 15 "Hg

Leak Rate After: 0.001 cfm @ 8 "Hg

Bar. Press. (in. Hg): 29.50

Static P: 0.4

O₂ (dry volume %): 3.10

CO₂ (dry volume %): 15.40

N₂+CO (dry volume %): 81.50

H₂O (condensate, ml or gm): 67.4

H₂O (silica, g): 6.8

Actual Moisture (%): 9.27

Nozzle ID No: 252-1

Nozzle Diameter (D_n): 0.252

Probe ID No: 67-4-1

Pitot C_p: 0.818

Pitot Leak Check: ☒ Pass ☐ Fail

Meter Box ID. No: 66-22

Meter ΔH@: 1.88190

Meter Y_d: 1.00200

Traverse Point	Run Time 5.0 min/read	Pitot ΔP _s (in. H ₂ O)	Sample ΔH (in. H ₂ O)	Metered (dcf)	Stack T _s (°F)	Dry Gas Meter		√ΔP _s (calculated) (√in. H ₂ O)	Volume (calculated) (ft ³)	Isokinetics (calculated) (%)
	0.0					T _{m-in} (°F)	T _{m-out} (°F)			
1-01	5.0	0.58	1.10	357.260	552	76	76	0.76	2.88	100.6
1-01	10.0	0.58	1.10	360.060	552	79	78	0.76	2.80	97.5
1-01	15.0	0.62	1.20	363.020	552	79	79	0.79	2.96	99.6
1-01	20.0	0.62	1.20	366.010	552	82	79	0.79	2.99	100.3
1-01	25.0	0.60	1.20	368.970	552	84	79	0.77	2.96	100.8
1-01	30.0	0.62	1.20	371.900	552	86	80	0.79	2.93	97.9
1-01	35.0	0.62	1.20	374.890	552	88	80	0.79	2.99	99.7
1-01	40.0	0.62	1.20	377.890	552	89	81	0.79	3.00	99.8
1-01	45.0	0.62	1.20	380.890	552	91	82	0.79	3.00	99.6
1-01	50.0	0.63	1.20	383.890	552	91	83	0.79	3.00	98.7
1-01	55.0	0.60	1.20	386.880	552	93	83	0.77	2.99	100.6
1-01	60.0	0.62	1.20	389.865	552	93	83	0.79	2.99	98.8
Final	60.0		1.18333	35.48000	552.00000	83.08333		0.78149	35.48000	

1 points sampled

Sq.Rt.ΔP

QC-Check: Field Averages

0.7815 1.1833 35.4800 552.0000 83.0833

☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK

053012 103806
M

TEST LOG

Client: Marathon Petroleum Company
Project No: 12010

Run Number	Location	Method	Analyte	Date	Start Time	End Time	Notes
1	FCCU Regenerator Stack	USEPA OTM-29	HCN	04/27/12	09:28	10:34	
2	FCCU Regenerator Stack	USEPA OTM-29	HCN	04/27/12	11:12	12:17	
3	FCCU Regenerator Stack	USEPA OTM-29	HCN	04/27/12	12:45	14:00	

Notes:

None

053012 103806

USEPA Method 3 Laboratory Data

Location: FCCU Regenerator Stack
Client: Marathon Petroleum Company

Test Method: USEPA OTM-29
Analyte: HCN

Project No: 12010

Method: EPA Method 3

Fuel Type: Non-Combustion

F_o for Fuel: N/A

Analyst: K. Sullivan

Analyst Emp No: 579

Run Number	Trial	Percent CO ₂	Percent O ₂ +CO ₂	Percent O ₂	Percent N ₂	Dry Mol. Weight	F _o	Method of Analysis: CEM
1	1							
	2							
	3							
	Avg.							
CEM or Other Avg:		11.60000		3.00000	85.40000	29.97600	1.54310	☐ Fo value within expected range.
2	1							
	2							
	3							
	Avg.							
CEM or Other Avg:		11.70000		2.90000	85.40000	29.98800	1.53846	☐ Fo value within expected range.
3	1							
	2							
	3							
	Avg.							
CEM or Other Avg:		12.20000		4.90000	82.90000	30.14800	1.31148	☐ Fo value within expected range.
	1							
	2							
	3							
	Avg.							
CEM or Other Avg:								☐ Fo value within expected range.

053012 103806
NOP@

USEPA Method 4 Laboratory Data

Location: FCCU Regenerator Stack
 Client: Marathon Petroleum Company
 Project No: 12010

Test Method: USEPA OTM-29
 Analyte: HCN
 Analyst: R. Vicere
 Analyst Emp No: 563

Test Run: **1**

Contents	Gross (gm)	Tare (gm)	Net (gm)		
Impinger 1	200 ml 6N NaOH	703.6	639.8	63.8	
Impinger 2	200 ml 6N NaOH	685.6	643.0	42.6	
Impinger 3	200 ml 6N NaOH	658.9	633.5	25.4	
Impinger 4	100 ml 6N NaOH	558.9	546.4	12.5	
Impinger 5	Silica Gel	724.8	714.2	10.6	
Impinger 6					
Impinger 7					
Impinger 8					
				144.3 Liquid (gm)	Field Data Check
				0.0 less rinse (gm)	
				144.3 Net Liquid (gm)	144.3 ☒ QA/QC OK
				+ 10.6 Silica Gel (gm)	10.6 ☒ QA/QC OK
				154.9 Total Vlc (gm)	154.9 ☒ QA/QC OK
	Rinse:		(ml or gm)		

Test Run: **2**

Contents	Gross (gm)	Tare (gm)	Net (gm)		
Impinger 1	200 ml 6N NaOH	706.6	641.7	64.9	
Impinger 2	200 ml 6N NaOH	695.9	655.7	40.2	
Impinger 3	200 ml 6N NaOH	669.7	643.9	25.8	
Impinger 4	100 ml 6N NaOH	544.8	531.1	13.7	
Impinger 5	Silica Gel	710.3	698.3	12.0	
Impinger 6					
Impinger 7					
Impinger 8					
				144.6 Liquid (gm)	Field Data Check
				0.0 less rinse (gm)	
				144.6 Net Liquid (gm)	144.6 ☒ QA/QC OK
				+ 12.0 Silica Gel (gm)	12.0 ☒ QA/QC OK
				156.6 Total Vlc (gm)	156.6 ☒ QA/QC OK
	Rinse:		(ml or gm)		

Test Run: **3**

Contents	Gross (gm)	Tare (gm)	Net (gm)		
Impinger 1	200 ml 6N NaOH	746.2	677.0	69.2	
Impinger 2	200 ml 6N NaOH	688.3	652.9	35.4	
Impinger 3	200 ml 6N NaOH	673.6	651.5	22.1	
Impinger 4	100 ml 6N NaOH	572.5	561.2	11.3	
Impinger 5	Silica Gel	749.8	738.7	11.1	
Impinger 6					
Impinger 7					
Impinger 8					
				138.0 Liquid (gm)	Field Data Check
				0.0 less rinse (gm)	
				138.0 Net Liquid (gm)	138.0 ☒ QA/QC OK
				+ 11.1 Silica Gel (gm)	11.1 ☒ QA/QC OK
				149.1 Total Vlc (gm)	149.1 ☒ QA/QC OK
	Rinse:		(ml or gm)		

Test Run:

Contents	Gross (gm)	Tare (gm)	Net (gm)		
Impinger 1					
Impinger 2					
Impinger 3					
Impinger 4					
Impinger 5					
Impinger 6					
Impinger 7					
Impinger 8					
				Liquid (gm)	Field Data Check
				less rinse (gm)	
				Net Liquid (gm)	☐ QA/QC OK
				Silica Gel (gm)	☐ QA/QC OK
				Total Vlc (gm)	☐ QA/QC OK
	Rinse:		(ml or gm)		

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 NOP@

Field Data Printout

Test Method:

USEPA OTM-29

Analyte:

HCN

Location: FCCU Regenerator Stack

Test Run: 1

Client: Marathon Petroleum Company

Project No: 12010

Source Area (ft²): 36.89769

Meter Operator: D. Luckhard 568

Probe Operator: N. Hitchins 569

Test Date: 4/27/12

Start Time: 09:28

Stop Time: 10:34

Leak Rate Before: 0.003 cfm @ 15 "Hg

Leak Rate After: 0.002 cfm @ 5 "Hg

Bar. Press. (in. Hg): 29.50

Static P: 0.5

O₂ (dry volume %): 3.00

CO₂ (dry volume %): 11.60

Nozzle ID No: 234-1

Nozzle Diameter (D_n): 0.234

Probe ID No: 67-8-19

Pitot C_p: 0.827

Pitot Leak Check: ☒ Pass ☐ Fail

H₂O (condensate, ml or gm): 144.3

H₂O (silica, g): 10.6

Actual Moisture (%): 9.75

Meter Box ID. No: 66-24

Meter ΔH@: 1.78160

Meter Y_d: 0.99700

Traverse Point	Run Time 2.5 min/read	Pitot ΔP _s (in. H ₂ O)	Sample ΔH (in. H ₂ O)	Metered (dcf)	Stack T _s (°F)	Dry Gas Meter		√ΔP _s (calculated) (√in. H ₂ O)	Volume (calculated) (ft ³)	Isokinetics (calculated) (%)
	0.0					T _{m-in} (°F)	T _{m-out} (°F)			
2-01	2.5	0.70	0.94	688.450	555	71	70	0.84	1.32	96.5
2-02	5.0	0.70	0.94	689.570	554	71	70	0.84	1.12	81.9*
2-03	7.5	0.61	0.82	691.130	553	71	70	0.78	1.56	122.1*
2-04	10.0	0.66	0.88	692.440	554	72	70	0.81	1.31	98.5
2-05	12.5	0.64	0.86	693.860	554	73	70	0.80	1.42	108.3
2-06	15.0	0.67	0.90	695.140	555	75	71	0.82	1.28	95.2
2-07	17.5	0.69	0.92	696.520	555	77	71	0.83	1.38	101.0
2-08	20.0	0.63	0.84	697.830	555	78	71	0.79	1.31	100.2
2-09	22.5	0.63	0.84	699.150	555	80	72	0.79	1.32	100.7
2-10	25.0	0.59	0.79	700.420	556	81	73	0.77	1.27	99.9
2-11	27.5	0.72	0.96	701.820	556	82	73	0.85	1.40	99.7
2-12	30.0	0.70	0.94	703.220	555	83	74	0.84	1.40	100.9
1-01	32.5	0.70	0.94	704.590	543	81	76	0.84	1.37	98.1
1-02	35.0	0.68	0.91	705.960	546	85	77	0.82	1.37	99.2
1-03	37.5	0.80	1.10	707.440	550	86	77	0.89	1.48	99.0
1-04	40.0	0.77	1.00	708.880	552	87	78	0.88	1.44	98.1
1-05	42.5	0.79	1.10	710.370	552	88	78	0.89	1.49	100.1
1-06	45.0	0.74	0.99	711.880	554	88	79	0.86	1.51	104.8
1-07	47.5	0.59	0.79	713.150	556	90	80	0.77	1.27	98.5
1-08	50.0	0.59	0.79	714.400	556	90	80	0.77	1.25	96.9
1-09	52.5	0.59	0.79	715.670	557	89	81	0.77	1.27	98.5
1-10	55.0	0.63	0.84	716.990	557	90	81	0.79	1.32	99.0
1-11	57.5	0.64	0.86	718.310	556	90	81	0.80	1.32	98.2
1-12	60.0	0.64	0.86	719.655	554	90	81	0.80	1.35	100.0
Final	60.0		0.90000	32.52500	553.75000	78.58333		0.81821	32.52500	

24 points sampled

Sq.Rt.ΔP

QC-Check: Field Averages

0.8182 0.9000 32.5250 553.7500 78.5833

☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK ☒ Avg. OK

053012 103806

N

Field Data Printout

Test Method:

USEPA OTM-29

Analyte:

HCN

Location: FCCU Regenerator Stack

Test Run: 2

Client: Marathon Petroleum Company

Project No: 12010

Source Area (ft²): 36.89769

Meter Operator: D. Luckhard 568

Probe Operator: N. Hitchins 569

Test Date: 4/27/12

Start Time: 11:12

Stop Time: 12:17

Leak Rate Before: 0.004 cfm @ 15 "Hg

Leak Rate After: 0.002 cfm @ 5 "Hg

Bar. Press. (in. Hg): 29.50

Static P: 0.5

O₂ (dry volume %): 2.90

CO₂ (dry volume %): 11.70

Nozzle ID No: 234-1

Nozzle Diameter (D_n): 0.234

Probe ID No: 67-8-19

Pitot C_p: 0.827

Pitot Leak Check: ☒ Pass ☐ Fail

H₂O (condensate, ml or gm): 144.6

H₂O (silica, g): 12.0

Actual Moisture (%): 9.66

Meter Box ID. No: 66-24

Meter ΔH@: 1.78160

Meter Y_d: 0.99700

Traverse Point	Run Time 2.5 min/read	Pitot ΔP _s (in. H ₂ O)	Sample ΔH (in. H ₂ O)	Metered (dcf)	Stack T _s (°F)	Dry Gas Meter		√ΔP _s (calculated) (√in. H ₂ O)	Volume (calculated) (ft ³)	Isokinetics (calculated) (%)
						T _{m-in} (°F)	T _{m-out} (°F)			
1-01	2.5	0.82	1.10	720.100	551	75	77	0.91	1.49	99.4
1-02	5.0	0.81	1.10	723.100	550	76	77	0.90	1.51	101.2
1-03	7.5	0.82	1.10	724.530	551	78	77	0.91	1.43	95.1
1-04	10.0	0.84	1.20	726.090	552	78	77	0.92	1.56	102.6
1-05	12.5	0.80	1.10	727.570	553	78	77	0.89	1.48	99.8
1-06	15.0	0.74	1.00	729.020	553	80	77	0.86	1.45	101.4
1-07	17.5	0.63	0.87	730.360	555	81	77	0.79	1.34	101.6
1-08	20.0	0.58	0.80	731.640	556	82	77	0.76	1.28	101.1
1-09	22.5	0.62	0.86	732.960	557	84	77	0.79	1.32	100.7
1-10	25.0	0.63	0.87	734.290	557	85	77	0.79	1.33	100.5
1-11	27.5	0.63	0.87	735.630	556	86	78	0.79	1.34	101.1
1-12	30.0	0.62	0.86	736.950	557	86	78	0.79	1.32	100.4
2-01	32.5	0.66	0.91	738.310	552	84	80	0.81	1.36	100.0
2-02	35.0	0.68	0.94	739.670	553	85	80	0.82	1.36	98.5
2-03	37.5	0.65	0.90	741.030	553	85	80	0.81	1.36	100.7
2-04	40.0	0.62	0.86	742.350	553	86	81	0.79	1.32	99.9
2-05	42.5	0.66	0.91	743.710	555	87	81	0.81	1.36	99.8
2-06	45.0	0.68	0.94	745.090	555	88	81	0.82	1.38	99.7
2-07	47.5	0.71	0.98	746.520	556	87	81	0.84	1.43	101.2
2-08	50.0	0.65	0.90	747.860	555	87	81	0.81	1.34	99.1
2-09	52.5	0.62	0.86	749.170	555	87	81	0.79	1.31	99.2
2-10	55.0	0.61	0.84	750.490	556	86	81	0.78	1.32	100.9
2-11	57.5	0.56	0.77	751.740	555	87	81	0.75	1.25	99.6
2-12	60.0	0.56	0.77	752.990	555	88	81	0.75	1.25	99.5
Final	60.0		0.92958	32.89000	554.20833	81.27083		0.82006	32.89000	

24 points sampled

Sq.Rt.ΔP

QC-Check: Field Averages

0.8201 0.9296 32.8900 554.2083 81.2708

☒ Avg. OK

☒ Avg. OK

☒ Avg. OK

☒ Avg. OK

☒ Avg. OK

053012 103806

0

Field Data Printout

Test Method:

USEPA OTM-29

Analyte:

HCN

Location: FCCU Regenerator Stack

Test Run: 3

Client: Marathon Petroleum Company

Project No: 12010

Source Area (ft²): 36.89769

Meter Operator: D. Luckhard 568

Probe Operator: N. Hitchins 569

Test Date: 4/27/12

Start Time: 12:45

Stop Time: 14:00

Leak Rate Before: 0.003 cfm @ 15 "Hg

Leak Rate After: 0.002 cfm @ 5 "Hg

Bar. Press. (in. Hg): 29.50

Static P: 0.5

O₂ (dry volume %): 4.90

CO₂ (dry volume %): 12.20

Nozzle ID No: 234-1

Nozzle Diameter (D_n): 0.234

Probe ID No: 67-8-19

Pitot C_p: 0.827

Pitot Leak Check: ☒ Pass ☐ Fail

H₂O (condensate, ml or gm): 138.0

H₂O (silica, g): 11.1

Actual Moisture (%): 9.27

Meter Box ID. No: 66-24

Meter ΔH@: 1.78160

Meter Y_d: 0.99700

Traverse Point	Run Time 2.5 min/read	Pitot ΔP _s (in. H ₂ O)	Sample ΔH (in. H ₂ O)	Metered (dcf)	Stack T _s (°F)	Dry Gas Meter		√ΔP _s (calculated) (√in. H ₂ O)	Volume (calculated) (ft ³)	Isokinetics (calculated) (%)
						T _{m-in} (°F)	T _{m-out} (°F)			
2-01	2.5	0.68	0.90	754.550	553	78	80	0.82	1.35	98.3
2-02	5.0	0.67	0.89	755.920	553	79	80	0.82	1.37	100.4
2-03	7.5	0.64	0.85	757.260	553	80	80	0.80	1.34	100.4
2-04	10.0	0.65	0.86	758.580	555	81	80	0.81	1.32	98.1
2-05	12.5	0.64	0.85	759.900	555	81	80	0.80	1.32	98.9
2-06	15.0	0.65	0.86	761.240	555	82	80	0.81	1.34	99.5
2-07	17.5	0.70	0.93	762.620	556	84	80	0.84	1.38	98.7
2-08	20.0	0.64	0.85	763.930	556	85	80	0.80	1.31	97.8
2-09	22.5	0.62	0.82	765.250	556	86	80	0.79	1.32	100.1
2-10	25.0	0.58	0.77	766.510	557	86	82	0.76	1.26	98.6
2-11	27.5	0.57	0.76	767.760	557	85	82	0.75	1.25	98.8
2-12	30.0	0.57	0.76	769.020	556	86	82	0.75	1.26	99.4
1-01	32.5	0.79	1.10	770.510	553	89	84	0.89	1.49	99.3
1-02	35.0	0.82	1.10	771.990	553	89	84	0.91	1.48	96.9
1-03	37.5	0.81	1.10	773.490	553	91	84	0.90	1.50	98.6
1-04	40.0	0.79	1.10	774.990	553	93	84	0.89	1.50	99.6
1-05	42.5	0.79	1.10	776.490	554	93	85	0.89	1.50	99.6
1-06	45.0	0.74	0.98	777.910	555	95	85	0.86	1.42	97.3
1-07	47.5	0.60	0.80	779.250	555	95	86	0.77	1.34	101.8
1-08	50.0	0.60	0.80	780.480	557	95	86	0.77	1.23	93.5
1-09	52.5	0.61	0.81	781.770	558	95	86	0.78	1.29	97.3
1-10	55.0	0.62	0.82	783.060	558	94	87	0.79	1.29	96.6
1-11	57.5	0.62	0.82	784.370	557	91	87	0.79	1.31	98.3
1-12	60.0	0.63	0.84	785.670	556	91	87	0.79	1.30	96.7
Final	60.0		0.89458	32.47000	555.16667	85.31250		0.81592	32.47000	

24 points sampled

Sq.Rt.ΔP

QC-Check: Field Averages

0.8159	0.8946	32.4700	555.1667	85.3125

☒ Avg. OK

☒ Avg. OK

☒ Avg. OK

☒ Avg. OK

☒ Avg. OK

053012 103806

P

TEST LOG

Client: Marathon Petroleum Company
Project No: 12010

Run Number	Location	Method	Analyte	Date	Start Time	End Time	Notes
1	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/24/12	10:34	11:34	
2	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/24/12	12:49	13:44	
3	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/24/12	14:37	15:43	
4	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/25/12	09:09	10:00	
5	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/25/12	12:08	13:02	
6	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/25/12	14:09	15:11	
7	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/26/12	08:26	09:19	
8	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/26/12	10:11	11:06	
9	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/26/12	12:01	13:06	
10	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/27/12	09:36	10:30	
11	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/27/12	11:18	12:07	
12	FCCU Regenerator Stack	USEPA Method 2F	3-D Velocity & Flow Rate	04/27/12	12:49	13:51	

Notes:

None

053012 103806

Airflow Sciences Corporation

Round 3-D Duct Traverse (Stack)

Project: 12010
 Site: MPC Detroit
 Task: 3D Flow
 Location: FCCU Stack Complex 3
 Condition: Run 1
 Personnel: P. Bihun
 Date: Tuesday, 4/24/2012

3DDAS011, Calibrated: 03/26/2012

3-D Probe v.4.9.13

Start Time: 10:34 AM
 End Time: 11:34 AM
 Formatting Parameters
 Velocities in fpm
 Insertion Depths from Near Wall

False
 False

Last Leak Check
 Date/Time
 04/24/12 09:54 AM
 Decay Time [s Start P [IWC] End P [IWC]
 5 9.28 9.3

Duct Diameter [ft]:	6.85
Number of Test Ports:	2
Number of Test Points per Port:	12
Dry Gas Molecular Weight [g/mol]:	30.69
Water Vapor Volume Fraction, Bws [-]:	0.095
Spec. Gas Constant [(ft-lbf)/(slug-°R)]:	1696.0

* Data from M-5F/202 Run 1

Test Data Summary

Total Wet Gas Mass Flow Rate [lbm/hr]:	299,417
Total Wet Gas Vol. Flow Rate, Qsw [WSCFH]:	3,916,784
Total Dry Gas Vol. Flow Rate, Qsd [DSCFH]:	3,545,609

	Min	Max	Avg
Axial Velocity [ft/s]	40.8	69.0	59.5
Temperature [°F]:	530.5	559.3	554.5
Wet Gas Density [lbm/ft³]:	0.0377	0.0388	0.0379
Static Pressure [IWC]:	-5.37	-4.88	-5.14
Total Pressure [IWC]:	-4.93	-4.33	-4.69
Barometric Pressure [°Hg at 32°F]:	28.81	28.87	28.85

Probe Used	207722																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			</

Pressure Transducer Zero Readings (in IWC)

	P1-P2 (low)	P1-P2 (high)	P2-P3	P4-P5 (low)	P4-P5 (high)	P1-Pbar	Time
PRE	0.000	0.002	-0.004	0.000	-0.001	-5.48	9:57 AM
POST	0.000	-0.041	0.016	0.000	-0.002	-4.59	11:38 AM
SN	60125972	40915142	70223952	70622645	70418554	3662543	
RANGE	0.0->1.0	0.0->5.0	-2.5->2.5	-0.5->0.5	-2.5->2.5	-69.2->69.2	

NOTES:

1. All averages are number averages, not flow weighted averages
2. Calculation of total mass flow rate (lbm/hr) is based on individual areas for each traverse point; these areas are not necessarily equal
3. Calculation of wet and dry volumetric flow rate (SCFH) is based on the number-average axial velocity (per EPA Method 2F) and hence assumes equal areas regardless of test port spacing

Airflow Sciences Corporation
 Round 3-D Duct Traverse (Stack)
 Project: 12010
 Site: MPC Detroit
 Task: 3D Flow
 Location: FCCU Stack Complex 3
 Condition: Run 1
 Personnel: P. Bihun
 Date: Tuesday, 4/24/2012

3DDAS011, Calibrated: 03/26/2012
 3-D Probe v.4.9.r13
 Start Time: 10:34 AM
 Formatting Parameters
 Velocities in fpm
 Insertion Depths from Near Wall

End Time: 11:34 AM
 False
 False

Decay Time [s Start P [IWC] End P [IWC]
 5 9.28 9.3

Date/Time
 04/24/12 08:54 AM
 Last Leak Check

Traverse Data

MEASURED VALUES												
Port	Point	Port Spacing [deg]	Withdrawal Distance [ft]	Time (Local)	Area [ft²]	Patm [°Hg at 32°F]	P1-P2 [IWC]	P2-P3 [IWC]	P4-P5 [IWC]	P1-Pbar (Total P Gage) [IWC]	Temp [°F]	Yaw Null Angle [°]
1	1	0.00	0.07	10:52 AM	1.54	28.85	0.518	0.036	-0.005	-4.40	555.6	-13.0
1	2	0.00	0.22	10:52 AM	1.54	28.85	0.508	0.013	-0.004	-4.40	557.9	-12.5
1	3	0.00	0.38	10:51 AM	1.54	28.86	0.483	0.032	0.001	-4.61	558.3	-11.8
1	4	0.00	0.54	10:50 AM	1.54	28.85	0.508	0.039	0.013	-4.33	559.2	-11.5
1	5	0.00	0.72	10:50 AM	1.54	28.86	0.473	0.017	-0.009	-4.40	559.3	-13.4
1	6	0.00	0.90	10:49 AM	1.54	28.86	0.497	0.046	0.005	-4.42	558.0	-14.4
1	7	0.00	1.11	10:40 AM	1.54	28.84	0.328	-0.021	-0.002	-4.93	557.5	-2.7
1	8	0.00	1.33	10:39 AM	1.54	28.83	0.263	0.020	-0.003	-4.85	557.7	20.1
1	9	0.00	1.58	10:38 AM	1.54	28.84	0.335	0.003	-0.001	-4.87	557.3	28.1
1	10	0.00	1.86	10:36 AM	1.54	28.83	0.391	-0.036	-0.004	-4.84	556.2	33.8
1	11	0.00	2.22	10:35 AM	1.54	28.82	0.422	-0.025	0.025	-4.74	553.2	36.2
1	12	0.00	2.73	10:34 AM	1.54	28.81	0.275	-0.004	0.271	-4.72	546.2	36.4
2	1	180.00	0.07	11:34 AM	1.54	28.87	0.412	0.035	0.022	-4.74	558.1	-20.1
2	2	180.00	0.22	11:32 AM	1.54	28.87	0.412	0.016	0.014	-4.82	559.2	-21.3
2	3	180.00	0.38	11:31 AM	1.54	28.87	0.380	-0.006	-0.021	-4.93	558.0	-18.5
2	4	180.00	0.54	11:31 AM	1.54	28.86	0.368	0.032	-0.045	-4.75	558.6	-15.8
2	5	180.00	0.72	11:29 AM	1.54	28.87	0.389	-0.009	-0.054	-4.70	558.8	-11.6
2	6	180.00	0.90	11:29 AM	1.54	28.86	0.413	0.036	-0.080	-4.74	557.9	-5.3
2	7	180.00	1.11	11:22 AM	1.54	28.86	0.464	0.012	-0.069	-4.67	555.0	6.5
2	8	180.00	1.33	11:22 AM	1.54	28.87	0.487	-0.020	-0.070	-4.75	553.6	11.5
2	9	180.00	1.58	11:21 AM	1.54	28.86	0.486	-0.031	-0.037	-4.59	552.3	15.0
2	10	180.00	1.86	11:19 AM	1.54	28.87	0.464	-0.042	-0.016	-4.86	546.0	18.3
2	11	180.00	2.22	11:19 AM	1.54	28.86	0.417	-0.015	0.023	-4.54	543.1	25.3
2	12	180.00	2.73	11:16 AM	1.54	28.87	0.345	0.029	0.140	-4.89	530.5	24.1

Airflow Sciences Corporation
Round 3-D Duct Traverse (Stack)

Project: 12010
 Site: MPC Detroit
 Task: 3D Flow
 Location: FCCU Stack Complex 3
 Condition: Run 1
 Personnel: P. Bhun
 Date: Tuesday, 4/24/2012

3DDAS011, Calibrated: 03/26/2012

3-D Probe v4.9.r13

Start Time: 10:34 AM

End Time: 11:34 AM

Formatting Parameters

Velocities in fpm

Insertion Depths from Near Wall

False

False

Last Leak Check
 Date/Time
 04/24/12 09:54 AM
 Decay Time [s Start P [IWC] End P [IWC]
 5 9.28 9.3

CALCULATED VALUES													
Port	Point	Yaw Angle [°]	F1 [I]	Pitch Angle [°]	F2 [I]	Dynam P [IWC]	Static P [IWC]	Wet Gas Density [lbm/ft³]	Total Velocity [ft/s]	Vxial [ft/s]	Vpitch [ft/s]	Vyaw [ft/s]	Mass Flow [lbm/hr]
													Wet Vol Flow [WSCFH]
1	1	-12.1	-0.009	0.0	1.043	0.563	-4.96	0.0379	70.6	69.0	0.0	-14.8	14,460
1	2	-11.5	-0.008	0.0	1.043	0.552	-4.95	0.0378	70.0	68.5	0.0	-14.0	14,329
1	3	-10.9	0.003	0.0	1.043	0.525	-5.13	0.0377	68.2	67.0	0.0	-12.8	14,002
1	4	-10.6	0.025	0.0	1.043	0.553	-4.88	0.0377	70.0	68.8	0.0	-12.9	14,373
1	5	-12.5	-0.019	0.0	1.043	0.515	-4.91	0.0377	67.6	66.0	0.0	-14.6	13,776
1	6	-13.5	0.009	0.0	1.043	0.541	-4.96	0.0378	69.2	67.3	0.0	-16.1	14,073
1	7	-1.8	-0.007	0.0	1.043	0.366	-5.29	0.0377	56.2	56.2	0.0	-1.7	11,738
1	8	21.0	-0.012	0.0	1.043	0.286	-5.14	0.0377	50.4	47.1	0.0	18.0	9,830
1	9	29.0	-0.004	0.0	1.043	0.364	-5.24	0.0377	56.8	49.7	0.0	27.5	10,380
1	10	34.7	-0.010	0.0	1.043	0.425	-5.26	0.0378	61.4	50.5	0.0	35.0	10,549
1	11	37.1	0.059	0.0	1.043	0.459	-5.20	0.0379	63.7	50.8	0.0	38.4	10,650
1	12	37.3	0.983	0.0	1.043	0.300	-5.02	0.0381	51.3	40.8	0.0	31.1	8,610
2	1	-19.2	0.054	0.0	1.043	0.448	-5.18	0.0378	63.0	59.5	0.0	-20.7	12,440
2	2	-20.4	0.034	0.0	1.043	0.448	-5.27	0.0377	63.1	59.1	0.0	-22.0	12,342
2	3	-17.6	-0.055	0.0	1.043	0.414	-5.34	0.0378	60.6	57.7	0.0	-18.3	12,061
2	4	-14.9	-0.123	0.0	1.043	0.401	-5.15	0.0377	59.6	57.6	0.0	-15.3	12,034
2	5	-10.7	-0.139	0.0	1.043	0.423	-5.12	0.0377	61.3	60.2	0.0	-11.3	12,578
2	6	-4.3	-0.193	0.0	1.043	0.449	-5.19	0.0378	63.1	62.9	0.0	-4.8	13,153
2	7	7.4	-0.149	0.0	1.043	0.505	-5.18	0.0379	66.8	66.3	0.0	8.6	13,891
2	8	12.4	-0.144	0.0	1.043	0.530	-5.28	0.0379	68.4	66.8	0.0	14.7	14,022
2	9	15.9	-0.075	0.0	1.043	0.529	-5.12	0.0380	68.3	65.6	0.0	18.7	13,797
2	10	19.3	-0.034	0.0	1.043	0.505	-5.37	0.0382	66.5	62.8	0.0	21.9	13,282
2	11	26.2	0.055	0.0	1.043	0.453	-4.99	0.0383	62.9	56.4	0.0	27.8	11,975
2	12	25.0	0.406	0.0	1.043	0.375	-5.26	0.0388	56.9	51.6	0.0	24.1	11,073
													285,333
													147,254

Airflow Sciences Corporation
Round 3-D Duct Traverse (Stack)

Project: 12010
 Site: MPC Detroit
 Task: 3D Flow
 Location: FCCU Stack Complex 3
 Condition: Run 2
 Personnel: P. Bihun
 Date: Tuesday, 4/24/2012

3DDAS011, Calibrated: 03/26/2012

3-D Probe v.4.9.r13

Start Time: 12:49 PM End Time: 1:44 PM

Formatting Parameters

Velocities in fpm False

Insertion Depths from Near Wall False

Last Leak Check 04/24/12 09:54 AM Decay Time [s Start P [IWC] End P [IWC] 5 9.28 9.3

Duct Diameter [ft]:	6.85
Number of Test Ports:	2
Number of Test Points per Port:	12
Dry Gas Molecular Weight [g/mol]:	30.69
Water Vapor Volume Fraction, Bws []:	0.093
Spec. Gas Constant [(ft-lbf)/(slug-R)]:	1685.0

* Data from M-5F/202 Run 2

Test Data Summary

Total Wet Gas Mass Flow Rate [lbm/hr]:	300,049
Total Wet Gas Vol. Flow Rate, Qsw [WSCFH]:	3,924,416
Total Dry Gas Vol. Flow Rate, Qsd [DSCFH]:	3,557,551

	Min	Max	Avg
Axial Velocity [ft/s]	45.2	70.2	59.5
Temperature [°F]:	529.4	558.9	552.9
Wet Gas Density [lbm/ft³]:	0.0378	0.0389	0.0380
Static Pressure [IWC]:	-5.42	-4.81	-5.15
Total Pressure [IWC]:	-5.09	-4.29	-4.69
Barometric Pressure [°Hg at 32°F]:	28.84	28.88	28.86

Probe Used	207722						
Rslc	-0.925						
Probe Calibration Date	11/08/2011						
	X6	X5	X4	X3	X2	X1	Constant
Probe Pitch Angle Calibration (F1)	0.000E+00	1.921E-09	-3.835E-09	2.618E-06	-7.557E-05	1.441E-02	-2.634E-02
Probe Velocity Calibration (F2)	-9.562E-13	-8.086E-10	5.501E-09	3.323E-07	3.171E-05	-1.037E-03	1.043E+00

Pressure Transducer Zero Readings (in IWC)

	P1-P2 (low)	P1-P2 (high)	P2-P3	P4-P5 (low)	P4-P5 (high)	P1-Pbar	Time
PRE	0.000	-0.002	-0.030	0.000	-0.003	-5.03	12:27 PM
POST	0.000	-0.004	-0.012	0.000	-0.003	-5.44	1:46 PM
SN	60125972	40915142	70223952	70622645	70418554	3662543	
RANGE	0.0->1.0	0.0->5.0	-2.5->2.5	-0.5->0.5	-2.5->2.5	-69.2->69.2	

NOTES:

1. All averages are number averages, not flow weighted averages
2. Calculation of total mass flow rate (lbm/hr) is based on individual areas for each traverse point; these areas are not necessarily equal
3. Calculation of wet and dry volumetric flow rate (SCFH) is based on the number-average axial velocity (per EPA Method 2F) and hence assumes equal areas regardless of test port spacing

Airflow Sciences Corporation

Round 3-D Duct Traverse (Stack)

Project: 12010

Site: MPC Detroit

Task: 3D Flow

Location: FCU Stack Complex 3

Condition: Run 2

Personnel: P. Bihun

Date: Tuesday, 4/24/2012

3DDAS011, Calibrated: 03/26/2012

3-D Probe v.4.9.r13

Start Time: 12:49 PM

Formatting Parameters

Velocities in fpm

Insertion Depths from Near Wall

End Time: 1:44 PM

False

False

Decay Time [s Start P [W/C] End P [W/C]

04/24/12 09:54 AM 5 9.28 9.3

Date/Time

04/24/12 09:54 AM

Last Leak Check

04/24/12 09:54 AM

Traverse Data

MEASURED VALUES												
Port	Point	Port Spacing [deg]	Withdrawal Distance [ft]	Time (Local)	Area [ft²]	Patm [inHg at 32°F]	P1-P2 [W/C]	P2-P3 [W/C]	P4-P5 [W/C]	P1-Pbar (Total P Gage) [W/C]	Temp [°F]	Yaw Null Angle [°]
1	1	0.00	0.07	1:44 PM	1.54	28.86	0.526	-0.012	0.004	-4.56	554.8	-11.1
1	2	0.00	0.22	1:43 PM	1.54	28.86	0.513	-0.013	-0.013	-4.29	557.4	-13.4
1	3	0.00	0.38	1:41 PM	1.54	28.87	0.484	0.005	-0.012	-4.62	557.2	-10.6
1	4	0.00	0.54	1:40 PM	1.54	28.87	0.460	0.031	-0.031	-4.67	556.4	-11.2
1	5	0.00	0.72	1:40 PM	1.54	28.87	0.494	-0.025	-0.018	-4.57	557.9	-15.2
1	6	0.00	0.90	1:39 PM	1.54	28.86	0.538	-0.019	0.010	-4.60	557.0	-13.9
1	7	0.00	1.11	1:32 PM	1.54	28.86	0.336	0.007	-0.003	-4.72	553.3	0.2
1	8	0.00	1.33	1:30 PM	1.54	28.87	0.265	0.015	-0.016	-4.87	550.2	20.6
1	9	0.00	1.58	1:29 PM	1.54	28.87	0.300	-0.004	-0.015	-5.09	547.8	31.4
1	10	0.00	1.86	1:29 PM	1.54	28.86	0.395	-0.026	-0.010	-4.67	547.7	33.9
1	11	0.00	2.22	1:28 PM	1.54	28.87	0.399	0.000	0.023	-4.65	538.6	35.9
1	12	0.00	2.73	1:27 PM	1.54	28.86	0.339	0.032	0.054	-4.60	529.4	34.6
2	1	180.00	0.07	1:08 PM	1.54	28.87	0.447	-0.014	0.018	-4.74	557.4	-22.7
2	2	180.00	0.22	1:07 PM	1.54	28.87	0.401	0.036	0.001	-4.80	557.5	-20.0
2	3	180.00	0.38	1:07 PM	1.54	28.87	0.444	-0.027	-0.036	-4.79	557.9	-18.0
2	4	180.00	0.54	1:06 PM	1.54	28.86	0.327	0.010	-0.039	-4.45	558.9	-14.3
2	5	180.00	0.72	1:05 PM	1.54	28.88	0.410	-0.002	-0.098	-4.84	557.6	-11.8
2	6	180.00	0.90	1:04 PM	1.54	28.88	0.410	0.021	-0.110	-4.78	556.4	-7.5
2	7	180.00	1.11	12:52 PM	1.54	28.85	0.452	0.020	-0.110	-4.42	558.2	5.7
2	8	180.00	1.33	12:52 PM	1.54	28.86	0.479	0.028	-0.071	-4.67	555.8	10.8
2	9	180.00	1.58	12:51 PM	1.54	28.86	0.410	0.036	-0.055	-4.73	554.9	19.5
2	10	180.00	1.86	12:51 PM	1.54	28.86	0.471	-0.002	-0.033	-4.86	550.7	18.7
2	11	180.00	2.22	12:50 PM	1.54	28.85	0.387	0.014	0.027	-4.74	548.3	27.2
2	12	180.00	2.73	12:49 PM	1.54	28.84	0.403	0.014	0.030	-4.89	547.7	22.2

Airflow Sciences Corporation
Round 3-D Duct Traverse (Stack)

Project: 12010
 Site: MPC Detroit
 Task: 3D Flow
 Location: FCCU Stack Complex 3
 Condition: Run 2
 Personnel: P. Bihun
 Date: Tuesday, 4/24/2012

3DDAS011, Calibrated: 03/26/2012
 3-D Probe v.4.9.r13

Start Time: 12:49 PM
 Formatting Parameters
 Velocities in fpm
 Insertion Depths from Near Wall
 End Time: 1:44 PM
 False
 False
 Date/Time
 04/24/12 09:54 AM
 Last Leak Check
 Decay Time [s Start P [IWC] End P [IWC]
 5 9.28 9.3

CALCULATED VALUES													
Port	Point	Yaw Angle [°]	F1 [-]	Pitch Angle [°]	F2 [-]	Dynam P [IWC]	Static P [IWC]	Wet Gas Density [lbm/ft³]	Total Velocity [ft/s]	Vxial [ft/s]	Vpitch [ft/s]	Vyaw [ft/s]	Mass Flow [lbm/hr]
													Wet Vol Flow [WACFH]
													Wet Vol Flow [WSCFH]
1	1	-10.2	0.008	0.0	1.043	0.572	-5.13	0.0379	71.1	68.6	0.0	-12.6	14,681
1	2	-12.5	-0.025	0.0	1.043	0.558	-4.85	0.0378	70.3	68.6	0.0	-15.2	14,362
1	3	-9.7	-0.025	0.0	1.043	0.527	-5.15	0.0378	68.3	67.3	0.0	-11.5	14,092
1	4	-10.3	-0.066	0.0	1.043	0.500	-5.17	0.0379	66.5	65.4	0.0	-11.9	13,712
1	5	-14.3	-0.036	0.0	1.043	0.537	-5.11	0.0378	69.0	66.8	0.0	-17.1	13,979
1	6	-12.9	0.018	0.0	1.043	0.586	-5.18	0.0378	72.0	70.2	0.0	-16.1	14,690
1	7	1.1	-0.010	0.0	1.043	0.366	-5.08	0.0380	56.8	56.8	0.0	1.1	11,935
1	8	21.5	-0.061	0.0	1.043	0.288	-5.15	0.0381	50.3	46.8	0.0	18.5	9,871
1	9	32.4	-0.051	0.0	1.043	0.327	-5.42	0.0381	53.5	45.2	0.0	28.7	9,545
1	10	34.9	-0.026	0.0	1.043	0.429	-5.09	0.0382	61.4	50.3	0.0	35.1	10,636
1	11	36.8	0.057	0.0	1.043	0.435	-5.09	0.0385	61.4	49.2	0.0	36.8	10,490
1	12	35.5	0.159	0.0	1.043	0.369	-4.97	0.0389	56.3	45.9	0.0	32.7	9,869
2	1	-21.8	0.040	0.0	1.043	0.486	-5.23	0.0378	65.6	60.9	0.0	-24.4	12,749
2	2	-19.1	0.001	0.0	1.043	0.436	-5.23	0.0378	62.2	58.7	0.0	-20.3	12,292
2	3	-17.0	-0.080	0.0	1.043	0.483	-5.27	0.0378	65.4	62.6	0.0	-19.2	13,086
2	4	-13.4	-0.119	0.0	1.043	0.356	-4.81	0.0378	56.1	54.6	0.0	-13.0	11,420
2	5	-10.9	-0.240	0.0	1.043	0.446	-5.29	0.0378	62.9	61.7	0.0	-11.9	12,916
2	6	-6.6	-0.269	0.0	1.043	0.446	-5.23	0.0379	62.8	62.4	0.0	-7.2	13,069
2	7	6.6	-0.244	0.0	1.043	0.492	-4.91	0.0378	66.0	65.6	0.0	7.6	13,713
2	8	11.7	-0.148	0.0	1.043	0.521	-5.19	0.0379	67.9	66.5	0.0	13.7	13,931
2	9	20.4	-0.135	0.0	1.043	0.447	-5.18	0.0379	62.8	58.9	0.0	21.9	12,344
2	10	19.6	-0.071	0.0	1.043	0.512	-5.37	0.0380	67.2	63.3	0.0	22.6	13,316
2	11	28.1	0.069	0.0	1.043	0.421	-5.16	0.0381	60.8	53.6	0.0	28.7	11,316
2	12	23.1	0.073	0.0	1.043	0.438	-5.33	0.0381	62.0	57.0	0.0	24.3	12,035
													315,700
													160,046

Airflow Sciences Corporation
Round 3-D Duct Traverse (Stack)

Project: 12010
 Site: MPC Detroit
 Task: 3D Flow
 Location: FCCU Stack Complex 3
 Condition: Run 3
 Personnel: P. Bihun
 Date: Tuesday, 4/24/2012

3DDAS011, Calibrated: 03/26/2012
 3-D Probe v.4.9.r13

Start Time: 2:37 PM
 End Time: 3:43 PM
 Formatting Parameters
 Velocities in fpm
 Insertion Depths from Near Wall

Date/Time
 04/24/12 03:21 PM
 Decay Time [s Start P [IWC] End P [IWC]
 5 6.67 6.7

Duct Diameter [ft]:	6.85
Number of Test Ports:	2
Number of Test Points per Port:	12
Dry Gas Molecular Weight [g/mol]:	30.68
Water Vapor Volume Fraction, Bws [%]:	0.094
Spec. Gas Constant [(ft-lbf)/(slug-R)]:	1685.9

* Data from M-5F/202 Run 3

Test Data Summary

Total Wet Gas Mass Flow Rate [lbm/hr]:	284,143
Total Wet Gas Vol. Flow Rate, Q _w [WSCFH]:	3,877,481
Total Dry Gas Vol. Flow Rate, Q _{sd} [DSCFH]:	3,512,734

	Min	Max	Avg
Axial Velocity [ft/s]	45.4	69.0	58.8
Temperature [°F]:	536.2	558.8	551.7
Wet Gas Density [lbm/ft³]:	0.0377	0.0385	0.0380
Static Pressure [IWC]:	-5.82	-4.69	-5.48
Total Pressure [IWC]:	-5.46	-4.26	-5.03
Barometric Pressure [Hg at 32°F]:	28.85	28.87	28.86

Probe Used	207722						
Rsls	-0.925						
Probe Calibration Date	11/08/2011						
	X6	X5	X4	X3	X2	X1	Constant
Probe Pitch Angle Calibration (F1)	0.000E+00	1.921E-09	-3.835E-09	2.618E-06	-7.557E-05	1.441E-02	-2.634E-02
Probe Velocity Calibration (F2)	-9.562E-13	-8.086E-10	5.501E-09	3.323E-07	3.171E-05	-1.037E-03	1.043E+00

Pressure Transducer Zero Readings (in IWC)

	P1-P2 (low)	P1-P2 (high)	P2-P3	P4-P5 (low)	P4-P5 (high)	P1-Pbar	Time
PRE	0.000	0.003	-0.026	0.000	-0.004	-5.17	3:22 PM
POST	0.000	-0.022	0.000	0.000	-0.003	-5.39	3:44 PM
SN	60125972	40915142	70223952	70622645	70418554	3662543	
RANGE	0.0->1.0	0.0->5.0	-2.5->2.5	-0.5->0.5	-2.5->2.5	-69.2->69.2	

NOTES:

1. All averages are number averages, not flow weighted averages
2. Calculation of total mass flow rate (lbm/hr) is based on individual areas for each traverse point; these areas are not necessarily equal
3. Calculation of wet and dry volumetric flow rate (SCFH) is based on the number-average axial velocity (per EPA Method 2F) and hence assumes equal areas regardless of test port spacing

Airflow Sciences Corporation

Round 3-D Duct Traverse (Stack)

Project: 12010

Site: MPC Detroit

Task: 3D Flow

Location: FCCU Stack Complex 3

Condition: Run 3

Personnel: P. Bihun

Date: Tuesday, 4/24/2012

3DDAS011, Calibrated: 03/26/2012

3-D Probe v.4.9.r13

Start Time: 2:37 PM

Formatting Parameters

Velocities in fpm

Insertion Depths from Near Wall

End Time: 3:43 PM

False

False

Decay Time [s Start P [IWC] End P [IWC]

5 6.67 6.7

Date/Time

04/24/12 03:21 PM

Last Leak Check

Traverse Data

MEASURED VALUES												
Port	Point	Port Spacing [deg]	Withdrawal Distance [ft]	Time (Local)	Area [ft²]	Patm [°Hg at 32°F]	P1-P2 [IWC]	P2-P3 [IWC]	P4-P5 [IWC]	P1-Pbar (Total P Gage) [IWC]	Temp [°F]	Yaw Null Angle [°]
1	1	0.00	0.07	2:52 PM	1.54	28.86	0.000	0.110	-0.094	-5.42	100.7	-7.0
1	2	0.00	0.22	2:52 PM	1.54	28.86	0.497	0.007	0.001	-5.27	554.8	-14.1
1	3	0.00	0.38	2:51 PM	1.54	28.86	0.452	0.020	-0.015	-5.26	556.5	-12.0
1	4	0.00	0.54	2:50 PM	1.54	28.86	0.503	-0.007	-0.010	-5.09	557.8	-12.8
1	5	0.00	0.72	2:50 PM	1.54	28.86	0.497	-0.022	-0.001	-5.15	558.8	-14.3
1	6	0.00	0.90	2:50 PM	1.54	28.86	0.504	0.010	0.014	-5.17	557.2	-14.3
1	7	0.00	1.11	2:39 PM	1.54	28.87	0.316	0.003	0.002	-5.46	555.1	-0.2
1	8	0.00	1.33	2:38 PM	1.54	28.86	0.267	0.003	0.021	-5.36	555.8	21.8
1	9	0.00	1.58	2:38 PM	1.54	28.86	0.287	0.012	-0.013	-5.43	554.2	29.2
1	10	0.00	1.86	2:37 PM	1.54	28.86	0.328	0.025	-0.008	-5.30	554.3	34.6
1	11	0.00	2.22	2:37 PM	1.54	28.86	0.345	0.034	0.006	-5.29	552.1	36.2
1	12	0.00	2.73	2:37 PM	1.54	28.86	0.384	-0.032	0.017	-5.16	551.5	35.7
2	1	180.00	0.07	3:43 PM	1.54	28.87	0.429	0.019	0.005	-4.44	553.5	-20.4
2	2	180.00	0.22	3:43 PM	1.54	28.85	0.400	0.031	-0.011	-4.26	554.8	-19.7
2	3	180.00	0.38	3:42 PM	1.54	28.86	0.380	0.015	-0.039	-4.47	554.1	-18.3
2	4	180.00	0.54	3:42 PM	1.54	28.87	0.342	0.011	-0.062	-4.67	553.6	-13.4
2	5	180.00	0.72	3:41 PM	1.54	28.86	0.374	-0.011	-0.063	-4.56	554.1	-11.7
2	6	180.00	0.90	3:41 PM	1.54	28.86	0.435	0.012	-0.130	-4.50	554.1	-3.7
2	7	180.00	1.11	3:33 PM	1.54	28.86	0.505	-0.007	-0.098	-4.98	548.2	5.9
2	8	180.00	1.33	3:32 PM	1.54	28.87	0.414	0.022	-0.085	-5.18	546.2	12.3
2	9	180.00	1.58	3:32 PM	1.54	28.87	0.514	-0.037	-0.061	-5.11	546.0	14.4
2	10	180.00	1.86	3:31 PM	1.54	28.87	0.407	-0.014	-0.043	-5.08	543.2	24.8
2	11	180.00	2.22	3:29 PM	1.54	28.87	0.419	-0.031	0.029	-5.35	536.2	16.7
2	12	180.00	2.73	3:29 PM	1.54	28.87	0.438	0.005	0.028	-5.21	536.5	22.8

Data from Port 1, Point 1 is erroneous and excluded from averages

Airflow Sciences Corporation

Round 3-D Duct Traverse (Stack)

Project: 12010

Site: MPC Detroit

Task: 3D Flow

Location: FCCU Stack Complex 3

Condition: Run 3

Personnel: P. Bihun

Date: Tuesday, 4/24/2012

3DDAS011, Calibrated: 03/26/2012

3-D Probe v.4.9.r13

Start Time: 2:37 PM

Formatting Parameters

Velocities in fpm

Insertion Depths from Near Wall

End Time: 3:43 PM

False

False

Decay Time [s Start P [W/C] End P [W/C]

5 6.67 6.7

Date/Time

04/24/12 03:21 PM

Last Leak Check

6.67

CALCULATED VALUES															
Port	Point	Yaw Angle [°]	F1 [-]	Pitch Angle [°]	F2 [-]	Dynam P [W/C]	Static P [W/C]	Wet Gas Density [lbm/ft³]	Total Velocity [ft/s]	Vaxial [ft/s]	Vpitch [ft/s]	Vyaw [ft/s]	Mass Flow [lbm/hr]	Wet Vol Flow [WACFH]	Wet Vol Flow [WSCFH]
1	1	-6.1	#####	-40.0	1.207	0.000	-5.42	0.0985	0.0	0.0	0.0	0.0	5	71	65
1	2	-13.2	0.001	0.0	1.043	0.541	-5.82	0.0378	69.2	67.4	0.0	-15.8	14.097	372.791	187.460
1	3	-11.0	-0.033	0.0	1.043	0.492	-5.75	0.0377	66.0	64.8	0.0	-12.6	13.542	358.722	180.076
1	4	-11.9	-0.020	0.0	1.043	0.547	-5.64	0.0377	69.7	68.2	0.0	-14.3	14.239	377.528	189.344
1	5	-13.4	-0.001	0.0	1.043	0.540	-5.69	0.0377	69.3	67.4	0.0	-16.1	14.054	372.938	186.882
1	6	-13.4	0.028	0.0	1.043	0.548	-5.72	0.0377	69.7	67.8	0.0	-16.2	14.165	375.437	188.367
1	7	0.7	0.006	0.0	1.043	0.344	-5.80	0.0378	55.2	55.2	0.0	0.7	11.555	305.513	153.654
1	8	22.8	0.080	0.0	1.043	0.290	-5.65	0.0378	50.7	46.7	0.0	19.6	9.778	258.721	130.022
1	9	30.1	-0.045	0.0	1.043	0.312	-5.74	0.0378	52.5	45.4	0.0	26.4	9.519	251.504	126.579
1	10	35.5	-0.024	0.0	1.043	0.357	-5.66	0.0379	56.2	45.7	0.0	32.6	9.584	253.171	127.449
1	11	37.1	0.018	0.0	1.043	0.375	-5.67	0.0379	57.5	45.9	0.0	34.7	9.629	253.873	128.042
1	12	36.6	0.045	0.0	1.043	0.417	-5.58	0.0380	60.7	48.7	0.0	36.2	10.233	269.598	136.081
2	1	-19.4	0.012	0.0	1.043	0.467	-4.90	0.0380	64.1	60.5	0.0	-21.3	12.710	334.768	169.014
2	2	-18.7	-0.029	0.0	1.043	0.435	-4.69	0.0379	62.0	58.7	0.0	-19.9	12.317	324.814	163.783
2	3	-17.4	-0.103	0.0	1.043	0.414	-4.88	0.0379	60.4	57.7	0.0	-18.1	12.107	319.110	160.994
2	4	-12.4	-0.181	0.0	1.043	0.372	-5.04	0.0379	57.3	56.0	0.0	-12.3	11.755	309.760	156.311
2	5	-10.8	-0.223	0.0	1.043	0.407	-4.96	0.0379	59.9	58.8	0.0	-11.2	12.354	325.700	164.280
2	6	-2.8	-0.300	0.0	1.043	0.473	-4.97	0.0379	64.6	64.5	0.0	-3.1	13.548	357.186	180.153
2	7	6.8	-0.193	0.0	1.043	0.550	-5.53	0.0381	69.5	69.0	0.0	8.3	14.551	381.981	193.497
2	8	13.2	-0.205	0.0	1.043	0.450	-5.63	0.0382	62.8	61.2	0.0	14.3	12.924	338.508	171.864
2	9	15.4	-0.118	0.0	1.043	0.559	-5.66	0.0382	70.0	67.5	0.0	18.5	14.263	373.540	189.661
2	10	25.8	-0.107	0.0	1.043	0.443	-5.52	0.0383	62.2	56.0	0.0	27.0	11.872	310.051	157.871
2	11	17.7	0.069	0.0	1.043	0.456	-5.80	0.0385	63.0	60.0	0.0	19.1	12.794	331.977	170.131
2	12	23.7	0.063	0.0	1.043	0.476	-5.69	0.0385	64.3	58.9	0.0	25.9	12.557	325.784	166.982

Airflow Sciences Corporation

Round 3-D Duct Traverse (Stack)

Project: 12010
 Site: MPC Detroit
 Task: 3D Flow
 Location: FCCU Stack Complex 3
 Condition: Run 4
 Personnel: P. Bihun
 Date: Wednesday, 4/25/2012

Duct Diameter [ft]:	6.85
Number of Test Ports:	2
Number of Test Points per Port:	12
Dry Gas Molecular Weight [g/mol]:	30.67
Water Vapor Volume Fraction, Bws [-]:	0.096
Spec. Gas Constant [(ft-lbf)/(slug-°R)]:	1687.7

* Data from M-5F/202 Run 4

Test Data Summary

Total Wet Gas Mass Flow Rate [lbm/hr]:	307,204
Total Wet Gas Vol. Flow Rate, Qsw [WSCFH]:	4,022,114
Total Dry Gas Vol. Flow Rate, Qsd [WSCFH]:	3,635,943

	Min	Max	Avg
Axial Velocity [ft/s]	52.5	65.6	59.6
Temperature [°F]:	527.1	543.5	539.0
Wet Gas Density [lbm/ft³]:	0.0386	0.0393	0.0388
Static Pressure [IWC]:	-5.25	-4.68	-4.97
Total Pressure [IWC]:	-4.83	-4.21	-4.54
Barometric Pressure [°Hg at 32°F]:	29.12	29.12	29.12

3DDAS011, Calibrated: 03/26/2012

3-D Probe v.4.9.r13

Start Time: 9:09 AM

End Time: 10:00 AM

Formatting Parameters

Velocities in fpm

False

Insertion Depths from Near Wall

False

Last Leak Check 04/25/12 08:31 AM
 Decay Time [s Start P [IWC] End P [IWC]] 5 5.83 5.81

Probe Used	207722																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			</

Pressure Transducer Zero Readings (in IWC)

	P1-P2 (low)	P1-P2 (high)	P2-P3	P4-P5 (low)	P4-P5 (high)	P1-Pbar	Time
PRE	0.000	0.001	-0.002	0.000	0.000	-5.87	8:32 AM
POST	0.000	0.005	0.009	0.000	0.000	-4.78	10:01 AM
SN	60125972	40915142	70223952	70622645	70418554	3662543	
RANGE	0.0->1.0	0.0->5.0	-2.5->2.5	-0.5->0.5	-2.5->2.5	-69.2->69.2	

NOTES:

1. All averages are number averages, not flow weighted averages
2. Calculation of total mass flow rate (lbm/hr) is based on individual areas for each traverse point; these areas are not necessarily equal
3. Calculation of wet and dry volumetric flow rate (SCFH) is based on the number-average axial velocity (per EPA Method 2F) and hence assumes equal areas regardless of test port spacing

Airflow Sciences Corporation

Round 3-D Duct Traverse (Stack)

Project: 12010
 Site: MPC Detroit
 Task: 3D Flow
 Location: FCCU Stack Complex 3
 Condition: Run 4
 Personnel: P. Bihun
 Date: Wednesday, 4/25/2012

3DDAS011, Calibrated: 03/26/2012

3-D Probe v.4.9.r13

Start Time: 9:09 AM
 End Time: 10:00 AM
 Formatting Parameters
 Velocities in fpm
 Insertion Depths from Near Wall

False
 False

Last Leak Check
 Date/Time
 04/25/12 08:31 AM
 Decay Time [s Start P [IWC] End P [IWC]
 5 5.83 5.81

Traverse Data

MEASURED VALUES												
Port	Point	Port Spacing [deg]	Withdrawal Distance [ft]	Time (Local)	Area [ft²]	Patm [°Hg at 32°F]	P1-P2 [IWC]	P2-P3 [IWC]	P4-P5 [IWC]	P1-Pbar (Total P Gage) [IWC]	Temp [°F]	Yaw Null Angle [°]
1	1	0.00	0.07	10:00 AM	1.54	29.12	0.430	0.012	0.005	-4.21	538.4	-8.6
1	2	0.00	0.22	9:59 AM	1.54	29.12	0.428	0.006	0.007	-4.28	539.2	-9.3
1	3	0.00	0.38	9:59 AM	1.54	29.12	0.468	-0.033	0.007	-4.25	540.3	-9.4
1	4	0.00	0.54	9:58 AM	1.54	29.12	0.464	-0.017	0.006	-4.34	541.0	-7.7
1	5	0.00	0.72	9:58 AM	1.54	29.12	0.422	0.024	-0.005	-4.33	541.7	-3.8
1	6	0.00	0.90	9:58 AM	1.54	29.12	0.441	-0.004	0.038	-4.28	541.8	-0.1
1	7	0.00	1.11	9:49 AM	1.54	29.12	0.349	0.009	0.027	-4.35	538.9	6.7
1	8	0.00	1.33	9:49 AM	1.54	29.12	0.379	-0.007	0.011	-4.32	538.6	5.0
1	9	0.00	1.58	9:48 AM	1.54	29.12	0.386	-0.012	0.007	-4.41	536.8	4.9
1	10	0.00	1.86	9:48 AM	1.54	29.12	0.393	0.016	-0.005	-4.44	535.3	5.3
1	11	0.00	2.22	9:47 AM	1.54	29.12	0.370	-0.027	0.045	-4.37	527.9	5.7
1	12	0.00	2.73	9:47 AM	1.54	29.12	0.351	0.018	0.044	-4.45	527.1	7.4
2	1	180.00	0.07	9:27 AM	1.54	29.12	0.398	0.012	0.030	-4.66	538.8	-1.0
2	2	180.00	0.22	9:26 AM	1.54	29.12	0.405	-0.028	0.025	-4.71	538.9	-3.7
2	3	180.00	0.38	9:25 AM	1.54	29.12	0.368	0.003	0.018	-4.70	542.1	-3.9
2	4	180.00	0.54	9:25 AM	1.54	29.12	0.340	0.022	0.027	-4.77	541.8	-3.6
2	5	180.00	0.72	9:24 AM	1.54	29.12	0.401	-0.031	0.024	-4.70	542.0	-5.2
2	6	180.00	0.90	9:24 AM	1.54	29.12	0.398	-0.014	0.025	-4.71	543.5	-5.6
2	7	180.00	1.11	9:11 AM	1.54	29.12	0.385	0.002	0.020	-4.83	541.9	1.1
2	8	180.00	1.33	9:11 AM	1.54	29.12	0.398	-0.018	0.022	-4.80	541.2	9.6
2	9	180.00	1.58	9:10 AM	1.54	29.12	0.359	0.015	0.007	-4.79	541.2	15.2
2	10	180.00	1.86	9:10 AM	1.54	29.12	0.363	0.009	0.003	-4.77	540.1	19.6
2	11	180.00	2.22	9:09 AM	1.54	29.12	0.342	0.006	0.024	-4.76	538.7	21.1
2	12	180.00	2.73	9:09 AM	1.54	29.12	0.341	-0.011	0.032	-4.83	539.8	20.1

Airflow Sciences Corporation
Round 3-D Duct Traverse (Stack)

Project: 12010
 Site: MPC Detroit
 Task: 3D Flow
 Location: FCCU Stack Complex 3
 Condition: Run 4
 Personnel: P. Bihun
 Date: Wednesday, 4/25/2012

3DDAS011, Calibrated: 03/26/2012
 3-D Probe v4.9.r13

Start Time: 9:09 AM
 Formatting Parameters
 Velocities in fpm
 Insertion Depths from Near Wall

End Time: 10:00 AM
 False
 False
 Decay Time [s Start P [IWC] End P [IWC]
 5 5.83 5.81

Date/Time: 04/25/12 08:31 AM
 Last Leak Check

CALCULATED VALUES															
Port	Point	Yaw Angle [°]	F1 [-]	Pitch Angle [°]	F2 [-]	Dynam P [IWC]	Static P [IWC]	Wet Gas Density [lbm/ft³]	Total Velocity [ft/s]	Vaxial [ft/s]	Vpitch [ft/s]	Vyaw [ft/s]	Mass Flow [lbm/hr]	Wet Vol Flow [WAGFH]	Wet Vol Flow [WSCFH]
1	1	-7.6	0.013	0.0	1.043	0.467	-4.68	0.0389	63.4	62.9	0.0	-8.4	13,527	348,023	179,874
1	2	-8.4	0.017	0.0	1.043	0.466	-4.75	0.0388	63.4	62.7	0.0	-9.3	13,473	346,993	179,162
1	3	-8.5	0.015	0.0	1.043	0.509	-4.75	0.0388	66.3	65.5	0.0	-9.8	14,067	362,740	187,057
1	4	-6.8	0.014	0.0	1.043	0.505	-4.85	0.0388	66.0	65.6	0.0	-7.8	14,060	362,830	186,966
1	5	-2.8	-0.011	0.0	1.043	0.459	-4.79	0.0387	63.0	62.9	0.0	-3.1	13,485	348,235	179,325
1	6	0.9	0.086	0.0	1.043	0.480	-4.76	0.0387	64.4	64.4	0.0	1.0	13,799	356,288	183,493
1	7	7.7	0.077	0.0	1.043	0.380	-4.73	0.0388	57.2	56.7	0.0	7.6	12,190	313,861	162,097
1	8	5.9	0.029	0.0	1.043	0.413	-4.74	0.0389	59.6	59.3	0.0	6.1	12,752	328,218	169,575
1	9	5.8	0.018	0.0	1.043	0.420	-4.83	0.0389	60.1	59.8	0.0	6.1	12,876	330,882	171,226
1	10	6.3	-0.012	0.0	1.043	0.428	-4.87	0.0390	60.6	60.3	0.0	6.6	12,998	333,563	172,852
1	11	6.6	0.122	0.0	1.043	0.402	-4.77	0.0393	58.6	58.2	0.0	6.8	12,639	321,886	168,076
1	12	8.4	0.124	0.0	1.043	0.381	-4.83	0.0393	57.0	56.4	0.0	8.3	12,264	312,123	163,083
2	1	-0.1	0.076	0.0	1.043	0.433	-5.09	0.0388	61.1	61.1	0.0	-0.1	13,121	338,121	174,485
2	2	-2.8	0.061	0.0	1.043	0.440	-5.15	0.0388	61.6	61.6	0.0	-3.0	13,218	340,688	175,771
2	3	-3.0	0.050	0.0	1.043	0.389	-5.09	0.0387	58.0	58.0	0.0	-3.0	12,408	320,810	165,005
2	4	-2.7	0.080	0.0	1.043	0.370	-5.14	0.0387	56.6	56.5	0.0	-2.6	12,098	312,742	160,879
2	5	-4.2	0.059	0.0	1.043	0.436	-5.13	0.0387	61.4	61.3	0.0	-4.5	13,117	339,165	174,430
2	6	-4.6	0.064	0.0	1.043	0.433	-5.15	0.0386	61.3	61.1	0.0	-4.9	13,057	338,124	173,635
2	7	2.0	0.052	0.0	1.043	0.419	-5.25	0.0387	60.2	60.2	0.0	2.1	12,875	332,942	171,205
2	8	10.5	0.055	0.0	1.043	0.433	-5.24	0.0387	61.2	60.2	0.0	11.2	12,892	333,182	171,440
2	9	16.1	0.020	0.0	1.043	0.390	-5.18	0.0387	58.1	55.8	0.0	16.1	11,960	309,001	159,039
2	10	20.6	0.007	0.0	1.043	0.395	-5.16	0.0387	58.4	54.7	0.0	20.5	11,728	302,674	155,953
2	11	22.0	0.070	0.0	1.043	0.372	-5.13	0.0388	56.6	52.5	0.0	21.2	11,277	290,610	149,954
2	12	21.1	0.095	0.0	1.043	0.370	-5.20	0.0388	56.6	52.8	0.0	20.3	11,323	292,173	150,575

Airflow Sciences Corporation
Round 3-D Duct Traverse (Stack)
 Project: 12010
 Site: MPC Detroit
 Task: 3D Flow
 Location: FCCU Stack Complex 3
 Condition: Run 5
 Personnel: P. Bihun
 Date: Wednesday, 4/25/2012

3DDAS011, Calibrated: 03/26/2012
 3-D Probe v.4.9.r13
 Start Time: 12:08 PM
 End Time: 1:02 PM
 Formatting Parameters
 Velocities in fpm
 Insertion Depths from Near Wall
 False
 False

Date/Time 04/25/12 08:31 AM
 Decay Time [s Start P [IWC] End P [IWC]
 5 5.83 5.81

Duct Diameter [ft]:	6.85
Number of Test Ports:	2
Number of Test Points per Port:	12
Dry Gas Molecular Weight [g/mol]:	30.66
Water Vapor Volume Fraction, Bws []:	0.099
Spec. Gas Constant [(ft-lbf)/(slug-R)]:	1690.5

* Data from M-5F/202 Run 5

Test Data Summary

Total Wet Gas Mass Flow Rate [lbm/hr]:	307,610
Total Wet Gas Vol. Flow Rate, Qsw [WSCFH]:	4,034,623
Total Dry Gas Vol. Flow Rate, Qsd [WSCFH]:	3,635,326

	Min	Max	Avg
Axial Velocity [ft/s]	51.9	65.7	59.7
Temperature [°F]:	531.5	547.4	540.9
Wet Gas Density [lbm/ft³]:	0.0386	0.0392	0.0388
Static Pressure [IWC]:	-3.91	-2.96	-3.61
Total Pressure [IWC]:	-3.48	-2.47	-3.19
Barometric Pressure [°Hg at 32°F]:	29.11	29.12	29.12

Probe Used	207722						
Rsl0	-0.925						
Probe Calibration Date	11/08/2011						
	X6	X5	X4	X3	X2	X1	Constant
Probe Pitch Angle Calibration (F1)	0.000E+00	1.921E-09	-3.835E-09	2.618E-06	-7.557E-05	1.441E-02	-2.634E-02
Probe Velocity Calibration (F2)	-9.562E-13	-8.086E-10	5.501E-09	3.323E-07	3.171E-05	-1.037E-03	1.043E+00

Pressure Transducer Zero Readings (in IWC)

	P1-P2 (low)	P1-P2 (high)	P2-P3	P4-P5 (low)	P4-P5 (high)	P1-Pbar	Time
PRE	0.000	0.007	0.008	0.000	0.000	-4.48	10:03 AM
POST	0.000	0.011	0.010	0.000	-0.004	-3.96	1:04 PM
SN	60125972	40915142	70223952	70622645	70418564	3662543	
RANGE	0.0->1.0	0.0->5.0	-2.5->2.5	-0.5->0.5	-2.5->2.5	-69.2->69.2	

NOTES:

1. All averages are number averages, not flow weighted averages
2. Calculation of total mass flow rate (lbm/hr) is based on individual areas for each traverse point; these areas are not necessarily equal
3. Calculation of wet and dry volumetric flow rate (SCFH) is based on the number-average axial velocity (per EPA Method 2F) and hence assumes equal areas regardless of test port spacing

Airflow Sciences Corporation

Round 3-D Duct Traverse (Stack)

Project: 12010
 Site: MPC Detroit
 Task: 3D Flow
 Location: FCCU Stack Complex 3
 Condition: Run 5
 Personnel: P. Bihun
 Date: Wednesday, 4/25/2012

3DDAS011, Calibrated: 03/26/2012

3-D Probe v.4.9.r13

Start Time: 12:08 PM
 End Time: 1:02 PM
 Formatting Parameters
 Velocities in fpm
 Insertion Depths from Near Wall
 False
 False

Date/Time
 04/25/12 08:31 AM
 Last Leak Check
 Decay Time [s Start P [WC] End P [WC]
 5 5.83 5.81

Traverse Data

MEASURED VALUES												
Port	Point	Port Spacing [deg]	Withdrawal Distance [ft]	Time (Local)	Area [ft ²]	Patm [inHg at 32°F]	P1-P2 [WC]	P2-P3 [WC]	P4-P5 [WC]	P1-Pbar (Total P Gage) [WC]	Temp [°F]	Yaw Null Angle [°]
1	1	0.00	0.07	12:26 PM	1.54	29.12	0.450	-0.002	0.007	-2.98	541.1	-9.3
1	2	0.00	0.22	12:25 PM	1.54	29.12	0.431	0.024	0.013	-2.73	544.3	-7.8
1	3	0.00	0.38	12:25 PM	1.54	29.12	0.453	-0.004	0.017	-2.47	547.0	-8.3
1	4	0.00	0.54	12:24 PM	1.54	29.12	0.462	0.000	0.024	-2.53	547.4	-7.1
1	5	0.00	0.72	12:23 PM	1.54	29.12	0.441	-0.023	0.001	-2.98	546.2	-6.3
1	6	0.00	0.90	12:23 PM	1.54	29.12	0.408	0.008	0.017	-3.06	546.5	1.2
1	7	0.00	1.11	12:10 PM	1.54	29.12	0.382	0.002	0.016	-3.22	545.6	7.2
1	8	0.00	1.33	12:10 PM	1.54	29.12	0.371	0.010	0.005	-3.19	545.3	5.6
1	9	0.00	1.58	12:09 PM	1.54	29.12	0.409	-0.017	-0.004	-3.13	545.4	3.4
1	10	0.00	1.86	12:09 PM	1.54	29.12	0.408	0.011	-0.002	-3.17	542.9	4.0
1	11	0.00	2.22	12:08 PM	1.54	29.12	0.364	0.027	0.033	-3.11	541.3	7.4
1	12	0.00	2.73	12:08 PM	1.54	29.12	0.372	-0.009	0.037	-3.09	541.0	6.0
2	1	180.00	0.07	1:02 PM	1.54	29.11	0.396	0.009	0.021	-3.41	536.4	-3.8
2	2	180.00	0.22	1:02 PM	1.54	29.11	0.364	0.032	0.015	-3.36	538.7	-3.1
2	3	180.00	0.38	1:01 PM	1.54	29.11	0.359	0.018	0.017	-3.28	540.5	-1.9
2	4	180.00	0.54	1:00 PM	1.54	29.11	0.341	0.022	0.020	-3.48	539.2	-2.8
2	5	180.00	0.72	1:00 PM	1.54	29.12	0.379	-0.006	0.025	-3.45	540.1	-5.9
2	6	180.00	0.90	12:59 PM	1.54	29.11	0.373	0.013	0.021	-3.43	541.4	-5.8
2	7	180.00	1.11	12:49 PM	1.54	29.11	0.412	-0.028	0.033	-3.47	538.0	0.8
2	8	180.00	1.33	12:49 PM	1.54	29.11	0.371	0.032	0.022	-3.44	537.8	10.9
2	9	180.00	1.58	12:48 PM	1.54	29.11	0.381	-0.005	0.006	-3.41	538.1	15.1
2	10	180.00	1.86	12:47 PM	1.54	29.11	0.373	-0.011	0.002	-3.38	534.3	17.9
2	11	180.00	2.22	12:47 PM	1.54	29.11	0.333	0.003	0.024	-3.41	531.7	20.3
2	12	180.00	2.73	12:47 PM	1.54	29.11	0.349	-0.012	0.024	-3.37	531.5	20.3

Airflow Sciences Corporation

Round 3-D Duct Traverse (Stack)

Project: 12010

Site: MPC Detroit

Task: 3D Flow

Location: FCCU Stack Complex 3

Condition: Run 5

Personnel: P. Bihun

Date: Wednesday, 4/25/2012

3DDAS011, Calibrated: 03/26/2012

3-D Probe v.4.9.r13

Start Time: 12:08 PM

Formatting Parameters

Velocities in fpm

Insertion Depths from Near Wall

End Time: 1:02 PM

False

False

Decay Time [s Start P [WCI] End P [WCI]

5 5.83 5.81

Date/Time

04/25/12 08:31 AM

Last Leak Check

CALCULATED VALUES															
Port	Point	Yaw Angle [°]	F1 [-]	Pitch Angle [°]	F2 [-]	Dynam P [W/C]	Static P [W/C]	Wet Gas Density [lbm/ft³]	Total Velocity [ft/s]	Vaxial [ft/s]	Vpitch [ft/s]	Vyaw [ft/s]	Mass Flow [lbm/hr]	Wet Vol Flow [WACFH]	Wet Vol Flow [WSCFH]
1	1	-8.4	0.014	0.0	1.043	0.489	-3.47	0.0388	65.0	64.3	0.0	-9.5	13,804	355,680	183,570
1	2	-6.9	0.030	0.0	1.043	0.489	-3.20	0.0387	63.7	63.2	0.0	-7.6	13,551	350,017	180,195
1	3	-7.4	0.037	0.0	1.043	0.493	-2.96	0.0386	65.4	64.8	0.0	-8.4	13,860	358,717	184,310
1	4	-6.2	0.051	0.0	1.043	0.503	-3.03	0.0386	66.0	65.7	0.0	-7.1	14,031	363,364	186,589
1	5	-5.4	0.002	0.0	1.043	0.480	-3.46	0.0386	64.5	64.2	0.0	-6.0	13,725	355,412	182,513
1	6	2.1	0.041	0.0	1.043	0.444	-3.51	0.0386	62.1	62.0	0.0	2.3	13,250	343,265	176,203
1	7	8.1	0.041	0.0	1.043	0.416	-3.63	0.0386	60.0	59.4	0.0	8.5	12,700	328,789	168,879
1	8	6.5	0.013	0.0	1.043	0.404	-3.60	0.0386	59.1	58.7	0.0	6.7	12,563	325,130	167,067
1	9	4.3	-0.010	0.0	1.043	0.445	-3.57	0.0386	62.1	61.9	0.0	4.7	13,236	342,538	176,010
1	10	5.0	-0.005	0.0	1.043	0.444	-3.61	0.0387	61.9	61.7	0.0	5.4	13,228	341,531	175,898
1	11	8.3	0.092	0.0	1.043	0.396	-3.50	0.0388	58.4	57.8	0.0	8.4	12,419	320,026	165,144
1	12	6.9	0.099	0.0	1.043	0.405	-3.49	0.0388	59.1	58.6	0.0	7.1	12,598	324,553	167,532
2	1	-2.9	0.054	0.0	1.043	0.431	-3.84	0.0389	60.9	60.8	0.0	-3.0	13,107	336,547	174,291
2	2	-2.2	0.040	0.0	1.043	0.396	-3.75	0.0389	58.4	58.4	0.0	-2.3	12,561	323,155	167,030
2	3	-1.0	0.046	0.0	1.043	0.391	-3.68	0.0388	58.0	58.0	0.0	-1.0	12,466	321,217	165,769
2	4	-1.9	0.058	0.0	1.043	0.371	-3.85	0.0388	56.6	56.5	0.0	-1.9	12,155	312,949	161,635
2	5	-4.9	0.066	0.0	1.043	0.412	-3.87	0.0388	59.6	59.4	0.0	-5.1	12,758	328,762	169,660
2	6	-4.9	0.057	0.0	1.043	0.406	-3.84	0.0388	59.2	59.0	0.0	-5.1	12,656	326,557	168,293
2	7	1.7	0.080	0.0	1.043	0.448	-3.91	0.0389	62.1	62.1	0.0	1.8	13,356	343,549	177,611
2	8	11.8	0.059	0.0	1.043	0.403	-3.84	0.0389	58.9	57.7	0.0	12.1	12,411	319,098	165,034
2	9	16.0	0.015	0.0	1.043	0.415	-3.83	0.0389	59.7	57.4	0.0	16.5	12,358	317,836	164,338
2	10	18.9	0.005	0.0	1.043	0.406	-3.79	0.0390	59.0	55.9	0.0	19.1	12,067	309,114	160,462
2	11	21.2	0.071	0.0	1.043	0.362	-3.78	0.0391	55.7	51.9	0.0	20.1	11,244	287,285	149,527
2	12	21.2	0.069	0.0	1.043	0.380	-3.75	0.0392	57.0	53.1	0.0	20.6	11,505	293,854	152,986

Airflow Sciences Corporation

Round 3-D Duct Traverse (Stack)

Project: 12010
 Site: MPC Detroit
 Task: 3D Flow
 Location: FCCU Stack Complex 3
 Condition: Run 6
 Personnel: P. Bihun
 Date: Wednesday, 4/25/2012

3DDAS011, Calibrated: 03/26/2012

3-D Probe v.4.9.r13

Start Time: 2:09 PM End Time: 3:11 PM
 Formatting Parameters
 Velocities in fpm False
 Insertion Depths from Near Wall False

Date/Time 04/25/12 02:49 PM Decay Time [s Start P [WCI End P [WCI
 Last Leak Check 5 4.72 4.74

Duct Diameter [ft]:	6.85
Number of Test Ports:	2
Number of Test Points per Port:	12
Dry Gas Molecular Weight [g/mol]:	30.68
Water Vapor Volume Fraction, Bws [-]:	0.097
Spec. Gas Constant [(ft-lbf)/(slug-°R)]:	1687.8

* Data from M-5F/202 Run 6

Test Data Summary

Total Wet Gas Mass Flow Rate [lbm/hr]:	306,107
Total Wet Gas Vol. Flow Rate, Qsw [WSCFH]:	4,008,007
Total Dry Gas Vol. Flow Rate, Qsd [DSCFH]:	3,619,124

	Min	Max	Avg
Axial Velocity [ft/s]	51.6	65.0	59.2
Temperature [°F]	528.3	541.4	537.8
Wet Gas Density [lbm/ft³]:	0.0388	0.0393	0.0389
Static Pressure [WCI]:	-3.88	-3.44	-3.64
Total Pressure [WCI]:	-3.46	-2.94	-3.22
Barometric Pressure [°Hg at 32°F]:	29.07	29.09	29.08

Probe Used	207722						
Rsls	-0.925						
Probe Calibration Date	11/08/2011						
	X6	X5	X4	X3	X2	X1	Constant
Probe Pitch Angle Calibration (F1)	0.000E+00	1.921E-09	-3.835E-09	2.618E-06	-7.557E-05	1.441E-02	-2.634E-02
Probe Velocity Calibration (F2)	-9.562E-13	-8.086E-10	5.501E-09	3.323E-07	3.171E-05	-1.037E-03	1.043E+00

Pressure Transducer Zero Readings (in IWC)

	P1-P2 (low)	P1-P2 (high)	P2-P3	P4-P5 (low)	P4-P5 (high)	P1-Pbar	Time
PRE	0.000	0.016	0.015	0.000	-0.012	-3.02	2:50 PM
POST	0.000	0.018	0.012	0.000	-0.016	-4.03	3:14 PM
SN	60125972	40915142	70223952	70622645	70418554	3662543	
RANGE	0.0->1.0	0.0->5.0	-2.5->2.5	-0.5->0.5	-2.5->2.5	-69.2->69.2	

NOTES:

1. All averages are number averages, not flow weighted averages
2. Calculation of total mass flow rate (lbm/hr) is based on individual areas for each traverse point; these areas are not necessarily equal
3. Calculation of wet and dry volumetric flow rate (SCFH) is based on the number-average axial velocity (per EPA Method 2F) and hence assumes equal areas regardless of test port spacing

Airflow Sciences Corporation

Round 3-D Duct Traverse (Stack)

Project: 12010
 Site: MPC Detroit
 Task: 3D Flow
 Location: FCCU Stack Complex 3
 Condition: Run 6
 Personnel: P. Bihun
 Date: Wednesday, 4/25/2012

3DDAS011, Calibrated: 03/26/2012

3-D Probe v.4.9.r13

Start Time: 2:09 PM
 Formatting Parameters
 Velocities in fpm
 Insertion Depths from Near Wall
 End Time: 3:11 PM
 False
 False

Date/Time: 04/25/12 02:49 PM
 Last Leak Check
 Decay Time [s Start P [IWC] End P [IWC]
 5 4.72 4.74

Traverse Data

MEASURED VALUES												
Port	Point	Port Spacing [deg]	Withdrawal Distance [ft]	Time (Local)	Area [ft²]	Patm [°Hg at 32°F]	P1-P2 [IWC]	P2-P3 [IWC]	P4-P5 [IWC]	P1-Pbar (Total P Gage) [IWC]	Temp [°F]	Yaw Null Angle [°]
1	1	0.00	0.07	3:11 PM	1.54	29.08	0.458	-0.026	0.016	-2.94	536.7	-10.4
1	2	0.00	0.22	3:11 PM	1.54	29.07	0.430	0.031	0.026	-3.15	537.2	-9.5
1	3	0.00	0.38	3:10 PM	1.54	29.08	0.458	0.025	0.013	-3.18	538.0	-7.7
1	4	0.00	0.54	3:10 PM	1.54	29.07	0.442	0.033	0.018	-3.26	539.2	-6.9
1	5	0.00	0.72	3:09 PM	1.54	29.07	0.415	0.004	-0.007	-3.29	539.9	-5.2
1	6	0.00	0.90	3:09 PM	1.54	29.07	0.389	0.032	0.004	-3.17	540.8	1.7
1	7	0.00	1.11	2:59 PM	1.54	29.08	0.367	-0.017	0.015	-3.39	536.9	7.0
1	8	0.00	1.33	2:58 PM	1.54	29.08	0.388	0.009	0.000	-3.46	536.6	5.4
1	9	0.00	1.58	2:58 PM	1.54	29.08	0.393	0.022	-0.003	-3.27	535.8	5.1
1	10	0.00	1.86	2:57 PM	1.54	29.07	0.384	0.024	-0.004	-3.26	534.5	5.0
1	11	0.00	2.22	2:57 PM	1.54	29.08	0.388	-0.025	0.030	-3.16	530.2	4.5
1	12	0.00	2.73	2:56 PM	1.54	29.08	0.343	0.023	0.042	-3.16	528.3	6.4
2	1	180.00	0.07	2:27 PM	1.54	29.09	0.390	0.009	0.025	-3.08	536.8	-4.9
2	2	180.00	0.22	2:26 PM	1.54	29.08	0.380	0.002	0.019	-3.35	537.7	-4.3
2	3	180.00	0.38	2:25 PM	1.54	29.09	0.351	0.024	0.016	-3.24	539.5	-2.7
2	4	180.00	0.54	2:24 PM	1.54	29.09	0.346	0.024	0.023	-3.24	539.9	-4.4
2	5	180.00	0.72	2:24 PM	1.54	29.09	0.353	0.008	0.022	-3.19	541.3	-3.7
2	6	180.00	0.90	2:24 PM	1.54	29.09	0.372	0.028	0.018	-3.21	541.1	-6.7
2	7	180.00	1.11	2:11 PM	1.54	29.09	0.404	-0.011	0.023	-3.22	539.6	0.1
2	8	180.00	1.33	2:11 PM	1.54	29.09	0.375	0.014	0.021	-3.16	541.4	10.9
2	9	180.00	1.58	2:10 PM	1.54	29.09	0.392	-0.032	0.005	-3.24	540.9	14.5
2	10	180.00	1.86	2:10 PM	1.54	29.09	0.360	0.015	0.008	-3.13	539.2	18.1
2	11	180.00	2.22	2:10 PM	1.54	29.09	0.352	-0.023	0.020	-3.17	538.7	19.4
2	12	180.00	2.73	2:09 PM	1.54	29.09	0.327	0.017	0.030	-3.29	537.1	20.0

Airflow Sciences Corporation

Round 3-D Duct Traverse (Stack)

Project: 12010

Site: MPC Detroit

Task: 3D Flow

Location: FCCU Stack Complex 3

Condition: Run 6

Personnel: P. Bihun

Date: Wednesday, 4/25/2012

3DDAS011, Calibrated: 03/26/2012

3-D Probe v.4.9.r13

Start Time: 2:09 PM

Formatting Parameters

Velocities in fpm

Insertion Depths from Near Wall

End Time: 3:11 PM

False

False

Decay Time [s Start P [W/C] End P [W/C]

5 4.72 4.74

Date/Time

04/25/12 02:49 PM

Last Leak Check

04/25/12 02:49 PM

CALCULATED VALUES															
Port	Point	Yaw Angle [°]	F1 [°]	Pitch Angle [°]	F2 [°]	Dynam P [IWC]	Static P [IWC]	Wet Gas Density [lbm/ft³]	Total Velocity [ft/s]	Vaxial [ft/s]	Vpitch [ft/s]	Vyaw [ft/s]	Mass Flow [lbm/hr]	Wet Vol Flow [WACFH]	Wet Vol Flow [WSCFH]
1	1	-9.5	0.035	0.0	1.043	0.499	-3.44	0.0390	65.4	64.5	0.0	-10.8	13.923	357.117	185.153
1	2	-8.6	0.061	0.0	1.043	0.468	-3.62	0.0389	63.4	62.7	0.0	-9.5	13.511	346.896	179.669
1	3	-6.8	0.027	0.0	1.043	0.498	-3.68	0.0389	65.5	65.0	0.0	-7.8	14.001	359.805	186.179
1	4	-6.0	0.040	0.0	1.043	0.481	-3.74	0.0389	64.4	64.0	0.0	-6.7	13.768	354.346	183.082
1	5	-4.3	-0.018	0.0	1.043	0.452	-3.74	0.0388	62.4	62.2	0.0	-4.7	13.372	344.369	177.818
1	6	2.6	0.010	0.0	1.043	0.424	-3.60	0.0388	60.5	60.4	0.0	2.8	12.972	334.255	172.500
1	7	8.0	0.042	0.0	1.043	0.399	-3.79	0.0389	58.6	58.0	0.0	8.1	12.500	320.937	166.225
1	8	6.4	0.000	0.0	1.043	0.422	-3.88	0.0389	60.2	59.8	0.0	6.7	12.896	331.121	171.496
1	9	6.0	-0.007	0.0	1.043	0.428	-3.69	0.0390	60.6	60.3	0.0	6.3	13.010	333.600	173.007
1	10	5.9	-0.009	0.0	1.043	0.418	-3.68	0.0390	59.9	59.5	0.0	6.2	12.866	329.480	171.087
1	11	5.4	0.076	0.0	1.043	0.422	-3.58	0.0392	60.0	59.7	0.0	5.7	12.971	330.631	172.487
1	12	7.3	0.121	0.0	1.043	0.373	-3.53	0.0393	56.3	55.9	0.0	7.2	12.158	309.269	161.681
2	1	-4.0	0.065	0.0	1.043	0.425	-3.50	0.0390	60.4	60.2	0.0	-4.2	12.998	333.332	172.841
2	2	-3.3	0.050	0.0	1.043	0.413	-3.77	0.0389	59.6	59.5	0.0	-3.5	12.823	329.388	170.520
2	3	-1.8	0.047	0.0	1.043	0.382	-3.63	0.0389	57.4	57.3	0.0	-1.8	12.339	317.400	164.080
2	4	-3.5	0.087	0.0	1.043	0.376	-3.61	0.0389	56.9	56.8	0.0	-3.4	12.220	314.474	162.505
2	5	-2.8	0.063	0.0	1.043	0.385	-3.58	0.0388	57.6	57.5	0.0	-2.8	12.357	318.381	164.320
2	6	-5.8	0.048	0.0	1.043	0.405	-3.62	0.0388	59.1	58.8	0.0	-6.0	12.625	325.263	167.888
2	7	1.1	0.056	0.0	1.043	0.440	-3.66	0.0389	61.5	61.5	0.0	1.1	13.239	340.579	176.051
2	8	11.9	0.055	0.0	1.043	0.408	-3.57	0.0388	59.3	58.0	0.0	12.2	12.464	321.107	165.741
2	9	15.4	0.012	0.0	1.043	0.426	-3.67	0.0388	60.6	58.4	0.0	16.1	12.553	323.346	166.925
2	10	19.0	0.022	0.0	1.043	0.391	-3.53	0.0389	58.0	54.9	0.0	18.9	11.816	303.746	157.126
2	11	20.4	0.057	0.0	1.043	0.383	-3.55	0.0389	57.4	53.8	0.0	20.0	11.591	297.837	154.138
2	12	20.9	0.090	0.0	1.043	0.355	-3.64	0.0390	55.2	51.6	0.0	19.7	11.134	285.677	148.056

Airflow Sciences Corporation

Round 3-D Duct Traverse (Stack)

Project: 12010
 Site: MPC Detroit
 Task: 3D Flow
 Location: FCCU Stack Complex 3
 Condition: Run 7
 Personnel: P. Bihun
 Date: Thursday, 4/26/2012

3DDAS011, Calibrated: 03/26/2012

3-D Probe v.4.9.r13

Start Time: 8:26 AM End Time: 9:19 AM
 Formatting Parameters
 Velocities in fpm False
 Insertion Depths from Near Wall False

Date/Time 04/26/12 07:42 AM Decay Time [s Start P [IWC] End P [IWC]
 5 8.78 8.78

Duct Diameter [ft]:	6.85
Number of Test Ports:	2
Number of Test Points per Port:	12
Dry Gas Molecular Weight [g/mol]:	30.65
Water Vapor Volume Fraction, Bws [-]:	0.100
Spec. Gas Constant [(ft-lbf)/(slug-R)]:	1692.0

* Data from M-5F/202 Run 7

Test Data Summary

Total Wet Gas Mass Flow Rate [lbm/hr]:	311,545
Total Wet Gas Vol. Flow Rate, Q _w [WSCFH]:	4,089,344
Total Dry Gas Vol. Flow Rate, Q _{sd} [DSCFH]:	3,678,598

	Min	Max	Avg
Axial Velocity [ft/s]	53.3	66.5	60.3
Temperature [°F]:	532.1	549.0	543.6
Wet Gas Density [lbm/ft³]:	0.0387	0.0393	0.0389
Static Pressure [IWC]:	0.56	0.93	0.78
Total Pressure [IWC]:	1.02	1.44	1.22
Barometric Pressure [°Hg at 32°F]:	28.94	28.95	28.94

Probe Used	207722						
Rsls	-0.925						
Probe Calibration Date	11/08/2011						
	X6	X5	X4	X3	X2	X1	Constant
Probe Pitch Angle Calibration (F1)	0.000E+00	1.921E-09	-3.835E-09	2.618E-06	-7.557E-05	1.441E-02	-2.634E-02
Probe Velocity Calibration (F2)	-9.562E-13	-8.088E-10	5.501E-09	3.323E-07	3.171E-05	-1.037E-03	1.043E+00

Pressure Transducer Zero Readings (in IWC)

	P1-P2 (low)	P1-P2 (high)	P2-P3	P4-P5 (low)	P4-P5 (high)	P1-Pbar	Time
PRE	0.000	0.000	0.001	0.000	-0.001	0.24	7:43 AM
POST	0.000	0.004	0.011	0.000	-0.002	0.50	9:20 AM
SN	60125972	40915142	70223952	70622645	70418554	3662543	
RANGE	0.0->1.0	0.0->5.0	-2.5->2.5	-0.5->0.5	-2.5->2.5	-89.2->89.2	

NOTES:

1. All averages are number averages, not flow weighted averages
2. Calculation of total mass flow rate (lbm/hr) is based on individual areas for each traverse point; these areas are not necessarily equal
3. Calculation of wet and dry volumetric flow rate (SCFH) is based on the number-average axial velocity (per EPA Method 2F) and hence assumes equal areas regardless of test port spacing

Airflow Sciences Corporation

Round 3-D Duct Traverse (Stack)

Project: 12010

Site: MPC Detroit

Task: 3D Flow

Location: FCCU Stack Complex 3

Condition: Run 7

Personnel: P. Bihun

Date: Thursday, 4/26/2012

3DDAS011, Calibrated: 03/26/2012

3-D Probe v.4.9.r13

Start Time: 8:26 AM

Formatting Parameters

Velocities in fpm

Insertion Depths from Near Wall

End Time: 9:19 AM

False

False

Decay Time [s Start P [IWC] End P [IWC]

5 8.78 8.78

Date/Time

04/26/12 07:42 AM

Last Leak Check

Traverse Data

MEASURED VALUES												
Port	Point	Port Spacing [deg]	Withdrawal Distance [ft]	Time (Local)	Area [ft ²]	Patm [inHg at 32°F]	P1-P2 [IWC]	P2-P3 [IWC]	P4-P5 [IWC]	P1-Pbar (Total P Gage) [IWC]	Temp [°F]	Yaw Null Angle [°]
1	1	0.00	0.07	9:19 AM	1.54	28.94	0.442	0.012	0.016	1.37	542.4	-10.9
1	2	0.00	0.22	9:18 AM	1.54	28.94	0.468	-0.012	0.011	1.40	543.1	-11.5
1	3	0.00	0.38	9:18 AM	1.54	28.94	0.489	-0.038	0.008	1.38	545.1	-12.2
1	4	0.00	0.54	9:17 AM	1.54	28.94	0.461	-0.001	0.008	1.44	546.1	-9.2
1	5	0.00	0.72	9:17 AM	1.54	28.94	0.450	0.007	0.013	1.32	546.0	-6.5
1	6	0.00	0.90	9:17 AM	1.54	28.94	0.432	-0.012	0.028	1.31	547.0	-0.6
1	7	0.00	1.11	9:05 AM	1.54	28.95	0.377	-0.012	0.016	1.27	542.6	5.7
1	8	0.00	1.33	9:04 AM	1.54	28.95	0.407	-0.020	0.006	1.19	541.1	3.5
1	9	0.00	1.58	9:04 AM	1.54	28.95	0.419	-0.001	-0.007	1.27	538.0	2.6
1	10	0.00	1.86	9:03 AM	1.54	28.94	0.428	-0.029	0.001	1.36	537.5	1.5
1	11	0.00	2.22	9:03 AM	1.54	28.95	0.350	0.004	0.035	1.20	533.7	4.8
1	12	0.00	2.73	9:03 AM	1.54	28.95	0.377	-0.015	0.035	1.24	532.1	3.9
2	1	180.00	0.07	8:44 AM	1.54	28.95	0.390	0.006	0.027	1.20	546.0	-5.6
2	2	180.00	0.22	8:44 AM	1.54	28.95	0.380	0.021	0.025	1.21	546.8	-6.6
2	3	180.00	0.38	8:44 AM	1.54	28.95	0.382	-0.008	0.028	1.16	548.1	-5.4
2	4	180.00	0.54	8:43 AM	1.54	28.95	0.370	-0.002	0.023	1.17	548.8	-5.2
2	5	180.00	0.72	8:42 AM	1.54	28.94	0.364	0.023	0.024	1.11	548.0	-6.5
2	6	180.00	0.90	8:42 AM	1.54	28.95	0.387	-0.013	0.021	1.19	549.0	-5.2
2	7	180.00	1.11	8:28 AM	1.54	28.95	0.421	-0.007	0.035	1.02	546.1	0.1
2	8	180.00	1.33	8:27 AM	1.54	28.94	0.375	0.026	0.013	1.03	545.7	8.6
2	9	180.00	1.58	8:27 AM	1.54	28.95	0.384	0.005	0.020	1.08	545.4	13.4
2	10	180.00	1.86	8:27 AM	1.54	28.94	0.361	0.020	0.009	1.12	543.9	17.6
2	11	180.00	2.22	8:26 AM	1.54	28.94	0.344	0.005	0.026	1.11	542.0	18.4
2	12	180.00	2.73	8:26 AM	1.54	28.94	0.345	0.005	0.028	1.08	541.1	19.1

Airflow Sciences Corporation

Round 3-D Duct Traverse (Stack)

Project: 12010

Site: MPC Detroit

Task: 3D Flow

Location: FOCU Stack Complex 3

Condition: Run 7

Personnel: P. Bihun

Date: Thursday, 4/26/2012

3DDAS011, Calibrated: 03/26/2012

3-D Probe v.4.9.r13

Start Time: 8:26 AM

End Time: 9:19 AM

Formatting Parameters

Velocities in fpm

Insertion Depths from Near Wall

False

False

Date/Time
04/26/12 07:42 AM
Decay Time [s Start P [IWC] End P [IWC]
5 8.78 8.78

Last Leak Check

CALCULATED VALUES															
Port	Point	Yaw Angle [°]	F1 [-]	Pitch Angle [°]	F2 [-]	Dynam P [IWC]	Static P [IWC]	Wet Gas Density [lbm/ft³]	Total Velocity [ft/s]	Vaxial [ft/s]	Vpitch [ft/s]	Vyaw [ft/s]	Mass Flow [lbm/hr]	Wet Vol Flow [WACFH]	Wet Vol Flow [WSCFH]
1	1	-10.0	0.036	0.0	1.043	0.481	0.88	0.0389	64.3	63.3	0.0	-11.1	13.642	350.528	181.404
1	2	-10.5	0.022	0.0	1.043	0.509	0.89	0.0389	66.2	65.1	0.0	-12.1	14.002	360.035	186.203
1	3	-11.3	0.015	0.0	1.043	0.532	0.84	0.0388	67.8	66.5	0.0	-13.3	14.275	367.798	189.821
1	4	-8.3	0.018	0.0	1.043	0.501	0.93	0.0388	65.8	65.1	0.0	-9.5	13.988	360.197	185.746
1	5	-5.6	0.030	0.0	1.043	0.490	0.83	0.0388	65.0	64.7	0.0	-6.3	13.886	358.129	184.657
1	6	0.4	0.064	0.0	1.043	0.470	0.84	0.0387	63.7	63.7	0.0	0.4	13.660	352.661	181.653
1	7	6.6	0.043	0.0	1.043	0.410	0.86	0.0389	59.4	59.0	0.0	6.8	12.705	326.479	168.954
1	8	4.4	0.015	0.0	1.043	0.443	0.75	0.0390	61.7	61.5	0.0	4.8	13.258	340.281	176.299
1	9	3.5	-0.016	0.0	1.043	0.466	0.82	0.0391	62.5	62.4	0.0	3.8	13.491	345.134	179.403
1	10	2.4	0.002	0.0	1.043	0.465	0.90	0.0391	63.1	63.0	0.0	2.7	13.646	348.891	181.464
1	11	5.7	0.100	0.0	1.043	0.380	0.82	0.0393	57.0	56.7	0.0	5.7	12.314	313.671	163.751
1	12	4.9	0.094	0.0	1.043	0.410	0.83	0.0393	59.1	58.9	0.0	5.0	12.809	325.747	170.338
2	1	-4.7	0.070	0.0	1.043	0.424	0.78	0.0388	60.5	60.3	0.0	-4.9	12.948	333.909	172.176
2	2	-5.7	0.066	0.0	1.043	0.414	0.80	0.0387	59.8	59.5	0.0	-5.9	12.755	329.193	169.617
2	3	-4.4	0.073	0.0	1.043	0.416	0.75	0.0387	60.0	59.8	0.0	-4.7	12.808	331.026	170.318
2	4	-4.3	0.063	0.0	1.043	0.402	0.77	0.0387	59.0	58.8	0.0	-4.4	12.590	325.602	167.420
2	5	-5.6	0.067	0.0	1.043	0.396	0.72	0.0387	58.5	58.2	0.0	-5.7	12.467	322.230	165.783
2	6	-4.2	0.055	0.0	1.043	0.421	0.77	0.0387	60.4	60.2	0.0	-4.5	12.883	333.267	171.316
2	7	1.0	0.082	0.0	1.043	0.458	0.56	0.0387	62.9	62.9	0.0	1.1	13.484	347.991	179.312
2	8	9.5	0.033	0.0	1.043	0.408	0.62	0.0388	59.4	58.5	0.0	9.8	12.560	323.963	167.016
2	9	14.3	0.052	0.0	1.043	0.418	0.66	0.0388	60.0	58.2	0.0	14.8	12.491	322.055	166.108
2	10	18.5	0.025	0.0	1.043	0.393	0.73	0.0388	58.2	55.2	0.0	18.5	11.862	305.382	157.738
2	11	19.3	0.075	0.0	1.043	0.375	0.73	0.0389	56.8	53.6	0.0	18.7	11.541	296.512	153.469
2	12	20.1	0.082	0.0	1.043	0.375	0.71	0.0390	56.8	53.3	0.0	19.5	11.500	295.220	152.922

Airflow Sciences Corporation
Round 3-D Duct Traverse (Stack)

Project: 12010
 Site: MPC Detroit
 Task: 3D Flow
 Location: FCCU Stack Complex 3
 Condition: Run 8
 Personnel: P. Bihun
 Date: Thursday, 4/26/2012

Duct Diameter [ft]:	6.85
Number of Test Ports:	2
Number of Test Points per Port:	12
Dry Gas Molecular Weight [g/mol]:	30.65
Water Vapor Volume Fraction, Bws [-]:	0.101
Spec. Gas Constant [(ft-lbf)/(slug-R)]:	1692.1

* Data from M-5F/202 Run 8

Test Data Summary

Total Wet Gas Mass Flow Rate [lbm/hr]:	302,926
Total Wet Gas Vol. Flow Rate, Qsw [WSCFH]:	3,976,430
Total Dry Gas Vol. Flow Rate, Qsd [DSCFH]:	3,576,534

	Min	Max	Avg
Axial Velocity [ft/s]	49.9	64.0	58.9
Temperature [°F]:	541.5	552.5	547.5
Wet Gas Density [lbm/ft³]:	0.0385	0.0390	0.0387
Static Pressure [IWC]:	0.38	0.96	0.55
Total Pressure [IWC]:	0.76	1.33	0.97
Barometric Pressure [°Hg at 32°F]:	28.95	28.96	28.95

3DDAS011, Calibrated: 03/26/2012

3-D Probe v.4.9.r13

Start Time: 10:11 AM End Time: 11:06 AM

Formatting Parameters

Velocities in fpm False

Insertion Depths from Near Wall False

Date/Time: 04/26/12 07:42 AM
 Decay Time [s Start P [IWC] End P [IWC]]: 5 8.78 8.78

Last Leak Check

Probe Used	207722						
Rsls	-0.925						
Probe Calibration Date	11/08/2011						
	X6	X5	X4	X3	X2	X1	Constant
Probe Pitch Angle Calibration (F1)	0.000E+00	1.921E-09	-3.835E-09	2.618E-06	-7.557E-05	1.441E-02	-2.634E-02
Probe Velocity Calibration (F2)	-9.562E-13	-8.086E-10	5.501E-09	3.323E-07	3.171E-05	-1.037E-03	1.043E+00

Pressure Transducer Zero Readings (in IWC)

	P1-P2 (low)	P1-P2 (high)	P2-P3	P4-P5 (low)	P4-P5 (high)	P1-Pbar	Time
PRE	0.000	0.003	0.011	0.000	-0.001	0.50	9:21 AM
POST	0.000	-0.014	-0.028	0.000	0.007	0.09	11:07 AM
SN	60125972	40915142	70223952	70622645	70418554	3662543	
RANGE	0.0->1.0	0.0->5.0	-2.5->2.5	-0.5->0.5	-2.5->2.5	-69.2->69.2	

NOTES:

1. All averages are number averages, not flow weighted averages
2. Calculation of total mass flow rate (lbm/hr) is based on individual areas for each traverse point; these areas are not necessarily equal
3. Calculation of wet and dry volumetric flow rate (SCFH) is based on the number-average axial velocity (per EPA Method 2F) and hence assumes equal areas regardless of test port spacing

Airflow Sciences Corporation
 Round 3-D Duct Traverse (Stack)
 Project: 12010
 Site: MPC Detroit
 Task: 3D Flow
 Location: FCCU Stack Complex 3
 Condition: Run 8
 Personnel: P. Bihun
 Date: Thursday, 4/26/2012

3DDAS011, Calibrated: 03/26/2012
 3-D Probe v4.9.r13
 Start Time: 10:11 AM
 End Time: 11:06 AM
 Formatting Parameters
 Velocities in fpm
 Insertion Depths from Near Wall
 False
 False

Last Leak Check
 Date/Time
 04/26/12 07:42 AM
 Decay Time Is Start P [IWC] End P [IWC]
 5 8.78 8.78

Traverse Data

MEASURED VALUES												
Port	Point	Port Spacing [deg]	Withdrawal Distance [ft]	Time (Local)	Area [ft²]	Palm [°Hg at 32°F]	P1-P2 [IWC]	P2-P3 [IWC]	P4-P5 [IWC]	P1-Pbar (Total P Gage) [IWC]	Temp [°F]	Yaw Null Angle [°]
1	1	0.00	0.07	10:27 AM	1.54	28.95	0.448	0.001	0.009	1.08	544.4	-10.3
1	2	0.00	0.22	10:27 AM	1.54	28.95	0.440	-0.003	0.014	1.10	545.7	-9.2
1	3	0.00	0.38	10:26 AM	1.54	28.95	0.441	0.005	0.002	1.06	546.9	-8.2
1	4	0.00	0.54	10:26 AM	1.54	28.95	0.440	-0.015	-0.004	1.07	547.9	-8.7
1	5	0.00	0.72	10:26 AM	1.54	28.95	0.437	-0.024	0.013	1.04	548.3	-5.5
1	6	0.00	0.90	10:25 AM	1.54	28.95	0.405	0.011	0.027	0.99	548.7	0.3
1	7	0.00	1.11	10:13 AM	1.54	28.95	0.339	0.017	0.013	1.03	546.5	7.8
1	8	0.00	1.33	10:13 AM	1.54	28.95	0.370	-0.022	0.008	1.01	545.9	4.5
1	9	0.00	1.58	10:12 AM	1.54	28.95	0.377	0.014	-0.003	0.99	545.1	4.5
1	10	0.00	1.86	10:12 AM	1.54	28.95	0.392	0.025	-0.002	1.06	543.3	5.6
1	11	0.00	2.22	10:12 AM	1.54	28.95	0.356	-0.013	0.038	1.20	541.5	6.2
1	12	0.00	2.73	10:11 AM	1.54	28.95	0.343	0.010	0.039	1.33	541.7	5.8
2	1	180.00	0.07	11:06 AM	1.54	28.95	0.383	-0.021	0.019	0.93	548.8	-4.2
2	2	180.00	0.22	11:05 AM	1.54	28.96	0.360	0.016	0.024	0.83	550.0	-5.3
2	3	180.00	0.38	11:04 AM	1.54	28.95	0.369	-0.021	0.024	0.81	550.8	-3.2
2	4	180.00	0.54	11:04 AM	1.54	28.95	0.349	0.011	0.027	0.76	551.1	-3.6
2	5	180.00	0.72	11:03 AM	1.54	28.95	0.348	0.014	0.023	0.76	552.5	-3.4
2	6	180.00	0.90	11:03 AM	1.54	28.95	0.379	-0.015	0.023	0.84	552.2	-7.1
2	7	180.00	1.11	10:53 AM	1.54	28.95	0.396	-0.003	0.027	0.84	551.1	0.3
2	8	180.00	1.33	10:52 AM	1.54	28.95	0.365	0.015	0.020	0.86	550.5	8.5
2	9	180.00	1.58	10:50 AM	1.54	28.95	0.358	-0.016	0.011	0.93	549.7	13.9
2	10	180.00	1.86	10:50 AM	1.54	28.95	0.370	-0.023	0.001	0.96	548.6	17.7
2	11	180.00	2.22	10:49 AM	1.54	28.95	0.348	-0.021	0.024	0.89	545.2	19.1
2	12	180.00	2.73	10:48 AM	1.54	28.95	0.308	0.010	0.038	0.82	542.7	20.9

Airflow Sciences Corporation
Round 3-D Duct Traverse (Stack)

Project: 12010
 Site: MPC Detroit
 Task: 3D Flow
 Location: FCCU Stack Complex 3
 Condition: Run 8
 Personnel: P. Bihun
 Date: Thursday, 4/26/2012

3DDAS011, Calibrated: 03/26/2012
 3-D Probe v4.9.r13

Start Time: 10:11 AM
 End Time: 11:06 AM
 Formatting Parameters
 Velocities in fpm
 Insertion Depths from Near Wall
 False
 False

Last Leak Check
 Date/Time
 04/26/12 07:42 AM
 Decay Time 5
 End P [IWC] 8.78

CALCULATED VALUES													
Port	Point	Yaw Angle [°]	F1 [-]	Pitch Angle [°]	F2 [-]	Dynam P [IWC]	Static P [IWC]	Wet Gas Density [lbm/ft³]	Total Velocity [ft/s]	Vaxial [ft/s]	Vpitch [ft/s]	Vyaw [ft/s]	Mass Flow [lbm/hr]
													Wet Vol Flow [WACFH]
													Wet Vol Flow [WACFH]
1	1	-8.4	0.021	0.0	1.043	0.487	0.59	0.0388	64.8	64.0	0.0	-10.6	13.743
1	2	-8.3	0.031	0.0	1.043	0.479	0.62	0.0388	64.3	63.6	0.0	-9.3	13.657
1	3	-7.3	0.006	0.0	1.043	0.480	0.58	0.0387	64.4	63.9	0.0	-8.2	13.692
1	4	-7.8	-0.009	0.0	1.043	0.479	0.60	0.0387	64.4	63.8	0.0	-8.7	13.656
1	5	-4.6	0.029	0.0	1.043	0.475	0.56	0.0387	64.1	63.9	0.0	-5.1	13.678
1	6	1.2	0.068	0.0	1.043	0.440	0.55	0.0387	61.7	61.7	0.0	1.3	13.204
1	7	8.7	0.038	0.0	1.043	0.389	0.66	0.0387	56.5	55.8	0.0	8.6	11.966
1	8	5.4	0.021	0.0	1.043	0.403	0.61	0.0388	59.0	58.7	0.0	5.6	12.592
1	9	5.4	-0.007	0.0	1.043	0.410	0.58	0.0388	59.5	59.3	0.0	5.6	12.720
1	10	6.5	-0.006	0.0	1.043	0.427	0.63	0.0389	60.6	60.2	0.0	6.9	12.957
1	11	7.2	0.108	0.0	1.043	0.387	0.81	0.0389	57.7	57.2	0.0	7.2	12.337
1	12	6.8	0.113	0.0	1.043	0.373	0.96	0.0390	56.6	56.2	0.0	6.7	12.119
2	1	-3.2	0.050	0.0	1.043	0.417	0.51	0.0386	60.1	60.0	0.0	-3.4	12.832
2	2	-4.4	0.066	0.0	1.043	0.392	0.44	0.0386	58.3	58.1	0.0	-4.4	12.422
2	3	-2.3	0.066	0.0	1.043	0.401	0.41	0.0386	59.0	59.0	0.0	-2.4	12.589
2	4	-2.7	0.077	0.0	1.043	0.379	0.38	0.0385	57.4	57.3	0.0	-2.7	12.234
2	5	-2.4	0.065	0.0	1.043	0.379	0.38	0.0385	57.4	57.3	0.0	-2.4	12.218
2	6	-6.2	0.061	0.0	1.043	0.412	0.42	0.0385	59.9	59.5	0.0	-6.4	12.685
2	7	1.2	0.068	0.0	1.043	0.430	0.41	0.0385	61.1	61.1	0.0	1.3	13.040
2	8	9.4	0.054	0.0	1.043	0.397	0.46	0.0386	58.7	57.9	0.0	9.6	12.362
2	9	14.9	0.030	0.0	1.043	0.389	0.54	0.0386	58.1	56.1	0.0	14.9	11.998
2	10	18.7	0.002	0.0	1.043	0.403	0.56	0.0387	59.0	55.9	0.0	18.9	11.970
2	11	20.1	0.070	0.0	1.043	0.378	0.51	0.0388	57.1	53.7	0.0	19.6	11.518
2	12	21.8	0.122	0.0	1.043	0.335	0.49	0.0389	53.7	49.9	0.0	19.9	10.737
													276.153
													142.780

Airflow Sciences Corporation
Round 3-D Duct Traverse (Stack)

Project: 12010
 Site: MPC Detroit
 Task: 3D Flow
 Location: FCCU Stack Complex 3
 Condition: Run 9
 Personnel: P. Bihun
 Date: Thursday, 4/26/2012

3DDAS011, Calibrated: 03/26/2012
 3-D Probe v.4.9.r13

Start Time: 12:01 PM
 End Time: 1:06 PM
 Formatting Parameters
 Velocities in fpm
 Insertion Depths from Near Wall
 False
 False

Date/Time
 04/26/12 12:52 PM
 Decay Time [s Start P [IWC] End P [IWC]
 5 10.25 10.29

Duct Diameter [ft]:	6.85
Number of Test Ports:	2
Number of Test Points per Port:	12
Dry Gas Molecular Weight [g/mol]:	30.62
Water Vapor Volume Fraction, Bws [-]:	0.100
Spec. Gas Constant [(ft-lbf)/(slug-R)]:	1692.9

* Data from M-5F/202 Run 9

Test Data Summary

Total Wet Gas Mass Flow Rate [lbm/hr]:	301,130
Total Wet Gas Vol. Flow Rate, Qsw [WSCFH]:	3,954,729
Total Dry Gas Vol. Flow Rate, Qsd [DSCFH]:	3,560,208

	Min	Max	Avg
Axial Velocity [ft/s]	50.0	65.1	58.4
Temperature [°F]:	543.3	552.8	549.9
Wet Gas Density [lbm/ft³]:	0.0387	0.0391	0.0388
Static Pressure [IWC]:	2.06	2.42	2.25
Total Pressure [IWC]:	2.44	2.81	2.65
Barometric Pressure [°Hg at 32°F]:	28.97	28.99	28.98

Probe Used	207722						
Rsls	-0.925						
Probe Calibration Date	11/08/2011						
	X6	X5	X4	X3	X2	X1	Constant
Probe Pitch Angle Calibration (F1)	0.000E+00	1.921E-09	-3.835E-09	2.618E-06	-7.557E-05	1.441E-02	-2.634E-02
Probe Velocity Calibration (F2)	-9.562E-13	-8.086E-10	5.501E-09	3.323E-07	3.171E-05	-1.037E-03	1.043E+00

Pressure Transducer Zero Readings (in IWC)

	P1-P2 (low)	P1-P2 (high)	P2-P3	P4-P5 (low)	P4-P5 (high)	P1-Pbar	Time
PRE	0.000	-0.013	-0.018	0.000	0.011	1.95	12:52 PM
POST	0.000	-0.014	-0.019	0.000	0.011	1.90	1:08 PM
SN	60125972	40915142	70223952	70622645	70418554	3662543	
RANGE	0.0->1.0	0.0->5.0	-2.5->2.5	-0.5->0.5	-2.5->2.5	-69.2->69.2	

NOTES:

1. All averages are number averages, not flow weighted averages
2. Calculation of total mass flow rate (lbm/hr) is based on individual areas for each traverse point; these areas are not necessarily equal
3. Calculation of wet and dry volumetric flow rate (SCFH) is based on the number-average axial velocity (per EPA Method 2F) and hence assumes equal areas regardless of test port spacing

Airflow Sciences Corporation

Round 3-D Duct Traverse (Stack)

Project: 12010

Site: MPC Detroit

Task: 3D Flow

Location: FCCU Stack Complex 3

Condition: Run 9

Personnel: P. Bihun

Date: Thursday, 4/26/2012

3DDAS011, Calibrated: 03/26/2012

3-D Probe v.4.9.r13

Start Time: 12:01 PM

Formatting Parameters

Velocities in fpm

Insertion Depths from Near Wall

End Time: 1:06 PM

False

False

Decay Time [s Start P [IWC] End P [IWC]

5 10.25 10.29

Date/Time

04/26/12 12:52 PM

Last Leak Check

Traverse Data

MEASURED VALUES												
Port	Point	Port Spacing [deg]	Withdrawal Distance [ft]	Time (Local)	Area [ft²]	Patm [T/Hg at 32°F]	P1-P2 [IWC]	P2-P3 [IWC]	P4-P5 [IWC]	P1-Pbar (Total P Gage) [IWC]	Temp [°F]	Yaw Null Angle [°]
1	1	0.00	0.07	1:06 PM	1.54	28.99	0.439	0.010	0.019	2.67	545.0	-10.0
1	2	0.00	0.22	1:05 PM	1.54	28.99	0.437	-0.015	0.017	2.81	548.7	-9.5
1	3	0.00	0.38	1:05 PM	1.54	28.99	0.462	-0.024	0.008	2.77	550.0	-9.4
1	4	0.00	0.54	1:05 PM	1.54	28.99	0.422	0.029	0.010	2.69	550.6	-6.2
1	5	0.00	0.72	1:04 PM	1.54	28.99	0.428	-0.007	0.006	2.79	551.4	-5.0
1	6	0.00	0.90	1:04 PM	1.54	28.99	0.385	0.021	0.023	2.80	551.8	1.7
1	7	0.00	1.11	12:41 PM	1.54	28.98	0.364	-0.024	0.020	2.61	551.9	6.5
1	8	0.00	1.33	12:41 PM	1.54	28.98	0.352	0.015	-0.011	2.59	551.5	6.4
1	9	0.00	1.58	12:40 PM	1.54	28.98	0.390	0.012	-0.001	2.61	549.9	5.1
1	10	0.00	1.86	12:39 PM	1.54	28.98	0.394	0.003	-0.005	2.68	548.0	4.8
1	11	0.00	2.22	12:39 PM	1.54	28.98	0.360	-0.016	0.032	2.78	544.4	5.4
1	12	0.00	2.73	12:38 PM	1.54	28.98	0.340	0.015	0.032	2.79	543.3	7.4
2	1	180.00	0.07	12:22 PM	1.54	28.98	0.365	0.014	0.023	2.71	547.0	-4.8
2	2	180.00	0.22	12:21 PM	1.54	28.97	0.383	-0.033	0.018	2.74	549.8	-5.5
2	3	180.00	0.38	12:20 PM	1.54	28.98	0.345	0.017	0.023	2.55	551.1	-3.0
2	4	180.00	0.54	12:19 PM	1.54	28.98	0.352	-0.003	0.023	2.56	551.7	-3.7
2	5	180.00	0.72	12:18 PM	1.54	28.98	0.354	0.010	0.028	2.44	552.8	-3.6
2	6	180.00	0.90	12:17 PM	1.54	28.98	0.346	0.016	0.023	2.55	552.8	-4.3
2	7	180.00	1.11	12:17 PM	1.54	28.98	0.405	-0.029	0.027	2.54	552.8	0.6
2	8	180.00	1.33	12:03 PM	1.54	28.98	0.354	0.007	0.025	2.54	552.5	9.7
2	9	180.00	1.58	12:02 PM	1.54	28.97	0.346	0.027	0.016	2.57	552.3	15.0
2	10	180.00	1.86	12:02 PM	1.54	28.98	0.356	-0.003	0.007	2.58	551.8	18.5
2	11	180.00	2.22	12:01 PM	1.54	28.97	0.315	0.015	0.024	2.58	549.0	19.8
2	12	180.00	2.73	12:01 PM	1.54	28.97	0.317	0.029	0.031	2.74	548.5	22.6

Airflow Sciences Corporation

Round 3-D Duct Traverse (Stack)

Project: 12010

Site: MPC Detroit

Task: 3D Flow

Location: FCCU Stack Complex 3

Condition: Run 9

Personnel: P. Bihun

Date: Thursday, 4/26/2012

3DDAS011, Calibrated: 03/26/2012

3-D Probe v.4.9.r13

Start Time: 12:01 PM

Formatting Parameters

Velocities in fpm

Insertion Depths from Near Wall

End Time: 1:06 PM

False

False

Decay Time [s Start P [IWC] End P [IWC]

5 10.25 10.29

Date/Time

04/26/12 12:52 PM

Last Leak Check

CALCULATED VALUES													
Port	Point	Yaw Angle [°]	F1 [-]	Pitch Angle [°]	F2 [-]	Dynam P [IWC]	Static P [IWC]	Wet Gas Density [lbm/ft³]	Total Velocity [ft/s]	Vxial [ft/s]	Vpitch [ft/s]	Vyaw [ft/s]	Mass Flow [lbm/hr]
													Wet Vol Flow [WSCFH]
													Wet Vol Flow [WACFH]
1	1	-9.0	0.044	0.0	1.043	0.478	2.19	0.0390	64.1	63.3	0.0	-10.1	13,651
1	2	-8.6	0.038	0.0	1.043	0.476	2.33	0.0389	64.0	63.3	0.0	-9.6	13,616
1	3	-8.5	0.016	0.0	1.043	0.503	2.27	0.0388	65.9	65.1	0.0	-9.7	13,987
1	4	-5.3	0.024	0.0	1.043	0.469	2.23	0.0388	62.9	62.7	0.0	-5.8	13,447
1	5	-4.1	0.013	0.0	1.043	0.466	2.32	0.0388	63.4	63.3	0.0	-4.5	13,570
1	6	2.6	0.059	0.0	1.043	0.419	2.38	0.0387	60.1	60.1	0.0	2.7	12,882
1	7	7.4	0.056	0.0	1.043	0.396	2.21	0.0387	58.5	58.0	0.0	7.6	12,427
1	8	7.4	-0.032	0.0	1.043	0.383	2.21	0.0387	57.5	57.0	0.0	7.4	12,224
1	9	6.0	-0.003	0.0	1.043	0.425	2.19	0.0388	60.5	60.2	0.0	6.3	12,923
1	10	5.7	-0.012	0.0	1.043	0.428	2.25	0.0389	60.7	60.4	0.0	6.1	13,001
1	11	6.3	0.090	0.0	1.043	0.392	2.39	0.0390	58.0	57.6	0.0	6.4	12,445
1	12	8.3	0.093	0.0	1.043	0.370	2.42	0.0391	56.3	55.7	0.0	8.1	12,046
2	1	-3.9	0.063	0.0	1.043	0.397	2.31	0.0389	58.4	58.3	0.0	-4.0	12,552
2	2	-4.6	0.048	0.0	1.043	0.417	2.32	0.0388	60.0	59.8	0.0	-4.8	12,833
2	3	-2.0	0.066	0.0	1.043	0.375	2.17	0.0387	57.0	56.9	0.0	-2.0	12,204
2	4	-2.7	0.066	0.0	1.043	0.383	2.18	0.0387	57.6	57.5	0.0	-2.8	12,317
2	5	-2.6	0.079	0.0	1.043	0.385	2.06	0.0387	57.7	57.7	0.0	-2.7	12,338
2	6	-3.4	0.068	0.0	1.043	0.376	2.17	0.0387	57.1	57.0	0.0	-3.4	12,191
2	7	1.5	0.066	0.0	1.043	0.441	2.10	0.0387	61.8	61.7	0.0	1.6	13,211
2	8	10.6	0.070	0.0	1.043	0.385	2.15	0.0387	57.7	56.8	0.0	10.7	12,150
2	9	15.9	0.046	0.0	1.043	0.376	2.19	0.0387	57.0	54.9	0.0	15.6	11,747
2	10	19.4	0.021	0.0	1.043	0.388	2.19	0.0387	57.9	54.6	0.0	19.3	11,700
2	11	20.7	0.078	0.0	1.043	0.342	2.24	0.0388	54.3	50.8	0.0	19.2	10,919
2	12	23.6	0.098	0.0	1.043	0.345	2.40	0.0389	54.5	50.0	0.0	21.8	10,746
													276,599
													142,901

Round 3-D Duct Traverse (Stack)

Project:	12010
Site:	MPC Detroit
Task:	3D Flow
Location:	FCCU Stack Complex 3
Condition:	Run 10
Personnel:	P. Bihun
Date:	Friday, 4/27/2012

Duct Diameter [ft]:	6.85
Number of Test Ports:	2
Number of Test Points per Port:	12
Dry Gas Molecular Weight [g/mol]:	30.50
Water Vapor Volume Fraction, Bws [-]:	0.098
Spec. Gas Constant [(ft·lbf)/(slug·°R)]:	1697.8

* Data from Mod. CTM-027 Run 10

Test Data Summary

Total Wet Gas Mass Flow Rate [lbm/hr]:	295,486
Total Wet Gas Vol. Flow Rate, Qsw [WSCFH]:	3,895,469
Total Dry Gas Vol. Flow Rate, Qsd [DSCFH]:	3,515,486

	Min	Max	Avg
Axial Velocity [ft/s]	17.7	64.0	56.6
Temperature [°F]	499.3	548.1	538.0
Wet Gas Density [lb/m ³]	0.0389	0.0409	0.0394
Static Pressure [IWCI]	-3.20	-2.58	-2.89
Total Pressure [IWCI]	-2.78	-2.11	-2.49
Barometric Pressure [°Hg at 32°F]	29.47	29.51	29.50

3DDAS011, Calibrated: 03/26/2012

3-D Probe v.4.9.r13

Start Time:	9:36 AM	End Time:	10:30 AM
Formatting Parameters			
Velocities in fpm			False
Insertion Depths from Near Wall			False

Date/Time	Decay Time [s	Start P [IWC]	End P [IWC]
Last Leak Check	04/27/12 09:09 AM	5	4.94 4.92

Probe Used	207722								
Rsl0	-0.925								
Probe Calibration Date	11/08/2011								
	X6	X5	X4	X3	X2	X1	Constant		
Probe Pitch Angle Calibration (F1)	0.000E+00	1.921E-09	-3.835E-09	2.618E-06	-7.557E-05	1.441E-02	-2.634E-02		
Probe Velocity Calibration (F2)	-9.562E-13	-8.086E-10	5.501E-09	3.323E-07	3.171E-05	1.037E-03	1.043E+00		

Pressure Transducer Zero Readings (in IWC)

	P1-P2 (low)	P1-P2 (high)	P2-P3	P4-P5 (low)	P4-P5 (high)	P1-Pbar	Time
PRE	0.000	-0.004	0.000	0.000	0.000	-3.11	9:11 AM
POST	0.000	0.002	-0.003	0.000	0.000	-3.29	10:33 AM
SN	601295972	40915142	702239652	70622645	70418554	36825543	
RANGE	0.0>-1.0	0.0>-5.0	-2.5>-2.5	-0.5>-0.5	-2.5>-2.5	-69.2	-69.2

NOTES:

1. All averages are number averages, not flow weighted averages
2. Calculation of total mass flow rate (lbm/hr) is based on individual areas for each traverse point; these areas are not necessarily equal
3. Calculation of wet and dry volumetric flow rate (SCFH) is based on the number-average axial velocity (per EPA Method 2F) and hence assumes equal areas regardless of test port spacing

Airflow Sciences Corporation
Round 3-D Duct Traverse (Stack)

Project: 12010
 Site: MPC Detroit
 Task: 3D Flow
 Location: FCCU Stack Complex 3
 Condition: Run 10
 Personnel: P. Bihun
 Date: Friday, 4/27/2012

3DDAS011, Calibrated: 03/26/2012
 3-D Probe v.4.9.r13

Start Time: 9:36 AM
 End Time: 10:30 AM
 Formatting Parameters
 Velocities in fpm
 Insertion Depths from Near Wall
 False
 False

Date/Time: 04/27/12 09:09 AM
 Decay Time [s Start P [IWC] End P [IWC]
 5 4.94 4.92

Last Leak Check

Traverse Data

MEASURED VALUES												
Port	Point	Port Spacing [deg]	Withdrawal Distance [ft]	Time (Local)	Area [ft²]	Patm [°Hg at 32°F]	P1-P2 [IWC]	P2-P3 [IWC]	P4-P5 [IWC]	P1-Pbar (Total P Gage) [IWC]	Temp [°F]	Yaw Null Angle [°]
1	1	0.00	0.07	9:49 AM	1.54	29.51	0.430	-0.005	-0.002	-2.19	541.4	-9.2
1	2	0.00	0.22	9:49 AM	1.54	29.51	0.438	0.023	0.005	-2.11	541.8	-8.9
1	3	0.00	0.38	9:48 AM	1.54	29.51	0.451	-0.020	0.012	-2.24	542.6	-9.5
1	4	0.00	0.54	9:48 AM	1.54	29.51	0.443	0.020	0.007	-2.15	543.5	-7.5
1	5	0.00	0.72	9:47 AM	1.54	29.51	0.433	0.021	0.022	-2.34	543.4	-4.3
1	6	0.00	0.90	9:46 AM	1.54	29.51	0.396	0.024	0.011	-2.35	544.6	0.8
1	7	0.00	1.11	9:39 AM	1.54	29.51	0.360	0.017	0.017	-2.32	542.2	7.7
1	8	0.00	1.33	9:39 AM	1.54	29.51	0.378	-0.018	0.004	-2.29	542.7	3.7
1	9	0.00	1.58	9:38 AM	1.54	29.51	0.393	0.002	0.003	-2.29	541.5	4.6
1	10	0.00	1.86	9:38 AM	1.54	29.51	0.408	-0.004	-0.001	-2.29	539.0	3.8
1	11	0.00	2.22	9:36 AM	1.54	29.51	0.362	-0.008	0.033	-2.31	534.5	4.4
1	12	0.00	2.73	9:37 AM	1.54	29.51	0.035	0.002	0.171	-2.58	528.4	-10.5
2	1	180.00	0.07	10:30 AM	1.54	29.47	0.367	-0.001	0.024	-2.69	544.0	-2.5
2	2	180.00	0.22	10:26 AM	1.54	29.48	0.365	-0.004	0.024	-2.78	546.1	-2.5
2	3	180.00	0.38	10:25 AM	1.54	29.48	0.359	-0.001	0.033	-2.71	547.4	-3.0
2	4	180.00	0.54	10:24 AM	1.54	29.48	0.353	-0.018	0.023	-2.61	548.1	-4.1
2	5	180.00	0.72	10:23 AM	1.54	29.49	0.333	0.027	0.018	-2.76	547.0	-4.1
2	6	180.00	0.90	10:21 AM	1.54	29.50	0.385	-0.013	0.017	-2.75	547.8	-5.0
2	7	180.00	1.11	10:10 AM	1.54	29.51	0.396	-0.006	0.018	-2.67	536.4	1.1
2	8	180.00	1.33	10:14 AM	1.54	29.51	0.373	0.017	0.020	-2.76	543.1	8.8
2	9	180.00	1.58	10:09 AM	1.54	29.51	0.368	-0.014	0.009	-2.68	531.1	14.2
2	10	180.00	1.86	10:09 AM	1.54	29.51	0.360	-0.002	-0.001	-2.62	522.6	18.3
2	11	180.00	2.22	10:08 AM	1.54	29.51	0.333	-0.003	0.021	-2.59	512.4	20.7
2	12	180.00	2.73	10:08 AM	1.54	29.51	0.182	-0.011	0.247	-2.73	499.3	20.0

Airflow Sciences Corporation

Round 3-D Duct Traverse (Stack)

Project: 12010

Site: MPC Detroit

Task: 3D Flow

Location: FCCU Stack Complex 3

Condition: Run 10

Personnel: P. Bihun

Date: Friday, 4/27/2012

3DDAS011, Calibrated: 03/26/2012

3-D Probe v4.9.r13

Start Time: 9:36 AM

End Time: 10:30 AM

Formatting Parameters

Velocities in fpm

Insertion Depths from Near Wall

False

False

Date/Time 04/27/12 09:09 AM
Decay Time [s Start P [IWC] End P [IWC]
5 4.94 4.92

Last Leak Check

CALCULATED VALUES													
Port	Point	Yaw Angle [°]	F1 [-]	Pitch Angle [°]	F2 [-]	Dynam P [IWC]	Static P [IWC]	Wet Gas Density [lbm/ft³]	Total Velocity [ft/s]	Vaxial [ft/s]	Vpitch [ft/s]	Vyaw [ft/s]	Mass Flow [lbm/hr]
													Wet Vol Flow [WACFH]
													Wet Vol Flow [WACFH]
1	1	-8.3	-0.004	0.0	1.043	0.468	-2.65	0.0392	63.2	62.5	0.0	-9.1	13.578
1	2	-7.9	0.012	0.0	1.043	0.476	-2.58	0.0392	63.8	63.1	0.0	-8.8	13.712
1	3	-8.6	0.026	0.0	1.043	0.491	-2.73	0.0392	64.8	64.0	0.0	-9.7	13.887
1	4	-6.6	0.015	0.0	1.043	0.482	-2.63	0.0392	64.2	63.8	0.0	-7.4	13.826
1	5	-3.4	0.051	0.0	1.043	0.471	-2.81	0.0392	63.5	63.4	0.0	-3.8	13.733
1	6	1.7	0.029	0.0	1.043	0.431	-2.78	0.0391	60.8	60.7	0.0	1.8	13.143
1	7	8.7	0.047	0.0	1.043	0.391	-2.71	0.0392	57.8	57.1	0.0	8.7	12.400
1	8	4.7	0.011	0.0	1.043	0.411	-2.70	0.0392	59.3	59.1	0.0	4.8	12.809
1	9	5.5	0.009	0.0	1.043	0.428	-2.71	0.0392	60.4	60.1	0.0	5.8	13.056
1	10	4.7	-0.002	0.0	1.043	0.443	-2.73	0.0393	61.4	61.2	0.0	5.0	13.329
1	11	5.4	0.091	0.0	1.043	0.394	-2.71	0.0395	57.8	57.5	0.0	5.4	12.577
1	12	-9.5	4.890	0.0	1.043	0.038	-2.61	0.0398	17.9	17.7	0.0	-3.0	3.889
2	1	-1.5	0.063	0.0	1.043	0.421	-3.11	0.0390	60.1	60.1	0.0	-1.6	12.979
2	2	-1.6	0.063	0.0	1.043	0.419	-3.20	0.0390	60.0	59.9	0.0	-1.7	12.926
2	3	-2.1	0.092	0.0	1.043	0.391	-3.10	0.0389	58.0	57.9	0.0	-2.1	12.479
2	4	-3.2	0.064	0.0	1.043	0.363	-3.00	0.0389	57.4	57.4	0.0	-3.2	12.351
2	5	-3.2	0.053	0.0	1.043	0.362	-3.13	0.0390	55.8	55.7	0.0	-3.1	12.014
2	6	-4.1	0.045	0.0	1.043	0.418	-3.17	0.0389	60.0	59.8	0.0	-4.3	12.892
2	7	2.0	0.046	0.0	1.043	0.431	-3.11	0.0394	60.5	60.5	0.0	2.1	13.179
2	8	9.8	0.054	0.0	1.043	0.405	-3.17	0.0391	58.9	58.1	0.0	10.0	12.569
2	9	15.1	0.025	0.0	1.043	0.400	-3.08	0.0396	56.2	56.2	0.0	15.1	12.309
2	10	19.3	-0.002	0.0	1.043	0.392	-3.01	0.0400	57.3	54.1	0.0	18.9	11.956
2	11	21.6	0.064	0.0	1.043	0.362	-2.95	0.0404	54.8	51.0	0.0	20.2	11.389
2	12	20.9	1.362	0.0	1.043	0.198	-2.93	0.0409	40.2	37.5	0.0	14.4	8.505
													207.776
													113.095

Airflow Sciences Corporation

Round 3-D Duct Traverse (Stack)

Project: 12010
 Site: MPC Detroit
 Task: 3D Flow
 Location: FCCU Stack Complex 3
 Condition: Run 11
 Personnel: P. Bihun
 Date: Friday, 4/27/2012

3DDAS011, Calibrated: 03/26/2012
 3-D Probe v4.9.r13

Start Time: 11:18 AM
 End Time: 12:07 PM
 Formatting Parameters
 Velocities in fpm
 Insertion Depths from Near Wall
 False
 False

Last Leak Check
 Date/Time
 04/27/12 09:09 AM
 Decay Time [s Start P [IWC] End P [IWC]
 5 4.94 4.92

Traverse Data

MEASURED VALUES												
Port	Point	Port Spacing [deg]	Withdrawal Distance [ft]	Time (Local)	Area [ft²]	Patm [inHg at 32°F]	P1-P2 [IWC]	P2-P3 [IWC]	P4-P5 [IWC]	P1-Pbar (Total P Gage) [IWC]	Temp [°F]	Yaw Null Angle [°]
1	1	0.00	0.07	12:07 PM	1.54	29.53	0.435	0.022	0.011	-2.52	539.6	-10.0
1	2	0.00	0.22	12:06 PM	1.54	29.53	0.466	-0.016	0.015	-2.43	541.4	-10.4
1	3	0.00	0.38	12:06 PM	1.54	29.53	0.445	0.000	0.017	-2.53	542.9	-9.1
1	4	0.00	0.54	12:04 PM	1.54	29.53	0.445	-0.006	0.012	-2.46	543.4	-8.5
1	5	0.00	0.72	12:04 PM	1.54	29.52	0.442	-0.005	0.024	-2.40	544.1	-5.4
1	6	0.00	0.90	12:03 PM	1.54	29.52	0.423	-0.012	0.004	-2.42	544.8	-1.4
1	7	0.00	1.11	11:53 AM	1.54	29.53	0.352	-0.001	0.032	-2.59	542.2	6.6
1	8	0.00	1.33	11:52 AM	1.54	29.53	0.388	0.025	0.010	-2.67	542.1	5.4
1	9	0.00	1.58	11:52 AM	1.54	29.53	0.387	0.017	-0.004	-2.59	539.2	4.6
1	10	0.00	1.86	11:51 AM	1.54	29.53	0.413	-0.013	-0.004	-2.50	536.5	3.2
1	11	0.00	2.22	11:51 AM	1.54	29.52	0.358	0.016	0.026	-2.65	531.3	5.5
1	12	0.00	2.73	11:49 AM	1.54	29.52	0.409	0.004	0.000	-2.62	521.5	4.3
2	1	180.00	0.07	11:37 AM	1.54	29.50	0.385	0.022	0.026	-2.31	544.7	-4.5
2	2	180.00	0.22	11:34 AM	1.54	29.52	0.390	-0.023	0.016	-2.31	548.4	-4.4
2	3	180.00	0.38	11:33 AM	1.54	29.52	0.345	0.016	0.020	-2.29	547.9	-3.6
2	4	180.00	0.54	11:32 AM	1.54	29.52	0.377	-0.020	0.018	-2.43	546.3	-5.1
2	5	180.00	0.72	11:31 AM	1.54	29.53	0.363	0.006	0.020	-2.57	545.9	-4.5
2	6	180.00	0.90	11:30 AM	1.54	29.52	0.385	-0.020	0.007	-2.37	544.9	-5.4
2	7	180.00	1.11	11:18 AM	1.54	29.52	0.404	-0.020	0.017	-2.23	542.6	-0.2
2	8	180.00	1.33	11:18 AM	1.54	29.52	0.361	0.006	0.009	-2.19	543.7	9.3
2	9	180.00	1.58	11:19 AM	1.54	29.52	0.355	0.019	0.008	-2.36	546.8	15.6
2	10	180.00	1.86	11:20 AM	1.54	29.52	0.376	-0.012	0.000	-2.24	547.8	18.8
2	11	180.00	2.22	11:21 AM	1.54	29.52	0.325	-0.001	0.025	-2.30	546.0	20.6
2	12	180.00	2.73	11:22 AM	1.54	29.52	0.101	-0.004	0.282	-2.53	536.2	25.1

Airflow Sciences Corporation
Round 3-D Duct Traverse (Stack)

Project: 12010
 Site: MPC Detroit
 Task: 3D Flow
 Location: FCCU Stack Complex 3
 Condition: Run 12
 Personnel: P. Bihun
 Date: Friday, 4/27/2012

Duct Diameter [ft]:	6.85
Number of Test Ports:	2
Number of Test Points per Port:	12
Dry Gas Molecular Weight [g/mol]:	30.59
Water Vapor Volume Fraction, Bws [-]:	0.093
Spec. Gas Constant [(ft-lbf)/(slug-R)]:	1889.7

* Data from Mod. C.TM-027 Run 12

Test Data Summary

Total Wet Gas Mass Flow Rate [lbm/hr]:	292,382
Total Wet Gas Vol. Flow Rate, Qsw [WSCFH]:	3,832,850
Total Dry Gas Vol. Flow Rate, Qsd [DSCFH]:	3,477,439

	Min	Max	Avg
Axial Velocity [ft/s]	23.5	63.5	56.0
Temperature [°F]:	523.4	548.2	542.8
Wet Gas Density [lbm/ft³]:	0.0391	0.0401	0.0393
Static Pressure [inWC]:	-3.67	-2.92	-3.33
Total Pressure [inWC]:	-3.26	-2.49	-2.94
Barometric Pressure [inHg at 32°F]:	29.50	29.51	29.51

3DDAS011, Calibrated: 03/26/2012
 3-D Probe v4.9.r13

Start Time: 12:49 PM
 End Time: 1:51 PM
 Formatting Parameters
 Velocities in fpm
 Insertion Depths from Near Wall
 False
 False

Date/Time
 04/27/12 01:15 PM
 Decay Time [s Start P [IWC] End P [IWC]
 5 4.14 4.2

Probe Used	207722								
Rsls	-0.925								
Probe Calibration Date	11/08/2011								
		X6	X5	X4	X3	X2	X1		Constant
Probe Pitch Angle Calibration (F1)		0.000E+00	1.921E-09	-3.835E-09	2.618E-06	-7.557E-05	1.441E-02		-2.634E-02
Probe Velocity Calibration (F2)		-9.562E-13	-8.088E-10	5.501E-09	3.323E-07	3.171E-05	-1.037E-03		1.043E+00

Pressure Transducer Zero Readings (in IWC)

	P1-P2 (low)	P1-P2 (high)	P2-P3	P4-P5 (low)	P4-P5 (high)	P1-Pbar	Time
PRE	0.000	0.002	-0.004	0.000	0.000	-3.40	1:16 PM
POST	0.000	0.001	0.001	0.000	0.001	-3.44	1:52 PM
SN	60125972	40915142	70223952	70622645	70418554	3662543	
RANGE	0.0->1.0	0.0->5.0	-2.5->2.5	-0.5->0.5	-2.5->2.5	-89.2->89.2	

NOTES:

1. All averages are number averages, not flow weighted averages
2. Calculation of total mass flow rate (lbm/hr) is based on individual areas for each traverse point; these areas are not necessarily equal
3. Calculation of wet and dry volumetric flow rate (lbm/hr) is based on the number-average axial velocity (per EPA Method 2F) and hence assumes equal areas regardless of test port spacing

Airflow Sciences Corporation

Round 3-D Duct Traverse (Stack)

Project: 12010
 Site: MPC Detroit
 Task: 3D Flow
 Location: FCCU Stack Complex 3
 Condition: Run 12
 Personnel: P. Bihun
 Date: Friday, 4/27/2012

3DDAS011, Calibrated: 03/26/2012

3-D Probe v.4.9.r13

Start Time: 12:49 PM
 Formatting Parameters
 Velocities in fpm
 Insertion Depths from Near Wall
 End Time: 1:51 PM
 False
 False

Date/Time: 04/27/12 01:15 PM
 Last Leak Check
 Decay Time Is Start P [IWC] End P [IWC]
 5 4.14 4.2

Traverse Data

MEASURED VALUES												
Port	Point	Port Spacing [deg]	Withdrawal Distance [ft]	Time (Local)	Area [ft²]	Palm [°Hg at 32°F]	P1-P2 [IWC]	P2-P3 [IWC]	P4-P5 [IWC]	P1-Pbar (Total P Gage) [IWC]	Temp [°F]	Yaw Null Angle [°]
1	1	0.00	0.07	1:22 PM	1.54	29.51	0.423	0.021	0.016	-3.21	538.3	-9.7
1	2	0.00	0.22	1:21 PM	1.54	29.50	0.438	-0.015	0.019	-2.99	541.6	-9.9
1	3	0.00	0.38	1:21 PM	1.54	29.51	0.443	-0.015	0.018	-2.99	541.5	-8.3
1	4	0.00	0.54	1:19 PM	1.54	29.50	0.433	0.011	0.020	-2.70	537.3	-7.1
1	5	0.00	0.72	1:18 PM	1.54	29.50	0.416	0.007	0.006	-2.68	523.4	-4.3
1	6	0.00	0.90	1:02 PM	1.54	29.51	0.408	0.010	0.023	-2.79	545.3	0.6
1	7	0.00	1.11	12:49 PM	1.54	29.51	0.361	0.003	0.033	-2.74	546.5	7.2
1	8	0.00	1.33	12:49 PM	1.54	29.51	0.358	0.022	0.010	-2.85	546.4	5.8
1	9	0.00	1.58	12:50 PM	1.54	29.51	0.420	-0.025	-0.005	-2.69	547.2	3.1
1	10	0.00	1.86	12:50 PM	1.54	29.51	0.394	0.000	0.000	-2.69	546.8	3.7
1	11	0.00	2.22	12:53 PM	1.54	29.51	0.338	0.012	0.027	-2.62	543.6	5.3
1	12	0.00	2.73	12:52 PM	1.54	29.51	0.069	0.003	0.194	-2.86	538.4	5.3
2	1	180.00	0.07	1:51 PM	1.54	29.50	0.396	-0.020	0.037	-2.49	544.4	-3.9
2	2	180.00	0.22	1:49 PM	1.54	29.50	0.365	0.008	0.024	-3.21	544.1	-4.3
2	3	180.00	0.38	1:48 PM	1.54	29.50	0.360	-0.004	0.024	-3.26	544.3	-4.2
2	4	180.00	0.54	1:47 PM	1.54	29.50	0.349	0.007	0.011	-3.11	544.5	-4.4
2	5	180.00	0.72	1:47 PM	1.54	29.50	0.373	0.004	0.011	-3.12	542.8	-5.3
2	6	180.00	0.90	1:46 PM	1.54	29.50	0.367	0.004	0.022	-3.14	543.1	-5.2
2	7	180.00	1.11	1:35 PM	1.54	29.51	0.390	-0.007	0.015	-3.18	542.5	-0.4
2	8	180.00	1.33	1:36 PM	1.54	29.51	0.392	-0.009	0.024	-3.06	545.5	8.2
2	9	180.00	1.58	1:36 PM	1.54	29.51	0.355	0.009	0.013	-3.10	546.5	14.7
2	10	180.00	1.86	1:37 PM	1.54	29.50	0.353	0.017	0.005	-2.96	548.2	19.4
2	11	180.00	2.22	1:38 PM	1.54	29.50	0.314	0.012	0.023	-3.01	544.4	20.9
2	12	180.00	2.73	1:39 PM	1.54	29.50	0.076	-0.004	0.235	-3.19	539.8	26.3

Airflow Sciences Corporation

Round 3-D Duct Traverse (Stack)

Project: 12010
 Site: MPC Detroit
 Task: 3D Flow
 Location: FCCU Stack Complex 3
 Condition: Run 12
 Personnel: P. Bhun
 Date: Friday, 4/27/2012

3DDAS011, Calibrated: 03/26/2012

3-D Probe v4.9.r13

Start Time: 12:49 PM
 End Time: 1:51 PM
 Formatting Parameters
 Velocities in fpm
 Insertion Depths from Near Wall
 False
 False

Last Leak Check
 Date/Time
 04/27/12 01:15 PM
 Decay Time [s Start P [IWC] End P [IWC]
 5 4.14 4.2

CALCULATED VALUES													
Port	Point	Yaw Angle [°]	F1 [-]	Pitch Angle [°]	F2 [-]	Dynam P [IWC]	Static P [IWC]	Wet Gas Density [lbm/ft³]	Total Velocity [ft/s]	Vaxial [ft/s]	Vpitch [ft/s]	Vyaw [ft/s]	Mass Flow [lbm/hr]
													Wet Vol Flow [WACFH]
													Wet Vol Flow [WSCFH]
1	1	-8.7	0.038	0.0	1.043	0.460	-3.67	0.0394	62.5	61.7	0.0	-9.5	13,478
1	2	-9.0	0.044	0.0	1.043	0.476	-3.47	0.0393	63.7	62.9	0.0	-9.9	13,684
1	3	-7.4	0.040	0.0	1.043	0.482	-3.48	0.0393	64.0	63.5	0.0	-8.2	13,825
1	4	-6.2	0.047	0.0	1.043	0.471	-3.17	0.0395	63.2	62.8	0.0	-6.8	13,739
1	5	-3.4	0.015	0.0	1.043	0.452	-3.13	0.0401	61.4	61.3	0.0	-3.6	13,608
1	6	1.5	0.056	0.0	1.043	0.443	-3.23	0.0392	61.5	61.5	0.0	1.6	13,349
1	7	8.1	0.092	0.0	1.043	0.393	-3.14	0.0392	57.9	57.4	0.0	8.1	12,435
1	8	6.7	0.028	0.0	1.043	0.390	-3.24	0.0392	57.7	57.3	0.0	6.7	12,425
1	9	4.0	-0.011	0.0	1.043	0.456	-3.15	0.0391	62.5	62.3	0.0	4.4	13,502
1	10	4.6	0.001	0.0	1.043	0.429	-3.12	0.0392	60.5	60.3	0.0	4.9	13,081
1	11	6.2	0.079	0.0	1.043	0.368	-2.99	0.0393	56.0	55.7	0.0	6.1	12,106
1	12	6.2	2.796	0.0	1.043	0.076	-2.93	0.0395	25.3	25.2	0.0	2.7	5,501
2	1	-3.0	0.092	0.0	1.043	0.431	-2.92	0.0393	60.6	60.5	0.0	-3.2	13,159
2	2	-3.3	0.065	0.0	1.043	0.397	-3.61	0.0392	58.2	58.1	0.0	-3.4	12,606
2	3	-3.3	0.066	0.0	1.043	0.391	-3.65	0.0392	57.8	57.7	0.0	-3.3	12,522
2	4	-3.5	0.031	0.0	1.043	0.380	-3.49	0.0392	57.0	56.9	0.0	-3.4	12,340
2	5	-4.4	0.030	0.0	1.043	0.405	-3.53	0.0393	58.8	58.6	0.0	-4.5	12,737
2	6	-4.3	0.061	0.0	1.043	0.400	-3.54	0.0393	58.4	58.2	0.0	-4.4	12,650
2	7	0.5	0.039	0.0	1.043	0.425	-3.60	0.0393	60.2	60.2	0.0	0.5	13,077
2	8	9.1	0.062	0.0	1.043	0.426	-3.49	0.0392	60.3	59.6	0.0	9.5	12,918
2	9	15.6	0.035	0.0	1.043	0.386	-3.48	0.0391	57.5	55.4	0.0	15.5	11,990
2	10	20.3	0.015	0.0	1.043	0.384	-3.34	0.0391	57.4	53.8	0.0	19.9	11,634
2	11	21.8	0.074	0.0	1.043	0.341	-3.35	0.0392	54.0	50.1	0.0	20.0	10,881
2	12	27.2	3.094	0.0	1.043	0.082	-3.27	0.0394	26.5	23.5	0.0	12.1	5,134
													130,249
													68,271

Marathon Petroleum Company
CleanAir Project No: 12010
FCCU Regenerator Stack

USEPA Method 2H - Velocity Decay Determination

Location: FCCU Regenerator Stack

Diameter (in): 82.25

Test Run: 1

Radius (in): 41.13

Client: Marathon Petroleum Company

Source Area (ft²): 36.8977

Project No: 12010

Meter Operator: D. Luckhard 568
Probe Operator: P. Bihun 505
Test Date: 4/24/12
Start Time: 09:30
Stop Time: 09:45

Pitot C_p: 0.827
Static P: -0.1
Bar. Press. (in. Hg): 28.85
Moisture (%)¹: 9.5
O₂ (dry volume %): 2.0
CO₂ (dry volume %): 16.3

Traverse Point	Pitot ΔP _s (in. H ₂ O)	Stack T _s (°F)	√ΔP _s (calculated) (√in. H ₂ O)	Unadjusted Velocity (calculated) ft/sec	Adjusted Velocity (calculated) ft/sec	
1-01	0.74	572	0.86	67.0	58.4	Replacement Velocity
1-02	0.77	573	0.88	68.4	68.4	
1-03	0.68	573	0.82	64.3	64.3	
1-04	0.64	573	0.80	62.3	62.3	
1-05	0.57	574	0.75	58.9	58.9	
1-06	0.56	573	0.75	58.3	58.3	
1-07	0.65	571	0.81	62.8	62.8	
1-08	0.68	570	0.82	64.2	64.2	
1-09	0.74	569	0.86	66.9	66.9	
1-10	0.73	567	0.85	66.4	66.4	
1-11	0.73	562	0.85	66.2	66.2	
1-12	0.76	561	0.87	67.5	52.0	Replacement Velocity
2-01	0.77	568	0.88	68.2	58.4	Replacement Velocity
2-02	0.87	569	0.93	72.5	72.5	
2-03	0.88	570	0.94	73.0	73.0	
2-04	0.84	571	0.92	71.3	71.3	
2-05	0.79	571	0.89	69.2	69.2	
2-06	0.80	572	0.89	69.7	69.7	
2-07	0.47	572	0.69	53.4	53.4	
2-08	0.49	571	0.70	54.5	54.5	
2-09	0.59	572	0.77	59.8	59.8	
2-10	0.64	572	0.80	62.3	62.3	
2-11	0.66	565	0.81	63.1	63.1	
2-12	0.56	565	0.75	58.1	56.2	Replacement Velocity
Final	0.8292	569.8		64.5	63.0	

WAF - Calculated 0.9768

WAF - Actual 0.9768

¹ Data obtained from

Sample Train: M-5F/202
Test Run: 1

Marathon Petroleum Company
CleanAir Project No: 12010
FCCU Regenerator Stack

USEPA Method 2H - Replacement Velocity Determination

Location: FCCU Regenerator Stack
Test Run: 1
Client: Marathon Petroleum Company
Project No: 12010

Diameter (in): 82.25
Radius (in): 41.13
Source Area (ft²): 36.8977

Total M-1 Points: 24
M-1 Points per Dia.: 12

Meter Operator: D. Luckhard 568
Probe Operator: P. Bihun 505
Test Date: 4/24/12
Port: 1
Duct Side: Far

Pitot C_p: 0.827
Static P: -0.1
Bar. Press. (in. Hg): 28.85
Moisture (%)¹: 9.5
O₂ (dry volume %)¹: 2.0
CO₂ (dry volume %)¹: 16.3

	(A)				(B)	(C)	(D)	(E)	(F)	(G)
Traverse Point	Distance from Wall (in.)	Pitot ΔP _s (in. H ₂ O)	Stack T _s (°F)	√ΔP _s (calculated) (√in. H ₂ O)	Velocity (calculated) (ft/sec)	Decay Velocity (ft/sec)	Intermediate Calculations (in ²)		Area of Sub-sector (in ²)	Volumetric Flow (ft-in ² /sec)
1-01	1.0	0.78	573	0.88	68.8	34.41	1,328.32	1,264.50	63.81	2,195.73
1-02	2.0	0.77	572	0.88	68.3	68.58	1,264.50	1,202.26	62.24	4,268.56
1-03	3.0	0.75	572	0.87	67.4	67.89	1,202.26	1,141.59	60.67	4,119.30
d _{rem}	3.0	0.75	572	0.87	67.4					
3. Total volumetric flow for all sub-sectors located between stack wall and d _{last} .										10,583.59
4. Volumetric flow for remainder of the Method 1 equal area sector.										
a. Velocity measurement at distance d _{rem} .										67.45
b. Total area in remainder of Method 1 equal-area segment. (A _{drem}) (in ²)										35
c. Total flow in remainder of Method 1 equal-area segment. (Q _{drem}) (ft-in ² /sec)										2,337.59
5. Wall effects-adjusted velocity in the Method 1 near-wall equal-area segment.										
a. Total volumetric flow for Method 1 equal-area sector closest to wall. (Q ₁) (ft-in ² /sec)										12,921.18
b. 'Replacement velocity' for Port 1, Far Side (ft/sec).										58.36

¹ Data obtained from Sample Train: M-5F/202
Test Run: 1

USEPA Method 2H - Replacement Velocity Determination

Location: FCCU Regenerator Stack
 Test Run: 1
 Client: Marathon Petroleum Company
 Project No: 12010

Diameter (in): 82.25
 Radius (in): 41.13
 Source Area (ft²): 36.8977

Total M-1 Points: 24
 M-1 Points per Dia.: 12

Meter Operator:	D. Luckhard	568
Probe Operator:	P. Bihun	505
Test Date:	4/24/12	
Port:	1	
Duct Side:	Near	

Pitot C_p: 0.827
 Static P: -0.1
 Bar. Press. (in. Hg): 28.85
 Moisture (%)¹: 9.5
 O₂ (dry volume %)¹: 2.0
 CO₂ (dry volume %)¹: 16.3

	(A)				(B)	(C)	(D)	(E)	(F)	(G)
Traverse Point	Distance from Wall (in.)	Pitot ΔP _s (in. H ₂ O)	Stack T _s (°F)	√ΔP _s (calculated) (√in. H ₂ O)	Velocity (calculated) (ft/sec)	Decay Velocity (ft/sec)	Intermediate Calculations (in ²)		Area of Sub-sector (in ²)	Volumetric Flow (ft-in ² /sec)
1-06	1.0	0.76	56	0.87	48.0	24.0	1,328.32	1,264.50	63.81	1,532
1-05	2.0	0.74	562	0.86	66.7	57.3	1,264.50	1,202.26	62.24	3,569
1-04	3.0	0.76	561	0.87	67.5	67.1	1,202.26	1,141.59	60.67	4,071
d _{rem}	3.0	0.76	561	0.87	67.5					
3. Total volumetric flow for all sub-sectors located between stack wall and d _{last} .										9,172.11
4. Volumetric flow for remainder of the Method 1 equal area sector.										
a. Velocity measurement at distance d _{rem} .										67.53
b. Total area in remainder of Method 1 equal-area segment. (A _{drem}) (in ²)										35
c. Total flow in remainder of Method 1 equal-area segment. (Q _{drem}) (ft-in ² /sec)										2,340.55
5. Wall effects-adjusted velocity in the Method 1 near-wall equal-area segment.										
a. Total volumetric flow for Method 1 equal-area sector closest to wall. (Q ₁) (ft-in ₂ /sec)										11,512.66
b. 'Replacement velocity' for Port 1, Near Side (ft/sec).										52.00

¹ Data obtained from Sample Train: M-5F/202
 Test Run: 1

USEPA Method 2H - Replacement Velocity Determination

Location: FCCU Regenerator Stack
Test Run: 1
Client: Marathon Petroleum Company
Project No: 12010

Diameter (in): 82.25
Radius (in): 41.13
Source Area (ft²): 36.8977

Total M-1 Points: 24
M-1 Points per Dia.: 12

Meter Operator: D. Luckhard 568
Probe Operator: P. Bihun 505
Test Date: 4/24/12
Port: 2
Duct Side: Far

Pitot C_p: 0.827
Static P: -0.1
Bar. Press. (in. Hg): 28.85
Moisture (%)¹: 9.5
O₂ (dry volume %)¹: 2.0
CO₂ (dry volume %)¹: 16.3

	(A)				(B)	(C)	(D)	(E)	(F)	(G)
Traverse Point	Distance from Wall (in.)	Pitot ΔP _s (in. H ₂ O)	Stack T _s (°F)	√ΔP _s (calculated) (√in. H ₂ O)	Velocity (calculated) (ft/sec)	Decay Velocity (ft/sec)	Intermediate Calculations (in ²)		Area of Sub-sector (in ²)	Volumetric Flow (ft-in ² /sec)
2-01	1.0	0.77	570	0.88	68.3	34.1	1,328.32	1,264.50	63.81	2,178
2-02	2.0	0.78	568	0.88	68.7	68.5	1,264.50	1,202.26	62.24	4,261
2-03	3.0	0.76	567	0.87	67.7	68.2	1,202.26	1,141.59	60.67	4,137
d _{rem}	3.0	0.76	567	0.87	67.7					
3. Total volumetric flow for all sub-sectors located between stack wall and d _{last} .										10,577.02
4. Volumetric flow for remainder of the Method 1 equal area sector.										
a. Velocity measurement at distance d _{rem} .										67.73
b. Total area in remainder of Method 1 equal-area segment. (A _{drem}) (in ²)										35
c. Total flow in remainder of Method 1 equal-area segment. (Q _{drem}) (ft-in ² /sec)										2,347.42
5. Wall effects-adjusted velocity in the Method 1 near-wall equal-area segment.										
a. Total volumetric flow for Method 1 equal-area sector closest to wall. (Q ₁) (ft-in ² /sec)										12,924.44
b. 'Replacement velocity' for Port 2, Far Side (ft/sec).										58.38

¹ Data obtained from Sample Train: M-5F/202
Test Run: 1

USEPA Method 2H - Replacement Velocity Determination

Location: FCCU Regenerator Stack

Test Run: 1

Client: Marathon Petroleum Company

Project No: 12010

Diameter (in): 82.25

Radius (in): 41.13

Source Area (ft²): 36.8977

Total M-1 Points: 24

M-1 Points per Dia.: 12

Pitot C_p: 0.83

Static P: -0.1

Bar. Press. (in. Hg): 28.85

Moisture (%)¹: 9.5

O₂ (dry volume %) ¹: 2.0

CO₂ (dry volume %) ¹: 16.3

Meter Operator:	D. Luckhard	568
Probe Operator:	P. Bihun	505

Test Date: 4/24/12

Port: 2

Duct Side: Near

	(A)				(B)	(C)	(D)	(E)	(F)	(G)
Traverse Point	Distance from Wall (in.)	Pitot ΔP _s (in. H ₂ O)	Stack T _s (°F)	√ΔP _s (calculated) (√in. H ₂ O)	Velocity (calculated) (ft/sec)	Decay Velocity (ft/sec)	Intermediate Calculations (in ²)		Area of Sub-sector (in ²)	Volumetric Flow (ft-in ² /sec)
2-06	1.0	0.64	565	0.80	62.1	31.0	1,328.32	1,264.50	63.81	1,981
2-05	2.0	0.73	568	0.85	66.4	64.3	1,264.50	1,202.26	62.24	3,999
2-04	3.0	0.77	570	0.88	68.3	67.3	1,202.26	1,141.59	60.67	4,086
d _{rem}	3.0	0.77	570	0.88	68.3					
3. Total volumetric flow for all sub-sectors located between stack wall and d _{last} .										10,066.47
4. Volumetric flow for remainder of the Method 1 equal area sector.										
a. Velocity measurement at distance d _{rem} .										68.28
b. Total area in remainder of Method 1 equal-area segment. (A _{drem}) (in ²)										35
c. Total flow in remainder of Method 1 equal-area segment. (Q _{drem}) (ft-in ² /sec)										2,366.26
5. Wall effects-adjusted velocity in the Method 1 near-wall equal-area segment.										
a. Total volumetric flow for Method 1 equal-area sector closest to wall. (Q ₁) (ft-in ² /sec)										12,432.73
b. 'Replacement velocity' for Port 2, Near Side (ft/sec).										56.16

¹ Data obtained from Sample Train: M-5F/202
Test Run: 1

Marathon Petroleum Company
CleanAir Project No: 12010
FCCU Regenerator Stack

USEPA Method 2H - Velocity Decay Determination

Location: FCCU Regenerator Stack Diameter (in): 82.25
Test Run: 2 Radius (in): 41.13
Client: Marathon Petroleum Company Source Area (ft²): 36.8977
Project No: 12010

Meter Operator:	D. Luckhard	568	Pitot C _p :	0.827
Probe Operator:	P. Bihun	505	Static P:	0.4
Test Date:	4/25/12		Bar. Press. (in. Hg):	28.15
Start Time:	08:40		Moisture (%) ¹ :	9.6
Stop Time:	08:56		O ₂ (dry volume %) ¹ :	2.4
			CO ₂ (dry volume %) ¹ :	16.1

Traverse Point	Pitot ΔP _s (in. H ₂ O)	Stack T _s (°F)	√ΔP _s (calculated) (√in. H ₂ O)	Unadjusted Velocity (calculated) ft/sec	Adjusted Velocity (calculated) ft/sec	
2-01	0.54	555	0.73	57.5	50.8	Replacement Velocity
2-02	0.62	554	0.79	61.5	61.5	
2-03	0.61	555	0.78	61.1	61.1	
2-04	0.59	556	0.77	60.1	60.1	
2-05	0.57	558	0.75	59.1	59.1	
2-06	0.58	558	0.76	59.6	59.6	
2-07	0.62	558	0.79	61.7	61.7	
2-08	0.63	558	0.79	62.1	62.1	
2-09	0.61	558	0.78	61.2	61.2	
2-10	0.63	558	0.79	62.1	62.1	
2-11	0.61	552	0.78	61.0	61.0	
2-12	0.62	552	0.79	61.5	52.1	Replacement Velocity
1-01	0.57	548	0.75	58.8	51.1	Replacement Velocity
1-02	0.71	551	0.84	65.7	65.7	
1-03	0.73	552	0.85	66.7	66.7	
1-04	0.74	552	0.86	67.2	67.2	
1-05	0.73	555	0.85	66.8	66.8	
1-06	0.68	556	0.82	64.5	64.5	
1-07	0.61	557	0.78	61.1	61.1	
1-08	0.57	558	0.75	59.1	59.1	
1-09	0.65	559	0.81	63.2	63.2	
1-10	0.72	558	0.85	66.4	66.4	
1-11	0.86	554	0.93	72.5	72.5	
1-12	0.95	551	0.97	76.1	61.2	Replacement Velocity
Final	0.8082	555.1		63.2	61.6	

WAF - Calculated 0.9746
WAF - Actual 0.9746

¹ Data obtained from

Sample Train: M-5F/202
Test Run: 4

Marathon Petroleum Company
CleanAir Project No: 12010
FCCU Regenerator Stack

USEPA Method 2H - Replacement Velocity Determination

Location: FCCU Regenerator Stack
Test Run: 2
Client: Marathon Petroleum Company
Project No: 12010

Diameter (in): 82.25
Radius (in): 41.13
Source Area (ft²): 36.8977

Total M-1 Points: 24
M-1 Points per Dia.: 12

Meter Operator:	D. Luckhard	568
Probe Operator:	P. Bihun	505
Test Date:	4/25/12	
Port:	2	
Duct Side:	Far	

Pitot C_p: 0.827
Static P: 0.4
Bar. Press. (in. Hg): 28.15
Moisture (%)¹: 9.6
O₂ (dry volume %) ¹: 2.4
CO₂ (dry volume %) ¹: 16.1

	(A)				(B)	(C)	(D)	(E)	(F)	(G)
Traverse Point	Distance from Wall (in.)	Pitot ΔP _s (in. H ₂ O)	Stack T _s (°F)	√ΔP _s (calculated) (√in. H ₂ O)	Velocity (calculated) (ft/sec)	Decay Velocity (ft/sec)	Intermediate Calculations (in ²)		Area of Sub-sector (in ²)	Volumetric Flow (ft-in ² /sec)
2-01	1.0	0.55	558	0.74	58.1	29.03	1,328.32	1,264.50	63.81	1,852.73
2-02	2.0	0.57	554	0.75	59.0	58.53	1,264.50	1,202.26	62.24	3,643.19
2-03	3.0	0.61	554	0.78	61.0	60.01	1,202.26	1,141.59	60.67	3,641.19
d _{rem}	3.0	0.61	554	0.78	61.0					
3. Total volumetric flow for all sub-sectors located between stack wall and d _{last} .										9,137.11
4. Volumetric flow for remainder of the Method 1 equal area sector.										
a. Velocity measurement at distance d _{rem} .										61.03
b. Total area in remainder of Method 1 equal-area segment. (A _{drem}) (in ²)										35
c. Total flow in remainder of Method 1 equal-area segment. (Q _{drem}) (ft-in ² /sec)										2,115.23
5. Wall effects-adjusted velocity in the Method 1 near-wall equal-area segment.										
a. Total volumetric flow for Method 1 equal-area sector closest to wall. (Q ₁) (ft-in ₂ /sec)										11,252.34
b. 'Replacement velocity' for Port 2, Far Side (ft/sec).										50.83

¹ Data obtained from Sample Train: M-5F/202
Test Run: 4

USEPA Method 2H - Replacement Velocity Determination

Location: FCCU Regenerator Stack
 Test Run: 2
 Client: Marathon Petroleum Company
 Project No: 12010

Diameter (in): 82.25
 Radius (in): 41.13
 Source Area (ft²): 36.8977

Total M-1 Points: 24
 M-1 Points per Dia.: 12

Meter Operator: D. Luckhard 568
 Probe Operator: P. Bihun 505
 Test Date: 4/25/12
 Port: 2
 Duct Side: Near

Pitot C_p: 0.827
 Static P: 0.4
 Bar. Press. (in. Hg): 28.15
 Moisture (%)¹: 9.6
 O₂ (dry volume %)¹: 2.4
 CO₂ (dry volume %)¹: 16.1

Traverse Point	(A) Distance from Wall (in.)	Pitot ΔP _s (in. H ₂ O)	Stack T _s (°F)	√ΔP _s (calculated) (√in. H ₂ O)	(B) Velocity (calculated) (ft/sec)	(C) Decay Velocity (ft/sec)	(D) Intermediate Calculations (in ²)	(E)	(F) Area of Sub-sector (in ²)	(G) Volumetric Flow (ft-in ² /sec)
2-06	1.0	0.62	552	0.79	61.5	30.7	1,328.32	1,264.50	63.81	1,961
2-05	2.0	0.59	554	0.77	60.0	60.7	1,264.50	1,202.26	62.24	3,781
2-04	3.0	0.61	556	0.78	61.1	60.6	1,202.26	1,141.59	60.67	3,674
d _{rem}	3.0	0.61	556	0.78	61.1					
3. Total volumetric flow for all sub-sectors located between stack wall and d _{last} .										9,416.45
4. Volumetric flow for remainder of the Method 1 equal area sector.										
a. Velocity measurement at distance d _{rem} .										61.09
b. Total area in remainder of Method 1 equal-area segment. (A _{drem}) (in ²)										35
c. Total flow in remainder of Method 1 equal-area segment. (Q _{drem}) (ft-in ² /sec)										2,117.31
5. Wall effects-adjusted velocity in the Method 1 near-wall equal-area segment.										
a. Total volumetric flow for Method 1 equal-area sector closest to wall. (Q ₁) (ft-in ₂ /sec)										11,533.77
b. 'Replacement velocity' for Port 2, Near Side (ft/sec).										52.10

¹ Data obtained from Sample Train: M-5F/202
 Test Run: 4

USEPA Method 2H - Replacement Velocity Determination

Location: FCCU Regenerator Stack
Test Run: 2
Client: Marathon Petroleum Company
Project No: 12010

Diameter (in): 82.25
Radius (in): 41.13
Source Area (ft²): 36.8977

Total M-1 Points: 24
M-1 Points per Dia.: 12

Meter Operator: D. Luckhard 568
Probe Operator: P. Bihun 505
Test Date: 4/25/12
Port: 1
Duct Side: Far

Pitot C_p: 0.827
Static P: 0.4
Bar. Press. (in. Hg): 28.15
Moisture (%)¹: 9.6
O₂ (dry volume %)¹: 2.4
CO₂ (dry volume %)¹: 16.1

	(A)				(B)	(C)	(D)	(E)	(F)	(G)
Traverse Point	Distance from Wall (in.)	Pitot ΔP _s (in. H ₂ O)	Stack T _s (°F)	√ΔP _s (calculated) (√in. H ₂ O)	Velocity (calculated) (ft/sec)	Decay Velocity (ft/sec)	Intermediate Calculations (in ²)		Area of Sub-sector (in ²)	Volumetric Flow (ft-in ² /sec)
1-01	1.0	0.55	548	0.74	57.8	28.9	1,328.32	1,264.50	63.81	1,844
1-02	2.0	0.58	549	0.76	59.4	58.6	1,264.50	1,202.26	62.24	3,646
1-03	3.0	0.63	550	0.79	61.9	60.6	1,202.26	1,141.59	60.67	3,679
d _{rem}	3.0	0.63	550	0.79	61.9					
3. Total volumetric flow for all sub-sectors located between stack wall and d _{last} .										9,168.12
4. Volumetric flow for remainder of the Method 1 equal area sector.										
a. Velocity measurement at distance d _{rem} .										61.90
b. Total area in remainder of Method 1 equal-area segment. (A _{drem}) (in ²)										35
c. Total flow in remainder of Method 1 equal-area segment. (Q _{drem}) (ft-in ² /sec)										2,145.38
5. Wall effects-adjusted velocity in the Method 1 near-wall equal-area segment.										
a. Total volumetric flow for Method 1 equal-area sector closest to wall. (Q ₁) (ft-in ₂ /sec)										11,313.50
b. 'Replacement velocity' for Port 1, Far Side (ft/sec).										51.10

¹ Data obtained from Sample Train: M-5F/202
Test Run: 4

USEPA Method 2H - Replacement Velocity Determination

Location: FCCU Regenerator Stack

Test Run: 2

Client: Marathon Petroleum Company

Project No: 12010

Diameter (in): 82.25

Radius (in): 41.13

Source Area (ft²): 36.8977

Total M-1 Points: 24

M-1 Points per Dia.: 12

Pitot C_p: 0.83

Static P: 0.4

Bar. Press. (in. Hg): 28.15

Moisture (%)¹: 9.6

O₂ (dry volume %)¹: 2.4

CO₂ (dry volume %)¹: 16.1

Meter Operator:	D. Luckhard	568
Probe Operator:	P. Bihun	505

Test Date: 4/25/12

Port: 1

Duct Side: Near

	(A)				(B)	(C)	(D)	(E)	(F)	(G)
Traverse Point	Distance from Wall (in.)	Pitot ΔP _s (in. H ₂ O)	Stack T _s (°F)	√ΔP _s (calculated) (√in. H ₂ O)	Velocity (calculated) (ft/sec)	Decay Velocity (ft/sec)	Intermediate Calculations (in ²)		Area of Sub-sector (in ²)	Volumetric Flow (ft-in ³ /sec)
1-06	1.0	0.89	551	0.94	73.6	36.8	1,328.32	1,264.50	63.81	2,349
1-05	2.0	0.86	554	0.93	72.5	73.0	1,264.50	1,202.26	62.24	4,546
1-04	3.0	0.77	558	0.88	68.7	70.6	1,202.26	1,141.59	60.67	4,283
d _{rem}	3.0	0.77	558	0.88	68.7					
3. Total volumetric flow for all sub-sectors located between stack wall and d _{last} .										11,177.47
4. Volumetric flow for remainder of the Method 1 equal area sector.										
a. Velocity measurement at distance d _{rem} .										68.71
b. Total area in remainder of Method 1 equal-area segment. (A _{drem}) (in ²)										35
c. Total flow in remainder of Method 1 equal-area segment. (Q _{drem}) (ft-in ³ /sec)										2,381.18
5. Wall effects-adjusted velocity in the Method 1 near-wall equal-area segment.										
a. Total volumetric flow for Method 1 equal-area sector closest to wall. (Q _i) (ft-in ³ /sec)										13,558.65
b. 'Replacement velocity' for Port 1, Near Side (ft/sec).										61.24

¹ Data obtained from Sample Train: M-5F/202
Test Run: 4

Marathon Petroleum Company
CleanAir Project No: 12010
FCCU Regenerator Stack

USEPA Method 2H - Velocity Decay Determination

Location: FCCU Regenerator Stack

Diameter (in): 82.25

Test Run: 3

Radius (in): 41.13

Client: Marathon Petroleum Company

Source Area (ft²): 36.8977

Project No: 12010

Meter Operator: D. Luckhard 568
Probe Operator: P. Bihun 505
Test Date: 4/26/12
Start Time: 08:02
Stop Time: 08:12

Pitot C_p: 0.827
Static P: 0.4
Bar. Press. (in. Hg): 29.00
Moisture (%)¹: 10.0
O₂ (dry volume %): 2.3
CO₂ (dry volume %): 16.0

Traverse Point	Pitot ΔP _s (in. H ₂ O)	Stack T _s (°F)	√ΔP _s (calculated) (√in. H ₂ O)	Unadjusted Velocity (calculated) ft/sec	Adjusted Velocity (calculated) ft/sec	
2-01	0.55	557	0.74	57.3	49.8	Replacement Velocity
2-02	0.63	558	0.79	61.3	61.3	
2-03	0.63	558	0.79	61.3	61.3	
2-04	0.61	559	0.78	60.4	60.4	
2-05	0.59	566	0.77	59.6	59.6	
2-06	0.62	561	0.79	60.9	60.9	
2-07	0.64	561	0.80	61.9	61.9	
2-08	0.63	562	0.79	61.4	61.4	
2-09	0.65	562	0.81	62.4	62.4	
2-10	0.71	562	0.84	65.2	65.2	
2-11	0.98	557	0.99	76.4	76.4	
2-12	0.94	556	0.97	74.8	62.1	Replacement Velocity
1-01	0.52	553	0.72	55.6	51.0	Replacement Velocity
1-02	0.72	555	0.85	65.4	65.4	
1-03	0.79	556	0.89	68.6	68.6	
1-04	0.74	558	0.86	66.4	66.4	
1-05	0.77	559	0.88	67.8	67.8	
1-06	0.74	559	0.86	66.5	66.5	
1-07	0.60	561	0.77	59.9	59.9	
1-08	0.66	562	0.81	62.9	62.9	
1-09	0.64	563	0.80	61.9	61.9	
1-10	0.70	562	0.84	64.8	64.8	
1-11	0.98	558	0.99	76.5	76.5	
1-12	1.00	556	1.00	77.2	65.7	Replacement Velocity
Final	0.8391	559.2		64.8	63.3	

WAF - Calculated 0.9768
WAF - Actual 0.9768

¹ Data obtained from

Sample Train: M-5F/202
Test Run: 7

USEPA Method 2H - Replacement Velocity Determination

Location: FCCU Regenerator Stack
Test Run: 3
Client: Marathon Petroleum Company
Project No: 12010

Diameter (in): 82.25
Radius (in): 41.13
Source Area (ft²): 36.8977

Total M-1 Points: 24
M-1 Points per Dia.: 12

Meter Operator: D. Luckhard 568
Probe Operator: P. Bihun 505
Test Date: 4/26/12
Port: 2
Duct Side: Far

Pitot C_p: 0.827
Static P: 0.4
Bar. Press. (in. Hg): 29.00
Moisture (%)¹: 10.0
O₂ (dry volume %) ¹: 2.3
CO₂ (dry volume %) ¹: 16.0

Traverse Point	(A) Distance from Wall (in.)	Pitot ΔP _s (in. H ₂ O)	Stack T _s (°F)	√ΔP _s (calculated) (√in. H ₂ O)	(B) Velocity (calculated) (ft/sec)	(C) Decay Velocity (ft/sec)	(D) Intermediate Calculations (in ²)	(E)	(F) Area of Sub-sector (in ²)	(G) Volumetric Flow (ft-in ² /sec)
2-01	1.0	0.55	560	0.74	57.3	28.67	1,328.32	1,264.50	63.81	1,829.50
2-02	2.0	0.58	557	0.76	58.8	58.07	1,264.50	1,202.26	62.24	3,614.25
2-03	3.0	0.57	557	0.75	58.3	58.54	1,202.26	1,141.59	60.67	3,551.78
d _{rem}	3.0	0.57	557	0.75	58.3					
3. Total volumetric flow for all sub-sectors located between stack wall and d _{last} .										8,995.52
4. Volumetric flow for remainder of the Method 1 equal area sector.										
a. Velocity measurement at distance d _{rem} .										58.29
b. Total area in remainder of Method 1 equal-area segment. (A _{drem}) (in ²)										35
c. Total flow in remainder of Method 1 equal-area segment. (Q _{drem}) (ft-in ² /sec)										2,020.06
5. Wall effects-adjusted velocity in the Method 1 near-wall equal-area segment.										
a. Total volumetric flow for Method 1 equal-area sector closest to wall. (Q ₁) (ft-in ₂ /sec)										11,015.59
b. 'Replacement velocity' for Port 2, Far Side (ft/sec).										49.76

¹ Data obtained from Sample Train: M-5F/202
Test Run: 7

USEPA Method 2H - Replacement Velocity Determination

Location: FCCU Regenerator Stack
 Test Run: 3
 Client: Marathon Petroleum Company
 Project No: 12010

Diameter (in): 82.25
 Radius (in): 41.13
 Source Area (ft²): 36.8977

Total M-1 Points: 24
 M-1 Points per Dia.: 12

Meter Operator:	D. Luckhard	568
Probe Operator:	P. Bihun	505
Test Date:	4/26/12	
Port:	2	
Duct Side:	Near	

Pitot C_p: 0.827
 Static P: 0.4
 Bar. Press. (in. Hg): 29.00
 Moisture (%)¹: 10.0
 O₂ (dry volume %)¹: 2.3
 CO₂ (dry volume %)¹: 16.0

	(A)				(B)	(C)	(D)	(E)	(F)	(G)
Traverse Point	Distance from Wall (in.)	Pitot ΔP _s (in. H ₂ O)	Stack T _s (°F)	√ΔP _s (calculated) (√in. H ₂ O)	Velocity (calculated) (ft/sec)	Decay Velocity (ft/sec)	Intermediate Calculations (in ²)		Area of Sub-sector (in ²)	Volumetric Flow (ft-in ² /sec)
2-06	1.0	1.00	555	1.00	77.1	38.6	1,328.32	1,264.50	63.81	2,461
2-05	2.0	0.87	558	0.93	72.0	74.6	1,264.50	1,202.26	62.24	4,642
2-04	3.0	0.79	560	0.89	68.7	70.4	1,202.26	1,141.59	60.67	4,270
d _{rem}	3.0	0.79	560	0.89	68.7					
3. Total volumetric flow for all sub-sectors located between stack wall and d _{last} .										11,373.45
4. Volumetric flow for remainder of the Method 1 equal area sector.										
a. Velocity measurement at distance d _{rem} .										68.72
b. Total area in remainder of Method 1 equal-area segment. (A _{drem}) (in ²)										35
c. Total flow in remainder of Method 1 equal-area segment. (Q _{drem}) (ft-in ² /sec)										2,381.67
5. Wall effects-adjusted velocity in the Method 1 near-wall equal-area segment.										
a. Total volumetric flow for Method 1 equal-area sector closest to wall. (Q ₁) (ft-in ₂ /sec)										13,755.11
b. 'Replacement velocity' for Port 2, Near Side (ft/sec).										62.13

¹ Data obtained from Sample Train: M-5F/202
 Test Run: 7

USEPA Method 2H - Replacement Velocity Determination

Location: FCCU Regenerator Stack
Test Run: 3
Client: Marathon Petroleum Company
Project No: 12010

Diameter (in): 82.25
Radius (in): 41.13
Source Area (ft²): 36.8977

Total M-1 Points: 24
M-1 Points per Dia.: 12

Meter Operator: D. Luckhard 568
Probe Operator: P. Bihun 505
Test Date: 4/26/12
Port: 1
Duct Side: Far

Pitot C_p: 0.827
Static P: 0.4
Bar. Press. (in. Hg): 29.00
Moisture (%)¹: 10.0
O₂ (dry volume %) ¹: 2.3
CO₂ (dry volume %) ¹: 16.0

	(A)				(B)	(C)	(D)	(E)	(F)	(G)
Traverse Point	Distance from Wall (in.)	Pitot ΔP _s (in. H ₂ O)	Stack T _s (°F)	√ΔP _s (calculated) (√in. H ₂ O)	Velocity (calculated) (ft/sec)	Decay Velocity (ft/sec)	Intermediate Calculations (in ²)		Area of Sub-sector (in ²)	Volumetric Flow (ft-in ² /sec)
1-01	1.0	0.64	558	0.80	61.8	30.9	1,328.32	1,264.50	63.81	1,972
1-02	2.0	0.56	554	0.75	57.7	59.7	1,264.50	1,202.26	62.24	3,718
1-03	3.0	0.59	554	0.77	59.2	58.4	1,202.26	1,141.59	60.67	3,546
d _{rem}	3.0	0.59	554	0.77	59.2					
3. Total volumetric flow for all sub-sectors located between stack wall and d _{last} .										9,236.20
4. Volumetric flow for remainder of the Method 1 equal area sector.										
a. Velocity measurement at distance d _{rem} .										59.21
b. Total area in remainder of Method 1 equal-area segment. (A _{drem}) (in ²)										35
c. Total flow in remainder of Method 1 equal-area segment. (Q _{drem}) (ft-in ² /sec)										2,052.16
5. Wall effects-adjusted velocity in the Method 1 near-wall equal-area segment.										
a. Total volumetric flow for Method 1 equal-area sector closest to wall. (Q _i) (ft-in ² /sec)										11,288.37
b. 'Replacement velocity' for Port 1, Far Side (ft/sec).										50.99

¹ Data obtained from Sample Train: M-5F/202
Test Run: 7

USEPA Method 2H - Replacement Velocity Determination

Location: FCCU Regenerator Stack
Test Run: 3
Client: Marathon Petroleum Company
Project No: 12010

Diameter (in): 82.25
Radius (in): 41.13
Source Area (ft²): 36.8977

Total M-1 Points: 24
M-1 Points per Dia.: 12

Meter Operator:	D. Luckhard	568
Probe Operator:	P. Bihun	505

Test Date: 4/26/12

Port: 1

Duct Side: Near

Pitot C_p: 0.83

Static P: 0.4

Bar. Press. (in. Hg): 29.00

Moisture (%)¹: 10.0

O₂ (dry volume %)¹: 2.3

CO₂ (dry volume %)¹: 16.0

	(A)				(B)	(C)	(D)	(E)	(F)	(G)
Traverse Point	Distance from Wall (in.)	Pitot ΔP _s (in. H ₂ O)	Stack T _s (°F)	√ΔP _s (calculated) (√in. H ₂ O)	Velocity (calculated) (ft/sec)	Decay Velocity (ft/sec)	Intermediate Calculations (in ²)		Area of Sub-sector (in ²)	Volumetric Flow (ft-in ² /sec)
1-06	1.0	1.20	561	1.10	84.7	42.4	1,328.32	1,264.50	63.81	2,704
1-05	2.0	0.99	558	0.99	76.9	80.8	1,264.50	1,202.26	62.24	5,029
1-04	3.0	0.81	545	0.90	69.1	73.0	1,202.26	1,141.59	60.67	4,427
d _{rem}	3.0	0.81	545	0.90	69.1					
3. Total volumetric flow for all sub-sectors located between stack wall and d _{last} .										12,159.27
4. Volumetric flow for remainder of the Method 1 equal area sector.										
a. Velocity measurement at distance d _{rem} .										69.07
b. Total area in remainder of Method 1 equal-area segment. (A _{drem}) (in ²)										35
c. Total flow in remainder of Method 1 equal-area segment. (Q _{drem}) (ft-in ² /sec)										2,393.83
5. Wall effects-adjusted velocity in the Method 1 near-wall equal-area segment.										
a. Total volumetric flow for Method 1 equal-area sector closest to wall. (Q ₁) (ft-in ² /sec)										14,553.10
b. 'Replacement velocity' for Port 1, Near Side (ft/sec).										65.74

¹ Data obtained from Sample Train: M-5F/202
Test Run: 7

Marathon Petroleum Company
CleanAir Project No: 12010
FCCU Regenerator Stack

USEPA Method 2H - Velocity Decay Determination

Location: FCCU Regenerator Stack

Diameter (in): 82.25

Test Run: 4

Radius (in): 41.13

Client: Marathon Petroleum Company

Source Area (ft²): 36.8977

Project No: 12010

Meter Operator:	D. Luckhard	568
Probe Operator:	P. Bihun	505
Test Date:	4/27/12	
Start Time:	08:52	
Stop Time:	09:05	

Pitot C _p :	0.827
Static P:	0.5
Bar. Press. (in. Hg):	29.50
Moisture (%) ¹ :	9.8
O ₂ (dry volume %):	3.8
CO ₂ (dry volume %):	14.7

Traverse Point	Pitot ΔP _s (in. H ₂ O)	Stack T _s (°F)	√ΔP _s (calculated) (√in. H ₂ O)	Unadjusted Velocity (calculated) ft/sec	Adjusted Velocity (calculated) ft/sec	
2-01	0.54	550	0.73	56.1	49.1	Replacement Velocity
2-02	0.60	552	0.77	59.2	59.2	
2-03	0.59	553	0.77	58.8	58.8	
2-04	0.58	555	0.76	58.3	58.3	
2-05	0.55	556	0.74	56.8	56.8	
2-06	0.57	556	0.75	57.9	57.9	
2-07	0.61	555	0.78	59.8	59.8	
2-08	0.64	556	0.80	61.3	61.3	
2-09	0.67	556	0.82	62.7	62.7	
2-10	0.73	556	0.85	65.5	65.5	
2-11	0.86	555	0.93	71.0	71.0	
2-12	1.10	552	1.05	80.2	69.6	Replacement Velocity
1-01	0.56	548	0.75	57.1	52.8	Replacement Velocity
1-02	0.70	550	0.84	63.9	63.9	
1-03	0.74	552	0.86	65.8	65.8	
1-04	0.71	553	0.84	64.5	64.5	
1-05	0.68	554	0.82	63.1	63.1	
1-06	0.68	555	0.82	63.2	63.2	
1-07	0.57	556	0.75	57.9	57.9	
1-08	0.57	557	0.75	57.9	57.9	
1-09	0.61	557	0.78	59.9	59.9	
1-10	0.62	556	0.79	60.3	60.3	
1-11	0.65	554	0.81	61.7	61.7	
1-12	0.62	551	0.79	60.2	50.6	Replacement Velocity
Final	0.8073	554.0		61.8	60.5	

WAF - Calculated 0.9787
WAF - Actual 0.9787

¹ Data obtained from

Sample Train: Mod. CTM-027
Test Run: 10

USEPA Method 2H - Replacement Velocity Determination

Location: FCCU Regenerator Stack
Test Run: 4
Client: Marathon Petroleum Company
Project No: 12010

Diameter (in): 82.25
Radius (in): 41.13
Source Area (ft²): 36.8977

Total M-1 Points: 24
M-1 Points per Dia.: 12

Meter Operator: D. Luckhard 568
Probe Operator: P. Bihun 505
Test Date: 4/27/12
Port: 2
Duct Side: Far

Pitot C_p: 0.827
Static P: 0.5
Bar. Press. (in. Hg): 29.50
Moisture (%)¹: 9.8
O₂ (dry volume %)¹: 3.8
CO₂ (dry volume %)¹: 14.7

	(A)				(B)	(C)	(D)	(E)	(F)	(G)
Traverse Point	Distance from Wall (in.)	Pitot ΔP_s (in. H ₂ O)	Stack T _s (°F)	$\sqrt{\Delta P_s}$ (calculated) ($\sqrt{\text{in. H}_2\text{O}}$)	Velocity (calculated) (ft/sec)	Decay Velocity (ft/sec)	Intermediate Calculations (in ²)		Area of Sub-sector (in ²)	Volumetric Flow (ft-in ² /sec)
2-01	1.0	0.52	551	0.72	55.1	27.56	1,328.32	1,264.50	63.81	1,758.66
2-02	2.0	0.57	550	0.75	57.7	56.40	1,264.50	1,202.26	62.24	3,510.43
2-03	3.0	0.60	551	0.77	59.2	58.44	1,202.26	1,141.59	60.67	3,545.86
d _{rem}	3.0	0.60	551	0.77	59.2					
3. Total volumetric flow for all sub-sectors located between stack wall and d _{last} .										8,814.96
4. Volumetric flow for remainder of the Method 1 equal area sector.										
a. Velocity measurement at distance d _{rem} .										59.21
b. Total area in remainder of Method 1 equal-area segment. (A _{drem}) (in ²)										35
c. Total flow in remainder of Method 1 equal-area segment. (Q _{drem}) (ft-in ² /sec)										2,051.98
5. Wall effects-adjusted velocity in the Method 1 near-wall equal-area segment.										
a. Total volumetric flow for Method 1 equal-area sector closest to wall. (Q ₁) (ft-in ₂ /sec)										10,866.94
b. 'Replacement velocity' for Port 2, Far Side (ft/sec).										49.09

¹ Data obtained from Sample Train: Mod. CTM-027
Test Run: 10

USEPA Method 2H - Replacement Velocity Determination

Location: FCCU Regenerator Stack
 Test Run: 4
 Client: Marathon Petroleum Company
 Project No: 12010

Diameter (in): 82.25
 Radius (in): 41.13
 Source Area (ft²): 36.8977

Total M-1 Points: 24
 M-1 Points per Dia.: 12

Meter Operator: D. Luckhard 568
 Probe Operator: P. Bihun 505
 Test Date: 4/27/12
 Port: 2
 Duct Side: Near

Pitot C_p: 0.827
 Static P: 0.5
 Bar. Press. (in. Hg): 29.50
 Moisture (%)¹: 9.8
 O₂ (dry volume %)¹: 3.8
 CO₂ (dry volume %)¹: 14.7

	(A)				(B)	(C)	(D)	(E)	(F)	(G)
Traverse Point	Distance from Wall (in.)	Pitot ΔP _s (in. H ₂ O)	Stack T _s (°F)	√ΔP _s (calculated) (√in. H ₂ O)	Velocity (calculated) (ft/sec)	Decay Velocity (ft/sec)	Intermediate Calculations (in ²)		Area of Sub-sector (in ²)	Volumetric Flow (ft-in ² /sec)
2-06	1.0	1.10	550	1.05	80.1	40.1	1,328.32	1,264.50	63.81	2,557
2-05	2.0	1.20	550	1.10	83.7	81.9	1,264.50	1,202.26	62.24	5,098
2-04	3.0	1.10	552	1.05	80.2	81.9	1,202.26	1,141.59	60.67	4,972
d _{rem}	3.0	1.10	552	1.05	80.2					
3. Total volumetric flow for all sub-sectors located between stack wall and d _{last} .										12,626.77
4. Volumetric flow for remainder of the Method 1 equal area sector.										
a. Velocity measurement at distance d _{rem} .										80.21
b. Total area in remainder of Method 1 equal-area segment. (A _{drem}) (in ²)										35
c. Total flow in remainder of Method 1 equal-area segment. (Q _{drem}) (ft-in ² /sec)										2,779.77
5. Wall effects-adjusted velocity in the Method 1 near-wall equal-area segment.										
a. Total volumetric flow for Method 1 equal-area sector closest to wall. (Q ₁) (ft-in ² /sec)										15,406.54
b. 'Replacement velocity' for Port 2, Near Side (ft/sec).										69.59

¹ Data obtained from Sample Train: Mod. CTM-027
 Test Run: 10

USEPA Method 2H - Replacement Velocity Determination

Location: FCCU Regenerator Stack
Test Run: 4
Client: Marathon Petroleum Company
Project No: 12010

Diameter (in): 82.25
Radius (in): 41.13
Source Area (ft²): 36.8977

Total M-1 Points: 24
M-1 Points per Dia.: 12

Meter Operator: D. Luckhard 568
Probe Operator: P. Bihun 505
Test Date: 4/27/12
Port: 1
Duct Side: Far

Pitot C_p: 0.827
Static P: 0.5
Bar. Press. (in. Hg): 29.50
Moisture (%)¹: 9.8
O₂ (dry volume %)¹: 3.8
CO₂ (dry volume %)¹: 14.7

	(A)				(B)	(C)	(D)	(E)	(F)	(G)
Traverse Point	Distance from Wall (in.)	Pitot ΔP_s (in. H ₂ O)	Stack T _s (°F)	$\sqrt{\Delta P_s}$ (calculated) ($\sqrt{\text{in. H}_2\text{O}}$)	Velocity (calculated) (ft/sec)	Decay Velocity (ft/sec)	Intermediate Calculations (in ²)		Area of Sub-sector (in ²)	Volumetric Flow (ft-in ² /sec)
1-01	1.0	0.73	555	0.85	65.4	32.7	1,328.32	1,264.50	63.81	2,088
1-02	2.0	0.59	548	0.77	58.6	62.0	1,264.50	1,202.26	62.24	3,861
1-03	3.0	0.64	548	0.80	61.1	59.8	1,202.26	1,141.59	60.67	3,631
d _{rem}	3.0	0.64	548	0.80	61.1					
3. Total volumetric flow for all sub-sectors located between stack wall and d _{last} .										9,579.47
4. Volumetric flow for remainder of the Method 1 equal area sector.										
a. Velocity measurement at distance d _{rem} .										61.06
b. Total area in remainder of Method 1 equal-area segment. (A _{drem}) (in ²)										35
c. Total flow in remainder of Method 1 equal-area segment. (Q _{drem}) (ft-in ² /sec)										2,116.13
5. Wall effects-adjusted velocity in the Method 1 near-wall equal-area segment.										
a. Total volumetric flow for Method 1 equal-area sector closest to wall. (Q ₁) (ft-in ₂ /sec)										11,695.60
b. 'Replacement velocity' for Port 1, Far Side (ft/sec).										52.83

¹ Data obtained from Sample Train: Mod. CTM-027
Test Run: 10

USEPA Method 2H - Replacement Velocity Determination

Location: FCCU Regenerator Stack

Test Run: 4

Client: Marathon Petroleum Company

Project No: 12010

Diameter (in): 82.25

Radius (in): 41.13

Source Area (ft²): 36.8977

Total M-1 Points: 24

M-1 Points per Dia.: 12

Pitot C_p: 0.83

Static P: 0.5

Bar. Press. (in. Hg): 29.50

Moisture (%)¹: 9.8

O₂ (dry volume %) ¹: 3.8

CO₂ (dry volume %) ¹: 14.7

Meter Operator:	D. Luckhard	568
Probe Operator:	P. Bihun	505

Test Date: 4/27/12

Port: 1

Duct Side: Near

	(A)				(B)	(C)	(D)	(E)	(F)	(G)
Traverse Point	Distance from Wall (in.)	Pitot ΔP _s (in. H ₂ O)	Stack T _s (°F)	√ΔP _s (calculated) (√in. H ₂ O)	Velocity (calculated) (ft/sec)	Decay Velocity (ft/sec)	Intermediate Calculations (in ²)		Area of Sub-sector (in ²)	Volumetric Flow (ft-in ² /sec)
1-06	1.0	0.57	550	0.75	57.7	28.8	1,328.32	1,264.50	63.81	1,840
1-05	2.0	0.60	547	0.77	59.1	58.4	1,264.50	1,202.26	62.24	3,634
1-04	3.0	0.63	547	0.79	60.5	59.8	1,202.26	1,141.59	60.67	3,629
d _{rem}	3.0	0.63	547	0.79	60.5					
3. Total volumetric flow for all sub-sectors located between stack wall and d _{last} .										9,103.74
4. Volumetric flow for remainder of the Method 1 equal area sector.										
a. Velocity measurement at distance d _{rem} .										60.55
b. Total area in remainder of Method 1 equal-area segment. (A _{drem}) (in ²)										35
c. Total flow in remainder of Method 1 equal-area segment. (Q _{drem}) (ft-in ² /sec)										2,098.49
5. Wall effects-adjusted velocity in the Method 1 near-wall equal-area segment.										
a. Total volumetric flow for Method 1 equal-area sector closest to wall. (Q ₁) (ft-in ² /sec)										11,202.23
b. 'Replacement velocity' for Port 1, Near Side (ft/sec).										50.60

¹ Data obtained from Sample Train: Mod. CTM-027
Test Run: 10

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LABORATORY DATA

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The following pages from the laboratory reports are reserved to reduce the total size of this document:

- Clean Air Analytical Services – “Laboratory Analysis for Anions” (Sulfate Report): Pages 49-162 (Raw chromatograms for calibrations and samples)
- Clean Air Analytical Services – “Laboratory Analysis for Cations” (Ammonium Report): Pages 52-300 (Raw chromatograms for calibrations and samples)
- Enthalpy Analytical, Inc. – “Analytical Report (0312-97)” (Cyanide Report): Pages 17-84 (Raw chromatograms for calibrations and samples)

The full laboratory reports are archived in digital format and available upon request.

I hereby certify that all pages contained within this Appendix have been reviewed and, to the best of my ability, verified as accurate.

QA/QC Initials: KRO

Date: 6/12/2012



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USEPA Method 5F/202 (NSFPM/CPM) Gravimetric Laboratory Data Summary for NSFPM

Run No.	Blank	1	2	3
Date (2012) ☐ Draft Lab Data		Apr 24	Apr 24	Apr 24
Start Time (approx.)		10:33	12:48	14:33
Stop Time (approx.)		11:43	13:53	15:55

Detection Limits

MDL _d	Minimum detection limit for front half digestion (g)	0.00043
MDL _{IC}	Minimum detection limit for IC sulfate analysis (mg/L)	0.10600

Filter and Front Half Rinse Digestion

Water

ρ	Density (g/mL)	1.000			
v _s	Sample volume (mL)		500	500	500
v _a	Aliquot volume (mL)	490	490	490	490
r _a	Aliquot residue mass (g)	0.00093	0.02762	0.02577	0.02792
r	Dried sample residue mass (g)		0.02818	0.02630	0.02849

Ion Chromatography Analysis

v _b	Aliquot volume used in IC analysis (mL)	10.0	10.0	10.0
C _{SO4}	Sulfate concentration (mg/L)	1.36	1.27	1.31
m _{SO4}	Sulfate mass (g)	0.00068	0.00064	0.00066
m _s	Sulfate mass as ammonium sulfate (g)	0.00094	0.00087	0.00090
r - m _s	Dried sample residue mass, less sulfate mass (g)	0.02725	0.02542	0.02759
m _b	Maximum allowable blank correction (g)	0.00095	0.00095	0.00095
m _r	Net Residue (g)	0.02630	0.02447	0.02664
m _D	Total Gravimetric Detection Limit (g)	0.00043	0.00043	0.00043
m _n	Total Non-Sulfate FPM (g)	0.02630	0.02447	0.02664
n _{MDL}	Number of Non-Detectable Fractions	N/A	N/A	N/A
DLC	Detection Level Classification	ADL	ADL	ADL

Comments:

For analytical results below detection limits:

Run samples are treated as the entire value of the MDL in calculations.

Reagent blank samples are treated as zero in calculations.

Detection level classifications are defined as follows:

ADL = Above Detection Level - all fractions are above detection limit

**USEPA Method 5F/202 (NSFPM/CPM)
Gravimetric Laboratory Data Summary for CPM**

☐ Draft Lab Data

Run No.	Field Blank	1	2	3
Date (2012)		Apr 24	Apr 24	Apr 24
Start Time (approx.)		10:33	12:48	14:33
Stop Time (approx.)		11:43	13:53	15:55

Analytical Detection Limits

MDL _i	Minimum detection limit for inorganic fraction (g)	0.00026
MDL _o	Minimum detection limit for organic fraction (g)	0.00030

Inorganic Fraction

Water

Gravimetric Extraction Data

ρ_i	Density (g/ml)	1.000			
V_{si}	Sample volume (mL)		531	539	511
V_{ai}	Aliquot volume (mL)	511	531	539	511
r_{ai}	Aliquot residue mass (g)	0.00132	0.05089	0.04932	0.05222
r_i	Inorganic sample residue mass (g)		0.05089	0.04932	0.05222

Ammonium Titration Analysis

pH	Reconstituted sample starting pH	7.21	4.92	4.77	4.77
N	Normality of titrant (meq/ml)		0.0541	0.0541	0.0541
V_t	Volume of titrant added (mL)		0.15	0.15	0.15
m_c	Mass of NH ₃ added to form ammonium sulfate (g)	0.00000	0.00014	0.00014	0.00014
$r_i - m_c$	Inorganic sample residue mass, less NH ₃ mass (g)	0.00132	0.05075	0.04918	0.05208

Organic Fraction

Acetone/Hexane

Gravimetric Extraction Data

ρ_o	Density (g/ml)	0.701			
V_{so}	Sample volume (mL)		498	470	463
V_{ao}	Aliquot volume (mL)	493	498	470	463
r_{ao}	Aliquot residue mass (g)	0.00096	0.00129	0.00123	0.00134
r_o	Organic sample residue mass (g)		0.00129	0.00123	0.00134

m_{bi}	Maximum Allowable Inorganic Blank Correction (g)		0.00116	0.00116	0.00116
m_{ri}	Net Inorganic Residue (g)		0.04959	0.04802	0.05092
m_{CPMi}	Total Inorganic CPM (g)		0.04959	0.04802	0.05092
m_{bo}	Maximum Allowable Organic Blank Correction (g)		0.00084	0.00084	0.00084
m_{ro}	Net Organic Residue (g)		0.00045	0.00039	0.00050
m_{CPMo}	Total Organic CPM (g)		0.00045	0.00039	0.00050
m_T	Total Gravimetric Result (g)		0.05004	0.04841	0.05142
MDL _C	Minimum Detection Limit for Combined Fractions (g)		0.00056	0.00056	0.00056
m_{CPM}	Total CPM (g)		0.05004	0.04841	0.05142
n_{MDL}	Number of Non-Detectable Fractions		N/A	N/A	N/A
DLC	Detection Level Classification		ADL	ADL	ADL

Comments:

For analytical results below detection limits:

Run samples are treated as the entire value of the MDL in calculations.

Reagent blank samples are treated as zero in calculations.

Detection level classifications are defined as follows:

ADL = Above Detection Level - all fractions are above detection limit

USEPA Method 5F/202 (NSFPM/CPM) Gravimetric Laboratory Data Summary for NSFPM

Run No.	Blank	4	5	6
Date (2012) ☐ Draft Lab Data		Apr 25	Apr 25	Apr 25
Start Time (approx.)		09:08	12:07	14:06
Stop Time (approx.)		10:12	13:14	15:23

Detection Limits

MDL _d	Minimum detection limit for front half digestion (g)	0.00043
MDL _{IC}	Minimum detection limit for IC sulfate analysis (mg/L)	0.10600

Filter and Front Half Rinse Digestion

Water

ρ	Density (g/mL)	1.000			
v _s	Sample volume (mL)		500	500	500
v _a	Aliquot volume (mL)	490	490	490	490
r _a	Aliquot residue mass (g)	0.00093	0.01427	0.01470	0.01713
r	Dried sample residue mass (g)		0.01456	0.01500	0.01748

Ion Chromatography Analysis

v _b	Aliquot volume used in IC analysis (mL)	10.0	10.0	10.0
C _{SO4}	Sulfate concentration (mg/L)	0.99	1.05	1.12
m _{SO4}	Sulfate mass (g)	0.00050	0.00053	0.00056
m _s	Sulfate mass as ammonium sulfate (g)	0.00068	0.00072	0.00077
r - m _s	Dried sample residue mass, less sulfate mass (g)	0.01388	0.01428	0.01671
m _b	Maximum allowable blank correction (g)	0.00095	0.00095	0.00095
m _r	Net Residue (g)	0.01293	0.01333	0.01576
m _D	Total Gravimetric Detection Limit (g)	0.00043	0.00043	0.00043
m _n	Total Non-Sulfate FPM (g)	0.01293	0.01333	0.01576
n _{MDL}	Number of Non-Detectable Fractions	N/A	N/A	N/A
DLC	Detection Level Classification	ADL	ADL	ADL

Comments:

For analytical results below detection limits:

Run samples are treated as the entire value of the MDL in calculations.

Reagent blank samples are treated as zero in calculations.

Detection level classifications are defined as follows:

ADL = Above Detection Level - all fractions are above detection limit

**USEPA Method 5F/202 (NSFPM/CPM)
Gravimetric Laboratory Data Summary for CPM**

☐ Draft Lab Data

Run No.	Field Blank	4	5	6
Date (2012)		Apr 25	Apr 25	Apr 25
Start Time (approx.)		09:08	12:07	14:06
Stop Time (approx.)		10:12	13:14	15:23

Analytical Detection Limits

MDL _i	Minimum detection limit for inorganic fraction (g)	0.00026
MDL _o	Minimum detection limit for organic fraction (g)	0.00030

Inorganic Fraction

Water

Gravimetric Extraction Data

ρ _i	Density (g/ml)	1.000			
V _{si}	Sample volume (mL)		487	511	508
V _{ai}	Aliquot volume (mL)	511	487	511	508
r _{ai}	Aliquot residue mass (g)	0.00132	0.04309	0.04512	0.04484
r _i	Inorganic sample residue mass (g)		0.04309	0.04512	0.04484

Ammonium Titration Analysis

pH	Reconstituted sample starting pH	7.21	4.16	3.57	4.08
N	Normality of titrant (meq/ml)		0.0541	0.0541	0.0541
V _t	Volume of titrant added (mL)		0.20	0.40	0.25
m _c	Mass of NH ₃ added to form ammonium sulfate (g)	0.00000	0.00018	0.00037	0.00023
r _i - m _c	Inorganic sample residue mass, less NH ₃ mass (g)	0.00132	0.04291	0.04475	0.04461

Organic Fraction

Acetone/Hexane

Gravimetric Extraction Data

ρ _o	Density (g/ml)	0.701			
V _{so}	Sample volume (mL)		479	448	418
V _{ao}	Aliquot volume (mL)	493	479	448	418
r _{ao}	Aliquot residue mass (g)	0.00096	0.00110	0.00130	0.00121
r _o	Organic sample residue mass (g)		0.00110	0.00130	0.00121

m _{bi}	Maximum Allowable Inorganic Blank Correction (g)		0.00116	0.00116	0.00116
m _{ri}	Net Inorganic Residue (g)		0.04175	0.04359	0.04345
m _{CPMi}	Total Inorganic CPM (g)		0.04175	0.04359	0.04345
m _{bo}	Maximum Allowable Organic Blank Correction (g)		0.00084	0.00084	0.00081
m _{ro}	Net Organic Residue (g)		0.00026	0.00046	0.00040
m _{CPMo}	Total Organic CPM (g)		0.00030	0.00046	0.00040
m _T	Total Gravimetric Result (g)		0.04205	0.04405	0.04385
MDL _C	Minimum Detection Limit for Combined Fractions (g)		0.00056	0.00056	0.00056
m _{CPM}	Total CPM (g)		0.04205	0.04405	0.04385
n _{MDL}	Number of Non-Detectable Fractions		N/A	N/A	N/A
DLC	Detection Level Classification		ADL	ADL	ADL

Comments:

For analytical results below detection limits:

Run samples are treated as the entire value of the MDL in calculations.

Reagent blank samples are treated as zero in calculations.

Detection level classifications are defined as follows:

ADL = Above Detection Level - all fractions are above detection limit

USEPA Method 5F/202 (NSFPM/CPM) Gravimetric Laboratory Data Summary for NSFPM

Run No.	Blank	7	8	9
Date (2012) ☐ Draft Lab Data		Apr 26	Apr 26	Apr 26
Start Time (approx.)		08:24	10:10	11:58
Stop Time (approx.)		09:31	11:17	13:17

Detection Limits

MDL _d	Minimum detection limit for front half digestion (g)	0.00043
MDL _{IC}	Minimum detection limit for IC sulfate analysis (mg/L)	0.10600

Filter and Front Half Rinse Digestion

Water

ρ	Density (g/mL)	1.000			
v _s	Sample volume (mL)		500	500	500
v _a	Aliquot volume (mL)	490	490	490	490
r _a	Aliquot residue mass (g)	0.00093	0.01800	0.01855	0.01506
r	Dried sample residue mass (g)		0.01837	0.01893	0.01537

Ion Chromatography Analysis

v _b	Aliquot volume used in IC analysis (mL)	10.0	10.0	10.0
C _{SO4}	Sulfate concentration (mg/L)	1.26	1.44	1.13
m _{SO4}	Sulfate mass (g)	0.00063	0.00072	0.00057
m _s	Sulfate mass as ammonium sulfate (g)	0.00087	0.00099	0.00078
r - m _s	Dried sample residue mass, less sulfate mass (g)	0.01750	0.01794	0.01459
m _b	Maximum allowable blank correction (g)	0.00095	0.00095	0.00095
m _r	Net Residue (g)	0.01655	0.01699	0.01364
m _D	Total Gravimetric Detection Limit (g)	0.00043	0.00043	0.00043
m _n	Total Non-Sulfate FPM (g)	0.01655	0.01699	0.01364
n _{MDL}	Number of Non-Detectable Fractions	N/A	N/A	N/A
DLC	Detection Level Classification	ADL	ADL	ADL

Comments:

For analytical results below detection limits:

Run samples are treated as the entire value of the MDL in calculations.

Reagent blank samples are treated as zero in calculations.

Detection level classifications are defined as follows:

ADL = Above Detection Level - all fractions are above detection limit

**USEPA Method 5F/202 (NSFPM/CPM)
Gravimetric Laboratory Data Summary for CPM**

☐ Draft Lab Data

Run No.	Field Blank	7	8	9
Date (2012)		Apr 26	Apr 26	Apr 26
Start Time (approx.)		08:24	10:10	11:58
Stop Time (approx.)		09:31	11:17	13:17

Analytical Detection Limits

MDL _i	Minimum detection limit for inorganic fraction (g)	0.00026
MDL _o	Minimum detection limit for organic fraction (g)	0.00030

Inorganic Fraction

Water

Gravimetric Extraction Data

ρ_i	Density (g/ml)	1.000			
V_{si}	Sample volume (mL)		506	501	504
V_{ai}	Aliquot volume (mL)	511	506	501	504
r_{ai}	Aliquot residue mass (g)	0.00132	0.04234	0.04728	0.04692
r_i	Inorganic sample residue mass (g)		0.04234	0.04728	0.04692

Ammonium Titration Analysis

pH	Reconstituted sample starting pH	7.21	3.79	3.30	3.55
N	Normality of titrant (meq/ml)		0.0541	0.0541	0.0541
V_t	Volume of titrant added (mL)		0.30	0.65	0.40
m_c	Mass of NH ₃ added to form ammonium sulfate (g)	0.00000	0.00028	0.00060	0.00037
$r_i - m_c$	Inorganic sample residue mass, less NH ₃ mass (g)	0.00132	0.04206	0.04668	0.04655

Organic Fraction

Acetone/Hexane

Gravimetric Extraction Data

ρ_o	Density (g/ml)	0.701			
V_{so}	Sample volume (mL)		423	400	420
V_{ao}	Aliquot volume (mL)	493	423	400	420
r_{ao}	Aliquot residue mass (g)	0.00096	0.00169	0.00111	0.00135
r_o	Organic sample residue mass (g)		0.00169	0.00111	0.00135

m_{bi}	Maximum Allowable Inorganic Blank Correction (g)		0.00116	0.00116	0.00116
m_{ri}	Net Inorganic Residue (g)		0.04091	0.04552	0.04539
m_{CPMi}	Total Inorganic CPM (g)		0.04091	0.04552	0.04539
m_{bo}	Maximum Allowable Organic Blank Correction (g)		0.00082	0.00078	0.00082
m_{ro}	Net Organic Residue (g)		0.00087	0.00033	0.00053
m_{CPMo}	Total Organic CPM (g)		0.00087	0.00033	0.00053
m_T	Total Gravimetric Result (g)		0.04177	0.04585	0.04593
MDL _C	Minimum Detection Limit for Combined Fractions (g)		0.00056	0.00056	0.00056
m_{CPM}	Total CPM (g)		0.04177	0.04585	0.04593
n_{MDL}	Number of Non-Detectable Fractions		N/A	N/A	N/A
DLC	Detection Level Classification		ADL	ADL	ADL

Comments:

For analytical results below detection limits:

Run samples are treated as the entire value of the MDL in calculations.

Reagent blank samples are treated as zero in calculations.

Detection level classifications are defined as follows:

ADL = Above Detection Level - all fractions are above detection limit

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LABORATORY ANALYSIS OF PARTICULATE MATTER
Laboratory Services Report No: 64-28842_GRAV_V0

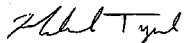
Performed for:
PALATINE SOURCE GROUP
500 W Wood St
Palatine IL, 60067

Pertaining to a Field Sampling Project Performed for :
MARATHON PETROLEUM COMPANY

Customer Reference No: 12010
Laboratory Services Project No: 28842
Revision 0: 5/10/2012

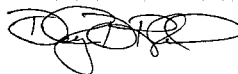
To the best of our knowledge, the laboratory results presented in this report are accurate, complete, error free, legible and representative of the samples per the analysis described here-in.

Submitted by,


Digitally signed
by Michael Tuegel
Date: 2012.05.10
14:00:41 -05'00'

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Reviewed by,


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by Douglas D.
Rhoades
Date: 2012.05.10
10:45:36 -05'00'

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CleanAirPALATINE SOURCE GROUP
MARATHON PETROLEUM COMPANYCustomer Reference No: 12010
Laboratory Services Project No: 28842**REVISION HISTORY****LABORATORY ANALYSIS OF PARTICULATE MATTER**
Laboratory Services Report No: 64-28842_GRAV_V0**FINAL REPORT REVISION HISTORY**

Revision:	Date	Pages	Comments
0	5/10/2012	All	Final version of original document.

Revision 0

PALATINE SOURCE GROUP
MARATHON PETROLEUM COMPANY

Customer Reference No: 12010
Laboratory Services Project No: 28842

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CERTIFICATE OF ANALYSIS

1-1

Revision 0

Certificate of Analysis

Method (3) U.S. EPA Method 5F		SampleType (5) Combined F1/2 Catch				
Location	SampleID	MediaID	Run	Volume (mL)	Net (g)	MDL (g)
All	28842-011	9779	FRB	490	0.00093	0.00043
FCCU Regenerator Stack	28842-012	9781	1	490	0.02762	0.00043
FCCU Regenerator Stack	28842-013	9799	2	490	0.02577	0.00043
FCCU Regenerator Stack	28842-014	9816	3	490	0.02792	0.00043
FCCU Regenerator Stack	28842-015	9797	4	490	0.01427	0.00043
FCCU Regenerator Stack	28842-016	9787	5	490	0.01470	0.00043
FCCU Regenerator Stack	28842-017	9778	6	490	0.01713	0.00043
FCCU Regenerator Stack	28842-018	9782	7	490	0.01800	0.00043
FCCU Regenerator Stack	28842-019	9795	8	490	0.01855	0.00043
FCCU Regenerator Stack	28842-020	9786	9	490	0.01506	0.00043

Method (7) U.S. EPA Method 202		SampleType (6) B1/2 Acetone Rinse				
Location	SampleID	MediaID	Run	Volume (mL)	Net (g)	MDL (g)
All	28842-021	9800	FRB	224	<	0.00030

Certificate of Analysis

Method	(7) U.S. EPA Method 202	SampleType	(7) B1/2 Inorganic Rinse			
Location	SampleID	MediaID	Run	Volume (mL)	Net (g)	MDL (g)
All	28842-022	9801	FRB	317	0.00080	0.00026
FCCU Regenerator Stack	28842-023	9812	1	531	0.05089	0.00026
FCCU Regenerator Stack	28842-024	9912	2	539	0.04932	0.00026
FCCU Regenerator Stack	28842-025	9826	3	511	0.05222	0.00026
FCCU Regenerator Stack	28842-026	9815	4	487	0.04309	0.00026
FCCU Regenerator Stack	28842-027	9804	5	511	0.04512	0.00026
FCCU Regenerator Stack	28842-028	9819	6	508	0.04484	0.00026
FCCU Regenerator Stack	28842-029	9788	7	506	0.04234	0.00026
FCCU Regenerator Stack	28842-030	9808	8	501	0.04728	0.00026
FCCU Regenerator Stack	28842-031	9811	9	504	0.04692	0.00026
FCCU Regenerator Stack	28842-032	9789	FTRB	511	0.00132	0.00026

Certificate of Analysis

Method	(7) U.S. EPA Method 202	SampleType	(8) B1/2 Organic Rinse			
<i>Location</i>	<i>SampleID</i>	<i>MediaID</i>	<i>Run</i>	<i>Volume (mL)</i>	<i>Net (g)</i>	<i>MDL (g)</i>
All	28842-033	9817	FRB	213	0.00065	0.00030
All	28842-043	9790	FTRB	493	0.00096	0.00030
FCCU Regenerator Stack	28842-034	9846	1	498	0.00129	0.00030
FCCU Regenerator Stack	28842-035	9850	2	470	0.00123	0.00030
FCCU Regenerator Stack	28842-036	9841	3	463	0.00134	0.00030
FCCU Regenerator Stack	28842-037	9820	4	479	0.00110	0.00030
FCCU Regenerator Stack	28842-038	9824	5	448	0.00130	0.00030
FCCU Regenerator Stack	28842-039	9784	6	418	0.00121	0.00030
FCCU Regenerator Stack	28842-040	9845	7	423	0.00169	0.00030
FCCU Regenerator Stack	28842-041	9783	8	400	0.00111	0.00030
FCCU Regenerator Stack	28842-042	9780	9	420	0.00135	0.00030

End of Section 1 - Certificate of Analysis

PALATINE SOURCE GROUP
MARATHON PETROLEUM COMPANY

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Laboratory Services Project No: 28842

ANALYTICAL CASE NARRATIVE

2-1

INTRODUCTION

Palatine Source Group contracted Clean Air Laboratory Services to determine the following:

- Condensable Particulate matter
- Non-Sulfate Particulate matter

All analyses were performed on samples received by the laboratory at their facility in Palatine, IL. All analyses were performed in accordance with the applicable EPA Method requirements along with all NELAP quality requirements as outlined and described in Section 3 of this report.

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Key Project Participants

Samples were received at Clean Air Engineering Laboratory Services facility on 4/30/2012. Custody transfer occurred between the following personnel:

**Table 2-2:
Pertinent Personnel**

Technician	Affiliation	Function
R Vicere	Palatine Source Group	COC Generation
K Sullivan	Palatine Source Group	COC Relinquished
E Ewing	Laboratory Services	Sample Receipt
M Tuegel	Laboratory Services	Sample Analysis

Accreditation

Clean Air Laboratory Services is accredited through the following state agencies.

**Table 2-3:
Specific Accreditations and Expiration Dates**

State	Certificate Number	Expiration Date
Texas	T104704431-11-2	6/30/2012
New Jersey	IL004	6/30/2012
Louisiana	169249	6/30/2012

Please visit the respective state websites to view our current accreditation status and a comprehensive list of our accredited services.

PALATINE SOURCE GROUP
MARATHON PETROLEUM COMPANY

Customer Reference No: 12010
Laboratory Services Project No: 28842

ANALYTICAL CASE NARRATIVE

2-2

DISCUSSION OF ANALYTICAL RESULTS

Table 2-4 shown below, presents the average amounts of particulate matter found for each sample fraction. Also shown are the standard deviations (SD) and percent relative standard deviations (RSD). These data are not corrected for plant conditions or sampling volumes.

Table 2-4:
Statistical Description of the Filterable Particulate Matter Catches.

Method	Location	Matrix	Average Net Weight (mg)	SD of Net Weights (mg)	RSD of Net Weights (%)
US EPA Method 5F					
	FCCU Regen Stack	Total FPM	19.89	5.63	28%
US EPA Method 202					
	FCCU Regen Stack	B1/2 Inorganic Rinse	46.89	3.41	7%
		B1/2 Organic Rinse	1.29	0.17	14%
		Total CPM	48.18	3.38	7%

A representative selection of sample photographs is shown in Figure 2-1 through Figure 2-2 on the next few pages. These photographs illustrate the condition of the samples and the residue contained therein. A photographic record of all samples is contained in the Appendix.

ANALYTICAL CASE NARRATIVE

2-3

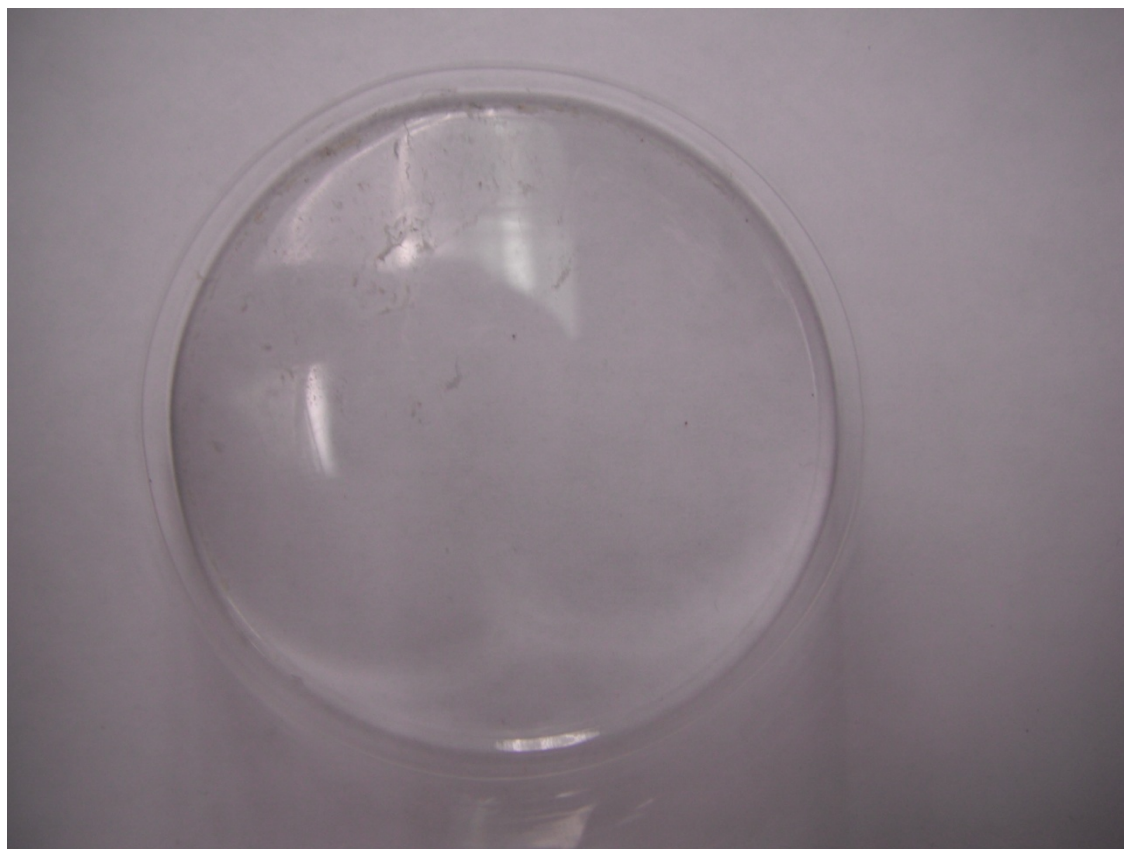
**Figure 2-1: Photograph Illustrating the Residue Found in
Laboratory Sample No: 28842-025.**



ANALYTICAL CASE NARRATIVE

2-4

**Figure 2-2: Photograph Illustrating the Residue Found in
Laboratory Sample No: 28842-040.**



End of Section 2 – Analytical Case Narrative

CleanAir

PALATINE SOURCE GROUP
MARATHON PETROLEUM COMPANY

Customer Reference No: 12010
Laboratory Services Project No: 28842

METHODOLOGY**3-1**

Clean Air Engineering followed procedures as detailed in USEPA Methods 5F and 202. Table 3-2, below summarizes the methods and their respective sources.

Table 3-2:
List of Analytical Methodology

<u>Title 40 CFR Part 60 Appendix A</u>	
Method 5F	"Determination of Nonsulfate Particulate Matter Emissions from Stationary Sources"
<u>Title 40 CFR Part 51 Appendix M</u>	
Method 202	"Dry Impinger Method for Determining Condensable Particulate Emissions from Stationary Sources"

These methods appear in detail in Title 40 of the Code of Federal Regulations (CFR) and are located on the internet at <http://ecfr.gpoaccess.gov>.

CleanAir followed specific quality assurance and quality control (QA/QC) procedures as outlined in the individual methods and as prescribed in CleanAir's internal Quality Manual. Results of recorded QA/QC activities performed by CleanAir are summarized in Appendix III.

PALATINE SOURCE GROUP
MARATHON PETROLEUM COMPANY

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Laboratory Services Project No: 28842

METHODOLOGY

3-2

Sample Preparation

EPA Method 5F

Inorganic Rinse

- 1 Filters were sliced into small pieces and quantitatively transferred and digested in approximately 75 mL of deionized water for 6 to 8 hours.
- 2 The solution and filter was quantitatively transferred to a 500 mL class A volumetric flask and combined with the probe rinse. The solution was then brought to volume.
- 3 A 10 mL aliquot was removed for Ion Chromatography analysis for sulfate
 - a. The flask was allowed to settle overnight to minimize the transfer of entrained particles.
- 4 Quantitatively transferred into a clean, individually numbered and tared Teflon® beaker liner.
- 5 Evaporated in an oven at 105C until 100 mL of sample is left, remove and allow to cool
- 6 Added five drops of phenolphthalein indicator, then added concentrated ammonium hydroxide until the solution turns pink.
- 7 Evaporated in an oven at 105C until dryness
- 8 Placed in a desiccator for a minimum of twenty-four hours prior to analysis.

Accreditation Through (As of reported date)

- 1 Texas (TCEQ)
- 2 New Jersey (NJDEP)
- 3 Louisiana (LELAP)

EPA Method 202

Zeflour® Membrane Filter

- 9 Carefully folded and placed into a 40 mL (VOA) vial
- 10 Added sufficient DI water to the vial to cover the filter
- 11 The VOA vial was loaded into a proprietary flotation device and placed into a ultrasonic bath for a minimum of 2 minutes
- 12 This was repeated twice more for a total of three extractions, these extractions are combined with the back half inorganic rinse
- 13 Added sufficient Hexane to the vial to cover the filter
- 14 The VOA vial was loaded into a proprietary flotation device and placed into an ultrasonic bath for a minimum of 2 minutes
- 15 This was repeated twice more for a total of three extractions, these extractions are combined with the back half organic rinse

Inorganic Rinse

1. Sample pH was measured
2. Sample was combined with 3 additional DI water rinses used to extract Ambient Zeflour® Membrane Filter

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METHODOLOGY**3-3**

3. The sample was extracted three times in a separatory funnel with Hexane
 - a. The solution was well mixed prior to the removal of the added Hexane
 - b. Care was taken to ensure that no water exits the funnel upon draining the Hexane
4. Quantitatively transferred into a clean, individually numbered and tared Teflon® beaker liner
5. Evaporated in an oven at 105C until just prior to dryness and evaporated fully at ambient temperature
6. The sample was redissolved with 100 mL of deionized water, then titrated with ammonium hydroxide until a pH of 7
7. Evaporated in an oven at 105C until just prior to dryness and evaporated fully at ambient temperature
8. Placed in a desiccator for a minimum of twenty-four hours prior to analysis.

Organic Rinse

1. Samples combined with 3 additional Hexane rinses used to extract Inorganic Rinse
2. Sample combined with 3 additional Hexane rinses used to extract Zeflour® Membrane Filter
3. Quantitatively transferred into a clean, individually numbered and tared Teflon® beaker liner
4. Evaporated under a hood at ambient conditions
5. Placed in a desiccator for a minimum of twenty-four hours prior to analysis

Accreditation Through (As of reported date)

- 4 Texas (TCEQ)
- 5 New Jersey (NJDEP)
- 6 Louisiana (LELAP)

METHODOLOGY**3-4****Analytical Procedures Common To All Methods****Sample Volumes**

- All sample volumes were determined gravimetrically at laboratory temperature.
- The Certificate of Analysis page shows the total volume evaporated by the laboratory, including rinses with laboratory reagents.
- The Certificate of Analysis page shows volumes calculated from those values.
 - Calculations assumed standard temperature (20°C) and pressure (1 atm).
 - The exact laboratory temperature over the course of this analysis is provided in the appendix of this report.
- Liquid density values used referenced from page 15-25 of the CRC Handbook, 91st Edition:
 - Water: 0.9982 g/mL
 - Acetone: 0.7902 g/mL
 - Methylene Chloride: 1.326 g/mL
 - Hexane: 0.6594 g/mL
- All volumes reported are not corrected if any aliquot was taken for further separate analysis (i.e. Ion Chromatography)

Sample Analysis

- Each sample is removed from the desiccator and placed on the balance pan after 24 hours of desiccation.
- Sample weights were computer recorded using the laboratory's proprietary data acquisition system.
- Samples were placed back into the desiccator for a minimum of six hours before the next weight was measured.
- This continued until a constant weight was attained.
 - Constant weight: A difference of no more than 0.5 mg or one percent of total weight less tare weight whichever is greater, between two consecutive weights, with no less than six hours of desiccation time between weights.
- The final weight acquired meeting the above criteria is used for the final weight, all weights reported are net weights.
 - Net weights reported for liquid samples represent the residue left after total evaporation.
 - Net weights reported for filter samples represent the particulate caught in and on the filter.
- Any net weight reported is not corrected if any aliquot was taken for further separate analysis (i.e. Ion Chromatography).

CleanAir

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METHODOLOGY**3-5**

- Reported net weights for Inorganic rinses are not corrected for the amount of ammonium hydroxide added during the acidic component neutralization step. The corrected values are shown on the "Corrected Values" page within this report.

Quality Control Procedures

Clean Air adheres to QA/QC procedures that both meet and exceed EPA requirements.

- Each analytical balance was calibrated and certified as accurate by an ISO 17025 calibration service on annual basis. A copy of this calibration data is available on request.
- Each balance is also calibrated prior to use on a daily basis using a minimum of three Class 1 weights. These daily calibrations must match the Class 1 weight values within ± 0.2 mg in order to proceed. Periodic calibrations are also performed throughout the day if the analyst believes they are required. A copy of pertinent daily balance calibration data is included as an appendix to this report.
- Each sample's respective tare and gross weights are acquired with a minimum desiccation time of six hours between consecutive weights.
- For a final weight to be considered, it must agree within 0.5 mg (or 1% of the net weight, whichever is greater) of the previously recorded weight for that sample.
- A minimum of three tare weights are acquired on Teflon® beaker liners to show a minimal effect of static. All three tare weights must be within 0.5mg of each other. All three weights are provided along with a calculated precision for each Teflon® beaker liner on the QC Criteria Sheet.
- For every set of ten samples per matrix, a matrix blank, and a matrix spike is created to ensure that no effect from either the laboratory environment or chemical has adversely effected the results of the measurement.
- All the lot numbers of any chemical used during this analysis was recorded. This information is available upon request.
- All solvents used are at a minimum ACS Certified reagent grade chemicals. All prepared chemicals were prepared from chemicals that were at a minimum ACS Certified reagent grade.
- A Teflon® FEP beaker liner was used for evaporation and measure of all liquid fractions. Throughout this report they will be referred to as Teflon® beaker liners. "Teflon" is a registered trademark of DuPont.

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METHODOLOGY

3-6

Project Archival

- A copy of this report and all associated supporting records will be archived and stored for at least 20 years.
- All samples are archived for a period of one year from the date of receipt in our facility.
- The archival facility is a controlled access storage facility that does not incorporate any environmental controls.
- Gravimetrics samples are archived in the following manner:
 - All filters are stored inside the originally provided Petri-dishes;
 - All other residues are stored within the Teflon® beaker liner in which they were evaporated to dryness.
 - These Teflon® beaker liners are sealed inside a polyethylene sample container (cup) prior to archival

Reporting Abbreviations

1	FRB: Field Reagent Blank
2	FTRB: Field Train Reagent Blank
3	TP: Train Proof
4	F1/2: Front Half
5	B1/2: Back Half

End of Section 3 – Methodology

CleanAir.

PALATINE SOURCE GROUP
MARATHON PETROLEUM COMPANY

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Laboratory Services Project No: 28842

APPENDIX

4-1

SAMPLE CALCULATIONS	I
RAW DATA	II
QUALITY ASSURANCE RECORDS	III
CHAIN-OF-CUSTODY DOCUMENTATION	IV
DETECTION LIMIT DETERMINATION DATA	V
EQUIPMENT CALIBRATION RECORDS	VI
SAMPLE VOLUME DATA	VII

PALATINE SOURCE GROUP
MARATHON PETROLEUM COMPANY

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SAMPLE CALCULATIONS

i

Sample Calculations

1. Determination of sample tare weight.

$$TW_s = TW_{Final}$$

Where:

TW_s = Tare weight of sample (g)

TW_{Final} = Final Tare weight of consecutive weights (g)

TW_s = 0.38848

TW_{Final} = 0.38848

2. Determination of difference between two consecutive weights (sample tare weight).

$$TW_{Difference} = 1000|TW_2 - TW_1|$$

Where:

$TW_{Difference}$ = Difference between two consecutive tare weights (mg)

$TW_{Trial\ 2}$ = Tare weight Trial 2 of consecutive weights (g)

$TW_{Trial\ 1}$ = Tare weight Trial 1 of consecutive weights (g)

1000 = Constant (mg/g)

$TW_{Difference}$ = 0.46

$TW_{Trial\ 2}$ = 0.38848

$TW_{Trial\ 1}$ = 0.38802

3. Determination of sample gross weight.

$$GW_s = GW_{Final}$$

Where:

GW_s = Gross weight of sample (g)

GW_{Final} = Final Gross weight of consecutive weights (g)

GW_s = 0.48065

GW_{Final} = 0.48065

Sample Calculations

4. Determination of difference between two consecutive weights (sample gross weight).

$$GW_{Difference} = 1000|GW_2 - GW_1|$$

Where:

$GW_{Difference}$ = Difference between two consecutive Gross weights (mg)

$GW_{Trial\ 2}$ = Gross weight Trial 2 of consecutive weights (g)

$GW_{Trial\ 1}$ = Gross weight Trial 1 of consecutive weights (g)

1000 = Constant (mg/g)

$GW_{Difference}$ = 4.17

$GW_{Trial\ 2}$ = 0.48065

$GW_{Trial\ 1}$ = 0.47648

5. Determination of sample net weight.

$$NW_S = GW_S - TW_S$$

Where:

NW_S = Net weight of sample (g)

GW_S = Gross weight of sample (g)

TW_S = Tare weight of sample (g)

NW_S = 0.09217

GW_S = 0.48065

TW_S = 0.38848

Sample Calculations

6. Determination of Method Determination Limits (MDL) for filters.

a. Determination of spike amount of residue added (total mg).

$$RA = \frac{(SA)(SSC)}{1000}$$

Where:

RA	=	Amount of spike residue added (g)
SSC	=	Spike solution concentration (mg/ml)
SA	=	Amount of spike solution added to filter (ml)
1000	=	Constant (mg/g)
RA	=	0.00101
SSC	=	2.01
SA	=	0.5

b. Determination of average spike results.

$$AvgM_{f,i} = \frac{\sum_{i=1}^n M_{f,i}}{n}$$

Where:

AvgM _{f,i}	=	Average of spike result net weights (mg)
M _{f,i}	=	Net weights recorded for each iteration (mg)
n	=	Number of iterations
i	=	Placeholder for iteration
AvgM _{f,i}	=	1.08
M _{f,i}	=	1.08
n	=	10

Sample Calculations

c. Determination of standard deviation of spike results.

$$\sigma_{f_i} = \sqrt{\frac{\sum_{i=1}^n (M_{f_i} - \text{Avg}M_{f_i})^2}{(n - 1)}}$$

Where:

σ_{f_i}	=	Standard deviation of spike results
$\text{Avg}M_{f_i}$	=	Average of spike result net weights (mg)
M_{f_i}	=	Net weights recorded for each iteration (mg)
n	=	Number of iterations
i	=	Placeholder for iteration
σ_{f_i}	=	0.08
$\text{Avg}M_{f_i}$	=	1.08
M_{f_i}	=	1.08
n	=	10

d. Determination of average spike recovery.

$$R_f = \frac{\text{Avg}M_{f_i}}{RA} 100$$

Where:

R_f	=	Average spike recovery (%)
$\text{Avg}M_{f_i}$	=	Average of spike result net weights (mg)
RA	=	Amount of spike residue added (mg)
100	=	Conversion constant (fraction to percent)
R_f	=	107.4%
$\text{Avg}M_{f_i}$	=	1.08
RA	=	1.01

Sample Calculations

e. Determination of $t_{(n-1, 0.99)}$.

n	$T_{(n-1,0.99)}$
7	3.143
8	2.998
9	2.896
10	2.821
11	2.764
16	2.602
21	2.528

Where:

$t_{(n-1,0.99)}$ = Students' t-value appropriate for a 99% confidence (n-1) degrees of freedom

n = Number of iterations

$t_{(n-1,0.99)}$ = 2.821

n = 10

f. Determination of Method Detection Limit (MDL).

$$MDL = \sigma_{f,i} t_{(n-1,0.99)}$$

Where:

MDL = Method detection limit (g)

$t_{(n-1,0.99)}$ = Students' t-value appropriate for a 99% confidence (n-1) degrees of freedom

$\sigma_{f,i}$ = Standard deviation of spike result.

MDL = 0.00023

$t_{(n-1,0.99)}$ = 2.821

$\sigma_{f,i}$ = 0.08083

Sample Calculations

7. Determination of volume (mL) from sample mass (g)

$$V_{mL} = \frac{M_{sample}}{D_{liquid}}$$

Where:

V_{mL} = Volume of sample (mL)

M_{sample} = Sample mass (g)

D_{liquid} = Density of Liquid (g/mL)

V_{mL} = 252

M_{sample} = 199.0

Liquid = Acetone

D_{liquid} = 0.7902

8. Determination of N_T for Acidic Component Neutralization

$$N_T = \frac{V_S N_S}{V_T}$$

Where:

N_T = Normality of titrant

V_S = Volume of standard used

N_S = Normality of standard used

V_T = Volume of titrant used

N_T = 0.0552

V_S = 20.0

N_S = 0.02

V_T = 7.25

Sample Calculations

9. Determination of Mass of ammonia correction

$$m_c = 17.03 \times V_t \times N$$

Where:

m_c = Mass of the NH_4^+ added to sample to form ammonium sulfate, mg.

17.03 = mg/milliequivalents for ammonium ion

V_t = Volume of NH_4OH titrant, ml.

N = Normality of ammonium hydroxide titrant.

m_c = 0.42

V_t = 0.45

N = 0.0552

10. Determination of Corrected Back half inorganic value

$$m_i = m_r - m_c$$

Where:

M_i = Mass of inorganic CPM, mg.

M_r = Mass of dried sample from inorganic fraction, mg.

M_c = Mass of the NH_4^+ added to sample to form ammonium sulfate, mg.

M_i = 5.47

M_r = 5.89

M_c = 0.42

CleanAir

PALATINE SOURCE GROUP
MARATHON PETROLEUM COMPANY

Customer Reference No: 12010
Laboratory Services Project No: 28842

RAW DATA

ii

Titrimetric Neutralization Data

Sample Type	Date	Time	Starting pH	Ending pH	Titrant Used (mL)	Nt	Technician
Calibration	5/3/2012	15:14	2.38	7.10	7.40	0.0541	mtuegel

Sample ID	Date	Time	Starting pH	Ending pH	Titrant Used (mL)	Correction (mg)	Technician
28842-022	5/3/2012	15:15	7.21		0.00		mtuegel
28842-023	5/3/2012	15:18	4.92	7.04	0.15	0.1381	mtuegel
28842-024	5/3/2012	15:20	4.77	7.08	0.15	0.1381	mtuegel
28842-025	5/3/2012	15:22	4.77	7.06	0.15	0.1381	mtuegel
28842-026	5/3/2012	15:23	4.16	7.04	0.20	0.1841	mtuegel
28842-027	5/3/2012	15:26	3.57	7.04	0.40	0.3682	mtuegel
28842-028	5/3/2012	15:28	4.08	7.04	0.25	0.2301	mtuegel
28842-029	5/3/2012	15:30	3.79	7.05	0.30	0.2762	mtuegel
28842-030	5/3/2012	15:32	3.30	7.10	0.65	0.5984	mtuegel
28842-031	5/3/2012	15:35	3.55	7.04	0.40	0.3682	mtuegel
28842-032	5/3/2012	15:36	7.79				mtuegel

Raw Gravimetric Data

Sample ID:	28842-011	Method:	(3) U.S. EPA Method 5F
Location:	All	Sample Type:	(5) Combined F1/2 Catch
Run No:	FRB	Recovery Date:	4/23/2012
Field Tech:	RV	Initial pH:	6.30

Media 1 ID:	9779	Media 2 ID :	44306

Media 2 Tared Weight Record

Media ID	Date	Time	Weight	Technician
44306	2/1/2012	4:15:37 PM	0.45114	
44306	2/2/2012	2:59:50 PM	0.45114	

Media 1 Tared Weight Record

Media ID	Date	Time	Weight (g)	Technician
9779	1/3/2012	9:38	3.81300	MT
9779	1/4/2012	15:12	3.81299	MT
9779	1/5/2012	9:36	3.81286	MT

Sample Weight Record

Media ID	Date	Time	Weight (g)	Technician
9779	5/7/2012	10:53	4.26500	mtuegel
9779	5/8/2012	9:09	4.26493	mtuegel



Sample ID:	28842-011	Method:	(3) U.S. EPA Method 5F
Location:	All	Sample Type:	(5) Combined F1/2 Catch
Run No:	FRB	Recovery Date:	4/23/2012
Field Tech:	RV	Initial pH:	6.30

Media 1 ID: 9781 **Media 2 ID :** 44308

Media 2 Tared Weight Record

<i>Media ID</i>	<i>Date</i>	<i>Time</i>	<i>Weight</i>	<i>Technician</i>
44308	2/1/2012	4:16:34 PM	0.45465	
44308	2/2/2012	2:58:20 PM	0.45465	

Media 1 Tared Weight Record

<i>Media ID</i>	<i>Date</i>	<i>Time</i>	<i>Weight (g)</i>	<i>Technician</i>
9781	1/3/2012	9:28	3.85790	MT
9781	1/4/2012	15:18	3.85790	MT
9781	1/5/2012	9:29	3.85800	MT

Sample Weight Record

<i>Media ID</i>	<i>Date</i>	<i>Time</i>	<i>Weight (g)</i>	<i>Technician</i>
9781	5/7/2012	10:47	4.34033	mtuegel
9781	5/8/2012	9:09	4.34027	mtuegel



Sample ID:	28842-013	Method:	(3) U.S. EPA Method 5F
Location:	FCCU Regenerator Stack	Sample Type:	(5) Combined F1/2 Catch
Run No:	2	Recovery Date:	4/24/2012
Field Tech:	RV	Initial pH:	5.30

Media 1 ID:	9799	Media 2 ID :	44309

Media 2 Tared Weight Record

<i>Media ID</i>	<i>Date</i>	<i>Time</i>	<i>Weight</i>	<i>Technician</i>
44309	2/1/2012	4:25:13 PM	0.45427	
44309	2/2/2012	2:53:08 PM	0.45430	

Media 1 Tared Weight Record

<i>Media ID</i>	<i>Date</i>	<i>Time</i>	<i>Weight (g)</i>	<i>Technician</i>
9799	1/3/2012	9:36	3.89533	MT
9799	1/4/2012	15:11	3.89524	MT
9799	1/5/2012	9:33	3.89535	MT

Sample Weight Record

<i>Media ID</i>	<i>Date</i>	<i>Time</i>	<i>Weight (g)</i>	<i>Technician</i>
9799	5/7/2012	10:47	4.37538	mtuegel
9799	5/8/2012	9:09	4.37542	mtuegel



Clean Air Engineering Lab Services ID: 28842-013 Acquired: 2012:05:08 15:14:36 Customer Reference 12010

Sample ID:	28842-014	Method:	(3) U.S. EPA Method 5F
Location:	FCCU Regenerator Stack	Sample Type:	(5) Combined F1/2 Catch
Run No:	3	Recovery Date:	4/24/2012
Field Tech:	RV	Initial pH:	5.28

Media 1 ID:	9816	Media 2 ID :	44307

Media 2 Tared Weight Record

<i>Media ID</i>	<i>Date</i>	<i>Time</i>	<i>Weight</i>	<i>Technician</i>
44307	2/1/2012	4:16:07 PM	0.45173	
44307	2/2/2012	2:59:23 PM	0.45171	

Media 1 Tared Weight Record

<i>Media ID</i>	<i>Date</i>	<i>Time</i>	<i>Weight (g)</i>	<i>Technician</i>
9816	1/3/2012	9:11	3.88531	MT
9816	1/4/2012	15:33	3.88531	MT
9816	1/5/2012	9:54	3.88546	MT

Sample Weight Record

<i>Media ID</i>	<i>Date</i>	<i>Time</i>	<i>Weight (g)</i>	<i>Technician</i>
9816	5/7/2012	10:47	4.36514	mtuegel
9816	5/8/2012	9:14	4.36509	mtuegel



Sample ID:	28842-015	Method:	(3) U.S. EPA Method 5F
Location:	FCCU Regenerator Stack	Sample Type:	(5) Combined F1/2 Catch
Run No:	4	Recovery Date:	4/25/2012
Field Tech:	RV	Initial pH:	5.40

Media 1 ID:	9797	Media 2 ID :	44305

Media 2 Tared Weight Record

<i>Media ID</i>	<i>Date</i>	<i>Time</i>	<i>Weight</i>	<i>Technician</i>
44305	2/1/2012	4:14:09 PM	0.45517	
44305	2/2/2012	3:09:48 PM	0.45520	

Media 1 Tared Weight Record

<i>Media ID</i>	<i>Date</i>	<i>Time</i>	<i>Weight (g)</i>	<i>Technician</i>
9797	1/3/2012	9:31	3.90079	MT
9797	1/4/2012	15:06	3.90078	MT
9797	1/5/2012	9:39	3.90084	MT

Sample Weight Record

<i>Media ID</i>	<i>Date</i>	<i>Time</i>	<i>Weight (g)</i>	<i>Technician</i>
9797	5/7/2012	10:42	4.37032	mtuegel
9797	5/8/2012	9:14	4.37031	mtuegel



Clean Air Engineering Lab Services ID: 28842-015 Acquired: 2012:05:08 15:14:53 Customer Reference 12010

Sample ID:	28842-016	Method:	(3) U.S. EPA Method 5F
Location:	FCCU Regenerator Stack	Sample Type:	(5) Combined F1/2 Catch
Run No:	5	Recovery Date:	4/25/2012
Field Tech:	RV	Initial pH:	5.60

Media 1 ID:	9787	Media 2 ID :	44304

Media 2 Tared Weight Record

<i>Media ID</i>	<i>Date</i>	<i>Time</i>	<i>Weight</i>	<i>Technician</i>
44304	2/1/2012	4:13:39 PM	0.45734	
44304	2/2/2012	3:10:16 PM	0.45729	

Media 1 Tared Weight Record

<i>Media ID</i>	<i>Date</i>	<i>Time</i>	<i>Weight (g)</i>	<i>Technician</i>
9787	1/3/2012	9:17	3.75626	MT
9787	1/4/2012	15:27	3.75627	MT
9787	1/5/2012	10:00	3.75636	MT

Sample Weight Record

<i>Media ID</i>	<i>Date</i>	<i>Time</i>	<i>Weight (g)</i>	<i>Technician</i>
9787	5/7/2012	10:42	4.22822	mtuegel
9787	5/8/2012	9:14	4.22835	mtuegel



Sample ID:	28842-017	Method:	(3) U.S. EPA Method 5F
Location:	FCCU Regenerator Stack	Sample Type:	(5) Combined F1/2 Catch
Run No:	6	Recovery Date:	4/25/2012
Field Tech:	RV	Initial pH:	5.85

Media 1 ID:	9778	Media 2 ID :	44303

Media 2 Tared Weight Record

Media ID	Date	Time	Weight	Technician
44303	2/1/2012	4:13:12 PM	0.45079	
44303	2/2/2012	3:10:51 PM	0.45081	

Media 1 Tared Weight Record

Media ID	Date	Time	Weight (g)	Technician
9778	1/3/2012	9:33	3.87028	MT
9778	1/4/2012	15:07	3.87019	MT
9778	1/5/2012	9:41	3.87031	MT

Sample Weight Record

Media ID	Date	Time	Weight (g)	Technician
9778	5/7/2012	10:42	4.33828	mtuegel
9778	5/8/2012	9:19	4.33825	mtuegel



Clean Air Engineering Lab Services ID: 28842-017 Acquired: 2012:05:08 15:15:10 Customer Reference 12010

Sample ID:	28842-018	Method:	(3) U.S. EPA Method 5F
Location:	FCCU Regenerator Stack	Sample Type:	(5) Combined F1/2 Catch
Run No:	7	Recovery Date:	4/26/2012
Field Tech:	RV	Initial pH:	7.08

Media 1 ID:	9782	Media 2 ID :	44302

Media 2 Tared Weight Record

<i>Media ID</i>	<i>Date</i>	<i>Time</i>	<i>Weight</i>	<i>Technician</i>
44302	2/1/2012	4:11:43 PM	0.45763	
44302	2/2/2012	3:14:05 PM	0.45766	

Media 1 Tared Weight Record

<i>Media ID</i>	<i>Date</i>	<i>Time</i>	<i>Weight (g)</i>	<i>Technician</i>
9782	1/3/2012	9:23	3.94791	MT
9782	1/4/2012	15:23	3.94792	MT
9782	1/5/2012	10:07	3.94792	MT

Sample Weight Record

<i>Media ID</i>	<i>Date</i>	<i>Time</i>	<i>Weight (g)</i>	<i>Technician</i>
9782	5/7/2012	10:34	4.42361	mtuegel
9782	5/8/2012	9:19	4.42358	mtuegel



Clean Air Engineering Lab Services ID: 28842-018 Acquired: 2012:05:08 15:15:18 Customer Reference 12010

Sample ID:	28842-019	Method:	(3) U.S. EPA Method 5F
Location:	FCCU Regenerator Stack	Sample Type:	(5) Combined F1/2 Catch
Run No:	8	Recovery Date:	4/26/2012
Field Tech:	RV	Initial pH:	7.64

Media 1 ID:	9795	Media 2 ID :	44301

Media 2 Tared Weight Record

Media ID	Date	Time	Weight	Technician
44301	2/1/2012	4:11:16 PM	0.45498	
44301	2/2/2012	3:14:37 PM	0.45499	

Media 1 Tared Weight Record

Media ID	Date	Time	Weight (g)	Technician
9795	1/3/2012	9:43	3.85952	MT
9795	1/4/2012	15:00	3.85952	MT
9795	1/5/2012	9:45	3.85950	MT

Sample Weight Record

Media ID	Date	Time	Weight (g)	Technician
9795	5/7/2012	10:35	4.33305	mtuegel
9795	5/8/2012	9:19	4.33304	mtuegel



Clean Air Engineering Lab Services ID: 28842-019 Acquired: 2012-05-08 15:15:27 Customer Reference 12010

Sample ID:	28842-020	Method:	(3) U.S. EPA Method 5F
Location:	FCCU Regenerator Stack	Sample Type:	(5) Combined F1/2 Catch
Run No:	9	Recovery Date:	4/26/2012
Field Tech:	RV	Initial pH:	7.10

Media 1 ID:	9786	Media 2 ID :	44300

Media 2 Tared Weight Record

Media ID	Date	Time	Weight	Technician
44300	2/1/2012	4:10:50 PM	0.45221	
44300	2/2/2012	3:15:04 PM	0.45226	

Media 1 Tared Weight Record

Media ID	Date	Time	Weight (g)	Technician
9786	1/3/2012	10:06	3.88502	MT
9786	1/4/2012	14:38	3.88497	MT
9786	1/5/2012	9:22	3.88517	MT

Sample Weight Record

Media ID	Date	Time	Weight (g)	Technician
9786	5/7/2012	10:34	4.35257	mtuegel
9786	5/8/2012	9:24	4.35249	mtuegel



Sample ID:	28842-021	Method:	(7) U.S. EPA Method 202
Location:	All	Sample Type:	(6) B1/2 Acetone Rinse
Run No:	FRB	Recovery Date:	4/23/2012
Field Tech:	RV	Initial pH:	

Media 1 ID: 9800

Media 1 Tared Weight Record

Media ID	Date	Time	Weight (g)	Technician
9800	1/3/2012	9:22	4.02072	MT
9800	1/4/2012	15:22	4.02073	MT
9800	1/5/2012	10:05	4.02080	MT

Sample Weight Record

Media ID	Date	Time	Weight (g)	Technician
9800	5/7/2012	11:32	4.02100	mtuegel
9800	5/8/2012	9:52	4.02103	mtuegel



Sample ID:	28842-022	Method:	(7) U.S. EPA Method 202
Location:	All	Sample Type:	(7) B1/2 Inorganic Rinse
Run No:	FRB	Recovery Date:	4/23/2012
Field Tech:	RV	Initial pH:	4.80

Media 1 ID: 9801

Media 1 Tared Weight Record

Media ID	Date	Time	Weight (g)	Technician
9801	1/3/2012	9:42	3.70616	MT
9801	1/4/2012	14:59	3.70618	MT
9801	1/5/2012	9:44	3.70619	MT

Sample Weight Record

Media ID	Date	Time	Weight (g)	Technician
9801	5/7/2012	11:08	3.70711	mtuegel
9801	5/8/2012	9:30	3.70699	mtuegel



Sample ID:	28842-023	Method:	(7) U.S. EPA Method 202
Location:	FCCU Regenerator Stack	Sample Type:	(7) B1/2 Inorganic Rinse
Run No:	1	Recovery Date:	4/24/2012
Field Tech:	RV	Initial pH:	7.14

Media 1 ID: 9812

Media 1 Tared Weight Record

Media ID	Date	Time	Weight (g)	Technician
9812	1/3/2012	9:18	3.94798	MT
9812	1/4/2012	15:28	3.94790	MT
9812	1/5/2012	10:01	3.94787	MT

Sample Weight Record

Media ID	Date	Time	Weight (g)	Technician
9812	5/7/2012	11:08	3.99950	mtuegel
9812	5/8/2012	9:24	3.99887	mtuegel
9812	5/8/2012	15:31	3.99876	mtuegel



Sample ID:	28842-024	Method:	(7) U.S. EPA Method 202
Location:	FCCU Regenerator Stack	Sample Type:	(7) B1/2 Inorganic Rinse
Run No:	2	Recovery Date:	4/24/2012
Field Tech:	RV	Initial pH:	6.88

Media 1 ID: 9912

Media 1 Tared Weight Record

Media ID	Date	Time	Weight (g)	Technician
9912	1/3/2012	10:02	3.94647	MT
9912	1/4/2012	14:45	3.94646	MT
9912	1/5/2012	9:18	3.94639	MT

Sample Weight Record

Media ID	Date	Time	Weight (g)	Technician
9912	5/7/2012	11:08	3.99592	mtuegel
9912	5/8/2012	9:24	3.99571	mtuegel



Sample ID:	28842-025	Method:	(7) U.S. EPA Method 202
Location:	FCCU Regenerator Stack	Sample Type:	(7) B1/2 Inorganic Rinse
Run No:	3	Recovery Date:	4/25/2012
Field Tech:	RV	Initial pH:	7.17

Media 1 ID: 9826

Media 1 Tared Weight Record

Media ID	Date	Time	Weight (g)	Technician
9826	1/3/2012	11:03	3.68096	MT
9826	1/4/2012	13:47	3.68095	MT
9826	1/5/2012	10:20	3.68094	MT

Sample Weight Record

Media ID	Date	Time	Weight (g)	Technician
9826	5/7/2012	11:03	3.73355	mtuegel
9826	5/8/2012	9:35	3.73316	mtuegel



Sample ID:	28842-026	Method:	(7) U.S. EPA Method 202
Location:	FCCU Regenerator Stack	Sample Type:	(7) B1/2 Inorganic Rinse
Run No:	4	Recovery Date:	4/25/2012
Field Tech:	RV	Initial pH:	4.72

Media 1 ID: 9815

Media 1 Tared Weight Record

Media ID	Date	Time	Weight (g)	Technician
9815	1/3/2012	9:07	3.79245	MT
9815	1/4/2012	15:40	3.79245	MT
9815	1/5/2012	9:50	3.79248	MT

Sample Weight Record

Media ID	Date	Time	Weight (g)	Technician
9815	5/7/2012	11:03	3.83599	mtuegel
9815	5/8/2012	9:30	3.83557	mtuegel



Sample ID:	28842-027	Method:	(7) U.S. EPA Method 202
Location:	FCCU Regenerator Stack	Sample Type:	(7) B1/2 Inorganic Rinse
Run No:	5	Recovery Date:	4/25/2012
Field Tech:	RV	Initial pH:	3.30

Media 1 ID: 9804

Media 1 Tared Weight Record

Media ID	Date	Time	Weight (g)	Technician
9804	1/3/2012	10:57	3.99261	MT
9804	1/4/2012	13:50	3.99271	MT
9804	1/5/2012	10:14	3.99258	MT

Sample Weight Record

Media ID	Date	Time	Weight (g)	Technician
9804	5/7/2012	11:03	4.03797	mtuegel
9804	5/8/2012	9:30	4.03770	mtuegel



Sample ID:	28842-028	Method:	(7) U.S. EPA Method 202
Location:	FCCU Regenerator Stack	Sample Type:	(7) B1/2 Inorganic Rinse
Run No:	6	Recovery Date:	4/26/2012
Field Tech:	RV	Initial pH:	4.09

Media 1 ID: 9819

Media 1 Tared Weight Record

Media ID	Date	Time	Weight (g)	Technician
9819	1/3/2012	9:13	3.75287	MT
9819	1/4/2012	15:35	3.75285	MT
9819	1/5/2012	9:57	3.75291	MT

Sample Weight Record

Media ID	Date	Time	Weight (g)	Technician
9819	5/7/2012	10:58	3.79814	mtuegel
9819	5/8/2012	9:46	3.79775	mtuegel



Sample ID:	28842-029	Method:	(7) U.S. EPA Method 202
Location:	FCCU Regenerator Stack	Sample Type:	(7) B1/2 Inorganic Rinse
Run No:	7	Recovery Date:	4/26/2012
Field Tech:	RV	Initial pH:	3.66

Media 1 ID: 9788

Media 1 Tared Weight Record

<i>Media ID</i>	<i>Date</i>	<i>Time</i>	<i>Weight (g)</i>	<i>Technician</i>
9788	1/3/2012	9:44	3.93804	MT
9788	1/4/2012	15:01	3.93808	MT
9788	1/5/2012	9:45	3.93811	MT

Sample Weight Record

<i>Media ID</i>	<i>Date</i>	<i>Time</i>	<i>Weight (g)</i>	<i>Technician</i>
9788	5/7/2012	10:58	3.98077	mtuegel
9788	5/8/2012	9:35	3.98045	mtuegel



Sample ID:	28842-030	Method:	(7) U.S. EPA Method 202
Location:	FCCU Regenerator Stack	Sample Type:	(7) B1/2 Inorganic Rinse
Run No:	8	Recovery Date:	4/26/2012
Field Tech:	RV	Initial pH:	3.17

Media 1 ID: 9808

Media 1 Tared Weight Record

Media ID	Date	Time	Weight (g)	Technician
9808	1/3/2012	9:13	3.91253	MT
9808	1/4/2012	15:34	3.91252	MT
9808	1/5/2012	9:55	3.91249	MT

Sample Weight Record

Media ID	Date	Time	Weight (g)	Technician
9808	5/7/2012	10:58	3.95997	mtuegel
9808	5/8/2012	9:35	3.95977	mtuegel



Sample ID:	28842-031	Method:	(7) U.S. EPA Method 202
Location:	FCCU Regenerator Stack	Sample Type:	(7) B1/2 Inorganic Rinse
Run No:	9	Recovery Date:	4/27/2012
Field Tech:	RV	Initial pH:	3.29

Media 1 ID: 9811

Media 1 Tared Weight Record

Media ID	Date	Time	Weight (g)	Technician
9811	1/3/2012	9:06	3.76809	MT
9811	1/4/2012	15:39	3.76808	MT
9811	1/5/2012	9:49	3.76824	MT

Sample Weight Record

Media ID	Date	Time	Weight (g)	Technician
9811	5/7/2012	10:53	3.81548	mtuegel
9811	5/8/2012	9:46	3.81516	mtuegel



Sample ID:	28842-032	Method:	(7) U.S. EPA Method 202
Location:	FCCU Regenerator Stack	Sample Type:	(7) B1/2 Inorganic Rinse
Run No:	FTRB	Recovery Date:	4/24/2012
Field Tech:	RV	Initial pH:	5.05

Media 1 ID: 9789

Media 1 Tared Weight Record

Media ID	Date	Time	Weight (g)	Technician
9789	1/3/2012	10:00	3.88312	MT
9789	1/4/2012	14:44	3.88302	MT
9789	1/5/2012	9:18	3.88312	MT

Sample Weight Record

Media ID	Date	Time	Weight (g)	Technician
9789	5/7/2012	10:53	3.88444	mtuegel
9789	5/8/2012	9:46	3.88444	mtuegel



Sample ID:	28842-033	Method:	(7) U.S. EPA Method 202
Location:	All	Sample Type:	(8) B1/2 Organic Rinse
Run No:	FRB	Recovery Date:	4/23/2012
Field Tech:	RV	Initial pH:	

Media 1 ID: 9817

Media 1 Tared Weight Record

<i>Media ID</i>	<i>Date</i>	<i>Time</i>	<i>Weight (g)</i>	<i>Technician</i>
9817	1/3/2012	9:08	3.75978	MT
9817	1/4/2012	15:41	3.75981	MT
9817	1/5/2012	9:51	3.75984	MT

Sample Weight Record

<i>Media ID</i>	<i>Date</i>	<i>Time</i>	<i>Weight (g)</i>	<i>Technician</i>
9817	5/7/2012	11:32	3.76051	mtuegel
9817	5/8/2012	9:52	3.76049	mtuegel



Sample ID:	28842-034	Method:	(7) U.S. EPA Method 202
Location:	FCCU Regenerator Stack	Sample Type:	(8) B1/2 Organic Rinse
Run No:	1	Recovery Date:	4/24/2012
Field Tech:	RV	Initial pH:	

Media 1 ID: 9846

Media 1 Tared Weight Record

Media ID	Date	Time	Weight (g)	Technician
9846	1/3/2012	11:09	3.67843	MT
9846	1/4/2012	13:34	3.67844	MT
9846	1/5/2012	10:30	3.67838	MT

Sample Weight Record

Media ID	Date	Time	Weight (g)	Technician
9846	5/7/2012	11:32	3.67969	mtuegel
9846	5/8/2012	9:52	3.67967	mtuegel



Sample ID:	28842-035	Method:	(7) U.S. EPA Method 202
Location:	FCCU Regenerator Stack	Sample Type:	(8) B1/2 Organic Rinse
Run No:	2	Recovery Date:	4/24/2012
Field Tech:	RV	Initial pH:	

Media 1 ID: 9850

Media 1 Tared Weight Record

Media ID	Date	Time	Weight (g)	Technician
9850	1/3/2012	11:01	3.61842	MT
9850	1/4/2012	13:44	3.61838	MT
9850	1/5/2012	10:19	3.61843	MT

Sample Weight Record

Media ID	Date	Time	Weight (g)	Technician
9850	5/7/2012	11:24	3.61976	mtuegel
9850	5/8/2012	9:57	3.61966	mtuegel



Sample ID:	28842-036	Method:	(7) U.S. EPA Method 202
Location:	FCCU Regenerator Stack	Sample Type:	(8) B1/2 Organic Rinse
Run No:	3	Recovery Date:	4/25/2012
Field Tech:	RV	Initial pH:	

Media 1 ID: 9841

Media 1 Tared Weight Record

Media ID	Date	Time	Weight (g)	Technician
9841	1/3/2012	11:15	3.77588	MT
9841	1/4/2012	13:39	3.77595	MT
9841	1/5/2012	10:25	3.77599	MT

Sample Weight Record

Media ID	Date	Time	Weight (g)	Technician
9841	5/7/2012	11:24	3.77740	mtuegel
9841	5/8/2012	9:57	3.77733	mtuegel



Sample ID:	28842-037	Method:	(7) U.S. EPA Method 202
Location:	FCCU Regenerator Stack	Sample Type:	(8) B1/2 Organic Rinse
Run No:	4	Recovery Date:	4/25/2012
Field Tech:	RV	Initial pH:	

Media 1 ID: 9820

Media 1 Tared Weight Record

Media ID	Date	Time	Weight (g)	Technician
9820	1/3/2012	10:57	3.80732	MT
9820	1/4/2012	13:50	3.80732	MT
9820	1/5/2012	10:15	3.80736	MT

Sample Weight Record

Media ID	Date	Time	Weight (g)	Technician
9820	5/7/2012	11:24	3.80848	mtuegel
9820	5/8/2012	9:57	3.80846	mtuegel



Sample ID:	28842-038	Method:	(7) U.S. EPA Method 202
Location:	FCCU Regenerator Stack	Sample Type:	(8) B1/2 Organic Rinse
Run No:	5	Recovery Date:	4/25/2012
Field Tech:	RV	Initial pH:	

Media 1 ID: 9824

Media 1 Tared Weight Record

Media ID	Date	Time	Weight (g)	Technician
9824	1/3/2012	10:58	3.56809	MT
9824	1/4/2012	13:52	3.56807	MT
9824	1/5/2012	10:16	3.56806	MT

Sample Weight Record

Media ID	Date	Time	Weight (g)	Technician
9824	5/7/2012	11:17	3.56947	mtuegel
9824	5/8/2012	10:08	3.56936	mtuegel



Sample ID:	28842-039	Method:	(7) U.S. EPA Method 202
Location:	FCCU Regenerator Stack	Sample Type:	(8) B1/2 Organic Rinse
Run No:	6	Recovery Date:	4/26/2012
Field Tech:	RV	Initial pH:	

Media 1 ID: 9784

Media 1 Tared Weight Record

Media ID	Date	Time	Weight (g)	Technician
9784	1/3/2012	9:18	3.96859	MT
9784	1/4/2012	15:29	3.96843	MT
9784	1/5/2012	10:02	3.96859	MT

Sample Weight Record

Media ID	Date	Time	Weight (g)	Technician
9784	5/7/2012	11:17	3.96989	mtuegel
9784	5/8/2012	10:08	3.96980	mtuegel



Sample ID:	28842-040	Method:	(7) U.S. EPA Method 202
Location:	FCCU Regenerator Stack	Sample Type:	(8) B1/2 Organic Rinse
Run No:	7	Recovery Date:	4/26/2012
Field Tech:	RV	Initial pH:	

Media 1 ID: 9845

Media 1 Tared Weight Record

Media ID	Date	Time	Weight (g)	Technician
9845	1/3/2012	11:02	3.54969	MT
9845	1/4/2012	13:46	3.54964	MT
9845	1/5/2012	10:19	3.54965	MT

Sample Weight Record

Media ID	Date	Time	Weight (g)	Technician
9845	5/7/2012	11:17	3.55134	mtuegel
9845	5/8/2012	10:08	3.55134	mtuegel



Sample ID:	28842-041	Method:	(7) U.S. EPA Method 202
Location:	FCCU Regenerator Stack	Sample Type:	(8) B1/2 Organic Rinse
Run No:	8	Recovery Date:	4/26/2012
Field Tech:	RV	Initial pH:	

Media 1 ID: 9783

Media 1 Tared Weight Record

Media ID	Date	Time	Weight (g)	Technician
9783	1/3/2012	9:22	3.74302	MT
9783	1/4/2012	15:22	3.74299	MT
9783	1/5/2012	10:06	3.74295	MT

Sample Weight Record

Media ID	Date	Time	Weight (g)	Technician
9783	5/7/2012	11:13	3.74417	mtuegel
9783	5/8/2012	10:13	3.74406	mtuegel



Sample ID:	28842-042	Method:	(7) U.S. EPA Method 202
Location:	FCCU Regenerator Stack	Sample Type:	(8) B1/2 Organic Rinse
Run No:	9	Recovery Date:	4/27/2012
Field Tech:	RV	Initial pH:	

Media 1 ID: 9780

Media 1 Tared Weight Record

Media ID	Date	Time	Weight (g)	Technician
9780	1/3/2012	9:28	3.87674	MT
9780	1/4/2012	15:17	3.87661	MT
9780	1/5/2012	9:29	3.87667	MT

Sample Weight Record

Media ID	Date	Time	Weight (g)	Technician
9780	5/7/2012	11:13	3.87817	mtuegel
9780	5/8/2012	10:13	3.87802	mtuegel



Sample ID:	28842-043	Method:	(7) U.S. EPA Method 202
Location:	All	Sample Type:	(8) B1/2 Organic Rinse
Run No:	FTRB	Recovery Date:	4/24/2012
Field Tech:	RV	Initial pH:	

Media 1 ID: 9790

Media 1 Tared Weight Record

Media ID	Date	Time	Weight (g)	Technician
9790	1/3/2012	9:54	3.77078	MT
9790	1/4/2012	14:49	3.77069	MT
9790	1/5/2012	9:13	3.77080	MT

Sample Weight Record

Media ID	Date	Time	Weight (g)	Technician
9790	5/7/2012	11:13	3.77190	mtuegel
9790	5/8/2012	10:13	3.77176	mtuegel



CleanAir.

PALATINE SOURCE GROUP
MARATHON PETROLEUM COMPANY

Customer Reference No: 12010
Laboratory Services Project No: 28842

QUALITY ASSURANCE RECORDS

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Quality Assurance Data - Time Check

<i>Sample ID</i>	<i>Date</i>	<i>Time</i>	<i>Results (hrs)</i>	<i>Pass / Fail</i>
28842-011	5/8/2012	9:04	22	Passed
28842-012	5/8/2012	9:04	22	Passed
28842-013	5/8/2012	9:04	22	Passed
28842-014	5/8/2012	9:13	22	Passed
28842-015	5/8/2012	9:13	23	Passed
28842-016	5/8/2012	9:13	23	Passed
28842-017	5/8/2012	9:18	23	Passed
28842-018	5/8/2012	9:18	23	Passed
28842-019	5/8/2012	9:18	23	Passed
28842-020	5/8/2012	9:23	23	Passed
28842-021	5/8/2012	9:50	22	Passed
28842-022	5/8/2012	9:28	22	Passed
28842-023	5/8/2012	9:23	22	Passed
28842-024	5/8/2012	9:23	22	Passed
28842-025	5/8/2012	9:34	23	Passed
28842-026	5/8/2012	9:28	22	Passed
28842-027	5/8/2012	9:28	22	Passed
28842-028	5/8/2012	9:39	23	Passed
28842-029	5/8/2012	9:34	23	Passed
28842-030	5/8/2012	9:34	23	Passed
28842-031	5/8/2012	9:39	23	Passed
28842-032	5/8/2012	9:39	23	Passed
28842-033	5/8/2012	9:51	22	Passed
28842-034	5/8/2012	9:51	22	Passed
28842-035	5/8/2012	9:56	23	Passed
28842-036	5/8/2012	9:56	23	Passed
28842-037	5/8/2012	9:56	23	Passed
28842-038	5/8/2012	10:02	23	Passed
28842-039	5/8/2012	10:02	23	Passed

<i>Sample ID</i>	<i>Date</i>	<i>Time</i>	<i>Results (hrs)</i>	<i>Pass / Fail</i>
28842-040	5/8/2012	10:02	23	Passed
28842-041	5/8/2012	10:12	23	Passed
28842-042	5/8/2012	10:12	23	Passed
28842-043	5/8/2012	10:12	23	Passed

Quality Assurance Data - Weight Check

<i>Sample ID</i>	<i>Date</i>	<i>Time</i>	<i>Results (g)</i>	<i>Pass / Fail</i>
28842-011	5/8/2012	9:09	0.00007	Passed
28842-012	5/8/2012	9:09	0.00006	Passed
28842-013	5/8/2012	9:09	0.00004	Passed
28842-014	5/8/2012	9:14	0.00005	Passed
28842-015	5/8/2012	9:14	0.00001	Passed
28842-016	5/8/2012	9:14	0.00013	Passed
28842-017	5/8/2012	9:19	0.00003	Passed
28842-018	5/8/2012	9:19	0.00003	Passed
28842-019	5/8/2012	9:19	0.00001	Passed
28842-020	5/8/2012	9:24	0.00008	Passed
28842-021	5/8/2012	9:52	0.00003	Passed
28842-022	5/8/2012	9:30	0.00012	Passed
28842-023	5/8/2012	15:31	0.00011	Passed
28842-024	5/8/2012	9:24	0.00021	Passed
28842-025	5/8/2012	9:35	0.00039	Passed
28842-026	5/8/2012	9:30	0.00042	Passed
28842-027	5/8/2012	9:30	0.00027	Passed
28842-028	5/8/2012	9:46	0.00039	Passed
28842-029	5/8/2012	9:35	0.00032	Passed
28842-030	5/8/2012	9:35	0.00020	Passed
28842-031	5/8/2012	9:46	0.00032	Passed
28842-032	5/8/2012	9:46	0.00000	Passed
28842-033	5/8/2012	9:52	0.00002	Passed
28842-034	5/8/2012	9:52	0.00002	Passed
28842-035	5/8/2012	9:57	0.00010	Passed
28842-036	5/8/2012	9:57	0.00007	Passed
28842-037	5/8/2012	9:57	0.00002	Passed
28842-038	5/8/2012	10:08	0.00011	Passed
28842-039	5/8/2012	10:08	0.00009	Passed

<i>Sample ID</i>	<i>Date</i>	<i>Time</i>	<i>Results (g)</i>	<i>Pass / Fail</i>
28842-040	5/8/2012	10:08	0.00000	Passed
28842-041	5/8/2012	10:13	0.00011	Passed
28842-042	5/8/2012	10:13	0.00015	Passed
28842-043	5/8/2012	10:13	0.00014	Passed

CleanAir

PALATINE SOURCE GROUP
MARATHON PETROLEUM COMPANY

Customer Reference No: 12010
Laboratory Services Project No: 28842

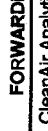
CHAIN-OF-CUSTODY DOCUMENTATION

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CLIENT		Marathon Petroleum Company		PROJECT		12010	
PLANT		Detroit Refinery		DEPT.		66	
PROJECT MANAGER		K. O'Halloren		 CleanAir. ENGINEERING 500 West Wood Street Palatine, IL 60067 800-627-0033 (phone) 847-991-3385 (fax)			
ANALYTICAL METHOD	CONTAINER NUMBER	SAMPLE FRACTION		ANALYSIS REQUESTED Gravimetric Archive			
USEPA M-5F	1	FILTER		FORWARDING LAB			
		PETRI DISH		CleanAir Analytical Services 500 West Wood Street Palatine, IL 60067 800-627-0033 (phone) Doug Rhoades			
LAB ID	DATE	TEST LOCATION	RUN NUMBER	NUMBER OF CONTAINERS		CONTAINER SEALED?	LIQUID LEVEL MARKED?
28848-001	4/24	FCCU Regenerator Stack	1	1	X		
28848-002	4/24	FCCU Regenerator Stack	2	1	X		
28848-003	4/24	FCCU Regenerator Stack	3	1	X		
28848-004	4/25	FCCU Regenerator Stack	4	1	X		
28848-005	4/25	FCCU Regenerator Stack	5	1	X		
28848-006	4/25	FCCU Regenerator Stack	6	1	X		
28848-007	4/26	FCCU Regenerator Stack	7	1	X		
28848-008	4/26	FCCU Regenerator Stack	8	1	X		
28848-009	4/26	FCCU Regenerator Stack	9	1	X		
28848-010	4/26	FCCU Regenerator Stack	10	1	X		
28848-011	4/26	FCCU Regenerator Stack	11	1	X		
28848-012	4/26	FCCU Regenerator Stack	12	1	X		
28848-013	4/26	FCCU Regenerator Stack	13	1	X		
28848-014	4/26	FCCU Regenerator Stack	14	1	X		
28848-015	4/26	FCCU Regenerator Stack	15	1	X		
28848-016	4/26	FCCU Regenerator Stack	16	1	X		
28848-017	4/26	FCCU Regenerator Stack	17	1	X		
28848-018	4/26	FCCU Regenerator Stack	18	1	X		
28848-019	4/26	FCCU Regenerator Stack	19	1	X		
28848-020	4/26	FCCU Regenerator Stack	20	1	X		
28848-021	4/26	FCCU Regenerator Stack	21	1	X		
28848-022	4/26	FCCU Regenerator Stack	22	1	X		
28848-023	4/26	FCCU Regenerator Stack	23	1	X		
28848-024	4/26	FCCU Regenerator Stack	24	1	X		
28848-025	4/26	FCCU Regenerator Stack	25	1	X		
28848-026	4/26	FCCU Regenerator Stack	26	1	X		
28848-027	4/26	FCCU Regenerator Stack	27	1	X		
28848-028	4/26	FCCU Regenerator Stack	28	1	X		
28848-029	4/26	FCCU Regenerator Stack	29	1	X		
28848-030	4/26	FCCU Regenerator Stack	30	1	X		
28848-031	4/26	FCCU Regenerator Stack	31	1	X		
28848-032	4/26	FCCU Regenerator Stack	32	1	X		
28848-033	4/26	FCCU Regenerator Stack	33	1	X		
28848-034	4/26	FCCU Regenerator Stack	34	1	X		
28848-035	4/26	FCCU Regenerator Stack	35	1	X		
28848-036	4/26	FCCU Regenerator Stack	36	1	X		
28848-037	4/26	FCCU Regenerator Stack	37	1	X		
28848-038	4/26	FCCU Regenerator Stack	38	1	X		
28848-039	4/26	FCCU Regenerator Stack	39	1	X		
28848-040	4/26	FCCU Regenerator Stack	40	1	X		
28848-041	4/26	FCCU Regenerator Stack	41	1	X		
28848-042	4/26	FCCU Regenerator Stack	42	1	X		
28848-043	4/26	FCCU Regenerator Stack	43	1	X		
28848-044	4/26	FCCU Regenerator Stack	44	1	X		
28848-045	4/26	FCCU Regenerator Stack	45	1	X		
28848-046	4/26	FCCU Regenerator Stack	46	1	X		
28848-047	4/26	FCCU Regenerator Stack	47	1	X		
28848-048	4/26	FCCU Regenerator Stack	48	1	X		

[illegible]

CLIENT Marathon Petroleum Company		PROJECT 12010		66-12010-	
PLANT Detroit Refinery		DEPT. 66			
PROJECT MANAGER K. O'Halloren					
ANALYTICAL METHOD USEPA M-5F		CONTAINER NUMBER 2		 CleanAir. ENGINEERING 500 West Wood Street Palatine, IL 60067 800-627-0033 (phone) 847-991-3385 (fax)	
SAMPLE FRACTION FRONT HALF DI WATER RINSE 250 mL CLEAR GLASS					

LAB ID		DATE (2012)	TEST LOCATION		RUN NUMBER	SAMPLE MATRIX		NUMBER OF CONTAINERS	CONTAINER SEALED?	ANALYSIS REQUESTED		FORWARDING LAB CleanAir Analytical Services 500 West Wood Street Palatine, IL 60067 800-627-0033 (phone) Doug Rhoades	ADDITIONAL INFORMATION
NUMBER							Gravimetric			Archive			
28842-081 R		4/24	FCCU Regenerator Stack		Train Proof	Front Half DI Water Rinse, 250 mL Clear Glass		1	X		X		
-012 R		4/24	FCCU Regenerator Stack		1	Front Half DI Water Rinse, 250 mL Clear Glass		1	X	X			178
-013 R		4/24	FCCU Regenerator Stack		2	Front Half DI Water Rinse, 250 mL Clear Glass		1	X	X			153
-014 R		4/24	FCCU Regenerator Stack		3	Front Half DI Water Rinse, 250 mL Clear Glass		1	X	X			172
-015 R		4/25	FCCU Regenerator Stack		4	Front Half DI Water Rinse, 250 mL Clear Glass		1	X	X			141
-016 R		4/25	FCCU Regenerator Stack		5	Front Half DI Water Rinse, 250 mL Clear Glass		1	X	X			151
-017 R		4/25	FCCU Regenerator Stack		6	Front Half DI Water Rinse, 250 mL Clear Glass		1	X	X			185
-018 R		4/26	FCCU Regenerator Stack		7	Front Half DI Water Rinse, 250 mL Clear Glass		1	X	X			133
-019 R		4/26	FCCU Regenerator Stack		8	Front Half DI Water Rinse, 250 mL Clear Glass		1	X	X			146
-020 R		4/26	FCCU Regenerator Stack		9	Front Half DI Water Rinse, 250 mL Clear Glass		1	X	X			183

Relinquished By: (signature) <i>[Signature]</i>	Date / Time	Relinquished By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time	This form completed by:	
R. VICERE		R. VICERE		R. VICERE		R. Vicere	Date
Received By: (signature) <i>[Signature]</i>	Date / Time	Received By: (signature)	Date / Time	Received By: (signature)	Date / Time	Signature	Date
	4/26/12 830						

CLIENT		PROJECT		66-12010-	
Marathon Petroleum Company		DEPT.			
Detroit Refinery		66			
PROJECT MANAGER		K. O'Halloren			
ANALYTICAL METHOD		CONTAINER NUMBER		SAMPLE FRACTION	
USEPA M-202		1		BACK HALF CATCH AND INORGANIC RINSE 950 mL Amber Glass	
LAB ID		DATE (2012)		TEST LOCATION	
NUMBER		NUMBER		SAMPLE MATRIX	
28872-023 R		4/24		Back Half Catch and Inorganic Rinse, 950 mL Amber Glass	
-024 R		4/24		Back Half Catch and Inorganic Rinse, 950 mL Amber Glass	
-025 R		4/25		Back Half Catch and Inorganic Rinse, 950 mL Amber Glass	
-026 R		4/25		Back Half Catch and Inorganic Rinse, 950 mL Amber Glass	
-027 R		4/25		Back Half Catch and Inorganic Rinse, 950 mL Amber Glass	
-028 R		4/26		Back Half Catch and Inorganic Rinse, 950 mL Amber Glass	
-029 R		4/26		Back Half Catch and Inorganic Rinse, 950 mL Amber Glass	
-030 R		4/26		Back Half Catch and Inorganic Rinse, 950 mL Amber Glass	
-031 R		4/27		Back Half Catch and Inorganic Rinse, 950 mL Amber Glass	
✓ -032 R		4/24		Field Train Recovery Blank	
Relinquished By: (signature) <i>R. Vicere</i>		Date / Time 4/29/12 8:30		Relinquished By: (signature) <i>K. Sullivan</i>	
Received By: (signature) <i>E. Sosa</i>		Date / Time		Received By: (signature)	

CLIENT		PROJECT		66-12010-					
PLANT		DEPT.							
PROJECT MANAGER		K. O'Halloren							
ANALYTICAL METHOD		CONTAINER NUMBER		SAMPLE FRACTION					
USEPA M-202		2		BACK HALF ORGANIC RINSE 950 mL AMBER GLASS					
LAB ID	DATE (2012)	TEST LOCATION	RUN NUMBER	SAMPLE MATRIX	NUMBER OF CONTAINERS	CONTAINER SEALED?	ANALYSIS REQUESTED	FORWARDING LAB	ADDITIONAL INFORMATION
2884-0341	4/24	FCCU Regenerator Stack	1	Back Half Organic Rinse, 950 mL Amber Glass	1	X	Gravimetric	CleanAir Analytical Services 500 West Wood Street Palatine, IL 60067 800-627-0033 (phone) Doug Rhoades	Acetone and Hexane rinse
-035	4/24	FCCU Regenerator Stack	2	Back Half Organic Rinse, 950 mL Amber Glass	1	X			
-036	4/25	FCCU Regenerator Stack	3	Back Half Organic Rinse, 950 mL Amber Glass	1	X			
-037	4/25	FCCU Regenerator Stack	4	Back Half Organic Rinse, 950 mL Amber Glass	1	X			
-038	4/25	FCCU Regenerator Stack	5	Back Half Organic Rinse, 950 mL Amber Glass	1	X			
-039	4/26	FCCU Regenerator Stack	6	Back Half Organic Rinse, 950 mL Amber Glass	1	X			
-040	4/26	FCCU Regenerator Stack	7	Back Half Organic Rinse, 950 mL Amber Glass	1	X			
-041	4/26	FCCU Regenerator Stack	8	Back Half Organic Rinse, 950 mL Amber Glass	1	X			
-042	4/27	FCCU Regenerator Stack	9	Back Half Organic Rinse, 950 mL Amber Glass	1	X			
-043	4/24	FCCU Regenerator Stack	Field Train Recovery Blank	Back Half Organic Rinse, 950 mL Amber Glass	1	X			Field Train Post Blank

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Received By: (signature) *[Signature]*

Date / Time: 4/30/12 830

Relinquished By: (signature)

Received By: (signature)

Date / Time

This form completed by: R. Vicere
Signature Date

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CLIENT Marathon Petroleum Company		PROJECT 12010		66-12010-1	
PLANT Detroit Refinery		DEPT. 66			
PROJECT MANAGER K. O'Halloren					
ANALYTICAL METHOD USEPA M-5F		CONTAINER NUMBER 1	SAMPLE FRACTION FILTER PETRI DISH		
CleanAir® ENGINEERING 500 West Wood Street Palatine, IL 60067 800-627-0033 (phone) 847-991-3385 (fax)					
LAB ID NUMBER	DATE (2012)	TEST LOCATION	RUN NUMBER	SAMPLE MATRIX	
	4/24	FCCU Regenerator Stack	1	Filter No. 44308	
	4/24	FCCU Regenerator Stack	2	Filter No. 44309	
	4/24	FCCU Regenerator Stack	3	Filter No. 44307	
	4/25	FCCU Regenerator Stack	4	Filter No. 44305	
	4/25	FCCU Regenerator Stack	5	Filter No. 44304	
	4/25	FCCU Regenerator Stack	6	Filter No. 44303	
	4/26	FCCU Regenerator Stack	7	Filter No. 44302	
	4/26	FCCU Regenerator Stack	8	Filter No. 44301	
	4/26	FCCU Regenerator Stack	9	Filter No. 44300	
Relinquished By: (signature)		Relinquished By: (signature)		Relinquished By: (signature)	
Date / Time		Date / Time		Date / Time	
K. O'Halloren		K. O'Halloren		K. O'Halloren	
Received By: (signature)		Received By: (signature)		Received By: (signature)	
Date / Time		Date / Time		Date / Time	
4/30/2013		4/30/2013		4/30/2013	
Relinquished By: (signature)		Relinquished By: (signature)		Relinquished By: (signature)	
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K. O'Halloren		K. O'Halloren		K. O'Halloren	
Received By: (signature)		Received By: (signature)		Received By: (signature)	
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4/30/2013		4/30/2013		4/30/2013	
Relinquished By: (signature)		Relinquished By: (signature)		Relinquished By: (signature)	
Date / Time		Date / Time		Date / Time	
K. O'Halloren		K. O'Halloren		K. O'Halloren	
Received By: (signature)		Received By: (signature)		Received By: (signature)	
Date / Time		Date / Time		Date / Time	
4/30/2013		4/30/2013		4/30/2013	
Relinquished By: (signature)		Relinquished By: (signature)		Relinquished By: (signature)	
Date / Time		Date / Time		Date / Time	
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Received By: (signature)		Received By: (signature)		Received By: (signature)	
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Received By: (signature)		Received By: (signature)		Received By: (signature)	
Date / Time		Date / Time		Date / Time	
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Relinquished By: (signature)		Relinquished By: (signature)		Relinquished By: (signature)	
Date / Time		Date / Time		Date / Time	
K. O'Halloren		K. O'Halloren		K. O'Halloren	
Received By: (signature)		Received By: (signature)		Received By: (signature)	
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Relinquished By: (signature)		Relinquished By: (signature)		Relinquished By: (signature)	
Date / Time		Date / Time		Date / Time	
K. O'Halloren		K. O'Halloren		K. O'Halloren	
Received By: (signature)		Received By: (signature)		Received By: (signature)	
Date / Time		Date / Time		Date / Time	
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Relinquished By: (signature)		Relinquished By: (signature)		Relinquished By: (signature)	
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K. O'Halloren		K. O'Halloren		K. O'Halloren	
Received By: (signature)		Received By: (signature)		Received By: (signature)	
Date / Time		Date / Time		Date / Time	
4/30/2013		4/30/2013		4/30/2013	
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Received By: (signature)		Received By: (signature)		Received By: (signature)	
Date / Time		Date / Time		Date / Time	
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K. O'Halloren		K. O'Halloren		K. O'Halloren	
Received By: (signature)		Received By: (signature)		Received By: (signature)	
Date / Time		Date / Time		Date / Time	
4/30/2013		4/30/2013		4/30/2013	
Relinquished By: (signature)		Relinquished By: (signature)		Relinquished By: (signature)	
Date / Time		Date / Time		Date / Time	
K. O'Halloren		K. O'Halloren		K. O'Halloren	
Received By:					

CLIENT		Marathon Petroleum Company		PROJECT		12010	
PLANT		Detroit Refinery		DEPT.		66	
PROJECT MANAGER		K. O'Halloren		FORWARDING LAB		CleanAir Analytical Services	
ANALYTICAL METHOD		CONTAINER NUMBER		SAMPLE FRACTION		500 West Wood Street Palatine, IL 60067 800-627-0033 (phone) 847-991-3365 (fax)	
USEPA M-5F		2		FRONT HALF DI WATER RINSE		250 mL CLEAR GLASS	
LAB ID	DATE (2012)	TEST LOCATION	RUN NUMBER	SAMPLE MATRIX	NUMBER OF CONTAINERS	CONTAINER SEALED?	ANALYSIS REQUESTED
	4/24	FCCU Regenerator Stack	Train Proof	Front Half DI Water Rinse, 250 mL Clear Glass	1	X	Gravimetric
	4/24	FCCU Regenerator Stack	1	Front Half DI Water Rinse, 250 mL Clear Glass	1	X	Archive
	4/24	FCCU Regenerator Stack	2	Front Half DI Water Rinse, 250 mL Clear Glass	1	X	
	4/24	FCCU Regenerator Stack	3	Front Half DI Water Rinse, 250 mL Clear Glass	1	X	
	4/25	FCCU Regenerator Stack	4	Front Half DI Water Rinse, 250 mL Clear Glass	1	X	
	4/25	FCCU Regenerator Stack	5	Front Half DI Water Rinse, 250 mL Clear Glass	1	X	
	4/25	FCCU Regenerator Stack	6	Front Half DI Water Rinse, 250 mL Clear Glass	1	X	
	4/26	FCCU Regenerator Stack	7	Front Half DI Water Rinse, 250 mL Clear Glass	1	X	
	4/26	FCCU Regenerator Stack	8	Front Half DI Water Rinse, 250 mL Clear Glass	1	X	
	4/26	FCCU Regenerator Stack	9	Front Half DI Water Rinse, 250 mL Clear Glass	1	X	
Relinquished By: (signature)				Date / Time	Relinquished By: (signature)	Date / Time	This form completed by:
K. O'Halloren				4/25/2012	K. O'Halloren		Signature
Received By: (signature)				Date / Time	Received By: (signature)		Date

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CLIENT Marathon Petroleum Company	PROJECT 12010									
PLANT Detroit Refinery	DEPT. 66									
PROJECT MANAGER K. O'Halloren										
ANALYTICAL METHOD USEPA M-202	CONTAINER NUMBER 1									
SAMPLE FRACTION BACK HALF CATCH AND INORGANIC RINSE 950 mL Amber Glass										
LAB ID NUMBER	DATE (2012)	TEST LOCATION	RUN NUMBER	SAMPLE MATRIX	NUMBER OF CONTAINERS	CONTAINER SEALED?	LIQUID LEVEL MARKED?	ANALYSIS REQUESTED	FORWARDING LAB	ADDITIONAL INFORMATION
	4/24	FCCU Regenerator Stack	1	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass	1	X		Gravimetric	CleanAir Analytical Services 500 West Wood Street Palatine, IL 60067 800-627-0033 (phone) Doug Rhoades	
	4/24	FCCU Regenerator Stack	2	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass	1	X				
	4/25	FCCU Regenerator Stack	3	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass	1	X				
	4/25	FCCU Regenerator Stack	4	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass	1	X				
	4/25	FCCU Regenerator Stack	5	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass	1	X				
	4/26	FCCU Regenerator Stack	6	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass	1	X				
	4/26	FCCU Regenerator Stack	7	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass	1	X				
	4/26	FCCU Regenerator Stack	8	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass	1	X				
	4/27	FCCU Regenerator Stack	9	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass	1	X				
	4/24	FCCU Regenerator Stack	Field Train Recovery Blank	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass	1	X				
Relinquished By: (signature) K. O'Halloren	Date / Time 4/23/2012	Relinquished By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time	This form completed by:	K. O'Halloren	Signature	Date	

CLIENT Marathon Petroleum Company	PROJECT 12010											
PLANT Detroit Refinery	DEPT. 66											
PROJECT MANAGER K. O'Halloren												
ANALYTICAL METHOD USEPA M-202	CONTAINER NUMBER 2	SAMPLE FRACTION BACK HALF ORGANIC RINSE 950 mL AMBER GLASS										
CleanAir[®] ENGINEERING 500 West Wood Street Palatine, IL 60067 800-627-0033 (phone) 847-991-3385 (fax)												
LAB ID NUMBER	DATE (2012)	TEST LOCATION	RUN NUMBER	SAMPLE MATRIX				NUMBER OF CONTAINERS	CONTAINER SEALED?	ANALYSIS REQUESTED		FORWARDING LAB
	4/24	FCCU Regenerator Stack	1	Back Half Organic Rinse, 950 mL Amber Glass	X			1	X	Gravimetric	CleanAir Analytical Services 500 West Wood Street Palatine, IL 60067 800-627-0033 (phone) Doug Rhoades	
	4/24	FCCU Regenerator Stack	2	Back Half Organic Rinse, 950 mL Amber Glass	X			1	X	Archive		
	4/25	FCCU Regenerator Stack	3	Back Half Organic Rinse, 950 mL Amber Glass	X			1	X			
	4/25	FCCU Regenerator Stack	4	Back Half Organic Rinse, 950 mL Amber Glass	X			1	X			
	4/25	FCCU Regenerator Stack	5	Back Half Organic Rinse, 950 mL Amber Glass	X			1	X			
	4/26	FCCU Regenerator Stack	6	Back Half Organic Rinse, 950 mL Amber Glass	X			1	X			
	4/26	FCCU Regenerator Stack	7	Back Half Organic Rinse, 950 mL Amber Glass	X			1	X			
	4/26	FCCU Regenerator Stack	8	Back Half Organic Rinse, 950 mL Amber Glass	X			1	X			
	4/27	FCCU Regenerator Stack	9	Back Half Organic Rinse, 950 mL Amber Glass	X			1	X			
	4/24	FCCU Regenerator Stack	Field Train Recovery Blank	Back Half Organic Rinse, 950 mL Amber Glass	X			1	X			
Relinquished By: (signature) [Signature]			Date / Time	Relinquished By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time	This form completed by:				
K. O'Halloren	4/25/12	[Signature]						K. O'Halloren Signature Date				

CLIENT Marathon Petroleum Company		PROJECT 12010		66-12010-6	
PLANT Detroit Refinery		DEPT. 66			
PROJECT MANAGER K. O'Halloren					
ANALYTICAL METHOD USEPA M-202		CONTAINER NUMBER 3		FORWARDING LAB CleanAir Analytical Services 500 West Wood Street Palatine, IL 60067 800-627-0033 (phone) Doug Rhoades	
SAMPLE FRACTION CPM FILTER Petri Dish				ANALYSIS REQUESTED Gravimetric Archive	
NUMBER OF CONTAINERS		CONTAINER SEALED?			
LAB ID NUMBER		DATE (2012)		TEST LOCATION	
RUN NUMBER		SAMPLE MATRIX			
1		FCCU Regenerator Stack		CPM Filter, Petri Dish	
2		FCCU Regenerator Stack		CPM Filter, Petri Dish	
3		FCCU Regenerator Stack		CPM Filter, Petri Dish	
4		FCCU Regenerator Stack		CPM Filter, Petri Dish	
5		FCCU Regenerator Stack		CPM Filter, Petri Dish	
6		FCCU Regenerator Stack		CPM Filter, Petri Dish	
7		FCCU Regenerator Stack		CPM Filter, Petri Dish	
8		FCCU Regenerator Stack		CPM Filter, Petri Dish	
9		FCCU Regenerator Stack		CPM Filter, Petri Dish	
Field Train Recovery Blank		FCCU Regenerator Stack		CPM Filter, Petri Dish	
6602-27				X	
6602-28				X	
6602-29				X	
6602-31				X	
6602-33				X	
6602-34				X	
6602-35				X	
6602-32				X	
6602-36				X	
6602-30				X	
Relinquished By: (signature) K. O'Halloren		Date / Time 4/26/2012		Relinquished By: (signature)	
Received By: (signature)		Date / Time		Received By: (signature)	
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This form completed by:		Date / Time		Signature	
K. O'Halloren		Date / Time		Signature	

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Lab Project No.: 28842

Date Received: 4/30/2012

Page 82 of 111

CleanAir No.: 12010

66

Customer : 66

Contact : Kevin O'halloren

Phone :

Fax :

Email : kohalloren@cleanair.com

Requested Analysis

Due	Analyst	Status	Sample Type		Container	Method
5/14/2012	MT	In Queue	1-10	Filter	Petri Dish	US EPA Method 5F
5/14/2012	MT	In Queue	11-20	DI Water	Clear Glass Con	US EPA Method 5F
5/14/2012	MT	In Queue	21-21	Acetone	Amber Glass Jar	US EPA Method 202
5/14/2012	MT	In Queue	22-32	DI Water	Amber Glass Jar	US EPA Method 202
5/14/2012	MT	In Queue	33-43	Hexane	Amber Glass Jar	US EPA Method 202
5/14/2012	MT	In Queue	44-53	Filter	Petri Dish	US EPA Method 202
5/14/2012	EE	In Queue	54-80	Impinger C&R	Nalgene Contair	EPA CTM-027
5/14/2012	MT	In Queue	81-81	DI Water	Clear Glass Con	Archive
5/14/2012	MT	In Queue	82-82	DI Water	Nalgene Contair	Archive
5/14/2012	MT	In Queue	83-99	Ash	Metal Container	Archive

Printed 2012/04/30 08:59:08

General PM Worksheet

Technician <u>WJN</u>	Lab Proj <u>28842</u>	Cust Proj <u>12010</u>

Sample ID <u>-001</u>	Vol:	Sample ID <u>-017</u>	Vol:
Media ID <u>94306</u>	pH:	Media ID <u>9816</u>	pH:
Sample ID <u>-002</u>	Vol:	Sample ID <u>-015</u>	Vol:
Media ID <u>94306</u>	pH:	Media ID <u>9797</u>	pH:
Sample ID <u>-003</u>	Vol:	Sample ID <u>-014</u>	Vol:
Media ID <u>94305</u>	pH:	Media ID <u>9787</u>	pH:
Sample ID <u>-004</u>	Vol:	Sample ID <u>-017</u>	Vol:
Media ID <u>94307</u>	pH:	Media ID <u>9778</u>	pH:
Sample ID <u>-005</u>	Vol:	Sample ID <u>-018</u>	Vol:
Media ID <u>94305</u>	pH:	Media ID <u>9782</u>	pH:
Sample ID <u>-006</u>	Vol:	Sample ID <u>-019</u>	Vol:
Media ID <u>94304</u>	pH:	Media ID <u>9795</u>	pH:
Sample ID <u>-007</u>	Vol:	Sample ID <u>-020</u>	Vol:
Media ID <u>94303</u>	pH:	Media ID <u>9786</u>	pH:
Sample ID <u>-008</u>	Vol:	Sample ID <u>-021</u>	Vol:
Media ID <u>94302</u>	pH:	Media ID <u>9800</u>	pH:
Sample ID <u>-009</u>	Vol:	Sample ID <u>-022</u>	Vol:
Media ID <u>94301</u>	pH:	Media ID <u>9801</u>	pH:
Sample ID <u>-010</u>	Vol:	Sample ID <u>-023</u>	Vol:
Media ID <u>94300</u>	pH:	Media ID <u>9812</u>	pH:
Sample ID <u>-011</u>	Vol:	Sample ID <u>-024</u>	Vol:
Media ID <u>9779</u>	pH:	Media ID <u>9912</u>	pH:
Sample ID <u>-012</u>	Vol:	Sample ID <u>-025</u>	Vol:
Media ID <u>9781</u>	pH:	Media ID <u>9826</u>	pH:
Sample ID <u>-013</u>	Vol:	Sample ID <u>-026</u>	Vol:
Media ID <u>9799</u>	pH:	Media ID <u>9813</u>	pH:

OBSERVATIONS

General PM Worksheet

Technician <u>W221</u>	Lab Proj <u>28842</u>	Cust Proj <u>12010</u>

Sample ID <u>-027</u>	Vol:	Sample ID <u>-040</u>	Vol:
Media ID <u>9804</u>	pH:	Media ID <u>9845</u>	pH:
Sample ID <u>-028</u>	Vol:	Sample ID <u>-041</u>	Vol:
Media ID <u>9819</u>	pH:	Media ID <u>9783</u>	pH:
Sample ID <u>-029</u>	Vol:	Sample ID <u>-042</u>	Vol:
Media ID <u>9788</u>	pH:	Media ID <u>9780</u>	pH:
Sample ID <u>-030</u>	Vol:	Sample ID <u>-043</u>	Vol:
Media ID <u>9808</u>	pH:	Media ID <u>9780</u>	pH:
Sample ID <u>-031</u>	Vol:	Sample ID <u>-044</u>	Vol:
Media ID <u>9811</u>	pH:	Media ID _____	pH:
Sample ID <u>-032</u>	Vol:	Sample ID _____	Vol:
Media ID <u>9789</u>	pH:	Media ID _____	pH:
Sample ID <u>-033</u>	Vol: ✗	Sample ID _____	Vol:
Media ID <u>9817</u>	pH:	Media ID _____	pH:
Sample ID <u>-034</u>	Vol:	Sample ID _____	Vol:
Media ID <u>9846</u>	pH: ✗	Media ID _____	pH:
Sample ID <u>-035</u>	Vol:	Sample ID _____	Vol:
Media ID <u>9850</u>	pH: ✓	Media ID _____	pH:
Sample ID <u>-036</u>	Vol:	Sample ID _____	Vol:
Media ID <u>9841</u>	pH: ✓	Media ID _____	pH:
Sample ID <u>-037</u>	Vol:	Sample ID _____	Vol:
Media ID <u>9820</u>	pH: ✗	Media ID _____	pH:
Sample ID <u>-038</u>	Vol:	Sample ID _____	Vol:
Media ID <u>9824</u>	pH: ✗	Media ID _____	pH:
Sample ID <u>-039</u>	Vol:	Sample ID _____	Vol:
Media ID <u>9784</u>	pH: ✗	Media ID _____	pH:

OBSERVATIONS

leanAir Laboratory Services

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Sample(s) # 11-20

Lab Proj# 28842 Cust Proj# 12010

Oven 3 Start Date/Time 5/2/12 1030 Tech WJT
End Date/Time 5/6/12 1653 Tech WJT

Hood 7 Start Date/Time 4/30/12 1530 Tech WJT
End Date/Time 5/11/12 1515 Tech WJT

Desiccator 16 Date/Time 5/7/12 1053 Tech WJT

Desiccator 16 Date/Time 5/8/12 924 Tech WJT

Desiccator Date/Time Tech

Desiccator Date/Time Tech

X
CleanAir Laboratory Services

Sample(s) # 23, 33-32

Lab Proj# 28842 Cust Proj# 12010

Oven 3 Start Date/Time 04/30 1630 Tech DR
End Date/Time 5/4/12 1630 Tech WJT

Hood Start Date/Time Tech
End Date/Time Tech

Desiccator 16 Date/Time 5/1/12 1106 Tech WJT

Desiccator 16 Date/Time 5/8/12 947 Tech WJT

Desiccator Date/Time Tech

Desiccator Date/Time Tech

leanAir Laboratory Services

Sample(s) # 21, 33-43

Lab Proj# 28842 Cust Proj# 12010

Oven Start Date/Time Tech
End Date/Time Tech

Hood 6 Start Date/Time 04/30 1630 Tech DR
End Date/Time 5/5/12 1053 Tech WJT

Desiccator 22 Date/Time 5/7/12 1132 Tech WJT

Desiccator 22 Date/Time 5/8/12 1000 Tech WJT

Desiccator Date/Time Tech

Desiccator Date/Time Tech

PALATINE SOURCE GROUP
MARATHON PETROLEUM COMPANY

Customer Reference No: 12010
Laboratory Services Project No: 28842

DETECTION LIMIT DETERMINATION DATA

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Summary MDL Report

Sample Type	(1) F1/2 Filter
Recovery (%)	97.8
MDL (mg)	0.16
Is the spike level higher than the MDL?	TRUE
Is the spike level less than 10 times the MDL?	TRUE
Is the Avg Recovery between 90% < Ra < 110%	TRUE

Sample Type	(2) F1/2 Acetone Rinse
Recovery (%)	105.6
MDL (mg)	0.30
Is the spike level higher than the MDL?	TRUE
Is the spike level less than 10 times the MDL?	TRUE
Is the Avg Recovery between 90% < Ra < 110%	TRUE

Sample Type	(6) B1/2 Acetone Rinse
Recovery (%)	105.6
MDL (mg)	0.30
Is the spike level higher than the MDL?	TRUE
Is the spike level less than 10 times the MDL?	TRUE
Is the Avg Recovery between 90% < Ra < 110%	TRUE

Sample Type	(7) B1/2 Inorganic Rinse
Recovery (%)	104.4
MDL (mg)	0.26
Is the spike level higher than the MDL?	TRUE
Is the spike level less than 10 times the MDL?	TRUE
Is the Avg Recovery between 90% < Ra < 110%	TRUE

Summary MDL Report

Sample Type	(8) B1/2 Organic Rinse
Recovery (%)	106.8
MDL (mg)	0.30
Is the spike level higher than the MDL?	TRUE
Is the spike level less than 10 times the MDL?	TRUE
Is the Avg Recovery between 90% < Ra < 110%	TRUE

Blank Analysis MDL

The following samples are only the most recent analyzed. Previous data is available upon request.

Sample Type	Sample ID	Media ID	Weight (mg)	Volume (g)	Concentration (mg/g)*
Acetone	AB-180	9704	-0.08	184.91	-0.00043
	AB-181	9769	-0.06	358.96	-0.00017
DI Water	DB-152	9719	0.19	552.26	0.00034
	DB-153	9839	0.36	458.67	0.00078
	DB-154	9776	0.25	450.19	0.00056
Hexane	HB-063	9792	0.29	440.07	0.00066
	HB-064	9844	0.35	262.57	0.00133
	HB-065	9853	0.90	262.52	0.00343

*Filters are presented in mg

Spike Analysis MDL

The following samples are only the most recent analyzed. Previous data is available upon request.

Sample Type Acetone

Sample ID	Media ID	NetWt (mg)	Volume (g)	Net (W/V)	Blank (mg/g)*	Corrected (W/V)	Corrected (g)
AS-177	9882	2.39	187.97	0.01271	0.00042	0.01229	2.31
AS-178	10064	2.50	290.99	0.00859	0.00042	0.00817	2.38

Sample Type DI Water

Sample ID	Media ID	NetWt (mg)	Volume (g)	Net (W/V)	Blank (mg/g)*	Corrected (W/V)	Corrected (g)
DS-146	9721	2.77	546.52	0.00507	0.00055	0.00452	2.47
DS-147	9847	2.38	439.05	0.00542	0.00055	0.00487	2.14
DS-148	9838	2.51	436.85	0.00575	0.00055	0.00520	2.27

Sample Type Hexane

Sample ID	Media ID	NetWt (mg)	Volume (g)	Net (W/V)	Blank (mg/g)*	Corrected (W/V)	Corrected (g)
HS-062	9913	2.46	400.32	0.00615	0.00060	0.00555	2.22
HS-063	9840	2.57	298.90	0.00860	0.00060	0.00800	2.39
HS-064	9823	2.55	280.54	0.00909	0.00060	0.00849	2.38

Filters are presented in mg

CleanAir.

PALATINE SOURCE GROUP
MARATHON PETROLEUM COMPANY

Customer Reference No: 12010
Laboratory Services Project No: 28842

EQUIPMENT CALIBRATION RECORDS

vi

Revision 0

Balance Calibrations

<i>Balance Serial Number</i>	<i>Date</i>	<i>Time</i>	<i>Weight</i>	<i>Technician</i>
<i>1123181459</i>				
	4/9/2012	15:40	0.00197	mtuegel
	4/9/2012	15:42	0.00099	mtuegel
	4/9/2012	15:44	4.99998	mtuegel
	4/9/2012	15:45	0.50003	mtuegel
	4/9/2012	15:38	0.20000	mtuegel
	4/10/2012	8:34	0.20000	mtuegel
	4/10/2012	8:35	0.00200	mtuegel
	4/10/2012	8:37	0.00099	mtuegel
	4/10/2012	8:39	4.99999	mtuegel
	4/10/2012	8:40	0.50001	mtuegel
	4/10/2012	10:00	5.00001	mtuegel
	4/10/2012	10:01	0.50001	mtuegel
	4/11/2012	11:34	0.50000	mtuegel
	4/11/2012	14:08	0.50004	mtuegel
	4/11/2012	11:33	4.99999	mtuegel
	4/11/2012	14:09	5.00005	mtuegel
	4/11/2012	11:29	0.00201	mtuegel
	4/11/2012	11:28	0.20001	mtuegel
	4/11/2012	11:31	0.00100	mtuegel
	4/12/2012	10:07	0.49999	mtuegel
	4/12/2012	11:18	4.99998	mtuegel
	4/12/2012	10:06	4.99999	mtuegel
	4/12/2012	10:04	0.00100	mtuegel
	4/12/2012	10:02	0.00199	mtuegel
	4/12/2012	10:01	0.20002	mtuegel
	4/12/2012	11:19	0.49999	mtuegel
	4/13/2012	8:35	0.20002	mtuegel
	4/13/2012	8:37	0.00201	mtuegel
	4/13/2012	8:39	0.00102	mtuegel
	4/13/2012	8:44	5.00000	mtuegel
	4/13/2012	8:45	0.50000	mtuegel
	4/14/2012	8:40	0.00098	mtuegel
	4/14/2012	9:22	0.49997	mtuegel
	4/14/2012	9:22	4.99991	mtuegel
	4/14/2012	8:44	0.49997	mtuegel
	4/14/2012	8:39	0.00198	mtuegel
	4/14/2012	8:37	0.19998	mtuegel
	4/14/2012	8:43	4.99997	mtuegel

<i>Balance Serial Number</i>	<i>Date</i>	<i>Time</i>	<i>Weight</i>	<i>Technician</i>
<i>1123181459</i>				
	4/16/2012	10:06	4.99997	mtuegel
	4/16/2012	9:45	0.20000	mtuegel
	4/16/2012	9:47	0.00200	mtuegel
	4/16/2012	9:48	0.00100	mtuegel
	4/16/2012	9:52	4.99996	mtuegel
	4/16/2012	9:54	0.49997	mtuegel
	4/17/2012	9:10	0.49998	mtuegel
	4/17/2012	8:59	0.49998	mtuegel
	4/17/2012	8:58	5.00000	mtuegel
	4/17/2012	8:54	0.00098	mtuegel
	4/17/2012	8:52	0.19999	mtuegel
	4/17/2012	9:10	4.99999	mtuegel
	4/17/2012	8:53	0.00198	mtuegel
	4/18/2012	10:47	0.49998	mtuegel
	4/18/2012	10:58	4.99997	mtuegel
	4/18/2012	10:59	0.49999	mtuegel
	4/18/2012	10:46	4.99998	mtuegel
	4/18/2012	10:41	0.00100	mtuegel
	4/18/2012	10:32	0.20000	mtuegel
	4/18/2012	10:40	0.00201	mtuegel
	4/19/2012	10:19	0.20002	mtuegel
	4/19/2012	10:20	0.00200	mtuegel
	4/19/2012	10:21	0.00100	mtuegel
	4/19/2012	10:24	4.99997	mtuegel
	4/19/2012	10:26	0.50000	mtuegel
	4/20/2012	8:30	0.50000	mtuegel
	4/20/2012	8:19	0.20002	mtuegel
	4/20/2012	8:23	0.00198	mtuegel
	4/20/2012	8:25	0.00097	mtuegel
	4/20/2012	8:29	4.99996	mtuegel
	4/23/2012	8:34	0.20001	mtuegel
	4/23/2012	8:39	0.00101	mtuegel
	4/23/2012	8:42	4.99996	mtuegel
	4/23/2012	8:43	0.50000	mtuegel
	4/23/2012	8:36	0.00202	mtuegel
	4/24/2012	8:48	0.00099	mtuegel
	4/24/2012	9:00	4.99996	mtuegel
	4/24/2012	8:36	0.00197	mtuegel
	4/24/2012	8:35	0.20000	mtuegel
	4/24/2012	9:06	0.49999	mtuegel

<i>Balance Serial Number</i>	<i>Date</i>	<i>Time</i>	<i>Weight</i>	<i>Technician</i>
<i>1123181459</i>				
	4/25/2012	8:37	0.20000	mtuegel
	4/25/2012	8:38	0.00199	mtuegel
	4/25/2012	8:39	0.00101	mtuegel
	4/25/2012	8:42	4.99998	mtuegel
	4/25/2012	8:43	0.50001	mtuegel
	4/26/2012	8:37	0.00097	mtuegel
	4/26/2012	8:39	5.00000	mtuegel
	4/26/2012	8:34	0.00200	mtuegel
	4/26/2012	8:32	0.44510	mtuegel
	4/26/2012	8:41	0.50001	mtuegel
	4/27/2012	11:07	0.50005	mtuegel
	4/27/2012	8:47	0.19998	mtuegel
	4/27/2012	8:48	0.00200	mtuegel
	4/27/2012	8:49	0.00097	mtuegel
	4/27/2012	8:53	5.00006	mtuegel
	4/27/2012	8:54	0.50003	mtuegel
	4/27/2012	11:06	5.00003	mtuegel
	4/30/2012	11:38	5.00000	mtuegel
	4/30/2012	8:50	0.50002	mtuegel
	4/30/2012	8:48	5.00000	mtuegel
	4/30/2012	8:45	0.00100	mtuegel
	4/30/2012	8:42	0.20001	mtuegel
	4/30/2012	11:39	0.50000	mtuegel
	4/30/2012	8:43	0.00202	mtuegel
	5/1/2012	9:09	0.49996	mtuegel
	5/1/2012	14:42	5.00000	mtuegel
	5/1/2012	14:43	0.50000	mtuegel
	5/1/2012	9:06	0.00097	mtuegel
	5/1/2012	9:04	0.20003	mtuegel
	5/1/2012	9:05	0.00202	mtuegel
	5/1/2012	9:09	5.00000	mtuegel
	5/2/2012	9:00	0.50005	mtuegel
	5/2/2012	10:44	5.00000	mtuegel
	5/2/2012	8:58	5.00002	mtuegel
	5/2/2012	8:55	0.00105	mtuegel
	5/2/2012	8:53	0.00202	mtuegel
	5/2/2012	8:52	0.20004	mtuegel
	5/2/2012	10:45	0.49999	mtuegel
	5/3/2012	16:25	0.50006	mtuegel
	5/3/2012	16:17	0.20008	mtuegel

<i>Balance Serial Number</i>	<i>Date</i>	<i>Time</i>	<i>Weight</i>	<i>Technician</i>
1123181459				
	5/3/2012	16:19	0.00207	mtuegel
	5/3/2012	16:22	0.00108	mtuegel
	5/3/2012	16:24	5.00005	mtuegel
	5/7/2012	10:25	5.00001	mtuegel
	5/7/2012	10:26	0.49999	mtuegel
	5/7/2012	11:56	4.99998	mtuegel
	5/7/2012	10:22	0.00100	mtuegel
	5/7/2012	10:20	0.19999	mtuegel
	5/7/2012	10:21	0.00198	mtuegel
	5/8/2012	8:46	0.20000	mtuegel
	5/8/2012	8:47	0.00200	mtuegel
	5/8/2012	8:49	0.00099	mtuegel
	5/8/2012	8:51	4.99999	mtuegel
	5/8/2012	8:52	0.49996	mtuegel
	5/9/2012	9:02	0.49999	mtuegel
	5/9/2012	8:56	0.19999	mtuegel
	5/9/2012	8:57	0.00199	mtuegel
	5/9/2012	8:58	0.00101	mtuegel
	5/9/2012	9:01	4.99998	mtuegel

Balance Calibrations

<i>Balance Serial Number</i>	<i>Date</i>	<i>Time</i>	<i>Weight</i>	<i>Technician</i>

1123173913

4/9/2012	15:40	0.00106	mtuegel
4/9/2012	15:42	0.20005	mtuegel
4/9/2012	15:43	5.00003	mtuegel
4/9/2012	15:44	0.50001	mtuegel
4/9/2012	15:38	0.00201	mtuegel
4/10/2012	8:34	0.00199	mtuegel
4/10/2012	8:35	0.00099	mtuegel
4/10/2012	8:37	0.19999	mtuegel
4/10/2012	8:39	4.99998	mtuegel
4/10/2012	8:40	0.50001	mtuegel
4/10/2012	9:59	5.00003	mtuegel
4/10/2012	10:00	0.50002	mtuegel
4/11/2012	11:33	0.50004	mtuegel
4/11/2012	14:07	0.50001	mtuegel
4/11/2012	11:32	5.00003	mtuegel
4/11/2012	14:08	4.99997	mtuegel
4/11/2012	11:30	0.00103	mtuegel
4/11/2012	11:28	0.00202	mtuegel
4/11/2012	11:31	0.20002	mtuegel
4/12/2012	10:06	0.50000	mtuegel
4/12/2012	11:14	5.00000	mtuegel
4/12/2012	10:05	4.99998	mtuegel
4/12/2012	10:04	0.20002	mtuegel
4/12/2012	10:02	0.00099	mtuegel
4/12/2012	10:01	0.00200	mtuegel
4/12/2012	11:18	0.50000	mtuegel
4/13/2012	8:35	0.00201	mtuegel
4/13/2012	8:37	0.00099	mtuegel
4/13/2012	8:39	0.20002	mtuegel
4/13/2012	8:44	5.00002	mtuegel
4/13/2012	8:44	0.50002	mtuegel
4/14/2012	8:40	0.19999	mtuegel
4/14/2012	9:22	0.50000	mtuegel
4/14/2012	9:21	5.00004	mtuegel
4/14/2012	8:43	0.49999	mtuegel
4/14/2012	8:39	0.00099	mtuegel
4/14/2012	8:37	0.00200	mtuegel
4/14/2012	8:42	5.00000	mtuegel

<i>Balance Serial Number</i>	<i>Date</i>	<i>Time</i>	<i>Weight</i>	<i>Technician</i>
<i>1123173913</i>				
	4/16/2012	10:06	4.99996	mtuegel
	4/16/2012	9:45	0.00203	mtuegel
	4/16/2012	9:47	0.00098	mtuegel
	4/16/2012	9:48	0.19998	mtuegel
	4/16/2012	9:51	5.00002	mtuegel
	4/16/2012	9:52	0.49998	mtuegel
	4/17/2012	9:10	4.99997	mtuegel
	4/17/2012	8:59	0.50003	mtuegel
	4/17/2012	8:58	5.00000	mtuegel
	4/17/2012	8:54	0.19999	mtuegel
	4/17/2012	8:52	0.00200	mtuegel
	4/17/2012	9:10	0.49996	mtuegel
	4/17/2012	8:53	0.00099	mtuegel
	4/18/2012	10:46	0.50003	mtuegel
	4/18/2012	10:58	0.50004	mtuegel
	4/18/2012	10:59	5.00003	mtuegel
	4/18/2012	10:46	5.00006	mtuegel
	4/18/2012	10:41	0.20003	mtuegel
	4/18/2012	10:33	0.00200	mtuegel
	4/18/2012	10:40	0.00102	mtuegel
	4/19/2012	10:19	0.00201	mtuegel
	4/19/2012	10:20	0.00099	mtuegel
	4/19/2012	10:21	0.20001	mtuegel
	4/19/2012	10:23	5.00000	mtuegel
	4/19/2012	10:24	0.50007	mtuegel
	4/20/2012	8:29	0.49998	mtuegel
	4/20/2012	8:19	0.00199	mtuegel
	4/20/2012	8:23	0.00100	mtuegel
	4/20/2012	8:25	0.20000	mtuegel
	4/20/2012	8:28	4.99997	mtuegel
	4/23/2012	8:34	0.00200	mtuegel
	4/23/2012	8:39	0.20001	mtuegel
	4/23/2012	8:41	4.99997	mtuegel
	4/23/2012	8:42	0.50003	mtuegel
	4/23/2012	8:36	0.00100	mtuegel
	4/24/2012	8:50	0.20001	mtuegel
	4/24/2012	8:57	5.00001	mtuegel
	4/24/2012	8:38	0.00100	mtuegel
	4/24/2012	8:35	0.00199	mtuegel
	4/24/2012	9:01	0.50002	mtuegel

<i>Balance Serial Number</i>	<i>Date</i>	<i>Time</i>	<i>Weight</i>	<i>Technician</i>
<i>1123173913</i>				
	4/25/2012	8:37	0.00199	mtuegel
	4/25/2012	8:38	0.00098	mtuegel
	4/25/2012	8:39	0.20000	mtuegel
	4/25/2012	8:41	5.00002	mtuegel
	4/25/2012	8:42	0.50001	mtuegel
	4/26/2012	8:37	0.20001	mtuegel
	4/26/2012	8:39	5.00001	mtuegel
	4/26/2012	8:34	0.00100	mtuegel
	4/26/2012	8:32	0.00198	mtuegel
	4/26/2012	8:40	0.50002	mtuegel
	4/27/2012	11:06	0.49998	mtuegel
	4/27/2012	8:47	0.00201	mtuegel
	4/27/2012	8:48	0.00100	mtuegel
	4/27/2012	8:49	0.19999	mtuegel
	4/27/2012	8:52	5.00000	mtuegel
	4/27/2012	8:53	0.50002	mtuegel
	4/27/2012	11:05	5.00000	mtuegel
	4/30/2012	11:37	5.00001	mtuegel
	4/30/2012	8:48	0.50003	mtuegel
	4/30/2012	8:47	5.00000	mtuegel
	4/30/2012	8:45	0.20000	mtuegel
	4/30/2012	8:42	0.00198	mtuegel
	4/30/2012	11:38	0.50003	mtuegel
	4/30/2012	8:43	0.00099	mtuegel
	5/1/2012	9:09	0.49997	mtuegel
	5/1/2012	14:41	5.00000	mtuegel
	5/1/2012	14:42	0.49999	mtuegel
	5/1/2012	9:06	0.19999	mtuegel
	5/1/2012	9:04	0.00200	mtuegel
	5/1/2012	9:05	0.00099	mtuegel
	5/1/2012	9:08	5.00003	mtuegel
	5/2/2012	8:58	0.50005	mtuegel
	5/2/2012	10:43	5.00002	mtuegel
	5/2/2012	8:57	5.00005	mtuegel
	5/2/2012	8:55	0.20002	mtuegel
	5/2/2012	8:53	0.00104	mtuegel
	5/2/2012	8:52	0.00203	mtuegel
	5/2/2012	10:44	0.50001	mtuegel
	5/3/2012	16:24	0.49999	mtuegel
	5/3/2012	16:17	0.00197	mtuegel

<i>Balance Serial Number</i>	<i>Date</i>	<i>Time</i>	<i>Weight</i>	<i>Technician</i>
<i>1123173913</i>				
	5/3/2012	16:19	0.00101	mtuegel
	5/3/2012	16:22	0.19999	mtuegel
	5/3/2012	16:23	5.00002	mtuegel
	5/7/2012	10:24	5.00001	mtuegel
	5/7/2012	10:25	0.49998	mtuegel
	5/7/2012	11:55	5.00000	mtuegel
	5/7/2012	10:22	0.19998	mtuegel
	5/7/2012	10:20	0.00199	mtuegel
	5/7/2012	10:21	0.00098	mtuegel
	5/8/2012	8:46	0.00198	mtuegel
	5/8/2012	8:47	0.00098	mtuegel
	5/8/2012	8:49	0.19999	mtuegel
	5/8/2012	8:50	5.00003	mtuegel
	5/8/2012	8:51	0.50000	mtuegel
	5/9/2012	9:01	0.50001	mtuegel
	5/9/2012	8:56	0.00200	mtuegel
	5/9/2012	8:57	0.00104	mtuegel
	5/9/2012	8:58	0.20002	mtuegel
	5/9/2012	9:00	5.00003	mtuegel

Balance Calibrations

<i>Balance Serial Number</i>	<i>Date</i>	<i>Time</i>	<i>Weight</i>	<i>Technician</i>
<i>1127211987</i>				
	4/9/2012	15:40	0.20005	mtuegel
	4/9/2012	15:42	0.00203	mtuegel
	4/9/2012	15:43	0.50004	mtuegel
	4/9/2012	15:45	5.00004	mtuegel
	4/9/2012	15:38	0.00101	mtuegel
	4/10/2012	8:34	0.00101	mtuegel
	4/10/2012	8:35	0.20001	mtuegel
	4/10/2012	8:37	0.00201	mtuegel
	4/10/2012	8:39	0.50003	mtuegel
	4/10/2012	8:40	5.00002	mtuegel
	4/10/2012	9:59	0.50005	mtuegel
	4/10/2012	10:01	5.00007	mtuegel
	4/11/2012	11:34	5.00005	mtuegel
	4/11/2012	14:07	5.00003	mtuegel
	4/11/2012	11:32	0.50002	mtuegel
	4/11/2012	14:09	0.50003	mtuegel
	4/11/2012	11:30	0.20006	mtuegel
	4/11/2012	11:28	0.00101	mtuegel
	4/11/2012	11:31	0.00201	mtuegel
	4/12/2012	11:14	0.50001	mtuegel
	4/12/2012	11:19	5.00003	mtuegel
	4/12/2012	10:07	5.00005	mtuegel
	4/12/2012	10:05	0.50001	mtuegel
	4/12/2012	10:04	0.00199	mtuegel
	4/12/2012	10:02	0.20005	mtuegel
	4/12/2012	10:01	0.00100	mtuegel
	4/13/2012	8:37	0.20003	mtuegel
	4/13/2012	8:39	0.00202	mtuegel
	4/13/2012	8:44	0.50004	mtuegel
	4/13/2012	8:45	5.00006	mtuegel
	4/13/2012	8:35	0.00101	mtuegel
	4/14/2012	8:39	0.20002	mtuegel
	4/14/2012	9:22	5.00004	mtuegel
	4/14/2012	9:21	0.50001	mtuegel
	4/14/2012	8:44	5.00003	mtuegel
	4/14/2012	8:40	0.00201	mtuegel
	4/14/2012	8:37	0.00100	mtuegel
	4/14/2012	8:42	0.50004	mtuegel

<i>Balance Serial Number</i>	<i>Date</i>	<i>Time</i>	<i>Weight</i>	<i>Technician</i>
1127211987				
	4/16/2012	9:54	5.00002	mtuegel
	4/16/2012	10:05	5.00002	mtuegel
	4/16/2012	9:51	0.50003	mtuegel
	4/16/2012	9:48	0.00201	mtuegel
	4/16/2012	9:47	0.20001	mtuegel
	4/16/2012	9:45	0.00101	mtuegel
	4/17/2012	8:53	0.20002	mtuegel
	4/17/2012	8:54	0.00200	mtuegel
	4/17/2012	8:58	0.50003	mtuegel
	4/17/2012	9:00	5.00003	mtuegel
	4/17/2012	8:52	0.00101	mtuegel
	4/18/2012	10:33	0.00101	mtuegel
	4/18/2012	10:47	5.00003	mtuegel
	4/18/2012	10:46	0.50003	mtuegel
	4/18/2012	10:40	0.20002	mtuegel
	4/18/2012	10:41	0.00201	mtuegel
	4/19/2012	10:19	0.00100	mtuegel
	4/19/2012	10:20	0.20002	mtuegel
	4/19/2012	10:21	0.00200	mtuegel
	4/19/2012	10:23	0.50002	mtuegel
	4/19/2012	10:26	5.00002	mtuegel
	4/20/2012	8:19	0.00101	mtuegel
	4/20/2012	8:23	0.20002	mtuegel
	4/20/2012	8:25	0.00201	mtuegel
	4/20/2012	8:28	0.50002	mtuegel
	4/20/2012	8:30	5.00003	mtuegel
	4/23/2012	8:41	0.50004	mtuegel
	4/23/2012	8:34	0.00101	mtuegel
	4/23/2012	8:36	0.20003	mtuegel
	4/23/2012	8:43	5.00002	mtuegel
	4/23/2012	8:39	0.00201	mtuegel
	4/24/2012	8:35	0.00100	mtuegel
	4/24/2012	8:40	0.00100	mtuegel
	4/24/2012	8:54	0.00200	mtuegel
	4/24/2012	8:59	0.50002	mtuegel
	4/24/2012	9:06	5.00003	mtuegel
	4/25/2012	8:38	0.20004	mtuegel
	4/25/2012	8:43	5.00004	mtuegel
	4/25/2012	8:40	0.00202	mtuegel
	4/25/2012	8:37	0.00100	mtuegel

<i>Balance Serial Number</i>	<i>Date</i>	<i>Time</i>	<i>Weight</i>	<i>Technician</i>
1127211987				
	4/25/2012	8:41	0.50005	mtuegel
	4/26/2012	8:41	5.00002	mtuegel
	4/26/2012	8:32	0.00101	mtuegel
	4/26/2012	8:34	0.20000	mtuegel
	4/26/2012	8:37	0.00200	mtuegel
	4/26/2012	8:39	0.50003	mtuegel
	4/27/2012	8:54	5.00003	mtuegel
	4/27/2012	11:07	5.00003	mtuegel
	4/27/2012	11:05	0.50003	mtuegel
	4/27/2012	8:52	0.50003	mtuegel
	4/27/2012	8:49	0.00206	mtuegel
	4/27/2012	8:47	0.00100	mtuegel
	4/27/2012	8:48	0.20000	mtuegel
	4/30/2012	8:42	0.00101	mtuegel
	4/30/2012	8:43	0.20002	mtuegel
	4/30/2012	8:45	0.00201	mtuegel
	4/30/2012	8:47	0.50003	mtuegel
	4/30/2012	8:50	5.00003	mtuegel
	4/30/2012	11:37	0.50001	mtuegel
	4/30/2012	11:39	5.00003	mtuegel
	5/1/2012	9:09	5.00004	mtuegel
	5/1/2012	9:04	0.00101	mtuegel
	5/1/2012	14:41	0.50002	mtuegel
	5/1/2012	14:43	5.00000	mtuegel
	5/1/2012	9:05	0.20005	mtuegel
	5/1/2012	9:06	0.00200	mtuegel
	5/1/2012	9:08	0.50002	mtuegel
	5/2/2012	10:43	0.50000	mtuegel
	5/2/2012	10:45	5.00000	mtuegel
	5/2/2012	9:00	5.00002	mtuegel
	5/2/2012	8:57	0.50003	mtuegel
	5/2/2012	8:55	0.00203	mtuegel
	5/2/2012	8:53	0.20003	mtuegel
	5/2/2012	8:52	0.00101	mtuegel
	5/3/2012	16:25	5.00000	mtuegel
	5/3/2012	16:19	0.20000	mtuegel
	5/3/2012	16:22	0.00197	mtuegel
	5/3/2012	16:23	0.49997	mtuegel
	5/3/2012	16:17	0.00099	mtuegel
	5/7/2012	10:24	0.50001	mtuegel

<i>Balance Serial Number</i>	<i>Date</i>	<i>Time</i>	<i>Weight</i>	<i>Technician</i>
<i>1127211987</i>				
	5/7/2012	10:26	5.00003	mtuegel
	5/7/2012	11:54	5.00002	mtuegel
	5/7/2012	10:22	0.00199	mtuegel
	5/7/2012	10:20	0.00100	mtuegel
	5/7/2012	10:21	0.20001	mtuegel
	5/8/2012	8:46	0.00101	mtuegel
	5/8/2012	8:47	0.20002	mtuegel
	5/8/2012	8:49	0.00201	mtuegel
	5/8/2012	8:50	0.50003	mtuegel
	5/8/2012	8:52	5.00004	mtuegel
	5/9/2012	9:02	5.00004	mtuegel
	5/9/2012	8:56	0.00102	mtuegel
	5/9/2012	8:57	0.20007	mtuegel
	5/9/2012	8:58	0.00202	mtuegel
	5/9/2012	9:00	0.50003	mtuegel

Balance Calibrations

<i>Balance Serial Number</i>	<i>Date</i>	<i>Time</i>	<i>Weight</i>	<i>Technician</i>

80123444

4/9/2012	9:02	999.98	mtuegel
4/9/2012	9:02	499.99	mtuegel
4/9/2012	9:01	100.00	mtuegel
4/9/2012	9:00	50.00	mtuegel
4/9/2012	8:59	19.99	mtuegel
4/13/2012	9:29	50.00	mtuegel
4/13/2012	9:31	999.99	mtuegel
4/13/2012	9:29	100.00	mtuegel
4/13/2012	9:28	20.00	mtuegel
4/13/2012	9:30	499.99	mtuegel
4/16/2012	8:49	999.99	mtuegel
4/16/2012	8:48	499.99	mtuegel
4/16/2012	8:46	20.00	mtuegel
4/16/2012	8:47	100.00	mtuegel
4/16/2012	8:47	50.00	mtuegel
4/23/2012	9:05	499.99	mtuegel
4/23/2012	9:04	100.00	mtuegel
4/23/2012	9:04	50.00	mtuegel
4/23/2012	9:04	20.00	mtuegel
4/23/2012	9:06	999.99	mtuegel
4/24/2012	9:17	50.00	mtuegel
4/24/2012	9:21	999.98	mtuegel
4/24/2012	9:17	100.00	mtuegel
4/24/2012	9:17	20.00	mtuegel
4/24/2012	9:20	499.99	mtuegel
4/25/2012	8:49	20.00	mtuegel
4/25/2012	8:52	50.00	mtuegel
4/25/2012	8:52	100.00	mtuegel
4/25/2012	8:52	499.99	mtuegel
4/25/2012	8:53	999.99	mtuegel
4/26/2012	9:00	500.00	mtuegel
4/26/2012	8:59	20.00	mtuegel
4/26/2012	8:59	50.00	mtuegel

<i>Balance Serial Number</i>	<i>Date</i>	<i>Time</i>	<i>Weight</i>	<i>Technician</i>
80123444				
	4/26/2012	8:59	100.00	mtuegel
	4/26/2012	9:00	999.99	mtuegel
	4/30/2012	8:57	50.00	mtuegel
	4/30/2012	8:58	100.00	mtuegel
	4/30/2012	9:01	499.99	mtuegel
	4/30/2012	9:02	999.99	mtuegel
	4/30/2012	8:57	20.00	mtuegel
	5/1/2012	9:55	100.00	mtuegel
	5/1/2012	9:59	500.00	mtuegel
	5/1/2012	9:55	50.00	mtuegel
	5/1/2012	9:55	20.00	mtuegel
	5/1/2012	9:59	1000.00	mtuegel
	5/2/2012	10:48	20.00	mtuegel
	5/2/2012	10:48	50.00	mtuegel
	5/2/2012	10:48	100.01	mtuegel
	5/2/2012	10:49	500.00	mtuegel
	5/2/2012	10:49	1000.00	mtuegel
	5/3/2012	9:02	50.00	mtuegel
	5/3/2012	9:04	999.99	mtuegel
	5/3/2012	9:02	20.00	mtuegel
	5/3/2012	9:03	100.01	mtuegel
	5/3/2012	9:03	500.00	mtuegel
	5/7/2012	11:22	20.00	mtuegel
	5/7/2012	11:22	50.00	mtuegel
	5/7/2012	11:22	100.00	mtuegel
	5/7/2012	11:23	500.00	mtuegel
	5/7/2012	11:24	1000.00	mtuegel
	5/8/2012	11:50	20.00	mtuegel
	5/8/2012	11:52	1000.00	mtuegel
	5/8/2012	11:52	499.99	mtuegel
	5/8/2012	11:51	50.00	mtuegel
	5/8/2012	11:51	100.00	mtuegel
	5/9/2012	9:09	999.99	mtuegel
	5/9/2012	9:07	20.01	mtuegel
	5/9/2012	9:07	50.00	mtuegel

<i>Balance Serial Number</i>	<i>Date</i>	<i>Time</i>	<i>Weight</i>	<i>Technician</i>
80123444				
	5/9/2012	9:07	100.00	mtuegel
	5/9/2012	9:08	500.00	mtuegel

CleanAir.

PALATINE SOURCE GROUP
MARATHON PETROLEUM COMPANY

Customer Reference No: 12010
Laboratory Services Project No: 28842

SAMPLE VOLUME DATA

vii

Sample Volume Data

Sample ID **28842-011**

<i>Field Volume</i>	<i>As Received</i>	<i>Total Evaporated</i>	<i>Container Rinse</i>	<i>Sample Extraction</i>	<i>Filter Extaction</i>	<i>Sample Titration</i>
150	152.3	490.0				

Sample ID **28842-012**

<i>Field Volume</i>	<i>As Received</i>	<i>Total Evaporated</i>	<i>Container Rinse</i>	<i>Sample Extraction</i>	<i>Filter Extaction</i>	<i>Sample Titration</i>
178	176.5	490.0				

Sample ID **28842-013**

<i>Field Volume</i>	<i>As Received</i>	<i>Total Evaporated</i>	<i>Container Rinse</i>	<i>Sample Extraction</i>	<i>Filter Extaction</i>	<i>Sample Titration</i>
153	154.0	490.0				

Sample ID **28842-014**

<i>Field Volume</i>	<i>As Received</i>	<i>Total Evaporated</i>	<i>Container Rinse</i>	<i>Sample Extraction</i>	<i>Filter Extaction</i>	<i>Sample Titration</i>
172	168.3	490.0				

Sample ID **28842-015**

<i>Field Volume</i>	<i>As Received</i>	<i>Total Evaporated</i>	<i>Container Rinse</i>	<i>Sample Extraction</i>	<i>Filter Extaction</i>	<i>Sample Titration</i>
141	140.5	490.0				

Sample ID **28842-016**

<i>Field Volume</i>	<i>As Received</i>	<i>Total Evaporated</i>	<i>Container Rinse</i>	<i>Sample Extraction</i>	<i>Filter Extaction</i>	<i>Sample Titration</i>
151	146.1	490.0				

Sample ID **28842-017**

<i>Field Volume</i>	<i>As Received</i>	<i>Total Evaporated</i>	<i>Container Rinse</i>	<i>Sample Extraction</i>	<i>Filter Extaction</i>	<i>Sample Titration</i>
185	182.1	490.0				

Sample ID **28842-018**

<i>Field Volume</i>	<i>As Received</i>	<i>Total Evaporated</i>	<i>Container Rinse</i>	<i>Sample Extraction</i>	<i>Filter Extaction</i>	<i>Sample Titration</i>
133	140.3	490.0				

Sample ID **28842-019**

<i>Field Volume</i>	<i>As Received</i>	<i>Total Evaporated</i>	<i>Container Rinse</i>	<i>Sample Extraction</i>	<i>Filter Extaction</i>	<i>Sample Titration</i>
146	144.0	490.0				

Sample ID **28842-020**

<i>Field Volume</i>	<i>As Received</i>	<i>Total Evaporated</i>	<i>Container Rinse</i>	<i>Sample Extraction</i>	<i>Filter Extaction</i>	<i>Sample Titration</i>
183	174.8	490.0				

Note: All volumes are recorded in grams

Sample Volume Data

Sample ID 28842-021

Field Volume	As Received	Total Evaporated	Container Rinse	Sample Extraction	Filter Extaction	Sample Titration
	164.3	177.4	13.1			

Sample ID 28842-022

Field Volume	As Received	Total Evaporated	Container Rinse	Sample Extraction	Filter Extaction	Sample Titration
200	199.0	316.2	17.2			100.0

Sample ID 28842-023

Field Volume	As Received	Total Evaporated	Container Rinse	Sample Extraction	Filter Extaction	Sample Titration
352	351.5	530.1	24.7	5.5	48.5	100.0

Sample ID 28842-024

Field Volume	As Received	Total Evaporated	Container Rinse	Sample Extraction	Filter Extaction	Sample Titration
348	346.1	538.1	26.4	8.4	57.2	100.0

Sample ID 28842-025

Field Volume	As Received	Total Evaporated	Container Rinse	Sample Extraction	Filter Extaction	Sample Titration
330	326.4	510.5	24.2	7.5	52.4	100.0

Sample ID 28842-026

Field Volume	As Received	Total Evaporated	Container Rinse	Sample Extraction	Filter Extaction	Sample Titration
312	309.0	486.4	16.8	11.8	48.8	100.0

Sample ID 28842-027

Field Volume	As Received	Total Evaporated	Container Rinse	Sample Extraction	Filter Extaction	Sample Titration
324	320.7	510.5	23.6	7.1	59.1	100.0

Sample ID 28842-028

Field Volume	As Received	Total Evaporated	Container Rinse	Sample Extraction	Filter Extaction	Sample Titration
326	324.6	506.6	25.4	7.6	49.1	100.0

Sample ID 28842-029

Field Volume	As Received	Total Evaporated	Container Rinse	Sample Extraction	Filter Extaction	Sample Titration
326	324.6	504.7	19.9	8.3	51.9	100.0

Sample ID 28842-030

Field Volume	As Received	Total Evaporated	Container Rinse	Sample Extraction	Filter Extaction	Sample Titration
325	322.1	500.2	20.4	9.7	47.9	100.0

Note: All volumes are recorded in grams

Sample Volume Data

Sample ID 28842-031

<i>Field Volume</i>	<i>As Received</i>	<i>Total Evaporated</i>	<i>Container Rinse</i>	<i>Sample Extraction</i>	<i>Filter Extaction</i>	<i>Sample Titration</i>
334	331.7	503.5	19.0	9.6	43.2	100.0

Sample ID 28842-032

<i>Field Volume</i>	<i>As Received</i>	<i>Total Evaporated</i>	<i>Container Rinse</i>	<i>Sample Extraction</i>	<i>Filter Extaction</i>	<i>Sample Titration</i>
333	331.5	510.1	17.0	11.8	49.8	100.0

Sample ID 28842-033

<i>Field Volume</i>	<i>As Received</i>	<i>Total Evaporated</i>	<i>Container Rinse</i>	<i>Sample Extraction</i>	<i>Filter Extaction</i>	<i>Sample Titration</i>
	132.7	140.6	7.9			

Sample ID 28842-034

<i>Field Volume</i>	<i>As Received</i>	<i>Total Evaporated</i>	<i>Container Rinse</i>	<i>Sample Extraction</i>	<i>Filter Extaction</i>	<i>Sample Titration</i>
	235.4	328.3	5.9	54.0	33.0	

Sample ID 28842-035

<i>Field Volume</i>	<i>As Received</i>	<i>Total Evaporated</i>	<i>Container Rinse</i>	<i>Sample Extraction</i>	<i>Filter Extaction</i>	<i>Sample Titration</i>
	211.8	310.1	9.2	54.8	34.3	

Sample ID 28842-036

<i>Field Volume</i>	<i>As Received</i>	<i>Total Evaporated</i>	<i>Container Rinse</i>	<i>Sample Extraction</i>	<i>Filter Extaction</i>	<i>Sample Titration</i>
	220.6	305.5	4.5	53.3	27.1	

Sample ID 28842-037

<i>Field Volume</i>	<i>As Received</i>	<i>Total Evaporated</i>	<i>Container Rinse</i>	<i>Sample Extraction</i>	<i>Filter Extaction</i>	<i>Sample Titration</i>
	226.8	316.1	7.1	54.9	27.3	

Sample ID 28842-038

<i>Field Volume</i>	<i>As Received</i>	<i>Total Evaporated</i>	<i>Container Rinse</i>	<i>Sample Extraction</i>	<i>Filter Extaction</i>	<i>Sample Titration</i>
	202.2	295.4	4.8	52.3	36.2	

Sample ID 28842-039

<i>Field Volume</i>	<i>As Received</i>	<i>Total Evaporated</i>	<i>Container Rinse</i>	<i>Sample Extraction</i>	<i>Filter Extaction</i>	<i>Sample Titration</i>
	186.4	275.8	5.4	52.8	31.1	

Sample ID 28842-040

<i>Field Volume</i>	<i>As Received</i>	<i>Total Evaporated</i>	<i>Container Rinse</i>	<i>Sample Extraction</i>	<i>Filter Extaction</i>	<i>Sample Titration</i>
	187.8	279.2	7.0	54.3	30.2	

Note: All volumes are recorded in grams

Sample Volume Data

Sample ID **28842-041**

<i>Field Volume</i>	<i>As Received</i>	<i>Total Evaporated</i>	<i>Container Rinse</i>	<i>Sample Extraction</i>	<i>Filter Extaction</i>	<i>Sample Titration</i>
	180.3	264.0	0.2	52.1	31.4	

Sample ID **28842-042**

<i>Field Volume</i>	<i>As Received</i>	<i>Total Evaporated</i>	<i>Container Rinse</i>	<i>Sample Extraction</i>	<i>Filter Extaction</i>	<i>Sample Titration</i>
	178.5	277.2	6.1	54.1	38.5	

Sample ID **28842-043**

<i>Field Volume</i>	<i>As Received</i>	<i>Total Evaporated</i>	<i>Container Rinse</i>	<i>Sample Extraction</i>	<i>Filter Extaction</i>	<i>Sample Titration</i>
	238.2	325.1	0.9	56.7	29.3	

Note: All volumes are recorded in grams

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Laboratory Analysis for Anions

Performed For:
Palatine Engineering Group
500 West Wood Street
Palatine, IL 60067

Laboratory Report No: 64-28842_IC_SO4_M5F_V0
Customer Reference No: 12010

Revision 0 - Dated: 05/09/2012

To the best of our knowledge, the laboratory results presented in this report are accurate, complete, error free, legible and representative of the samples per the analysis described here-in.

Digitally signed
by Eric Ewing
Date: 2012.05.09
09:57:07 -05'00'

Eric Ewing
Title: Analyst
email: eewing@cleanair.com
Ph: 847-654-4519

Digitally signed by
Douglas D. Rhoades
Date: 2012.05.09
10:50:34 -05'00'

Douglas D. Rhoades
Title: Team Leader
email: drhoades@cleanair.com
Ph: 847-654-4504



CERTIFICATE OF ANALYSIS
Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28842	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Method 5F			Analyte:	Sulfate

Laboratory Sample Identification Number	Sample Identification	Sample Volume (mL)	Sulfate Sample Conc. (mg/L)	Total Sulfate (mg)
Control Blank CB-002	Control Blank	500	<	
Reagent Blank 28842-011A	M5F Combination RB	500	<	
FCCU Regen Stack 28842-012A	M5F Combination R1	500	1.36	0.68
28842-013A	M5F Combination R2	500	1.27	0.63
28842-014A	M5F Combination R3	500	1.31	0.66
28842-015A	M5F Combination R4	500	0.99†	0.50
28842-016A	M5F Combination R5	500	1.05	0.52
28842-017A	M5F Combination R6	500	1.12	0.56
28842-018A	M5F Combination R7	500	1.26	0.63
28842-019A	M5F Combination R8	500	1.44	0.72
28842-020A	M5F Combination R9	500	1.13	0.57

Method Detection Limit at 5x Dilution (mg/L): 0.106
Limit of Quantitation at 5x Dilution (mg/L): 1.000

† Values were quantified using the calibration curve. The peak areas are considered to be readily quantifiable, therefore these values are believed to be accurate. But as the concentrations are below the Limit of Quantitation (LOQ) value of 1.000 mg/L, they should probably be used with some discretion.

Analysis Case Narrative

Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28842	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Method 5F			Analyte:	Sulfate

Summary of Analysis

This report summarizes the results of the analysis performed on samples received on: 04/30/12
The samples were analyzed in accordance with NELAC and procedures found in U.S. EPA Method 300.1 and CleanAir Method 8B.

All analysis was carried out using a Dionex ICS-90, Dionex AS4A-SC column, 4.5mM/1.5mM sodium carbonate/bicarbonate eluent, and 40mN sulfuric acid regenerant.

Detection Limits

Method Detection Limits have been determined in accordance with procedures in 40 CFR 136, Appendix B. Documentation showing the determination of detection limits are included with this report. The Limit of Quantitation (LOQ) is set to be the concentration of the lowest calibration point for each analyte. Values between these limits were quantified, but should be used with discretion as they were below the LOQ. Values that were below the MDL are indicated by a "<" where appropriate.

Sample Preparation

Samples were prepared according to the procedures listed in the EPA Method above. Each sample was analyzed at full strength and a dilution was prepared if necessary to achieve a concentration that was within calibration range limits.

Standard and Reagent Traceability

Each calibration standard has been prepared in accordance with US EPA Method 300.1 and US EPA Method 26 and has been designated an original lot number. This number can be used to trace back to the original dry salts used in the preparation of these standards. This number is found in Table 1 below. In addition, the dilution scheme used for the preparation of standards is included in this report.

Table 1: Standard Lot Numbers Used For Analysis

Standard Type	Lot Number	Concentration of Analyte
Stock Standard	04261202-64-00000-02	4999.98 mg/L
QC Standard	04261202-64-00000-03	305.30 mg/L
Working Standard	04261202-64-00000-04	49.9998 mg/L
Cal 01	04261202-64-00000-05	0.2000 mg/L
Cal 02	04261202-64-00000-06	1.0000 mg/L
Cal 03	04261202-64-00000-07	2.0000 mg/L
Cal 04	04261202-64-00000-08	6.2500 mg/L
Cal 05	04261202-64-00000-09	8.0000 mg/L
Cal 06	04261202-64-00000-10	12.4999 mg/L
CCV	04261202-64-00000-11	4.0000 mg/L
QC	04261202-64-00000-12	3.0530 mg/L

In suppressed ion chromatography, eluent is defined as the carrier that moves chemicals through the column and regenerant is defined as a reagent used to remove ions opposite in charge of the specific analyte. Regenerant also reduces the overall conductivity of the eluent. A table displaying the lot numbers of these reagents used for each day of analysis is displayed below in Table 2.

Table 2: Eluent and Regenerant Lot Numbers Used for Each Day of Analysis

Analysis Date	Eluent Lot Number	Regenerant Lot Number
5/2/2012	1067-64-00000-03	1200-64-00000-03
5/3/2012	1067-64-00000-03	1200-64-00000-03

Analysis Case Narrative

Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28842	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Method 5F			Analyte:	Sulfate

Instrument Calibration

Instrument calibration followed regulations found in US EPA Method 300.1.

Calibration standards were prepared from ACS grade dry salts as per section 7.3 of US EPA Method 300.1. As per section 4.2.2 of US EPA CTM-027, a series of 6 diluted standards are prepared from the original calibration standard and run through the column in duplicate from lowest concentration to highest. The average peak area for each calibration point is gathered and plotted against the expected solution concentration. In accordance with section 7.2.3 of EPA Method 9057, a least-squares regression with an r^2 value of .995 or greater must be produced from the resulting curve. In accordance with US EPA Method 26 a full post-test calibration is performed. The pre test calibration and post test calibration average peak area for any standard must agree within $\pm 5\%$ of any observed area. All calibration standards were prepared in a deionized water matrix.

Chromatograms

Chromatograms were generated using Dionex Chromeleon software. All chromatograms are included as an appendix of this report. Please note: Chromatograms marked as "End" are place markers meant to signify the end of a batch run and are purposely left blank as no data was acquired for that run.

Analysis QA/QC

Many elements of various EPA methods have been combined and are adhered to:

EPA Method 300.1 quality procedures:

- 1 Before the first sample was analyzed and every twenty samples thereafter (and before the post-test calibration) a laboratory blank and a Continuing Calibration Verification (CCV) were analyzed.
The CCV is prepared from the same calibration standard as used to create the 7 diluted standards that make up the calibration curve.
The laboratory blank must show a regression concentration of zero, and the CCV must show a regression concentration within 10 percent of the expected concentration
- 2 After the first ten samples and every twenty there after, a Quality Control (QC) sample was analyzed.
The QC sample was created using ACS grade dry salts from a different manufacturer and or lot number than for the salts used to create the calibration standards.
The QC must meet the same acceptance criteria as noted for the CCV above.
- 3 A matrix spike analysis was performed on ten percent of the total number of samples. This sample was prepared with equal amounts of a sample and a calibration standard whose concentration was known to be larger than that of the sample.
The matrix spike is acceptable when the recovery is found to be 100 ± 10 percent.
- 4 As a measure of precision, all matrix spikes were prepared and analyzed in duplicate. The average area count of two identical matrix spikes may not have a relative percent difference of more than 10 percent.

EPA Method 26 quality procedure:

- 1 As per section 11.1.3, every sample was analyzed in duplicate and the mean area count used to determine the concentration. The duplicate area counts must have a relative percent difference of no greater than five percent. If this was the case, a third injection was made and the average of the three injections was used to determine the concentration.

EPA Method 7E quality procedures:

- 1 Each point on the calibration curve should be within ± 2 percent of the calibration span of the curve used.

Other CleanAir quality procedures:

- 1 The observed concentration value of each point on the calibration curve should have a relative percent difference of no more than 10 percent from its expected concentration.

Analysis Case Narrative

Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28842	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Method 5F			Analyte:	Sulfate

Additional Comments

This report shall in no way be reproduced except in full without the prior written approval of Clean Air Analytical Laboratory management.

A copy of this report and all associated supporting records will be archived and stored for at least 20 years. All samples are archived for a period of one year from date of receipt in a non-temperature controlled facility. All samples are stored in the original container, any digestates or reconstitutions are stored in a adequately sized Nalgene container.

Table 3 below shows the average analyte concentration found, the standard deviation, and percent relative standard deviation for each sample fraction. This data does not include any corrections for plant conditions. In addition, no sample concentrations reported were corrected for any blanks.

Table 3: Statistical Description of the Ion Chromatography Results

Sample Fraction	Location	Average Concentration (mg/L)	Standard Deviation of Concentration (mg/L)	Relative Standard Deviation of Concentration (%)
M5F Combination	FCCU Regen. Stack	1.21	0.15	12.29%

Table 4, below, shows a comparison of the sulfate found by IC to the gravimetric mass found for each sample.

Table 4: Comparison of Sulfate Content to Gravimetric Mass

Sample ID	Run Number	Sulfate Content Measured by IC		Gravimetric Mass (mg)	% Sulfate
		(mg)			
28842-12	1	0.68		27.6	2.5%
28842-13	2	0.63		25.8	2.5%
28842-14	3	0.66		27.9	2.3%
28842-15	4	0.50		14.3	3.5%
28842-16	5	0.52		14.7	3.6%
28842-17	6	0.56		17.1	3.3%
28842-18	7	0.63		18.0	3.5%
28842-19	8	0.72		18.6	3.9%
28842-20	9	0.57		15.1	3.8%

Sulfate was found to be about 3% of the total gravimetric mass for all samples.

Clean Air Laboratory Services is accredited in the following states. Please visit the respective state websites to view our current status and a comprehensive list of our accredited services.

Table 5: Specific Accreditation and Expiration Date

State	Certificate Number	Expiration Date
Texas	T104704431-11-2	6/30/2012
New Jersey	IL004	6/30/2012
Louisiana	169249	6/30/2012

CHROMATOGRAPHIC DATA REDUCTION
Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28842	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Method 5F			Analyte:	Sulfate

Stock Standard: 4999.98 mg/L
Working Stock Conc.: 49.9998 mg/L
QC Standard: 305.30 mg/L

Analyte:

Calibration ID Conc. (mg/L)	Date of Injection	Sulfate Standards Calibration Data †						
		0 0.0000	Cal 01 0.2000	Cal 02 1.0000	Cal 03 2.0000	Cal 04 6.2500	Cal 05 8.0000	Cal 06 12.4999
Cal 1 Trial 1	05/02/2012	0.0000	0.0343	0.1824	0.3662	1.1618	1.4928	2.2919
Cal 1 Trial 2		0.0000	0.0345	0.1815	0.3657	1.1582	1.4882	2.2983
Cal 2 Trial 1	05/02/2012			0.1829	0.3613			
Cal 2 Trial 2				0.1809	0.3610			
Cal 3 Trial 1	05/03/2012		0.0361	0.1800	0.3559	1.1301	1.4822	2.3023
Cal 3 Trial 2			0.0361	0.1783	0.3548	1.1397	1.4895	2.3036

n	2	4	6	6	4	4	4
Average	0.0000	0.0353	0.1810	0.3608	1.1475	1.4882	2.2990
Standard Deviation	0.0000	0.0010	0.0017	0.0048	0.0151	0.0044	0.0053
%RSD	0.00	2.79	0.93	1.32	1.31	0.30	0.23

Quality Control Checks							
Measured Area Counts (Counts)	Actual Concentration (mg/L)	Regression Concentration (mg/L)	Difference pt-Line (% Scale)	Is Difference Less Than 2% of Scale?	Difference pt-Line (Relative %)	Is Relative Difference Less Than 10%?	
0.0000	0.000	0.013	-0.10%	Yes	0.00%	Yes	
0.0353	0.200	0.204	-0.03%	Yes	-2.03%	Yes	
0.1810	1.000	0.994	0.05%	Yes	0.64%	Yes	
0.3608	2.000	1.968	0.26%	Yes	1.61%	Yes	
1.1475	6.250	6.229	0.17%	Yes	0.33%	Yes	
1.4882	8.000	8.075	-0.60%	Yes	-0.94%	Yes	
2.2990	12.500	12.467	0.26%	Yes	0.26%	Yes	
Regression Constants			Is Coefficient of Regression > 0.995?				
Slope	m =	5.4172	Yes				
Intercept	b =	0.0131					
Coeff.	R ² =	0.99994					

† Lot numbers for the individual calibration standards are listed in the Standard and Reagent Traceability section in the Case Narrative.

Stock Solution Standard Mixing Recipe (Anions)
Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28842	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Method 5F			Analyte:	Sulfate

Order of Elution

	8	9	10	11	12	13	14	15
Analyte	Fluoride	Chloride	Nitrite	Bromide	Nitrate	Phosphate	Sulfate	Iodide
Analyte Weight (g/g-mole)	19.00	35.45	46.01	79.90	62.01	94.97	96.07	126.91
Solid Formula	NaF	NaCl	NaNO ₂	NaBr	NaNO ₃	Na ₂ HPO ₄	Na ₂ SO ₄	NaI
Number of ions/Formula	1	1	1	1	1	1	1	1
Formula Weight (g/g-mole)	41.99	58.44	69.00	102.89	85.00	141.96	142.04	149.90
% Analyte in Solid	45.25%	60.66%	66.68%	77.66%	72.95%	66.90%	67.63%	84.66%

Recommended Analyte

Concentration (mg/L)	500	1007.21	2000	3000	3000	5000	5000	7000

Amount of Solid Required to Achieve the Above Stock Solution Concentration In The Listed Volumetric Flask:

500 ml	0.5525	0.8302	1.4997	1.9316	2.0561	3.7370	3.6964	4.1341

Size of Flask

500 ml ▼

Amount of Solid Used

						3.6964 g	

Actual Concentration (mg/L)

4999.98

Concentration in the Five Cal Flasks (mg/L)

Stock (1 liter Flask) Solution Concentrations

10 ml Original Solution Used

49.9998

Cal. ID

Dilution Flask Size	Aliquot Stock
500	2
250	5
250	10
250	20
200	25
250	40
200	50

0.2000	Cal 01
1.0000	Cal 02
2.0000	Cal 03
4.0000	CCV
6.2500	Cal 04
8.0000	Cal 05
12.4999	Cal 06

QC Standard Mixing Recipe (Anions)
Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28842	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Method 5F			Analyte:	Sulfate

Order of Elution

	8	9	10	11	12	13	14	15
Analyte	Fluoride	Chloride	Nitrite	Bromide	Nitrate	Phosphate	Sulfate	Iodide
Analyte Weight (g/g-mole)	19.00	35.45	46.01	79.90	62.01	94.97	96.07	126.91
Solid Formula	NaF	NaCl	NaNO ₂	NaBr	NaNO ₃	Na ₂ HPO ₄	Na ₂ SO ₄	NaI
Number of ions/Formula	1	1	1	1	1	1	1	1
Formula Weight (g/g-mole)	41.99	58.44	69.00	102.89	85.00	141.96	142.04	149.90
% Analyte in Solid	45.25%	60.66%	66.68%	77.66%	72.95%	66.90%	67.63%	84.66%

Recommended Analyte

Concentration (mg/L)	140	200	200	400	300	300	300	500

Amount of Solid Required to Achieve the Above Stock Solution Concentration In The Listed Volumetric Flask:

500 ml	0.1547	0.1649	0.1500	0.2575	0.2056	0.2242	0.2218	0.2953

Size of Flask

500 ml ▼

Amount of Solid Used

						0.2257 g	

Actual Concentration (mg/L)

305.30

Concentration in the QC Flask (mg/L)

Dilution Flask Size
1000

Aliquot Stock
10

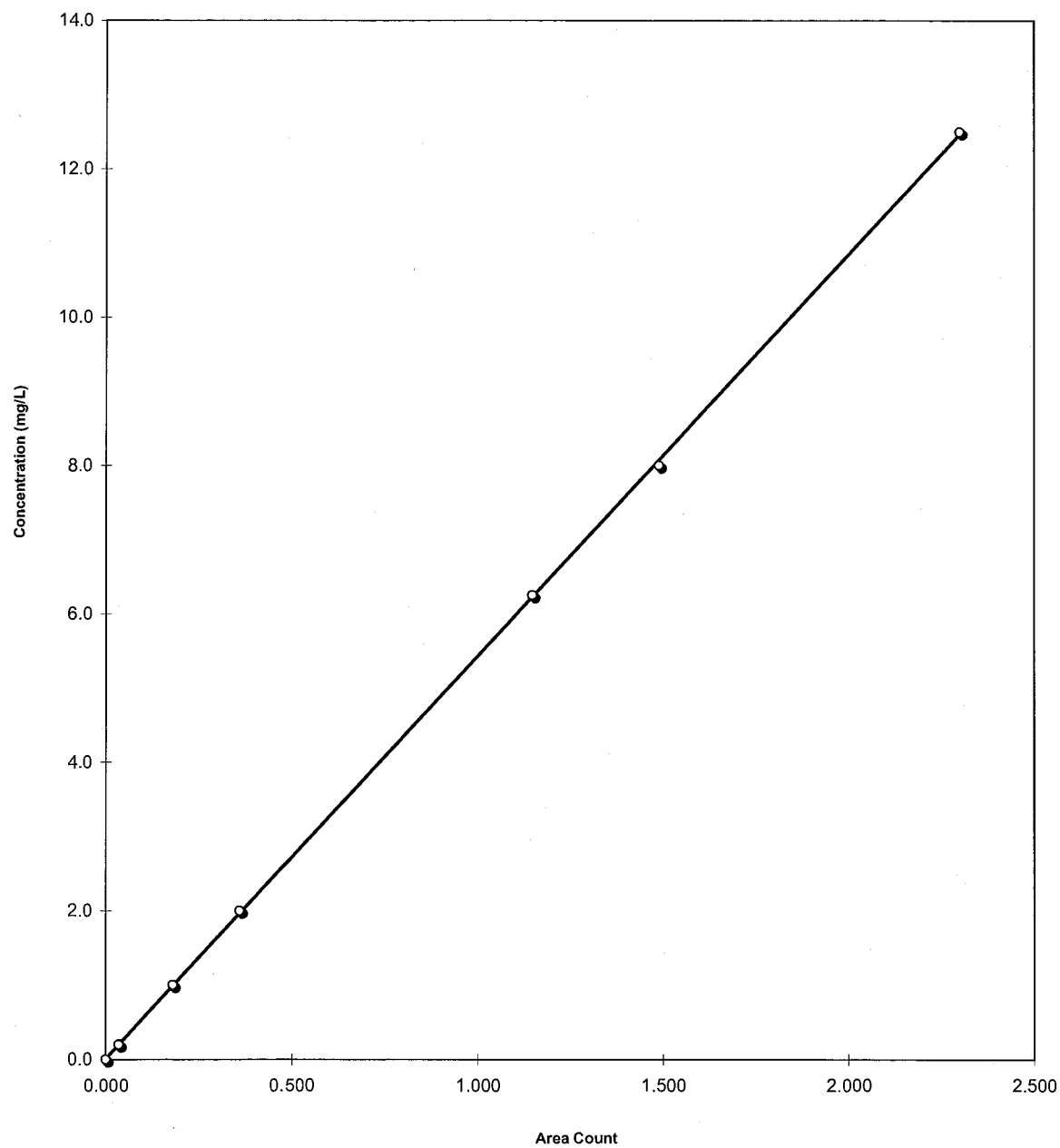
3.0530

Cal. ID

QC

CHROMATOGRAPHIC DATA REDUCTION
Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28842	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Method 5F			Analyte:	Sulfate

Sulfate Calibration Curve

Sample Information

Customer:	Palatine Engineering Group	Lab Project No:	28842	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Method 300.1			Analyte:	Sulfate

Sample Identification Number	Sample Location	Run No.	Sample Identification	Sample Recovery Date	Field Tech	Sample Volume (mL)
CB-002	CleanAir	CB	Control Blank	4/30/2012	MT	500
28842-011	Reagent Blank	RB	M5F Combination RB	4/23/2012	RV	500
28842-012	FCCU Regen. Stack	1	M5F Combination R1	4/24/2012	RV	500
28842-013	FCCU Regen. Stack	2	M5F Combination R2	4/24/2012	RV	500
28842-014	FCCU Regen. Stack	3	M5F Combination R3	4/24/2012	RV	500
28842-015	FCCU Regen. Stack	4	M5F Combination R4	4/25/2012	RV	500
28842-016	FCCU Regen. Stack	5	M5F Combination R5	4/25/2012	RV	500
28842-017	FCCU Regen. Stack	6	M5F Combination R6	4/25/2012	RV	500
28842-018	FCCU Regen. Stack	7	M5F Combination R7	4/26/2012	RV	500
28842-019	FCCU Regen. Stack	8	M5F Combination R8	4/26/2012	RV	500
28842-020	FCCU Regen. Stack	9	M5F Combination R9	4/26/2012	RV	500

CHROMATOGRAPHIC DATA REDUCTION
Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28842	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Method 300.1			Analyte:	Sulfate

MDL=	0.106 mg/L	Average Flow Rate 1.70 mL/min
LOQ=	1.000 mg/L	

Sample Location	Sample Identification Number	Sample Identification	Date of Injection	Area Counts Trial 1	Area Counts Trial 2	Area Count Average	DF (Analysis Dilution Factor)	V _{in} (Total Sample Volume, mL)	C _{reg} (Concentration, mg/L from Reg Curve)	M _{analyte} Total Amount of Analyte (mg)
CleanAir	CB-002	Control Blank	05/02/12	0.0000	0.0000	0.0000	5	500.0	<	<0.500
Reagent Blank	28842-011A	M5F Combination RB	05/02/12	0.0000	0.0000	0.0000	5	500.0	<	<0.500
FCCU Regen. Stack	28842-012A	M5F Combination R1	05/02/12	0.0479	0.0476	0.0478	5	500.0	1.36	0.68
FCCU Regen. Stack	28842-013A	M5F Combination R2	05/02/12	0.0440	0.0446	0.0443	5	500.0	1.27	0.63
FCCU Regen. Stack	28842-014A	M5F Combination R3	05/02/12	0.0453	0.0466	0.0460	5	500.0	1.31	0.66
FCCU Regen. Stack	28842-015A	M5F Combination R4	05/02/12	0.0343	0.0342	0.0343	5	500.0	0.99 †	0.50
FCCU Regen. Stack	28842-016A	M5F Combination R5	05/02/12	0.0362	0.0364	0.0363	5	500.0	1.05	0.52
FCCU Regen. Stack	28842-017A	M5F Combination R6	05/02/12	0.0381	0.0397	0.0389	5	500.0	1.12	0.56
FCCU Regen. Stack	28842-018A	M5F Combination R7	05/02/12	0.0440	0.0442	0.0441	5	500.0	1.26	0.63
FCCU Regen. Stack	28842-019A	M5F Combination R8	05/02/12	0.0511	0.0504	0.0508	5	500.0	1.44	0.72
FCCU Regen. Stack	28842-020A	M5F Combination R9	05/02/12	0.0389	0.0398	0.0394	5	500.0	1.13	0.57

† Values were quantified using the calibration curve. The peak areas are considered to be readily quantifiable, therefore these values are believed to be accurate. But as the concentrations are below the Method Reporting Limit (MRL) value of 1.000 mg/L, they should probably be used with some discretion.

CHROMATOGRAPHIC DATA REDUCTION
Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28842	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Method 300.1			Analyte:	Sulfate

QUALITY CONTROL CHECKS

Sample Location	Sample Identification Number	Sample Identification	Date of Injection	Area Counts Trial 1	Area Counts Trial 2	Area Count Average	Area Count Duplicate Difference	Duplicate Relative Difference (%)	Is Duplicate Difference < 5%?
CleanAir	CB-002	Control Blank	05/02/12	0.0000	0.0000	0.0000	na	na	Yes
Reagent Blank	28842-011A	M5F Combination RB	05/02/12	0.0000	0.0000	0.0000	na	na	Yes
FCCU Regen. Stack	28842-012A	M5F Combination R1	05/02/12	0.0479	0.0476	0.0478	0.0003	0.6%	Yes
FCCU Regen. Stack	28842-013A	M5F Combination R2	05/02/12	0.0440	0.0446	0.0443	0.0006	1.4%	Yes
FCCU Regen. Stack	28842-014A	M5F Combination R3	05/02/12	0.0453	0.0466	0.0460	0.0013	2.8%	Yes
FCCU Regen. Stack	28842-015A	M5F Combination R4	05/02/12	0.0343	0.0342	0.0343	0.0001	0.3%	Yes
FCCU Regen. Stack	28842-016A	M5F Combination R5	05/02/12	0.0362	0.0364	0.0363	0.0002	0.6%	Yes
FCCU Regen. Stack	28842-017A	M5F Combination R6	05/02/12	0.0381	0.0397	0.0389	0.0016	4.1%	Yes
FCCU Regen. Stack	28842-018A	M5F Combination R7	05/02/12	0.0440	0.0442	0.0441	0.0002	0.5%	Yes
FCCU Regen. Stack	28842-019A	M5F Combination R8	05/02/12	0.0511	0.0504	0.0508	0.0007	1.4%	Yes
FCCU Regen. Stack	28842-020A	M5F Combination R9	05/02/12	0.0389	0.0398	0.0394	0.0009	2.3%	Yes

CHROMATOGRAPHIC DATA REDUCTION

Customer:	Palatine Engineering Group	Lab Project No:	28842	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Method 300.1			Analyte:	Sulfate

CCV Concentration: 4.00 mg/L
QC Concentration: 3.05 mg/L

MDL=	0.106 mg/L
LOQ=	1.000 mg/L

QUALITY CONTROL CHECKS (CONT)

Sample Location	Sample Identification Number	Sample Identification	Date of Injection	Area Counts Trial 1	Area Counts Trial 2	Area Count Average	Area Count Duplicate Difference	Duplicate Relative Difference (%)	C _{Reg} (Concentration, mg/L from Reg Curve)	Percent Difference from Actual Value (%)	Is Percent Difference from Actual Value <10%?
CleanAir	28842-00	CCB	05/02/12	0.0000	0.0000	0.0000	na	na	<		
CleanAir	28842-990	CCV	05/02/12	0.7309	0.7304	0.7307	0.0005	0.1%	3.97	0.72%	Yes
CleanAir	28842-991	QC	05/02/12	0.5554	0.5492	0.5523	0.0062	1.1%	3.01	1.57%	Yes
CleanAir	28842-00	CCB	05/02/12	0.0000	0.0000	0.0000	na	na	<		
CleanAir	28842-992	CCV	05/02/12	0.7260	0.7270	0.7265	0.0010	0.1%	3.95	1.28%	Yes
CleanAir	28842-993	QC	05/03/12	0.5557	0.5581	0.5569	0.0024	0.4%	3.03	0.75%	Yes
CleanAir	28842-00	CCB	05/03/12	0.0000	0.0000	0.0000	na	na	<		
CleanAir	28842-994	CCV	05/03/12	0.7320	0.7260	0.7290	0.0060	0.8%	3.96	0.94%	Yes

Sample Duplicate Analysis Area Count Check

									Precision		Is Precision within ±5% Tolerance?
FCCU Regen. Stack	28842-012A	M5F Combination R1	05/02/12	0.0479	0.0476	0.0478	0.0003	0.6%			
FCCU Regen. Stack	28842-012A	M5F Combination R1	05/03/12	0.0499	0.0494	0.0497	0.0005	1.0%	3.9%		Yes
FCCU Regen. Stack	28842-020A	M5F Combination R9	05/02/12	0.0389	0.0398	0.0394	0.0009	2.3%			
FCCU Regen. Stack	28842-020A	M5F Combination R9	05/03/12	0.0405	0.0396	0.0401	0.0009	2.2%	1.8%		Yes

Matrix Spike Recoveries

									Precision	Spike Recovery	Is Spike Recovery Between 90-110%
Matrix Spike	28842-013A	M5F Combination R2	05/03/12	0.1956	0.1951	0.1954	0.0005	0.3%		95.1%	Yes
Matrix Spike	28842-013A	M5F Combination R2	05/03/12	0.1979	0.1980	0.1980	0.0001	0.1%	1.3%	96.4%	Yes
Matrix Spike	28842-017A	M5F Combination R6	05/03/12	0.1957	0.1960	0.1959	0.0003	0.2%		96.6%	Yes

Determination of Method Detection Limit

Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28842	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Method 300.1			Analyte:	Sulfate

MDL Reference 40 CFR 136, Appendix B
 CleanAir Reference SOP EPA5-11

Matrix Deionized Water

Analyte Sulfate
 Spike Concentration 0.2000 mg/L
 Slope 5.4172
 Intercept 0.0131
 Coefficient of Corr. 0.9999

Non-Iterative Study

No. of Replicates	$t_{(n-1, 0.99)}$
7	3.143
8	2.998
9	2.896
10	2.821
11	2.764
16	2.602
21	2.528

Spike Aliquots	Spike Result Area Count	Measured Concentration (mg/L)
1	0.0343	0.199
2	0.0345	0.200
3	0.0372	0.215
4	0.0383	0.221
5	0.0361	0.209
6	0.0361	0.209
7	0.0358	0.207
8	0.0364	0.210

Average Spike Concentration: 0.209
 Recovery (R_a): 104.30%
 Standard Deviation (S_a): 0.00710
 RMS Deviation: 3.4%
 $t_{(n-1, 0.99)}$: 2.998
 MDL: 0.021
 LOQ: 0.200
 MDL for 5x Dilution: 0.106
 LOQ for 5x Dilution: 1.000

Is the spike level higher than the MDL? Yes
 Is the spike level less than ten times the MDL? Yes
 Is the Avg Recovery between 90% < R_a < 110%? Yes

Sample Calculations

Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28842	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Method 300.1			Analyte:	Sulfate

Calibration Point No: Cal 02
Sample No: 28842-012A
Sample Location: FCCU Regen. Stack

1. Difference between duplicate injections for pre-test calibration (Pre Cal 1).

$$\Delta_{Injection} = |Area_{Trial\ 2} - Area_{Trial\ 1}|$$

Where:

$\Delta_{Injection}$ = Area count difference between duplicate injections

$Area_{Trial2}$ = Area count for injection Trial 2

$Area_{Trial1}$ = Area count for injection Trial 1

$\Delta_{Injection}$ = 0.0009

$Area_{Trial2}$ = 0.1815

$Area_{Trial1}$ = 0.1824

2. Average area count value for duplicate injections for pre-test calibration (Pre Cal 1).

$$Avg_{PreInj} = \frac{(Area_{Trial1} + Area_{Trial2})}{2}$$

Where:

Avg_{PreInj} = Average of duplicate injection area counts

$Area_{Trial2}$ = Area count for injection Trial 2

$Area_{Trial1}$ = Area count for injection Trial 1

2 = Constant (number of values)

Avg_{Inj} = 0.1820

$Area_{Trial2}$ = 0.1815

$Area_{Trial1}$ = 0.1824

Sample Calculations

Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28842	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Method 300.1			Analyte:	Sulfate

Calibration Point No: Cal 02
Sample No: 28842-012A
Sample Location: FCCU Regen. Stack

3. Difference between individual injection and average area count for pre-test calibration.

$$\Delta_{PreMean\%} = \frac{|Area_{Trial2} - Avg_{PreInj}|}{Avg_{PreInj}} 100$$

Where:

$\Delta_{PreMean\%}$ = Difference between individual injection and average area count (%).
 Avg_{PreInj} = Average of duplicate injection area counts
 $Area_{Trial2}$ = Area count for injection Trial 2
100 = Constant (conversion factor for percentage)

$\Delta_{PreMean\%}$ = 0.2479
 Avg_{PreInj} = 0.1820
 $Area_{Trial2}$ = 0.1815

Note: EPA Method 26 requires $\Delta_{PreMean\%}$ to be less than 5%.

4. Average of all area count values for a given calibration point.

$$\bar{X} = \frac{\sum_{i=1}^n x_i}{n}$$

Where:

$\bar{X}$ = Average of all area count values for a given calibration point.
 x_i = Individual area count values for each individual injection.
i = Iteration value.
n = Number of injections for the calibration point under question.

$\bar{X}$ = 0.1810
 x_1 = 0.1824
 x_2 = 0.1815
n = 6

Sample Calculations

Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28842	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Method 300.1			Analyte:	Sulfate

Calibration Point No: Cal 02
Sample No: 28842-012A
Sample Location: FCCU Regen. Stack

5. Average of all concentration values used for generating calibration curve.

$$\overline{Y}_{All} = \frac{\sum_{i=1}^n y_i}{n}$$

Where:

$\overline{Y}_{All}$ = Average of all area concentration values.
 y_i = Individual concentration values for each individual injection.
n = Number of injections.

$\overline{Y}_{All}$ = 4.2786
 y_1 = 0.0000
 y_2 = 0.2000
n = 7

6. Average of all area count values for the calibration curve.

$$\overline{X}_{All} = \frac{\sum_{i=1}^n x_i}{n}$$

Where:

$\overline{X}_{All}$ = Average of all area count values.
 x_i = Individual area count values.
i = Iteration value.
n = Number of injections.

$\overline{X}_{All}$ = 0.7710
 x_1 = 0.1824
 x_2 = 0.1815
n = 30

Sample Calculations

Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28842	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Method 300.1			Analyte:	Sulfate

Calibration Point No: Cal 02
Sample No: 28842-012A
Sample Location: FCCU Regen. Stack

7. Determination of slope (least-squares regression) value for calibration curve.

$$m = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{\sum_{i=1}^n (x_i - \bar{x})^2}$$

Where:

m = Slope of least-squares regression curve.
 x_i = Individual area count values for each individual injection.
 $\bar{x}$ = Average of all area count values = $\bar{X}_{All}$
 y_i = Actual area concentration values for each individual injection.
 $\bar{y}$ = Average of all concentration values = $\bar{Y}_{All}$
 i = Iteration value.
 n = Number of injections.

m = 5.41720
 x_1 = 0.1824
 x_2 = 0.1815
 $\bar{x}$ = 0.7710
 y_1 = 0.0000
 y_2 = 0.2000
 $\bar{y}$ = 4.2786
 n = 30

8. Determination of y-intercept (least-squares regression) value for calibration curve.

$$b = \bar{y} - m \bar{x}$$

Where:

b = Y-axis intercept.
 $\bar{x}$ = Average of all area count values = $\bar{X}_{All}$
 $\bar{y}$ = Average of all concentration values = $\bar{Y}_{All}$

b = 0.01311
 m = 5.41720
 $\bar{x}$ = 0.7710
 $\bar{y}$ = 4.2786

Sample Calculations

Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28842	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Method 300.1			Analyte:	Sulfate

Calibration Point No: Cal 02
Sample No: 28842-012A
Sample Location: FCCU Regen. Stack

9. Determination of coefficient of correlation (least-squares regression) value for calibration curve.

$$r = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^n (x_i - \bar{x})^2 \sum_{i=1}^n (y_i - \bar{y})^2}}$$

Where:

- r^2 = Square of the Pearson product moment correlation coefficient through data points in known y's and known x's.
- r = Pearson product moment correlation coefficient through data points in known y's and known x's.
- x_i = Individual area count values for each individual injection.
- y_i = Actual area concentration values for each individual injection.
- $\bar{x}$ = Average of all area count values = $\bar{X}_{All}$
- $\bar{y}$ = Average of all concentration values = $\bar{Y}_{All}$
- i = Iteration value.
- n = Number of injections.

r^2	=	0.99994
r	=	0.99997
x_1	=	0.1824
x_2	=	0.1815
$\bar{x}$	=	0.7710
y_1	=	0.0000
y_2	=	0.2000
$\bar{y}$	=	4.2786
n	=	30

Sample Calculations

Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28842	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Method 300.1			Analyte:	Sulfate

Calibration Point No: Cal 02
Sample No: 28842-012A
Sample Location: FCCU Regen. Stack

10. Determination of average sample area counts from duplicate injections.

$$Avg_{Sample} = \frac{(Area_{Trial1} + Area_{Trial2})}{2}$$

Where:

Avg_{Sample} = Average of duplicate injection area counts
Area_{Trial2} = Area count for injection Trial 2
Area_{Trial1} = Area count for injection Trial 1
2 = Constant (number of injections)

Avg_{Inj} = 0.0478
Area_{Trial2} = 0.0476
Area_{Trial1} = 0.0479

11. Difference between duplicate injections for the sample.

$$\Delta_{Injection} = |Area_{Trial2} - Area_{Trial1}|$$

Where:

$\Delta_{Injection}$ = Area count difference between duplicate injections
Area_{Trial2} = Area count for injection Trial 2
Area_{Trial1} = Area count for injection Trial 1

$\Delta_{Injection}$ = 0.0003
Area_{Trial2} = 0.0476
Area_{Trial1} = 0.0479

Sample Calculations

Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28842	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Method 300.1			Analyte:	Sulfate

Calibration Point No: Cal 02
Sample No: 28842-012A
Sample Location: FCCU Regen. Stack

12. Difference between individual injection and average area count for the sample.

$$\Delta_{Injection} = \frac{|Area_{Trial2} - Avg_{Inj}|}{Avg_{Inj}} 100$$

Where:

$\Delta_{Injection}$ = Difference between individual injection and average area count (%).
 Avg_{Inj} = Average of duplicate injection area counts
 $Area_{Trial2}$ = Area count for injection Trial 2
100 = Constant (conversion factor for percentage)

$\Delta_{Injection}$ = 0.3%
 Avg_{Inj} = 0.0478
 $Area_{Trial2}$ = 0.0476

Note: EPA Method 26 requires $\Delta_{Injection}$ to be less than 5%.

13. Determination of sample concentration from least-squares regression curve (mg/L).

$$C_{Reg} = DF [m(Avg_{Inj}) + b]$$

Where:

C_{Reg} = Sample concentration determined using the regression curve (mg/L)
DF = Sample dilution factor
 Avg_{Inj} = Average of duplicate injection area counts.
m = Slope of least-squares regression curve.
b = Y-intercept of least-squares regression curve.

C_{Reg} = 1.36
DF = 5
 Avg_{Inj} = 0.0478
m = 5.4172
b = 0.0131

Sample Calculations

Ion Chromatography Analysis

Customer: Palatine Engineering Group	Lab Project No: 28842	Analyst: Eric Ewing
Plant: Marathon	Customer Reference No: 12010	Received: 4/30/12
Applicable Analytical Method: U.S. EPA Method 300.1	Analyte: Sulfate	

Calibration Point No: Cal 02
Sample No: 28842-012A
Sample Location: FCCU Regen. Stack

14. Determination of total amount of analyte in sample (total mg).

$$M_{Analyte} = \frac{(C_{Reg})(V_{Soln})}{1000}$$

Where:

$M_{Analyte}$ = Amount of analyte in sample (total mg)
 C_{Reg} = Sample concentration determined using the response factor (mg/L)
 V_{Soln} = Sample volume (ml)
1000 = Conversion constant (ml to L)

$M_{Analyte}$ = 0.68
 C_{Reg} = 1.3589
 V_{Soln} = 500.0

15. Determination of Detection Limits.

15a. Determination of average spike result.

$$AvgM_{f-i} = \frac{\sum_{i=1}^n M_{f-i}}{n}$$

Where:

$AvgM_{f-i}$ = Average of spike result (mg/L)
 M_{f-i} = Net results recorded for each iteration (mg/L)
n = Number of iterations.
i = Placeholder for iteration.

$AvgM_{f-i}$	=	0.209		
M_{f-1}	=	0.199	M_{f-5}	= 0.209
M_{f-2}	=	0.200	M_{f-6}	= 0.209
M_{f-3}	=	0.215	M_{f-7}	= 0.207
M_{f-4}	=	0.221	M_{f-8}	= 0.210
n	=	8		

Sample Calculations

Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28842	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Method 300.1			Analyte:	Sulfate

Calibration Point No: Cal 02
Sample No: 28842-012A
Sample Location: FCCU Regen. Stack

15b. Determination of standard deviation of spike result.

$$\sigma_{f-i} = \sqrt{\frac{\sum_{i=1}^n (M_{f-i} - \text{Avg}M_{f-i})^2}{(n-1)}}$$

Where:

σ_{f-i} = Standard deviation of spike result.
 $\text{Avg}M_{f-i}$ = Average spike result (mg/L)
 M_{f-i} = Concentration recorded for each iteration (mg/L)
n = Number of iterations.
i = Placeholder for iteration.

σ_{f-i}	=	0.0071		
$\text{Avg}M_{f-i}$	=	0.209		
M_{f-1}	=	0.199	M_{f-5}	= 0.209
M_{f-2}	=	0.200	M_{f-6}	= 0.209
M_{f-3}	=	0.215	M_{f-7}	= 0.207
M_{f-4}	=	0.221	M_{f-8}	= 0.210
n	=	8		

15c. Determination of variance of spike result.

$$V_{f-i} = (\sigma_{f-i})^2$$

Where:

V_{f-i} = Variance of spike result.
 σ_{f-i} = Standard deviation of spike result.

V_{f-i}	=	5.04E-05
σ_{f-i}	=	0.0071

Sample Calculations

Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28842	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Method 300.1			Analyte:	Sulfate

Calibration Point No: Cal 02
Sample No: 28842-012A
Sample Location: FCCU Regen. Stack

15d. Determination of RMS deviation of spike result.

$$RMS_{f-i} = 100 \frac{\sigma_{f-i}}{AvgM_{f-i}}$$

Where:

RMS_{f-i} = RMS deviation of spike results (%).
 σ_{f-i} = Standard deviation of spike result.
 $AvgM_{f-i}$ = Average spike result (mg/L)
100 = Conversion constant (fraction to percent)

RMS_{f-i} = 0.0340

σ_{f-i} = 0.0071

$AvgM_{f-i}$ = 0.2086

15e. Determination of average spike recovery.

$$R_f = 100 \frac{AvgM_{f-i}}{RA}$$

Where:

R_f = Average spike recovery (%)
 $AvgM_{f-i}$ = Average spike result (mg/L)
RA = Spike concentration added (mg/L)
100 = Conversion constant (fraction to percent)

R_f = 104.3%

$AvgM_{f-i}$ = 0.20860

RA = 0.20000

Sample Calculations

Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28842	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Method 300.1			Analyte:	Sulfate

Calibration Point No: Cal 02
Sample No: 28842-012A
Sample Location: FCCU Regen. Stack

15f. Determination of $t_{(n-1, 0.99)}$.

Value taken from the following Table:

n	$t_{(n-1, 0.99)}$
7	3.143
8	2.998
9	2.896
10	2.821
11	2.764
16	2.602
21	2.528

Where:

$t_{(n-1, 0.99)}$ = Students' t value appropriate for a 99% confidence level and a standard deviation estimate with n-1 degrees of freedom.

n = Number of iterations.

$t_{(n-1, 0.99)}$ = 2.998

n = 8

15g. Determination of Method Detection Limit (MDL).

$$MDL = \sigma_{f-i} t_{(n-1, 0.99)}$$

Where:

MDL = Method detection limit (mg/L)

$t_{(n-1, 0.99)}$ = Students' t value appropriate for a 99% confidence level and a standard deviation estimate with n-1 degrees of freedom.

σ_{f-i} = Standard deviation of spike result.

MDL = 0.021

$t_{(n-1, 0.99)}$ = 2.998

σ_{f-i} = 0.0071

AS40 Log Sheet

Customer Project No:	12010	Analyte(s):	Sulfate
Lab Project No:	28842		
Dates:	5/2/2012 - 5/3/2012		
Analyst:	Eric Ewing		

Standard Lot#	04261202-64-00000-02
QC Standard Lot#	04261202-64-00000-03
Working Stock Lot#	04261202-64-00000-04

Inj Type: Loop

Inj Mode: Cnst

Inj / Vial: 2

Serial Dilution DataMicrolab 600
Dilution Data

Cartridge ID: 1B 5/2/2012

Pos	Sample #	Identification	Volume	Dilution Factor
1		Blank		1
2		Cal 01 04261202-64-00000-05		1
3		Cal 01 04261202-64-00000-05		1
4		Cal 02 04261202-64-00000-06		1
5		Cal 03 04261202-64-00000-07		1
6		Cal 04 04261202-64-00000-08		1

Pipet Serial No.	Pipet Size	Flask Serial No.	Flask Size

Aliquot Size (uL)	Total Volume (uL)

Cartridge ID: 2B

Pos	Sample #	Identification	Volume	Dilution Factor
1		Cal 05 04261202-64-00000-09		1
2		Cal 06 04261202-64-00000-10		1
3		Blank		1
4		CCV 04261202-64-00000-11		1
5		Blank		1
6	CB-002	CleanAir Control Blank	500	5

Pipet Serial No.	Pipet Size	Flask Serial No.	Flask Size

Aliquot Size (uL)	Total Volume (uL)

Cartridge ID: 3B

Pos	Sample #	Identification	Volume	Dilution Factor
1	28842-011A	Reagent Blank M5F Combination RB	500	5
2	28842-012A	FCCU Regen. Stack M5F Combination R	500	5
3	28842-013A	FCCU Regen. Stack M5F Combination R	500	5
4	28842-014A	FCCU Regen. Stack M5F Combination R	500	5
5	28842-015A	FCCU Regen. Stack M5F Combination R	500	5
6	28842-016A	FCCU Regen. Stack M5F Combination R	500	5

Pipet Serial No.	Pipet Size	Flask Serial No.	Flask Size

Aliquot Size (uL)	Total Volume (uL)

Cartridge ID: 4B

Pos	Sample #	Identification	Volume	Dilution Factor
1	28842-017A	FCCU Regen. Stack M5F Combination R	500	5
2	28842-018A	FCCU Regen. Stack M5F Combination R	500	5
3	28842-019A	FCCU Regen. Stack M5F Combination R	500	5
4		Blank		1
5		QC 04261202-64-00000-12		1
6		Blank		1

Pipet Serial No.	Pipet Size	Flask Serial No.	Flask Size

Aliquot Size (uL)	Total Volume (uL)

Cartridge ID: 5B

Pos	Sample #	Identification	Volume	Dilution Factor
1	28842-020A	FCCU Regen. Stack M5F Combination R	500	5
2		Blank		1
3		CCV 04261202-64-00000-11		1
4		Blank		1
5		Cal 02 04261202-64-00000-06		1
6		Blank		1

Pipet Serial No.	Pipet Size	Flask Serial No.	Flask Size

Aliquot Size (uL)	Total Volume (uL)

AS40 Log Sheet

Customer Project No:	12010	Analyte(s):	Sulfate
Lab Project No:	28842		
Dates:	5/2/2012 - 5/3/2012		
Analyst:	Eric Ewing		

Standard Lot#	04261202-64-00000-02
QC Standard Lot#	04261202-64-00000-03
Working Stock Lot#	04261202-64-00000-04

Inj Type: Loop

Inj Mode: Cnst

Inj / Vial: 2

Serial Dilution DataMicrolab 600
Dilution Data

Cartridge ID: 1B 5/3/2012

Pos	Sample #	Identification	Volume	Dilution Factor
1		Blank		1
2		Cal 03 04261202-64-00000-07		1
3		Blank		1
4		QC 04261202-64-00000-12		1
5		Blank		1
6	28842-012A	FCCU Regen. Stack M5F Combination R	500	5

Pipet Serial No.	Pipet Size	Flask Serial No.	Flask Size

Aliquot Size (uL)	Total Volume (uL)

Cartridge ID: 2B

Pos	Sample #	Identification	Volume	Dilution Factor
1	28842-020A	FCCU Regen. Stack M5F Combination R	500	5
2		Blank		1
3		CCV 04261202-64-00000-11		1
4		Blank		1
5	28842-013A	Matrix Spike 04261202-64-00000-07	500	5
6	28842-013A	Matrix Spike 04261202-64-00000-07	500	5

Pipet Serial No.	Pipet Size	Flask Serial No.	Flask Size

Aliquot Size (uL)	Total Volume (uL)

Cartridge ID: 3B

Pos	Sample #	Identification	Volume	Dilution Factor
1	28842-017A	Matrix Spike 04261202-64-00000-07	500	5
2		Blank		1
3		Cal 01 04261202-64-00000-05		1
4		Cal 01 04261202-64-00000-05		1
5		Cal 02 04261202-64-00000-06		1
6		Cal 03 04261202-64-00000-07		1

Pipet Serial No.	Pipet Size	Flask Serial No.	Flask Size

Aliquot Size (uL)	Total Volume (uL)

Cartridge ID: 4B

Pos	Sample #	Identification	Volume	Dilution Factor
1		Cal 04 04261202-64-00000-08		1
2		Cal 05 04261202-64-00000-09		1
3		Cal 06 04261202-64-00000-10		1
4		Blank		1
5				
6				

Pipet Serial No.	Pipet Size	Flask Serial No.	Flask Size

Aliquot Size (uL)	Total Volume (uL)

CLIENT <u>Marathon Petroleum Company</u>			PROJECT <u>12010</u>			66-12010-		
PLANT <u>Detroit Refinery</u>			DEPT. <u>66</u>					
PROJECT MANAGER <u>K. O'Halloren</u>								
ANALYTICAL METHOD <u>USEPA M-202</u>		CONTAINER NUMBER <u>1</u>	SAMPLE FRACTION <u>BACK HALF CATCH AND INORGANIC RINSE</u>			CleanAir ENGINEERING 500 West Wood Street Palatine, IL 60067 800-627-0033 (phone) 847-991-3385 (fax) FORWARDING LAB CleanAir Analytical Services 500 West Wood Street Palatine, IL 60067 800-627-0033 (phone) Doug Rhoades		
						ANALYSIS REQUESTED Gravimetric Archival		
			NUMBER OF CONTAINERS			CONTAINER SEaled?		
			SAMPLE MATRIX			LIQUID LEVEL MARKED?		
			RUN					
LAB ID	DATE (2012)	TEST LOCATION	NUMBER	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass				
28842-023 R	4/24	FCCU Regenerator Stack	1	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass		X		352
-024 R	4/24	FCCU Regenerator Stack	2	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass		X		348
-025 R	4/25	FCCU Regenerator Stack	3	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass		X		330
-026 R	4/25	FCCU Regenerator Stack	4	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass		X		312
-027 R	4/25	FCCU Regenerator Stack	5	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass		X		324
-028 R	4/26	FCCU Regenerator Stack	6	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass		X		326
-029 R	4/26	FCCU Regenerator Stack	7	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass		X		326
-030 R	4/26	FCCU Regenerator Stack	8	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass		X		325
-031 R	4/27	FCCU Regenerator Stack	9	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass		X		334
-032 R	4/24	FCCU Regenerator Stack	Field Train Recovery Blank	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass		X		333
								Field Train Ref
								Blank Gas
Relinquished By: (signature) <u>R. Vicere</u>			Date / Time		Relinquished By: (signature)		Date / Time	
Received By: (signature) <u>R. Vicere</u>			Date / Time		Received By: (signature)		Date / Time	
			4/30/12 8:30					

CLIENT <u>Marathon Petroleum Company</u>			PROJECT <u>12010</u>		66-12010-																																																																																									
PLANT <u>Detroit Refinery</u>			DEPT. <u>66</u>																																																																																											
PROJECT MANAGER <u>K. O'Halloren</u>																																																																																														
ANALYTICAL METHOD <u>USEPA M-202</u>		CONTAINER NUMBER <u>2</u>	 CleanAir ENGINEERING 500 West Wood Street Palatine, IL 60067 800-627-0033 (phone) 847-991-3385 (fax)																																																																																											
SAMPLE FRACTION <u>BACK HALF ORGANIC RINSE 950 mL AMBER GLASS</u>		ANALYSIS REQUESTED Gravimetric Archive																																																																																												
		NUMBER OF CONTAINERS		CONTAINER SEALED?		FORWARDING LAB CleanAir Analytical Services 500 West Wood Street Palatine, IL 60067 800-627-0033 (phone) Doug Rhoades																																																																																								
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CLIENT Marathon Petroleum Company		PROJECT 12010		66-12010-																																																																																																																																	
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CLIENT <u>Marathon Petroleum Company</u>			PROJECT <u>12010</u>		66-12010-	
PLANT <u>Detroit Refinery</u>			DEPT. <u>66</u>			
PROJECT MANAGER <u>K. O'Halloran</u>						
ANALYTICAL METHOD USEPA CTM-027	CONTAINER NUMBER 3	SAMPLE FRACTION IMPINGER 1-3 CATCH AND RINSE 1000 mL HDPE				
 CleanAir[®] ENGINEERING 500 West Wood Street Palatine, IL 60067 800-627-0033 (phone) 847-991-3385 (fax)			ANALYSIS REQUESTED Ammonium Archive			
			FORWARDING LAB CleanAir Analytical Services 500 West Wood Street Palatine, IL 60067 800-627-0033 (phone) Doug Rhoades		ADDITIONAL INFORMATION	

LAB ID NUMBER	DATE (2012)	TEST LOCATION	RUN		CONTAINER SEALS?	NUMBER OF CONTAINERS	LIQUID LEVEL MARKED?	ANALYSIS REQUESTED	FORWARDING LAB
			NUMBER	NUMBER					
28824-069 R	4/24	FCCU Regenerator Stack	1	Impinger 1-3 Catch and Rinse, 1000 mL HDPE	X	1	X		569
-070 R	4/24	FCCU Regenerator Stack	2	Impinger 1-3 Catch and Rinse, 1000 mL HDPE	X	1	X		593
-071 R	4/24	FCCU Regenerator Stack	3	Impinger 1-3 Catch and Rinse, 1000 mL HDPE	X	1	X		566
-072 R	4/25	FCCU Regenerator Stack	4	Impinger 1-3 Catch and Rinse, 1000 mL HDPE	X	1	X		604
-073 R	4/25	FCCU Regenerator Stack	5	Impinger 1-3 Catch and Rinse, 1000 mL HDPE	X	1	X		573
-074 R	4/25	FCCU Regenerator Stack	6	Impinger 1-3 Catch and Rinse, 1000 mL HDPE	X	1	X		577
-075 R	4/26	FCCU Regenerator Stack	7	Impinger 1-3 Catch and Rinse, 1000 mL HDPE	X	1	X		600
-076 R	4/26	FCCU Regenerator Stack	8	Impinger 1-3 Catch and Rinse, 1000 mL HDPE	X	1	X		602
-077 R	4/26	FCCU Regenerator Stack	9	Impinger 1-3 Catch and Rinse, 1000 mL HDPE	X	1	X		568
-078 R	4/27	FCCU Regenerator Stack	10	Impinger 1-3 Catch and Rinse, 1000 mL HDPE	X	1	X		613
-079 R	4/27	FCCU Regenerator Stack	11	Impinger 1-3 Catch and Rinse, 1000 mL HDPE	X	1	X		590
-080 R	4/27	FCCU Regenerator Stack	12	Impinger 1-3 Catch and Rinse, 1000 mL HDPE	X	1	X		578
-081 R	4/26	FCCU Regenerator Stack	Field Blank	Impinger 1 Field Blank Recovery, 1000 mL HDPE	X	1	X		178

Relinquished By: (signature) <u>R. Vicere</u>	Date / Time	Relinquished By: (signature)	Date / Time
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R. Vicere	Date
Signature	Date

CLIENT <u>Marathon Petroleum Company</u>		PROJECT <u>12010</u>		66-12010-8	
PLANT <u>Detroit Refinery</u>		DEPT. <u>66</u>			
PROJECT MANAGER <u>K. O'Halloren</u>					
ANALYTICAL METHOD <u>USEPA CTM-027</u>		CleanAir ENGINEERING 500 West Wood Street Palatine, IL 60067 800-627-0033 (phone) 847-991-3385 (fax) FORWARDING LAB CleanAir Analytical Services 500 West Wood Street Palatine, IL 60067 800-627-0033 (phone) Doug Rhoades ADDITIONAL INFORMATION			
CONTAINER NUMBER <u>2</u>		SAMPLE FRACTION <u>FRONT HALF DI WATER RINSE</u> <u>250 mL HDPE</u>		ANALYSIS REQUESTED Ammonium Archive	
DATE (2012)		TEST LOCATION		NUMBER OF CONTAINERS CONTAINER SEALED? LIQUID LEVEL MARKED?	
LAB ID NUMBER	DATE (2012)	TEST LOCATION	RUN NUMBER	SAMPLE MATRIX	
	4/24	FCCU Regenerator Stack	Train Proof	Front Half DI Water Rinse, 250 mL HDPE	1 X 78
	4/24	FCCU Regenerator Stack	1	Front Half DI Water Rinse, 250 mL HDPE	1 X 166
	4/24	FCCU Regenerator Stack	2	Front Half DI Water Rinse, 250 mL HDPE	1 X 202
	4/24	FCCU Regenerator Stack	3	Front Half DI Water Rinse, 250 mL HDPE	1 X 222
	4/25	FCCU Regenerator Stack	4	Front Half DI Water Rinse, 250 mL HDPE	1 X 193
	4/25	FCCU Regenerator Stack	5	Front Half DI Water Rinse, 250 mL HDPE	1 X 175
	4/25	FCCU Regenerator Stack	6	Front Half DI Water Rinse, 250 mL HDPE	1 X 168
	4/26	FCCU Regenerator Stack	7	Front Half DI Water Rinse, 250 mL HDPE	1 X 196
	4/26	FCCU Regenerator Stack	8	Front Half DI Water Rinse, 250 mL HDPE	1 X 155
	4/26	FCCU Regenerator Stack	9	Front Half DI Water Rinse, 250 mL HDPE	1 X 198
	4/27	FCCU Regenerator Stack	10	Front Half DI Water Rinse, 250 mL HDPE	1 X 198
	4/27	FCCU Regenerator Stack	11	Front Half DI Water Rinse, 250 mL HDPE	1 X 240
	4/27	FCCU Regenerator Stack	12	Front Half DI Water Rinse, 250 mL HDPE	1 X
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CLIENT <u>Marathon Petroleum Company</u>			PROJECT <u>12010</u>		66-12010-9	
PLANT <u>Detroit Refinery</u>			DEPT. <u>66</u>			
PROJECT MANAGER <u>K. O'Halloren</u>						
ANALYTICAL METHOD <u>USEPA CTM-027</u>		CONTAINER NUMBER <u>3</u>	 CleanAir_® ENGINEERING 500 West Wood Street Palatine, IL 60067 800-627-0033 (phone) 847-991-3385 (fax)			
SAMPLE FRACTION <u>IMPINGER 1-3 CATCH AND RINSE</u>		FORWARDING LAB CleanAir Analytical Services 500 West Wood Street Palatine, IL 60067 800-627-0033 (phone) Doug Rhoades				
<u>1000 mL HDPE</u>		ADDITIONAL INFORMATION				

LAB ID NUMBER	DATE (2012)	TEST LOCATION	RUN NUMBER	SAMPLE MATRIX	NUMBER OF CONTAINERS	CONTAINER SEALED?	ANALYSIS REQUESTED		AMMONIUM	ARCHIVE
	4/24	FCCU Regenerator Stack	1	Impinger 1-3 Catch and Rinse, 1000 mL HDPE	1	X		X		569
	4/24	FCCU Regenerator Stack	2	Impinger 1-3 Catch and Rinse, 1000 mL HDPE	1	X		X		593
	4/24	FCCU Regenerator Stack	3	Impinger 1-3 Catch and Rinse, 1000 mL HDPE	1	X		X		566
	4/25	FCCU Regenerator Stack	4	Impinger 1-3 Catch and Rinse, 1000 mL HDPE	1	X		X		604
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	4/26	FCCU Regenerator Stack	7	Impinger 1-3 Catch and Rinse, 1000 mL HDPE	1	X		X		600
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	4/27	FCCU Regenerator Stack	11	Impinger 1-3 Catch and Rinse, 1000 mL HDPE	1	X		X		590
	4/27	FCCU Regenerator Stack	12	Impinger 1-3 Catch and Rinse, 1000 mL HDPE	1	X		X		578
	4/26	FCCU Regenerator Stack	Field Blank	Impinger 1 Field Blank Recovery, 1000 mL HDPE	1	X		X		178

Relinquished By: (signature) <u>K. O'Halloren</u>		Date / Time <u>4/25/12</u>		Relinquished By: (signature)		Date / Time	
Received By: (signature)		Date / Time		Received By: (signature)		Date / Time	

This form completed by:	
K. O'Halloren	Date
Signature	

Marathon Petroleum Company
Clean Air Project No: 12010
FCCU Regenerator Stack

USEPA Mod. CTM-027 Ammonium Laboratory Data Summary

Run No.	Blank	1	2	3
Date (2012)		Apr 24	Apr 24	Apr 24
Start Time (approx.)		10:33	12:48	14:33
Stop Time (approx.)		11:33	13:48	15:33

☐ DRAFT LAB DATA

MDL Min. detectable limit (mg NH₄⁺/liter) 0.0110

NH₃ as Total Ammonium (NH₄⁺)

B_{NH4} Blank concentration (mg NH₄⁺/liter) <0.0110

S _{NH4-1}	Fraction 1 concentration (mg NH ₄ ⁺ /liter)	13.5700	18.4600	8.9200
S _{NH4-2}	Fraction 2 concentration (mg NH ₄ ⁺ /liter)	33.5200	30.6400	35.9400
v ₁	Fraction 1 sample volume (ml)	166.0	202.0	222.0
v ₂	Fraction 2 sample volume (ml)	569.0	593.0	566.0
m _{NH3}	NH ₃ collected before blank subtraction (mg)	20.1313	20.6721	21.0722
m _b	Allowable blank subtraction (mg)	0.0000	0.0000	0.0000
m _{nb}	NH ₃ collected after blank subtraction (mg)	20.1313	20.6721	21.0722
m _{MDL}	Minimum detectable NH ₃ (mg)	0.0076	0.0083	0.0082
m _n	Total NH ₃ used in emission calculations (mg)	20.1313	20.6721	21.0722

053012 110731
M

Marathon Petroleum Company
Clean Air Project No: 12010
FCCU Regenerator Stack

USEPA Mod. CTM-027 Ammonium Laboratory Data Summary

Run No.	Blank	4	5	6
Date (2012)		Apr 25	Apr 25	Apr 25
Start Time (approx.)		09:08	12:07	14:06
Stop Time (approx.)		10:08	13:07	15:06

☐ DRAFT LAB DATA

MDL Min. detectable limit (mg NH₄⁺/liter) 0.0110

NH₃ as Total Ammonium (NH₄⁺)

B_{NH4} Blank concentration (mg NH₄⁺/liter) <0.0110

S _{NH4-1}	Fraction 1 concentration (mg NH ₄ ⁺ /liter)	15.7800	12.6500	9.7800
S _{NH4-2}	Fraction 2 concentration (mg NH ₄ ⁺ /liter)	13.4800	15.6800	14.7200
v ₁	Fraction 1 sample volume (ml)	193.0	175.0	168.0
v ₂	Fraction 2 sample volume (ml)	604.0	573.0	577.0
m _{NH3}	NH ₃ collected before blank subtraction (mg)	10.5610	10.5713	9.5688
m _b	Allowable blank subtraction (mg)	0.0000	0.0000	0.0000
m _{nb}	NH ₃ collected after blank subtraction (mg)	10.5610	10.5713	9.5688
m _{MDL}	Minimum detectable NH ₃ (mg)	0.0083	0.0078	0.0077
m _n	Total NH ₃ used in emission calculations (mg)	10.5610	10.5713	9.5688

053012 110740
N

Marathon Petroleum Company
Clean Air Project No: 12010
FCCU Regenerator Stack

USEPA Mod. CTM-027 Ammonium Laboratory Data Summary

Run No.	Blank	7	8	9
Date (2012)		Apr 26	Apr 26	Apr 26
Start Time (approx.)		08:24	10:10	11:58
Stop Time (approx.)		09:24	11:10	12:58

☐ DRAFT LAB DATA

MDL Min. detectable limit (mg NH₄⁺/liter) 0.0110

NH₃ as Total Ammonium (NH₄⁺)

B_{NH4} Blank concentration (mg NH₄⁺/liter) <0.0110

S _{NH4-1}	Fraction 1 concentration (mg NH ₄ ⁺ /liter)	15.6400	9.4800	8.2100
S _{NH4-2}	Fraction 2 concentration (mg NH ₄ ⁺ /liter)	13.6700	14.7600	16.6300
v ₁	Fraction 1 sample volume (ml)	196.0	155.0	198.0
v ₂	Fraction 2 sample volume (ml)	600.0	602.0	568.0
m _{NH3}	NH ₃ collected before blank subtraction (mg)	10.6365	9.7750	10.4514
m _b	Allowable blank subtraction (mg)	0.0000	0.0000	0.0000
m _{nb}	NH ₃ collected after blank subtraction (mg)	10.6365	9.7750	10.4514
m _{MDL}	Minimum detectable NH ₃ (mg)	0.0083	0.0079	0.0080
m _n	Total NH ₃ used in emission calculations (mg)	10.6365	9.7750	10.4514

053012 110751
Q

Marathon Petroleum Company
Clean Air Project No: 12010
FCCU Regenerator Stack

USEPA Mod. CTM-027 Ammonium Laboratory Data Summary

Run No.	Blank	10	11	12
Date (2012)		Apr 27	Apr 27	Apr 27
Start Time (approx.)		09:28	11:12	12:45
Stop Time (approx.)		10:28	12:12	13:45

☐ DRAFT LAB DATA

MDL Min. detectable limit (mg NH₄⁺/liter) 0.0110

NH₃ as Total Ammonium (NH₄⁺)

B_{NH4} Blank concentration (mg NH₄⁺/liter) <0.0110

S _{NH4-1}	Fraction 1 concentration (mg NH ₄ ⁺ /liter)	9.8100	12.7000	10.9200
S _{NH4-2}	Fraction 2 concentration (mg NH ₄ ⁺ /liter)	15.3800	14.9400	16.6300
v ₁	Fraction 1 sample volume (ml)	198.0	240.0	220.0
v ₂	Fraction 2 sample volume (ml)	613.0	590.0	578.0
m _{NH3}	NH ₃ collected before blank subtraction (mg)	10.7336	11.1983	11.3417
m _b	Allowable blank subtraction (mg)	0.0000	0.0000	0.0000
m _{nb}	NH ₃ collected after blank subtraction (mg)	10.7336	11.1983	11.3417
m _{MDL}	Minimum detectable NH ₃ (mg)	0.0084	0.0086	0.0083
m _n	Total NH ₃ used in emission calculations (mg)	10.7336	11.1983	11.3417

053012 110756
1



Laboratory Analysis for Cations

Performed For:
Palatine Engineering Group
500 West Wood Street
Palatine, IL 60067

Laboratory Report No: 64-28842_IC_NH4_V0
Customer Reference No: 12010

Revision 0 - Dated: 05/07/2012

To the best of our knowledge, the data presented in this report are accurate, complete, error free,
legible and representative of the samples received by the laboratory.

 Digitally signed
by Eric Ewing
Date: 2012.05.07
12:56:44 -05'00'

Eric Ewing
Title: Analyst
email: eewing@cleanair.com
Ph: 847-654-4519

 Digitally signed by
Douglas D. Rhoades
Date: 2012.05.07
13:21:41 -05'00'

Douglas D. Rhoades
Title: Team Leader
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Ph: 847-654-4504



CERTIFICATE OF ANALYSIS
Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28442	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Conditional Test Method 027			Analyte:	Ammonium

Laboratory Sample Identification Number	Sample Identification	Sample Volume (mL)	Ammonium Sample Conc. (mg/L)
Reagent Blanks			
28442-054	DI H2O RB	200	<
28442-055	0.1N H2SO4 RB	200	<
Field Blank			
28442-056	Imp 1 C&R FB	178	<
FCCU Regen. Stack			
28442-057	FH DI Rinse R1	166	13.57
28442-058	FH DI Rinse R2	202	18.46
28442-059	FH DI Rinse R3	222	8.92
28442-060	FH DI Rinse R4	193	15.78
28442-061	FH DI Rinse R5	175	12.65
28442-062	FH DI Rinse R6	168	9.78
28442-063	FH DI Rinse R7	196	15.64
28442-064	FH DI Rinse R8	155	9.48
28442-065	FH DI Rinse R9	198	8.21
28442-066	FH DI Rinse R10	198	9.81
28442-067	FH DI Rinse R11	240	12.70
28442-068	FH DI Rinse R12	220	10.92
28442-069	Imp 1-3 C&R R1	569	33.52
28442-070	Imp 1-3 C&R R2	593	30.64
28442-071	Imp 1-3 C&R R3	566	35.94
28442-072	Imp 1-3 C&R R4	604	13.48
28442-073	Imp 1-3 C&R R5	573	15.68
28442-074	Imp 1-3 C&R R6	577	14.72
28442-075	Imp 1-3 C&R R7	600	13.67
28442-076	Imp 1-3 C&R R8	602	14.76
28442-077	Imp 1-3 C&R R9	568	16.63
28442-078	Imp 1-3 C&R R10	613	15.38
28442-079	Imp 1-3 C&R R11	590	14.94
28442-080	Imp 1-3 C&R R12	578	16.63

Method Detection Limit (mg/L): 0.011
Limit of Quantitation (mg/L): 0.100

Analysis Case Narrative Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28442	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Conditional Test Method 027			Analyte:	Ammonium

Summary of Analysis

This report summarizes the results of the analysis performed on samples received on: 04/30/12
The samples were analyzed in accordance with NELAC and procedures found in U.S. EPA Conditional Test Method 027 and U.S. EPA Method 300.1 (Modified for Cations).

Please Note: Method 300.1 is written for analysis of anions, however it is readily applicable for cations

All analysis was carried out using a Dionex ICS-90, Dionex CS12A column, 20 mM methanesulfonic acid eluent, and 0.15M tetrabutylammonium hydroxide regenerant.

Detection Limits

Method Detection Limits have been determined in accordance with procedures in 40 CFR 136, Appendix B. Documentation showing the determination of detection limits are included with this report. The Limit of Quantitation (LOQ) is set to be the concentration of the lowest calibration point for each analyte. Values between these limits were quantified, but should be used with discretion as they were below the LOQ. Values that were below the MDL are indicated by a "<" where appropriate.

Sample Preparation

Samples were prepared according to the procedures listed in the EPA Method above. Each sample was analyzed at full strength and a dilution was prepared if necessary to achieve a concentration that was within calibration range limits.

Standard and Reagent Traceability

Each calibration standard has been prepared in accordance with US EPA Method 300.1 and US EPA Method 26 and has been designated an original lot number. This number can be used to trace back to the original dry salts used in the preparation of these standards. This number is included on the calibration page of this report and may also be found in Table 1 below. In addition, the dilution scheme used for the preparation of standards has been included in this report

Table 1: Standard Lot Numbers Used For Analysis

Standard Type	Lot Number	Concentration of Analyte
Stock Standard	04161202-64-00000-01	2502.30 mg/L
QC Standard	04161202-64-00000-02	103.1236 mg/L
Working Standard	04251202-64-00000-01	25.0230 mg/L
Cal 01	04251202-64-00000-02	0.1001 mg/L
Cal 02	04251202-64-00000-03	0.2502 mg/L
Cal 03	04251202-64-00000-04	0.5005 mg/L
Cal 04	04251202-64-00000-05	1.0009 mg/L
Cal 05	04251202-64-00000-06	1.5014 mg/L
Cal 06	04251202-64-00000-07	2.0018 mg/L
Cal 07	04251202-64-00000-08	3.0028 mg/L
Cal 08	04251202-64-00000-09	5.0046 mg/L
CCV	04251202-64-00000-10	0.8007 mg/L
QC	04251202-64-00000-11	1.0312 mg/L

In suppressed ion chromatography, eluent is defined as the carrier that moves chemicals through the column and regenerant is defined as a reagent used to remove ions opposite in charge of the specific analyte. Regenerant also reduces the overall conductivity of the eluent. A table displaying the lot numbers of these reagents used for each day of analysis is displayed below in Table 2.

Table 2: Eluent and Regenerant Lot Numbers Used for Each Day of Analysis

Analysis Date	Eluent Lot Number	Regenerant Lot Number
4/27/2012	1105-64-00000-01	04271202-64-00000-02
4/30/2012	1105-64-00000-01	04271202-64-00000-02
5/1/2012	1105-64-00000-01	05011202-64-00000-01
5/2/2012	1105-64-00000-02	05021202-64-00000-01
5/3/2012	1105-64-00000-02	05021202-64-00000-01

Analysis Case Narrative

Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28442	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Conditional Test Method 027			Analyte:	Ammonium

Instrument Calibration

Instrument calibration followed regulations found in US EPA Method 300.1 and U.S. EPA Conditional Test Method 027. Calibration standards were prepared from ACS grade dry salts as per section 7.3 of US EPA Method 300.1. As per section 4.2.2 of US EPA CTM-027, a series of 6 diluted standards are prepared from the original calibration standard and run through the column in duplicate from lowest concentration to highest. The average peak area for each calibration point is gathered and plotted against the expected solution concentration. In accordance with section 7.2.3 of EPA Method 9057, a least-squares regression with an r^2 value of .995 or greater must be produced from the resulting curve. In accordance with US EPA Method 26 a full post-test calibration is performed. The pre test calibration and post test calibration average peak area for any standard must agree within $\pm 5\%$ of any observed area. All calibration standards were prepared in a deionized water matrix. This is a deviation from CTM-027 which states that calibration standards are to be prepared using a 0.04N sulfuric acid matrix. Documentation of the acceptability of this deviation is kept on file. It is available on request.

Chromatograms

Chromatograms were generated using Dionex Chromeleon software. All chromatograms are included as an appendix of this report. Please note: Chromatograms marked as "End" are place markers meant to signify the end of a batch run and are purposely left blank as no data was acquired for that run.

Analysis QA/QC

Many elements of various EPA methods have been combined and are adhered to:

EPA Method 300.1 quality procedures:

- 1 Before the first sample was analyzed and every twenty samples thereafter (and before the post-test calibration) a laboratory blank and a Continuing Calibration Verification (CCV) were analyzed. The CCV is prepared from the same calibration standard as used to create the 7 diluted standards that make up the calibration curve. The laboratory blank must show a regression concentration of zero, and the CCV must show a regression concentration within 10 percent of the expected concentration.
- 2 After the first ten samples and every twenty there after, a Quality Control (QC) sample was analyzed. The QC sample was created using ACS grade dry salts from a different manufacturer and or lot number than for the salts used to create the calibration standards. The QC must meet the same acceptance criteria as noted for the CCV above.
- 3 A matrix spike analysis was performed on ten percent of the total number of samples. This sample was prepared with equal amounts of a sample and a calibration standard whose concentration was known to be larger than that of the sample. The matrix spike is acceptable when the recovery is found to be 100 ± 10 percent.
- 4 As a measure of precision, all matrix spikes were prepared and analyzed in duplicate. The average area count of two identical matrix spikes may not have a relative percent difference of more than 10 percent.

EPA Method 26 quality procedure:

- 1 As per section 11.1.3, every sample was analyzed in duplicate and the mean area count used to determine the concentration. The duplicate area counts must have a relative percent difference of no greater than five percent. If this was the case, a third injection was made and the average of the three injections was used to determine the concentration.

EPA Method 7E quality procedures:

- 1 Each point on the calibration curve should be within ± 2 percent of the calibration span of the curve used.

Other CleanAir quality procedures:

- 1 The observed concentration value of each point on the calibration curve should have a relative percent difference of no more than 10 percent from its expected concentration.

Analysis Case Narrative

Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28442	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Conditional Test Method 027			Analyte:	Ammonium

Additional Comments

This report shall in no way be reproduced except in full without the prior written approval of Clean Air Analytical Laboratory management.

A copy of this report and all associated supporting records will be archived and stored for at least 20 years. All samples are archived for a period of one year from date of receipt in a non-temperature controlled facility. All samples are stored in the original container, any digestates or reconstitutions are stored in a adequately sized Nalgene container.

As ammonium follows a nonlinear regression, the laboratory uses the Excel function Linest to calculate the regression constants. The Linest function uses the least squares method to calculate a line that best fits the data. The syntax used for the calculation is as follows: "=LINEST(Known_Yvalues,Known_Xvalues,1,1)". The known area counts and the square of the known area counts were both used as the known x values and the known concentrations of each calibration point were used for the known y values. It should be noted that the Linest function must be entered as an array function which is done by highlighting a 3x3 group of cells prior to entering the formula and using Ctrl+Shift+Enter once entered.

Sample 28842-068 did not have a volume recorded at the time of sample receipt. The volume of this sample was determined using a serialized Class A graduated cylinder (S/N 0591). All other sample volumes were determined by field personnel.

Table 3 below shows the average analyte concentration found, the standard deviation, and percent relative standard deviation for each sample fraction. This data does not include any corrections for plant conditions. In addition, no sample concentrations reported were corrected for any blanks.

Table 3: Statistical Description of the Ion Chromatography Results

Sample Fraction	Location	Average Concentration (mg/L)	Standard Deviation of Concentration (mg/L)	Relative Standard Deviation of Concentration (%)
FH DI Rinse	FCCU Regen. Stack	12.16	3.21	26.40%
Imp 1-3 C&R	FCCU Regen. Stack	19.67	8.39	42.69%

Clean Air Laboratory Services is accredited in the following states. Please visit the respective state websites to view our current status and a comprehensive list of our accredited services.

Table 4: Specific Accreditation and Expiration Date

State	Certificate Number	Expiration Date
Texas	T104704431-11-2	6/30/2012
New Jersey	IL004	6/30/2012
Louisiana	169249	6/30/2012

Analysis Case Narrative

Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28442	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Conditional Test Method 027			Analyte:	Ammonium

The samples were not received at a temperature of 4C as directed in US EPA Conditional Test Method 027. Instead, the samples were received at 23C. It is the laboratory's opinion that the samples should not need refrigeration so long as the pH of the samples are less than 4.5 (the pH of a 0.1N solution of (NH₄)₂SO₄). The pHs of the samples are shown in Table 6 below.

Table 5: Sample pH Data

Sample Identification	Sample ID	pH
DI H ₂ O RB	28442-054	4.46
0.1N H ₂ SO ₄ RB	28442-055	1.87
Imp 1 C&R FB	28442-056	1.98
FH DI Rinse R1	28442-057	6.25
FH DI Rinse R2	28442-058	6.02
FH DI Rinse R3	28442-059	5.93
FH DI Rinse R4	28442-060	5.14
FH DI Rinse R5	28442-061	5.46
FH DI Rinse R6	28442-062	5.29
FH DI Rinse R7	28442-063	5.24
FH DI Rinse R8	28442-064	5.35
FH DI Rinse R9	28442-065	5.19
FH DI Rinse R10	28442-066	5.20
FH DI Rinse R11	28442-067	5.12
FH DI Rinse R12	28442-068	4.77
Imp 1-3 C&R R1	28442-069	1.97
Imp 1-3 C&R R2	28442-070	2.00
Imp 1-3 C&R R3	28442-071	2.01
Imp 1-3 C&R R4	28442-072	2.01
Imp 1-3 C&R R5	28442-073	2.00
Imp 1-3 C&R R6	28442-074	2.01
Imp 1-3 C&R R7	28442-075	2.02
Imp 1-3 C&R R8	28442-076	2.02
Imp 1-3 C&R R9	28442-077	2.01
Imp 1-3 C&R R10	28442-078	2.02
Imp 1-3 C&R R11	28442-079	2.01
Imp 1-3 C&R R12	28442-080	2.01

CHROMATOGRAPHIC DATA REDUCTION
Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28442	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Conditional Test Method 027			Analyte:	Ammonium

Stock Standard: 2502.30 mg/L
Working Stock Conc.: 25.0230 mg/L
QC Standard 103.12 mg/L

Analyte:

		Ammonium Standards Calibration Data †								
Calibration Point Conc. (mg/L)	Date of Injection	0	Cal 01	Cal 02	Cal 03	Cal 04	Cal 05	Cal 06	Cal 07	Cal 08
		0.0000	0.1001	0.2502	0.5005	1.0009	1.5014	2.0018	3.0028	5.0046
Cal 1 Trial 1	04/27/2012	0.0000	0.0647	0.1545	0.2921	0.5361	0.7368	0.9377	1.2858	1.8007
Cal 1 Trial 2		0.0000	0.0647	0.1561	0.2918	0.5384	0.7478	0.9294	1.2767	1.8898
Cal 2 Trial 1	04/30/2012			0.1508						
Cal 2 Trial 2				0.1530						
Cal 3 Trial 1	05/01/2012				0.2968	0.5270				
Cal 3 Trial 2					0.2967	0.5403				
Cal 4 Trial 1	05/02/2012						0.7473	0.9207		
Cal 4 Trial 2							0.7382	0.9200		
Cal 5 Trial 1	05/03/2012		0.0674	0.1597	0.2993	0.5453	0.7387	0.9251	1.2930	1.8808
Cal 5 Trial 2			0.0674	0.1600	0.2982	0.5370	0.7378	0.9447	1.2819	1.8833
n		2	4	6	6	6	6	6	4	4
Average		0.0000	0.0661	0.1557	0.2958	0.5374	0.7411	0.9296	1.2844	1.8637
Standard Deviation		0.0000	0.0016	0.0037	0.0031	0.0060	0.0050	0.0099	0.0069	0.0421
%RSD		0.00	2.36	2.36	1.06	1.12	0.68	1.06	0.53	2.26

Quality Control Checks							
Measured Area Counts	Area Count Squared (Counts ²)	Actual Concentration (mg/L)	Regression Concentration (mg/L)	Difference pt-Line (% Scale)	Is Difference Less Than 2% of Scale?	Difference pt-Line (Relative %)	Is Relative Difference Less Than 10%?
0.0000	0.000	0.000	-0.010	0.21%	Yes	0.00%	Yes
0.0661	0.004	0.100	0.098	0.05%	Yes	2.39%	Yes
0.1557	0.024	0.250	0.252	-0.04%	Yes	-0.89%	Yes
0.2958	0.088	0.500	0.513	-0.26%	Yes	-2.57%	Yes
0.5374	0.289	1.001	1.017	-0.32%	Yes	-1.62%	Yes
0.7411	0.549	1.501	1.495	0.12%	Yes	0.40%	Yes
0.9296	0.864	2.002	1.981	0.41%	Yes	1.02%	Yes
1.2844	1.650	3.003	3.009	-0.13%	Yes	-0.22%	Yes
1.8637	3.473	5.005	5.006	-0.02%	Yes	-0.02%	Yes
Linest Coefficients							
Value	a	b	c				
	0.5878	1.5961	-0.0103				
Std. Error Values	0.0132	0.0244	0.0082				
R ²	0.99995	0.013					
				Is Coefficient of Regression > 0.995?			
				Yes			

† Lot numbers for the individual calibration standards are listed in the Standard and Reagent Traceability section in the Case Narrative.

Stock Solution Standard Mixing Recipe (Cations)
Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28442	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Conditional Test Method 027			Analyte:	Ammonium

Order of Elution

	1	2	3	4	5	6
Analyte	Lithium	Sodium	Ammonium	Potassium	Magnesium	Calcium
Analyte Weight (g/g-mole)	6.94	22.99	18.05	39.1	24.31	40.08
Solid Formula	LiCl	NaCl	NH ₄ Cl	KCl	MgCl ₂ ·6H ₂ O	CaCl ₂ ·2H ₂ O
Number of Ions/Formula	1	1	1	1	1	1
Formula Weight (g/g-mole)	42.39	58.44	53.49	74.55	203.3	147.02
% Analyte in Solid	16.37%	39.34%	33.74%	52.45%	11.96%	27.26%

Recommended Analyte

Concentration (mg/l)	500	1,200	2,500	2,500	2,500	3,500

Amount of Solid Required to Achieve the Above Stock Solution Concentration In The Listed Volumetric Flask:

500 ml	1.5270	1.5252	3.7043	2.3833	10.4535	6.4193

Size of Flask

500 ml 

Amount of Solid Used

	1.5273 g	3.7077 g	2.3835 g		6.4222 g

Actual Concentration (mg/l)

1201.66	2502.30	2500.20		3501.59

Concentration in the Five Cal Flasks (mg/L)

Stock (1 liter Flask) Solution Concentrations

10 ml Original Solution Used	12.0166	25.0230	25.0020		35.0159

Dilution Flask Size

AliquotStock

500	2	0.0481	0.1001	0.1000	0.1401	1
500	5	0.1202	0.2502	0.2500	0.3502	2
500	10	0.2403	0.5005	0.5000	0.7003	3
250	8	0.3845	0.8007	0.8001	1.1205	CCV
250	10	0.4807	1.0009	1.0001	1.4006	4
500	30	0.7210	1.5014	1.5001	2.1010	5
250	20	0.9613	2.0018	2.0002	2.8013	6
250	30	1.4420	3.0028	3.0002	4.2019	7
250	50	2.4033	5.0046	5.0004	7.0032	8

QC Standard Mixing Recipe (Cations)
Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28442	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Conditional Test Method 027			Analyte:	Ammonium

Order of Elution

	1	2	3	4	5	6
Analyte	Lithium	Sodium	Ammonium	Potassium	Magnesium	Calcium
Analyte Weight (g/g-mole)	6.94	22.99	18.05	39.1	24.31	40.08
Solid Formula	LiCl	NaCl	NH ₄ Cl	KCl	MgCl ₂ •6H ₂ O	CaCl ₂ •2H ₂ O
Number of ions/Formula	1	1	1	1	1	1
Formula Weight (g/g-mole)	42.39	58.44	53.49	74.55	203.3	147.02
% Analyte in Solid	16.37%	39.34%	33.74%	52.45%	11.96%	27.26%

Recommended Analyte

Concentration (mg/l)	50	100	100	200	200	200

Amount of Solid Required to Achieve the Above Stock Solution Concentration In The Listed Volumetric Flask:

500 ml	0.1527	0.1271	0.1482	0.1907	0.8363	0.3668

Size of Flask

500 ml ▼

Amount of Solid Used

	0.1313 g	0.1528 g	0.2197 g		0.3727 g	

Actual Concentration (mg/l)

103.31	103.12	230.46		203.21	

Concentration in the QC Flask (mg/L)Dilution Flask Size
1000Aliquot Stock
10

1.0331	1.0312	2.3046	

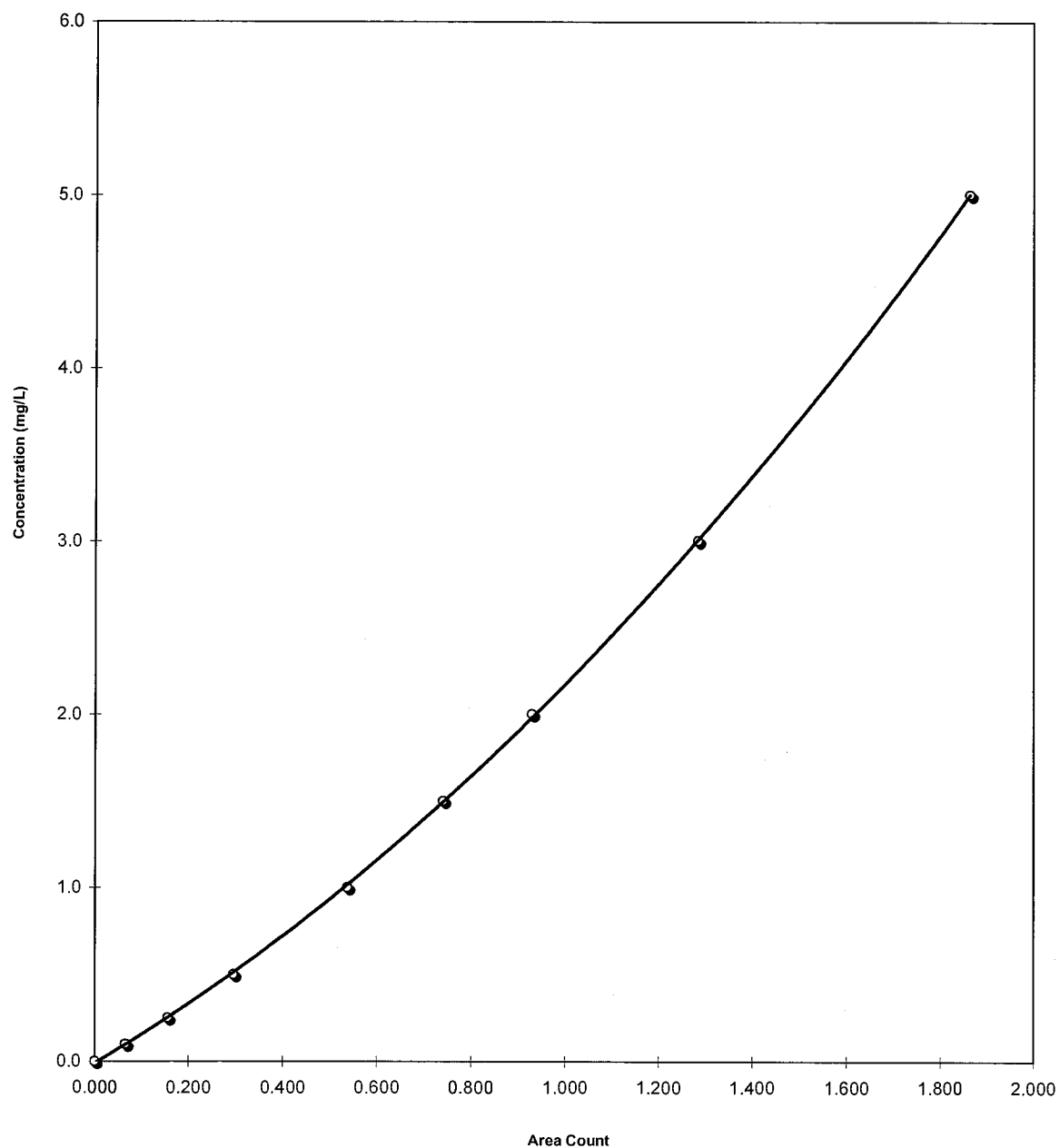
Cal. ID

2.0321 QC

CHROMATOGRAPHIC DATA REDUCTION
Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28442	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Conditional Test Method 027			Analyte:	Ammonium

Ammonium Calibration Curve



Sample Information

Customer:	Palatine Engineering Group	Lab Project No:	28442	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Conditional Test Method 027			Analyte:	Ammonium

Sample Identification			Sample		Sample Recovery		Field Tech	Sample Volume (mL)
Number	Sample Location	Run No.	Identification	Date				
28442-54	Reagent Blank	RB	DI H2O RB	4/23/2012		RV		200
28442-55	Reagent Blank	RB	0.1N H2SO4 RB	4/23/2012		RV		200
28442-56	FCCU Regen Stack	FB	Imp 1 C&R FB	4/26/2012		RV		178
28442-57	FCCU Regen Stack	1	FH DI Rinse R1	4/24/2012		RV		166
28442-58	FCCU Regen Stack	2	FH DI Rinse R2	4/24/2012		RV		202
28442-59	FCCU Regen Stack	3	FH DI Rinse R3	4/24/2012		RV		222
28442-60	FCCU Regen Stack	4	FH DI Rinse R4	4/25/2012		RV		193
28442-61	FCCU Regen Stack	5	FH DI Rinse R5	4/25/2012		RV		175
28442-62	FCCU Regen Stack	6	FH DI Rinse R6	4/25/2012		RV		168
28442-63	FCCU Regen Stack	7	FH DI Rinse R7	4/26/2012		RV		196
28442-64	FCCU Regen Stack	8	FH DI Rinse R8	4/26/2012		RV		155
28442-65	FCCU Regen Stack	9	FH DI Rinse R9	4/26/2012		RV		198
28442-66	FCCU Regen Stack	10	FH DI Rinse R10	4/27/2012		RV		198
28442-67	FCCU Regen Stack	11	FH DI Rinse R11	4/27/2012		RV		240
28442-68	FCCU Regen Stack	12	FH DI Rinse R12	4/27/2012		RV		220
28442-69	FCCU Regen Stack	1	Imp 1-3 C&R R1	4/24/2012		RV		569
28442-70	FCCU Regen Stack	2	Imp 1-3 C&R R2	4/24/2012		RV		593
28442-71	FCCU Regen Stack	3	Imp 1-3 C&R R3	4/24/2012		RV		566
28442-72	FCCU Regen Stack	4	Imp 1-3 C&R R4	4/25/2012		RV		604
28442-73	FCCU Regen Stack	5	Imp 1-3 C&R R5	4/25/2012		RV		573
28442-74	FCCU Regen Stack	6	Imp 1-3 C&R R6	4/25/2012		RV		577
28442-75	FCCU Regen Stack	7	Imp 1-3 C&R R7	4/26/2012		RV		600
28442-76	FCCU Regen Stack	8	Imp 1-3 C&R R8	4/26/2012		RV		602
28442-77	FCCU Regen Stack	9	Imp 1-3 C&R R9	4/26/2012		RV		568
28442-78	FCCU Regen Stack	10	Imp 1-3 C&R R10	4/27/2012		RV		613
28442-79	FCCU Regen Stack	11	Imp 1-3 C&R R11	4/27/2012		RV		590
28442-80	FCCU Regen Stack	12	Imp 1-3 C&R R12	4/27/2012		RV		578

CHROMATOGRAPHIC DATA REDUCTION
Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28442	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Conditional Test Method 027			Analyte:	Ammonium

MDL=	0.011 mg/L	Average Flow Rate
MRL=	0.100 mg/L	0.70 mL/min

Sample Location	Sample Identification Number	Sample Identification	Date of Injection	Area Counts Trial 1	Area Counts Trial 2	Area Count Average	DF (Analysis Dilution Factor)	V _{adj} (Total Sample Volume, mL)	C _{Reg} (Concentration, mg/L from Reg Curve)	M _{analyte} Total Amount of Analyte (mg)
Reagent Blank	28442-054	DI H2O RB	04/30/12	0.0000	0.0000	0.0000	1	200.0	<	<0.020
Reagent Blank	28442-055	0.1N H2SO4 RB	04/30/12	0.0000	0.0000	0.0000	1	200.0	<	<0.020
FCCU Regen Stack	28442-056	Imp 1 C&R FB	04/30/12	0.0000	0.0000	0.0000	1	178.0	<	<0.018
FCCU Regen Stack	28442-057	FH DI Rinse R1	05/01/12	0.6829	0.6854	0.6842	10	166.0	13.57	2.25
FCCU Regen Stack	28442-058	FH DI Rinse R2	05/01/12	0.8807	0.8766	0.8787	10	202.0	18.46	3.73
FCCU Regen Stack	28442-059	FH DI Rinse R3	05/01/12	0.4807	0.4802	0.4805	10	222.0	8.92	1.98
FCCU Regen Stack	28442-060	FH DI Rinse R4	05/01/12	0.7754	0.7729	0.7742	10	193.0	15.78	3.04
FCCU Regen Stack	28442-061	FH DI Rinse R5	05/01/12	0.6475	0.6439	0.6457	10	175.0	12.65	2.21
FCCU Regen Stack	28442-062	FH DI Rinse R6	05/01/12	0.5195	0.5203	0.5199	10	168.0	9.78	1.64
FCCU Regen Stack	28442-063	FH DI Rinse R7	05/01/12	0.7685	0.7686	0.7686	10	196.0	15.64	3.06
FCCU Regen Stack	28442-064	FH DI Rinse R8	05/02/12	0.5058	0.5064	0.5061	10	155.0	9.48	1.47
FCCU Regen Stack	28442-065	FH DI Rinse R9	05/02/12	0.4484	0.4463	0.4474	10	198.0	8.21	1.63
FCCU Regen Stack	28442-066	FH DI Rinse R10	05/02/12	0.5211	0.5207	0.5209	10	198.0	9.81	1.94
FCCU Regen Stack	28442-067	FH DI Rinse R11	05/02/12	0.6467	0.6483	0.6475	10	240.0	12.70	3.05
FCCU Regen Stack	28442-068	FH DI Rinse R12	05/02/12	0.5689	0.5720	0.5705	10	220.0	10.92	2.40
FCCU Regen Stack	28442-069	Imp 1-3 C&R R1	05/02/12	0.8131	0.8131	0.8131	20	569.0	33.52	19.07
FCCU Regen Stack	28442-070	Imp 1-3 C&R R2	05/02/12	0.7555	0.7564	0.7560	20	593.0	30.64	18.17
FCCU Regen Stack	28442-071	Imp 1-3 C&R R3	05/02/12	0.8587	0.8612	0.8600	20	586.0	35.94	20.34
FCCU Regen Stack	28442-072	Imp 1-3 C&R R4	05/02/12	0.6811	0.6798	0.6805	10	604.0	13.48	8.14
FCCU Regen Stack	28442-073	Imp 1-3 C&R R5	05/02/12	0.7705	0.7704	0.7705	10	573.0	15.68	8.99
FCCU Regen Stack	28442-074	Imp 1-3 C&R R6	05/02/12	0.7321	0.7312	0.7317	10	577.0	14.72	8.49
FCCU Regen Stack	28442-075	Imp 1-3 C&R R7	05/02/12	0.6887	0.6878	0.6883	10	600.0	13.67	8.20
FCCU Regen Stack	28442-076	Imp 1-3 C&R R8	05/02/12	0.7324	0.7341	0.7333	10	602.0	14.76	8.89
FCCU Regen Stack	28442-077	Imp 1-3 C&R R9	05/02/12	0.8080	0.8081	0.8081	10	568.0	16.63	9.45
FCCU Regen Stack	28442-078	Imp 1-3 C&R R10	05/02/12	0.7591	0.7571	0.7581	10	613.0	15.38	9.43
FCCU Regen Stack	28442-079	Imp 1-3 C&R R11	05/02/12	0.7398	0.7411	0.7405	10	590.0	14.94	8.81
FCCU Regen Stack	28442-080	Imp 1-3 C&R R12	05/02/12	0.8095	0.8062	0.8079	10	578.0	16.63	9.61

CHROMATOGRAPHIC DATA REDUCTION
Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28442	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Conditional Test Method 027			Analyte:	Ammonium

QUALITY CONTROL CHECKS

Sample Location	Sample Identification Number	Sample Identification	Date of Injection	Area Counts		Area Count Average	Area Count Duplicate Difference	Duplicate Relative Difference (%)	Is Duplicate Difference < 5%?
				Trial 1	Trial 2				
Reagent Blank	28442-054	DI H2O RB	04/30/12	0.0000	0.0000	0.0000	na	na	Yes
Reagent Blank	28442-055	0.1N H2SO4 RB	04/30/12	0.0000	0.0000	0.0000	na	na	Yes
FCCU Regen Stack	28442-056	Imp 1 C&R FB	04/30/12	0.0000	0.0000	0.0000	na	na	Yes
FCCU Regen Stack	28442-057	FH DI Rinse R1	05/01/12	0.6829	0.6854	0.6842	0.0025	0.4%	Yes
FCCU Regen Stack	28442-058	FH DI Rinse R2	05/01/12	0.8807	0.8766	0.8787	0.0041	0.5%	Yes
FCCU Regen Stack	28442-059	FH DI Rinse R3	05/01/12	0.4807	0.4802	0.4805	0.0005	0.1%	Yes
FCCU Regen Stack	28442-060	FH DI Rinse R4	05/01/12	0.7754	0.7729	0.7742	0.0025	0.3%	Yes
FCCU Regen Stack	28442-061	FH DI Rinse R5	05/01/12	0.6475	0.6439	0.6457	0.0036	0.6%	Yes
FCCU Regen Stack	28442-062	FH DI Rinse R6	05/01/12	0.5195	0.5203	0.5199	0.0008	0.2%	Yes
FCCU Regen Stack	28442-063	FH DI Rinse R7	05/01/12	0.7685	0.7686	0.7686	0.0001	0.0%	Yes
FCCU Regen Stack	28442-064	FH DI Rinse R8	05/02/12	0.5058	0.5064	0.5061	0.0006	0.1%	Yes
FCCU Regen Stack	28442-065	FH DI Rinse R9	05/02/12	0.4484	0.4463	0.4474	0.0021	0.5%	Yes
FCCU Regen Stack	28442-066	FH DI Rinse R10	05/02/12	0.5211	0.5207	0.5209	0.0004	0.1%	Yes
FCCU Regen Stack	28442-067	FH DI Rinse R11	05/02/12	0.6467	0.6483	0.6475	0.0016	0.2%	Yes
FCCU Regen Stack	28442-068	FH DI Rinse R12	05/02/12	0.5689	0.5720	0.5705	0.0031	0.5%	Yes
FCCU Regen Stack	28442-069	Imp 1-3 C&R R1	05/02/12	0.8131	0.8131	0.8131	0.0000	0.0%	Yes
FCCU Regen Stack	28442-070	Imp 1-3 C&R R2	05/02/12	0.7555	0.7564	0.7560	0.0009	0.1%	Yes
FCCU Regen Stack	28442-071	Imp 1-3 C&R R3	05/02/12	0.8587	0.8612	0.8600	0.0025	0.3%	Yes
FCCU Regen Stack	28442-072	Imp 1-3 C&R R4	05/02/12	0.6811	0.6798	0.6805	0.0013	0.2%	Yes
FCCU Regen Stack	28442-073	Imp 1-3 C&R R5	05/02/12	0.7705	0.7704	0.7705	0.0001	0.0%	Yes
FCCU Regen Stack	28442-074	Imp 1-3 C&R R6	05/02/12	0.7321	0.7312	0.7317	0.0009	0.1%	Yes
FCCU Regen Stack	28442-075	Imp 1-3 C&R R7	05/02/12	0.6887	0.6878	0.6883	0.0009	0.1%	Yes
FCCU Regen Stack	28442-076	Imp 1-3 C&R R8	05/02/12	0.7324	0.7341	0.7333	0.0017	0.2%	Yes
FCCU Regen Stack	28442-077	Imp 1-3 C&R R9	05/02/12	0.8080	0.8081	0.8081	0.0001	0.0%	Yes
FCCU Regen Stack	28442-078	Imp 1-3 C&R R10	05/02/12	0.7591	0.7571	0.7581	0.0020	0.3%	Yes
FCCU Regen Stack	28442-079	Imp 1-3 C&R R11	05/02/12	0.7398	0.7411	0.7405	0.0013	0.2%	Yes
FCCU Regen Stack	28442-080	Imp 1-3 C&R R12	05/02/12	0.8095	0.8062	0.8079	0.0033	0.4%	Yes

CHROMATOGRAPHIC DATA REDUCTION

Customer:	Palatine Engineering Group	Lab Project No:	28442	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Conditional Test Method 027			Analyte:	Ammonium

CCV Concentration: 0.80 mg/L
QC Concentration: 1.03 mg/L

MDL=	0.011 mg/L
MRL=	0.100 mg/L

QUALITY CONTROL CHECKS (CONT)

Sample Location	Sample Identification Number	Sample Identification	Date of Injection	Area Counts Trial 1	Area Counts Trial 2	Area Count Average	Area Count Duplicate Difference	Duplicate Relative Difference (%)	C _{Reg} (Concentration, mg/L from Reg Curve)	Percent Difference from Actual Value (%)	Is Percent Difference from Actual Value <10%?
CleanAir	28442-00	CCB	04/27/12	0.0000	0.0000	0.0000	na	na	<		
CleanAir	28442-990	CCV	04/27/12	0.4393	0.4473	0.4433	0.0080	1.8%	0.81	1.51%	Yes
CleanAir	28442-991	QC	04/28/12	0.5378	0.5557	0.5468	0.0179	3.3%	1.04	0.67%	Yes
CleanAir	28442-00	CCB	04/30/12	0.0000	0.0000	0.0000	na	na	<		
CleanAir	28442-992	CCV	04/30/12	0.4311	0.4357	0.4334	0.0046	1.1%	0.79	1.11%	Yes
CleanAir	28442-993	QC	04/30/12	0.5610	0.5436	0.5523	0.0174	3.2%	1.05	1.87%	Yes
CleanAir	28442-00	CCB	05/01/12	0.0000	0.0000	0.0000	na	na	<		
CleanAir	28442-994	CCV	05/01/12	0.4441	0.4559	0.4500	0.0118	2.6%	0.83	3.28%	Yes
CleanAir	28442-995	QC	05/01/12	0.5375	0.5378	0.5377	0.0003	0.1%	1.02	1.30%	Yes
CleanAir	28442-00	CCB	05/02/12	0.0000	0.0000	0.0000	na	na	<		
CleanAir	28442-996	CCV	05/02/12	0.4422	0.4452	0.4442	0.0040	0.9%	0.81	1.74%	Yes
CleanAir	28442-997	QC	05/02/12	0.5732	0.5621	0.5677	0.0111	2.0%	1.09	5.23%	Yes
CleanAir	28442-00	CCB	05/02/12	0.0000	0.0000	0.0000	na	na	<		
CleanAir	28442-998	CCV	05/02/12	0.4509	0.4453	0.4481	0.0056	1.2%	0.82	2.78%	Yes

Sample Duplicate Analysis Area Count Check

									Precision	Is Precision within ±5% Tolerance?
FCCU Regen Stack	28442-057	FH DI Rinse R1	05/01/12	0.6829	0.6854	0.6842	0.0025	0.4%		
FCCU Regen Stack	28442-057	FH DI Rinse R1	05/02/12	0.6919	0.6912	0.6916	0.0007	0.1%	1.1%	Yes
FCCU Regen Stack	28442-067	FH DI Rinse R11	05/02/12	0.6467	0.6483	0.6475	0.0016	0.2%		
FCCU Regen Stack	28442-067	FH DI Rinse R11	05/02/12	0.6555	0.6534	0.6545	0.0021	0.3%	1.1%	Yes
FCCU Regen Stack	28442-077	Imp 1-3 C&R R9	05/02/12	0.8080	0.8081	0.8081	0.0001	0.0%		
FCCU Regen Stack	28442-077	Imp 1-3 C&R R9	05/02/12	0.8065	0.8050	0.8058	0.0015	0.2%	0.3%	Yes

Matrix Spike Recoveries

									Precision	Spike Recovery	Is Spike Recovery Between 90-110%?
Matrix Spike	28442-058	FH DI Rinse R2	05/02/12	1.4186	1.4143	1.4165	0.0043	0.3%			
Matrix Spike	28442-058	FH DI Rinse R2	05/02/12	1.4115	1.4132	1.4124	0.0017	0.1%	0.3%	100.1%	Yes
Matrix Spike	28442-068	FH DI Rinse R12	05/02/12	1.2719	1.2738	1.2729	0.0019	0.1%		99.7%	Yes
Matrix Spike	28442-078	Imp 1-3 C&R R10	05/02/12	1.3643	1.3483	1.3563	0.0160	1.2%		97.6%	Yes
										98.9%	Yes

Determination of Method Detection Limit Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28442	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Conditional Test Method 027			Analyte:	Ammonium

MDL Reference		40 CFR 136, Appendix B	Non-Iterative Study	
CleanAir Reference		SOP EPA5-11		
Matrix		Deionized Water		
Analyte		Ammonium		
Spike Concentration		0.1001 mg/L		
X-squared Coefficient		0.5878		
X Coefficient		1.5961		
Intercept		-0.0103		
Coefficient of Corr.		0.0000		

No. of Replicates	t _(n-1,0.99)
7	3.143
8	2.998
9	2.896
10	2.821
11	2.764
16	2.602
21	2.528

Spike Aliquots	Spike Result Area Count	Measured Concentration (mg/L)
1	0.0647	0.095
2	0.0647	0.095
3	0.0646	0.095
4	0.0639	0.094
5	0.0674	0.100
6	0.0674	0.100
7	0.0692	0.103
8	0.0688	0.102

Average Spike Concentration: 0.098
 Recovery (R_d): 98.09%
 Standard Deviation (S_d): 0.00351
 RMS Deviation: 3.6%
 $t_{(n-1,0.99)}$: 2.998
 MDL: 0.011
 LOQ: 0.100

Is the spike level higher than the MDL? Yes
 Is the spike level less than ten times the MDL? Yes
 Is the Avg Recovery between 90% < R_d < 110%? Yes

Sample Calculations

Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28442	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Conditional Test Method 027			Analyte:	Ammonium

Calibration Point No: Cal 02
Sample No: 28442-059
Sample Location: FCCU Regen Stack

1. Difference between duplicate injections for pre-test calibration (Pre Cal 1).

$$\Delta_{Injection} = |Area_{Trial\ 2} - Area_{Trial\ 1}|$$

Where:

$\Delta_{Injection}$ = Area count difference between duplicate injections

$Area_{Trial2}$ = Area count for injection Trial 2

$Area_{Trial1}$ = Area count for injection Trial 1

$\Delta_{Injection}$ = 0.0016

$Area_{Trial2}$ = 0.1561

$Area_{Trial1}$ = 0.1545

2. Average area count value for duplicate injections for pre-test calibration (Pre Cal 1).

$$Avg_{PreInj} = \frac{(Area_{Trial1} + Area_{Trial2})}{2}$$

Where:

Avg_{PreInj} = Average of duplicate injection area counts

$Area_{Trial2}$ = Area count for injection Trial 2

$Area_{Trial1}$ = Area count for injection Trial 1

2 = Constant (number of values)

Avg_{Inj} = 0.1553

$Area_{Trial2}$ = 0.1561

$Area_{Trial1}$ = 0.1545

Sample Calculations

Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28442	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Conditional Test Method 027			Analyte:	Ammonium

Calibration Point No: Cal 02
Sample No: 28442-059
Sample Location: FCCU Regen Stack

3. Difference between individual injection and average area count for pre-test calibration.

$$\Delta_{PreMean\%} = \frac{|Area_{Trial2} - Avg_{PreInj}|}{Avg_{PreInj}} 100$$

Where:

$\Delta_{PreMean\%}$ = Difference between individual injection and average area count (%).
 Avg_{PreInj} = Average of duplicate injection area counts
 $Area_{Trial2}$ = Area count for injection Trial 2
100 = Constant (conversion factor for percentage)

$\Delta_{PreMean\%}$ = 0.5125
 Avg_{PreInj} = 0.1553
 $Area_{Trial2}$ = 0.1561

Note: EPA Method 26 requires $\Delta_{PreMean\%}$ to be less than 5%.

Sample Calculations

Ion Chromatography Analysis

Customer: Palatine Engineering Group	Lab Project No: 28442	Analyst: Eric Ewing
Plant: Marathon	Customer Reference No: 12010	Received: 4/30/12
Applicable Analytical Method: U.S. EPA Conditional Test Method 027	Analyte: Ammonium	

Calibration Point No: Cal 02
Sample No: 28442-059
Sample Location: FCCU Regen Stack

4. Least-squares regression of calibration curve performed using MS Excel Linest Function.

Linest calculates the statistics for a curve using the "least-squares" method for a polynomial series. Ammonium ions fit a quadratic equation well. A quadratic equation is a polynomial equation of the second degree. The general form is:

$$y = ax^2 + bx + c$$

where x represents a variable, and a, b and c, constants, with a≠0.

For this project, the following data were used as input for the Linest Function:

Measured Area Counts (Counts)	Area Count Squared (mg/L)	Actual Concentration (mg/L)
0.0000	0.0000	0.0000
0.0661	0.0044	0.1001
0.1557	0.0242	0.2502
0.2958	0.0875	0.5005
0.5374	0.2887	1.0009
0.7411	0.5492	1.5014
0.9296	0.8642	2.0018
1.2844	1.6496	3.0028
1.8637	3.4732	5.0046

The Linest Function then generated the following data as an output:

Linest Coefficients	a	b	c
Value	0.58778	1.59614	-0.01029
Std. Error Values	0.0132	0.0244	0.0082
	<u>Value</u>	<u>Std. Error Value</u>	
R ²	0.99995	0.0132	

Sample Calculations

Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28442	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Conditional Test Method 027			Analyte:	Ammonium

Calibration Point No: Cal 02
Sample No: 28442-059
Sample Location: FCCU Regen Stack

5. Determination of average sample area counts from duplicate injections.

$$Avg_{Sample} = \frac{(Area_{Trial1} + Area_{Trial2})}{2}$$

Where:

Avg_{Sample} = Average of duplicate injection area counts
 $Area_{Trial2}$ = Area count for injection Trial 2
 $Area_{Trial1}$ = Area count for injection Trial 1
2 = Constant (number of injections)

Avg_{inj} = 0.4805
 $Area_{Trial2}$ = 0.4802
 $Area_{Trial1}$ = 0.4807

6. Difference between duplicate injections for the sample.

$$\Delta_{Injection} = |Area_{Trial2} - Area_{Trial1}|$$

Where:

$\Delta_{Injection}$ = Area count difference between duplicate injections
 $Area_{Trial2}$ = Area count for injection Trial 2
 $Area_{Trial1}$ = Area count for injection Trial 1

$\Delta_{Injection}$ = 0.0005
 $Area_{Trial2}$ = 0.4802
 $Area_{Trial1}$ = 0.4807

Sample Calculations

Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28442	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Conditional Test Method 027			Analyte:	Ammonium

Calibration Point No: Cal 02
Sample No: 28442-059
Sample Location: FCCU Regen Stack

7. Difference between individual injection and average area count for the sample.

$$\Delta_{Injection} = \frac{|Area_{Trial2} - Avg_{Inj}|}{Avg_{Inj}} 100$$

Where:

$\Delta_{Injection}$ = Difference between individual injection and average area count (%).
 Avg_{Inj} = Average of duplicate injection area counts
 $Area_{Trial2}$ = Area count for injection Trial 2
100 = Constant (conversion factor for percentage)

$\Delta_{Injection}$ = 0.1%
 Avg_{Inj} = 0.4805
 $Area_{Trial2}$ = 0.4802

Note: EPA Method 26 requires $\Delta_{Injection}$ to be less than 5%.

8. Determination of sample concentration from least-squares regression curve (mg/L).

$$C_{Reg} = DF \left[a(Avg_{Inj})^2 + b(Avg_{Inj}) + c \right]$$

Where:

C_{Reg} = Sample concentration determined using the regression curve (mg/L)
DF = Sample dilution factor
 Avg_{Inj} = Average of duplicate injection area counts.
a = Coefficient of the x-squared term of the regression curve.
b = Coefficient of the x term of the regression curve.
c = Y-intercept of the regression curve

C_{Reg} = 8.92
DF = 10
 Avg_{Inj} = 0.4805
a = 0.5878
b = 1.5961
c = -0.0103

Sample Calculations

Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28442	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Conditional Test Method 027			Analyte:	Ammonium

Calibration Point No: Cal 02
Sample No: 28442-059
Sample Location: FCCU Regen Stack

9. Determination of total amount of analyte in sample (total mg).

$$M_{Analyte} = \frac{(C_{Reg})(V_{Soln})}{1000}$$

Where:

$M_{Analyte}$ = Amount of analyte in sample (total mg)
 C_{Reg} = Sample concentration determined using the response factor (mg/L)
 V_{Soln} = Sample volume (ml)
1000 = Conversion constant (ml to L)

$M_{Analyte}$ = 1.98
 C_{Reg} = 8.92
 V_{Soln} = 222.0

10. Determination of Detection Limits.

10a. Determination of average spike result.

$$AvgM_{f-i} = \frac{\sum_{i=1}^n M_{f-i}}{n}$$

Where:

$AvgM_{f-i}$ = Average of spike result (mg/L)
 M_{f-i} = Net results recorded for each iteration (mg/L)
n = Number of iterations.
i = Placeholder for iteration.

$AvgM_{f-i}$ = 0.098
 M_{f_1} = 0.095 M_{f_5} = 0.100
 M_{f_2} = 0.095 M_{f_6} = 0.100
 M_{f_3} = 0.095 M_{f_7} = 0.103
 M_{f_4} = 0.094 M_{f_8} = 0.102
n = 8

Sample Calculations

Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28442	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Conditional Test Method 027			Analyte:	Ammonium

Calibration Point No: Cal 02
Sample No: 28442-059
Sample Location: FCCU Regen Stack

10b. Determination of standard deviation of spike result.

$$\sigma_{f-i} = \sqrt{\frac{\sum_{i=1}^n (M_{f-i} - \text{Avg}M_{f-i})^2}{(n-1)}}$$

Where:

σ_{f-i} = Standard deviation of spike result.
 $\text{Avg}M_{f-i}$ = Average spike result (mg/L)
 M_{f-i} = Concentration recorded for each iteration (mg/L)
n = Number of iterations.
i = Placeholder for iteration.

σ_{f-i}	=	0.0035			
$\text{Avg}M_{f-i}$	=	0.098			
M_{f-1}	=	0.095	M_{f-5}	=	0.100
M_{f-2}	=	0.095	M_{f-6}	=	0.100
M_{f-3}	=	0.095	M_{f-7}	=	0.103
M_{f-4}	=	0.094	M_{f-8}	=	0.102
n	=	8			

10c. Determination of variance of spike result.

$$V_{f-i} = (\sigma_{f-i})^2$$

Where:

V_{f-i} = Variance of spike result.
 σ_{f-i} = Standard deviation of spike result.

V_{f-i}	=	1.24E-05
σ_{f-i}	=	0.0035

Sample Calculations

Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28442	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Conditional Test Method 027			Analyte:	Ammonium

Calibration Point No: Cal 02
Sample No: 28442-059
Sample Location: FCCU Regen Stack

10d. Determination of RMS deviation of spike result.

$$RMS_{f-i} = 100 \frac{\sigma_{f-i}}{AvgM_{f-i}}$$

Where:

RMS_{f-i} = RMS deviation of spike results (%)
 σ_{f-i} = Standard deviation of spike result.
 $AvgM_{f-i}$ = Average spike result (mg/L)
100 = Conversion constant (fraction to percent)

RMS_{f-i} = 0.0358
 σ_{f-i} = 0.0035
 $AvgM_{f-i}$ = 0.0982

10e. Determination of average spike recovery.

$$R_f = 100 \frac{AvgM_{f-i}}{RA}$$

Where:

R_f = Average spike recovery (%)
 $AvgM_{f-i}$ = Average spike result (mg/L)
RA = Spike concentration added (mg/L)
100 = Conversion constant (fraction to percent)

R_f = 98.09%
 $AvgM_{f-i}$ = 0.09818
RA = 0.10009

Sample Calculations

Ion Chromatography Analysis

Customer:	Palatine Engineering Group	Lab Project No:	28442	Analyst:	Eric Ewing
Plant:	Marathon	Customer Reference No:	12010	Received:	4/30/12
Applicable Analytical Method:	U.S. EPA Conditional Test Method 027			Analyte:	Ammonium

Calibration Point No: Cal 02
Sample No: 28442-059
Sample Location: FCCU Regen Stack

10f. Determination of $t_{(n-1, 0.99)}$.

Value taken from the following Table:

n	$t_{(n-1, 0.99)}$
7	3.143
8	2.998
9	2.896
10	2.821
11	2.764
16	2.602
21	2.528

Where:

$t_{(n-1, 0.99)}$ = Students' t value appropriate for a 99% confidence level and a standard deviation estimate with n-1 degrees of freedom.

n = Number of iterations.

$t_{(n-1, 0.99)}$ = 2.998

n = 8

10g. Determination of Method Detection Limit (MDL).

$$MDL = \sigma_{f_i} t_{(n-1, 0.99)}$$

Where:

MDL = Method detection limit (mg/L)

$t_{(n-1, 0.99)}$ = Students' t value appropriate for a 99% confidence level and a standard deviation estimate with n-1 degrees of freedom.

σ_{f_i} = Standard deviation of spike result.

MDL = 0.011

$t_{(n-1, 0.99)}$ = 2.998

σ_{f_i} = 0.0035

AS40 Log Sheet

Customer Project No:	12010	Analyte(s):	Ammonium
Lab Project No:	28842		
Dates:	4/27/2012 - 5/2/2012		
Analyst:	Eric Ewing		

Standard Lot#	04161202-64-00000-01
QC Standard Lot#	04161202-64-00000-02
Working Stock Lot#	04251202-64-00000-01

Inj Type: Loop

Inj Mode: Cnst

Inj / Vial: 2

Serial Dilution DataMicrolab 600
Dilution Data

Cartridge ID: 1C 4/27/2012

Pos	Sample #	Identification	Volume	Dilution Factor
1		Blank		1
2		Cal 01 04251202-64-00000-02		1
3		Cal 01 04251202-64-00000-02		1
4		Cal 02 04251202-64-00000-03		1
5		Cal 03 04251202-64-00000-04		1
6		Cal 04 04251202-64-00000-05		1

Pipet Serial No.	Pipet Size	Flask Serial No.	Flask Size

Aliquot Size (uL)	Total Volume (uL)

Cartridge ID: 2C

Pos	Sample #	Identification	Volume	Dilution Factor
1		Cal 05 04251202-64-00000-06		1
2		Cal 06 04251202-64-00000-07		1
3		Cal 07 04251202-64-00000-08		1
4		Cal 08 04251202-64-00000-09		1
5		Blank		1
6		CCV 04251202-64-00000-10		1

Pipet Serial No.	Pipet Size	Flask Serial No.	Flask Size

Aliquot Size (uL)	Total Volume (uL)

Cartridge ID: 3C

Pos	Sample #	Identification	Volume	Dilution Factor
1		QC 04251202-64-00000-11		1
2		Blank		1
3		0 0		
4		0 0		
5		0 0		
6		0 0		

Pipet Serial No.	Pipet Size	Flask Serial No.	Flask Size

Aliquot Size (uL)	Total Volume (uL)

Cartridge ID: 1C 4/30/2012

Pos	Sample #	Identification	Volume	Dilution Factor
1		Blank		1
2		Cal 02 04251202-64-00000-03		1
3		Blank		1
4		CCV 04251202-64-00000-10		1
5		Blank		1
6	28842-054	Reagent Blank DI H2O RB	200	1

Pipet Serial No.	Pipet Size	Flask Serial No.	Flask Size

Aliquot Size (uL)	Total Volume (uL)

AS40 Log Sheet

Customer Project No:	12010	Analyte(s):	Ammonium
Lab Project No:	28842		
Dates:	4/27/2012 - 5/2/2012		
Analyst:	Eric Ewing		

Standard Lot#	04161202-64-00000-01
QC Standard Lot#	04161202-64-00000-02
Working Stock Lot#	04251202-64-00000-01

Inj Type: Loop

Inj Mode: Cnst

Inj / Vial: 2

Serial Dilution DataMicrolab 600
Dilution Data

Cartridge ID: 2C

Pos	Sample #	Identification	Volume	Dilution Factor
1	28842-055	Reagent Blank 0.1N H2SO4 RB	200	1
2	28842-056	FCCU Regen Stack Imp 1 C&R FB	178	1
3	28842-057	FCCU Regen Stack FH DI Rinse R1	166	1
4	28842-058	FCCU Regen Stack FH DI Rinse R2	202	1
5	28842-059	FCCU Regen Stack FH DI Rinse R3	222	1
6	28842-060	FCCU Regen Stack FH DI Rinse R4	193	1

Pipet Serial No.	Pipet Size	Flask Serial No.	Flask Size

Aliquot Size (uL)	Total Volume (uL)

Cartridge ID: 3C

Pos	Sample #	Identification	Volume	Dilution Factor
1	28842-061	FCCU Regen Stack FH DI Rinse R5	175	1
2	28842-062	FCCU Regen Stack FH DI Rinse R6	168	1
3	28842-063	FCCU Regen Stack FH DI Rinse R7	196	1
4		Blank		1
5		QC 04251202-64-00000-11		1
6		Blank		1

Pipet Serial No.	Pipet Size	Flask Serial No.	Flask Size

Aliquot Size (uL)	Total Volume (uL)

Cartridge ID: 4C

Pos	Sample #	Identification	Volume	Dilution Factor
1	28842-064	FCCU Regen Stack FH DI Rinse R8	155	1
2	28842-065	FCCU Regen Stack FH DI Rinse R9	198	1
3	28842-066	FCCU Regen Stack FH DI Rinse R10	198	1
4	28842-067	FCCU Regen Stack FH DI Rinse R11	240	1
5	28842-068	FCCU Regen Stack FH DI Rinse R12	220	1
6	28842-069	FCCU Regen Stack Imp 1-3 C&R R1	569	1

Pipet Serial No.	Pipet Size	Flask Serial No.	Flask Size

Aliquot Size (uL)	Total Volume (uL)

Cartridge ID: 5C

Pos	Sample #	Identification	Volume	Dilution Factor
1	28842-070	FCCU Regen Stack Imp 1-3 C&R R2	593	1
2	28842-071	FCCU Regen Stack Imp 1-3 C&R R3	566	1
3	28842-072	FCCU Regen Stack Imp 1-3 C&R R4	604	1
4	28842-073	FCCU Regen Stack Imp 1-3 C&R R5	573	1
5		Blank		1
6		CCV 04251202-64-00000-10		1

Pipet Serial No.	Pipet Size	Flask Serial No.	Flask Size

Aliquot Size (uL)	Total Volume (uL)

AS40 Log Sheet

Customer Project No:	12010	Analyte(s):	Ammonium
Lab Project No:	28842		
Dates:	4/27/2012 - 5/2/2012		
Analyst:	Eric Ewing		

Standard Lot#	04161202-64-00000-01
QC Standard Lot#	04161202-64-00000-02
Working Stock Lot#	04251202-64-00000-01

Inj Type: Loop

Inj Mode: Cnst

Inj / Vial: 2

Serial Dilution DataMicrolab 600
Dilution Data

Cartridge ID: 6C

Pos	Sample #	Identification	Volume	Dilution Factor
1		Blank		1
2		Cal 03 04251202-64-00000-04		1
3		Blank		1
4				
5				
6				

Pipet Serial No.	Pipet Size	Flask Serial No.	Flask Size

Aliquot Size (uL)	Total Volume (uL)

Cartridge ID: 1C 5/1/2012

Pos	Sample #	Identification	Volume	Dilution Factor
1		Blank		1
2		Cal 04 04251202-64-00000-05		1
3		Blank		1
4		CCV 04251202-64-00000-10		1
5		Blank		1
6	28842-074	FCCU Regen Stack Imp 1-3 C&R R6	577	1

Pipet Serial No.	Pipet Size	Flask Serial No.	Flask Size

Aliquot Size (uL)	Total Volume (uL)

Cartridge ID: 2C

Pos	Sample #	Identification	Volume	Dilution Factor
1	28842-075	FCCU Regen Stack Imp 1-3 C&R R7	600	1
2	28842-076	FCCU Regen Stack Imp 1-3 C&R R8	602	1
3	28842-077	FCCU Regen Stack Imp 1-3 C&R R9	568	1
4	28842-078	FCCU Regen Stack Imp 1-3 C&R R10	613	1
5	28842-079	FCCU Regen Stack Imp 1-3 C&R R11	590	1
6	28842-080	FCCU Regen Stack Imp 1-3 C&R R12	578	1

Pipet Serial No.	Pipet Size	Flask Serial No.	Flask Size

Aliquot Size (uL)	Total Volume (uL)

Cartridge ID: 3C

Pos	Sample #	Identification	Volume	Dilution Factor
1		Blank		1
2		QC 04251202-64-00000-11		1
3		Blank		1
4	28842-057	FCCU Regen Stack FH DI Rinse R1	166	10
5	28842-058	FCCU Regen Stack FH DI Rinse R2	202	10
6	28842-059	FCCU Regen Stack FH DI Rinse R3	222	10

Pipet Serial No.	Pipet Size	Flask Serial No.	Flask Size

Aliquot Size (uL)	Total Volume (uL)
600	6,000
600	6,000
600	6,000

AS40 Log Sheet

Customer Project No:	12010	Analyte(s):	Ammonium
Lab Project No:	28842		
Dates:	4/27/2012 - 5/2/2012		
Analyst:	Eric Ewing		

Standard Lot#	04161202-64-00000-01
QC Standard Lot#	04161202-64-00000-02
Working Stock Lot#	04251202-64-00000-01

Inj Type: Loop

Inj Mode: Cnst

Inj / Vial: 2

Serial Dilution DataMicrolab 600
Dilution Data

Cartridge ID: 4C

Pos	Sample #	Identification	Volume	Dilution Factor
1	28842-060	FCCU Regen Stack FH DI Rinse R4	193	10
2	28842-061	FCCU Regen Stack FH DI Rinse R5	175	10
3	28842-062	FCCU Regen Stack FH DI Rinse R6	168	10
4	28842-063	FCCU Regen Stack FH DI Rinse R7	196	10
5	28842-064	FCCU Regen Stack FH DI Rinse R8	155	10
6	28842-065	FCCU Regen Stack FH DI Rinse R9	198	10

Pipet Serial No.	Pipet Size	Flask Serial No.	Flask Size

Aliquot Size (uL)	Total Volume (uL)
600	6,000
600	6,000
600	6,000
600	6,000
600	6,000
600	6,000

Cartridge ID: 5C

Pos	Sample #	Identification	Volume	Dilution Factor
1	28842-066	FCCU Regen Stack FH DI Rinse R10	198	10
2		Blank		1
3		CCV 04251202-64-00000-10		1
4		Blank		1
5	28842-067	FCCU Regen Stack FH DI Rinse R11	240	10
6	28842-068	FCCU Regen Stack FH DI Rinse R12	220	10

Pipet Serial No.	Pipet Size	Flask Serial No.	Flask Size

Aliquot Size (uL)	Total Volume (uL)
600	6,000
600	6,000
600	6,000

Cartridge ID: 6C

Pos	Sample #	Identification	Volume	Dilution Factor
1	28842-069	FCCU Regen Stack Imp 1-3 C&R R1	569	20
2	28842-070	FCCU Regen Stack Imp 1-3 C&R R2	593	20
3	28842-071	FCCU Regen Stack Imp 1-3 C&R R3	566	20
4	28842-072	FCCU Regen Stack Imp 1-3 C&R R4	604	10
5	28842-073	FCCU Regen Stack Imp 1-3 C&R R5	573	10
6		Blank		1

Pipet Serial No.	Pipet Size	Flask Serial No.	Flask Size

Aliquot Size (uL)	Total Volume (uL)
300	6,000
300	6,000
300	6,000
600	6,000
600	6,000

Cartridge ID: 7C

Pos	Sample #	Identification	Volume	Dilution Factor
1		QC 04251202-64-00000-11		1
2		Blank		1
3		Cal 05 04251202-64-00000-06		1
4		Blank		1
5				
6				

Pipet Serial No.	Pipet Size	Flask Serial No.	Flask Size

Aliquot Size (uL)	Total Volume (uL)

AS40 Log Sheet

Customer Project No:	12010	Analyte(s):	Ammonium
Lab Project No:	28842		
Dates:	4/27/2012 - 5/2/2012		
Analyst:	Eric Ewing		

Standard Lot#	04161202-64-00000-01
QC Standard Lot#	04161202-64-00000-02
Working Stock Lot#	04251202-64-00000-01

Inj Type: Loop

Inj Mode: Cnst

Inj / Vial: 2

Serial Dilution DataMicrolab 600
Dilution Data

Cartridge ID: 1C 5/2/2012

Pos	Sample #	Identification	Volume	Dilution Factor
1		Blank		1
2		Cal 06 04251202-64-00000-07		1
3		Blank		1
4		QC 04251202-64-00000-11		1
5		Blank		1
6	28842-074	FCCU Regen Stack Imp 1-3 C&R R6	577	10

Pipet Serial No.	Pipet Size	Flask Serial No.	Flask Size

Aliquot Size (uL)	Total Volume (uL)
600	6,000

Cartridge ID: 2C

Pos	Sample #	Identification	Volume	Dilution Factor
1	28842-075	FCCU Regen Stack Imp 1-3 C&R R7	600	10
2	28842-076	FCCU Regen Stack Imp 1-3 C&R R8	602	10
3	28842-077	FCCU Regen Stack Imp 1-3 C&R R9	568	10
4	28842-078	FCCU Regen Stack Imp 1-3 C&R R10	613	10
5	28842-079	FCCU Regen Stack Imp 1-3 C&R R11	590	10
6	28842-080	FCCU Regen Stack Imp 1-3 C&R R12	578	10

Pipet Serial No.	Pipet Size	Flask Serial No.	Flask Size

Aliquot Size (uL)	Total Volume (uL)
600	6,000
600	6,000
600	6,000
600	6,000
600	6,000
600	6,000
600	6,000

Cartridge ID: 3C

Pos	Sample #	Identification	Volume	Dilution Factor
1	28842-057	FCCU Regen Stack FH DI Rinse R1	166	10
2	28842-067	FCCU Regen Stack FH DI Rinse R11	240	10
3	28842-077	FCCU Regen Stack Imp 1-3 C&R R9	568	10
4		Blank		1
5		CCV 04251202-64-00000-10		1
6		Blank		1

Pipet Serial No.	Pipet Size	Flask Serial No.	Flask Size

Aliquot Size (uL)	Total Volume (uL)
600	6,000
600	6,000
600	6,000

Cartridge ID: 4C

Pos	Sample #	Identification	Volume	Dilution Factor
1	28842-058	Matrix Spike 04251202-64-00000-09	202	10
2	28842-058	Matrix Spike 04251202-64-00000-09	202	10
3	28842-068	Matrix Spike 04251202-64-00000-09	220	10
4	28842-078	Matrix Spike 04251202-64-00000-09	613	10
5		Blank		1
6		Cal 01 04251202-64-00000-02		1

Pipet Serial No.	Pipet Size	Flask Serial No.	Flask Size

Aliquot Size (uL)	Total Volume (uL)
275	2,750
275	2,750
275	2,750
275	2,750

AS40 Log Sheet

Customer Project No:	12010	Analyte(s):	Ammonium
Lab Project No:	28842		
Dates:	4/27/2012 - 5/2/2012		
Analyst:	Eric Ewing		

Standard Lot#	04161202-64-00000-01
QC Standard Lot#	04161202-64-00000-02
Working Stock Lot#	04251202-64-00000-01

Inj Type: Loop

Inj Mode: Cnst

Inj / Vial: 2

Serial Dilution DataMicrolab 600
Dilution Data

Cartridge ID: 5C

Pos	Sample #	Identification	Volume	Dilution Factor
1		Cal 01 04251202-64-00000-02		1
2		Cal 02 04251202-64-00000-03		1
3		Cal 03 04251202-64-00000-04		1
4		Cal 04 04251202-64-00000-05		1
5		Cal 05 04251202-64-00000-06		1
6		Cal 06 04251202-64-00000-07		1

Pipet Serial No.	Pipet Size	Flask Serial No.	Flask Size

Aliquot Size (uL)	Total Volume (uL)

Cartridge ID: 6C

Pos	Sample #	Identification	Volume	Dilution Factor
1		Cal 07 04251202-64-00000-08		1
2		Cal 08 04251202-64-00000-09		1
3		Blank		1
4				
5				
6				

Pipet Serial No.	Pipet Size	Flask Serial No.	Flask Size

Aliquot Size (uL)	Total Volume (uL)

CLIENT Marathon Petroleum Company		PROJECT 12010		66-12010-	
PLANT Detroit Refinery		DEPT. 66			
PROJECT MANAGER K. O'Halloren					
ANALYTICAL METHOD USEPA M-5F		CONTAINER NUMBER 2		SAMPLE FRACTION FRONT HALF DI WATER RINSE 250 mL CLEAR GLASS	
CleanAir® ENGINEERING 500 West Wood Street Palatine, IL 60067 800-627-0033 (phone) 847-991-3385 (fax)		CONTAINER SEALED?		ANALYSIS REQUESTED Gravimetric Archive	
FORWARDING LAB CleanAir Analytical Services 500 West Wood Street Palatine, IL 60067 800-627-0033 (phone) Doug Rhoades		ADDITIONAL INFORMATION			

LAB ID NUMBER	DATE (2012)	TEST LOCATION	RUN NUMBER		SAMPLE MATRIX	NUMBER OF CONTAINERS	LIQUID LEVEL MARKED?	ANALYSIS REQUESTED	
			Train Proof					Gravimetric	Archive
20842-051 R	4/24	FCCU Regenerator Stack			Front Half DI Water Rinse, 250 mL Clear Glass	1	X		X 69
-040 R	4/24	FCCU Regenerator Stack	1		Front Half DI Water Rinse, 250 mL Clear Glass	1	X	X	178
-043 R	4/24	FCCU Regenerator Stack	2		Front Half DI Water Rinse, 250 mL Clear Glass	1	X	X	153
-044 R	4/24	FCCU Regenerator Stack	3		Front Half DI Water Rinse, 250 mL Clear Glass	1	X	X	172
-045 R	4/25	FCCU Regenerator Stack	4		Front Half DI Water Rinse, 250 mL Clear Glass	1	X	X	141
-046 R	4/25	FCCU Regenerator Stack	5		Front Half DI Water Rinse, 250 mL Clear Glass	1	X	X	151
-047 R	4/25	FCCU Regenerator Stack	6		Front Half DI Water Rinse, 250 mL Clear Glass	1	X	X	185
-048 R	4/26	FCCU Regenerator Stack	7		Front Half DI Water Rinse, 250 mL Clear Glass	1	X	X	133
-049 R	4/26	FCCU Regenerator Stack	8		Front Half DI Water Rinse, 250 mL Clear Glass	1	X	X	146
-020 R	4/26	FCCU Regenerator Stack	9		Front Half DI Water Rinse, 250 mL Clear Glass	1	X	X	183

Relinquished By: (signature) <i>R. Vicere</i>	Date / Time	Relinquished By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time	This form completed by: R. Vicere Signature Date	
Received By: (signature) <i>E. J. Sog</i>	4/24/12 8:30	Received By: (signature)		Relinquished By: (signature)			

CLIENT <u>Marathon Petroleum Company</u>		PROJECT <u>12010</u>		66-12010-	
PLANT <u>Detroit Refinery</u>		DEPT. <u>66</u>			
PROJECT MANAGER <u>K. O'Halloren</u>					
ANALYTICAL METHOD <u>USEPA M-202</u>		CONTAINER NUMBER <u>1</u>		SAMPLE FRACTION <u>BACK HALF CATCH AND INORGANIC RINSE 950 mL Amber Glass</u>	
 CleanAir ENGINEERING 500 West Wood Street Palatine, IL 60067 800-627-0033 (phone) 847-991-3385 (fax)		CONTAINER SEALED? NUMBER OF CONTAINERS		ANALYSIS REQUESTED Gravimetric Archive	
		FORWARDING LAB CleanAir Analytical Services 500 West Wood Street Palatine, IL 60067 800-627-0033 (phone) Doug Rhoades		ADDITIONAL INFORMATION	

LAB ID NUMBER	DATE (2012)	TEST LOCATION	RUN NUMBER	SAMPLE MATRIX	CONTAINER SEALED?	NUMBER OF CONTAINERS	ANALYSIS REQUESTED	ADDITIONAL INFORMATION
28842-023 R	4/24	FCCU Regenerator Stack	1	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass	X	1	Gravimetric	352
-024 R	4/24	FCCU Regenerator Stack	2	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass	X	1	Gravimetric	348
-025 R	4/25	FCCU Regenerator Stack	3	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass	X	1	Gravimetric	330
-026 R	4/25	FCCU Regenerator Stack	4	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass	X	1	Gravimetric	312
-027 R	4/25	FCCU Regenerator Stack	5	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass	X	1	Gravimetric	324
-028 R	4/26	FCCU Regenerator Stack	6	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass	X	1	Gravimetric	326
-029 R	4/26	FCCU Regenerator Stack	7	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass	X	1	Gravimetric	326
-030 R	4/26	FCCU Regenerator Stack	8	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass	X	1	Gravimetric	325
-031 R	4/27	FCCU Regenerator Stack	9	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass	X	1	Gravimetric	334
-032 R	4/24	FCCU Regenerator Stack	Field Train Recovery Blank	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass	X	1	Gravimetric	333
								Field Train Ref
								Blank Gap

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CLIENT Marathon Petroleum Company		PROJECT 12010		66-12010-	
PLANT Detroit Refinery		DEPT. 66			
PROJECT MANAGER K. O'Halloren					
ANALYTICAL METHOD USEPA M-202		CONTAINER NUMBER 2		FORWARDING LAB CleanAir Analytical Services 500 West Wood Street Palatine, IL 60067 800-627-0033 (phone) Doug Rhoades	
SAMPLE FRACTION BACK HALF ORGANIC RINSE 950 mL AMBER GLASS				ANALYSIS REQUESTED Gravimetric Archival	
		NUMBER OF CONTAINERS		CONTAINER SEALED?	
		1		X	
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CLIENT <u>Marathon Petroleum Company</u>			PROJECT <u>12010</u>		66-12010-4		
PLANT <u>Detroit Refinery</u>			DEPT. <u>66</u>				
PROJECT MANAGER <u>K. O'Halloren</u>							
ANALYTICAL METHOD <u>USEPA M-202</u>		CONTAINER NUMBER <u>1</u>	SAMPLE FRACTION <u>BACK HALF CATCH AND INORGANIC RINSE</u>		FORWARDING LAB CleanAir Analytical Services 500 West Wood Street Palatine, IL 60067 800-627-0033 (phone) Doug Rhoades		
					ANALYSIS REQUESTED Gravimetric Archive		
			CONTAINER SEALED?		LIQUID LEVEL MARKED?		
			NUMBER OF CONTAINERS				
			SAMPLE MATRIX				
LAB ID NUMBER	DATE (2012)	TEST LOCATION	RUN NUMBER	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass			
	4/24	FCCU Regenerator Stack	1				352
	4/24	FCCU Regenerator Stack	2	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass			348
	4/25	FCCU Regenerator Stack	3	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass			330
	4/25	FCCU Regenerator Stack	4	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass			312
	4/25	FCCU Regenerator Stack	5	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass			324
	4/26	FCCU Regenerator Stack	6	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass			326
	4/26	FCCU Regenerator Stack	7	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass			326
	4/26	FCCU Regenerator Stack	8	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass			325
	4/27	FCCU Regenerator Stack	9	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass			334
	4/24	FCCU Regenerator Stack	Field Train Recovery Blank	Back Half Catch and Inorganic Rinse, 950 mL Amber Glass			333
Relinquished By: (signature) <u>[Signature]</u>			Date / Time <u>4/23/2012</u>	Relinquished By: (signature)		Date / Time	
Received By: (signature) <u>[Signature]</u>			Date / Time	Relinquished By: (signature)		Date / Time	
K. O'Halloren				K. O'Halloren		Date	
This form completed by:							

CLIENT <u>Marathon Petroleum Company</u>			PROJECT <u>12010</u>		66-12010-5	
PLANT <u>Detroit Refinery</u>			DEPT. <u>66</u>			
PROJECT MANAGER <u>K. O'Halloren</u>						
ANALYTICAL METHOD		CONTAINER NUMBER	SAMPLE FRACTION			
USEPA M-202		2	BACK HALF ORGANIC RINSE 950 mL AMBER GLASS			

CleanAir
ENGINEERING
500 West Wood Street
Palatine, IL 60067
800-627-0033 (phone)
847-991-3385 (fax)

FORWARDING LAB
CleanAir Analytical Services
500 West Wood Street
Palatine, IL 60067
800-627-0033 (phone)
Doug Rhoades

LAB ID NUMBER	DATE (2012)	TEST LOCATION	RUN NUMBER	SAMPLE MATRIX	NUMBER OF CONTAINERS	CONTAINER SEALED?	ANALYSIS REQUESTED		ADDITIONAL INFORMATION
							Gravimetric	Archival	
	4/24	FCCU Regenerator Stack	1	Back Half Organic Rinse, 950 mL Amber Glass	1	X			Acetone and Hexane rinse
	4/24	FCCU Regenerator Stack	2	Back Half Organic Rinse, 950 mL Amber Glass	1	X			
	4/25	FCCU Regenerator Stack	3	Back Half Organic Rinse, 950 mL Amber Glass	1	X			
	4/25	FCCU Regenerator Stack	4	Back Half Organic Rinse, 950 mL Amber Glass	1	X			
	4/25	FCCU Regenerator Stack	5	Back Half Organic Rinse, 950 mL Amber Glass	1	X			
	4/26	FCCU Regenerator Stack	6	Back Half Organic Rinse, 950 mL Amber Glass	1	X			
	4/26	FCCU Regenerator Stack	7	Back Half Organic Rinse, 950 mL Amber Glass	1	X			
	4/26	FCCU Regenerator Stack	8	Back Half Organic Rinse, 950 mL Amber Glass	1	X			
	4/27	FCCU Regenerator Stack	9	Back Half Organic Rinse, 950 mL Amber Glass	1	X			
	4/24	FCCU Regenerator Stack	Field Train Recovery Blank	Back Half Organic Rinse, 950 mL Amber Glass	1	X			

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This form completed by:	
K. O'Halloren Signature	Date

CLIENT <u>Marathon Petroleum Company</u>		PROJECT <u>12010</u>		66-12010-8	
PLANT <u>Detroit Refinery</u>		DEPT. <u>66</u>			
PROJECT MANAGER <u>K. O'Halloren</u>					
ANALYTICAL METHOD <u>USEPA CTM-027</u>		CONTAINER NUMBER <u>2</u>		 CleanAir_® ENGINEERING 500 West Wood Street Palatine, IL 60067 800-627-0033 (phone) 847-991-3385 (fax)	
SAMPLE FRACTION <u>FRONT HALF DI WATER RINSE</u> <u>250 mL HDPE</u>				ANALYSIS REQUESTED Ammonium _____ Archive _____	
		CONTAINER SEALED?		FORWARDING LAB CleanAir Analytical Services 500 West Wood Street Palatine, IL 60067 800-627-0033 (phone) Doug Rhoades	
NUMBER OF CONTAINERS		LIQUID LEVEL MARKED?		ADDITIONAL INFORMATION	
LAB ID NUMBER	DATE (2012)	TEST LOCATION	RUN NUMBER	SAMPLE MATRIX	
	4/24	FCCU Regenerator Stack	Train Proof	Front Half DI Water Rinse, 250 mL HDPE	1 X 78
	4/24	FCCU Regenerator Stack	1	Front Half DI Water Rinse, 250 mL HDPE	1 X 166
	4/24	FCCU Regenerator Stack	2	Front Half DI Water Rinse, 250 mL HDPE	1 X 202
	4/24	FCCU Regenerator Stack	3	Front Half DI Water Rinse, 250 mL HDPE	1 X 222
	4/25	FCCU Regenerator Stack	4	Front Half DI Water Rinse, 250 mL HDPE	1 X 193
	4/25	FCCU Regenerator Stack	5	Front Half DI Water Rinse, 250 mL HDPE	1 X 175
	4/25	FCCU Regenerator Stack	6	Front Half DI Water Rinse, 250 mL HDPE	1 X 168
	4/26	FCCU Regenerator Stack	7	Front Half DI Water Rinse, 250 mL HDPE	1 X 196
	4/26	FCCU Regenerator Stack	8	Front Half DI Water Rinse, 250 mL HDPE	1 X 155
	4/26	FCCU Regenerator Stack	9	Front Half DI Water Rinse, 250 mL HDPE	1 X 198
	4/27	FCCU Regenerator Stack	10	Front Half DI Water Rinse, 250 mL HDPE	1 X 198
	4/27	FCCU Regenerator Stack	11	Front Half DI Water Rinse, 250 mL HDPE	1 X 240
	4/27	FCCU Regenerator Stack	12	Front Half DI Water Rinse, 250 mL HDPE	1 X
Relinquished By: (signature) <u>K. O'Halloren</u>		Relinquished By: (signature)		Date / Time	
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Marathon Petroleum Company
Clean Air Project No: 12010
FCCU Regenerator Stack

USEPA OTM-29 Cyanide Laboratory Data Summary

Run No.	Blank	1	2	3
Date (2012)		Apr 27	Apr 27	Apr 27
Start Time (approx.)		09:28	11:12	12:45
Stop Time (approx.)		10:34	12:17	14:00

☐ DRAFT LAB DATA

MDL Min. detectable limit ($\mu\text{g HCN/mL}$) 0.0145

HCN as Total Cyanide

B_i Blank concentration ($\mu\text{g HCN/mL}$) <0.0145

S_{i-1}	Fraction 1 concentration ($\mu\text{g HCN/mL}$)	1.67	1.75	1.73
DF_1	Dilution factor for Fraction 1	10	10	10
S_{i-2}	Fraction 2 concentration ($\mu\text{g HCN/mL}$)	<0.0145	<0.0145	<0.0145
DF_2	Dilution factor for Fraction 1	5	5	5
v_1	Fraction 1 sample volume (mL)	990	940	980
v_2	Fraction 2 sample volume (mL)	270	230	230
m_a	HCN collected before blank subtraction (μg)	16533	16450	16954
m_b	Allowable blank subtraction (μg)	0	0	0
m_{nb}	HCN collected after blank subtraction (μg)	16533	16450	16954
m_{MDL}	Minimum detectable HCN (μg)	18	17	18
m_n	Total HCN used in emission calculations (μg)	16533	16450	16954
EFF	Collection QC Check (% collected in Fraction 2)	<0.12%	<0.10%	<0.10%

053012 110756
N

Clean Air Engineering

321 Century Plaza, #130
Houston, TX 77073

Marathon Petroleum Company
Detroit Refinery
Client # 12010

Analytical Report
(0312-97)

EPA OTM-29

Hydrogen cyanide



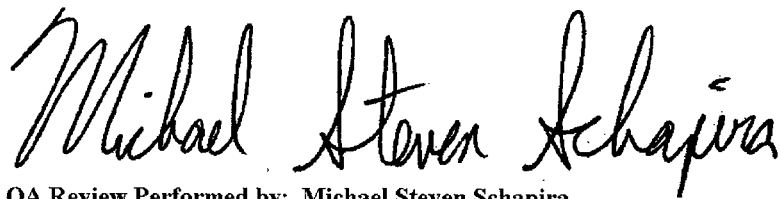
Enthalpy Analytical, Inc.

Phone: (919) 850 - 4392 / Fax: (919) 850 - 9012 / www.enthalpy.com
800-1 Capitola Drive Durham, NC 27713-4385

I certify that to the best of my knowledge all analytical data presented in this report:

- Have been checked for completeness
- Are accurate, error-free, and legible
- Have been conducted in accordance with approved protocol, and that all deviations and analytical problems are summarized in the appropriate narrative(s)

This analytical report was prepared in Portable Document Format (.PDF) and contains 84 pages.

A handwritten signature in black ink that reads "Michael Steven Schapira". The signature is fluid and cursive, with the first name "Michael" being the most prominent.

QA Review Performed by: Michael Steven Schapira

Report Issued: 5/16/12



Summary of Results



Company	Clean Air Engineering
Analyst	AMP
Parameters	EPA OTM-29

Client #	12010
Job #	0312-97
# Samples	3 runs, 4 blanks, 1 spike

Compound	Sample ID / Catch Weight (ug)		
	Regen Stack R1	Regen Stack R2	Regen Stack R3
Hydrogen cyanide	16,521	16,487	16,994
	Regen Stack FB	Field Spike-NaOH Solution	
Hydrogen cyanide	54.4 ND	3,321	
	Reagent Blank-6N NaOH	Reagent Blank-0.1N NaOH	
Hydrogen cyanide	6.24 ND	3.77 ND	

Results



Company Analyst Parameters	Clean Air Engineering AMP EPA OTM-29

Client # Job # # Samples	12010 0312-97 3 runs, 4 blanks, 1 field spike

MDL 0.0145 (ug/mL)
LOQ 0.100 (ug/mL)
Compound Hydrogen cyanide

Lower Curve Limit 0.100 (ug/mL)
Upper Curve Limit 2.00 (ug/mL)

Sample ID	Lab ID # 1	Lab ID # 2	Analysis Method	Ret Time (min)	Ret Time (min)	% Diff Ret	Conc # 1 (ug/mL)	Conc # 2 (ug/mL)	% Diff Conc	Avg Conc (ug/mL)	DF	Vol (mL)	Catch Weight (ug)	Qual
Regen Stack R1 Imp 1-3	18	19	HCN-Method	7.08	7.12	0.5	1.68	1.66	0.5	1.67	10	990	16,521	
Regen Stack R1 Imp 4	24	25	HCN-Method	NA	NA	NA	0.0145	0.0145	0.0	0.0145	5	270	19.6	ND
													16,521	
Regen Stack R2 Imp 1-3	66	67	HCN-Method	7.70	7.70	0.0	1.85	1.66	5.3	1.75	10	940	16,487	
Regen Stack R2 Imp 4	32	33	HCN-Method	NA	NA	NA	0.0145	0.0145	0.0	0.0145	5	230	16.7	ND
													16,487	
Regen Stack R3 Imp 1-3	80	81	HCN-Method	7.83	8.00	2.1	1.82	1.65	5.1	1.73	10	980	16,994	
Regen Stack R3 Imp 4	36	37	HCN-Method	NA	NA	NA	0.0145	0.0145	0.0	0.0145	5	230	16.7	ND
													16,994	
Regen Stack FB Imp 1-3	38	39	HCN-Method	NA	NA	NA	0.0145	0.0145	0.0	0.0145	5	750	54.4	ND
Regen Stack FB Imp 4	40	41	HCN-Method	NA	NA	NA	0.0145	0.0145	0.0	0.0145	5	255	18.5	ND
													54.4	ND
Field Spike-NaOH Solution	70	71	HCN-Method	7.78	7.75	0.4	1.60	1.66	1.9	1.63	20	102	3,321	
													Spike Amount (ug)	4,011
													Spike Recovery (%)	82.8%
Reagent Blank-6N NaOH	48	49	HCN-Method	NA	NA	NA	0.0145	0.0145	0.0	0.0145	5	86.0	6.24	ND
Reagent Blank-0.1N NaOH	50	51	HCN-Method	NA	NA	NA	0.0145	0.0145	0.0	0.0145	1	260	3.77	ND

Company Analyst Parameters	Clean Air Engineering AMP EPA OTM-29	Client # Job # # Samples	12010 0312-97 3 runs, 4 blanks, 1 field spike

MDL 0.0145 (ug/mL)
 LOQ 0.100 (ug/mL)
 Compound Hydrogen cyanide
 Lower Curve Limit 0.100 (ug/mL)
 Upper Curve Limit 2.00 (ug/mL)

Sample ID	Lab ID # 1	Lab ID # 2	Analysis Method	Ret Time (min)	% Diff Ret	Conc # 1 (ug/mL)	Conc # 2 (ug/mL)	% Diff Conc	Avg Conc (ug/mL)	DF	Vol (mL)	Catch Weight (ug)	Qual
HPLC60PG64 #RB	16	17	HCN-Method	NA	NA	0.0145	0.0145	0.0	0.0145	1	1.00	0.0145	ND
MS / Regen Stack-R1 Imp 1-3	20	21	HCN-Method	7.13	0.2	1.69	1.73	1.1	1.71	1	0.525	0.897	
MSD / Regen Stack-R1 Imp 1-3	64	65	HCN-Method	7.70	0.0	1.72	1.82	2.8	1.77	1	0.525	0.929	
LCS-1	72	73	HCN-Method	8.02	3.2	1.09	1.10	0.6	1.10	200	25.0	5.477	
LCS-2	78	79	HCN-Method	7.73	0.0	0.946	0.906	2.2	0.926	200	25.0	4.630	

Narrative Summary



Enthalpy Analytical Narrative Summary

Company	Clean Air Engineering
Analyst	AMP
Parameters	EPA OTM-29

Client #	12010
Job #	0312-97
# Samples	3 Runs, 4 Blanks, 1 Spike

Custody Lindsey Chatterton received the samples on 5/1/12 after being relinquished by Clean Air Engineering. The samples were received at 3.2°C and were in good condition. Prior to, during, and after analysis, the samples were kept under lock with access only to authorized personnel by Enthalpy Analytical, Inc.

Analysis The samples were analyzed for hydrogen cyanide using the analytical procedures in OTM-29, Sampling and Analysis of Hydrogen Cyanide Emissions from Stationary Sources.

The pH values of the samples were measured at 14 prior to analysis, meeting the method requirement of pH 12 or higher.

The ICS-3000 Ion Chromatograph ("Flanders") was equipped with an Electrochemical Detector and a Dionex Ion Pac AS7, 4 x 250 mm (S/N 06060340) column, for these analyses.

Calibration The calibration curve is located in the back of this report and referenced in the Analysis Method column on the Detailed Results page.

Chromatographic Conditions The acquisition method (HCN-BACK.M) is included in the Calibration Curve Chromatograms section of this report.

QC Notes Prior to sample collection, five aqueous spikes containing 4,011 µg of hydrogen cyanide were prepared from a spike solution. Three were shipped to the client; the spike solution and two spikes were retained by the lab for use in preparing Laboratory Control Samples (LCSs). The LCSs were prepared and analyzed with the samples, and gave recovery values of 137% and 115%.

The recovery value for the client field spike was 82.8%.

The analysis of the field reagent blanks, **Reagent Blank-6N NaOH** and **Reagent Blank-0.1N NaOH** did not contain hydrogen cyanide at a concentration greater than the detection limit. The analysis of the laboratory reagent blank also did not contain hydrogen cyanide at a concentration greater than the detection limit.



Enthalpy Analytical Narrative Summary (continued)

QC Notes (continued)

A Matrix Spike (*MS*) and a Matrix Spike Duplicate (*MSD*) were prepared using aliquots of *Regen Stack - R1 Imp 1-3*. Recovery values were calculated to be 89.9% and 95.1% for the *MS* and *MSD* respectively.

The samples were analyzed within the holding time specified by the method.

Reporting Notes

The results presented in this report are representative of the samples as provided to the laboratory.



General Reporting Notes

The following are general reporting notes that are applicable to all Enthalpy Analytical, Inc. data reports, unless specifically noted otherwise.

- The acronym **MDL** represents the Minimum Detection Limit. Below this value the laboratory cannot determine the presence of the analyte of interest reliably.
- The acronym **LOQ** represents the Limit of Quantification. Below this value the laboratory cannot quantitate the analyte of interest within the criteria of the method.
- The acronym **ND** following a value indicates a non-detect or analytical result below the MDL.
- The letter **J** following a value indicates an analytical result between the MDL and the LOQ. A J flag indicates that the laboratory can positively identify the analyte of interest as present, but the value should be considered an estimate.
- The letter **E** following a value indicates an analytical result exceeding 100% of the highest calibration point. The associated value should be considered as an estimate.
- The acronym **DF** represents Dilution Factor. This number represents dilution of the sample during the preparation and/or analysis process. The analytical result taken from a laboratory instrument is multiplied by the DF to determine the final undiluted sample results.
- The addition of **MS** to the Sample ID represents a Matrix Spike. An aliquot of an actual sample is spiked with a known amount of analyte so that a percent recovery value can be determined. This shows what effect the sample matrix may have on the target analyte, i.e. whether or not anything in the sample matrix interferes with the analysis of the analyte(s).
- The addition of **MSD** to the Sample ID represents a Matrix Spike Duplicate. Prepared in the same manner as an MS, the use of duplicate matrix spikes allows further confirmation of laboratory quality by showing the consistency of results gained by performing the same steps multiple times.
- The addition of **LD** to the Sample ID represents a Laboratory Duplicate. The analyst prepares an additional aliquot of sample for testing and the results of the duplicate analysis are compared to the initial result. The result should have a difference value of within 10% of the initial result (if the results of the original analysis are greater than the LOQ).
- The addition of **AD** to the Sample ID represents an Alternate Dilution. The analyst prepares an additional aliquot at a different dilution factor (usually double the initial factor). This analysis helps confirm that no additional compound is present and coeluting or sharing absorbance with the analyte of interest, as they would have a different response/absorbance than the analyte of interest.
- The Sample ID **LCS** represents a Laboratory Control Sample. Clean matrix, similar to the client sample matrix, prepared and analyzed by the laboratory using the same reagents, spiking standards and procedures used for the client samples. The LCS is used to assess the control of the laboratory's analytical system. Whenever spikes are prepared for our client projects, two extra spikes are prepared. The extras (randomly chosen) are labeled with the associated project number and kept in-house at the appropriate temperature conditions. When the project samples are received for analysis, the LCSs are analyzed to confirm that the analyte could be recovered from the media, separate from the samples which were used on the project and which may have been affected by source matrix, sample collection and/or sample transport.



General Reporting Notes

(continued)

- **Significant Figures:** Where the reported value is much greater than unity (1.00) in the units expressed, the number is rounded to a whole number of units, rather than to 3 significant figures. For example, a value of 10,456.45 ug catch is rounded to 10,456 ug. There are five significant digits displayed, but no confidence should be placed on more than two significant digits.
- **Manual Integration:** The data systems used for processing will flag manually integrated peaks with an "M". There are several reasons a peak may be manually integrated. These reasons will be identified by the following two letter designations. The peak was *not integrated* by the software "NI", the peak was *integrated incorrectly* by the software "II" or the *wrong peak* was integrated by the software "WP". These codes will accompany the analyst's manual integration stamp placed next to the compound name.



Sample Custody



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PLANT DATA

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I hereby certify that all pages contained within this Appendix have been reviewed and, to the best of my ability, verified as accurate.

QA/QC Initials: KR

Date: 6/12/2012



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Marathon Petroleum Company
Clean Air Project No: 12010
FCCU Regenerator Stack
Summary of Process Data

Method	Run	Date	Start Time (hh:mm)	Stop Time (hh:mm)	Coke burn (lb coke burn/hr)	Feed rate (bpd)	ESP Operation	ESP Power Reduction	NH3 Injection (lb/hr)
M-5F/202	1	4/24/2012	10:33	11:43	18,351	33,012	West	Medium	8
M-5F/202	2	4/24/2012	12:48	13:53	18,240	33,018	West	Medium	8
M-5F/202	3	4/24/2012	14:33	15:55	18,196	32,988	West	Medium	8
	Average				18,262	33,006			
M-5F/202	4	4/25/2012	9:08	10:12	18,143	32,512	Both	Medium	8
M-5F/202	5	4/25/2012	12:07	13:14	18,106	32,478	Both	Medium	8
M-5F/202	6	4/25/2012	14:06	15:23	18,053	32,476	Both	Medium	8
	Average				18,101	32,489			
M-5F/202	7	4/26/2012	8:24	9:31	18,063	32,503	Both	Low	8
M-5F/202	8	4/26/2012	10:10	11:17	18,077	32,506	Both	Low	8
M-5F/202	9	4/26/2012	11:58	13:17	18,084	32,518	Both	Low	8
	Average				18,075	32,509			
Mod. CTM-027	1	4/24/2012	10:33	11:33	18,352	33,016	West	Medium	8
Mod. CTM-027	2	4/24/2012	12:48	13:48	18,245	33,014	West	Medium	8
Mod. CTM-027	3	4/24/2012	14:33	15:33	18,192	32,998	West	Medium	8
	Average				18,263	33,009			
Mod. CTM-027	4	4/25/2012	9:08	10:08	18,143	32,512	Both	Medium	8
Mod. CTM-027	5	4/25/2012	12:07	13:07	18,096	32,483	Both	Medium	8
Mod. CTM-027	6	4/25/2012	14:06	15:06	18,060	32,468	Both	Medium	8
	Average				18,100	32,487			
Mod. CTM-027	7	4/26/2012	8:24	9:24	18,067	32,506	Both	Low	8
Mod. CTM-027	8	4/26/2012	10:10	11:10	18,080	32,515	Both	Low	8
Mod. CTM-027	9	4/26/2012	11:58	12:58	18,077	32,518	Both	Low	8
	Average				18,075	32,513			
Mod. CTM-027	10	4/27/2012	9:28	10:28	17,932	32,504	Both	Unknown	8
Mod. CTM-027	11	4/27/2012	11:12	12:12	17,949	32,482	Both	Unknown	8
Mod. CTM-027	12	4/27/2012	12:45	13:45	17,927	32,488	Both	Unknown	8
	Average				17,936	32,491			
OTM-29	1	4/27/2012	9:28	10:34	17,932	32,508	Both	Unknown	8
OTM-29	2	4/27/2012	11:12	12:17	17,948	32,483	Both	Unknown	8
OTM-29	3	4/27/2012	12:45	14:00	17,915	32,528	Both	Unknown	8
	Average				17,932	32,507			

Feed rate	coke burn	Primary current to Primary current to Primary power to						Secondary			Primary voltage to Primary voltage to		
		TR1	TR2	TR3	TR1	TR2	TR3	current to TR1	current to TR2	current to TR3	TR1	TR2	TR3
bpd	lb/hr	11I0032A	11I0033A	11I0034A	11J0032A	11J0033A	11J0034A	mA	mA	mA	V	V	V
11FC0118	11mickbr	69	78	80	12	15	16	303	347	352	234	248	255
32922	18208	67	78	80	11	15	16	295	350	351	232	249	255
32922	18261	66	79	80	11	15	16	289	348	351	230	249	255
32926	18257	66	76	80	11	15	16	278	332	351	228	244	255
32930	18218	65	73	80	11	15	16	281	316	351	227	239	255
32934	18104	64	78	80	11	15	16	278	343	351	225	247	255
32938	18168	58	78	80	10	15	16	247	348	351	216	248	255
32942	18262	62	76	80	10	15	16	268	333	351	224	244	255
32946	18197	64	72	80	11	15	16	281	316	351	227	239	255
32950	18199	68	76	80	12	15	16	300	337	351	233	245	255
32954	18251	68	77	80	12	15	16	298	331	351	234	244	255
32958	18219	61	74	80	10	15	16	258	316	351	219	242	255
32958	18248	60	77	80	9	15	16	257	339	351	218	247	255
32956	18324	61	74	80	10	15	16	266	319	351	222	241	255
32955	18316	66	77	80	11	15	16	291	338	351	230	245	255
32954	18280	62	78	80	10	15	16	266	345	351	224	248	255
32952	18274	63	74	80	11	15	16	272	318	351	224	241	255
32951	18290	67	77	80	12	15	16	295	338	351	232	246	255
32950	18324	66	70	80	12	13	16	292	309	351	230	237	255
32948	18336	65	70	80	12	13	16	284	308	351	227	235	255
32947	18384	67	75	80	12	15	16	298	329	350	232	243	255
32946	18454	60	74	77	10	15	16	260	321	334	219	241	249
32948	18455	62	77	79	11	15	16	267	341	344	222	247	252
32950	18381	60	77	80	11	15	16	257	349	350	219	250	254
32953	18287	63	75	80	11	14	16	272	340	350	225	246	254
32956	18262	66	73	80	11	14	16	292	327	350	232	242	254
32959	18340	62	72	80	11	14	16	270	313	350	224	239	254
32962	18355	63	76	80	12	14	16	275	335	350	225	245	254
32965	18342	62	77	80	12	14	16	265	341	350	221	246	254
32968	18377	64	75	80	12	14	16	278	322	350	226	241	254
32971	18372	64	73	80	12	13	16	273	315	351	225	239	254
32974	18454	66	77	80	12	13	16	287	340	351	230	247	254
32977	18424	64	76	80	11	13	16	281	338	351	227	245	254
32979	18406	66	72	80	11	13	16	290	316	351	229	238	254
32982	18429	64	67	80	11	12	16	277	287	351	226	229	254
32985	18366	67	76	80	11	14	16	291	337	351	230	245	254
32988	18344	68	79	80	11	15	16	296	350	351	232	249	254
32991	18302	65	78	80	12	15	16	279	350	351	227	248	254
32993	18385	61	78	80	12	15	16	261	346	351	224	248	254
32996	18360	62	74	80	12	15	16	265	320	351	223	241	254
32999	18315	64	73	80	12	15	16	281	317	351	228	240	254
33002	18329	65	77	80	12	15	16	283	342	351	229	247	254
33003	18405	65	78	80	11	15	16	284	350	351	228	249	254
33003	18377	66	77	80	11	15	16	294	349	351	231	249	254
33002	18314												

Feed rate bpd	coke burn lb/hr	Primary current to Primary current to Primary power to				Secondary current to				Primary voltage to Primary voltage to			
		TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR1	TR2	TR3	TR3
		A	A	A	kW	kW	kW	mA	mA	V	V	V	V
11FC0118	11micbkr	11I0032A	11I0033A	11I0034A	11J0032A	11J0033A	11J0034A	11I0032B	11I0033B	11I0034B	11E0032A	11E0033A	11E0034A
4/24/2012 10:14	18263	63	76	80	11	15	16	277	334	352	225	244	254
4/24/2012 10:15	18276	65	72	80	11	15	16	285	312	352	229	238	254
4/24/2012 10:16	18273	66	73	80	11	15	16	281	318	352	229	240	254
4/24/2012 10:17	18270	66	78	80	11	15	16	283	344	352	228	248	254
4/24/2012 10:18	18271	66	77	80	11	15	16	289	339	352	230	246	254
4/24/2012 10:19	18239	64	78	80	11	15	16	280	344	352	227	247	254
4/24/2012 10:20	18284	64	73	80	11	15	16	280	321	352	226	240	254
4/24/2012 10:21	18331	60	73	80	11	15	16	262	317	351	221	239	254
4/24/2012 10:22	18256	62	76	80	11	15	16	267	328	350	223	243	254
4/24/2012 10:23	18201	61	78	80	10	15	16	258	342	350	221	248	254
4/24/2012 10:24	18197	59	74	80	10	15	16	254	321	350	218	241	254
4/24/2012 10:25	18173	58	78	80	10	15	16	249	343	350	217	248	254
4/24/2012 10:26	18195	63	79	80	11	15	16	276	350	350	226	250	254
4/24/2012 10:27	18275	62	79	80	11	15	16	266	350	350	223	250	254
4/24/2012 10:28	18296	62	79	80	11	15	16	265	350	350	222	249	254
4/24/2012 10:29	18263	53	79	80	8	15	16	218	350	350	204	249	254
4/24/2012 10:30	18243	59	79	80	10	15	16	253	349	350	218	249	254
4/24/2012 10:31	18272	62	73	80	11	15	16	262	321	350	223	241	254
4/24/2012 10:32	18322	64	77	80	11	15	16	278	339	350	227	246	254
4/24/2012 10:33	18294	64	75	80	11	15	16	274	331	350	227	243	254
4/24/2012 10:34	18306	66	78	80	11	15	16	291	345	350	230	248	254
4/24/2012 10:35	18227	65	78	80	11	15	16	288	348	350	229	249	254
4/24/2012 10:36	18231	65	76	80	11	15	16	288	331	350	230	245	254
4/24/2012 10:37	18287	66	74	80	11	15	16	291	316	350	231	240	254
4/24/2012 10:38	18351	67	73	80	11	15	16	296	311	350	232	238	254
4/24/2012 10:39	18328	66	77	80	11	15	16	289	337	350	231	246	254
4/24/2012 10:40	18332	65	79	80	11	15	16	276	343	350	229	246	254
4/24/2012 10:41	18368	64	79	80	11	15	16	278	346	350	227	247	254
4/24/2012 10:42	18378	67	74	80	11	15	16	293	321	350	232	241	254
4/24/2012 10:43	18301	63	78	80	11	15	16	278	341	350	226	247	254
4/24/2012 10:44	18284	65	79	80	11	15	16	282	344	350	228	248	254
4/24/2012 10:45	18365	65	79	80	11	15	16	280	349	350	229	250	254
4/24/2012 10:46	18309	65	79	80	11	15	16	282	350	350	228	250	254
4/24/2012 10:47	18245	65	79	80	11	15	16	285	349	350	228	249	254
4/24/2012 10:48	18351	67	74	80	11	15	16	295	324	350	231	242	254
4/24/2012 10:49	18390	65	77	80	11	15	16	287	336	350	230	245	254
4/24/2012 10:50	18361	63	75	80	11	15	16	270	325	350	226	242	254
4/24/2012 10:51	18411	61	74	80	10	15	16	265	322	350	222	242	254
4/24/2012 10:52	18453	64	75	80	11	15	16	283	335	350	228	245	254
4/24/2012 10:53	18429	62	76	80	10	15	16	268	337	350	223	246	254
4/24/2012 10:54	18376	64	76	80	10	15	16	278	335	350	225	245	254
4/24/2012 10:55	18347	65	73	80	10	15	16	275	317	350	228	240	254
4/24/2012 10:56	18336	62	78	80	10	15	16	262	344	350	222	248	254
4/24/2012 10:57	18382	64	79	80	11	15	16	276	350	350	225	250	254

Feed rate bpd	coke burn lb/hr	Primary current to Primary current to Primary current to Primary current to				Primary power to Primary power to Primary power to Primary power to				Secondary current to Secondary current to Secondary current to Secondary current to				Primary voltage to Primary voltage to Primary voltage to Primary voltage to			
		TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3	TR3
11FC0118	11micckbr	11I0032A	11I0033A	11I0034A	11I0032A	11I0033A	11I0034A	11I0032B	11I0033B	11I0034B	11E0032A	11E0033A	11E0034A	11E0032A	11E0033A	11E0034A	11E0034A
33024	18358	60	79	80	11	15	16	260	350	350	220	249	254	220	249	254	254
4/24/2012 10:58	18358	63	79	80	11	15	16	266	348	350	224	249	254	224	249	254	254
33023	18397	65	71	80	12	13	16	281	303	350	228	236	254	228	236	254	254
4/24/2012 11:00	18471	61	75	80	10	14	16	262	320	350	221	242	254	221	242	254	254
33020	18523	62	78	80	10	15	16	271	337	350	223	245	254	223	245	254	254
4/24/2012 11:02	18504	64	79	80	10	15	16	282	345	350	227	248	254	227	248	254	254
33021	18410	61	75	80	10	15	16	260	331	350	221	243	254	221	243	254	254
4/24/2012 11:03	18381	57	72	80	10	15	16	244	310	350	215	237	254	215	237	254	254
33022	18444	62	73	80	11	15	16	267	318	350	223	240	254	223	240	254	254
4/24/2012 11:05	18457	61	76	80	11	15	16	262	332	350	222	244	254	222	244	254	254
33023	18450	61	75	80	11	15	16	262	331	350	222	243	254	222	243	254	254
4/24/2012 11:06	18470	64	73	80	11	15	16	279	315	350	226	240	254	226	240	254	254
33024	18470	66	77	80	12	15	16	293	337	350	231	246	254	231	246	254	254
4/24/2012 11:07	18364	65	75	80	12	15	16	283	330	350	230	243	254	230	243	254	254
33025	18274	65	71	80	12	15	16	282	308	350	229	237	254	229	237	254	254
4/24/2012 11:08	18281	67	76	80	12	15	16	294	332	350	232	244	254	232	244	254	254
33026	18284	67	78	80	12	15	16	296	339	350	232	248	254	232	248	254	254
4/24/2012 11:09	18338	67	77	80	11	15	16	280	339	350	228	247	254	228	247	254	254
33027	18297	64	66	80	11	12	16	285	281	350	228	228	254	228	228	254	254
4/24/2012 11:10	18262	65	66	80	11	12	16	279	324	350	226	241	254	226	241	254	254
33028	18291	64	74	80	11	14	16	288	341	350	229	247	254	229	247	254	254
4/24/2012 11:11	18313	66	79	80	11	15	16	283	346	350	228	249	254	228	249	254	254
33029	18270	65	79	80	12	15	16	283	350	350	230	250	254	230	250	254	254
4/24/2012 11:12	18265	66	79	80	12	15	16	282	347	350	231	249	254	231	249	254	254
33030	18366	66	78	80	12	15	16	280	299	350	228	234	254	228	234	254	254
4/24/2012 11:13	18422	65	69	80	12	12	16	282	332	350	229	244	254	229	244	254	254
33031	18356	65	75	80	12	14	16	262	334	350	221	247	254	221	247	254	254
4/24/2012 11:14	18282	61	77	80	10	15	16	251	344	350	219	249	254	219	249	254	254
33032	18303	59	78	80	10	15	16	281	330	350	228	243	254	228	243	254	254
4/24/2012 11:15	18416	65	77	80	11	15	16	274	331	350	226	245	254	226	245	254	254
33033	18465	63	76	80	11	15	16	279	340	350	227	247	254	227	247	254	254
4/24/2012 11:16	18354	64	77	80	11	15	16	295	320	350	232	240	254	232	240	254	254
33034	18365	67	73	80	12	15	16	272	317	351	226	239	254	226	239	254	254
4/24/2012 11:17	18288	63	73	80	12	15	16	269	335	351	224	246	254	224	246	254	254
33035	18322	62	76	80	12	15	16	287	344	351	229	249	254	229	249	254	254
4/24/2012 11:18	18372	66	78	80	11	15	16	283	315	351	229	240	254	229	240	254	254
33036	18310	65	72	80	11	15	16	274	334	351	226	245	254	226	245	254	254
4/24/2012 11:19	18245	63	76	80	11	15	16	260	318	351	222	240	254	222	240	254	254
33037	18287	61	73	80	10	15	16	283	324	351	229	242	255	229	242	255	255
4/24/2012 11:20	18353	65	74	80	11	15	16	281	337	351	228	246	255	228	246	255	255
33038	18341	64	76	80	12	15	16	283	347	351	228	250	255	228	250	255	255
4/24/2012 11:21	18285	64	78	80	11	15	16	269	333	351	223	245	255	223	245	255	255
33039	18341	62	76	80	10	15	16	281	327	351	227	242	255	227	242	255	255
4/24/2012 11:22	18277	65	74	80	12	15	16	285	321	351	228	241	255	228	241	255	255
33040	18357	66	73	80	12	15	16	285	321	351	228	241	255	228	241	255	255
4/24/2012 11:23	18399	66	73	80	12	15	16	285	321	351	228	241	255	228	241	255	255

Feed rate bpd	coke burn lb/hr	Primary current to Primary current to Primary current to						Secondary current to			Primary voltage to Primary voltage to Primary voltage to		
		TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3
		A	A	A	kW	kW	kW	mA	mA	mA	V	V	V
		11I0032A	11I0033A	11I0034A	11J0032A	11J0033A	11J0034A	11I0032B	11I0033B	11I0034B	11E0032A	11E0033A	11E0034A
11FC0118		64	73	80	12	15	16	282	321	351	228	242	255
32983	4/24/2012 11:42	18418	18418	18418	18394	18394	18394	18394	18394	18394	18394	18394	18394
32986	4/24/2012 11:43	18394	18394	18394	18394	18394	18394	18394	18394	18394	18394	18394	18394
32989	4/24/2012 11:44	18397	18397	18397	18374	18374	18374	18374	18374	18374	18374	18374	18374
32992	4/24/2012 11:45	18374	18374	18374	18391	18391	18391	18391	18391	18391	18391	18391	18391
32995	4/24/2012 11:46	18391	18391	18391	18398	18398	18398	18398	18398	18398	18398	18398	18398
32998	4/24/2012 11:47	18398	18398	18398	18305	18305	18305	18305	18305	18305	18305	18305	18305
33001	4/24/2012 11:48	18305	18305	18305	18330	18330	18330	18330	18330	18330	18330	18330	18330
33004	4/24/2012 11:49	18330	18330	18330	18261	18261	18261	18261	18261	18261	18261	18261	18261
33007	4/24/2012 11:50	18261	18261	18261	18262	18262	18262	18262	18262	18262	18262	18262	18262
33009	4/24/2012 11:51	18262	18262	18262	18309	18309	18309	18309	18309	18309	18309	18309	18309
33002	4/24/2012 11:52	18309	18309	18309	18317	18317	18317	18317	18317	18317	18317	18317	18317
32994	4/24/2012 11:53	18317	18317	18317	18209	18209	18209	18209	18209	18209	18209	18209	18209
32986	4/24/2012 11:54	18209	18209	18209	18279	18279	18279	18279	18279	18279	18279	18279	18279
32978	4/24/2012 11:55	18279	18279	18279	18331	18331	18331	18331	18331	18331	18331	18331	18331
32970	4/24/2012 11:56	18331	18331	18331	18289	18289	18289	18289	18289	18289	18289	18289	18289
32962	4/24/2012 11:57	18289	18289	18289	18226	18226	18226	18226	18226	18226	18226	18226	18226
32954	4/24/2012 11:58	18226	18226	18226	18223	18223	18223	18223	18223	18223	18223	18223	18223
32946	4/24/2012 11:59	18223	18223	18223	18184	18184	18184	18184	18184	18184	18184	18184	18184
32938	4/24/2012 12:00	18184	18184	18184	18101	18101	18101	18101	18101	18101	18101	18101	18101
32931	4/24/2012 12:01	18101	18101	18101	18214	18214	18214	18214	18214	18214	18214	18214	18214
32929	4/24/2012 12:02	18214	18214	18214	18241	18241	18241	18241	18241	18241	18241	18241	18241
32927	4/24/2012 12:03	18241	18241	18241	18256	18256	18256	18256	18256	18256	18256	18256	18256
32926	4/24/2012 12:04	18256	18256	18256	18236	18236	18236	18236	18236	18236	18236	18236	18236
32924	4/24/2012 12:05	18236	18236	18236	18209	18209	18209	18209	18209	18209	18209	18209	18209
32923	4/24/2012 12:06	18209	18209	18209	18278	18278	18278	18278	18278	18278	18278	18278	18278
32921	4/24/2012 12:07	18278	18278	18278	18382	18382	18382	18382	18382	18382	18382	18382	18382
32920	4/24/2012 12:08	18382	18382	18382	18372	18372	18372	18372	18372	18372	18372	18372	18372
32918	4/24/2012 12:09	18372	18372	18372	18414	18414	18414	18414	18414	18414	18414	18414	18414
32917	4/24/2012 12:10	18414	18414	18414	18450	18450	18450	18450	18450	18450	18450	18450	18450
32916	4/24/2012 12:11	18450	18450	18450	18415	18415	18415	18415	18415	18415	18415	18415	18415
32924	4/24/2012 12:12	18415	18415	18415	18373	18373	18373	18373	18373	18373	18373	18373	18373
32935	4/24/2012 12:13	18373	18373	18373	18295	18295	18295	18295	18295	18295	18295	18295	18295
32945	4/24/2012 12:14	18295	18295	18295	18379	18379	18379	18379	18379	18379	18379	18379	18379
32956	4/24/2012 12:15	18379	18379	18379	18381	18381	18381	18381	18381	18381	18381	18381	18381
32966	4/24/2012 12:16	18381	18381	18381	18375	18375	18375	18375	18375	18375	18375	18375	18375
32976	4/24/2012 12:17	18375	18375	18375	18329	18329	18329	18329	18329	18329	18329	18329	18329
32987	4/24/2012 12:18	18329	18329	18329	18296	18296	18296	18296	18296	18296	18296	18296	18296
32997	4/24/2012 12:19	18296	18296	18296	18314	18314	18314	18314	18314	18314	18314	18314	18314
33008	4/24/2012 12:20	18314	18314	18314	18350	18350	18350	18350	18350	18350	18350	18350	18350
33018	4/24/2012 12:21	18350	18350	18350	18346	18346	18346	18346	18346	18346	18346	18346	18346
33020	4/24/2012 12:22	18346	18346	18346	18377	18377	18377	18377	18377	18377	18377	18377	18377
33021	4/24/2012 12:23	18377	18377	18377	18407	18407	18407	18407	18407	18407	18407	18407	18407
33021	4/24/2012 12:24	18407	18407	18407	18351	18351	18351	18351	18351	18351	18351	18351	18351
33022	4/24/2012 12:25	18351	18351	18351									

Feed rate bpd	coke burn lb/hr	Primary current to Primary current to Primary power to						Secondary current to TR1 mA	Secondary current to TR2 mA	Secondary current to TR3 mA	Primary voltage to Primary voltage to Primary voltage to		
		TR1 A	TR2 A	TR3 A	TR1 kW	TR2 kW	TR3 kW				TR1 V	TR2 V	TR3 V
11FC0118	11mickbr	11I0032A	11I0033A	11I0034A	11J0032A	11J0033A	11J0034A	11I0032B	11I0033B	11I0034B	11E0032A	11E0033A	11E0034A
33022	18269	60	77	80	10	15	16	256	337	351	219	245	255
33023	18249	59	75	80	10	15	16	257	320	351	219	241	255
33023	18223	62	74	80	11	15	16	269	320	351	224	242	255
33024	18273	63	74	80	11	15	16	271	330	351	225	244	255
33024	18247	67	77	80	12	15	16	291	325	351	231	244	255
33025	18300	65	78	80	12	15	16	284	342	351	228	248	255
33026	18301	63	79	80	11	15	16	267	343	351	224	250	255
33027	18275	63	79	80	11	15	16	270	345	351	226	250	255
33028	18222	59	79	80	9	15	16	247	349	351	218	250	255
33029	18199	61	79	80	10	15	16	256	347	351	221	249	255
33031	18234	64	79	80	11	15	16	278	349	351	227	249	255
33032	18201	57	79	80	9	15	16	245	347	351	212	249	255
33033	18255	60	72	80	10	13	16	261	314	350	219	239	255
33034	18255	60	75	80	11	14	16	261	325	350	221	242	255
33035	18195	62	75	80	11	15	16	268	327	350	223	242	255
33036	18196	65	75	80	11	15	16	282	330	350	229	243	255
33031	18217	68	74	80	11	15	16	302	319	350	234	240	255
33024	18251	66	73	80	11	15	16	291	317	350	230	240	255
33017	18280	61	77	80	11	15	16	264	338	350	223	246	255
33011	18352	61	73	80	11	15	16	261	316	350	221	240	255
33004	18333	59	74	80	11	15	16	251	325	350	218	242	255
32997	18286	65	78	80	11	15	16	283	343	350	227	248	255
32990	18251	64	79	80	11	15	16	282	350	350	227	250	255
32983	18219	65	79	80	11	15	16	282	349	350	228	250	255
32976	18237	67	77	80	11	15	16	298	334	350	233	246	255
32970	18247	65	74	80	11	14	16	286	321	350	228	241	255
32972	18168	61	77	80	11	14	16	261	342	350	221	247	255
32979	18151	63	77	80	10	14	16	272	342	350	223	247	255
32986	18182	64	75	80	10	14	16	281	327	350	226	243	255
32993	18258	62	76	80	10	14	16	267	335	350	223	244	255
32999	18279	68	73	80	12	14	16	297	319	350	232	240	255
33006	18296	66	76	80	12	14	16	289	334	350	231	246	255
33013	18201	62	75	80	11	14	16	268	331	350	224	244	255
33020	18206	63	76	80	11	14	16	275	332	350	226	245	255
33027	18168	66	78	80	11	14	16	288	344	350	230	248	255
33033	18212	62	74	80	11	14	16	262	320	350	222	242	255
33031	18254	61	77	80	11	14	16	262	340	350	222	247	255
33023	18178	65	78	80	12	14	16	284	350	350	228	250	255
33016	18257	61	77	80	12	14	16	266	349	350	222	249	255
33009	18267	64	76	80	12	14	16	281	333	351	227	245	255
33002	18192	65	72	80	12	14	16	286	308	351	228	238	255
32994	18232	68	77	80	12	14	16	295	337	351	232	246	255
32987	18270	64	76	80	11	14	16	275	344	351	226	247	255
32980	18198	65	72	80	11	14	16	285	317	351	227	240	255

Feed rate bpd	coke burn lb/hr	Primary current to Primary current to			Primary power to			Secondary current to			Primary voltage to Primary voltage to		
		TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3
		A	A	A	kW	kW	kW	mA	mA	mA	V	V	V
11FC0118	11mickbr	11I0032A	11I0033A	11I0034A	11J0032A	11J0033A	11J0034A	11I0032B	11I0033B	11I0034B	11E0032A	11E0033A	11E0034A
4/24/2012 13:10	18211	67	71	80	11	14	16	292	308	351	231	237	255
4/24/2012 13:11	18254	65	72	80	11	14	16	284	309	351	228	238	255
4/24/2012 13:12	18215	66	73	80	11	14	16	293	310	351	230	238	255
4/24/2012 13:13	18219	64	73	80	11	14	16	278	313	351	226	239	255
4/24/2012 13:14	18230	65	74	80	11	13	16	281	311	351	226	239	255
4/24/2012 13:15	18227	64	74	80	11	13	16	286	331	351	227	245	255
4/24/2012 13:16	18307	61	75	80	11	13	16	263	329	351	221	244	255
4/24/2012 13:17	18359	62	73	80	11	13	16	270	318	351	223	239	255
4/24/2012 13:18	18321	66	77	80	12	13	16	292	340	351	231	247	255
4/24/2012 13:19	18316	65	78	80	12	13	16	286	349	351	228	249	255
4/24/2012 13:20	18330	67	77	80	11	13	16	296	340	351	231	246	255
4/24/2012 13:21	18308	65	74	80	11	13	16	288	319	351	228	240	255
4/24/2012 13:22	18335	62	77	80	10	13	16	265	337	351	223	246	255
4/24/2012 13:23	18344	64	76	80	11	13	16	282	332	351	226	244	255
4/24/2012 13:24	18286	66	75	80	12	13	16	292	330	351	230	243	254
4/24/2012 13:25	18217	63	72	80	12	13	16	276	314	351	224	239	254
4/24/2012 13:26	18243	66	74	80	12	13	16	290	324	351	229	241	254
4/24/2012 13:27	18279	68	69	80	12	12	16	296	300	351	232	234	254
4/24/2012 13:28	18185	67	75	80	12	14	16	294	329	351	232	243	254
4/24/2012 13:29	18132	64	76	80	12	15	16	276	335	350	226	244	254
4/24/2012 13:30	18190	63	77	76	11	15	16	274	344	331	226	247	247
4/24/2012 13:31	18233	65	78	78	11	15	16	285	349	342	228	249	251
4/24/2012 13:32	18331	68	75	80	11	15	16	300	328	350	233	243	254
4/24/2012 13:33	18387	66	73	80	11	15	16	290	322	350	231	240	254
4/24/2012 13:34	18352	65	72	80	11	15	16	282	311	350	228	238	255
4/24/2012 13:35	18279	62	72	80	11	15	16	271	313	350	224	238	255
4/24/2012 13:36	18236	61	77	80	11	15	16	261	342	350	221	247	255
4/24/2012 13:37	18276	64	75	80	11	15	16	279	330	350	225	243	255
4/24/2012 13:38	18279	65	74	80	11	15	16	278	322	350	227	243	255
4/24/2012 13:39	18254	64	73	80	11	15	16	278	326	350	227	243	256
4/24/2012 13:40	18266	67	73	80	11	15	16	293	313	350	231	240	256
4/24/2012 13:41	18314	63	72	80	12	15	16	279	313	350	226	239	256
4/24/2012 13:42	18289	64	77	80	12	15	16	283	341	350	228	246	255
4/24/2012 13:43	18184	64	79	80	12	15	16	277	348	350	227	249	254
4/24/2012 13:44	18169	63	77	80	12	15	16	276	341	350	225	247	254
4/24/2012 13:45	18240	66	71	80	12	13	16	290	309	350	229	237	254
4/24/2012 13:46	18127	67	75	80	12	12	16	299	330	350	232	243	254
4/24/2012 13:47	18137	67	77	80	12	12	16	293	342	350	230	247	254
4/24/2012 13:48	18162	65	77	80	12	12	16	282	333	351	227	245	254
4/24/2012 13:49	18211	67	75	80	12	12	16	298	317	351	232	240	254
4/24/2012 13:50	18197	65	73	80	12	12	16	288	313	351	228	239	254
4/24/2012 13:51	18112	68	76	80	12	13	16	299	336	351	232	246	254
4/24/2012 13:52	18172	65	75	80	12	13	16	285	330	351	227	243	254
4/24/2012 13:53	18183	64	74	80	12	13	16	276	323	351	224	242	254

Feed rate bpd	coke burn lb/hr	Primary current to Primary current to						Primary power to Primary power to						Secondary current to		Primary voltage to Primary voltage to	
		TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR1	TR2
		A	A	A	kw	kw	kw	kw	kw	kw	mA	mA	mA	V	V	V	V
11FC0118	11micbcr	11I0032A	11I0033A	11I0034A	11J0032A	11J0033A	11J0034A	11J0032B	11I0033B	11I0034B	11E0032A	11E0033A	11E0034A				
4/24/2012 13:54	18240	66	75	80	12	13	16	292	328	351	231	242	254				
33055	18260	68	75	80	12	13	16	301	328	351	234	242	254				
33048	18222	69	73	80	12	13	16	307	310	351	235	236	253				
33041	18159	63	72	80	11	13	16	274	308	351	225	237	253				
33033	18210	63	74	80	10	13	16	272	331	351	223	243	253				
33026	18241	65	78	80	10	13	16	276	347	351	226	248	253				
33018	18225	62	79	80	10	13	16	261	349	351	222	250	253				
33011	18288	65	75	80	12	13	16	281	328	351	229	244	253				
33004	18358	63	77	80	12	14	16	275	341	351	225	248	253				
33000	18318	66	75	80	12	14	16	289	331	351	230	245	253				
33001	18299	65	76	80	12	14	16	279	338	351	228	246	253				
33003	18223	65	77	80	12	14	16	289	348	351	230	249	253				
33004	18291	65	78	80	12	14	16	287	347	351	229	248	253				
33006	18256	66	76	79	11	14	16	294	327	346	231	243	252				
33008	18286	65	73	74	11	14	14	285	317	318	228	240	245				
33009	18313	65	76	78	11	14	15	286	337	340	229	246	251				
33011	18271	65	77	80	11	14	16	284	348	350	228	250	254				
33012	18289	64	77	80	11	14	16	278	335	350	226	245	254				
33014	18347	64	76	80	11	14	16	274	324	350	225	242	254				
33013	18338	67	75	80	11	14	16	294	319	350	231	240	254				
33008	18344	66	77	80	11	14	16	287	322	350	228	241	254				
33002	18308	66	74	80	11	14	16	295	335	350	231	245	254				
32996	18272	66	73	80	11	14	16	291	316	350	230	239	254				
32991	18234	62	74	80	11	14	16	268	324	350	222	241	254				
32985	18243	65	73	80	11	14	16	285	319	350	228	241	254				
32979	18277	66	77	80	11	14	16	291	339	350	229	247	254				
32973	18267	64	79	80	11	14	16	276	341	350	226	247	254				
32968	18277	67	78	80	11	14	16	287	339	350	230	248	254				
32962	18251	64	72	80	11	14	16	276	313	350	225	239	254				
32958	18183	66	74	80	12	14	16	289	321	350	229	242	254				
32957	18179	65	78	80	11	14	16	286	344	350	228	248	254				
32956	18198	62	78	80	10	14	16	269	342	350	223	247	254				
32956	18165	66	77	80	11	14	16	287	344	351	229	248	255				
32955	18068	66	76	80	12	14	16	292	339	351	230	246	255				
32955	18161	64	78	80	12	14	16	283	345	351	226	248	255				
32954	18204	66	75	80	12	14	16	292	330	351	229	244	255				
32954	18247	66	77	80	12	14	16	290	340	351	230	247	255				
32953	18286	65	74	80	12	14	16	285	318	351	228	241	255				
32954	18252	65	74	80	12	14	16	282	319	351	227	241	255				
32959	18185	69	77	80	12	14	16	302	336	351	234	246	255				
32964	18101	65	76	80	12	14	16	280	329	351	227	243	255				
32970	18117	67	75	80	12	14	16	293	329	351	230	244	255				
32975	18104	65	78	80	11	14	16	282	346	351	228	249	255				
32981	18103	63	79	80	11	14	16	269	350	351	225	249	255				

Feed rate	coke burn	Primary current to Primary current to Primary power to			Primary power to			Secondary current to			Primary voltage to Primary voltage to		
bpd	lb/hr	TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3
11FC0118	11mickbr	11I0032A	11I0033A	11I0034A	11I0032A	11I0033A	11I0034A	11I0032B	11I0033B	11I0034B	11E0032A	11E0033A	11E0034A
4/24/2012 14:38	18093	61	79	80	11	14	16	261	347	351	220	247	255
4/24/2012 14:39	18174	66	79	80	11	14	16	290	339	351	229	246	255
4/24/2012 14:40	18286	67	79	80	11	14	16	295	346	351	230	249	255
4/24/2012 14:41	18272	65	79	80	12	14	16	283	350	351	227	250	255
4/24/2012 14:42	18210	65	79	80	12	14	16	291	348	351	228	248	255
4/24/2012 14:43	18192	64	73	80	12	14	16	280	318	351	227	240	255
4/24/2012 14:44	18215	64	73	80	12	14	16	276	311	351	226	240	255
4/24/2012 14:45	18148	67	78	80	12	14	16	296	342	351	231	248	255
4/24/2012 14:46	18175	65	79	80	11	14	16	286	347	351	229	250	255
4/24/2012 14:47	18206	66	79	80	11	14	16	284	348	351	229	250	255
4/24/2012 14:48	18203	65	74	80	11	14	16	278	326	351	228	243	255
4/24/2012 14:49	18257	64	75	80	11	14	16	278	322	351	226	242	255
4/24/2012 14:50	18303	64	78	80	11	14	16	283	343	351	226	247	255
4/24/2012 14:51	18281	65	79	80	11	14	16	280	350	351	227	249	255
4/24/2012 14:52	18301	65	79	80	12	14	16	287	350	351	228	250	255
4/24/2012 14:53	18300	67	79	80	12	14	16	296	350	351	232	250	255
4/24/2012 14:54	18270	66	79	80	12	14	16	293	350	351	230	251	255
4/24/2012 14:55	18282	67	78	80	12	14	16	297	347	351	231	250	255
4/24/2012 14:56	18296	68	74	80	12	14	16	299	325	351	232	243	255
4/24/2012 14:57	18208	65	77	80	11	14	16	286	342	351	228	248	255
4/24/2012 14:58	18152	64	79	80	11	14	16	281	346	351	227	250	256
4/24/2012 14:59	18172	68	79	80	12	14	16	304	348	351	233	250	256
4/24/2012 15:00	18182	68	79	80	13	14	16	304	350	351	233	250	256
4/24/2012 15:01	18213	67	79	80	13	14	16	297	350	351	231	250	256
4/24/2012 15:02	18188	69	79	80	13	14	16	309	350	351	236	250	256
4/24/2012 15:03	18163	66	79	80	12	14	16	286	349	351	229	250	256
4/24/2012 15:04	18209	69	76	80	13	14	16	307	338	351	235	247	256
4/24/2012 15:05	18190	70	77	80	13	14	16	309	347	351	235	249	256
4/24/2012 15:06	18169	67	78	80	12	14	16	287	348	351	230	248	256
4/24/2012 15:07	18218	68	76	80	12	14	16	298	336	351	233	246	256
4/24/2012 15:08	18185	69	72	80	13	14	16	308	316	351	235	241	256
4/24/2012 15:09	18175	70	74	80	13	14	16	304	318	351	235	243	256
4/24/2012 15:10	18183	69	73	80	13	14	16	304	314	351	234	241	256
4/24/2012 15:11	18193	62	77	80	11	14	16	266	339	351	223	247	256
4/24/2012 15:12	18109	63	77	80	10	14	16	273	335	351	225	246	256
4/24/2012 15:13	18088	65	75	80	11	14	16	285	324	351	228	242	256
4/24/2012 15:14	18110	66	76	80	12	14	16	285	329	351	229	244	254
4/24/2012 15:15	18132	65	78	80	12	14	16	282	343	351	226	246	255
4/24/2012 15:16	18231	67	74	80	12	14	16	294	320	351	230	240	256
4/24/2012 15:17	18249	66	77	80	12	14	16	290	340	351	229	247	256
4/24/2012 15:18	18214	66	79	80	12	14	16	283	347	351	229	250	256
4/24/2012 15:19	18168	64	79	80	13	14	16	272	347	351	226	250	256
4/24/2012 15:20	18123	65	74	80	13	14	16	276	321	351	227	242	256
4/24/2012 15:21	18163	65	77	80	13	14	16	275	339	351	228	246	256

Feed rate bpd	coke burn lb/hr	Primary current to Primary current to Primary current to			Primary power to Primary power to Primary power to			Secondary current to Secondary current to Secondary current to			Primary voltage to Primary voltage to Primary voltage to		
		TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3
		A	A	A	kW	kW	kW	mA	mA	mA	V	V	V
11FC0118	11micbcr	11I0032A	11I0033A	11I0034A	11J0032A	11J0033A	11J0034A	11I0032B	11I0033B	11I0034B	11E0032A	11E0033A	11E0034A
33012	18175	68	78	80	13	14	16	293	349	352	231	249	256
4/24/2012 15:22													
33009	18181	68	78	80	13	14	16	301	349	352	234	249	256
4/24/2012 15:23													
33004	18190	62	77	80	11	14	16	268	350	352	222	249	256
4/24/2012 15:24													
32999	18192	64	77	80	11	14	16	283	348	352	227	249	256
4/24/2012 15:25													
32993	18184	63	76	80	12	14	16	275	336	352	225	247	256
4/24/2012 15:26													
32988	18129	63	77	80	12	14	16	275	345	352	225	249	256
4/24/2012 15:27													
32983	18070	65	78	80	12	14	16	286	350	352	228	250	255
4/24/2012 15:28													
32978	18169	60	79	80	10	14	16	260	349	352	219	249	255
4/24/2012 15:29													
32973	18197	64	75	80	11	14	16	282	325	352	226	244	255
4/24/2012 15:30													
32968	18242	66	71	80	12	14	16	280	302	352	228	238	255
4/24/2012 15:31													
32963	18247	65	73	80	11	14	16	277	316	352	227	241	255
4/24/2012 15:32													
32962	18260	62	73	80	10	14	16	270	314	352	223	241	255
4/24/2012 15:33													
32961	18205	66	72	80	12	14	16	293	315	352	229	241	255
4/24/2012 15:34													
32960	18233	69	75	80	12	14	16	306	331	352	235	245	255
4/24/2012 15:35													
32960	18277	69	78	80	12	14	16	303	347	352	234	249	255
4/24/2012 15:36													
32959	18195	69	78	80	12	14	16	307	345	352	235	248	255
4/24/2012 15:37													
32958	18118	70	76	80	12	14	16	308	338	352	235	246	255
4/24/2012 15:38													
32957	18184	69	78	80	12	14	16	304	344	352	234	247	255
4/24/2012 15:39													
32957	18245	65	74	80	11	14	16	287	321	352	229	241	255
4/24/2012 15:40													
32956	18286	64	77	80	11	14	16	285	340	352	228	247	255
4/24/2012 15:41													
32955	18184	64	79	80	11	14	16	278	350	352	227	250	255
4/24/2012 15:42													
32956	18166	67	79	80	11	14	16	291	350	352	231	251	255
4/24/2012 15:43													
32957	18217	64	79	80	11	14	16	282	348	352	228	250	255
4/24/2012 15:44													
32958	18176	63	75	80	11	14	16	269	331	352	225	244	255
4/24/2012 15:45													
32959	18186	67	78	80	11	14	16	293	345	352	231	249	255
4/24/2012 15:46													
32960	18279	65	79	80	11	14	16	286	341	352	229	248	255
4/24/2012 15:47													
32961	18209	64	79	80	11	13	16	276	346	352	226	247	255
4/24/2012 15:48													
32962	18202	61	79	80	11	13	16	264	350	352	221	248	255
4/24/2012 15:49													
32964	18212	66	79	80	11	13	16	289	350	352	229	249	255
4/24/2012 15:50													
32965	18231	65	79	80	12	13	16	284	349	352	229	249	255
4/24/2012 15:51													
32966	18165	62	79	80	12	13	16	270	347	352	224	249	254
4/24/2012 15:52													
32968	18178	67	73	80	12	13	16	287	321	352	230	242	254
4/24/2012 15:53													
32972	18218	66	72	80	12	13	16	290	315	352	232	240	254
4/24/2012 15:54													
32975	18180	67	75	80	12	13	16	294	335	352	232	245	254
4/24/2012 15:55													

Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1	Arcs/min on TR2	Arcs/min on TR3	Primary current to Primary current to Primary current to			Primary power to		
									TR1	TR2	TR3	TR1	TR2	TR3
11E0032B	11E0033B	11E0034B	11XA0032A	11XA0033A	11XA0034A	11XA0032B	11XA0033B	11XA0034B	11I0067A	11I0068A	11I0069A	11J0067A	11J0068A	11J0069A
27	27	26	18	4	1	0	0	0	0	0	0	0	0	0
4/24/2012 9:30														
4/24/2012 9:31	27	26	18	4	1	0	0	0	0	0	0	0	0	0
4/24/2012 9:32	27	26	18	4	1	0	0	0	0	0	0	0	0	0
4/24/2012 9:33	27	26	18	4	1	0	0	0	0	0	0	0	0	0
4/24/2012 9:34	27	26	18	2	1	0	0	0	0	0	0	0	0	0
4/24/2012 9:35	27	26	18	3	1	0	0	0	0	0	0	0	0	0
4/24/2012 9:36	27	26	18	4	1	0	0	0	0	0	0	0	0	0
4/24/2012 9:37	27	26	16	4	1	0	0	0	0	0	0	0	0	0
4/24/2012 9:38	27	26	15	4	1	0	0	0	0	0	0	0	0	0
4/24/2012 9:39	27	26	15	2	1	0	0	0	0	0	0	0	0	0
4/24/2012 9:40	27	26	15	1	1	0	0	0	0	0	0	0	0	0
4/24/2012 9:41	27	26	15	2	1	0	0	0	0	0	0	0	0	0
4/24/2012 9:42	27	26	15	3	1	0	0	0	0	0	0	0	0	0
4/24/2012 9:43	27	26	15	3	1	0	0	0	0	0	0	0	0	0
4/24/2012 9:44	27	26	15	4	1	0	0	0	0	0	0	0	0	0
4/24/2012 9:45	27	26	15	2	1	0	0	0	0	0	0	0	0	0
4/24/2012 9:46	27	26	15	1	1	0	0	0	0	0	0	0	0	0
4/24/2012 9:47	27	26	15	2	1	0	0	0	0	0	0	0	0	0
4/24/2012 9:48	27	26	15	5	1	0	0	0	0	0	0	0	0	0
4/24/2012 9:49	27	26	15	7	1	0	0	0	0	0	0	0	0	0
4/24/2012 9:50	27	26	15	7	1	0	0	0	0	0	0	0	0	0
4/24/2012 9:51	27	26	15	7	1	0	0	0	0	0	0	0	0	0
4/24/2012 9:52	27	26	15	7	1	0	0	0	0	0	0	0	0	0
4/24/2012 9:53	27	26	15	7	1	0	0	0	0	0	0	0	0	0
4/24/2012 9:54	27	26	15	7	1	0	0	0	0	0	0	0	0	0
4/24/2012 9:55	27	26	15	7	1	0	0	0	0	0	0	0	0	0
4/24/2012 9:56	27	26	15	7	1	0	0	0	0	0	0	0	0	0
4/24/2012 9:57	27	26	15	7	1	0	0	0	0	0	0	0	0	0
4/24/2012 9:58	27	26	15	7	1	0	0	0	0	0	0	0	0	0
4/24/2012 9:59	27	26	15	7	1	0	0	0	0	0	0	0	0	0
4/24/2012 10:00	27	26	15	7	1	0	0	0	0	0	0	0	0	0
4/24/2012 10:01	27	26	15	7	1	0	0	0	0	0	0	0	0	0
4/24/2012 10:02	27	26	15	7	1	0	0	0	0	0	0	0	0	0
4/24/2012 10:03	27	26	16	7	1	0	0	0	0	0	0	0	0	0
4/24/2012 10:04	27	26	16	7	1	0	0	0	0	0	0	0	0	0
4/24/2012 10:05	27	26	16	5	1	0	0	0	0	0	0	0	0	0
4/24/2012 10:06	27	26	16	4	1	0	0	0	0	0	0	0	0	0
4/24/2012 10:07	27	26	16	4	1	0	0	0	0	0	0	0	0	0
4/24/2012 10:08	27	26	16	4	1	0	0	0	0	0	0	0	0	0
4/24/2012 10:09	27	26	16	4	1	0	0	0	0	0	0	0	0	0
4/24/2012 10:10	27	26	16	4	1	0	0	0	0	0	0	0	0	0
4/24/2012 10:11	27	26	16	4	1	0	0	0	0	0	0	0	0	0
4/24/2012 10:12	27	26	16	4	1	0	0	0	0	0	0	0	0	0
4/24/2012 10:13	27	26	16	3	1	0	0	0	0	0	0	0	0	0

	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1	Arcs/min on TR2	Arcs/min on TR3	Primary current to Primary power to			
										TR1	TR2	TR3	TR1
	kV	kV	kV							A	A	A	kW
4/24/2012 10:14	11E0032B	11E0033B	11E0034B	11XA0032A	11XA0033A	11XA0034A	11XA0032B	11XA0033B	11XA0034B	11I0067A	11I0068A	11I0069A	11J0068A
4/24/2012 10:15	27	27	26	16	3	1	0	0	0	0	0	0	0
4/24/2012 10:16	27	27	26	16	3	1	0	0	0	0	0	0	0
4/24/2012 10:17	27	27	26	16	3	1	0	0	0	0	0	0	0
4/24/2012 10:18	27	27	26	16	4	1	0	0	0	0	0	0	0
4/24/2012 10:19	27	27	26	16	4	1	0	0	0	0	0	0	0
4/24/2012 10:20	27	27	26	16	4	1	0	0	0	0	0	0	0
4/24/2012 10:21	27	27	26	16	4	1	0	0	0	0	0	0	0
4/24/2012 10:22	27	27	26	16	4	1	0	0	0	0	0	0	0
4/24/2012 10:23	27	27	26	16	5	1	0	0	0	0	0	0	0
4/24/2012 10:24	27	27	26	16	5	1	0	0	0	0	0	0	0
4/24/2012 10:25	27	27	26	16	5	1	0	0	0	0	0	0	0
4/24/2012 10:26	27	27	26	16	2	1	0	0	0	0	0	0	0
4/24/2012 10:27	27	27	26	16	2	1	0	0	0	0	0	0	0
4/24/2012 10:28	27	27	26	16	3	1	0	0	0	0	0	0	0
4/24/2012 10:29	27	27	26	18	4	1	0	0	0	0	0	0	0
4/24/2012 10:30	27	27	26	16	5	1	0	0	0	0	0	0	0
4/24/2012 10:31	27	27	26	15	6	1	0	0	0	0	0	0	0
4/24/2012 10:32	27	27	26	15	6	1	0	0	0	0	0	0	0
4/24/2012 10:33	27	27	26	15	5	1	0	0	0	0	0	0	0
4/24/2012 10:34	27	27	26	15	2	1	0	0	0	0	0	0	0
4/24/2012 10:35	27	27	26	15	3	1	0	0	0	0	0	0	0
4/24/2012 10:36	27	27	26	15	5	1	0	0	0	0	0	0	0
4/24/2012 10:37	27	27	26	15	5	1	0	0	0	0	0	0	0
4/24/2012 10:38	27	27	26	15	5	1	0	0	0	0	0	0	0
4/24/2012 10:39	27	27	26	15	5	1	0	0	0	0	0	0	0
4/24/2012 10:40	27	27	26	15	6	1	0	0	0	0	0	0	0
4/24/2012 10:41	27	27	26	15	6	1	0	0	0	0	0	0	0
4/24/2012 10:42	27	27	26	15	6	1	0	0	0	0	0	0	0
4/24/2012 10:43	27	27	26	15	6	1	0	0	0	0	0	0	0
4/24/2012 10:44	27	27	26	15	4	1	0	0	0	0	0	0	0
4/24/2012 10:45	27	27	26	15	3	1	0	0	0	0	0	0	0
4/24/2012 10:46	27	27	26	15	3	1	0	0	0	0	0	0	0
4/24/2012 10:47	27	27	26	15	4	1	0	0	0	0	0	0	0
4/24/2012 10:48	27	27	26	15	4	1	0	0	0	0	0	0	0
4/24/2012 10:49	27	27	26	15	6	1	0	0	0	0	0	0	0
4/24/2012 10:50	27	27	26	15	7	1	0	0	0	0	0	0	0
4/24/2012 10:51	27	27	26	15	6	1	0	0	0	0	0	0	0
4/24/2012 10:52	27	27	26	15	6	1	0	0	0	0	0	0	0
4/24/2012 10:53	27	27	26	15	6	1	0	0	0	0	0	0	0
4/24/2012 10:54	27	27	26	15	6	1	0	0	0	0	0	0	0
4/24/2012 10:55	27	27	26	15	5	1	0	0	0	0	0	0	0
4/24/2012 10:56	27	27	26	15	5	1	0	0	0	0	0	0	0
4/24/2012 10:57	27	27	26	15	5	1	0	0	0	0	0	0	0

	Secondary voltage to TR1 KV	Secondary voltage to TR2 KV	Secondary voltage to TR3 KV	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1	Arcs/min on TR2	Arcs/min on TR3	Primary current to TR1 A	Primary current to TR2 A	Primary current to TR3 A	Primary power to TR1 KW	Primary power to TR2 KW
4/24/2012 10:58	11E0032B 27	11E0033B 27	11E0034B 26	11XA0032A 15	11XA0033A 4	11XA0034A 1	11XA0032B 0	11XA0033B 0	11XA0034B 0	11I0067A 0	11I0068A 0	11I0069A 0	11J0067A 0	11J0068A 0
4/24/2012 10:59	27	27	26	15	4	1	0	0	0	0	0	0	0	0
4/24/2012 11:00	27	27	26	15	4	1	0	0	0	0	0	0	0	0
4/24/2012 11:01	27	27	26	15	5	1	0	0	0	0	0	0	0	0
4/24/2012 11:02	27	27	26	15	6	1	0	0	0	0	0	0	0	0
4/24/2012 11:03	27	27	26	15	6	1	0	0	0	0	0	0	0	0
4/24/2012 11:04	27	27	26	15	6	1	0	0	0	0	0	0	0	0
4/24/2012 11:05	27	27	26	15	7	1	0	0	0	0	0	0	0	0
4/24/2012 11:06	27	27	26	15	7	1	0	0	0	0	0	0	0	0
4/24/2012 11:07	27	27	26	15	7	1	0	0	0	0	0	0	0	0
4/24/2012 11:08	27	27	26	16	7	1	0	0	0	0	0	0	0	0
4/24/2012 11:09	27	27	26	16	7	1	0	0	0	0	0	0	0	0
4/24/2012 11:10	27	27	26	16	8	1	0	0	0	0	0	0	0	0
4/24/2012 11:11	27	27	26	16	8	1	0	0	0	0	0	0	0	0
4/24/2012 11:12	27	27	26	16	8	1	0	0	0	0	0	0	0	0
4/24/2012 11:13	27	27	26	16	6	1	0	0	0	0	0	0	0	0
4/24/2012 11:14	27	27	26	16	6	1	0	0	0	0	0	0	0	0
4/24/2012 11:15	27	27	26	16	5	1	0	0	0	0	0	0	0	0
4/24/2012 11:16	27	27	26	16	7	1	0	0	0	0	0	0	0	0
4/24/2012 11:17	27	27	26	16	7	1	0	0	0	0	0	0	0	0
4/24/2012 11:18	27	27	26	16	6	1	0	0	0	0	0	0	0	0
4/24/2012 11:19	27	27	26	16	5	1	0	0	0	0	0	0	0	0
4/24/2012 11:20	27	27	26	16	5	1	0	0	0	0	0	0	0	0
4/24/2012 11:21	27	27	26	16	5	1	0	0	0	0	0	0	0	0
4/24/2012 11:22	27	27	26	16	5	1	0	0	0	0	0	0	0	0
4/24/2012 11:23	27	27	26	16	5	1	0	0	0	0	0	0	0	0
4/24/2012 11:24	27	27	26	16	6	1	0	0	0	0	0	0	0	0
4/24/2012 11:25	27	27	26	16	6	1	0	0	0	0	0	0	0	0
4/24/2012 11:26	27	27	26	16	6	1	0	0	0	0	0	0	0	0
4/24/2012 11:27	27	27	26	16	6	1	0	0	0	0	0	0	0	0
4/24/2012 11:28	27	27	26	16	6	1	0	0	0	0	0	0	0	0
4/24/2012 11:29	27	27	26	16	6	1	0	0	0	0	0	0	0	0
4/24/2012 11:30	27	27	26	16	6	1	0	0	0	0	0	0	0	0
4/24/2012 11:31	27	27	26	16	6	1	0	0	0	0	0	0	0	0
4/24/2012 11:32	27	27	26	16	7	1	0	0	0	0	0	0	0	0
4/24/2012 11:33	27	27	26	16	7	1	0	0	0	0	0	0	0	0
4/24/2012 11:34	27	27	26	16	7	1	0	0	0	0	0	0	0	0
4/24/2012 11:35	27	27	26	16	7	1	0	0	0	0	0	0	0	0
4/24/2012 11:36	27	27	26	16	7	1	0	0	0	0	0	0	0	0
4/24/2012 11:37	27	27	26	16	7	1	0	0	0	0	0	0	0	0
4/24/2012 11:38	27	27	26	16	6	1	0	0	0	0	0	0	0	0
4/24/2012 11:39	27	27	26	16	4	1	0	0	0	0	0	0	0	0
4/24/2012 11:40	27	27	26	16	4	1	0	0	0	0	0	0	0	0
4/24/2012 11:41	27	27	26	16	4	1	0	0	0	0	0	0	0	0

	Secondary voltage to TR1		Secondary voltage to TR2		Secondary voltage to TR3		Sparks/min on TR1		Sparks/min on TR2		Sparks/min on TR3		Arcs/min on TR1		Arcs/min on TR2		Arcs/min on TR3		Primary current to TR1		Primary current to TR2		Primary current to TR3		Primary power to TR1		Primary power to TR2		Primary power to TR3	
	11E0032B	kV	11E0033B	kV	11E0034B	kV	11XA0032A		11XA0033A		11XA0034A		11XA0032B		11XA0033B		11XA0034B		11I0067A	A	11I0068A	A	11I0069A	A	11J0067A	kW	11J0068A	kW	11J0069A	kW
4/24/2012 11:42	27		27		26		16		5		1		0		0		0		0		0		0		0		0		0	
4/24/2012 11:43	27		27		26		16		5		1		0		0		0		0		0		0		0		0		0	
4/24/2012 11:44	27		27		26		16		5		1		0		0		0		0		0		0		0		0		0	
4/24/2012 11:45	27		27		26		16		5		1		0		0		0		0		0		0		0		0		0	
4/24/2012 11:46	27		27		26		16		5		1		0		0		0		0		0		0		0		0		0	
4/24/2012 11:47	27		27		26		16		6		1		0		0		0		0		0		0		0		0		0	
4/24/2012 11:48	27		27		26		16		6		1		0		0		0		0		0		0		0		0		0	
4/24/2012 11:49	27		27		26		16		6		1		0		0		0		0		0		0		0		0		0	
4/24/2012 11:50	27		27		26		16		6		1		0		0		0		0		0		0		0		0		0	
4/24/2012 11:51	27		27		26		16		6		1		0		0		0		0		0		0		0		0		0	
4/24/2012 11:52	27		27		26		16		6		1		0		0		0		0		0		0		0		0		0	
4/24/2012 11:53	27		27		26		16		7		1		0		0		0		0		0		0		0		0		0	
4/24/2012 11:54	27		27		26		16		7		1		0		0		0		0		0		0		0		0		0	
4/24/2012 11:55	27		27		26		16		7		1		0		0		0		0		0		0		0		0		0	
4/24/2012 11:56	27		27		26		16		7		1		0		0		0		0		0		0		0		0		0	
4/24/2012 11:57	27		27		26		16		7		1		0		0		0		0		0		0		0		0		0	
4/24/2012 11:58	27		27		26		17		7		1		0		0		0		0		0		0		0		0		0	
4/24/2012 11:59	27		27		26		17		6		1		0		0		0		0		0		0		0		0		0	
4/24/2012 12:00	27		27		26		17		6		1		0		0		0		0		0		0		0		0		0	
4/24/2012 12:01	27		27		26		17		6		1		0		0		0		0		0		0		0		0		0	
4/24/2012 12:02	27		27		26		17		6		1		0		0		0		0		0		0		0		0		0	
4/24/2012 12:03	27		27		26		17		4		1		0		0		0		0		0		0		0		0		0	
4/24/2012 12:04	27		27		26		17		3		1		0		0		0		0		0		0		0		0		0	
4/24/2012 12:05	27		27		26		17		3		1		0		0		0		0		0		0		0		0		0	
4/24/2012 12:06	27		27		26		17		3		1		0		0		0		0		0		0		0		0		0	
4/24/2012 12:07	27		27		26		17		5		1		0		0		0		0		0		0		0		0		0	
4/24/2012 12:08	27		27		26		17		5		1		0		0		0		0		0		0		0		0		0	
4/24/2012 12:09	27		27		26		17		4		1		0		0		0		0		0		0		0		0		0	
4/24/2012 12:10	27		27		26		17		2		1		0		0		0		0		0		0		0		0		0	
4/24/2012 12:11	27		27		26		17		4		1		0		0		0		0		0		0		0		0		0	
4/24/2012 12:12	27		27		26		17		6		1		0		0		0		0		0		0		0		0		0	
4/24/2012 12:13	27		27		26		17		6		1		0		0		0		0		0		0		0		0		0	
4/24/2012 12:14	27		27		26		17		7		1		0		0		0		0		0		0		0		0		0	
4/24/2012 12:15	27		27		26		17		8		1		0		0		0		0		0		0		0		0		0	
4/24/2012 12:16	27		27		26		17		8		1		0		0		0		0		0		0		0		0		0	
4/24/2012 12:17	27		27		26		17		8		1		0		0		0		0		0		0		0		0		0	
4/24/2012 12:18	27		27		26		17		6		1		0		0		0		0		0		0		0		0		0	
4/24/2012 12:19	27		27		26		17		5		1		0		0		0		0		0		0		0		0		0	
4/24/2012 12:20	27		27		26		17		5		1		0		0		0		0		0		0		0		0		0	
4/24/2012 12:21	27		27		26		17		5		1		0		0		0		0		0		0		0		0		0	
4/24/2012 12:22	27		27		26		17		5		1		0		0		0		0		0		0		0		0		0	
4/24/2012 12:23	27		27		26		17		5		1		0		0		0		0		0		0		0		0		0	
4/24/2012 12:24	27		27		26		18		5		1		0		0		0		0		0		0		0		0		0	
4/24/2012 12:25	27		27		26		18		5		1		0		0		0		0		0		0		0		0		0	

	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1	Arcs/min on TR2	Arcs/min on TR3	Primary current to Primary current to Primary power to			
										TR1	TR2	TR3	TR1
	11E0032B	11E0033B	11E0034B	11X0032A	11X0033A	11X0034A	11X0032B	11X0033B	11X0034B	A	A	A	kW
4/24/2012 12:26	27	27	26	18	4	1	0	0	0	0	0	0	0
4/24/2012 12:27	27	27	26	18	4	1	0	0	0	0	0	0	0
4/24/2012 12:28	27	27	26	18	4	1	0	0	0	0	0	0	0
4/24/2012 12:29	27	27	26	18	4	1	0	0	0	0	0	0	0
4/24/2012 12:30	27	27	26	18	4	1	0	0	0	0	0	0	0
4/24/2012 12:31	27	27	26	18	4	1	0	0	0	0	0	0	0
4/24/2012 12:32	27	27	26	18	4	1	0	0	0	0	0	0	0
4/24/2012 12:33	27	27	26	18	4	1	0	0	0	0	0	0	0
4/24/2012 12:34	27	27	26	18	2	1	0	0	0	0	0	0	0
4/24/2012 12:35	27	27	26	18	4	1	0	0	0	0	0	0	0
4/24/2012 12:36	27	27	26	18	6	1	0	0	0	0	0	0	0
4/24/2012 12:37	27	27	26	18	6	1	0	0	0	0	0	0	0
4/24/2012 12:38	27	27	26	16	7	1	0	0	0	0	0	0	0
4/24/2012 12:39	27	27	26	15	5	1	0	0	0	0	0	0	0
4/24/2012 12:40	27	27	26	15	4	1	0	0	0	0	0	0	0
4/24/2012 12:41	27	27	26	15	4	1	0	0	0	0	0	0	0
4/24/2012 12:42	27	27	26	15	4	1	0	0	0	0	0	0	0
4/24/2012 12:43	27	27	26	15	4	1	0	0	0	0	0	0	0
4/24/2012 12:44	27	27	26	15	4	1	0	0	0	0	0	0	0
4/24/2012 12:45	27	27	26	15	4	1	0	0	0	0	0	0	0
4/24/2012 12:46	27	27	26	15	6	1	0	0	0	0	0	0	0
4/24/2012 12:47	27	27	26	15	4	1	0	0	0	0	0	0	0
4/24/2012 12:48	27	27	26	15	3	1	0	0	0	0	0	0	0
4/24/2012 12:49	27	27	26	15	4	1	0	0	0	0	0	0	0
4/24/2012 12:50	27	27	26	15	4	1	0	0	0	0	0	0	0
4/24/2012 12:51	27	27	26	15	5	1	0	0	0	0	0	0	0
4/24/2012 12:52	27	27	26	15	5	1	0	0	0	0	0	0	0
4/24/2012 12:53	27	27	26	15	6	1	0	0	0	0	0	0	0
4/24/2012 12:54	27	27	26	15	4	1	0	0	0	0	0	0	0
4/24/2012 12:55	27	27	26	15	3	1	0	0	0	0	0	0	0
4/24/2012 12:56	27	27	26	15	3	1	0	0	0	0	0	0	0
4/24/2012 12:57	27	27	26	15	4	1	0	0	0	0	0	0	0
4/24/2012 12:58	27	27	26	15	4	1	0	0	0	0	0	0	0
4/24/2012 12:59	27	27	26	15	4	1	0	0	0	0	0	0	0
4/24/2012 13:00	27	27	26	15	4	1	0	0	0	0	0	0	0
4/24/2012 13:01	27	27	26	15	4	1	0	0	0	0	0	0	0
4/24/2012 13:02	27	27	26	15	5	1	0	0	0	0	0	0	0
4/24/2012 13:03	27	27	26	15	5	1	0	0	0	0	0	0	0
4/24/2012 13:04	27	27	26	15	5	1	0	0	0	0	0	0	0
4/24/2012 13:05	27	27	26	15	5	1	0	0	0	0	0	0	0
4/24/2012 13:06	27	27	26	15	6	0	0	0	0	0	0	0	0
4/24/2012 13:07	27	27	26	15	6	0	0	0	0	0	0	0	0
4/24/2012 13:08	27	27	26	15	6	0	0	0	0	0	0	0	0
4/24/2012 13:09	27	27	26	15	6	0	0	0	0	0	0	0	0

	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1	Arcs/min on TR2	Arcs/min on TR3	Primary current to				Primary power to			
										TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2
	kV	kV	kV							A	A	A	kW	kW	kW		
4/24/2012 13:10	27	27	26	15	6	0	0	0	0	11I0032B	11XA0032B	11XA0034B	11I0067A	11I0068A	11J0068A		
4/24/2012 13:11	27	27	26	15	6	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:12	27	27	26	15	6	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:13	27	27	26	16	7	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:14	27	27	26	16	7	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:15	27	27	26	16	4	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:16	27	27	26	16	5	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:17	27	27	26	16	6	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:18	27	27	26	16	5	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:19	27	27	26	16	3	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:20	27	27	26	16	5	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:21	27	27	26	16	6	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:22	27	27	26	16	6	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:23	27	27	26	16	6	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:24	27	27	26	16	6	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:25	27	27	26	16	6	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:26	27	27	26	16	6	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:27	27	27	26	16	6	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:28	27	27	26	16	8	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:29	27	27	26	16	7	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:30	27	27	26	16	6	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:31	27	27	26	16	6	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:32	27	27	26	16	6	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:33	27	27	26	16	6	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:34	27	27	26	16	6	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:35	27	27	26	16	6	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:36	27	27	26	16	6	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:37	27	27	26	16	6	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:38	27	27	26	16	6	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:39	27	27	26	16	6	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:40	27	27	26	16	6	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:41	27	27	26	16	6	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:42	27	27	26	16	6	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:43	27	27	26	16	6	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:44	27	27	26	16	6	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:45	27	27	26	16	6	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:46	27	27	26	16	6	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:47	27	27	26	16	6	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:48	27	27	26	16	6	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:49	27	27	26	16	6	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:50	27	27	26	16	6	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:51	27	27	26	16	6	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:52	27	27	26	16	6	0	0	0	0	0	0	0	0	0	0		
4/24/2012 13:53	27	27	26	16	6	0	0	0	0	0	0	0	0	0	0		

	Secondary voltage to TR1 KV	Secondary voltage to TR2 KV	Secondary voltage to TR3 KV	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1	Arcs/min on TR2	Arcs/min on TR3	A TR1 11I0067A	A TR2 11I0068A	A TR3 11I0069A	KW TR1 11J0067A	KW TR2 11J0068A	
4/24/2012 13:54	27	27	26	16	6	0	0	0	0	0	0	0	0	0	
4/24/2012 13:55	27	27	26	16	6	0	0	0	0	0	0	0	0	0	
4/24/2012 13:56	27	27	26	16	6	0	0	0	0	0	0	0	0	0	
4/24/2012 13:57	27	27	26	16	6	0	0	0	0	0	0	0	0	0	
4/24/2012 13:58	27	27	26	16	6	0	0	0	0	0	0	0	0	0	
4/24/2012 13:59	27	27	26	16	6	0	0	0	0	0	0	0	0	0	
4/24/2012 14:00	27	27	26	16	6	0	0	0	0	0	0	0	0	0	
4/24/2012 14:01	27	27	26	16	6	0	0	0	0	0	0	0	0	0	
4/24/2012 14:02	27	27	26	16	6	0	0	0	0	0	0	0	0	0	
4/24/2012 14:03	27	27	26	16	6	0	0	0	0	0	0	0	0	0	
4/24/2012 14:04	27	27	26	16	6	0	0	0	0	0	0	0	0	0	
4/24/2012 14:05	27	27	26	16	6	0	0	0	0	0	0	0	0	0	
4/24/2012 14:06	27	27	26	16	6	0	0	0	0	0	0	0	0	0	
4/24/2012 14:07	27	27	26	16	7	0	0	0	0	0	0	0	0	0	
4/24/2012 14:08	27	27	26	16	9	0	0	0	0	0	0	0	0	0	
4/24/2012 14:09	27	27	26	16	7	0	0	0	0	0	0	0	0	0	
4/24/2012 14:10	27	27	26	16	6	0	0	0	0	0	0	0	0	0	
4/24/2012 14:11	27	27	26	16	6	0	0	0	0	0	0	0	0	0	
4/24/2012 14:12	27	27	26	16	7	0	0	0	0	0	0	0	0	0	
4/24/2012 14:13	27	27	26	16	7	0	0	0	0	0	0	0	0	0	
4/24/2012 14:14	27	27	26	16	7	0	0	0	0	0	0	0	0	0	
4/24/2012 14:15	27	27	26	16	7	0	0	0	0	0	0	0	0	0	
4/24/2012 14:16	27	27	26	16	8	0	0	0	0	0	0	0	0	0	
4/24/2012 14:17	27	27	26	16	8	0	0	0	0	0	0	0	0	0	
4/24/2012 14:18	27	27	26	16	6	0	0	0	0	0	0	0	0	0	
4/24/2012 14:19	27	27	26	16	5	0	0	0	0	0	0	0	0	0	
4/24/2012 14:20	27	27	26	16	5	0	0	0	0	0	0	0	0	0	
4/24/2012 14:21	27	27	26	16	5	0	0	0	0	0	0	0	0	0	
4/24/2012 14:22	27	27	26	16	5	0	0	0	0	0	0	0	0	0	
4/24/2012 14:23	27	27	26	17	6	0	0	0	0	0	0	0	0	0	
4/24/2012 14:24	27	27	26	17	6	0	0	0	0	0	0	0	0	0	
4/24/2012 14:25	27	27	26	17	6	0	0	0	0	0	0	0	0	0	
4/24/2012 14:26	27	27	26	17	6	0	0	0	0	0	0	0	0	0	
4/24/2012 14:27	27	27	26	17	4	0	0	0	0	0	0	0	0	0	
4/24/2012 14:28	27	27	26	17	4	0	0	0	0	0	0	0	0	0	
4/24/2012 14:29	27	27	26	17	6	0	0	0	0	0	0	0	0	0	
4/24/2012 14:30	27	27	26	17	3	0	0	0	0	0	0	0	0	0	
4/24/2012 14:31	27	27	26	17	5	0	0	0	0	0	0	0	0	0	
4/24/2012 14:32	27	27	26	17	5	0	0	0	0	0	0	0	0	0	
4/24/2012 14:33	27	27	26	17	4	0	0	0	0	0	0	0	0	0	
4/24/2012 14:34	27	27	26	17	5	0	0	0	0	0	0	0	0	0	
4/24/2012 14:35	27	27	26	17	6	0	0	0	0	0	0	0	0	0	
4/24/2012 14:36	27	27	26	17	4	0	0	0	0	0	0	0	0	0	
4/24/2012 14:37	27	27	26	17	4	0	0	0	0	0	0	0	0	0	

	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1	Arcs/min on TR2	Arcs/min on TR3	Primary current to Primary power to			
										TR1	TR2	TR3	TR1
	kV	kV	kV							A	A	A	kW
4/24/2012 14:38	11E0032B	11E0033B	11E0034B	11XA0032A	11XA0033A	11XA0034A	11XA0032B	11XA0033B	11XA0034B	11I00067A	11I00068A	11I00069A	11J00067A
	27	27	26	17	6	0	0	0	0	0	0	0	0
4/24/2012 14:39	27	27	26	17	4	0	0	0	0	0	0	0	0
4/24/2012 14:40	27	27	26	17	3	0	0	0	0	0	0	0	0
4/24/2012 14:41	27	27	26	17	3	0	0	0	0	0	0	0	0
4/24/2012 14:42	27	27	26	17	3	0	0	0	0	0	0	0	0
4/24/2012 14:43	27	27	26	17	3	0	0	0	0	0	0	0	0
4/24/2012 14:44	27	27	26	17	3	0	0	0	0	0	0	0	0
4/24/2012 14:45	27	27	26	17	3	0	0	0	0	0	0	0	0
4/24/2012 14:46	27	27	26	17	3	0	0	0	0	0	0	0	0
4/24/2012 14:47	27	27	26	17	3	0	0	0	0	0	0	0	0
4/24/2012 14:48	27	27	26	17	3	0	0	0	0	0	0	0	0
4/24/2012 14:49	27	27	26	17	3	0	0	0	0	0	0	0	0
4/24/2012 14:50	27	27	26	17	3	0	0	0	0	0	0	0	0
4/24/2012 14:51	27	27	26	17	3	0	0	0	0	0	0	0	0
4/24/2012 14:52	27	27	26	17	3	0	0	0	0	0	0	0	0
4/24/2012 14:53	27	27	26	17	5	0	0	0	0	0	0	0	0
4/24/2012 14:54	27	27	26	17	5	0	0	0	0	0	0	0	0
4/24/2012 14:55	27	27	26	17	4	0	0	0	0	0	0	0	0
4/24/2012 14:56	27	27	26	17	6	0	0	0	0	0	0	0	0
4/24/2012 14:57	27	27	26	17	6	0	0	0	0	0	0	0	0
4/24/2012 14:58	27	27	26	17	5	0	0	0	0	0	0	0	0
4/24/2012 14:59	27	28	26	17	4	0	0	0	0	0	0	0	0
4/24/2012 15:00	27	28	26	17	3	0	0	0	0	0	0	0	0
4/24/2012 15:01	27	28	26	17	3	0	0	0	0	0	0	0	0
4/24/2012 15:02	27	28	26	17	3	0	0	0	0	0	0	0	0
4/24/2012 15:03	27	28	26	17	3	0	0	0	0	0	0	0	0
4/24/2012 15:04	27	28	26	17	5	0	0	0	0	0	0	0	0
4/24/2012 15:05	27	28	26	17	6	0	0	0	0	0	0	0	0
4/24/2012 15:06	27	28	26	17	6	0	0	0	0	0	0	0	0
4/24/2012 15:07	27	28	26	17	6	0	0	0	0	0	0	0	0
4/24/2012 15:08	27	28	26	17	6	0	0	0	0	0	0	0	0
4/24/2012 15:09	27	28	26	17	7	0	0	0	0	0	0	0	0
4/24/2012 15:10	27	28	26	17	7	0	0	0	0	0	0	0	0
4/24/2012 15:11	27	28	26	17	3	0	0	0	0	0	0	0	0
4/24/2012 15:12	27	28	26	17	3	0	0	0	0	0	0	0	0
4/24/2012 15:13	27	28	26	16	4	0	0	0	0	0	0	0	0
4/24/2012 15:14	27	28	26	16	5	0	0	0	0	0	0	0	0
4/24/2012 15:15	27	28	26	16	7	0	0	0	0	0	0	0	0
4/24/2012 15:16	27	28	26	16	7	0	0	0	0	0	0	0	0
4/24/2012 15:17	27	28	26	16	4	0	0	0	0	0	0	0	0
4/24/2012 15:18	27	28	26	16	4	0	0	0	0	0	0	0	0
4/24/2012 15:19	27	28	26	16	5	0	0	0	0	0	0	0	0
4/24/2012 15:20	27	28	26	16	6	0	0	0	0	0	0	0	0
4/24/2012 15:21	27	28	26	16	4	0	0	0	0	0	0	0	0

	Secondary voltage to TR1 KV	Secondary voltage to TR2 KV	Secondary voltage to TR3 KV	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1	Arcs/min on TR2	Arcs/min on TR3	Primary current to TR1 A	Primary current to TR2 A	Primary current to TR3 A	Primary power to TR1 KW	Primary power to TR2 KW
4/24/2012 15:22	11E0032B 27	11E0033B 28	11E0034B 26	11XA0032A 16	11XA0033A 2	11XA0034A 0	11XA0032B 0	11XA0033B 0	11XA0034B 0	11I0067A 0	11I0068A 0	11I0069A 0	11J0067A 0	11J0068A 0
4/24/2012 15:23	27	28	26	16	3	0	0	0	0	0	0	0	0	0
4/24/2012 15:24	27	28	26	16	4	0	0	0	0	0	0	0	0	0
4/24/2012 15:25	27	28	26	16	3	0	0	0	0	0	0	0	0	0
4/24/2012 15:26	27	28	26	16	3	0	0	0	0	0	0	0	0	0
4/24/2012 15:27	27	28	26	16	3	0	0	0	0	0	0	0	0	0
4/24/2012 15:28	27	28	26	16	3	0	0	0	0	0	0	0	0	0
4/24/2012 15:29	27	28	26	16	2	0	0	0	0	0	0	0	0	0
4/24/2012 15:30	27	28	26	16	2	0	0	0	0	0	0	0	0	0
4/24/2012 15:31	27	28	26	16	6	0	0	0	0	0	0	0	0	0
4/24/2012 15:32	27	28	26	16	7	0	0	0	0	0	0	0	0	0
4/24/2012 15:33	27	28	26	16	8	0	0	0	0	0	0	0	0	0
4/24/2012 15:34	27	28	26	16	6	0	0	0	0	0	0	0	0	0
4/24/2012 15:35	27	28	26	16	5	0	0	0	0	0	0	0	0	0
4/24/2012 15:36	27	28	26	16	5	0	0	0	0	0	0	0	0	0
4/24/2012 15:37	27	28	26	16	4	0	0	0	0	0	0	0	0	0
4/24/2012 15:38	27	28	26	16	4	0	0	0	0	0	0	0	0	0
4/24/2012 15:39	27	28	26	16	2	0	0	0	0	0	0	0	0	0
4/24/2012 15:40	27	28	26	16	4	0	0	0	0	0	0	0	0	0
4/24/2012 15:41	27	28	26	16	5	0	0	0	0	0	0	0	0	0
4/24/2012 15:42	27	28	26	16	5	0	0	0	0	0	0	0	0	0
4/24/2012 15:43	27	28	26	16	5	0	0	0	0	0	0	0	0	0
4/24/2012 15:44	27	28	26	16	5	0	0	0	0	0	0	0	0	0
4/24/2012 15:45	27	28	26	16	5	0	0	0	0	0	0	0	0	0
4/24/2012 15:46	27	28	26	16	5	0	0	0	0	0	0	0	0	0
4/24/2012 15:47	27	28	26	16	4	0	0	0	0	0	0	0	0	0
4/24/2012 15:48	27	28	26	16	4	0	0	0	0	0	0	0	0	0
4/24/2012 15:49	27	28	26	16	4	0	0	0	0	0	0	0	0	0
4/24/2012 15:50	27	28	26	16	4	0	0	0	0	0	0	0	0	0
4/24/2012 15:51	27	28	26	16	4	0	0	0	0	0	0	0	0	0
4/24/2012 15:52	27	28	26	16	4	0	0	0	0	0	0	0	0	0
4/24/2012 15:53	27	28	26	16	4	0	0	0	0	0	0	0	0	0
4/24/2012 15:54	27	28	26	16	4	0	0	0	0	0	0	0	0	0
4/24/2012 15:55	27	28	26	16	4	0	0	0	0	0	0	0	0	0

Primary power to TR3	Secondary current to TR1	Secondary current to TR2	Secondary current to TR3	Primary voltage to Primary voltage to TR1	Primary voltage to Primary voltage to TR2	Primary voltage to Primary voltage to TR3	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcls/min on TR1
11J0069A	11I0067B	11I0068B	11I0069B	11E0067A	11E0068A	11E0069A	11E0067B	11E0068B	11E0069B	11XA0067A	11XA0068A	11XA0069A	11XA0067B
0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 9:30													
4/24/2012 9:31													
4/24/2012 9:32													
4/24/2012 9:33													
4/24/2012 9:34													
4/24/2012 9:35													
4/24/2012 9:36													
4/24/2012 9:37													
4/24/2012 9:38													
4/24/2012 9:39													
4/24/2012 9:40													
4/24/2012 9:41													
4/24/2012 9:42													
4/24/2012 9:43													
4/24/2012 9:44													
4/24/2012 9:45													
4/24/2012 9:46													
4/24/2012 9:47													
4/24/2012 9:48													
4/24/2012 9:49													
4/24/2012 9:50													
4/24/2012 9:51													
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4/24/2012 9:56													
4/24/2012 9:57													
4/24/2012 9:58													
4/24/2012 9:59													
4/24/2012 10:00													
4/24/2012 10:01													
4/24/2012 10:02													
4/24/2012 10:03													
4/24/2012 10:04													
4/24/2012 10:05													
4/24/2012 10:06													
4/24/2012 10:07													
4/24/2012 10:08													
4/24/2012 10:09													
4/24/2012 10:10													
4/24/2012 10:11													
4/24/2012 10:12													
4/24/2012 10:13													

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Primary power to TR3	Primary power to TR3	Secondary current to TR1	Secondary current to TR2	Secondary current to TR3	Primary voltage to Primary voltage to TR1	Primary voltage to Primary voltage to TR2	Primary voltage to Primary voltage to TR3	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcls/min on TR1
11J00689A	11I0067B	11I0068B	11I0068B	11I0069B	11E0067A	11E0068A	11E0069A	11E0067B	11E0068B	11E0069B	11XA0067A	11XA0068A	11XA0069A	11XA0067B
4/24/2012 11:42	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 11:43	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 11:44	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 11:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 11:46	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 11:47	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 11:48	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 11:49	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 11:50	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 11:51	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 11:52	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 11:53	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 11:54	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 11:55	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 11:56	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 11:57	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 11:58	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 11:59	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 12:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 12:01	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 12:02	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 12:03	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 12:04	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 12:05	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 12:06	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 12:07	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 12:08	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 12:09	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 12:10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 12:11	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 12:12	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 12:13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 12:14	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 12:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 12:16	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 12:17	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 12:18	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 12:19	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 12:20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 12:21	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 12:22	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 12:23	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 12:24	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 12:25	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Primary power to TR3	Secondary current to TR1	Secondary current to TR2	Secondary current to TR3	Primary voltage to TR1	Primary voltage to TR2	Primary voltage to TR3	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1
11J0069A	11I0067B	11I0068B	11I0069B	11E0067A	11E0068A	11E0069A	11E0067B	11E0068B	11E0069B	11XA0067A	11XA0068A	11XA0069A	11XA0067B
4/24/2012 13:54	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 13:55	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 13:56	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 13:57	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 13:58	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 13:59	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:00	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:01	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:02	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:03	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:04	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:05	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:06	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:07	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:08	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:09	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:10	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:11	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:12	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:13	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:14	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:15	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:16	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:17	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:18	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:19	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:20	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:21	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:22	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:23	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:24	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:25	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:26	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:27	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:28	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:29	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:30	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:31	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:32	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:33	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:34	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:35	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:36	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 14:37	0	0	0	0	0	0	0	0	0	0	0	0	0

Primary power to TR3	Secondary current to TR1	Secondary current to TR2	Secondary current to TR3	Primary voltage to TR1	Primary voltage to TR2	Primary voltage to TR3	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1
kW	mA	mA	mA	V	V	V	kV	kV	kV	11XA0067A	11XA0068A	11XA0069A	11XA0067B
11J0069A	11I0067B	11I0068B	11I0069B	11E0067A	11E0068A	11E0069A	11E0067B	11E0068B	11E0069B	0	0	0	0
4/24/2012 15:22	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 15:23	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 15:24	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 15:25	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 15:26	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 15:27	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 15:28	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 15:29	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 15:30	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 15:31	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 15:32	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 15:33	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 15:34	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 15:35	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 15:36	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 15:37	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 15:38	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 15:39	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 15:40	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 15:41	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 15:42	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 15:43	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 15:44	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 15:45	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 15:46	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 15:47	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 15:48	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 15:49	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 15:50	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 15:51	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 15:52	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 15:53	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 15:54	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2012 15:55	0	0	0	0	0	0	0	0	0	0	0	0	0

	Arct/min on TR2	Arct/min on TR3	Inst Opacity %	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	CORRECTED REGEN SO2 ppm	CORRECTED REGEN NOX ppm	CORRECTED REGEN CO ppm	FCC Feed Sulfur wt%	Wet Air rate to regen mscfd	Flue gas CO2 %
	11XA0068B	11XA0069B	11A00689	11T00520	11T00521	11T00522	11T00523	11M00812	11M00813	11M00814	11CFLRLD	11F0175	11A00815
4/24/2012 9:30	0	0	4.7	1263	1243	1256	1260	4	30	92	0.053	83130	16.48
4/24/2012 9:31	0	0	4.6	1264	1241	1256	1260	3	30	91	0.053	83299	16.45
4/24/2012 9:32	0	0	4.5	1264	1240	1256	1260	3	30	96	0.053	83445	16.44
4/24/2012 9:33	0	0	4.5	1264	1241	1257	1260	2	30	101	0.053	83048	16.41
4/24/2012 9:34	0	0	4.2	1263	1242	1257	1259	1	30	99	0.053	82979	16.39
4/24/2012 9:35	0	0	4.1	1263	1242	1257	1259	1	30	88	0.053	83178	16.47
4/24/2012 9:36	0	0	4.2	1263	1241	1256	1259	1	29	95	0.053	83242	16.43
4/24/2012 9:37	0	0	4.2	1263	1240	1256	1259	1	29	91	0.053	83238	16.42
4/24/2012 9:38	0	0	4.7	1263	1239	1256	1259	1	29	96	0.053	83233	16.46
4/24/2012 9:39	0	0	4.7	1263	1240	1256	1259	1	29	96	0.053	83225	16.46
4/24/2012 9:40	0	0	4.5	1263	1240	1257	1259	1	29	106	0.053	82999	16.49
4/24/2012 9:41	0	0	4.6	1263	1240	1256	1258	1	29	92	0.053	83137	16.52
4/24/2012 9:42	0	0	4.3	1263	1240	1255	1258	1	29	93	0.053	83280	16.53
4/24/2012 9:43	0	0	4.2	1263	1240	1255	1258	1	29	91	0.053	83233	16.49
4/24/2012 9:44	0	0	4.2	1263	1240	1256	1259	1	28	91	0.053	83186	16.50
4/24/2012 9:45	0	0	4.4	1262	1239	1255	1259	0	29	94	0.053	83139	16.54
4/24/2012 9:46	0	0	4.5	1262	1238	1255	1259	1	29	86	0.053	83092	16.55
4/24/2012 9:47	0	0	4.4	1262	1238	1254	1259	1	28	78	0.053	83045	16.57
4/24/2012 9:48	0	0	4.2	1263	1240	1254	1259	1	28	73	0.053	82999	16.62
4/24/2012 9:49	0	0	4.4	1262	1240	1255	1259	1	29	76	0.053	83111	16.63
4/24/2012 9:50	0	0	4.2	1262	1241	1255	1260	3	29	74	0.053	83361	16.64
4/24/2012 9:51	0	0	4.1	1263	1242	1256	1260	4	29	81	0.053	83434	16.59
4/24/2012 9:52	0	0	4.3	1264	1241	1256	1260	4	30	84	0.053	83364	16.51
4/24/2012 9:53	0	0	4.5	1263	1240	1256	1260	4	30	84	0.053	83294	16.44
4/24/2012 9:54	0	0	4.6	1263	1240	1256	1260	3	30	82	0.053	83224	16.50
4/24/2012 9:55	0	0	4.5	1263	1241	1255	1260	3	29	83	0.053	83232	16.52
4/24/2012 9:56	0	0	4.5	1263	1241	1256	1260	2	29	84	0.053	83322	16.50
4/24/2012 9:57	0	0	4.5	1263	1241	1256	1260	2	29	84	0.053	83411	16.54
4/24/2012 9:58	0	0	4.3	1264	1241	1257	1260	2	29	84	0.053	83334	16.56
4/24/2012 9:59	0	0	4.2	1264	1242	1258	1260	2	28	77	0.053	83223	16.61
4/24/2012 10:00	0	0	4.1	1264	1243	1259	1260	1	28	78	0.053	83316	16.65
4/24/2012 10:01	0	0	4.1	1264	1243	1258	1260	1	29	75	0.053	83380	16.62
4/24/2012 10:02	0	0	4.2	1265	1243	1256	1260	1	28	74	0.053	83403	16.63
4/24/2012 10:03	0	0	4.2	1265	1242	1256	1261	1	28	81	0.053	83426	16.59
4/24/2012 10:04	0	0	4.2	1264	1242	1257	1261	1	28	82	0.053	83450	16.56
4/24/2012 10:05	0	0	4.1	1264	1243	1257	1261	1	28	86	0.053	83253	16.56
4/24/2012 10:06	0	0	4.1	1265	1242	1257	1261	1	28	83	0.053	83117	16.56
4/24/2012 10:07	0	0	4.2	1265	1242	1257	1260	1	28	85	0.053	83484	16.54
4/24/2012 10:08	0	0	4.2	1265	1242	1257	1261	1	28	86	0.053	83531	16.53
4/24/2012 10:09	0	0	4.2	1265	1242	1257	1261	1	29	88	0.053	83573	16.49
4/24/2012 10:10	0	0	4.2	1265	1244	1258	1261	1	29	86	0.053	83614	16.52
4/24/2012 10:11	0	0	4.3	1265	1243	1258	1261	3	29	86	0.053	83642	16.55
4/24/2012 10:12	0	0	4.3	1265	1241	1258	1261	4	30	98	0.053	83643	16.49
4/24/2012 10:13	0	0	4.3	1265	1240	1258	1261	4	30	102	0.053	83627	16.41

	Arct/min on TR2	Arct/min on TR3	Inst Opacity %	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	CORRECTED REGEN SO2 ppm	CORRECTED REGEN NOX ppm	CORRECTED REGEN CO ppm	FCC Feed Sulfur wt%	Wet Air rate to regen mscfd	Flue gas CO2 %
4/24/2012 10:14	11XA0068B	11XA0069B	11A00889	11T0520	11T0521	11T0522	11T0523	11T0524	11M0842	11M0843	11M0844	11CFSLFLD	11F0175	11A0845
0	0	0	4.3	1265	1241	1258	1261	1265	4	30	103	0.053	83591	16.40
4/24/2012 10:15	0	0	4.4	1264	1243	1258	1261	1265	4	30	93	0.053	83550	16.43
4/24/2012 10:16	0	0	4.4	1264	1241	1257	1261	1264	3	30	94	0.053	83510	16.43
4/24/2012 10:17	0	0	4.1	1264	1240	1256	1261	1264	2	29	92	0.053	83469	16.43
4/24/2012 10:18	0	0	4.1	1263	1241	1257	1261	1264	2	29	93	0.053	83428	16.46
4/24/2012 10:19	0	0	4.2	1263	1242	1256	1260	1264	1	29	92	0.053	83387	16.44
4/24/2012 10:20	0	0	4.2	1263	1241	1255	1260	1263	1	29	88	0.053	83347	16.51
4/24/2012 10:21	0	0	4.6	1263	1240	1254	1260	1263	1	29	81	0.053	83310	16.55
4/24/2012 10:22	0	0	4.2	1264	1241	1255	1260	1263	1	29	94	0.053	83283	16.43
4/24/2012 10:23	0	0	4.2	1263	1241	1256	1259	1263	1	30	96	0.053	83256	16.38
4/24/2012 10:24	0	0	4.2	1262	1241	1256	1259	1262	1	29	98	0.053	83229	16.40
4/24/2012 10:25	0	0	4.2	1263	1240	1256	1259	1262	1	29	93	0.053	83203	16.40
4/24/2012 10:26	0	0	4.1	1263	1240	1256	1259	1263	1	29	95	0.053	83176	16.42
4/24/2012 10:27	0	0	4.0	1263	1240	1256	1259	1263	1	29	96	0.053	83149	16.49
4/24/2012 10:28	0	0	4.0	1263	1240	1256	1259	1263	1	29	89	0.053	83122	16.50
4/24/2012 10:29	0	0	4.6	1262	1240	1255	1259	1264	1	28	88	0.053	83109	16.50
4/24/2012 10:30	0	0	4.1	1263	1240	1255	1259	1263	1	29	91	0.053	83129	16.52
4/24/2012 10:31	0	0	3.9	1263	1241	1255	1259	1263	1	29	86	0.053	83151	16.56
4/24/2012 10:32	0	0	3.9	1262	1241	1256	1259	1263	3	29	83	0.053	83173	16.57
4/24/2012 10:33	0	0	3.9	1264	1240	1257	1260	1263	4	29	79	0.053	83195	16.57
4/24/2012 10:34	0	0	3.8	1264	1239	1257	1260	1264	4	29	84	0.053	83216	16.50
4/24/2012 10:35	0	0	3.9	1263	1239	1257	1260	1264	4	30	91	0.053	83236	16.42
4/24/2012 10:36	0	0	4.0	1263	1239	1257	1259	1263	3	30	96	0.053	83257	16.44
4/24/2012 10:37	0	0	4.1	1263	1240	1257	1259	1263	3	30	97	0.053	83277	16.49
4/24/2012 10:38	0	0	3.9	1262	1241	1256	1259	1263	2	29	87	0.053	83298	16.54
4/24/2012 10:39	0	0	3.8	1262	1240	1255	1259	1262	2	29	86	0.053	83319	16.51
4/24/2012 10:40	0	0	3.9	1262	1241	1256	1259	1262	2	29	86	0.053	83339	16.54
4/24/2012 10:41	0	0	3.9	1263	1241	1257	1259	1262	2	29	84	0.053	83346	16.58
4/24/2012 10:42	0	0	3.7	1263	1241	1256	1259	1263	1	29	81	0.053	83302	16.59
4/24/2012 10:43	0	0	3.9	1264	1240	1256	1259	1263	1	28	89	0.053	83253	16.54
4/24/2012 10:44	0	0	3.8	1264	1240	1256	1260	1264	1	29	82	0.053	83205	16.52
4/24/2012 10:45	0	0	3.9	1264	1241	1256	1260	1264	1	28	83	0.053	83156	16.55
4/24/2012 10:46	0	0	3.8	1264	1241	1255	1260	1264	1	29	79	0.053	83107	16.49
4/24/2012 10:47	0	0	3.8	1264	1241	1256	1260	1264	1	28	78	0.053	83072	16.59
4/24/2012 10:48	0	0	3.9	1265	1241	1256	1259	1264	1	28	79	0.053	83105	16.59
4/24/2012 10:49	0	0	3.9	1264	1241	1256	1260	1263	1	29	85	0.053	83146	16.54
4/24/2012 10:50	0	0	4.0	1264	1241	1255	1259	1263	1	28	81	0.053	83188	16.59
4/24/2012 10:51	0	0	4.1	1264	1241	1255	1259	1264	1	28	80	0.053	83229	16.63
4/24/2012 10:52	0	0	4.2	1264	1241	1256	1259	1263	2	28	75	0.053	83270	16.63
4/24/2012 10:53	0	0	4.2	1264	1242	1256	1259	1263	3	29	79	0.053	83311	16.57
4/24/2012 10:54	0	0	4.0	1264	1242	1256	1260	1263	4	29	79	0.053	83342	16.56
4/24/2012 10:55	0	0	4.0	1263	1240	1257	1260	1264	5	30	77	0.053	83311	16.58
4/24/2012 10:56	0	0	4.0	1263	1238	1257	1260	1263	4	29	80	0.053	83279	16.60
4/24/2012 10:57	0	0	4.2	1263	1239	1256	1259	1263	4	30	77	0.053	83299	16.53

	Arcs/min on TR2	Arcs/min on TR3	Inst Opacity	DENSE BED TEMP	DENSE BED TEMP	DENSE BED TEMP	DENSE BED TEMP	DENSE BED TEMP	DENSE BED TEMP	CORRECTED REGEN SO2	CORRECTED REGEN NOX	CORRECTED REGEN CO	FCC Feed Sulfur	Wet Air rate to regen	Flue gas CO2
	11XA0068B	11XA0069B	11A00889	degF	degF	degF	degF	degF	degF	ppm	ppm	ppm	wt%	mscfd	%
4/24/2012 10:58	0	0	4.6	1263	1239	1256	1259	1264	3	29	85	0.053	11F0175	83327	16.55
4/24/2012 10:59	0	0	4.6	1263	1239	1256	1259	1264	2	28	79	0.053	11F0175	83355	16.61
4/24/2012 11:00	0	0	4.7	1264	1240	1256	1260	1265	2	28	78	0.053	11F0175	83383	16.68
4/24/2012 11:01	0	0	4.5	1264	1242	1257	1260	1265	2	28	75	0.053	11F0175	83411	16.71
4/24/2012 11:02	0	0	4.1	1264	1242	1258	1260	1264	2	28	78	0.053	11F0175	83432	16.61
4/24/2012 11:03	0	0	3.9	1264	1241	1257	1261	1264	2	28	76	0.053	11F0175	83394	16.59
4/24/2012 11:04	0	0	3.9	1264	1241	1257	1261	1264	2	28	72	0.053	11F0175	83343	16.67
4/24/2012 11:05	0	0	4.0	1265	1241	1257	1261	1264	1	28	73	0.053	11F0175	83292	16.70
4/24/2012 11:06	0	0	4.5	1265	1241	1257	1261	1264	1	28	69	0.053	11F0175	83250	16.67
4/24/2012 11:07	0	0	3.9	1265	1241	1258	1261	1264	2	28	73	0.053	11F0175	83298	16.70
4/24/2012 11:08	0	0	4.0	1265	1242	1258	1261	1265	1	28	78	0.053	11F0175	83332	16.61
4/24/2012 11:09	0	0	4.0	1264	1242	1257	1261	1266	1	28	79	0.053	11F0175	83019	16.54
4/24/2012 11:10	0	0	4.1	1264	1242	1257	1261	1265	1	28	84	0.053	11F0175	83020	16.51
4/24/2012 11:11	0	0	4.0	1264	1242	1257	1261	1265	1	28	86	0.053	11F0175	83129	16.52
4/24/2012 11:12	0	0	3.9	1264	1242	1257	1261	1265	1	28	82	0.053	11F0175	83185	16.62
4/24/2012 11:13	0	0	3.9	1265	1242	1258	1261	1265	1	28	84	0.053	11F0175	83225	16.53
4/24/2012 11:14	0	0	3.8	1265	1243	1258	1261	1265	3	28	87	0.053	11F0175	83266	16.46
4/24/2012 11:15	0	0	3.9	1265	1244	1257	1262	1265	4	28	83	0.053	11F0175	83306	16.53
4/24/2012 11:16	0	0	4.0	1265	1244	1258	1261	1265	5	29	88	0.053	11F0175	83346	16.54
4/24/2012 11:17	0	0	4.0	1265	1242	1258	1261	1265	4	29	95	0.053	11F0175	83387	16.50
4/24/2012 11:18	0	0	4.0	1265	1242	1258	1260	1265	4	28	89	0.053	11F0175	83427	16.49
4/24/2012 11:19	0	0	4.0	1265	1242	1258	1260	1264	3	29	89	0.053	11F0175	83468	16.56
4/24/2012 11:20	0	0	4.0	1265	1241	1258	1260	1265	3	29	89	0.053	11F0175	83508	16.60
4/24/2012 11:21	0	0	4.0	1265	1241	1257	1261	1265	2	29	87	0.053	11F0175	83545	16.54
4/24/2012 11:22	0	0	3.9	1265	1241	1257	1261	1265	2	28	86	0.053	11F0175	83498	16.50
4/24/2012 11:23	0	0	4.0	1266	1241	1257	1260	1265	2	29	86	0.053	11F0175	83416	16.50
4/24/2012 11:24	0	0	4.4	1265	1242	1257	1260	1264	1	28	82	0.053	11F0175	83335	16.55
4/24/2012 11:25	0	0	3.8	1264	1242	1257	1260	1264	1	28	88	0.053	11F0175	83293	16.58
4/24/2012 11:26	0	0	3.8	1265	1242	1258	1261	1264	1	28	76	0.053	11F0175	83268	16.58
4/24/2012 11:27	0	0	3.8	1265	1242	1258	1261	1264	1	28	72	0.053	11F0175	83243	16.62
4/24/2012 11:28	0	0	3.8	1265	1242	1258	1261	1264	1	28	81	0.053	11F0175	83218	16.55
4/24/2012 11:29	0	0	3.9	1265	1242	1258	1261	1264	1	28	80	0.053	11F0175	83194	16.57
4/24/2012 11:30	0	0	3.9	1264	1242	1257	1261	1264	1	28	80	0.053	11F0175	83169	16.61
4/24/2012 11:31	0	0	4.1	1265	1242	1258	1261	1264	1	28	73	0.053	11F0175	83147	16.61
4/24/2012 11:32	0	0	4.1	1265	1242	1258	1261	1265	1	28	87	0.053	11F0175	83306	16.54
4/24/2012 11:33	0	0	4.6	1265	1242	1259	1260	1265	1	28	83	0.053	11F0175	83159	16.48
4/24/2012 11:34	0	0	4.1	1265	1243	1259	1260	1264	1	28	83	0.053	11F0175	83164	16.56
4/24/2012 11:35	0	0	4.0	1264	1243	1258	1260	1264	3	28	82	0.053	11F0175	83192	16.61
4/24/2012 11:36	0	0	4.0	1264	1242	1258	1260	1264	4	29	85	0.053	11F0175	83054	16.60
4/24/2012 11:37	0	0	3.9	1264	1240	1257	1260	1264	4	29	83	0.053	11F0175	82917	16.61
4/24/2012 11:38	0	0	3.7	1264	1241	1257	1260	1264	4	29	77	0.053	11F0175	82928	16.56
4/24/2012 11:39	0	0	3.9	1265	1240	1257	1260	1264	4	28	83	0.053	11F0175	83053	16.56
4/24/2012 11:40	0	0	3.9	1265	1240	1258	1260	1264	3	28	80	0.053	11F0175	83178	16.60
4/24/2012 11:41	0	0	3.8	1265	1242	1258	1260	1264	2	28	77	0.053	11F0175	83302	16.62

	Arcs/min on TR2	Arcs/min on TR3	Inst Opacity	DENSE BED TEMP	DENSE BED TEMP	DENSE BED TEMP	DENSE BED TEMP	DENSE BED TEMP	DENSE BED TEMP	CORRECTED REGEN SO2	CORRECTED REGEN NOX	CORRECTED REGEN CO	FCC Feed Sulfur	Wet Air rate to regen	Flue gas CO2
	11XA0068B	11XA0069B	11A10889	11T00520	11T00521	11T00522	11T00523	11T00524	11M0812	11M0813	11M0814	11CFSLRLLD	wt%	mscfd	%
4/24/2012 11:42	0	0	3.7	1265	1241	1259	1261	1264	2	27	75	0.053	83265	11A1075	16.65
4/24/2012 11:43	0	0	3.8	1265	1242	1258	1261	1265	2	28	72	0.053	83077	11A1075	16.68
4/24/2012 11:44	0	0	3.8	1266	1242	1258	1261	1265	2	28	80	0.053	83133	11A1075	16.63
4/24/2012 11:45	0	0	3.9	1265	1241	1258	1261	1265	2	28	75	0.053	83253	11A1075	16.61
4/24/2012 11:46	0	0	3.9	1265	1242	1258	1261	1264	2	28	72	0.053	83192	11A1075	16.68
4/24/2012 11:47	0	0	4.0	1265	1242	1258	1261	1265	1	28	76	0.053	83131	11A1075	16.57
4/24/2012 11:48	0	0	4.0	1265	1242	1258	1262	1265	1	28	81	0.053	83242	11A1075	16.54
4/24/2012 11:49	0	0	3.9	1265	1242	1258	1262	1265	1	27	83	0.053	83396	11A1075	16.52
4/24/2012 11:50	0	0	3.9	1266	1243	1258	1262	1265	1	28	87	0.053	83330	11A1075	16.50
4/24/2012 11:51	0	0	3.9	1265	1242	1257	1261	1265	1	28	92	0.053	83263	11A1075	16.54
4/24/2012 11:52	0	0	3.8	1265	1242	1257	1261	1265	1	28	82	0.053	83196	11A1075	16.59
4/24/2012 11:53	0	0	3.9	1264	1242	1258	1261	1265	1	28	83	0.053	83130	11A1075	16.49
4/24/2012 11:54	0	0	4.2	1264	1242	1259	1261	1265	1	28	86	0.053	83063	11A1075	16.51
4/24/2012 11:55	0	0	4.0	1264	1243	1259	1261	1265	2	29	88	0.053	83069	11A1075	16.54
4/24/2012 11:56	0	0	3.9	1264	1245	1258	1261	1265	3	29	86	0.053	83182	11A1075	16.51
4/24/2012 11:57	0	0	4.1	1264	1243	1257	1261	1264	4	29	88	0.053	83295	11A1075	16.46
4/24/2012 11:58	0	0	4.0	1264	1242	1257	1261	1264	4	30	95	0.053	83358	11A1075	16.45
4/24/2012 11:59	0	0	3.9	1263	1242	1258	1261	1264	4	30	96	0.053	83344	11A1075	16.51
4/24/2012 12:00	0	0	3.9	1265	1242	1257	1260	1264	3	29	96	0.054	83330	11A1075	16.47
4/24/2012 12:01	0	0	4.0	1264	1241	1256	1259	1264	2	30	97	0.054	83315	11A1075	16.36
4/24/2012 12:02	0	0	4.4	1263	1241	1256	1259	1263	2	29	95	0.054	83300	11A1075	16.43
4/24/2012 12:03	0	0	4.6	1263	1241	1257	1260	1263	2	29	96	0.054	83285	11A1075	16.45
4/24/2012 12:04	0	0	4.5	1263	1240	1256	1260	1263	1	28	94	0.054	83270	11A1075	16.46
4/24/2012 12:05	0	0	4.4	1263	1241	1256	1259	1263	1	29	91	0.054	83256	11A1075	16.43
4/24/2012 12:06	0	0	4.0	1263	1240	1256	1260	1263	1	28	89	0.054	83241	11A1075	16.42
4/24/2012 12:07	0	0	3.8	1263	1240	1256	1260	1263	1	28	82	0.054	83226	11A1075	16.59
4/24/2012 12:08	0	0	3.7	1263	1240	1255	1260	1263	1	27	78	0.054	83211	11A1075	16.64
4/24/2012 12:09	0	0	3.7	1264	1239	1256	1260	1263	1	27	70	0.054	83196	11A1075	16.69
4/24/2012 12:10	0	0	4.0	1264	1240	1257	1260	1263	1	28	70	0.054	83181	11A1075	16.71
4/24/2012 12:11	0	0	4.1	1264	1241	1258	1261	1264	1	27	69	0.054	83131	11A1075	16.67
4/24/2012 12:12	0	0	3.9	1264	1241	1259	1261	1264	1	27	68	0.054	83004	11A1075	16.70
4/24/2012 12:13	0	0	4.1	1265	1241	1259	1262	1265	1	27	74	0.054	82914	11A1075	16.56
4/24/2012 12:14	0	0	3.8	1266	1241	1258	1262	1265	1	27	70	0.054	82917	11A1075	16.64
4/24/2012 12:15	0	0	3.6	1266	1242	1258	1262	1266	2	27	74	0.054	82924	11A1075	16.67
4/24/2012 12:16	0	0	3.7	1266	1243	1258	1262	1266	3	28	74	0.054	82931	11A1075	16.67
4/24/2012 12:17	0	0	3.8	1266	1245	1258	1262	1265	5	28	76	0.054	83041	11A1075	16.63
4/24/2012 12:18	0	0	3.9	1266	1243	1258	1262	1265	5	28	77	0.054	83260	11A1075	16.52
4/24/2012 12:19	0	0	3.9	1265	1241	1258	1262	1265	5	29	78	0.054	83168	11A1075	16.56
4/24/2012 12:20	0	0	3.9	1264	1240	1258	1261	1265	4	28	77	0.054	83061	11A1075	16.63
4/24/2012 12:21	0	0	3.9	1264	1242	1258	1261	1264	3	28	74	0.054	82984	11A1075	16.64
4/24/2012 12:22	0	0	3.7	1264	1242	1258	1261	1265	3	28	79	0.054	82989	11A1075	16.62
4/24/2012 12:23	0	0	4.3	1265	1242	1259	1261	1265	2	28	72	0.054	82999	11A1075	16.67
4/24/2012 12:24	0	0	3.8	1265	1242	1259	1261	1265	2	28	75	0.054	83009	11A1075	16.64
4/24/2012 12:25	0	0	3.8	1265	1242	1259	1261	1265	2	28	78	0.054	83019	11A1075	16.53

Date/Time	11XA0068B	11XA0069B	11A10889	Inst Opacity %	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	CORRECTED REGEN SO2 ppm	CORRECTED REGEN NOX ppm	CORRECTED REGEN CO ppm	FCC Feed Sulfur wt%	Wet Air rate to regen mscfd	Flue gas CO2 %
4/24/2012 12:26	0	0	3.8	11T10520	1265	1242	1259	1262	1265	11M10812	11M10813	11M10814	11CFSLR-LD	11F10175	11A10815
4/24/2012 12:27	0	0	3.7	1265	1243	1258	1261	1265	1265	2	28	83	0.054	83029	16.55
4/24/2012 12:28	0	0	3.6	1265	1243	1258	1261	1265	1265	1	28	82	0.054	83038	16.57
4/24/2012 12:29	0	0	3.7	1265	1242	1257	1261	1265	1265	1	27	83	0.054	83048	16.49
4/24/2012 12:30	0	0	3.7	1265	1241	1256	1261	1265	1265	1	28	89	0.054	83058	16.53
4/24/2012 12:31	0	0	3.6	1264	1240	1256	1261	1264	1264	1	28	80	0.054	83068	16.50
4/24/2012 12:32	0	0	3.8	1264	1242	1257	1261	1264	1264	1	28	86	0.054	83078	16.55
4/24/2012 12:33	0	0	3.8	1264	1243	1257	1260	1264	1264	1	28	86	0.054	83088	16.48
4/24/2012 12:34	0	0	3.9	1263	1242	1257	1260	1264	1264	1	28	87	0.054	83098	16.55
4/24/2012 12:35	0	0	4.1	1263	1241	1257	1260	1264	1264	1	29	84	0.054	83058	16.50
4/24/2012 12:36	0	0	4.2	1263	1241	1257	1260	1264	1264	2	29	90	0.054	83023	16.50
4/24/2012 12:37	0	0	4.2	1263	1240	1257	1260	1263	1263	4	29	83	0.054	82987	16.50
4/24/2012 12:38	0	0	3.8	1263	1240	1258	1260	1260	1264	5	29	85	0.054	82952	16.51
4/24/2012 12:39	0	0	3.8	1263	1240	1256	1260	1260	1264	5	29	81	0.054	82867	16.57
4/24/2012 12:40	0	0	3.8	1262	1239	1256	1260	1260	1264	4	28	81	0.054	82646	16.59
4/24/2012 12:41	0	0	3.9	1263	1239	1256	1260	1260	1264	3	28	79	0.054	82946	16.54
4/24/2012 12:42	0	0	4.1	1263	1239	1256	1260	1260	1263	3	28	83	0.054	82999	16.49
4/24/2012 12:43	0	0	4.1	1263	1239	1256	1259	1260	1263	3	28	85	0.054	83002	16.52
4/24/2012 12:44	0	0	4.1	1263	1239	1256	1259	1260	1263	2	28	83	0.054	83004	16.54
4/24/2012 12:45	0	0	4.1	1264	1240	1257	1260	1260	1263	2	28	79	0.054	83006	16.60
4/24/2012 12:46	0	0	3.9	1264	1240	1257	1260	1260	1264	2	28	78	0.054	83008	16.60
4/24/2012 12:47	0	0	3.8	1263	1239	1257	1260	1260	1263	2	27	80	0.054	82992	16.57
4/24/2012 12:48	0	0	3.7	1263	1239	1257	1260	1260	1263	2	28	80	0.054	82852	16.56
4/24/2012 12:49	0	0	3.7	1263	1239	1257	1260	1260	1263	2	28	80	0.054	82688	16.57
4/24/2012 12:50	0	0	4.2	1263	1241	1255	1259	1260	1263	2	28	77	0.054	82566	16.62
4/24/2012 12:51	0	0	4.2	1263	1240	1255	1259	1260	1263	2	28	75	0.054	82732	16.61
4/24/2012 12:52	0	0	4.2	1263	1240	1255	1259	1260	1263	1	28	82	0.054	82744	16.56
4/24/2012 12:53	0	0	4.2	1263	1240	1254	1259	1260	1263	1	28	83	0.054	82725	16.50
4/24/2012 12:54	0	0	4.3	1263	1240	1254	1259	1260	1263	1	28	85	0.054	82816	16.49
4/24/2012 12:55	0	0	4.0	1263	1239	1255	1259	1260	1263	1	28	81	0.054	82929	16.56
4/24/2012 12:56	0	0	3.9	1263	1241	1256	1259	1260	1263	1	28	82	0.054	83042	16.56
4/24/2012 12:57	0	0	3.9	1262	1241	1257	1259	1260	1263	2	28	83	0.054	83098	16.61
4/24/2012 12:58	0	0	3.8	1263	1240	1255	1259	1260	1263	4	29	82	0.054	82735	16.54
4/24/2012 12:59	0	0	4.3	1263	1239	1254	1259	1260	1263	5	29	85	0.054	82721	16.51
4/24/2012 13:00	0	0	3.7	1263	1240	1255	1258	1260	1263	5	29	87	0.054	82814	16.49
4/24/2012 13:01	0	0	3.8	1262	1240	1255	1258	1260	1262	5	29	80	0.054	82889	16.52
4/24/2012 13:02	0	0	3.8	1262	1240	1255	1259	1260	1262	4	29	84	0.054	82946	16.59
4/24/2012 13:03	0	0	3.8	1261	1240	1255	1259	1260	1263	3	29	88	0.054	82848	16.53
4/24/2012 13:04	0	0	3.6	1261	1238	1254	1258	1260	1262	3	28	84	0.054	82717	16.58
4/24/2012 13:05	0	0	3.6	1262	1237	1254	1257	1260	1261	2	29	75	0.054	82694	16.60
4/24/2012 13:06	0	0	3.6	1262	1238	1253	1258	1260	1261	2	29	80	0.054	82704	16.52
4/24/2012 13:07	0	0	4.2	1262	1239	1253	1258	1260	1261	2	27	78	0.054	82714	16.56
4/24/2012 13:08	0	0	3.6	1262	1240	1254	1259	1260	1262	2	28	74	0.054	82724	16.63
4/24/2012 13:09	0	0	3.6	1261	1238	1254	1259	1260	1262	2	28	73	0.054	82735	16.56
4/24/2012 13:09	0	0	3.7	1261	1237	1254	1259	1260	1262	2	28	80	0.054	82758	16.53

	Arct/min on TR2	Arct/min on TR3	Inst Opacity %	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	CORRECTED REGEN SO2 ppm	CORRECTED REGEN NOX ppm	CORRECTED REGEN CO ppm	FCC Feed Sulfur wt%	Wet Air rate to regen mscfd	Flue gas CO2 %
	11XA0068B	11XA0069B	11AJ0889	11TI0520	11TI0521	11TI0522	11TI0523	11TI0524	11MI0812	11MI0813	11MI0814	11CFLR.LD	11FI0175	11AI0815
4/24/2012 13:54	0	0	3.6	1263	1240	1255	1259	1262	1	28	86	0.054	82774	16.59
4/24/2012 13:55	0	0	3.6	1262	1239	1255	1259	1262	2	28	80	0.054	82812	16.59
4/24/2012 13:56	0	0	3.6	1262	1239	1255	1259	1263	1	28	78	0.054	82718	16.57
4/24/2012 13:57	0	0	3.6	1262	1239	1254	1259	1262	1	28	89	0.054	82518	16.56
4/24/2012 13:58	0	0	3.5	1261	1238	1255	1258	1262	1	28	77	0.054	82536	16.67
4/24/2012 13:59	0	0	3.5	1261	1238	1254	1258	1262	2	28	74	0.054	82557	16.66
4/24/2012 14:00	0	0	3.7	1261	1238	1253	1258	1262	4	28	77	0.054	82578	16.63
4/24/2012 14:01	0	0	3.7	1262	1238	1253	1258	1262	5	28	73	0.054	82662	16.68
4/24/2012 14:02	0	0	4.0	1262	1239	1254	1259	1263	6	29	72	0.054	82856	16.61
4/24/2012 14:03	0	0	4.0	1262	1239	1255	1259	1263	5	28	73	0.054	82826	16.64
4/24/2012 14:04	0	0	4.0	1263	1240	1257	1260	1263	5	28	78	0.054	82545	16.59
4/24/2012 14:05	0	0	4.1	1262	1240	1257	1260	1262	4	28	74	0.054	82564	16.67
4/24/2012 14:06	0	0	3.7	1262	1239	1257	1260	1262	3	28	76	0.054	82590	16.62
4/24/2012 14:07	0	0	3.7	1262	1239	1256	1260	1263	3	29	74	0.054	82616	16.67
4/24/2012 14:08	0	0	3.7	1263	1239	1256	1260	1262	3	28	76	0.054	82641	16.70
4/24/2012 14:09	0	0	3.9	1264	1240	1256	1260	1262	2	27	74	0.054	82667	16.68
4/24/2012 14:10	0	0	4.2	1264	1240	1256	1259	1263	2	28	73	0.054	82692	16.64
4/24/2012 14:11	0	0	4.2	1263	1239	1256	1259	1263	2	27	74	0.054	82718	16.67
4/24/2012 14:12	0	0	4.3	1263	1240	1256	1259	1263	2	27	75	0.054	82744	16.66
4/24/2012 14:13	0	0	4.1	1263	1240	1257	1259	1263	2	27	71	0.054	82769	16.67
4/24/2012 14:14	0	0	3.8	1263	1240	1256	1260	1264	2	27	73	0.054	82795	16.64
4/24/2012 14:15	0	0	3.7	1264	1240	1256	1260	1264	2	28	75	0.054	82808	16.63
4/24/2012 14:16	0	0	3.7	1264	1241	1257	1260	1264	2	28	73	0.054	82783	16.60
4/24/2012 14:17	0	0	3.7	1264	1241	1258	1260	1264	1	28	72	0.054	82754	16.60
4/24/2012 14:18	0	0	4.2	1264	1241	1257	1260	1264	1	27	74	0.054	82726	16.65
4/24/2012 14:19	0	0	4.2	1265	1242	1256	1260	1265	2	28	81	0.054	82730	16.64
4/24/2012 14:20	0	0	4.3	1265	1242	1257	1261	1265	3	28	85	0.054	82852	16.58
4/24/2012 14:21	0	0	4.4	1265	1242	1256	1261	1265	5	28	78	0.054	82948	16.59
4/24/2012 14:22	0	0	4.1	1265	1242	1257	1261	1264	5	29	83	0.054	82901	16.54
4/24/2012 14:23	0	0	3.9	1264	1241	1257	1261	1264	5	29	85	0.054	82839	16.54
4/24/2012 14:24	0	0	3.8	1264	1241	1256	1260	1264	4	29	80	0.054	82777	16.52
4/24/2012 14:25	0	0	3.8	1263	1241	1255	1260	1263	3	29	85	0.054	82716	16.57
4/24/2012 14:26	0	0	3.8	1263	1241	1255	1260	1263	3	28	86	0.054	82654	16.48
4/24/2012 14:27	0	0	3.9	1263	1239	1255	1260	1263	2	29	83	0.054	82650	16.52
4/24/2012 14:28	0	0	3.9	1263	1239	1255	1259	1263	2	28	81	0.054	82801	16.54
4/24/2012 14:29	0	0	3.9	1263	1240	1256	1259	1263	2	28	79	0.054	82547	16.62
4/24/2012 14:30	0	0	3.9	1263	1240	1256	1259	1263	2	28	76	0.054	82642	16.64
4/24/2012 14:31	0	0	3.8	1264	1240	1256	1259	1263	2	28	77	0.054	82790	16.64
4/24/2012 14:32	0	0	3.6	1262	1240	1257	1259	1264	2	28	82	0.054	82859	16.56
4/24/2012 14:33	0	0	3.7	1262	1239	1257	1259	1264	1	27	87	0.054	82588	16.50
4/24/2012 14:34	0	0	3.9	1263	1239	1256	1259	1264	1	28	90	0.054	82543	16.50
4/24/2012 14:35	0	0	3.8	1263	1240	1257	1259	1263	1	28	89	0.054	82536	16.50
4/24/2012 14:36	0	0	3.7	1263	1240	1256	1259	1263	1	28	83	0.054	82529	16.54
4/24/2012 14:37	0	0	3.8	1263	1241	1255	1259	1263	1	28	88	0.054	82522	16.50

Date/Time	11XA0068B	11XA0069B	Inst Opacity %	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	CORRECTED REGEN SO2 ppm	CORRECTED REGEN NOX ppm	CORRECTED REGEN CO ppm	FCC Feed Sulfur wt%	Wet Air rate to regen mscfd	Flue gas CO2 %
4/24/2012 14:38	0	0	3.8	1263	1240	1254	1259	1	27	84	0.054	82528	16.51
4/24/2012 14:39	0	0	3.7	1263	1239	1255	1259	2	28	87	0.054	82612	16.61
4/24/2012 14:40	0	0	3.7	1262	1239	1254	1259	3	29	85	0.054	82688	16.54
4/24/2012 14:41	0	0	3.6	1262	1239	1254	1259	5	28	75	0.054	82640	16.64
4/24/2012 14:42	0	0	3.7	1262	1239	1256	1259	5	29	73	0.054	82572	16.59
4/24/2012 14:43	0	0	3.7	1262	1241	1257	1259	5	28	75	0.054	82503	16.61
4/24/2012 14:44	0	0	3.7	1262	1241	1258	1259	4	28	76	0.054	82435	16.60
4/24/2012 14:45	0	0	3.7	1263	1239	1256	1259	3	28	79	0.054	82396	16.57
4/24/2012 14:46	0	0	3.6	1263	1239	1255	1259	3	27	81	0.054	82574	16.60
4/24/2012 14:47	0	0	3.5	1263	1239	1255	1259	2	27	73	0.054	82601	16.61
4/24/2012 14:48	0	0	3.6	1263	1239	1256	1259	2	27	70	0.054	82585	16.65
4/24/2012 14:49	0	0	3.5	1263	1239	1256	1259	2	27	69	0.054	82568	16.70
4/24/2012 14:50	0	0	3.3	1264	1239	1256	1259	2	26	68	0.054	82551	16.73
4/24/2012 14:51	0	0	3.3	1264	1240	1256	1259	2	27	67	0.054	82541	16.70
4/24/2012 14:52	0	0	3.3	1263	1241	1256	1260	2	27	66	0.054	82592	16.68
4/24/2012 14:53	0	0	3.5	1263	1241	1257	1260	2	27	68	0.054	82659	16.65
4/24/2012 14:54	0	0	3.6	1263	1242	1258	1260	2	27	72	0.054	82726	16.63
4/24/2012 14:55	0	0	3.5	1262	1241	1258	1260	2	27	72	0.054	82793	16.66
4/24/2012 14:56	0	0	3.5	1262	1240	1257	1260	2	27	72	0.054	82860	16.66
4/24/2012 14:57	0	0	3.7	1262	1241	1257	1260	2	28	77	0.054	82900	16.55
4/24/2012 14:58	0	0	3.8	1262	1240	1257	1260	1	28	82	0.054	82599	16.53
4/24/2012 14:59	0	0	3.7	1263	1241	1257	1260	2	28	76	0.054	82464	16.60
4/24/2012 15:00	0	0	3.7	1263	1240	1257	1259	3	28	76	0.054	82419	16.60
4/24/2012 15:01	0	0	4.1	1263	1240	1256	1259	5	28	76	0.054	82375	16.64
4/24/2012 15:02	0	0	3.6	1263	1241	1256	1260	5	28	75	0.054	82336	16.63
4/24/2012 15:03	0	0	3.6	1263	1241	1257	1260	5	28	77	0.054	82399	16.60
4/24/2012 15:04	0	0	3.6	1264	1242	1257	1260	4	27	77	0.054	82500	16.61
4/24/2012 15:05	0	0	3.7	1264	1242	1256	1260	3	27	79	0.054	82556	16.60
4/24/2012 15:06	0	0	3.6	1264	1242	1257	1260	3	28	85	0.054	82594	16.61
4/24/2012 15:07	0	0	3.7	1263	1241	1256	1260	2	27	75	0.054	82632	16.66
4/24/2012 15:08	0	0	4.3	1263	1240	1256	1260	2	27	78	0.054	82670	16.59
4/24/2012 15:09	0	0	3.7	1263	1241	1256	1260	2	27	84	0.054	82707	16.58
4/24/2012 15:10	0	0	3.7	1263	1240	1256	1260	2	28	80	0.054	82742	16.58
4/24/2012 15:11	0	0	3.7	1263	1239	1253	1260	2	28	83	0.054	82637	16.55
4/24/2012 15:12	0	0	3.7	1262	1239	1253	1259	2	27	86	0.054	82467	16.50
4/24/2012 15:13	0	0	4.0	1262	1237	1253	1259	2	27	82	0.054	82588	16.51
4/24/2012 15:14	0	0	4.2	1262	1238	1254	1259	1	27	82	0.054	82628	16.57
4/24/2012 15:15	0	0	4.0	1263	1239	1255	1259	1	27	74	0.054	82525	16.65
4/24/2012 15:16	0	0	3.9	1263	1241	1256	1259	1	27	72	0.054	82520	16.63
4/24/2012 15:17	0	0	3.9	1264	1241	1256	1260	1	26	75	0.054	82570	16.59
4/24/2012 15:18	0	0	3.9	1264	1242	1256	1260	1	26	70	0.054	82618	16.59
4/24/2012 15:19	0	0	3.8	1264	1243	1256	1260	2	28	77	0.054	82463	16.54
4/24/2012 15:20	0	0	3.9	1264	1242	1257	1260	4	28	79	0.054	82577	16.55
4/24/2012 15:21	0	0	3.8	1264	1241	1257	1260	5	28	72	0.054	82692	16.59

	Arct/min on TR2	Arct/min on TR3	Inst Opacity %	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	CORRECTED REGEN SO2 ppm	CORRECTED REGEN NOX ppm	CORRECTED REGEN CO ppm	FCC Feed Sulfur wt%	Wet Air rate to regen mscfd	Flue gas CO2 %
	11XA0068B	11XA0069B	11A0889	11T0520	11T0521	11T0522	11T0523	11T0524	11M0812	11M0813	11M0814	11CFSLR.LD	11F0175	11A0815
4/24/2012 15:22	0	0	3.8	1263	1241	1255	1261	1264	5	29	78	0.054	82630	16.57
4/24/2012 15:23	0	0	3.9	1262	1241	1254	1260	1264	5	28	85	0.054	82568	16.59
4/24/2012 15:24	0	0	3.9	1262	1241	1257	1260	1263	4	28	80	0.054	82507	16.61
4/24/2012 15:25	0	0	3.9	1262	1242	1258	1260	1263	3	28	80	0.054	82445	16.61
4/24/2012 15:26	0	0	3.9	1263	1241	1256	1259	1263	3	28	79	0.054	82576	16.55
4/24/2012 15:27	0	0	3.8	1263	1241	1256	1259	1263	2	28	80	0.054	82420	16.53
4/24/2012 15:28	0	0	3.7	1262	1240	1256	1259	1263	2	27	79	0.054	82313	16.59
4/24/2012 15:29	0	0	3.8	1262	1240	1257	1260	1263	2	27	75	0.054	82532	16.60
4/24/2012 15:30	0	0	3.8	1263	1240	1256	1260	1263	2	27	77	0.054	82750	16.62
4/24/2012 15:31	0	0	4.4	1263	1240	1255	1260	1264	2	27	74	0.054	82579	16.68
4/24/2012 15:32	0	0	4.3	1263	1240	1254	1260	1263	1	27	76	0.054	82355	16.67
4/24/2012 15:33	0	0	3.9	1263	1239	1255	1260	1263	2	27	75	0.054	82366	16.61
4/24/2012 15:34	0	0	3.9	1263	1239	1257	1260	1264	1	27	77	0.054	82378	16.58
4/24/2012 15:35	0	0	3.8	1263	1240	1257	1260	1264	1	27	80	0.054	82389	16.57
4/24/2012 15:36	0	0	3.9	1264	1241	1257	1260	1264	1	26	73	0.054	82401	16.68
4/24/2012 15:37	0	0	4.0	1264	1240	1257	1260	1264	1	27	77	0.054	82412	16.59
4/24/2012 15:38	0	0	4.0	1264	1241	1256	1261	1263	1	27	81	0.054	82424	16.55
4/24/2012 15:39	0	0	3.9	1264	1241	1256	1261	1263	2	28	74	0.054	82435	16.61
4/24/2012 15:40	0	0	3.8	1263	1241	1257	1261	1263	4	27	74	0.054	82475	16.67
4/24/2012 15:41	0	0	3.8	1264	1240	1257	1260	1264	5	28	72	0.054	82544	16.66
4/24/2012 15:42	0	0	3.9	1264	1239	1256	1260	1264	5	28	81	0.054	82593	16.58
4/24/2012 15:43	0	0	4.0	1264	1239	1256	1260	1264	4	28	80	0.054	82620	16.57
4/24/2012 15:44	0	0	4.0	1264	1241	1255	1260	1264	3	28	75	0.054	82648	16.59
4/24/2012 15:45	0	0	3.9	1264	1241	1256	1260	1264	3	27	79	0.054	82474	16.58
4/24/2012 15:46	0	0	3.8	1263	1240	1256	1260	1263	3	28	78	0.054	82319	16.66
4/24/2012 15:47	0	0	3.8	1263	1241	1257	1260	1264	2	27	70	0.054	82435	16.68
4/24/2012 15:48	0	0	3.8	1264	1241	1257	1260	1264	2	27	80	0.054	82551	16.61
4/24/2012 15:49	0	0	3.8	1263	1240	1257	1260	1264	2	28	83	0.054	82668	16.60
4/24/2012 15:50	0	0	3.9	1264	1240	1256	1260	1264	2	28	85	0.054	82784	16.59
4/24/2012 15:51	0	0	3.9	1263	1239	1256	1260	1263	2	28	80	0.054	82729	16.59
4/24/2012 15:52	0	0	3.8	1263	1240	1257	1260	1263	1	27	78	0.054	82438	16.61
4/24/2012 15:53	0	0	3.8	1263	1241	1256	1260	1263	1	27	77	0.054	82364	16.62
4/24/2012 15:54	0	0	4.3	1263	1241	1255	1260	1263	1	27	79	0.054	82611	16.59
4/24/2012 15:55	0	0	4.2	1263	1240	1255	1260	1263	1	28	80	0.054	82737	16.57

Flue gas O2 %	11AC0816	fresh catalyst		SuperSogetter		SuperSogetter		SuperSogetter		NOx additive		Ammonia injection	riser temp	hr outlet temp
		lb/d	11FC0870	lb/d	11FC0870.SP	lb/d	11W0866	lb/d	11W0867.SP	lb/d	11W0869			
4/24/2012 9:30	1.66	2947	3000	48	40	48	40	0	0	0	0	11TC0025	964.58	600.93
4/24/2012 9:31	1.66	2947	3000	48	40	48	40	0	0	0	0	11TC0025	964.58	600.93
4/24/2012 9:32	1.66	2947	3000	48	40	48	40	0	0	0	0	11TC0025	964.62	600.94
4/24/2012 9:33	1.66	2947	3000	48	40	48	40	0	0	0	0	11TC0025	964.77	600.94
4/24/2012 9:34	1.66	2947	3000	48	40	48	40	0	0	0	0	11TC0025	964.76	600.94
4/24/2012 9:35	1.66	2947	3000	48	40	48	40	0	0	0	0	11TC0025	964.37	600.95
4/24/2012 9:36	1.67	2947	3000	48	40	48	40	0	0	0	0	11TC0025	964.17	600.95
4/24/2012 9:37	1.67	2947	3000	48	40	48	40	0	0	0	0	11TC0025	964.46	600.96
4/24/2012 9:38	1.67	2947	3000	48	40	48	40	0	0	0	0	11TC0025	964.58	600.96
4/24/2012 9:39	1.67	2947	3000	48	40	48	40	0	0	0	0	11TC0025	964.58	600.96
4/24/2012 9:40	1.67	2947	3000	48	40	48	40	0	0	0	0	11TC0025	964.54	600.97
4/24/2012 9:41	1.67	2947	3000	48	40	48	40	0	0	0	0	11TC0025	964.25	600.97
4/24/2012 9:42	1.67	2947	3000	48	40	48	40	0	0	0	0	11TC0025	964.27	600.98
4/24/2012 9:43	1.67	2947	3000	48	40	48	40	0	0	0	0	11TC0025	964.59	600.98
4/24/2012 9:44	1.67	2947	3000	48	40	48	40	0	0	0	0	11TC0025	964.94	600.98
4/24/2012 9:45	1.67	2947	3000	48	40	48	40	0	0	0	0	11TC0025	964.97	600.99
4/24/2012 9:46	1.67	2947	3000	48	40	48	40	0	0	0	0	11TC0025	964.76	600.99
4/24/2012 9:47	1.67	2947	3000	48	40	48	40	0	0	0	0	11TC0025	964.46	601.00
4/24/2012 9:48	1.67	2947	3000	48	40	48	40	0	0	0	0	11TC0025	964.47	601.00
4/24/2012 9:49	1.66	2947	3000	48	40	48	40	0	0	0	0	11TC0025	964.69	601.00
4/24/2012 9:50	1.66	2947	3000	48	40	48	40	0	0	0	0	11TC0025	964.88	601.01
4/24/2012 9:51	1.65	2947	3000	48	40	48	40	0	0	0	0	11TC0025	964.95	601.01
4/24/2012 9:52	1.65	2947	3000	48	40	48	40	0	0	0	0	11TC0025	965.15	601.02
4/24/2012 9:53	1.65	2947	3000	48	40	48	40	0	0	0	0	11TC0025	965.41	601.02
4/24/2012 9:54	1.65	2947	3000	48	40	48	40	0	0	0	0	11TC0025	965.04	601.02
4/24/2012 9:55	1.65	2947	3000	48	40	48	40	0	0	0	0	11TC0025	964.98	601.03
4/24/2012 9:56	1.65	2947	3000	48	40	48	40	0	0	0	0	11TC0025	965.01	601.03
4/24/2012 9:57	1.65	2947	3000	48	40	48	40	0	0	0	0	11TC0025	965.05	601.04
4/24/2012 9:58	1.65	2947	3000	48	40	48	40	0	0	0	0	11TC0025	965.08	601.04
4/24/2012 9:59	1.65	2947	3000	48	40	48	40	0	0	0	0	11TC0025	965.11	601.04
4/24/2012 10:00	1.65	2947	3000	48	40	48	40	0	0	0	0	11TC0025	965.17	601.05
4/24/2012 10:01	1.65	2947	3000	48	40	48	40	0	0	0	0	11TC0025	965.43	601.05
4/24/2012 10:02	1.65	2947	3000	48	40	48	40	0	0	0	0	11TC0025	965.47	601.06
4/24/2012 10:03	1.65	2947	3000	48	40	48	40	0	0	0	0	11TC0025	965.34	601.06
4/24/2012 10:04	1.65	2947	3000	48	40	48	40	0	0	0	0	11TC0025	965.39	601.06
4/24/2012 10:05	1.65	2947	3000	48	40	48	40	0	0	0	0	11TC0025	965.56	601.07
4/24/2012 10:06	1.65	2947	3000	48	40	48	40	0	0	0	0	11TC0025	965.68	601.07
4/24/2012 10:07	1.65	2947	3000	48	40	48	40	0	0	0	0	11TC0025	965.35	601.08
4/24/2012 10:08	1.65	2947	3000	48	40	48	40	0	0	0	0	11TC0025	965.32	601.08
4/24/2012 10:09	1.65	2947	3000	48	40	48	40	0	0	0	0	11TC0025	965.54	601.08
4/24/2012 10:10	1.65	2947	3000	48	40	48	40	0	0	0	0	11TC0025	965.70	601.09
4/24/2012 10:11	1.65	2947	3000	48	40	48	40	0	0	0	0	11TC0025	965.38	601.09
4/24/2012 10:12	1.65	2947	3000	48	40	48	40	0	0	0	0	11TC0025	965.43	601.10
4/24/2012 10:13	1.65	2947	3000	48	40	48	40	0	0	0	0	11TC0025	965.43	601.10

Flue gas O2 %	Flue gas O2 %	fresh catalyst		SuperSoxgetter		SuperSoxgetter		NOx additive lb/d	Ammonia Injection 11FC2032	riser temp	hr outlet temp
		lb/d	sepoint lb/d	lb/d	sepoint lb/d						
11AC0816	11A0816	11FC0670	11FC0670.SP	11W0686	11W0687.SP	11W0686	11W0686			11TCRXTR	11TC0025
4/24/2012 10:14	1.65	2947	3000	48	40	0	0	8	8	965.09	601.10
4/24/2012 10:15	1.65	2947	3000	48	40	0	0	8	8	965.14	601.11
4/24/2012 10:16	1.65	2947	3000	48	40	0	0	8	8	965.16	601.11
4/24/2012 10:17	1.65	2947	3000	48	40	0	0	8	8	964.90	601.12
4/24/2012 10:18	1.65	2947	3000	48	40	0	0	8	8	964.85	601.12
4/24/2012 10:19	1.65	2947	3000	48	40	0	0	8	8	964.93	601.14
4/24/2012 10:20	1.65	2947	3000	48	40	0	0	8	8	965.16	601.29
4/24/2012 10:21	1.65	2947	3000	48	40	0	0	8	8	964.88	601.23
4/24/2012 10:22	1.65	2947	3000	48	40	0	0	8	8	964.66	601.10
4/24/2012 10:23	1.65	2947	3000	48	40	0	0	8	8	964.58	600.96
4/24/2012 10:24	1.65	2947	3000	48	40	0	0	8	8	964.50	600.83
4/24/2012 10:25	1.65	2947	3000	48	40	0	0	8	8	964.46	600.69
4/24/2012 10:26	1.65	2947	3000	48	40	0	0	8	8	964.50	600.56
4/24/2012 10:27	1.65	2947	3000	48	40	0	0	8	8	964.55	600.42
4/24/2012 10:28	1.65	2947	3000	48	40	0	0	8	8	964.59	600.29
4/24/2012 10:29	1.65	2947	3000	48	40	0	0	8	8	964.60	600.15
4/24/2012 10:30	1.65	2947	3000	48	40	0	0	8	8	964.59	600.02
4/24/2012 10:31	1.65	2947	3000	48	40	0	0	8	8	964.58	599.89
4/24/2012 10:32	1.65	2947	3000	48	40	0	0	8	8	964.60	599.75
4/24/2012 10:33	1.65	2947	3000	48	40	0	0	8	8	964.69	599.62
4/24/2012 10:34	1.65	2947	3000	48	40	0	0	8	8	964.78	599.36
4/24/2012 10:35	1.65	2947	3000	48	40	0	0	8	8	964.87	599.32
4/24/2012 10:36	1.65	2947	3000	48	40	0	0	8	8	964.96	599.33
4/24/2012 10:37	1.65	2947	3000	48	40	0	0	8	8	965.05	599.33
4/24/2012 10:38	1.65	2947	3000	48	40	0	0	8	8	965.14	599.34
4/24/2012 10:39	1.65	2947	3000	48	40	0	0	8	8	965.23	599.34
4/24/2012 10:40	1.65	2947	3000	48	40	0	0	8	8	965.33	599.35
4/24/2012 10:41	1.65	2947	3000	48	40	0	0	8	8	965.35	599.35
4/24/2012 10:42	1.65	2947	3000	48	40	0	0	8	8	965.34	599.36
4/24/2012 10:43	1.65	2947	3000	48	40	0	0	8	8	965.20	599.37
4/24/2012 10:44	1.65	2947	3000	48	40	0	0	8	8	964.66	599.37
4/24/2012 10:45	1.65	2947	3000	48	40	0	0	8	8	964.56	599.38
4/24/2012 10:46	1.65	2947	3000	48	40	0	0	8	8	964.61	599.38
4/24/2012 10:47	1.65	2947	3000	48	40	0	0	8	8	964.58	599.39
4/24/2012 10:48	1.65	2947	3000	48	40	0	0	8	8	964.59	599.40
4/24/2012 10:49	1.65	2947	3000	48	40	0	0	8	8	964.75	599.40
4/24/2012 10:50	1.65	2947	3000	48	40	0	0	8	8	964.91	599.41
4/24/2012 10:51	1.65	2947	3000	48	40	0	0	8	8	964.96	599.41
4/24/2012 10:52	1.65	2947	3000	48	40	0	0	8	8	964.60	599.42
4/24/2012 10:53	1.65	2947	3000	48	40	0	0	8	8	964.47	599.42
4/24/2012 10:54	1.65	2947	3000	48	40	0	0	8	8	964.69	599.43
4/24/2012 10:55	1.65	2947	3000	48	40	0	0	8	8	964.91	599.44
4/24/2012 10:56	1.65	2947	3000	48	40	0	0	8	8	965.12	599.44
4/24/2012 10:57	1.65	2947	3000	48	40	0	0	8	8	965.33	599.45

Flue gas O2 %	Flue gas O2 %	fresh catalyst				SuperSoygeter				NOx additive				riser temp	hr outlet temp
		fresh catalyst lb/d	fresh catalyst setpoint	lb/d	11FC0870 SP	SuperSoygeter lb/d	11W0866	SuperSoygeter setpoint	lb/d	11W0867 SP	lb/d	11W0868	11FC2032		
11AC0816	1.66	1.49	11A0816	2947	3000	48	48	40	40	0	0	0	8	11TC0825	599.71
4/24/2012 11:42	1.66	1.52	2947	3000	48	48	40	40	40	0	0	0	8	964.99	599.72
4/24/2012 11:43	1.66	1.53	2947	3000	48	48	40	40	40	0	0	0	8	965.25	599.72
4/24/2012 11:44	1.66	1.53	2947	3000	48	48	40	40	40	0	0	0	8	965.35	599.72
4/24/2012 11:45	1.66	1.53	2947	3000	48	48	40	40	40	0	0	0	8	965.46	599.73
4/24/2012 11:46	1.66	1.50	2947	3000	48	48	40	40	40	0	0	0	8	965.56	599.73
4/24/2012 11:47	1.66	1.54	2947	3000	48	48	40	40	40	0	0	0	8	965.66	599.74
4/24/2012 11:48	1.66	1.57	2947	3000	48	48	40	40	40	0	0	0	8	965.76	599.74
4/24/2012 11:49	1.66	1.65	2947	3000	48	48	40	40	40	0	0	0	8	965.83	599.75
4/24/2012 11:50	1.66	1.65	2947	3000	48	48	40	40	40	0	0	0	8	965.75	599.76
4/24/2012 11:51	1.66	1.66	2947	3000	48	48	40	40	40	0	0	0	8	965.58	599.76
4/24/2012 11:52	1.66	1.60	2947	3000	48	48	40	40	40	0	0	0	8	965.31	599.77
4/24/2012 11:53	1.66	1.64	2947	3000	48	48	40	40	40	0	0	0	8	965.03	599.77
4/24/2012 11:54	1.66	1.68	2947	3000	48	48	40	40	40	0	0	0	8	964.75	599.78
4/24/2012 11:55	1.66	1.65	2947	3000	48	48	40	40	40	0	0	0	8	964.61	599.79
4/24/2012 11:56	1.66	1.65	2947	3000	48	48	40	40	40	0	0	0	8	964.67	599.79
4/24/2012 11:57	1.66	1.72	2947	3000	48	48	40	40	40	0	0	0	8	964.71	599.80
4/24/2012 11:58	1.66	1.76	2947	3000	48	48	40	40	40	0	0	0	8	964.73	599.80
4/24/2012 11:59	1.65	1.68	2947	3000	48	48	40	40	40	0	0	0	8	964.56	599.81
4/24/2012 12:00	1.65	1.68	2947	3000	48	48	40	40	40	0	0	0	8	964.57	599.81
4/24/2012 12:01	1.64	1.76	2947	3000	48	48	40	40	40	0	0	0	8	964.95	599.82
4/24/2012 12:02	1.64	1.72	2947	3000	48	48	40	40	40	0	0	0	8	965.08	599.83
4/24/2012 12:03	1.63	1.70	2947	3000	48	48	40	40	40	0	0	0	8	965.05	599.83
4/24/2012 12:04	1.63	1.63	2947	3000	48	48	40	40	40	0	0	0	8	964.87	599.84
4/24/2012 12:05	1.62	1.66	2947	3000	48	48	40	40	40	0	0	0	8	964.67	599.84
4/24/2012 12:06	1.62	1.65	2947	3000	48	48	40	40	40	0	0	0	8	964.47	599.85
4/24/2012 12:07	1.62	1.58	2947	3000	48	48	40	40	40	0	0	0	8	964.32	599.86
4/24/2012 12:08	1.61	1.50	2947	3000	48	48	40	40	40	0	0	0	8	964.41	599.86
4/24/2012 12:09	1.61	1.52	2947	3000	48	48	40	40	40	0	0	0	8	964.55	599.87
4/24/2012 12:10	1.60	1.49	2947	3000	48	48	40	40	40	0	0	0	8	964.68	599.87
4/24/2012 12:11	1.60	1.52	2947	3000	48	48	40	40	40	0	0	0	8	964.82	599.88
4/24/2012 12:12	1.59	1.45	2947	3000	48	48	40	40	40	0	0	0	8	964.96	599.88
4/24/2012 12:13	1.59	1.53	2947	3000	48	48	40	40	40	0	0	0	8	965.13	599.89
4/24/2012 12:14	1.58	1.50	2947	3000	48	48	40	40	40	0	0	0	8	965.37	599.90
4/24/2012 12:15	1.58	1.50	2947	3000	48	48	40	40	40	0	0	0	8	965.42	599.90
4/24/2012 12:16	1.57	1.51	2947	3000	48	48	40	40	40	0	0	0	8	965.38	599.91
4/24/2012 12:17	1.57	1.60	2947	3000	48	48	40	40	40	0	0	0	8	965.48	599.91
4/24/2012 12:18	1.57	1.60	2947	3000	48	48	40	40	40	0	0	0	8	965.77	599.92
4/24/2012 12:19	1.57	1.58	2947	3000	48	48	40	40	40	0	0	0	8	965.61	599.93
4/24/2012 12:20	1.57	1.59	2947	3000	48	48	40	40	40	0	0	0	8	965.37	599.93
4/24/2012 12:21	1.57	1.58	2947	3000	48	48	40	40	40	0	0	0	8	964.94	599.94
4/24/2012 12:22	1.56	1.59	2947	3000	48	48	40	40	40	0	0	0	8	964.67	599.94
4/24/2012 12:23	1.56	1.56	2947	3000	48	48	40	40	40	0	0	0	8	964.64	599.95
4/24/2012 12:24	1.56	1.56	2947	3000	48	48	40	40	40	0	0	0	8	964.82	599.95
4/24/2012 12:25	1.56	1.59	2947	3000	48	48	40	40	40	0	0	0	8	965.05	599.96

Flue gas O2 %	11AC0816	fresh catalyst lb/d	fresh catalyst setpoint lb/d	SuperSogaster lb/d	SuperSogaster setpoint lb/d	NOX additive lb/d	Ammonia injection lb/d	riser temp	htr outlet temp
		11FC0870	11FC0870.SP	11W0866	11W0867.SP	11W0869	11FC0832	11TCRXTR	11TC0025
4/24/2012 12:26	1.56	2947	3000	48	40	0	8	965.31	599.97
4/24/2012 12:27	1.56	2947	3000	48	40	0	8	965.31	599.97
4/24/2012 12:28	1.56	2947	3000	48	40	0	8	965.07	599.98
4/24/2012 12:29	1.56	2947	3000	48	40	0	8	964.84	599.98
4/24/2012 12:30	1.56	2947	3000	48	40	0	8	964.65	599.99
4/24/2012 12:31	1.56	2947	3000	48	40	0	8	964.90	600.00
4/24/2012 12:32	1.55	2947	3000	48	40	0	8	965.15	600.00
4/24/2012 12:33	1.55	2947	3000	48	40	0	8	965.06	600.01
4/24/2012 12:34	1.55	2947	3000	48	40	0	8	964.90	600.01
4/24/2012 12:35	1.55	2947	3000	48	40	0	8	964.85	600.02
4/24/2012 12:36	1.55	2947	3000	48	40	0	8	964.80	600.02
4/24/2012 12:37	1.55	2947	3000	48	40	0	8	964.72	600.03
4/24/2012 12:38	1.55	2947	3000	48	40	0	8	964.61	600.04
4/24/2012 12:39	1.55	2947	3000	48	40	0	8	964.50	600.04
4/24/2012 12:40	1.55	2947	3000	48	40	0	8	964.39	600.05
4/24/2012 12:41	1.55	2947	3000	48	40	0	8	964.38	600.05
4/24/2012 12:42	1.54	2947	3000	48	40	0	8	964.45	600.06
4/24/2012 12:43	1.54	2947	3000	48	40	0	8	964.57	600.07
4/24/2012 12:44	1.54	2947	3000	48	40	0	8	964.73	600.07
4/24/2012 12:45	1.54	2947	3000	48	40	0	8	964.89	600.08
4/24/2012 12:46	1.54	2947	3000	48	40	0	8	965.05	600.08
4/24/2012 12:47	1.54	2947	3000	48	40	0	8	965.21	600.09
4/24/2012 12:48	1.54	2947	3000	48	40	0	8	965.17	600.09
4/24/2012 12:49	1.54	2947	3000	48	40	0	8	964.98	600.10
4/24/2012 12:50	1.54	2947	3000	48	40	0	8	964.79	600.11
4/24/2012 12:51	1.54	2947	3000	48	40	0	8	964.62	600.11
4/24/2012 12:52	1.53	2947	3000	48	40	0	8	964.64	600.12
4/24/2012 12:53	1.53	2947	3000	48	40	0	8	964.72	600.12
4/24/2012 12:54	1.53	2947	3000	48	40	0	8	964.79	600.13
4/24/2012 12:55	1.53	2947	3000	48	40	0	8	964.82	600.14
4/24/2012 12:56	1.53	2947	3000	48	40	0	8	964.75	600.14
4/24/2012 12:57	1.53	2947	3000	48	40	0	8	964.68	600.15
4/24/2012 12:58	1.53	2947	3000	48	40	0	8	964.61	600.15
4/24/2012 12:59	1.53	2947	3000	48	40	0	8	964.53	600.16
4/24/2012 13:00	1.53	2947	3000	48	40	0	8	964.51	600.16
4/24/2012 13:01	1.53	2947	3000	48	40	0	8	964.63	600.17
4/24/2012 13:02	1.52	2947	3000	48	40	0	8	964.72	600.18
4/24/2012 13:03	1.52	2947	3000	48	40	0	8	964.38	600.18
4/24/2012 13:04	1.52	2947	3000	48	40	0	8	964.30	600.19
4/24/2012 13:05	1.52	2947	3000	48	40	0	8	964.64	600.19
4/24/2012 13:06	1.52	2947	3000	48	40	0	8	964.81	600.20
4/24/2012 13:07	1.52	2947	3000	48	40	0	8	964.81	600.21
4/24/2012 13:08	1.52	2947	3000	48	40	0	8	964.81	600.21
4/24/2012 13:09	1.52	2947	3000	48	40	0	8	964.78	600.22

	Flue gas O2		fresh catalyst		SuperSoygeter		SuperSoygeter		NOx additive		Ammonia Injection	riser temp	hr outlet temp
	%	11AC0816	lb/d	11FC0670	lb/d	11W0866	lb/d	11W0867	lb/d	11W0869			
	11A0816		11FC0670	11FC0670.SP							11FC2032	11TCRXTR	11TC0025
4/24/2012 13:10	1.52	1.63	2947	3000	48	40	0	0	0	8	964.58	600.22	600.22
4/24/2012 13:11	1.52	1.64	2947	3000	48	40	0	0	0	8	964.44	600.23	600.23
4/24/2012 13:12	1.51	1.60	2947	3000	48	40	0	0	0	8	964.64	600.23	600.23
4/24/2012 13:13	1.51	1.53	2947	3000	48	40	0	0	0	8	964.83	600.24	600.24
4/24/2012 13:14	1.51	1.58	2947	3000	48	40	0	0	0	8	965.02	600.25	600.25
4/24/2012 13:15	1.51	1.52	2947	3000	48	40	0	0	0	8	965.20	600.25	600.25
4/24/2012 13:16	1.51	1.54	2947	3000	48	40	0	0	0	8	965.32	600.26	600.26
4/24/2012 13:17	1.51	1.45	2947	3000	48	40	0	0	0	8	965.04	600.26	600.26
4/24/2012 13:18	1.51	1.47	2947	3000	48	40	0	0	0	8	965.19	600.27	600.27
4/24/2012 13:19	1.51	1.52	2947	3000	48	40	0	0	0	8	965.53	600.28	600.28
4/24/2012 13:20	1.51	1.52	2947	3000	48	40	0	0	0	8	965.34	600.28	600.28
4/24/2012 13:21	1.51	1.51	2947	3000	48	40	0	0	0	8	965.07	600.29	600.29
4/24/2012 13:22	1.51	1.49	2947	3000	48	40	0	0	0	8	964.79	600.29	600.29
4/24/2012 13:23	1.51	1.53	2947	3000	48	40	0	0	0	8	964.52	600.30	600.30
4/24/2012 13:24	1.51	1.58	2947	3000	48	40	0	0	0	8	964.68	600.30	600.30
4/24/2012 13:25	1.51	1.58	2947	3000	48	40	0	0	0	8	965.08	600.31	600.31
4/24/2012 13:26	1.51	1.50	2947	3000	48	40	0	0	0	8	965.13	600.32	600.32
4/24/2012 13:27	1.51	1.56	2947	3000	48	40	0	0	0	8	965.20	600.32	600.32
4/24/2012 13:28	1.51	1.58	2947	3000	48	40	0	0	0	8	965.29	600.33	600.33
4/24/2012 13:29	1.51	1.55	2947	3000	48	40	0	0	0	8	965.34	600.33	600.33
4/24/2012 13:30	1.51	1.57	2947	3000	48	40	0	0	0	8	965.33	600.34	600.34
4/24/2012 13:31	1.51	1.55	2947	3000	48	40	0	0	0	8	965.32	600.35	600.35
4/24/2012 13:32	1.51	1.45	2947	3000	48	40	0	0	0	8	965.31	600.35	600.35
4/24/2012 13:33	1.51	1.41	2947	3000	48	40	0	0	0	8	965.29	600.36	600.36
4/24/2012 13:34	1.51	1.48	2947	3000	48	40	0	0	0	8	965.35	600.36	600.36
4/24/2012 13:35	1.51	1.57	2947	3000	48	40	0	0	0	8	965.59	600.37	600.37
4/24/2012 13:36	1.51	1.54	2947	3000	48	40	0	0	0	8	965.80	600.37	600.37
4/24/2012 13:37	1.51	1.49	2947	3000	48	40	0	0	0	8	965.78	600.38	600.38
4/24/2012 13:38	1.51	1.56	2947	3000	48	40	0	0	0	8	965.57	600.39	600.39
4/24/2012 13:39	1.51	1.56	2947	3000	48	40	0	0	0	8	965.10	600.39	600.39
4/24/2012 13:40	1.51	1.56	2947	3000	48	40	0	0	0	8	965.01	600.40	600.40
4/24/2012 13:41	1.51	1.63	2947	3000	48	40	0	0	0	8	965.01	600.40	600.40
4/24/2012 13:42	1.51	1.68	2947	3000	48	40	0	0	0	8	965.01	600.41	600.41
4/24/2012 13:43	1.51	1.68	2947	3000	48	40	0	0	0	8	965.01	600.42	600.42
4/24/2012 13:44	1.51	1.59	2947	3000	48	40	0	0	0	8	965.02	600.42	600.42
4/24/2012 13:45	1.51	1.68	2947	3000	48	40	0	0	0	8	965.04	600.43	600.43
4/24/2012 13:46	1.51	1.63	2947	3000	48	40	0	0	0	8	965.07	600.43	600.43
4/24/2012 13:47	1.51	1.64	2947	3000	48	40	0	0	0	8	965.10	600.44	600.44
4/24/2012 13:48	1.51	1.59	2947	3000	48	40	0	0	0	8	965.13	600.44	600.44
4/24/2012 13:49	1.51	1.59	2947	3000	48	40	0	0	0	8	964.98	600.45	600.45
4/24/2012 13:50	1.51	1.63	2947	3000	48	40	0	0	0	8	964.70	600.46	600.46
4/24/2012 13:51	1.51	1.64	2947	3000	48	40	0	0	0	8	964.49	600.46	600.46
4/24/2012 13:52	1.51	1.62	2947	3000	48	40	0	0	0	8	964.48	600.47	600.47
4/24/2012 13:53	1.52	1.58	2947	3000	48	40	0	0	0	8	964.48	600.47	600.47

Flue gas O2 %	Flue gas O2 %	fresh catalyst		fresh catalyst		SuperSogaster		SuperSogaster		NOx additive		Ammonia Injection	riser temp	htr outlet temp
		lb/d	setpoint	lb/d	setpoint	lb/d	setpoint	lb/d	setpoint	lb/d	setpoint			
11AC0816	11AC0816	11FC0870	11FC0870.SP	11W0866	11W0866	11W0867	11W0867.SP	11W0869	11FC2032	11TCRXTR	11TC0025			
4/24/2012 13:54	1.52	2947	3000	48	40	0	8			964.51	600.48			
4/24/2012 13:55	1.52	2947	3000	48	40	0	8			964.85	600.49			
4/24/2012 13:56	1.52	2947	3000	48	40	0	8			965.28	600.49			
4/24/2012 13:57	1.52	2947	3000	48	40	0	8			965.60	600.50			
4/24/2012 13:58	1.52	2947	3000	48	40	0	8			965.62	600.50			
4/24/2012 13:59	1.52	2947	3000	48	40	0	8			965.22	600.51			
4/24/2012 14:00	1.52	2947	3000	48	40	0	8			964.90	600.51			
4/24/2012 14:01	1.52	2947	3000	48	40	0	8			964.93	600.52			
4/24/2012 14:02	1.52	2947	3000	48	40	0	8			964.96	600.53			
4/24/2012 14:03	1.52	2947	3000	48	40	0	8			964.99	600.53			
4/24/2012 14:04	1.52	2947	3000	48	40	0	8			965.02	600.54			
4/24/2012 14:05	1.52	2947	3000	48	40	0	8			965.05	600.54			
4/24/2012 14:06	1.52	2947	3000	48	40	0	8			965.08	600.55			
4/24/2012 14:07	1.52	2947	3000	48	40	0	8			965.11	600.56			
4/24/2012 14:08	1.52	2947	3000	48	40	0	8			965.15	600.56			
4/24/2012 14:09	1.52	2947	3000	48	40	0	8			965.19	600.57			
4/24/2012 14:10	1.52	2947	3000	48	40	0	8			965.41	600.57			
4/24/2012 14:11	1.52	2947	3000	48	40	0	8			965.65	600.58			
4/24/2012 14:12	1.52	2947	3000	48	40	0	8			965.55	600.58			
4/24/2012 14:13	1.52	2947	3000	48	40	0	8			965.49	600.59			
4/24/2012 14:14	1.52	2947	3000	48	40	0	8			965.56	600.60			
4/24/2012 14:15	1.52	2947	3000	48	40	0	8			965.63	600.60			
4/24/2012 14:16	1.52	2947	3000	48	40	0	8			965.58	600.61			
4/24/2012 14:17	1.52	2947	3000	48	40	0	8			965.49	600.61			
4/24/2012 14:18	1.52	2947	3000	48	40	0	8			965.40	600.62			
4/24/2012 14:19	1.52	2947	3000	48	40	0	8			965.33	600.63			
4/24/2012 14:20	1.52	2947	3000	48	40	0	8			965.28	600.63			
4/24/2012 14:21	1.52	2947	3000	48	40	0	8			965.20	600.64			
4/24/2012 14:22	1.52	2947	3000	48	40	0	8			965.10	600.64			
4/24/2012 14:23	1.52	2947	3000	48	40	0	8			965.00	600.65			
4/24/2012 14:24	1.52	2947	3000	48	40	0	8			964.90	600.65			
4/24/2012 14:25	1.52	2947	3000	48	40	0	8			964.80	600.66			
4/24/2012 14:26	1.52	2947	3000	48	40	0	8			964.70	600.67			
4/24/2012 14:27	1.52	2947	3000	48	40	0	8			964.66	600.67			
4/24/2012 14:28	1.52	2947	3000	48	40	0	8			964.71	600.68			
4/24/2012 14:29	1.52	2947	3000	48	40	0	8			964.75	600.68			
4/24/2012 14:30	1.52	2947	3000	48	40	0	8			964.79	600.69			
4/24/2012 14:31	1.52	2947	3000	48	40	0	8			964.83	600.70			
4/24/2012 14:32	1.52	2947	3000	48	40	0	8			964.81	600.70			
4/24/2012 14:33	1.52	2947	3000	48	40	0	8			964.76	600.71			
4/24/2012 14:34	1.52	2947	3000	48	40	0	8			964.71	600.71			
4/24/2012 14:35	1.52	2947	3000	48	40	0	8			964.66	600.72			
4/24/2012 14:36	1.52	2947	3000	48	40	0	8			964.61	600.72			
4/24/2012 14:37	1.52	2947	3000	48	40	0	8			964.56	600.73			

Flue gas O2 %	Flue gas O2 %	fresh catalyst		SuperSoxgetter		SuperSoxgetter		NOx additive		Ammonia Injection	riser temp	hr outlet temp
		lb/d	setpoint	lb/d	setpoint	lb/d	setpoint	lb/d				
11AC0816	11A10816	11FC0670	11FC0670 SP	11W0686	11W0686	11W0687 SP	11W0689	11FC2032	11TCRXTR	11TCRXTR	600.74	
4/24/2012 14:38	1.52	2947	3000	48	40	0	0	8	964.51	964.51	600.74	
4/24/2012 14:39	1.52	2947	3000	48	40	0	0	8	964.49	964.49	600.74	
4/24/2012 14:40	1.52	2947	3000	48	40	0	0	8	964.59	964.59	600.75	
4/24/2012 14:41	1.52	2947	3000	48	40	0	0	8	964.77	964.77	600.75	
4/24/2012 14:42	1.52	2947	3000	48	40	0	0	8	964.95	964.95	600.76	
4/24/2012 14:43	1.52	2947	3000	48	40	0	0	8	965.12	965.12	600.77	
4/24/2012 14:44	1.52	2947	3000	48	40	0	0	8	965.30	965.30	600.77	
4/24/2012 14:45	1.52	2947	3000	48	40	0	0	8	965.46	965.46	600.78	
4/24/2012 14:46	1.52	2947	3000	48	40	0	0	8	965.48	965.48	600.78	
4/24/2012 14:47	1.51	2947	3000	48	40	0	0	8	965.56	965.56	600.79	
4/24/2012 14:48	1.51	2947	3000	48	40	0	0	8	965.78	965.78	600.79	
4/24/2012 14:49	1.51	2947	3000	48	40	0	0	8	965.58	965.58	600.80	
4/24/2012 14:50	1.51	2947	3000	48	40	0	0	8	965.28	965.28	600.81	
4/24/2012 14:51	1.51	2947	3000	48	40	0	0	8	965.07	965.07	600.81	
4/24/2012 14:52	1.51	2947	3000	48	40	0	0	8	965.12	965.12	600.82	
4/24/2012 14:53	1.51	2947	3000	48	40	0	0	8	965.15	965.15	600.82	
4/24/2012 14:54	1.51	2947	3000	48	40	0	0	8	964.99	964.99	600.83	
4/24/2012 14:55	1.51	2947	3000	48	40	0	0	8	965.27	965.27	600.84	
4/24/2012 14:56	1.51	2947	3000	48	40	0	0	8	965.58	965.58	600.84	
4/24/2012 14:57	1.50	2947	3000	48	40	0	0	8	965.78	965.78	600.85	
4/24/2012 14:58	1.50	2947	3000	48	40	0	0	8	965.74	965.74	600.85	
4/24/2012 14:59	1.50	2947	3000	48	40	0	0	8	965.42	965.42	600.86	
4/24/2012 15:00	1.50	2947	3000	48	40	0	0	8	965.10	965.10	600.86	
4/24/2012 15:01	1.50	2947	3000	48	40	0	0	8	964.79	964.79	600.87	
4/24/2012 15:02	1.50	2947	3000	48	40	0	0	8	964.58	964.58	600.88	
4/24/2012 15:03	1.50	2947	3000	48	40	0	0	8	964.54	964.54	600.88	
4/24/2012 15:04	1.50	2947	3000	48	40	0	0	8	964.64	964.64	600.89	
4/24/2012 15:05	1.50	2947	3000	48	40	0	0	8	964.77	964.77	600.89	
4/24/2012 15:06	1.49	2947	3000	48	40	0	0	8	964.89	964.89	600.90	
4/24/2012 15:07	1.49	2947	3000	48	40	0	0	8	965.02	965.02	600.91	
4/24/2012 15:08	1.49	2947	3000	48	40	0	0	8	965.14	965.14	600.91	
4/24/2012 15:09	1.49	2947	3000	48	40	0	0	8	965.09	965.09	600.92	
4/24/2012 15:10	1.49	2947	3000	48	40	0	0	8	964.96	964.96	600.92	
4/24/2012 15:11	1.49	2947	3000	48	40	0	0	8	964.84	964.84	600.93	
4/24/2012 15:12	1.49	2947	3000	48	40	0	0	8	964.74	964.74	600.93	
4/24/2012 15:13	1.49	2947	3000	48	40	0	0	8	964.81	964.81	600.94	
4/24/2012 15:14	1.49	2947	3000	48	40	0	0	8	964.83	964.83	600.95	
4/24/2012 15:15	1.48	2947	3000	48	40	0	0	8	964.67	964.67	600.95	
4/24/2012 15:16	1.48	2947	3000	48	40	0	0	8	964.55	964.55	600.96	
4/24/2012 15:17	1.48	2947	3000	48	40	0	0	8	964.69	964.69	600.96	
4/24/2012 15:18	1.48	2947	3000	48	40	0	0	8	964.87	964.87	600.97	
4/24/2012 15:19	1.48	2947	3000	48	40	0	0	8	965.05	965.05	600.98	
4/24/2012 15:20	1.48	2947	3000	48	40	0	0	8	965.19	965.19	600.98	
4/24/2012 15:21	1.48	2947	3000	48	40	0	0	8	965.24	965.24	600.99	

Flue gas O2 %	11A0816	fresh catalyst lb/d	fresh catalyst setpoint lb/d	SuperSoygetter		SuperSoygetter		NOx additive		Ammonia Injection	riser temp	htr outlet temp
		11FO8370	11FO8370.SP	11WB0866	lb/d	11WB0866	setpoint lb/d	11WY0867.SP	lb/d			
4/24/2012 15:22	1.48	2947	3000	48	40	0	0	0	8	11TCRTR	965.23	11TC0025
4/24/2012 15:23	1.48	2947	3000	48	40	0	0	0	8		964.88	600.99
4/24/2012 15:24	1.48	2947	3000	48	40	0	0	0	8		964.72	601.00
4/24/2012 15:25	1.47	2947	3000	48	40	0	0	0	8		964.73	601.01
4/24/2012 15:26	1.47	2947	3000	48	40	0	0	0	8		964.73	601.02
4/24/2012 15:27	1.47	2947	3000	48	40	0	0	0	8		964.74	601.02
4/24/2012 15:28	1.47	2947	3000	48	40	0	0	0	8		964.75	601.03
4/24/2012 15:29	1.47	2947	3000	48	40	0	0	0	8		964.76	601.03
4/24/2012 15:30	1.47	2947	3000	48	40	0	0	0	8		964.77	601.04
4/24/2012 15:31	1.47	2947	3000	48	40	0	0	0	8		964.78	601.05
4/24/2012 15:32	1.47	2947	3000	48	40	0	0	0	8		964.84	601.05
4/24/2012 15:33	1.47	2947	3000	48	40	0	0	0	8		964.90	601.06
4/24/2012 15:34	1.46	2947	3000	48	40	0	0	0	8		964.97	601.06
4/24/2012 15:35	1.46	2947	3000	48	40	0	0	0	8		965.04	601.07
4/24/2012 15:36	1.46	2947	3000	48	40	0	0	0	8		965.11	601.07
4/24/2012 15:37	1.46	2947	3000	48	40	0	0	0	8		965.20	601.08
4/24/2012 15:38	1.46	2947	3000	48	40	0	0	0	8		965.30	601.09
4/24/2012 15:39	1.46	2947	3000	48	40	0	0	0	8		965.40	601.09
4/24/2012 15:40	1.46	2947	3000	48	40	0	0	0	8		965.51	601.10
4/24/2012 15:41	1.46	2947	3000	48	40	0	0	0	8		965.83	601.10
4/24/2012 15:42	1.46	2947	3000	48	40	0	0	0	8		965.64	601.11
4/24/2012 15:43	1.45	2947	3000	48	40	0	0	0	8		965.33	601.12
4/24/2012 15:44	1.45	2947	3000	48	40	0	0	0	8		965.36	601.12
4/24/2012 15:45	1.45	2947	3000	48	40	0	0	0	8		965.43	601.13
4/24/2012 15:46	1.45	2947	3000	48	40	0	0	0	8		965.51	601.13
4/24/2012 15:47	1.45	2947	3000	48	40	0	0	0	8		965.58	601.14
4/24/2012 15:48	1.46	2947	3000	48	40	0	0	0	8		965.62	601.14
4/24/2012 15:49	1.47	2947	3000	48	40	0	0	0	8		965.52	601.15
4/24/2012 15:50	1.47	2947	3000	48	40	0	0	0	8		965.41	601.16
4/24/2012 15:51	1.48	2947	3000	48	40	0	0	0	8		965.23	601.16
4/24/2012 15:52	1.49	2947	3000	48	40	0	0	0	8		965.02	601.17
4/24/2012 15:53	1.49	2947	3000	48	40	0	0	0	8		964.93	601.17
4/24/2012 15:54	1.50	2947	3000	48	40	0	0	0	8		964.90	601.18
4/24/2012 15:55	1.50	2947	3000	48	40	0	0	0	8		964.87	601.19

Feed rate bpd	coke burn lb/hr	Primary current to Primary current to Primary current to			Primary power to			Secondary current to TR1 mA	Secondary current to TR2 mA	Secondary current to TR3 mA	Primary voltage to Primary voltage to Primary voltage to		
		TR1 A	TR2 A	TR3 A	TR1 kW	TR2 kW	TR3 kW				TR1 V	TR2 V	TR3 V
11FC0118	11micbkr	11I0032A	11I0033A	11I0034A	11J0032A	11J0033A	11J0034A	11I0032B	11I0033B	11I0034B	11E0032A	11E0033A	11E0034A
32560	18151	61	64	80	11	11	16	263	271	351	224	227	256
4/25/2012 8:40													
32553	18147	62	72	80	10	12	16	264	310	351	224	238	256
4/25/2012 8:41													
32547	18125	67	72	80	12	14	16	296	318	351	233	242	256
4/25/2012 8:42													
32540	18177	62	69	80	11	14	16	270	296	351	224	237	256
4/25/2012 8:43													
32533	18199	65	67	80	12	13	16	284	283	351	229	232	256
4/25/2012 8:44													
32526	18194	64	71	80	12	13	16	276	304	351	227	239	256
4/25/2012 8:45													
32519	18223	65	75	80	12	12	16	285	329	351	230	244	256
4/25/2012 8:46													
32512	18252	65	74	80	11	12	16	285	327	351	229	244	256
4/25/2012 8:47													
32505	18261	64	72	80	11	12	16	277	313	351	226	240	256
4/25/2012 8:48													
32502	18210	62	67	80	10	11	16	266	280	351	223	231	256
4/25/2012 8:49													
32501	18229	66	70	80	11	12	16	289	295	351	231	236	256
4/25/2012 8:50													
32499	18244	66	73	80	12	13	16	282	308	351	231	239	256
4/25/2012 8:51													
32498	18190	64	74	80	11	14	16	280	319	351	227	242	256
4/25/2012 8:52													
32496	18230	62	75	80	10	15	16	265	331	351	224	246	256
4/25/2012 8:53													
32495	18236	63	72	80	10	15	16	265	315	351	226	241	256
4/25/2012 8:54													
32494	18177	65	73	80	11	15	16	281	320	351	228	242	256
4/25/2012 8:55													
32492	18169	66	75	80	12	15	16	292	328	352	231	244	256
4/25/2012 8:56													
32491	18220	64	72	80	11	15	16	282	311	352	228	239	256
4/25/2012 8:57													
32489	18252	61	73	80	10	15	16	264	318	352	224	241	256
4/25/2012 8:58													
32485	18238	64	71	80	11	15	16	279	307	352	227	238	256
4/25/2012 8:59													
32479	18227	64	73	80	12	15	16	280	319	352	227	240	256
4/25/2012 9:00													
32474	18205	63	73	80	12	15	16	269	318	352	224	242	256
4/25/2012 9:01													
32468	18230	66	70	80	11	15	16	287	300	352	230	236	256
4/25/2012 9:02													
32462	18254	63	73	80	11	15	16	277	311	352	227	241	256
4/25/2012 9:03													
32457	18210	61	78	80	10	15	16	260	343	350	221	249	256
4/25/2012 9:04													
32451	18146	63	75	80	11	15	16	266	343	349	224	247	256
4/25/2012 9:05													
32445	18132	67	72	80	12	15	16	294	312	348	232	239	256
4/25/2012 9:06													
32440	18130	67	70	78	12	15	16	299	304	336	233	237	252
4/25/2012 9:07													
32435	18159	65	76	80	12	14	16	280	335	347	228	246	255
4/25/2012 9:08													
32447	18204	63	79	80	11	14	16	270	349	350	224	251	256
4/25/2012 9:09													
32467	18227	64	79	80	11	14	16	271	347	350	226	250	256
4/25/2012 9:10													
32487	18274	61	79	80	10	14	16	258	346	350	221	250	256
4/25/2012 9:11													
32507	18280	63	74	80	10	14	16	274	320	350	225	242	256
4/25/2012 9:12													
32527	18249	64	76	80	10	14	16	270	332	351	226	245	256
4/25/2012 9:13													
32547	18256	64	73	80	10	14	16	269	318	351	225	241	256
4/25/2012 9:14													
32567	18247	64	77	80	10	14	16	278	334	351	227	246	256
4/25/2012 9:15													
32587	18128	60	75	80	10	14	16	263	329	351	222	243	256
4/25/2012 9:16													
32607	18092	64	76	80	11	14	16	283	336	351	228	246	256
4/25/2012 9:17													
32627	18113	61	72	80	11	14	16	260	312	351	222	241	256
4/25/2012 9:18													
32626	18150	60	72	80	10	14	16	253	309	351	219	239	256
4/25/2012 9:19													
32614	18098	64	75	80	10	14	16	278	333	351	226	244	256
4/25/2012 9:20													
32602	18130	63	78	80	10	14	16	271	345	352	226	249	256
4/25/2012 9:21													
32590	18106	62	75	80	10	14	16	261	317	352	222	244	256
4/25/2012 9:22													
32578	18050	60	70	80	10	14	16	258	300	352	220	237	256
4/25/2012 9:23													

Feed rate bpd	coke burn lb/hr	Primary current to				Primary power to				Secondary current to TR1 mA	Secondary current to TR2 mA	Secondary current to TR3 mA	Primary voltage to Primary voltage to Primary voltage		
		TR1 A	TR2 A	TR3 A	TR1 kW	TR2 kW	TR3 kW	TR1 V	TR2 V				TR3 V		
11FC0118	11mickbr	11I0032A	11I0033A	11I0034A	11I0032A	11I0033A	11I0034A	11I0032B	11I0033B	11I0034B	11E0032A	11E0033A	11E0034A		
4/25/2012 9:24	32565	65	72	80	12	14	16	284	310	352	228	239	256		
4/25/2012 9:25	32553	65	74	80	11	14	16	282	324	350	226	243	256		
4/25/2012 9:26	32541	61	74	80	10	13	16	266	322	349	221	242	256		
4/25/2012 9:27	32529	60	77	80	10	13	16	256	341	349	220	249	256		
4/25/2012 9:28	32517	61	74	80	10	13	16	256	324	349	221	244	256		
4/25/2012 9:29	32510	64	72	80	10	13	16	275	308	349	226	240	256		
4/25/2012 9:30	32507	63	77	80	10	13	16	270	335	350	225	247	256		
4/25/2012 9:31	32504	61	72	80	10	13	16	263	311	350	222	240	256		
4/25/2012 9:32	32500	60	74	80	10	12	16	257	321	350	220	242	256		
4/25/2012 9:33	32497	60	74	80	10	12	16	256	326	350	219	244	256		
4/25/2012 9:34	32494	62	69	80	10	12	16	266	298	350	223	234	256		
4/25/2012 9:35	32490	65	76	80	11	14	16	288	330	350	230	244	256		
4/25/2012 9:36	32487	60	78	80	10	14	16	259	345	350	220	249	256		
4/25/2012 9:37	32484	61	75	80	10	13	16	266	325	350	222	244	256		
4/25/2012 9:38	32481	62	71	80	11	12	16	266	305	351	222	237	256		
4/25/2012 9:39	32478	61	74	80	11	14	16	260	325	351	222	243	256		
4/25/2012 9:40	32477	65	73	80	11	15	16	285	318	351	229	240	256		
4/25/2012 9:41	32476	66	77	80	11	15	16	290	338	351	231	247	256		
4/25/2012 9:42	32474	64	73	80	11	15	16	282	317	351	227	241	256		
4/25/2012 9:43	32473	62	76	80	12	15	16	271	331	350	223	245	256		
4/25/2012 9:44	32472	60	76	80	12	15	16	260	332	345	220	245	254		
4/25/2012 9:45	32470	60	77	80	12	15	16	261	336	349	221	247	254		
4/25/2012 9:46	32469	60	72	80	12	15	16	258	312	350	220	240	255		
4/25/2012 9:47	32468	65	70	80	12	15	16	282	298	350	227	235	256		
4/25/2012 9:48	32466	66	73	80	11	15	16	286	317	350	229	241	257		
4/25/2012 9:49	32467	63	75	80	11	15	16	273	318	350	226	243	257		
4/25/2012 9:50	32471	61	74	80	11	15	16	265	329	350	223	245	257		
4/25/2012 9:51	32475	61	73	80	11	15	16	259	325	350	221	243	257		
4/25/2012 9:52	32478	61	77	80	11	15	16	258	339	350	220	247	257		
4/25/2012 9:53	32482	62	73	80	11	15	16	256	317	350	219	241	257		
4/25/2012 9:54	32486	62	77	80	11	15	16	258	337	350	222	248	257		
4/25/2012 9:55	32489	59	71	80	10	12	16	245	303	350	217	238	257		
4/25/2012 9:56	32493	61	74	80	10	12	16	256	319	350	220	242	257		
4/25/2012 9:57	32497	61	72	80	11	12	16	265	312	350	222	240	257		
4/25/2012 9:58	32500	60	75	80	11	12	16	262	327	350	222	245	257		
4/25/2012 9:59	32503	60	76	80	11	12	16	261	333	350	221	247	257		
4/25/2012 10:00	32504	60	75	80	11	12	16	258	319	350	221	245	257		
4/25/2012 10:01	32506	64	74	80	11	12	16	272	321	350	226	243	257		
4/25/2012 10:02	32507	65	71	80	11	12	16	277	307	351	227	238	257		
4/25/2012 10:03	32509	61	76	80	11	14	16	259	333	351	222	246	257		
4/25/2012 10:04	32510	63	72	80	11	15	16	276	316	351	226	240	257		
4/25/2012 10:05	32512	62	77	80	11	15	16	269	341	351	224	248	257		
4/25/2012 10:06	32513	61	77	80	10	15	16	257	338	351	221	247	257		
4/25/2012 10:07	32515	63	78	80	10	14	16	272	345	351	225	249	256		

Feed rate bpd	coke burn lb/hr	Primary current to Primary current to Primary power to						Secondary current to TR1 mA	Secondary current to TR2 mA	Secondary current to TR3 mA	Primary voltage to Primary voltage to Primary voltage to		
		TR1 A	TR2 A	TR3 A	TR1 kW	TR2 kW	TR3 kW				TR1 V	TR2 V	TR3 V
11FC0118	11mickbr	11I0032A	11I0033A	11I0034A	11J0032A	11J0033A	11J0034A	11I0032B	11I0033B	11I0034B	11E0032A	11E0033A	11E0034A
4/25/2012 10:08	18083	63	76	80	10	14	16	277	334	351	226	246	256
4/25/2012 10:09	18085	61	74	80	10	14	16	262	332	351	221	245	256
4/25/2012 10:10	18155	63	73	80	10	14	16	265	324	351	224	243	256
4/25/2012 10:11	18168	60	75	80	10	14	16	258	330	351	220	244	256
4/25/2012 10:12	18173	64	75	80	10	14	16	280	324	351	227	244	256
4/25/2012 10:13	18176	63	74	80	10	14	16	278	326	351	227	244	256
4/25/2012 10:14	18212	62	77	80	10	13	16	271	340	351	223	247	256
4/25/2012 10:15	18256	60	75	80	10	13	16	261	332	351	221	245	256
4/25/2012 10:16	18200	60	69	80	10	13	16	263	295	351	221	234	256
4/25/2012 10:17	18259	60	71	80	10	13	16	260	303	351	220	237	256
4/25/2012 10:18	18189	60	71	80	10	13	16	260	303	351	220	237	256
4/25/2012 10:19	18173	65	74	80	11	13	16	280	325	351	228	243	256
4/25/2012 10:20	18227	61	78	80	11	13	16	261	344	350	221	249	256
4/25/2012 10:21	18269	63	75	80	10	14	16	275	329	351	226	245	256
4/25/2012 10:22	18167	64	71	80	10	14	16	279	304	352	226	238	256
4/25/2012 10:23	18164	63	74	80	10	14	16	269	323	352	223	243	256
4/25/2012 10:24	18128	64	71	80	10	14	16	273	311	351	227	238	256
4/25/2012 10:25	18119	65	71	80	11	14	16	279	315	349	225	240	256
4/25/2012 10:26	18128	63	73	77	11	15	16	271	318	333	223	240	251
4/25/2012 10:27	18100	64	72	79	11	15	16	282	313	346	228	239	255
4/25/2012 10:28	18140	64	77	80	11	15	16	280	336	350	227	246	256
4/25/2012 10:29	18179	63	70	80	11	12	16	277	301	350	224	235	256
4/25/2012 10:30	18151	63	73	80	11	13	16	273	316	350	223	240	256
4/25/2012 10:31	18137	61	78	80	11	14	16	262	344	350	222	249	256
4/25/2012 10:32	18131	60	75	80	11	14	16	259	327	350	222	244	256
4/25/2012 10:33	18102	65	75	80	11	14	16	281	329	350	229	244	256
4/25/2012 10:34	18148	66	75	80	11	14	16	289	320	350	231	241	256
4/25/2012 10:35	18132	66	74	80	11	14	16	287	320	350	231	242	256
4/25/2012 10:36	18098	65	77	80	11	13	16	288	341	350	230	248	256
4/25/2012 10:37	18052	62	74	80	11	13	16	264	322	350	222	242	256
4/25/2012 10:38	18113	60	74	80	11	13	16	258	321	350	220	243	256
4/25/2012 10:39	18181	61	75	80	11	13	16	259	325	350	222	243	256
4/25/2012 10:40	18128	64	70	80	11	13	16	276	302	350	225	237	256
4/25/2012 10:41	18040	60	72	80	10	13	16	255	310	350	220	239	256
4/25/2012 10:42	18000	60	77	80	10	13	16	260	339	350	221	248	256
4/25/2012 10:43	18006	61	72	80	10	13	16	257	312	350	221	239	256
4/25/2012 10:44	18008	62	71	80	11	13	16	259	307	350	222	238	256
4/25/2012 10:45	18022	63	73	80	11	12	16	266	307	350	224	239	256
4/25/2012 10:46	18081	65	73	80	12	12	16	285	316	350	229	241	256
4/25/2012 10:47	18112	62	69	80	11	12	16	268	292	350	224	235	256
4/25/2012 10:48	18094	61	65	80	10	12	16	258	271	350	221	227	256
4/25/2012 10:49	18125	60	63	80	10	11	16	255	270	350	220	225	256
4/25/2012 10:50	18128	60	63	80	10	11	16	252	269	350	219	225	256
4/25/2012 10:51	18129	60	72	80	10	13	16	249	311	350	219	239	256
4/25/2012 10:51	18173	63	78	80	10	14	16	272	344	350	225	249	256

Feed rate bpd	coke burn lb/hr	Primary current to Primary current to						Secondary current to			Primary voltage to Primary voltage to		
		TR1 A	TR2 A	TR3 A	TR1 kW	TR2 kW	TR3 kW	TR1 mA	TR2 mA	TR3 mA	TR1 V	TR2 V	TR3 V
11FC0118	11mickbr	11I0032A	11I0033A	11I0034A	11J0032A	11J0033A	11J0034A	11I0032B	11I0033B	11I0034B	11E0032A	11E0033A	11E0034A
4/25/2012 10:52	18118	62	76	80	11	14	16	273	341	350	225	246	256
32540	18114	62	73	80	11	14	16	270	320	350	223	241	256
32539	18165	61	74	80	11	14	16	262	324	350	222	243	256
32538	18152	63	72	80	11	14	16	271	309	350	225	239	256
32537	18181	64	76	80	11	14	16	278	333	350	226	245	256
32536	18237	63	76	80	11	13	16	276	336	350	225	245	256
32535	18237	62	73	80	11	13	16	266	318	350	223	241	256
32535	18271	60	77	80	11	13	16	261	337	350	221	247	256
32533	18272	64	77	80	11	13	16	277	336	350	227	248	256
32530	18159	66	78	80	11	13	16	285	343	350	229	249	256
32526	18179	63	74	80	11	13	16	275	323	350	226	242	256
32523	18197	61	73	80	11	13	16	264	320	350	222	242	256
32519	18190	64	71	80	11	12	16	276	309	350	226	238	256
32516	18186	60	77	80	10	13	16	258	343	350	219	248	256
32512	18158	62	78	80	10	15	16	269	345	350	223	249	256
32509	18149	61	72	80	11	13	16	268	310	350	222	238	256
32505	18131	65	76	80	11	14	16	286	332	350	229	245	256
32501	18110	65	78	80	11	15	16	282	349	350	228	249	256
32499	18134	61	76	80	11	15	16	266	338	350	222	246	256
32501	18127	65	77	80	11	15	16	288	346	350	228	249	256
32503	18153	65	78	80	11	15	16	285	348	350	227	250	256
32505	18163	63	75	80	11	15	16	272	327	350	223	244	256
32507	18163	62	78	80	11	15	16	260	343	350	222	249	256
32509	18173	62	77	80	11	15	16	261	340	350	222	248	256
32511	18127	64	76	80	11	15	16	273	331	350	227	245	256
32512	18117	65	78	80	12	15	16	288	343	350	230	249	256
32514	18148	64	77	80	12	15	16	284	342	350	228	248	256
32516	18160	66	73	80	12	15	16	290	316	350	230	242	256
32518	18187	67	75	80	12	15	16	296	329	350	231	245	256
32519	18180	65	78	80	12	15	16	289	345	350	230	249	256
32519	18097	65	74	80	12	15	16	280	319	350	228	242	256
32520	18209	65	75	80	12	14	16	276	324	350	228	243	256
32521	18225	65	77	80	12	14	16	289	339	350	230	247	256
32522	18224	65	76	80	12	14	16	290	330	350	230	244	256
32522	18143	67	74	80	12	14	16	297	314	350	231	240	256
32523	18117	68	73	80	12	14	16	297	308	350	231	238	256
32524	18066	68	76	80	12	14	16	299	332	350	232	245	256
32524	18057	62	75	80	11	14	16	272	330	350	224	243	256
32523	18092	64	76	80	10	14	16	272	328	350	225	243	256
32523	18089	63	78	80	11	14	16	274	343	350	225	249	256
32522	18127	63	75	80	11	14	16	270	321	350	223	244	256
32521	18103	67	78	80	12	14	16	292	341	350	231	249	256
32521	18042	65	78	80	12	14	16	282	338	350	228	248	256
32520	18174	64	74	80	12	14	16	280	319	350	226	242	256

Feed rate bpd	coke burn lb/hr	Primary current to Primary current to						Primary power to Primary power to						Secondary current to			Primary voltage to Primary voltage to		
		TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3
		11I0032A	11I0033A	11I0034A	11I0032A	11I0033A	11I0034A	11I0032A	11I0033A	11I0034A	11I0032B	11I0033B	11I0034B	11E0032A	11E0033A	11E0034A			
4/25/2012 11:36	11FC0118	66	78	80	12	14	16	12	14	16	289	343	350	229	249	256			
4/25/2012 11:37	32519	66	76	80	12	14	16	12	14	16	288	338	350	229	245	256			
4/25/2012 11:38	32518	64	73	80	12	14	16	12	14	16	279	319	350	227	239	256			
4/25/2012 11:39	32517	63	77	80	11	14	16	11	14	16	273	338	350	225	247	256			
4/25/2012 11:40	32516	62	79	80	11	14	16	11	14	16	267	349	350	224	250	256			
4/25/2012 11:41	32514	67	74	80	11	14	16	11	14	16	294	323	350	231	242	256			
4/25/2012 11:42	32513	65	71	80	11	14	16	11	14	16	290	309	350	230	237	256			
4/25/2012 11:43	32512	64	77	80	11	14	16	11	14	16	279	338	350	226	246	256			
4/25/2012 11:44	32510	63	73	80	11	14	16	11	14	16	275	319	350	225	242	256			
4/25/2012 11:45	32509	66	73	80	11	14	16	11	14	16	280	312	350	229	240	256			
4/25/2012 11:46	32508	66	78	80	11	14	16	11	14	16	285	344	350	229	249	256			
4/25/2012 11:47	32506	65	79	80	10	14	16	10	14	16	281	349	350	227	251	256			
4/25/2012 11:48	32505	61	75	80	10	14	16	10	14	16	263	326	350	222	244	256			
4/25/2012 11:49	32503	59	74	80	10	14	16	10	14	16	253	318	350	217	241	256			
4/25/2012 11:50	32495	58	72	80	9	14	16	10	14	16	242	307	350	214	239	256			
4/25/2012 11:51	32485	60	70	80	10	13	16	10	13	16	255	299	350	220	235	256			
4/25/2012 11:52	32475	64	73	80	11	13	16	11	13	16	279	314	350	227	241	256			
4/25/2012 11:53	32466	63	78	80	11	13	16	11	13	16	275	343	350	226	248	256			
4/25/2012 11:54	32456	63	78	80	11	13	16	11	13	16	271	347	350	224	249	256			
4/25/2012 11:55	32447	65	74	80	11	13	16	11	13	16	289	322	350	230	242	256			
4/25/2012 11:56	32437	66	78	80	11	13	16	11	13	16	292	344	350	231	249	256			
4/25/2012 11:57	32428	64	79	80	12	13	16	12	13	16	281	350	350	227	251	256			
4/25/2012 11:58	32418	64	79	80	12	13	16	12	13	16	271	350	350	226	251	256			
4/25/2012 11:59	32409	65	79	80	12	13	16	12	13	16	280	350	350	227	250	256			
4/25/2012 12:00	32410	64	79	80	12	13	16	12	13	16	272	350	350	225	250	256			
4/25/2012 12:01	32413	67	79	80	12	13	16	12	13	16	292	348	350	230	249	256			
4/25/2012 12:02	32416	65	73	80	11	13	16	11	13	16	285	317	350	228	241	256			
4/25/2012 12:03	32419	62	76	80	11	13	16	11	13	16	267	330	350	223	244	256			
4/25/2012 12:04	32422	66	74	80	11	13	16	11	13	16	286	320	350	228	241	256			
4/25/2012 12:05	32425	64	71	80	11	13	16	11	13	16	280	306	350	226	237	256			
4/25/2012 12:06	32428	64	69	80	11	13	16	11	13	16	284	297	350	226	235	256			
4/25/2012 12:07	32431	63	76	80	10	13	16	10	13	16	280	333	350	225	246	256			
4/25/2012 12:08	32434	66	73	80	10	13	16	10	13	16	287	318	350	229	240	256			
4/25/2012 12:09	32437	66	76	80	10	13	16	10	13	16	291	334	350	230	245	256			
4/25/2012 12:10	32443	65	73	80	10	14	16	10	14	16	285	314	350	229	240	256			
4/25/2012 12:11	32451	62	71	80	10	14	16	10	14	16	270	313	350	224	239	256			
4/25/2012 12:12	32458	66	73	80	12	14	16	12	14	16	291	318	350	230	242	256			
4/25/2012 12:13	32466	64	78	80	12	14	16	12	14	16	280	343	351	227	248	256			
4/25/2012 12:14	32473	63	78	80	12	14	16	12	14	16	276	346	351	225	250	256			
4/25/2012 12:15	32480	62	73	80	12	14	16	12	14	16	268	316	351	224	240	256			
4/25/2012 12:16	32488	64	74	80	12	14	16	12	14	16	278	315	351	226	239	256			
4/25/2012 12:17	32495	64	75	80	12	14	16	12	14	16	274	331	351	226	243	256			
4/25/2012 12:18	32503	63	77	80	12	15	16	12	15	16	265	341	351	225	247	256			
4/25/2012 12:19	32510	63	79	80	12	15	16	12	15	16	265	348	351	224	249	256			

Feed rate bpd	coke burn lb/hr	Primary current to Primary current to Primary current to Primary current to Primary current to Primary current to						Secondary current to			Primary voltage to Primary voltage to Primary voltage to		
		TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3
		A	A	A	kW	kW	kW	mA	mA	mA	V	V	V
11FC0118	11micbtr	11I0032A	11I0033A	11I0034A	11J0032A	11J0033A	11J0034A	11I0032B	11I0033B	11I0034B	11E0032A	11E0033A	11E0034A
4/25/2012 12:20	32513	65	79	80	12	15	16	285	350	351	227	250	256
4/25/2012 12:21	32515	67	79	80	12	15	16	294	348	351	231	250	256
4/25/2012 12:22	32516	65	72	80	11	13	16	287	310	351	228	238	256
4/25/2012 12:23	32517	67	73	80	11	12	16	298	312	351	232	241	256
4/25/2012 12:24	32519	65	77	80	12	12	16	289	338	351	229	247	256
4/25/2012 12:25	32520	58	73	80	10	13	16	249	313	351	215	240	256
4/25/2012 12:26	32522	64	73	80	11	13	16	279	319	351	225	241	256
4/25/2012 12:27	32523	65	78	80	12	13	16	281	345	351	228	249	256
4/25/2012 12:28	32525	63	78	80	11	13	16	274	343	351	224	249	256
4/25/2012 12:29	32526	61	73	80	10	13	16	266	317	351	221	242	256
4/25/2012 12:30	32522	64	77	80	11	13	16	282	336	351	228	246	256
4/25/2012 12:31	32516	64	77	80	11	14	16	281	337	351	226	246	256
4/25/2012 12:32	32510	61	74	80	10	14	16	265	325	351	221	242	256
4/25/2012 12:33	32504	62	72	80	10	14	16	262	312	351	223	238	256
4/25/2012 12:34	32498	64	75	80	10	14	16	282	318	351	226	240	256
4/25/2012 12:35	32493	64	78	80	10	14	16	281	344	351	227	249	256
4/25/2012 12:36	32487	63	77	80	10	15	16	281	348	351	228	249	256
4/25/2012 12:37	32481	64	76	80	10	15	16	285	335	351	228	246	256
4/25/2012 12:38	32475	64	77	80	10	15	16	278	341	351	226	247	256
4/25/2012 12:39	32469	62	71	80	10	14	16	265	308	351	224	237	256
4/25/2012 12:40	32466	61	70	80	10	13	16	261	309	351	221	237	256
4/25/2012 12:41	32466	60	72	80	10	13	16	255	325	351	219	242	256
4/25/2012 12:42	32465	63	74	80	11	13	16	270	326	351	224	243	256
4/25/2012 12:43	32464	63	72	80	11	13	16	275	312	351	224	238	256
4/25/2012 12:44	32463	61	77	80	11	13	16	267	336	351	223	246	256
4/25/2012 12:45	32463	66	73	80	11	13	16	290	318	351	230	240	256
4/25/2012 12:46	32462	63	75	80	11	13	16	274	328	351	224	243	256
4/25/2012 12:47	32461	60	76	80	11	13	16	260	326	351	221	243	256
4/25/2012 12:48	32461	62	76	80	12	13	16	275	329	351	226	244	256
4/25/2012 12:49	32460	65	73	80	12	13	16	287	315	351	230	240	256
4/25/2012 12:50	32462	64	77	80	12	13	16	278	337	351	226	246	256
4/25/2012 12:51	32466	62	79	80	12	13	16	267	348	351	224	249	256
4/25/2012 12:52	32470	64	73	80	12	13	16	283	318	351	227	240	256
4/25/2012 12:53	32474	65	72	80	11	13	16	286	312	351	228	238	256
4/25/2012 12:54	32478	66	73	80	11	13	16	292	318	351	230	240	256
4/25/2012 12:55	32482	65	78	80	11	13	16	283	344	351	228	248	256
4/25/2012 12:56	32486	68	79	80	11	13	16	297	350	351	232	250	256
4/25/2012 12:57	32490	69	79	80	11	13	16	304	350	351	234	251	256
4/25/2012 12:58	32494	68	79	80	11	13	16	303	349	351	234	251	256
4/25/2012 12:59	32498	66	74	80	12	13	16	292	326	351	230	244	256
4/25/2012 13:00	32495	64	75	80	12	13	16	277	331	351	226	245	255
4/25/2012 13:01	32488	63	78	80	12	13	16	266	345	351	224	248	255
4/25/2012 13:02	32480	65	79	80	12	13	16	281	347	351	226	249	255
4/25/2012 13:03	32472	66	75	80	12	13	16	289	320	351	229	243	255

Feed rate bpd	coke burn lb/hr	Primary current to Primary current to Primary current to Primary current to				Primary power to Primary power to Primary power to Primary power to				Secondary current to Secondary current to Secondary current to Secondary current to				Primary voltage to Primary voltage to Primary voltage to Primary voltage to			
		TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3	TR3
11FC0118	11mickbr	1110032A	1110033A	1110034A	1110032A	1110033A	1110034A	1110032B	1110033B	1110034B	11E0032A	11E0033A	11E0034A	11E0032A	11E0033A	11E0034A	11E0034A
4/25/2012 13:04	18085	63	78	80	11	13	16	278	338	351	226	247	255	226	247	255	255
4/25/2012 13:05	18056	62	79	80	11	13	16	265	349	351	223	249	255	223	249	255	255
4/25/2012 13:06	18035	64	79	80	11	13	16	272	350	351	226	249	255	226	249	255	255
4/25/2012 13:07	18095	66	79	80	11	13	16	291	350	351	230	249	255	230	249	255	255
4/25/2012 13:08	18038	66	79	80	11	13	16	291	347	351	228	250	255	228	250	255	255
4/25/2012 13:09	18172	64	79	80	11	13	16	278	349	351	225	250	255	225	250	255	255
4/25/2012 13:10	18269	64	79	80	11	13	16	277	348	351	225	250	255	225	250	255	255
4/25/2012 13:11	18241	61	73	80	11	13	16	262	317	351	221	241	255	221	241	255	255
4/25/2012 13:12	18254	64	77	80	11	13	16	279	339	351	226	247	255	226	247	255	255
4/25/2012 13:13	18213	65	79	80	11	13	16	283	350	351	228	250	255	228	250	255	255
4/25/2012 13:14	18122	64	78	80	11	13	16	278	347	351	227	249	255	227	249	255	255
4/25/2012 13:15	18099	66	74	80	11	13	16	294	321	351	230	241	255	230	241	255	255
4/25/2012 13:16	18119	66	78	80	12	13	16	290	342	351	230	248	255	230	248	255	255
4/25/2012 13:17	18135	65	77	80	12	13	16	288	336	351	229	246	255	229	246	255	255
4/25/2012 13:18	18026	61	77	80	10	13	16	258	345	351	219	249	255	219	249	255	255
4/25/2012 13:19	17991	62	79	80	10	13	16	260	350	351	221	250	255	221	250	255	255
4/25/2012 13:20	18062	65	77	80	11	13	16	282	340	351	228	247	255	228	247	255	255
4/25/2012 13:21	18099	66	76	80	11	13	16	285	346	351	230	249	255	230	249	255	255
4/25/2012 13:22	18141	63	77	80	11	13	16	265	350	351	224	250	255	224	250	255	255
4/25/2012 13:23	18131	60	78	80	11	13	16	257	350	351	220	250	255	220	250	255	255
4/25/2012 13:24	18166	65	78	80	11	13	16	282	350	351	226	250	255	226	250	255	255
4/25/2012 13:25	18100	65	78	80	11	14	16	281	347	351	227	249	255	227	249	255	255
4/25/2012 13:26	18146	66	75	80	11	14	16	287	325	351	230	243	255	230	243	255	255
4/25/2012 13:27	18157	67	78	80	11	14	16	295	345	351	231	249	255	231	249	255	255
4/25/2012 13:28	18093	67	79	80	11	14	16	296	350	351	231	249	255	231	249	255	255
4/25/2012 13:29	18081	64	78	80	11	14	16	282	343	351	227	247	255	227	247	255	255
4/25/2012 13:30	18109	67	74	80	12	14	16	293	319	351	231	241	255	231	241	255	255
4/25/2012 13:31	18081	62	73	80	11	14	16	267	311	351	223	239	255	223	239	255	255
4/25/2012 13:32	18140	63	74	80	11	14	16	270	321	351	223	241	255	223	241	255	255
4/25/2012 13:33	18124	65	78	80	12	14	16	283	342	351	227	247	255	227	247	255	255
4/25/2012 13:34	18092	65	75	80	11	14	16	276	320	351	225	242	255	225	242	255	255
4/25/2012 13:35	18088	62	72	80	10	14	16	268	312	351	222	239	255	222	239	255	255
4/25/2012 13:36	18131	66	75	80	11	14	16	288	334	351	228	245	255	228	245	255	255
4/25/2012 13:37	18186	65	78	80	12	14	16	285	345	351	229	248	255	229	248	255	255
4/25/2012 13:38	18179	63	77	80	12	14	16	269	339	351	225	247	255	225	247	255	255
4/25/2012 13:39	18198	62	73	80	12	14	16	273	316	351	225	241	255	225	241	255	255
4/25/2012 13:40	18091	62	74	80	12	14	16	269	320	351	223	241	255	223	241	255	255
4/25/2012 13:41	18205	66	72	80	12	14	16	288	314	351	228	238	255	228	238	255	255
4/25/2012 13:42	18027	66	77	80	12	14	16	289	340	351	229	247	255	229	247	255	255
4/25/2012 13:43	18012	62	79	80	11	14	16	270	350	351	223	251	255	223	251	255	255
4/25/2012 13:44	18080	66	79	80	12	14	16	287	350	351	228	251	255	228	251	255	255
4/25/2012 13:45	18094	64	79	80	12	14	16	281	350	351	227	251	255	227	251	255	255
4/25/2012 13:46	18078	63	79	80	12	14	16	268	350	351	224	251	255	224	251	255	255
4/25/2012 13:47	18092	64	79	80	11	14	16	276	350	351	226	251	255	226	251	255	255

Feed rate bpd	coke burn lb/hr	Primary current to Primary current to Primary current to						Secondary current to			Primary voltage to Primary voltage to Primary voltage to		
		TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3
		A	A	A	kW	kW	kW	mA	mA	mA	V	V	V
		11I0032A	11I0033A	11I0034A	11J0032A	11J0033A	11J0034A	11I0032B	11I0033B	11I0034B	11E0032A	11E0033A	11E0034A
4/25/2012 13:48	18108	65	79	80	11	14	16	283	350	351	227	251	255
4/25/2012 13:49	18040	64	76	80	11	14	16	282	332	351	226	244	255
4/25/2012 13:50	18081	62	75	80	10	14	16	271	334	351	223	244	255
4/25/2012 13:51	18133	60	77	80	10	14	16	258	346	351	219	249	255
4/25/2012 13:52	18123	61	78	80	10	14	16	262	348	351	220	250	255
4/25/2012 13:53	18076	67	73	80	12	14	16	295	317	351	229	241	255
4/25/2012 13:54	18076	68	77	80	12	14	16	298	338	351	231	247	255
4/25/2012 13:55	18114	63	75	80	11	14	16	277	327	351	226	243	255
4/25/2012 13:56	18154	60	78	80	10	14	16	259	344	351	220	248	255
4/25/2012 13:57	18096	64	79	80	11	14	16	278	344	351	226	249	255
4/25/2012 13:58	18062	64	78	80	12	14	16	279	340	351	226	247	255
4/25/2012 13:59	18169	67	77	80	11	14	16	295	327	351	231	245	255
4/25/2012 14:00	18189	65	75	80	11	14	16	284	319	351	227	242	255
4/25/2012 14:01	18102	62	73	80	10	14	16	266	311	351	222	239	255
4/25/2012 14:02	17991	65	77	80	12	14	16	281	339	351	227	248	255
4/25/2012 14:03	17986	63	79	80	11	14	16	278	350	349	225	251	255
4/25/2012 14:04	18032	62	79	76	10	14	16	268	350	326	222	250	249
4/25/2012 14:05	18036	67	78	79	12	14	16	293	347	343	229	249	253
4/25/2012 14:06	18041	65	74	80	12	14	16	287	321	350	228	242	255
4/25/2012 14:07	18068	65	77	80	12	14	16	285	341	350	229	248	255
4/25/2012 14:08	18112	66	75	80	12	14	16	293	325	350	231	244	255
4/25/2012 14:09	18142	64	77	80	11	14	16	272	339	350	225	247	255
4/25/2012 14:10	18082	66	79	80	11	14	16	288	349	350	229	250	255
4/25/2012 14:11	18023	65	75	80	11	14	16	286	326	351	228	243	255
4/25/2012 14:12	18075	63	78	80	11	14	16	272	341	351	223	248	255
4/25/2012 14:13	18080	61	79	80	10	14	16	262	349	351	221	250	255
4/25/2012 14:14	18035	61	78	80	10	14	16	258	346	351	221	250	255
4/25/2012 14:15	17984	63	72	80	10	14	16	275	314	351	224	240	255
4/25/2012 14:16	17983	61	76	80	10	14	16	264	330	351	220	244	255
4/25/2012 14:17	18016	61	76	80	10	14	16	257	328	351	221	244	255
4/25/2012 14:18	18075	64	75	80	10	14	16	274	325	351	226	243	255
4/25/2012 14:19	18040	62	77	80	10	14	16	269	342	351	224	247	255
4/25/2012 14:20	18053	63	79	80	10	14	16	272	341	351	225	249	255
4/25/2012 14:21	18063	62	79	80	10	14	16	267	346	352	222	250	255
4/25/2012 14:22	18062	61	79	80	10	14	16	262	349	352	222	251	255
4/25/2012 14:23	18020	66	79	80	12	14	16	285	347	352	228	250	255
4/25/2012 14:24	18001	64	77	80	12	14	16	275	338	352	225	247	255
4/25/2012 14:25	18027	63	78	80	12	14	16	268	347	352	223	250	255
4/25/2012 14:26	18077	66	79	80	11	14	16	287	349	352	228	251	255
4/25/2012 14:27	18104	66	79	80	11	14	16	288	347	352	229	251	255
4/25/2012 14:28	18044	61	79	80	10	14	16	262	348	352	220	251	255
4/25/2012 14:29	17976	59	79	80	10	14	16	252	348	352	217	251	255
4/25/2012 14:30	17920	58	76	80	10	14	16	249	338	352	216	247	255
4/25/2012 14:31	17925	61	73	80	10	14	16	265	319	352	220	241	255

Feed rate bpd	coke burn lb/hr	Primary current to Primary current to Primary power to Primary power to Primary power to						Secondary current to			Primary voltage to		
		TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3
A	lb/hr	11I0032A	11I0033A	11I0034A	11I0032A	11I0033A	11I0034A	11I0032B	11I0033B	11I0034B	11E0032A	11E0033A	11E0034A
61	17953	73	80	10	14	16	16	262	320	352	220	242	255
65	18037	72	80	12	14	16	16	283	310	352	228	239	255
64	18051	71	80	12	14	16	16	282	314	352	226	240	255
62	18005	72	80	11	14	16	16	272	313	352	223	240	255
62	17970	78	80	11	14	16	16	275	343	352	223	248	255
61	18029	79	80	10	14	16	16	267	350	352	221	250	255
64	17976	79	80	11	14	16	16	277	349	352	226	251	255
65	17942	74	80	12	14	16	16	284	324	352	228	243	255
64	17965	77	80	11	14	16	16	279	338	352	226	247	255
63	18004	79	80	11	14	16	16	270	348	352	224	249	255
62	17999	73	80	10	14	16	16	263	316	352	223	240	255
63	18056	72	80	10	14	16	16	267	304	352	224	238	255
64	18065	72	80	10	14	16	16	279	306	352	226	240	255
63	18092	73	80	10	14	16	16	268	320	352	222	242	255
63	18139	78	80	10	14	16	16	276	345	352	225	249	255
61	18132	77	80	10	14	16	16	268	348	352	222	250	255
66	18097	75	80	11	14	16	16	287	332	352	228	246	255
66	18103	74	80	12	14	16	16	290	319	352	229	242	255
63	18107	77	80	11	14	16	16	277	340	352	225	248	255
61	18089	77	80	10	14	16	16	265	342	352	221	247	255
61	18148	75	80	10	14	16	16	264	326	352	221	243	255
67	18121	75	80	12	15	16	16	294	318	352	231	241	255
69	18085	75	80	13	15	16	16	300	326	352	233	245	255
62	18143	76	80	11	15	16	16	265	342	352	222	249	255
64	18177	77	80	11	15	16	16	281	348	352	226	249	255
66	18165	78	80	12	15	16	16	292	342	352	230	248	255
66	18160	77	80	12	15	16	16	294	335	352	231	246	255
66	18107	77	80	12	15	16	16	292	344	352	230	248	255
69	18111	79	80	12	15	16	16	307	350	352	235	250	255
66	18078	78	80	12	15	16	16	293	340	352	230	249	255
65	18053	76	80	12	15	16	16	286	335	352	228	247	255
65	18089	77	80	12	15	16	16	284	346	352	228	250	255
63	18124	78	80	12	15	16	16	277	350	352	226	251	255
63	18192	78	80	12	15	16	16	277	346	352	225	249	255
67	18065	74	80	12	15	16	16	296	322	352	231	243	255
65	18010	73	80	11	15	16	16	285	318	352	227	241	258
65	18044	77	80	11	15	16	16	286	340	352	228	248	258
66	18043	73	80	11	15	16	16	288	319	352	229	242	258
67	18052	76	80	11	15	16	16	287	337	352	230	247	258
67	17971	79	80	11	15	16	16	291	349	352	230	251	258
67	18029	79	80	11	15	16	16	295	346	352	230	250	258
62	18101	75	80	12	15	16	16	269	327	352	223	244	258
66	18093	74	80	12	15	16	16	292	324	352	230	243	258
65	18051	78	80	12	15	16	16	279	345	352	228	249	257

Feed rate	coke burn	Primary current to Primary current to Primary current to			Primary power to			Secondary current to			Primary voltage to Primary voltage to Primary voltage to		
		TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3
bpd	lb/hr	A	A	A	kW	kW	kW	mA	mA	mA	V	V	V
11FC0118	11mickbr	11I0032A	11I0033A	11I0034A	11J0032A	11J0033A	11J0034A	11I0032B	11I0033B	11I0034B	11E0032A	11E0033A	11E0034A
32508	18088	63	77	80	12	15	16	271	348	352	225	251	257
4/25/2012 15:16													
32508	18047	67	75	80	12	15	16	292	330	352	231	246	257
4/25/2012 15:17													
32508	17988	69	77	80	13	15	16	305	341	352	236	248	257
4/25/2012 15:18													
32507	18067	65	79	80	12	15	16	278	350	352	228	251	257
4/25/2012 15:19													
32507	17974	60	79	80	11	15	16	258	350	352	221	251	257
4/25/2012 15:20													
32504	17986	61	79	80	11	15	16	256	350	352	220	251	257
4/25/2012 15:21													
32502	18009	63	79	80	11	15	16	273	350	352	225	251	257
4/25/2012 15:22													
32499	17941	63	79	80	11	15	16	273	350	352	224	251	257
4/25/2012 15:23													

	Secondary voltage to TR1 kV	Secondary voltage to TR2 kV	Secondary voltage to TR3 kV	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1	Arcs/min on TR2	Arcs/min on TR3	Primary current to Primary current to Primary current to Primary power to			
										TR1	TR2	TR3	TR1
	11E0032B	11E0033B	11E0034B	11XA0032A	11XA0033A	11XA0034A	11XA0032B	11XA0033B	11XA0034B	11I0067A	11I0068A	11I0069A	11J0067A
	27	26	23	17	9	0	0	0	0	84	69	63	17
4/25/2012 8:40													
4/25/2012 8:41													
4/25/2012 8:42													
4/25/2012 8:43													
4/25/2012 8:44													
4/25/2012 8:45													
4/25/2012 8:46													
4/25/2012 8:47													
4/25/2012 8:48													
4/25/2012 8:49													
4/25/2012 8:50													
4/25/2012 8:51													
4/25/2012 8:52													
4/25/2012 8:53													
4/25/2012 8:54													
4/25/2012 8:55													
4/25/2012 8:56													
4/25/2012 8:57													
4/25/2012 8:58													
4/25/2012 8:59													
4/25/2012 9:00													
4/25/2012 9:01													
4/25/2012 9:02													
4/25/2012 9:03													
4/25/2012 9:04													
4/25/2012 9:05													
4/25/2012 9:06													
4/25/2012 9:07													
4/25/2012 9:08													
4/25/2012 9:09													
4/25/2012 9:10													
4/25/2012 9:11													
4/25/2012 9:12													
4/25/2012 9:13													
4/25/2012 9:14													
4/25/2012 9:15													
4/25/2012 9:16													
4/25/2012 9:17													
4/25/2012 9:18													
4/25/2012 9:19													
4/25/2012 9:20													
4/25/2012 9:21													
4/25/2012 9:22													
4/25/2012 9:23													

Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1	Arcs/min on TR2	Arcs/min on TR3	Primary current to Primary current to Primary current to Primary power to			
									TR1	TR2	TR3	TR1
kV	kV	kV							A	A	A	kW
11E0032B	11E0033B	11E0034B	11XA0032A	11XA0033A	11XA0034A	11XA0032B	11XA0033B	11XA0034B	11I0067A	11I0068A	11I0069A	11J0067A
27	26	23	17	9	0	0	0	0	84	69	63	17
4/25/2012 9:24	27	23	17	9	0	0	0	0	84	69	63	17
4/25/2012 9:25	27	23	17	9	0	0	0	0	84	69	63	17
4/25/2012 9:26	27	23	17	8	0	0	0	0	84	69	63	17
4/25/2012 9:27	27	23	17	8	0	0	0	0	84	69	63	17
4/25/2012 9:28	27	23	17	8	0	0	0	0	84	69	63	17
4/25/2012 9:29	27	23	17	8	0	0	0	0	84	69	63	17
4/25/2012 9:30	27	23	17	8	0	0	0	0	84	69	63	17
4/25/2012 9:31	27	23	17	7	0	0	0	0	84	69	63	17
4/25/2012 9:32	27	23	17	7	0	0	0	0	84	69	63	17
4/25/2012 9:33	27	23	17	7	0	0	0	0	84	69	63	17
4/25/2012 9:34	27	23	17	7	0	0	0	0	84	69	63	17
4/25/2012 9:35	27	23	17	6	0	0	0	0	84	69	63	17
4/25/2012 9:36	27	23	17	6	0	0	0	0	84	69	63	17
4/25/2012 9:37	27	23	17	6	0	0	0	0	84	69	63	17
4/25/2012 9:38	27	23	17	8	0	0	0	0	84	69	63	17
4/25/2012 9:39	27	23	17	8	0	0	0	0	84	69	63	17
4/25/2012 9:40	27	23	17	6	0	0	0	0	84	69	63	17
4/25/2012 9:41	26	23	17	5	0	0	0	0	84	69	63	17
4/25/2012 9:42	26	23	17	6	0	0	0	0	84	69	63	17
4/25/2012 9:43	26	23	17	7	0	0	0	0	84	69	63	17
4/25/2012 9:44	26	23	17	7	0	0	0	0	84	69	63	17
4/25/2012 9:45	26	23	17	7	0	0	0	0	84	69	63	17
4/25/2012 9:46	26	23	17	7	0	0	0	0	84	69	63	17
4/25/2012 9:47	26	23	17	7	0	0	0	0	84	69	63	17
4/25/2012 9:48	26	23	17	7	0	0	0	0	84	69	63	17
4/25/2012 9:49	26	23	17	7	0	0	0	0	84	69	63	17
4/25/2012 9:50	26	23	17	7	0	0	0	0	84	69	63	17
4/25/2012 9:51	26	23	17	7	0	0	0	0	84	69	63	17
4/25/2012 9:52	26	23	17	7	0	0	0	0	84	69	63	17
4/25/2012 9:53	26	23	17	7	0	0	0	0	84	69	63	17
4/25/2012 9:54	26	23	17	7	0	0	0	0	84	69	63	17
4/25/2012 9:55	26	23	17	7	0	0	0	0	84	69	63	17
4/25/2012 9:56	26	23	17	7	0	0	0	0	84	69	63	17
4/25/2012 9:57	26	23	17	7	0	0	0	0	84	69	63	17
4/25/2012 9:58	26	23	17	7	0	0	0	0	84	69	63	17
4/25/2012 9:59	26	23	17	7	0	0	0	0	84	69	63	17
4/25/2012 10:00	26	23	17	7	0	0	0	0	84	69	63	17
4/25/2012 10:01	26	23	17	7	0	0	0	0	84	69	63	17
4/25/2012 10:02	26	23	17	7	0	0	0	0	84	69	63	17
4/25/2012 10:03	26	23	17	7	0	0	0	0	84	69	63	17
4/25/2012 10:04	26	23	17	7	0	0	0	0	84	69	63	17
4/25/2012 10:05	26	23	17	7	0	0	0	0	84	69	63	17
4/25/2012 10:06	26	23	17	7	0	0	0	0	84	69	63	17
4/25/2012 10:07	26	23	17	7	0	0	0	0	84	69	63	17

	Secondary voltage to TR1 kV	Secondary voltage to TR2 kV	Secondary voltage to TR3 kV	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1	Arcs/min on TR2	Arcs/min on TR3	Primary current to TR1 A	Primary current to TR2 A	Primary current to TR3 A	Primary power to TR1 kW	Primary power to TR2 kW	Primary power to TR3 kW
4/25/2012 10:08	11E0032B 26	11E0033B 26	11E0034B 23	11XA0032A 17	11XA0033A 7	11XA0034A 0	11XA0032B 0	11XA0033B 0	11XA0034B 0	11H0067A 84	11H0068A 69	11H0069A 63	11J0067A 17	11J0068A 13	11J0069A 13
4/25/2012 10:09	26	26	23	17	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:10	26	26	23	17	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:11	26	26	23	17	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:12	26	26	23	17	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:13	26	26	23	17	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:14	26	26	23	17	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:15	26	26	23	17	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:16	26	26	23	17	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:17	26	26	23	17	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:18	26	26	23	17	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:19	26	26	23	17	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:20	26	26	23	17	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:21	26	26	23	17	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:22	26	26	23	17	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:23	26	26	23	17	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:24	26	26	23	17	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:25	26	26	23	17	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:26	26	26	23	17	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:27	26	26	23	17	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:28	26	26	23	17	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:29	26	26	23	17	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:30	26	26	23	17	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:31	26	26	23	17	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:32	26	26	23	17	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:33	26	26	23	17	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:34	26	26	23	17	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:35	26	26	23	17	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:36	26	26	23	17	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:37	26	26	23	17	8	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:38	26	26	23	17	8	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:39	26	26	23	17	8	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:40	26	26	23	17	8	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:41	26	26	23	17	8	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:42	26	26	23	17	6	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:43	26	26	23	17	5	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:44	26	26	23	17	6	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:45	26	26	23	17	6	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:46	26	26	23	17	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:47	26	26	23	17	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:48	26	26	23	17	8	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:49	26	26	23	17	8	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:50	26	26	23	17	9	0	0	0	0	84	69	63	17	13	13
4/25/2012 10:51	26	26	23	17	7	0	0	0	0	84	69	63	17	13	13

	Secondary voltage to TR1 KV	Secondary voltage to TR2 KV	Secondary voltage to TR3 KV	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1	Arcs/min on TR2	Arcs/min on TR3	A TR1 11I0067A	A TR2 11I0068A	A TR3 11I0069A	KW TR1 11J0067A	KW TR2 11J0068A	Primary power to TR2
4/25/2012 12:20	26	26	22	16	6	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:21	26	26	22	16	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:22	26	26	22	16	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:23	26	26	22	16	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:24	26	26	22	16	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:25	26	26	22	16	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:26	26	26	22	16	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:27	26	26	22	16	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:28	26	26	22	16	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:29	26	26	22	16	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:30	26	26	22	16	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:31	26	26	22	16	6	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:32	26	26	22	16	6	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:33	26	26	22	16	6	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:34	26	26	22	16	6	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:35	26	26	22	16	6	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:36	26	25	22	16	6	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:37	26	25	22	16	6	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:38	26	25	22	16	6	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:39	26	25	22	16	6	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:40	26	25	22	16	6	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:41	26	25	22	16	6	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:42	26	25	22	16	6	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:43	26	25	22	16	6	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:44	26	25	22	16	6	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:45	26	25	22	16	6	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:46	26	25	22	16	6	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:47	26	25	22	16	6	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:48	26	25	22	16	6	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:49	26	25	22	16	6	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:50	26	25	22	16	6	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:51	26	25	22	16	6	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:52	26	25	22	16	6	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:53	26	25	22	16	5	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:54	26	25	22	16	5	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:55	26	25	22	16	5	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:56	26	25	22	16	5	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:57	26	25	22	16	5	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:58	26	25	22	16	3	0	0	0	0	84	69	63	17	13	13
4/25/2012 12:59	26	25	22	16	3	0	0	0	0	84	69	63	17	13	13
4/25/2012 13:00	26	25	22	16	5	0	0	0	0	84	69	63	17	13	13
4/25/2012 13:01	26	25	22	16	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 13:02	26	25	22	16	6	0	0	0	0	84	69	63	17	13	13
4/25/2012 13:03	26	25	22	16	6	0	0	0	0	84	69	63	17	13	13

Secondary voltage to TR1 kV	Secondary voltage to TR2 kV	Secondary voltage to TR3 kV	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1	Arcs/min on TR2	Arcs/min on TR3	Primary current to TR1 A	Primary current to TR2 A	Primary current to TR3 A	Primary power to TR1 kW	Primary power to TR2 kW	Primary power to TR3 kW
4/25/2012 13:04	26	25	16	5	0	0	0	0	84	69	63	17	13	11J0068A
4/25/2012 13:05	26	25	16	4	0	0	0	0	84	69	63	17	13	11J0067A
4/25/2012 13:06	26	25	16	4	0	0	0	0	84	69	63	17	13	11J0069A
4/25/2012 13:07	26	25	16	4	0	0	0	0	84	69	63	17	13	11J0068A
4/25/2012 13:08	26	25	16	5	0	0	0	0	84	69	63	17	13	11J0067A
4/25/2012 13:09	26	25	16	5	0	0	0	0	84	69	63	17	13	11J0069A
4/25/2012 13:10	26	25	16	5	0	0	0	0	84	69	63	17	13	11J0068A
4/25/2012 13:11	26	25	16	5	0	0	0	0	84	69	63	17	13	11J0067A
4/25/2012 13:12	26	25	16	6	0	0	0	0	84	69	63	17	13	11J0069A
4/25/2012 13:13	26	25	16	6	0	0	0	0	84	69	63	17	13	11J0068A
4/25/2012 13:14	26	25	16	3	0	0	0	0	84	69	63	17	13	11J0067A
4/25/2012 13:15	26	25	16	2	0	0	0	0	84	69	63	17	13	11J0069A
4/25/2012 13:16	26	25	16	3	0	0	0	0	84	69	63	17	13	11J0068A
4/25/2012 13:17	26	25	16	7	0	0	0	0	84	69	63	17	13	11J0067A
4/25/2012 13:18	26	25	16	4	0	0	0	0	84	69	63	17	13	11J0069A
4/25/2012 13:19	26	25	16	3	0	0	0	0	84	69	63	17	13	11J0068A
4/25/2012 13:20	26	25	16	3	0	0	0	0	84	69	63	17	13	11J0067A
4/25/2012 13:21	26	25	16	3	0	0	0	0	84	69	63	17	13	11J0069A
4/25/2012 13:22	26	25	16	3	0	0	0	0	84	69	63	17	13	11J0068A
4/25/2012 13:23	26	25	16	3	0	0	0	0	84	69	63	17	13	11J0067A
4/25/2012 13:24	26	25	16	2	0	0	0	0	84	69	63	17	13	11J0069A
4/25/2012 13:25	26	25	16	2	0	0	0	0	84	69	63	17	13	11J0068A
4/25/2012 13:26	26	25	16	5	0	0	0	0	84	69	63	17	13	11J0067A
4/25/2012 13:27	26	25	16	4	0	0	0	0	84	69	63	17	13	11J0069A
4/25/2012 13:28	26	25	16	5	0	0	0	0	84	69	63	17	13	11J0068A
4/25/2012 13:29	26	25	16	6	0	0	0	0	84	69	63	17	13	11J0067A
4/25/2012 13:30	26	25	16	6	0	0	0	0	84	69	63	17	13	11J0069A
4/25/2012 13:31	26	25	16	6	0	0	0	0	84	69	63	17	13	11J0068A
4/25/2012 13:32	26	25	16	6	0	0	0	0	84	69	63	17	13	11J0067A
4/25/2012 13:33	26	25	16	6	0	0	0	0	84	69	63	17	13	11J0069A
4/25/2012 13:34	26	25	16	6	0	0	0	0	84	69	63	17	13	11J0068A
4/25/2012 13:35	26	25	16	6	0	0	0	0	84	69	63	17	13	11J0067A
4/25/2012 13:36	26	25	16	4	0	0	0	0	84	69	63	17	13	11J0069A
4/25/2012 13:37	26	25	16	4	0	0	0	0	84	69	63	17	13	11J0068A
4/25/2012 13:38	26	25	16	6	0	0	0	0	84	69	63	17	13	11J0067A
4/25/2012 13:39	26	25	16	6	0	0	0	0	84	69	63	17	13	11J0069A
4/25/2012 13:40	26	25	16	6	0	0	0	0	84	69	63	17	13	11J0068A
4/25/2012 13:41	26	25	16	6	0	0	0	0	84	69	63	17	13	11J0067A
4/25/2012 13:42	26	25	16	4	0	0	0	0	84	69	63	17	13	11J0069A
4/25/2012 13:43	26	25	16	2	0	0	0	0	84	69	63	17	13	11J0068A
4/25/2012 13:44	26	25	16	2	0	0	0	0	84	69	63	17	13	11J0067A
4/25/2012 13:45	26	25	16	3	0	0	0	0	84	69	63	17	13	11J0069A
4/25/2012 13:46	26	25	16	2	0	0	0	0	84	69	63	17	13	11J0068A
4/25/2012 13:47	26	25	16	2	0	0	0	0	84	69	63	17	13	11J0067A

Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1	Arcs/min on TR2	Arcs/min on TR3	Primary current to Primary current to Primary power to					
									TR1	TR2	TR3			
KV	KV	KV							A	A	A	KW	KW	KW
11E0032B	11E0033B	11E0034B	11XA0032A	11XA0033A	11XA0034A	11XA0032B	11XA0033B	11XA0034B	11I0067A	11I0068A	11I0069A	11J0067A	11J0068A	11J0069A
26	25	22	16	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 14:32	25	22	16	7	0	0	0	0	84	69	63	17	13	13
4/25/2012 14:33	25	22	16	5	0	0	0	0	84	69	63	17	13	13
4/25/2012 14:34	25	22	16	4	0	0	0	0	84	69	63	17	13	13
4/25/2012 14:35	25	22	16	4	0	0	0	0	84	69	63	17	13	13
4/25/2012 14:36	25	22	16	4	0	0	0	0	84	69	63	17	13	13
4/25/2012 14:37	25	22	16	4	0	0	0	0	84	69	63	17	13	13
4/25/2012 14:38	25	22	16	4	0	0	0	0	84	69	63	17	13	13
4/25/2012 14:39	25	22	16	4	0	0	0	0	84	69	63	17	13	13
4/25/2012 14:40	25	22	16	4	0	0	0	0	84	69	63	17	13	13
4/25/2012 14:41	25	22	16	4	0	0	0	0	84	69	63	17	13	13
4/25/2012 14:42	25	22	16	4	0	0	0	0	84	69	63	17	13	13
4/25/2012 14:43	25	22	16	5	0	0	0	0	84	69	63	17	13	13
4/25/2012 14:44	25	22	16	5	0	0	0	0	84	69	63	17	13	13
4/25/2012 14:45	25	22	16	5	0	0	0	0	84	69	63	17	13	13
4/25/2012 14:46	25	22	16	5	0	0	0	0	84	69	63	17	13	13
4/25/2012 14:47	25	22	16	5	0	0	0	0	84	69	63	17	13	13
4/25/2012 14:48	25	22	16	5	0	0	0	0	84	69	63	17	13	13
4/25/2012 14:49	25	22	16	5	0	0	0	0	84	69	63	17	13	13
4/25/2012 14:50	25	22	16	5	0	0	0	0	84	69	63	17	13	13
4/25/2012 14:51	25	22	16	3	0	0	0	0	84	69	63	17	13	13
4/25/2012 14:52	25	22	16	2	0	0	0	0	84	69	63	17	13	13
4/25/2012 14:53	25	22	16	3	0	0	0	0	84	69	63	17	13	13
4/25/2012 14:54	25	22	16	3	0	0	0	0	84	69	63	17	13	13
4/25/2012 14:55	25	22	16	4	0	0	0	0	84	69	63	17	13	13
4/25/2012 14:56	25	22	16	4	0	0	0	0	84	69	63	17	13	13
4/25/2012 14:57	25	22	16	5	0	0	0	0	84	69	63	17	13	13
4/25/2012 14:58	25	22	16	3	0	0	0	0	84	69	63	17	13	13
4/25/2012 14:59	25	22	16	4	0	0	0	0	84	69	63	17	13	13
4/25/2012 15:00	25	22	16	5	0	0	0	0	84	69	63	17	13	13
4/25/2012 15:01	25	22	16	5	0	0	0	0	84	69	63	17	13	13
4/25/2012 15:02	25	22	16	4	0	0	0	0	84	69	63	17	13	13
4/25/2012 15:03	25	22	16	4	0	0	0	0	84	69	63	17	13	13
4/25/2012 15:04	25	22	16	4	0	0	0	0	84	69	63	17	13	13
4/25/2012 15:05	25	22	16	2	0	0	0	0	84	69	63	17	13	13
4/25/2012 15:06	25	22	16	3	0	0	0	0	84	69	63	17	13	13
4/25/2012 15:07	25	22	16	5	0	0	0	0	84	69	63	17	13	13
4/25/2012 15:08	25	22	16	3	0	0	0	0	84	69	63	17	13	13
4/25/2012 15:09	25	22	16	2	0	0	0	0	84	69	63	17	13	13
4/25/2012 15:10	25	22	16	3	0	0	0	0	84	69	63	17	13	13
4/25/2012 15:11	25	22	16	3	0	0	0	0	84	69	63	17	13	13
4/25/2012 15:12	25	22	16	4	0	0	0	0	84	69	63	17	13	13
4/25/2012 15:13	25	22	16	3	0	0	0	0	84	69	63	17	13	13
4/25/2012 15:14	25	22	16	2	0	0	0	0	84	69	63	17	13	13
4/25/2012 15:15	25	22	16	4	0	0	0	0	84	69	63	17	13	13

	Secondary voltage to TR1 KV	Secondary voltage to TR2 KV	Secondary voltage to TR3 KV	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1	Arcs/min on TR2	Arcs/min on TR3	Primary current to TR1 A	Primary current to TR2 A	Primary current to TR3 A	Primary power to TR1 KW	Primary power to TR2 KW
4/25/2012 15:16	11E0032B 26	11E0033B 25	11E0034B 22	11XA0032A 16	11XA0033A 1	11XA0034A 0	11XA0032B 0	11XA0033B 0	11XA0034B 0	11I0067A 84	11I0068A 69	11I0069A 63	11J0067A 17	11J0068A 13
4/25/2012 15:17	26	25	22	16	4	0	0	0	0	84	69	63	17	13
4/25/2012 15:18	26	25	22	16	4	0	0	0	0	84	69	63	17	13
4/25/2012 15:19	26	25	22	16	3	0	0	0	0	84	69	63	17	13
4/25/2012 15:20	26	25	22	16	2	0	0	0	0	84	69	63	17	13
4/25/2012 15:21	26	25	22	16	1	0	0	0	0	84	69	63	17	13
4/25/2012 15:22	26	25	22	16	2	0	0	0	0	84	69	63	17	13
4/25/2012 15:23	26	25	22	16	2	0	0	0	0	84	69	63	17	13

Primary power to TR3	Secondary current to TR1	Secondary current to TR2	Secondary current to TR3	Primary voltage to TR1	Primary voltage to TR2	Primary voltage to TR3	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1
kW	mA	mA	mA	V	V	V	kV	kV	kV	11XA0067A	11XA0068A	11XA0069A	11XA0067B
11JU0069A	11IU0067B	11IU0068B	11IU0069B	11E0067A	11E0068A	11E0069A	11E0067B	11E0068B	11E0069B				
11	401	301	301	256	239	229	32	27	24	0	0	1	0
4/25/2012 8:40													
4/25/2012 8:41	401	301	301	256	239	229	32	27	24	0	0	1	0
4/25/2012 8:42	401	301	301	256	239	229	32	27	24	0	0	1	0
4/25/2012 8:43	401	301	301	256	239	229	32	27	24	0	0	1	0
4/25/2012 8:44	401	301	301	256	239	229	32	27	24	0	0	1	0
4/25/2012 8:45	401	301	301	256	239	229	32	27	24	0	0	1	0
4/25/2012 8:46	401	301	301	256	239	229	32	27	24	0	0	1	0
4/25/2012 8:47	401	301	301	256	239	229	32	27	24	0	0	1	0
4/25/2012 8:48	401	301	301	256	239	229	32	27	24	0	0	1	0
4/25/2012 8:49	401	301	301	256	239	229	32	27	24	0	0	1	0
4/25/2012 8:50	401	301	301	256	239	229	32	27	24	0	0	1	0
4/25/2012 8:51	401	301	301	256	239	229	32	27	24	0	0	1	0
4/25/2012 8:52	401	301	301	256	239	229	32	27	24	0	0	1	0
4/25/2012 8:53	401	301	301	256	239	229	32	27	24	0	0	1	0
4/25/2012 8:54	401	301	301	256	239	229	32	27	23	0	0	1	0
4/25/2012 8:55	401	301	301	256	239	229	32	27	23	0	0	1	0
4/25/2012 8:56	401	301	301	256	239	229	32	27	23	0	0	1	0
4/25/2012 8:57	401	301	301	256	239	229	32	27	23	0	0	1	0
4/25/2012 8:58	401	301	301	256	239	229	32	27	23	0	0	1	0
4/25/2012 8:59	401	301	301	256	239	229	32	27	23	0	0	1	0
4/25/2012 9:00	401	301	301	256	239	229	32	27	23	0	0	1	0
4/25/2012 9:01	401	301	301	256	239	229	32	27	23	0	0	1	0
4/25/2012 9:02	401	301	301	256	239	229	32	27	23	0	0	1	0
4/25/2012 9:03	401	301	301	256	239	229	32	27	23	0	0	1	0
4/25/2012 9:04	401	301	301	256	239	229	32	27	23	0	0	1	0
4/25/2012 9:05	401	301	301	256	239	229	32	27	23	0	0	1	0
4/25/2012 9:06	401	301	301	256	239	229	32	27	23	0	0	1	0
4/25/2012 9:07	401	301	301	256	239	229	32	27	23	0	0	1	0
4/25/2012 9:08	401	301	301	256	239	229	32	27	23	0	0	1	0
4/25/2012 9:09	401	301	301	256	239	229	32	27	23	0	0	1	0
4/25/2012 9:10	401	301	301	256	239	229	32	27	23	0	0	1	0
4/25/2012 9:11	401	301	301	256	239	229	32	27	23	0	0	1	0
4/25/2012 9:12	401	301	301	256	239	229	32	27	23	0	0	1	0
4/25/2012 9:13	401	301	301	256	239	229	32	27	23	0	0	1	0
4/25/2012 9:14	401	301	301	256	239	229	32	26	23	0	0	1	0
4/25/2012 9:15	401	301	301	256	239	229	32	26	23	0	0	1	0
4/25/2012 9:16	401	301	301	256	239	229	32	26	23	0	0	1	0
4/25/2012 9:17	401	301	301	256	239	229	32	26	23	0	0	1	0
4/25/2012 9:18	401	301	301	256	239	229	32	26	23	0	0	1	0
4/25/2012 9:19	401	301	301	256	239	228	32	26	23	0	0	1	0
4/25/2012 9:20	401	301	301	256	239	228	32	26	23	0	0	1	0
4/25/2012 9:21	401	301	301	256	239	228	32	26	23	0	0	1	0
4/25/2012 9:22	401	301	301	256	239	228	32	26	23	0	0	1	0
4/25/2012 9:23	401	301	301	256	239	228	32	26	23	0	0	1	0

Primary power to TR3	Secondary current to TR1	Secondary current to TR2	Secondary current to TR3	Primary voltage to Primary voltage to TR1	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcls/min on TR1
kW	mA	mA	mA	TR1 V	TR2 V	TR3 V	kV	11XA0067A	11XA0068A	11XA0069A	11XA0067B
11J0069A	11I0067B	11I0068B	11I0069B	11E0067A	11E0068A	11E0069A	11E0067B	11E0068B	11E0069B		
11	401	301	301	256	239	228	32	26	23	0	0
4/25/2012 9:24											
11	401	301	301	256	239	228	32	26	23	0	0
4/25/2012 9:25											
11	401	301	301	256	239	228	32	26	23	0	0
4/25/2012 9:26											
11	401	301	301	256	239	228	32	26	23	0	0
4/25/2012 9:27											
11	401	301	301	256	239	228	32	26	23	0	0
4/25/2012 9:28											
11	401	301	301	256	239	228	32	26	23	0	0
4/25/2012 9:29											
11	401	301	301	256	239	228	32	26	23	0	0
4/25/2012 9:30											
11	401	301	301	256	239	228	32	26	23	0	0
4/25/2012 9:31											
11	401	301	301	256	239	228	32	26	23	0	0
4/25/2012 9:32											
11	401	301	301	256	239	228	32	26	23	0	0
4/25/2012 9:33											
11	401	301	301	256	239	228	32	26	23	0	0
4/25/2012 9:34											
11	401	301	301	256	239	228	32	26	23	0	0
4/25/2012 9:35											
11	401	301	301	256	239	228	32	26	23	0	0
4/25/2012 9:36											
11	401	301	301	256	239	228	32	26	23	0	0
4/25/2012 9:37											
11	401	301	301	256	239	228	32	26	23	0	0
4/25/2012 9:38											
11	401	301	301	256	239	228	32	26	23	0	0
4/25/2012 9:39											
11	401	301	301	256	239	228	32	26	23	0	0
4/25/2012 9:40											
11	401	301	301	256	239	228	32	26	23	0	0
4/25/2012 9:41											
11	401	301	301	256	239	228	32	26	23	0	0
4/25/2012 9:42											
11	401	301	301	256	239	228	32	26	23	0	0
4/25/2012 9:43											
11	401	301	301	256	239	228	32	26	23	0	0
4/25/2012 9:44											
11	401	301	301	256	239	228	32	26	23	0	0
4/25/2012 9:45											
11	401	301	301	256	239	228	32	26	23	0	0
4/25/2012 9:46											
11	401	301	301	256	239	228	32	26	23	0	0
4/25/2012 9:47											
11	401	301	301	256	239	228	32	26	23	0	0
4/25/2012 9:48											
11	401	301	301	256	239	228	32	26	23	0	0
4/25/2012 9:49											
11	401	301	301	256	239	228	32	26	23	0	0
4/25/2012 9:50											
11	401	301	301	256	239	228	32	26	23	0	0
4/25/2012 9:51											
11	401	301	301	256	238	228	32	26	23	0	0
4/25/2012 9:52											
11	401	301	301	256	238	228	32	26	23	0	0
4/25/2012 9:53											
11	401	301	301	256	238	228	32	26	23	0	0
4/25/2012 9:54											
11	401	301	301	256	238	228	32	26	23	0	0
4/25/2012 9:55											
11	401	301	301	256	238	228	32	26	23	0	0
4/25/2012 9:56											
11	401	301	301	256	238	228	32	26	23	0	0
4/25/2012 9:57											
11	401	301	301	256	238	228	32	26	23	0	0
4/25/2012 9:58											
11	401	301	301	256	238	228	32	26	23	0	0
4/25/2012 9:59											
11	401	301	301	256	238	228	32	26	23	0	0
4/25/2012 10:00											
11	401	301	301	256	238	228	32	26	23	0	0
4/25/2012 10:01											
11	401	301	301	256	238	228	32	26	23	0	0
4/25/2012 10:02											
11	401	301	301	256	238	228	32	26	23	0	0
4/25/2012 10:03											
11	401	301	301	256	238	228	32	26	23	0	0
4/25/2012 10:04											
11	401	301	301	256	238	228	32	26	23	0	0
4/25/2012 10:05											
11	401	301	301	256	238	228	32	26	23	0	0
4/25/2012 10:06											
11	401	301	301	256	238	228	32	26	23	0	0
4/25/2012 10:07											
11	401	301	301	256	238	228	32	26	23	0	0

Primary power to TR3	Primary voltage to Primary voltage to Primary voltage to TR3	Secondary current to TR3	Secondary current to TR2	Secondary current to TR1	Primary voltage to TR1	Primary voltage to TR2	Primary voltage to TR3	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	ArCs/min on TR1
kW	V	V	V	V	V	V	V	kV	kV	kV	11XA0067A	11XA0068A	11XA0069A	11XA0067B
11JU0069A	11JU0067B	11JU0068B	11JU0069B	11E0067A	11E0068A	11E0069A	11E0067B	11E0068B	11E0069B					
11	401	301	301	256	238	228	32	26	23	0	0	0	1	0
4/25/2012 10:08														
11	401	301	301	256	238	228	32	26	23	0	0	0	1	0
4/25/2012 10:09														
11	401	301	301	256	238	228	32	26	23	0	0	0	1	0
4/25/2012 10:10														
11	401	301	301	256	238	228	32	26	23	0	0	0	1	0
4/25/2012 10:11														
11	401	301	301	256	238	228	32	26	23	0	0	0	1	0
4/25/2012 10:12														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:13														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:14														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:15														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:16														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:17														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:18														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:19														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:20														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:21														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:22														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:23														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:24														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:25														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:26														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:27														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:28														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:29														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:30														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:31														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:32														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:33														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:34														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:35														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:36														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:37														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:38														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:39														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:40														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:41														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:42														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:43														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:44														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:45														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:46														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:47														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:48														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:49														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:50														
11	401	301	301	256	238	228	31	26	22	0	0	0	1	0
4/25/2012 10:51														

Primary power to TR3	Primary voltage to Primary voltage to Primary voltage to TR3	Secondary current to TR2	Secondary current to TR3	Primary voltage to TR1	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1
kW	V	mA	mA	V	kV	kV	kV	11XA0067A	11XA0068A	11XA0069A	11XA0067B
11JU069A	11E0067A	11JU068B	11JU069B	11E0068A	11E0067B	11E0068B	11E0069B				
11	256	301	301	238	31	26	22	0	0	0	0
4/25/2012 10:52	256	301	301	238	31	26	22	0	0	0	0
4/25/2012 10:53	256	301	301	238	31	26	22	0	0	0	0
4/25/2012 10:54	256	301	301	238	31	26	22	0	0	0	0
4/25/2012 10:55	256	301	301	238	31	26	22	0	0	0	0
4/25/2012 10:56	256	301	301	238	31	26	22	0	0	0	0
4/25/2012 10:57	256	301	301	238	31	26	22	0	0	0	0
4/25/2012 10:58	256	301	301	238	31	26	22	0	0	0	0
4/25/2012 10:59	256	301	301	238	31	26	22	0	0	0	0
4/25/2012 11:00	256	301	301	238	31	26	22	0	0	0	0
4/25/2012 11:01	256	301	301	238	31	26	22	0	0	0	0
4/25/2012 11:02	256	301	301	238	31	26	22	0	0	0	0
4/25/2012 11:03	256	301	301	238	31	26	22	0	0	0	0
4/25/2012 11:04	256	301	301	238	31	26	22	0	0	0	0
4/25/2012 11:05	256	301	301	238	31	26	22	0	0	0	0
4/25/2012 11:06	256	301	301	238	31	26	22	0	0	0	0
4/25/2012 11:07	256	301	301	238	31	26	22	0	0	0	0
4/25/2012 11:08	256	301	301	238	31	26	22	0	0	0	0
4/25/2012 11:09	256	301	301	238	31	26	22	0	0	0	0
4/25/2012 11:10	256	301	301	238	31	26	22	0	0	0	0
4/25/2012 11:11	256	301	301	238	31	26	22	0	0	0	0
4/25/2012 11:12	256	301	301	238	31	25	22	0	0	0	0
4/25/2012 11:13	256	301	301	238	31	25	22	0	0	0	0
4/25/2012 11:14	256	301	301	238	31	25	22	0	0	0	0
4/25/2012 11:15	256	301	301	238	31	25	22	0	0	0	0
4/25/2012 11:16	256	301	301	238	31	25	22	0	0	0	0
4/25/2012 11:17	256	301	301	238	31	25	22	0	0	0	0
4/25/2012 11:18	256	301	301	238	31	25	22	0	0	0	0
4/25/2012 11:19	256	301	301	238	31	25	22	0	0	0	0
4/25/2012 11:20	256	301	301	238	31	25	22	0	0	0	0
4/25/2012 11:21	256	301	301	238	31	25	22	0	0	0	0
4/25/2012 11:22	256	301	301	238	31	25	22	0	0	0	0
4/25/2012 11:23	256	301	301	238	31	25	22	0	0	0	0
4/25/2012 11:24	256	301	301	238	31	25	22	0	0	0	0
4/25/2012 11:25	256	301	301	238	31	25	22	0	0	0	0
4/25/2012 11:26	256	301	301	238	31	25	22	0	0	0	0
4/25/2012 11:27	256	301	301	238	31	25	22	0	0	0	0
4/25/2012 11:28	256	301	301	238	31	25	22	0	0	0	0
4/25/2012 11:29	256	301	301	238	31	25	22	0	0	0	0
4/25/2012 11:30	256	301	301	238	31	25	22	0	0	0	0
4/25/2012 11:31	256	301	301	238	31	25	21	0	0	0	0
4/25/2012 11:32	256	301	301	238	31	25	21	0	0	0	0
4/25/2012 11:33	256	301	301	238	31	25	21	0	0	0	0
4/25/2012 11:34	256	301	301	238	31	25	21	0	0	0	0
4/25/2012 11:35	256	301	301	238	31	25	21	0	0	0	0

Primary power to TR3	Primary voltage to Primary voltage to Primary voltage to TR3	Secondary current to TR3	Secondary current to TR2	Secondary current to TR1	Primary voltage to TR1	Primary voltage to TR2	Primary voltage to TR3	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1
kW	V	mA	mA	mA	V	V	V	kV	kV	kV	11XA0067A	11XA0068A	11XA0069A	11XA0067B
11J0069A	11E0067A	11I0069B	11I0068B	11I0067B	11E0068A	11E0068A	11E0069A	11E0067B	11E0068B	11E0069B	0	0	0	0
11	256	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 11:36														
11	256	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 11:37														
11	256	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 11:38														
11	256	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 11:39														
11	256	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 11:40														
11	256	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 11:41														
11	256	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 11:42														
11	256	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 11:43														
11	256	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 11:44														
11	256	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 11:45														
11	256	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 11:46														
11	256	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 11:47														
11	256	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 11:48														
11	256	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 11:49														
11	256	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 11:50														
11	256	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 11:51														
11	256	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 11:52														
11	256	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 11:53														
11	256	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 11:54														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 11:55														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 11:56														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 11:57														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 11:58														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 11:59														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 12:00														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 12:01														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 12:02														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 12:03														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 12:04														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 12:05														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 12:06														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 12:07														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 12:08														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 12:09														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 12:10														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 12:11														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 12:12														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 12:13														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 12:14														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 12:15														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 12:16														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 12:17														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 12:18														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 12:19														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0

Primary power to TR3	Primary voltage to Primary voltage to Primary voltage to TR3	Secondary current to TR3	Secondary current to TR2	Secondary current to TR1	Primary voltage to TR1	Primary voltage to TR2	Primary voltage to TR3	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1
kW	V	mA	mA	mA	V	V	V	kV	kV	kV	11XA0067A	11XA0068A	11XA0069A	11XA0067B
11J0069A	11E0067A	11I0068B	11I0068B	11I0067B	11E0068A	11E0068A	11E0069A	11E0067B	11E0068B	11E0069B	0	0	0	0
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:04														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:05														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:06														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:07														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:08														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:09														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:10														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:11														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:12														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:13														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:14														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:15														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:16														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:17														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:18														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:19														
11	255	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:20														
11	254	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:21														
11	254	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:22														
11	254	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:23														
11	254	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:24														
11	254	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:25														
11	254	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:26														
11	254	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:27														
11	254	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:28														
11	254	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:29														
11	254	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:30														
11	254	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:31														
11	254	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:32														
11	254	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:33														
11	254	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:34														
11	254	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:35														
11	254	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:36														
11	254	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:37														
11	254	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:38														
11	254	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:39														
11	254	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:40														
11	254	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:41														
11	254	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:42														
11	254	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:43														
11	254	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:44														
11	254	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:45														
11	254	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:46														
11	254	300	301	401	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:47														
11	254	300	301	401	238	238	228	31	25	21	0	0	0	0

Primary power to TR3	Primary voltage to Primary voltage to Primary voltage to	Secondary current to TR1	Secondary current to TR2	Secondary current to TR3	Primary voltage to TR1	Primary voltage to TR2	Primary voltage to TR3	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1
kW	V	mA	mA	mA	V	V	V	kV	kV	kV	11XA0067A	11XA0068A	11XA0069A	11XA0067B
11J0069A	11E0067A	11I0068B	11I0068B	11I0069B	11E0068A	11E0068A	11E0069A	11E0067B	11E0068B	11E0069B	11XA0067A	11XA0068A	11XA0069A	11XA0067B
11	254	300	301	300	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:48	254	300	301	300	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:49	254	300	301	300	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:50	254	300	301	300	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:51	254	300	301	300	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:52	254	300	301	300	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:53	254	300	301	300	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:54	254	300	301	300	238	238	228	31	25	21	0	0	0	0
4/25/2012 13:55	254	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 13:56	254	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 13:57	254	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 13:58	254	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 13:59	254	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 14:00	254	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 14:01	254	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 14:02	256	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 14:03	257	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 14:04	257	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 14:05	257	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 14:06	257	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 14:07	257	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 14:08	257	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 14:09	257	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 14:10	257	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 14:11	256	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 14:12	256	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 14:13	256	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 14:14	256	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 14:15	256	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 14:16	256	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 14:17	256	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 14:18	256	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 14:19	256	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 14:20	256	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 14:21	256	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 14:22	256	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 14:23	256	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 14:24	256	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 14:25	256	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 14:26	255	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 14:27	255	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 14:28	255	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 14:29	255	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 14:30	255	300	301	300	237	237	228	31	25	21	0	0	0	0
4/25/2012 14:31	255	300	301	300	237	237	228	31	25	21	0	0	0	0

Primary power to TR3	Primary voltage to Primary voltage to Primary voltage to TR3	Secondary current to TR1	Secondary current to TR2	Secondary current to TR3	Primary voltage to TR1	Primary voltage to TR2	Primary voltage to TR3	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1
11J0069A	11E0067A	11I0068B	11I0068B	11I0069B	11E0068A	11E0068A	11E0069A	11E0067B	11E0068B	11E0069B	11XA0067A	11XA0068A	11XA0069A	11XA0067B
kW	V	mA	mA	mA	V	V	V	kV	kV	kV				
4/25/2012 14:32	255	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 14:33	255	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 14:34	255	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 14:35	255	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 14:36	255	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 14:37	255	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 14:38	255	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 14:39	255	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 14:40	255	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 14:41	255	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 14:42	254	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 14:43	254	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 14:44	254	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 14:45	254	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 14:46	254	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 14:47	254	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 14:48	254	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 14:49	254	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 14:50	254	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 14:51	254	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 14:52	254	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 14:53	254	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 14:54	254	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 14:55	254	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 14:56	254	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 14:57	254	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 14:58	255	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 14:59	255	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 15:00	255	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 15:01	255	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 15:02	255	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 15:03	255	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 15:04	255	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 15:05	255	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 15:06	255	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 15:07	255	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 15:08	255	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 15:09	255	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 15:10	255	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 15:11	255	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 15:12	255	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 15:13	255	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 15:14	255	301	301	300	237	228	228	31	25	21	0	0	0	0
4/25/2012 15:15	255	301	301	300	237	228	228	31	25	21	0	0	0	0

Primary power to TR3	KW	Secondary current to TR1	Secondary current to TR2	Secondary current to TR3	Primary voltage to Primary voltage to Primary voltage to			Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1
		mA	mA	mA	TR1	TR2	TR3							
					V	V	V	kV	kV	kV				
4/25/2012 15:16	11	401	301	300	256	237	228	31	25	21	0	0	0	0
4/25/2012 15:17	11	401	301	300	256	237	228	31	25	21	0	0	0	0
4/25/2012 15:18	11	401	301	300	256	237	228	31	25	21	0	0	0	0
4/25/2012 15:19	11	401	301	300	256	237	228	31	25	21	0	0	0	0
4/25/2012 15:20	11	401	301	300	256	237	228	31	25	21	0	0	0	0
4/25/2012 15:21	11	401	301	300	256	237	228	31	25	21	0	0	0	0
4/25/2012 15:22	11	401	301	300	256	237	228	31	25	21	0	0	0	0
4/25/2012 15:23	11	401	301	300	256	237	228	31	25	21	0	0	0	0

Date/Time	11XA0068B	11XA0069B	Inst Opacity %	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	CORRECTED REGEN SO2 ppm	CORRECTED REGEN NOX ppm	CORRECTED REGEN CO ppm	FCC Feed Sulfur wt%	Wet Air rate to regen mscfd	Flue gas CO2 %
4/25/2012 9:24	0	0	1.2	1251	1230	1245	1249	1253	3	29	97	0.056	11F0175	11A0815
4/25/2012 9:25	0	0	1.2	1251	1231	1244	1249	1253	3	29	92	0.056	82384	16.41
4/25/2012 9:26	0	0	1.3	1252	1231	1246	1249	1253	3	29	95	0.056	82423	16.51
4/25/2012 9:27	0	0	1.2	1253	1230	1246	1248	1253	3	29	100	0.056	82462	16.58
4/25/2012 9:28	0	0	1.2	1252	1228	1245	1249	1252	3	29	90	0.056	82502	16.57
4/25/2012 9:29	0	0	1.1	1250	1229	1244	1249	1252	3	28	90	0.056	82537	16.59
4/25/2012 9:30	0	0	1.1	1250	1230	1244	1249	1253	3	29	84	0.056	82524	16.56
4/25/2012 9:31	0	0	1.1	1251	1232	1245	1249	1252	3	29	83	0.056	82494	16.57
4/25/2012 9:32	0	0	1.1	1251	1232	1246	1249	1252	4	28	83	0.056	82465	16.65
4/25/2012 9:33	0	0	1.0	1251	1232	1246	1249	1252	6	29	86	0.056	82436	16.72
4/25/2012 9:34	0	0	1.0	1252	1231	1245	1249	1253	7	29	75	0.056	82406	16.61
4/25/2012 9:35	0	0	1.0	1252	1231	1245	1249	1253	8	29	74	0.056	82377	16.69
4/25/2012 9:36	0	0	1.0	1252	1232	1246	1249	1254	8	29	77	0.056	82351	16.65
4/25/2012 9:37	0	0	0.9	1253	1232	1246	1250	1254	7	29	80	0.056	82379	16.63
4/25/2012 9:38	0	0	0.9	1253	1231	1246	1250	1254	6	29	83	0.056	82427	16.67
4/25/2012 9:39	0	0	1.0	1252	1231	1246	1250	1254	5	28	77	0.056	82475	16.66
4/25/2012 9:40	0	0	1.1	1252	1231	1246	1250	1254	5	28	77	0.056	82519	16.65
4/25/2012 9:41	0	0	1.1	1252	1231	1246	1250	1254	5	28	82	0.056	82510	16.57
4/25/2012 9:42	0	0	1.1	1252	1232	1245	1250	1254	4	28	83	0.056	82481	16.55
4/25/2012 9:43	0	0	1.0	1252	1232	1245	1250	1254	4	29	90	0.056	82452	16.56
4/25/2012 9:44	0	0	1.1	1252	1232	1245	1250	1254	4	28	89	0.056	82423	16.56
4/25/2012 9:45	0	0	1.0	1252	1231	1246	1250	1253	3	28	95	0.056	82394	16.57
4/25/2012 9:46	0	0	1.0	1252	1231	1246	1249	1253	3	28	89	0.056	82365	16.57
4/25/2012 9:47	0	0	1.1	1252	1232	1246	1249	1253	3	29	87	0.056	82336	16.58
4/25/2012 9:48	0	0	1.1	1252	1231	1247	1249	1253	3	29	87	0.056	82307	16.51
4/25/2012 9:49	0	0	1.2	1253	1231	1246	1249	1253	3	28	88	0.056	82284	16.52
4/25/2012 9:50	0	0	1.1	1252	1231	1246	1249	1253	3	29	96	0.056	82352	16.56
4/25/2012 9:51	0	0	1.2	1251	1231	1246	1249	1253	3	29	93	0.056	82454	16.54
4/25/2012 9:52	0	0	1.2	1251	1231	1246	1249	1253	3	29	94	0.056	82550	16.51
4/25/2012 9:53	0	0	1.2	1251	1231	1246	1249	1252	5	29	94	0.056	82554	16.48
4/25/2012 9:54	0	0	1.2	1251	1232	1246	1249	1252	7	29	102	0.056	82523	16.51
4/25/2012 9:55	0	0	1.3	1251	1231	1245	1248	1252	8	30	103	0.056	82491	16.44
4/25/2012 9:56	0	0	1.3	1251	1230	1245	1248	1252	7	29	91	0.056	82459	16.50
4/25/2012 9:57	0	0	1.3	1252	1230	1245	1248	1251	7	29	85	0.056	82428	16.55
4/25/2012 9:58	0	0	1.3	1251	1230	1245	1248	1251	6	29	92	0.056	82396	16.58
4/25/2012 9:59	0	0	1.2	1251	1230	1246	1248	1252	6	28	82	0.056	82365	16.56
4/25/2012 10:00	0	0	1.2	1251	1230	1246	1248	1252	5	28	80	0.056	82333	16.58
4/25/2012 10:01	0	0	1.1	1251	1231	1245	1248	1253	5	29	78	0.056	82302	16.67
4/25/2012 10:02	0	0	1.1	1251	1232	1245	1249	1253	4	29	82	0.056	82298	16.63
4/25/2012 10:03	0	0	1.0	1251	1232	1245	1249	1252	4	29	93	0.056	82305	16.59
4/25/2012 10:04	0	0	1.1	1251	1232	1246	1249	1252	4	29	93	0.056	82312	16.58
4/25/2012 10:05	0	0	1.2	1251	1231	1246	1249	1252	3	28	87	0.056	82320	16.57
4/25/2012 10:06	0	0	1.1	1250	1231	1246	1249	1252	3	28	89	0.056	82327	16.55
4/25/2012 10:07	0	0	1.1	1251	1231	1245	1249	1252	3	28	85	0.056	82334	16.54
														16.55

	Arct/min on TR2	Arct/min on TR3	Inst Opacity %	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	CORRECTED REGEN SO2 ppm	CORRECTED REGEN NOX ppm	CORRECTED REGEN CO ppm	FCC Feed Sulfur wt%	Wet Air rate to regen mscfd	Flue gas CO2 %
	11XA0068B	11XA0069B	11A100689	11T100520	11T100621	11T100522	11T100523	11T100524	11M100812	11M100813	11M100814	11CFLSFLRLD	11F10175	11A100815
4/25/2012 10:08	0	0	1.1	1251	1231	1245	1249	1252	3	28	81	0.056	82349	16.56
4/25/2012 10:09	0	0	1.1	1250	1231	1246	1248	1252	3	28	84	0.056	82356	16.67
4/25/2012 10:10	0	0	1.2	1250	1231	1246	1249	1252	3	28	84	0.056	82363	16.64
4/25/2012 10:11	0	0	1.1	1251	1231	1245	1249	1252	4	28	90	0.056	82370	16.66
4/25/2012 10:12	0	0	1.1	1251	1231	1245	1249	1252	6	28	83	0.056	82378	16.62
4/25/2012 10:13	0	0	1.1	1251	1231	1245	1249	1252	7	29	83	0.056	82385	16.65
4/25/2012 10:14	0	0	1.3	1253	1231	1245	1249	1252	8	28	83	0.056	82407	16.64
4/25/2012 10:15	0	0	1.1	1253	1231	1246	1249	1253	8	29	77	0.056	82438	16.68
4/25/2012 10:16	0	0	1.1	1253	1232	1247	1249	1252	7	28	76	0.056	82468	16.68
4/25/2012 10:17	0	0	1.2	1253	1232	1247	1249	1253	6	28	78	0.056	82498	16.66
4/25/2012 10:18	0	0	1.1	1252	1232	1247	1250	1253	5	29	78	0.056	82529	16.66
4/25/2012 10:19	0	0	1.2	1252	1232	1246	1250	1253	5	28	80	0.056	82558	16.72
4/25/2012 10:20	0	0	1.1	1253	1231	1245	1251	1253	4	28	82	0.056	82533	16.63
4/25/2012 10:21	0	0	1.2	1253	1232	1246	1251	1254	4	28	82	0.056	82470	16.63
4/25/2012 10:22	0	0	1.2	1253	1233	1246	1250	1253	4	28	78	0.056	82407	16.59
4/25/2012 10:23	0	0	1.2	1253	1233	1247	1250	1253	4	28	84	0.056	82344	16.57
4/25/2012 10:24	0	0	1.3	1253	1233	1247	1250	1254	4	28	87	0.056	82281	16.61
4/25/2012 10:25	0	0	1.4	1253	1232	1246	1250	1254	3	29	97	0.056	82219	16.58
4/25/2012 10:26	0	0	1.4	1253	1232	1247	1250	1254	3	28	91	0.056	82227	16.55
4/25/2012 10:27	0	0	1.3	1253	1231	1246	1250	1254	3	28	87	0.056	82294	16.60
4/25/2012 10:28	0	0	1.2	1252	1232	1245	1250	1254	3	28	89	0.056	82360	16.55
4/25/2012 10:29	0	0	1.2	1251	1233	1245	1250	1254	4	28	87	0.056	82426	16.55
4/25/2012 10:30	0	0	1.3	1251	1233	1246	1250	1254	6	28	84	0.056	82428	16.59
4/25/2012 10:31	0	0	1.2	1252	1233	1246	1250	1254	7	29	84	0.056	82357	16.57
4/25/2012 10:32	0	0	1.2	1252	1232	1246	1249	1253	7	28	83	0.056	82286	16.63
4/25/2012 10:33	0	0	1.1	1252	1231	1245	1249	1254	7	28	80	0.056	82215	16.65
4/25/2012 10:34	0	0	1.0	1252	1231	1246	1249	1253	6	28	76	0.056	82145	16.66
4/25/2012 10:35	0	0	0.9	1252	1230	1246	1249	1253	5	28	79	0.056	82074	16.60
4/25/2012 10:36	0	0	0.9	1252	1231	1246	1250	1253	5	28	79	0.056	82003	16.62
4/25/2012 10:37	0	0	1.0	1253	1232	1247	1250	1253	4	28	81	0.056	82094	16.65
4/25/2012 10:38	0	0	0.9	1254	1232	1247	1250	1254	4	29	83	0.056	82296	16.63
4/25/2012 10:39	0	0	0.9	1253	1231	1246	1250	1254	4	28	88	0.056	82329	16.54
4/25/2012 10:40	0	0	1.0	1252	1231	1246	1250	1253	4	28	88	0.056	82360	16.48
4/25/2012 10:41	0	0	1.1	1251	1231	1246	1250	1253	4	29	93	0.056	82391	16.49
4/25/2012 10:42	0	0	1.2	1251	1231	1245	1250	1253	3	29	98	0.056	82422	16.45
4/25/2012 10:43	0	0	1.1	1251	1231	1245	1250	1253	3	29	93	0.056	82453	16.46
4/25/2012 10:44	0	0	1.2	1251	1231	1246	1249	1252	3	28	97	0.056	82484	16.50
4/25/2012 10:45	0	0	1.2	1251	1230	1245	1249	1252	3	29	97	0.056	82399	16.55
4/25/2012 10:46	0	0	1.1	1252	1232	1246	1249	1251	3	28	91	0.056	82216	16.56
4/25/2012 10:47	0	0	1.2	1251	1231	1246	1249	1252	3	28	90	0.056	82204	16.56
4/25/2012 10:48	0	0	1.2	1251	1232	1246	1249	1253	5	29	88	0.056	82164	16.64
4/25/2012 10:49	0	0	1.2	1251	1232	1245	1249	1253	7	29	82	0.056	82065	16.64
4/25/2012 10:50	0	0	1.2	1251	1233	1244	1249	1252	8	29	81	0.056	82102	16.70
4/25/2012 10:51	0	0	1.2	1251	1232	1244	1249	1252	8	29	88	0.056	82211	16.62

Date/Time	Arcs/min on TR2		Inst Opacity %	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	CORRECTED REGEN SO2 ppm	CORRECTED REGEN NOX ppm	CORRECTED REGEN CO ppm	FCC Feed Sulfur wt%	Wet Air rate to regen mscfd	Flue gas CO2 %
	11XA0068B	11XA0069B		11T0520	11T0521	11T0522	11T0523	11M0812	11M0813	11M0814	11CFLRLLD	11F0175	
4/25/2012 10:52	0	0	1.1	1252	1231	1245	1249	7	29	85	0.056	82168	16.61
4/25/2012 10:53	0	0	1.2	1252	1232	1246	1249	6	28	84	0.056	82384	16.62
4/25/2012 10:54	0	0	1.2	1251	1231	1245	1250	5	29	82	0.056	82112	16.64
4/25/2012 10:55	0	0	1.2	1252	1231	1245	1249	5	29	82	0.056	81944	16.71
4/25/2012 10:56	0	0	1.1	1252	1231	1246	1249	5	28	75	0.056	82048	16.73
4/25/2012 10:57	0	0	1.2	1252	1232	1247	1249	5	28	78	0.056	82066	16.74
4/25/2012 10:58	0	0	1.2	1252	1233	1247	1249	4	27	77	0.056	82030	16.79
4/25/2012 10:59	0	0	1.2	1252	1233	1247	1250	4	28	81	0.056	82286	16.76
4/25/2012 11:00	0	0	1.2	1253	1233	1246	1251	4	28	76	0.056	82288	16.75
4/25/2012 11:01	0	0	1.2	1253	1233	1246	1251	4	28	75	0.056	82279	16.65
4/25/2012 11:02	0	0	1.3	1254	1233	1246	1251	4	28	79	0.056	82269	16.65
4/25/2012 11:03	0	0	1.2	1253	1232	1247	1250	4	28	79	0.056	82260	16.70
4/25/2012 11:04	0	0	1.2	1252	1232	1247	1251	3	27	76	0.056	82250	16.70
4/25/2012 11:05	0	0	1.2	1254	1233	1247	1251	3	28	75	0.056	82241	16.67
4/25/2012 11:06	0	0	1.3	1253	1234	1247	1251	3	28	75	0.056	82231	16.64
4/25/2012 11:07	0	0	1.3	1253	1232	1246	1251	4	28	72	0.056	82222	16.65
4/25/2012 11:08	0	0	1.3	1253	1232	1245	1250	6	28	81	0.056	82212	16.64
4/25/2012 11:09	0	0	1.3	1253	1232	1247	1250	7	28	82	0.056	82202	16.64
4/25/2012 11:10	0	0	1.3	1252	1233	1248	1251	8	29	77	0.056	82193	16.66
4/25/2012 11:11	0	0	1.3	1252	1232	1246	1251	7	28	76	0.056	82183	16.65
4/25/2012 11:12	0	0	1.3	1253	1232	1246	1250	6	28	77	0.056	82185	16.66
4/25/2012 11:13	0	0	1.2	1253	1232	1246	1251	6	28	79	0.056	82222	16.63
4/25/2012 11:14	0	0	1.2	1253	1231	1247	1251	5	28	78	0.056	82263	16.61
4/25/2012 11:15	0	0	1.3	1253	1231	1247	1251	5	28	76	0.056	82304	16.62
4/25/2012 11:16	0	0	1.4	1253	1231	1246	1251	4	27	81	0.056	82345	16.57
4/25/2012 11:17	0	0	1.5	1253	1230	1246	1251	4	29	84	0.056	82386	16.58
4/25/2012 11:18	0	0	1.4	1253	1231	1248	1251	4	28	79	0.056	82412	16.61
4/25/2012 11:19	0	0	1.4	1253	1231	1247	1250	4	28	79	0.056	82389	16.63
4/25/2012 11:20	0	0	1.3	1251	1231	1246	1250	4	28	77	0.056	82361	16.68
4/25/2012 11:21	0	0	1.2	1251	1232	1246	1250	4	28	77	0.056	82334	16.61
4/25/2012 11:22	0	0	1.4	1252	1233	1247	1250	4	28	75	0.056	82296	16.69
4/25/2012 11:23	0	0	1.5	1253	1233	1248	1250	4	28	80	0.056	82220	16.68
4/25/2012 11:24	0	0	1.4	1254	1232	1248	1250	3	29	75	0.056	82141	16.70
4/25/2012 11:25	0	0	1.4	1253	1232	1247	1250	3	28	76	0.056	82062	16.65
4/25/2012 11:26	0	0	1.4	1253	1231	1247	1251	4	28	79	0.056	81982	16.62
4/25/2012 11:27	0	0	1.3	1253	1231	1246	1250	6	29	82	0.056	81903	16.59
4/25/2012 11:28	0	0	1.2	1253	1231	1247	1250	7	28	79	0.056	81824	16.59
4/25/2012 11:29	0	0	1.1	1253	1231	1247	1250	8	29	77	0.056	81825	16.66
4/25/2012 11:30	0	0	1.2	1253	1231	1247	1250	8	29	78	0.056	82163	16.60
4/25/2012 11:31	0	0	1.3	1252	1230	1247	1250	7	29	83	0.056	82277	16.62
4/25/2012 11:32	0	0	1.2	1252	1230	1246	1250	6	28	85	0.056	82288	16.64
4/25/2012 11:33	0	0	1.3	1253	1229	1245	1250	5	28	85	0.056	82030	16.61
4/25/2012 11:34	0	0	1.3	1253	1230	1245	1250	5	28	84	0.056	82103	16.63
4/25/2012 11:35	0	0	1.1	1253	1232	1247	1250	5	27	75	0.056	82230	16.75

Date/Time	11XA0068B	11XA0069B	Inst Opacity %	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	CORRECTED REGEN SO2 ppm	CORRECTED REGEN NOX ppm	CORRECTED REGEN CO ppm	FCC Feed Sulfur wt%	Wet Air rate to regen mscfd	Flue gas CO2 %
4/25/2012 11:36	0	0	1.1	1253	1247	1250	1254	1254	4	29	76	0.056	11F0175	11A0816
4/25/2012 11:37	0	0	1.2	1253	1247	1250	1254	1254	4	29	77	0.056	82331	16.68
4/25/2012 11:38	0	0	1.3	1252	1246	1250	1254	1254	4	28	92	0.056	82269	16.52
4/25/2012 11:39	0	0	1.3	1252	1245	1250	1254	1254	4	27	86	0.056	82207	16.53
4/25/2012 11:40	0	0	1.3	1253	1246	1250	1254	1254	4	28	96	0.056	82308	16.59
4/25/2012 11:41	0	0	1.2	1253	1246	1250	1254	1254	3	28	84	0.056	82114	16.57
4/25/2012 11:42	0	0	1.2	1253	1246	1250	1253	1253	4	28	77	0.056	82149	16.60
4/25/2012 11:43	0	0	1.2	1253	1244	1250	1253	1253	4	28	83	0.056	82244	16.65
4/25/2012 11:44	0	0	1.3	1253	1244	1250	1253	1253	3	28	83	0.056	82339	16.64
4/25/2012 11:45	0	0	1.3	1254	1246	1250	1253	1253	4	28	83	0.056	82426	16.64
4/25/2012 11:46	0	0	1.3	1253	1245	1250	1253	1253	5	28	83	0.056	82442	16.59
4/25/2012 11:47	0	0	1.4	1253	1245	1250	1253	1253	7	29	82	0.056	82444	16.56
4/25/2012 11:48	0	0	1.4	1253	1245	1250	1253	1253	8	29	82	0.056	82445	16.59
4/25/2012 11:49	0	0	1.5	1253	1246	1250	1254	1254	8	29	83	0.056	82446	16.62
4/25/2012 11:50	0	0	1.5	1254	1246	1250	1254	1254	8	29	79	0.056	82449	16.64
4/25/2012 11:51	0	0	1.3	1254	1247	1251	1253	1253	7	28	85	0.056	82409	16.56
4/25/2012 11:52	0	0	1.4	1253	1247	1250	1253	1253	6	28	85	0.056	82027	16.58
4/25/2012 11:53	0	0	1.4	1253	1247	1250	1253	1253	6	28	81	0.056	82202	16.63
4/25/2012 11:54	0	0	1.3	1252	1247	1250	1254	1254	5	28	74	0.056	82264	16.61
4/25/2012 11:55	0	0	1.2	1252	1247	1250	1254	1254	5	28	79	0.056	82245	16.66
4/25/2012 11:56	0	0	1.3	1251	1247	1250	1253	1253	5	28	75	0.056	82227	16.69
4/25/2012 11:57	0	0	1.2	1252	1247	1250	1253	1253	5	28	77	0.056	82209	16.63
4/25/2012 11:58	0	0	1.3	1252	1246	1250	1254	1254	4	28	79	0.056	82190	16.59
4/25/2012 11:59	0	0	1.4	1252	1246	1250	1254	1254	4	28	77	0.056	82172	16.65
4/25/2012 12:00	0	0	1.2	1251	1246	1250	1254	1254	4	28	78	0.058	82153	16.60
4/25/2012 12:01	0	0	1.3	1252	1247	1250	1253	1253	4	27	78	0.058	82135	16.73
4/25/2012 12:02	0	0	1.3	1252	1247	1250	1253	1253	4	27	80	0.058	82116	16.68
4/25/2012 12:03	0	0	1.3	1253	1247	1251	1254	1254	4	28	76	0.058	82098	16.63
4/25/2012 12:04	0	0	1.4	1253	1247	1250	1254	1254	4	28	83	0.058	82080	16.63
4/25/2012 12:05	0	0	1.3	1252	1246	1250	1255	1255	4	28	79	0.058	82062	16.62
4/25/2012 12:06	0	0	1.2	1252	1247	1250	1254	1254	5	28	78	0.058	82061	16.67
4/25/2012 12:07	0	0	1.2	1253	1246	1251	1253	1253	7	29	78	0.058	82064	16.67
4/25/2012 12:08	0	0	1.2	1253	1247	1251	1254	1254	9	28	88	0.058	82067	16.67
4/25/2012 12:09	0	0	1.2	1253	1248	1251	1254	1254	9	28	80	0.058	82071	16.70
4/25/2012 12:10	0	0	1.2	1252	1247	1251	1254	1254	9	29	77	0.058	82074	16.70
4/25/2012 12:11	0	0	1.1	1252	1246	1251	1254	1254	8	29	75	0.058	82077	16.65
4/25/2012 12:12	0	0	1.1	1252	1246	1251	1255	1255	7	28	77	0.058	82081	16.68
4/25/2012 12:13	0	0	1.2	1252	1247	1251	1255	1255	6	28	74	0.058	82084	16.68
4/25/2012 12:14	0	0	1.3	1253	1247	1251	1254	1254	6	28	74	0.058	82087	16.63
4/25/2012 12:15	0	0	1.2	1254	1247	1251	1254	1254	5	28	76	0.058	82091	16.65
4/25/2012 12:16	0	0	1.2	1254	1248	1251	1254	1254	5	28	86	0.058	82094	16.58
4/25/2012 12:17	0	0	1.2	1254	1249	1251	1254	1254	5	29	80	0.058	82097	16.61
4/25/2012 12:18	0	0	1.2	1254	1248	1251	1254	1254	5	28	85	0.058	82115	16.62
4/25/2012 12:19	0	0	1.2	1254	1247	1250	1254	1254	5	28	82	0.058	82337	16.65

Date/Time	Arct/min on TR2	Arct/min on TR3	Inst Opacity %	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	CORRECTED REGEN SO2 ppm	CORRECTED REGEN NOX ppm	CORRECTED REGEN CO ppm	FCC Feed Sulfur wt%	Wet Air rate to regen mscfd	Flue gas CO2 %
	11XA0068B	11XA0069B	11A10889	11T10520	11T10521	11T10522	11T10523	11T10524	11M10812	11M10813	11M10814	11CFLSLR.LD	11F10175	11A10815
4/25/2012 12:20	0	0	1.3	1254	1233	1246	1251	1254	5	28	91	0.058	82375	16.60
4/25/2012 12:21	0	0	1.3	1254	1233	1246	1251	1255	4	27	83	0.058	82325	16.64
4/25/2012 12:22	0	0	1.2	1253	1233	1247	1251	1255	4	28	77	0.058	82275	16.69
4/25/2012 12:23	0	0	1.3	1252	1234	1247	1251	1254	4	28	78	0.058	82225	16.65
4/25/2012 12:24	0	0	1.3	1253	1234	1248	1252	1254	4	28	76	0.058	82175	16.62
4/25/2012 12:25	0	0	1.3	1253	1233	1248	1251	1254	4	28	83	0.058	82125	16.59
4/25/2012 12:26	0	0	1.2	1253	1232	1248	1251	1254	5	29	86	0.058	82077	16.59
4/25/2012 12:27	0	0	1.3	1253	1233	1248	1251	1255	7	29	86	0.058	82070	16.51
4/25/2012 12:28	0	0	1.4	1253	1231	1248	1251	1254	8	29	91	0.058	82079	16.52
4/25/2012 12:29	0	0	1.4	1252	1231	1248	1251	1254	9	30	98	0.058	82088	16.40
4/25/2012 12:30	0	0	1.5	1252	1231	1246	1250	1253	8	30	96	0.058	82097	16.45
4/25/2012 12:31	0	0	1.4	1252	1231	1245	1250	1253	8	29	94	0.058	82107	16.50
4/25/2012 12:32	0	0	1.4	1252	1232	1247	1250	1253	7	29	99	0.058	82116	16.45
4/25/2012 12:33	0	0	1.4	1253	1232	1247	1250	1253	6	28	92	0.058	82125	16.49
4/25/2012 12:34	0	0	1.4	1252	1232	1245	1250	1252	6	29	91	0.058	82134	16.52
4/25/2012 12:35	0	0	1.4	1252	1231	1245	1249	1253	6	29	90	0.058	82141	16.54
4/25/2012 12:36	0	0	1.4	1251	1230	1246	1249	1253	5	29	86	0.058	82146	16.55
4/25/2012 12:37	0	0	1.3	1253	1231	1246	1249	1253	5	28	81	0.058	82151	16.57
4/25/2012 12:38	0	0	1.4	1253	1231	1245	1249	1254	5	29	83	0.058	82156	16.56
4/25/2012 12:39	0	0	1.3	1252	1232	1246	1250	1253	5	28	86	0.058	82161	16.53
4/25/2012 12:40	0	0	1.3	1252	1231	1246	1250	1253	5	29	84	0.058	82159	16.53
4/25/2012 12:41	0	0	1.3	1252	1230	1245	1250	1253	5	29	88	0.058	81917	16.54
4/25/2012 12:42	0	0	1.3	1251	1230	1246	1249	1253	4	29	86	0.058	82130	16.53
4/25/2012 12:43	0	0	1.4	1251	1231	1247	1249	1253	4	29	84	0.058	82045	16.58
4/25/2012 12:44	0	0	1.4	1251	1232	1246	1249	1253	4	28	78	0.058	82063	16.65
4/25/2012 12:45	0	0	1.4	1251	1231	1246	1249	1253	4	29	90	0.058	82086	16.58
4/25/2012 12:46	0	0	1.4	1251	1232	1246	1250	1253	5	29	77	0.058	81990	16.58
4/25/2012 12:47	0	0	1.3	1251	1232	1246	1250	1253	7	29	82	0.058	81974	16.59
4/25/2012 12:48	0	0	1.3	1251	1230	1246	1250	1253	9	29	77	0.058	82001	16.69
4/25/2012 12:49	0	0	1.4	1250	1230	1245	1249	1252	9	30	73	0.058	82028	16.69
4/25/2012 12:50	0	0	1.4	1250	1231	1244	1249	1252	9	29	80	0.058	82055	16.65
4/25/2012 12:51	0	0	1.2	1252	1231	1244	1249	1252	9	29	87	0.058	82082	16.61
4/25/2012 12:52	0	0	1.3	1251	1230	1245	1249	1252	8	28	83	0.058	82110	16.62
4/25/2012 12:53	0	0	1.2	1251	1229	1246	1249	1253	7	29	80	0.058	82137	16.62
4/25/2012 12:54	0	0	1.3	1251	1229	1246	1249	1253	7	29	77	0.058	82164	16.60
4/25/2012 12:55	0	0	1.3	1251	1231	1246	1249	1253	6	28	79	0.058	82191	16.64
4/25/2012 12:56	0	0	1.3	1252	1231	1246	1249	1253	6	28	79	0.058	82218	16.65
4/25/2012 12:57	0	0	1.2	1251	1230	1246	1250	1253	6	28	77	0.058	82184	16.64
4/25/2012 12:58	0	0	1.3	1251	1231	1246	1250	1253	5	28	75	0.058	82111	16.65
4/25/2012 12:59	0	0	1.4	1251	1231	1246	1250	1253	5	28	74	0.058	82092	16.67
4/25/2012 13:00	0	0	1.2	1251	1230	1247	1250	1252	5	28	81	0.058	82112	16.66
4/25/2012 13:01	0	0	1.2	1251	1231	1247	1249	1252	5	28	80	0.058	82131	16.61
4/25/2012 13:02	0	0	1.1	1252	1231	1246	1249	1252	5	28	78	0.058	82151	16.61
4/25/2012 13:03	0	0	1.1	1253	1231	1246	1249	1252	5	28	86	0.058	82170	16.60

	Arcs/min on TR2	Arcs/min on TR3	Inst Opacity	DENSE BED TEMP	DENSE BED TEMP	DENSE BED TEMP	DENSE BED TEMP	DENSE BED TEMP	DENSE BED TEMP	CORRECTED REGEN SO2	CORRECTED REGEN NOX	CORRECTED REGEN CO	FCC Feed Sulfur	Wet Air rate to regen	Flue gas CO2
	11XA0068B	11XA0069B	11A0889	degF	degF	degF	degF	degF	degF	ppm	ppm	ppm	wt%	mscfd	%
4/25/2012 13:04	0	0	1.2	1253	1246	1231	1246	1249	1253	5	28	80	0.058	11F0175	11A0815
4/25/2012 13:05	0	0	1.3	1252	1245	1230	1245	1249	1253	4	28	81	0.058	82189	16.58
4/25/2012 13:06	0	0	1.3	1251	1245	1230	1245	1249	1253	5	29	78	0.058	82209	16.54
4/25/2012 13:07	0	0	1.2	1251	1246	1231	1246	1249	1253	6	29	85	0.058	82228	16.60
4/25/2012 13:08	0	0	1.3	1251	1246	1231	1246	1250	1252	8	29	79	0.058	82248	16.56
4/25/2012 13:09	0	0	1.2	1251	1247	1230	1247	1250	1252	9	28	72	0.058	82267	16.62
4/25/2012 13:10	0	0	1.3	1252	1247	1230	1247	1249	1252	9	28	72	0.058	82286	16.73
4/25/2012 13:11	0	0	1.2	1251	1248	1230	1248	1250	1252	9	28	72	0.058	82268	16.75
4/25/2012 13:12	0	0	1.3	1251	1248	1230	1248	1250	1252	9	28	73	0.058	82219	16.75
4/25/2012 13:13	0	0	1.1	1252	1247	1231	1247	1250	1252	8	29	82	0.058	82169	16.73
4/25/2012 13:14	0	0	1.3	1252	1246	1230	1246	1250	1253	7	28	80	0.058	82120	16.63
4/25/2012 13:15	0	0	1.3	1252	1245	1229	1245	1249	1253	7	28	80	0.058	82071	16.62
4/25/2012 13:16	0	0	1.2	1252	1246	1229	1246	1249	1253	7	28	81	0.058	82022	16.61
4/25/2012 13:17	0	0	1.2	1251	1246	1231	1246	1249	1253	6	28	83	0.058	81972	16.68
4/25/2012 13:18	0	0	1.2	1252	1246	1230	1246	1250	1252	6	28	84	0.058	81923	16.60
4/25/2012 13:19	0	0	1.3	1253	1246	1230	1246	1250	1252	5	28	87	0.058	81874	16.52
4/25/2012 13:20	0	0	1.2	1252	1245	1230	1245	1250	1252	5	28	88	0.058	81982	16.54
4/25/2012 13:21	0	0	1.2	1251	1244	1231	1244	1250	1252	5	28	87	0.058	82224	16.53
4/25/2012 13:22	0	0	1.3	1252	1246	1231	1246	1250	1252	5	28	80	0.058	82222	16.66
4/25/2012 13:23	0	0	1.3	1252	1246	1230	1246	1249	1253	5	28	80	0.058	82011	16.64
4/25/2012 13:24	0	0	1.2	1252	1246	1230	1246	1249	1253	5	27	81	0.058	82170	16.65
4/25/2012 13:25	0	0	1.1	1252	1245	1231	1245	1249	1254	5	28	77	0.058	82142	16.64
4/25/2012 13:26	0	0	1.2	1251	1246	1230	1246	1249	1254	5	28	75	0.058	81945	16.65
4/25/2012 13:27	0	0	1.2	1251	1246	1230	1246	1249	1253	6	28	79	0.058	81978	16.69
4/25/2012 13:28	0	0	1.2	1251	1245	1230	1245	1250	1253	7	28	80	0.058	82011	16.64
4/25/2012 13:29	0	0	1.2	1252	1246	1230	1246	1250	1253	9	29	92	0.058	82045	16.60
4/25/2012 13:30	0	0	1.3	1253	1246	1230	1246	1250	1253	9	29	83	0.058	82078	16.61
4/25/2012 13:31	0	0	1.4	1253	1247	1231	1247	1249	1253	9	29	86	0.058	82111	16.57
4/25/2012 13:32	0	0	1.3	1252	1246	1230	1246	1249	1253	9	29	87	0.058	82144	16.62
4/25/2012 13:33	0	0	1.4	1252	1246	1231	1246	1249	1253	8	28	91	0.058	82177	16.63
4/25/2012 13:34	0	0	1.5	1251	1246	1232	1246	1249	1253	7	28	88	0.058	82185	16.63
4/25/2012 13:35	0	0	1.2	1252	1246	1231	1246	1249	1252	7	28	88	0.058	82168	16.62
4/25/2012 13:36	0	0	1.2	1252	1246	1231	1246	1249	1253	6	28	82	0.058	82151	16.61
4/25/2012 13:37	0	0	1.3	1252	1246	1231	1246	1249	1253	6	28	79	0.058	82134	16.66
4/25/2012 13:38	0	0	1.3	1251	1246	1232	1246	1250	1253	6	28	79	0.058	82118	16.65
4/25/2012 13:39	0	0	1.3	1251	1247	1232	1247	1250	1254	6	28	82	0.058	82101	16.68
4/25/2012 13:40	0	0	1.3	1251	1247	1232	1247	1250	1254	5	29	82	0.058	82084	16.67
4/25/2012 13:41	0	0	1.3	1252	1246	1232	1246	1250	1254	5	28	82	0.058	82057	16.60
4/25/2012 13:42	0	0	1.3	1252	1246	1231	1246	1250	1253	5	28	88	0.058	82019	16.57
4/25/2012 13:43	0	0	1.3	1252	1245	1230	1245	1249	1253	5	28	87	0.058	81981	16.52
4/25/2012 13:44	0	0	1.4	1252	1245	1231	1245	1249	1253	4	28	85	0.058	81943	16.62
4/25/2012 13:45	0	0	1.4	1252	1246	1231	1246	1250	1252	4	28	81	0.058	81905	16.65
4/25/2012 13:46	0	0	1.4	1252	1247	1231	1247	1249	1252	4	27	86	0.058	81867	16.64
4/25/2012 13:47	0	0	1.2	1252	1247	1232	1247	1249	1253	5	28	86	0.058	81829	16.60
												80	0.058	81791	16.66

	Arct/min on TR2	Arct/min on TR3	Inst Opacity %	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	CORRECTED REGEN SO2 ppm	CORRECTED REGEN NOX ppm	CORRECTED REGEN CO ppm	FCC Feed Sulfur wt%	Wet Air rate to regen mscfd	Flue gas CO2 %
	11XA0069B	11XA0069B	11A0889	11T0520	11T0521	11T0522	11T0523	11T0524	11M0512	11M0513	11M0514	11CFLR.LD	11F0175	11A0815
4/25/2012 13:48	0	0	1.4	1252	1231	1246	1250	1253	7	29	77	0.058	81753	16.64
4/25/2012 13:49	0	0	1.4	1252	1231	1245	1250	1253	8	29	83	0.058	81820	16.60
4/25/2012 13:50	0	0	1.3	1252	1230	1245	1250	1253	9	29	80	0.058	82029	16.59
4/25/2012 13:51	0	0	1.3	1252	1231	1246	1250	1253	9	29	82	0.058	82239	16.60
4/25/2012 13:52	0	0	1.4	1253	1230	1245	1250	1253	9	29	81	0.058	82309	16.58
4/25/2012 13:53	0	0	1.4	1253	1230	1245	1249	1253	8	29	87	0.058	82202	16.60
4/25/2012 13:54	0	0	1.4	1252	1229	1245	1249	1253	7	28	90	0.058	82095	16.62
4/25/2012 13:55	0	0	1.3	1252	1231	1245	1250	1253	7	28	83	0.058	81987	16.68
4/25/2012 13:56	0	0	1.2	1252	1232	1245	1250	1253	6	28	80	0.058	81892	16.66
4/25/2012 13:57	0	0	1.2	1252	1232	1246	1250	1253	6	28	94	0.058	81812	16.63
4/25/2012 13:58	0	0	1.3	1252	1231	1246	1250	1253	5	28	86	0.058	81901	16.63
4/25/2012 13:59	0	0	1.2	1251	1231	1245	1250	1253	5	28	77	0.058	82215	16.65
4/25/2012 14:00	0	0	1.3	1250	1231	1246	1250	1253	5	28	79	0.058	82267	16.62
4/25/2012 14:01	0	0	1.3	1250	1230	1246	1250	1253	5	28	80	0.058	81963	16.59
4/25/2012 14:02	0	0	1.3	1251	1229	1245	1250	1253	5	29	79	0.058	81803	16.54
4/25/2012 14:03	0	0	1.4	1252	1229	1244	1249	1252	5	28	82	0.058	81837	16.58
4/25/2012 14:04	0	0	1.2	1252	1229	1245	1249	1252	5	29	78	0.058	81872	16.61
4/25/2012 14:05	0	0	1.3	1251	1229	1245	1249	1252	4	29	81	0.058	81907	16.60
4/25/2012 14:06	0	0	1.4	1251	1230	1245	1249	1252	4	29	86	0.058	81941	16.61
4/25/2012 14:07	0	0	1.4	1251	1230	1246	1249	1253	5	29	78	0.058	81976	16.59
4/25/2012 14:08	0	0	1.4	1252	1230	1246	1249	1253	7	29	82	0.058	82011	16.63
4/25/2012 14:09	0	0	1.3	1252	1231	1246	1250	1253	9	29	77	0.058	82046	16.66
4/25/2012 14:10	0	0	1.4	1252	1230	1247	1249	1252	9	30	87	0.058	82042	16.61
4/25/2012 14:11	0	0	1.3	1252	1230	1245	1249	1253	9	29	90	0.058	81976	16.60
4/25/2012 14:12	0	0	1.3	1252	1231	1245	1249	1253	9	29	77	0.058	82068	16.58
4/25/2012 14:13	0	0	1.4	1251	1231	1246	1249	1253	8	29	80	0.058	82111	16.60
4/25/2012 14:14	0	0	1.4	1251	1230	1247	1249	1253	7	29	81	0.058	81858	16.56
4/25/2012 14:15	0	0	1.5	1251	1231	1246	1249	1252	6	28	89	0.058	81935	16.52
4/25/2012 14:16	0	0	1.5	1251	1231	1245	1249	1252	6	28	89	0.058	82018	16.54
4/25/2012 14:17	0	0	1.4	1251	1231	1245	1249	1252	5	29	88	0.058	82100	16.59
4/25/2012 14:18	0	0	1.4	1251	1230	1246	1249	1252	5	28	91	0.058	82137	16.58
4/25/2012 14:19	0	0	1.5	1251	1230	1246	1249	1252	5	29	84	0.058	82092	16.57
4/25/2012 14:20	0	0	1.5	1251	1229	1246	1249	1252	5	28	86	0.058	82025	16.60
4/25/2012 14:21	0	0	1.6	1251	1229	1246	1249	1252	5	29	81	0.058	81922	16.58
4/25/2012 14:22	0	0	1.5	1251	1230	1244	1249	1252	5	28	86	0.058	81736	16.58
4/25/2012 14:23	0	0	1.4	1251	1230	1243	1248	1252	5	28	78	0.058	81566	16.62
4/25/2012 14:24	0	0	1.5	1250	1230	1243	1248	1252	5	28	76	0.058	81703	16.64
4/25/2012 14:25	0	0	1.4	1250	1229	1244	1249	1251	4	29	76	0.058	81848	16.63
4/25/2012 14:26	0	0	1.4	1250	1230	1245	1249	1252	5	29	77	0.058	81946	16.66
4/25/2012 14:27	0	0	1.3	1251	1230	1246	1249	1252	7	28	78	0.058	81943	16.66
4/25/2012 14:28	0	0	1.4	1252	1230	1245	1249	1252	8	29	82	0.058	81937	16.61
4/25/2012 14:29	0	0	1.3	1252	1229	1244	1249	1252	9	30	87	0.058	81932	16.52
4/25/2012 14:30	0	0	1.3	1252	1229	1243	1248	1251	9	30	88	0.058	81926	16.48
4/25/2012 14:31	0	0	1.5	1251	1229	1242	1248	1251	9	30	88	0.058	81920	16.50

Date/Time	11XA0068B	11XA0069B	Inst Opacity %	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	CORRECTED REGEN SO2 ppm	CORRECTED REGEN NOX ppm	CORRECTED REGEN CO ppm	FCC Feed Sulfur wt%	Wet Air rate to regen mscfd	Flue gas CO2 %
				11T00620	11T00621	11T00622	11T00623	11T00624	11M00812	11M00813	11M00814	11CFSLR.LD	11F0175	11A00815
4/25/2012 14:32	0	0	1.5	1251	1227	1242	1248	1251	8	30	80	0.058	81915	16.53
4/25/2012 14:33	0	0	1.4	1252	1228	1242	1248	1251	8	30	77	0.058	81909	16.60
4/25/2012 14:34	0	0	1.5	1252	1228	1243	1248	1251	7	29	76	0.058	81823	16.61
4/25/2012 14:35	0	0	1.5	1251	1229	1244	1248	1251	6	29	74	0.058	81705	16.58
4/25/2012 14:36	0	0	1.5	1250	1230	1244	1248	1252	6	29	80	0.058	81871	16.57
4/25/2012 14:37	0	0	1.5	1250	1229	1243	1248	1252	6	29	86	0.058	81688	16.59
4/25/2012 14:38	0	0	1.3	1250	1227	1242	1248	1252	5	29	86	0.058	81559	16.58
4/25/2012 14:39	0	0	1.3	1250	1228	1242	1248	1252	5	28	86	0.058	81614	16.56
4/25/2012 14:40	0	0	1.3	1250	1229	1243	1248	1251	5	29	76	0.058	81679	16.58
4/25/2012 14:41	0	0	1.4	1250	1229	1243	1248	1251	5	29	78	0.058	81744	16.63
4/25/2012 14:42	0	0	1.4	1250	1229	1244	1248	1251	5	29	71	0.058	81808	16.62
4/25/2012 14:43	0	0	1.3	1250	1230	1245	1248	1251	5	29	67	0.058	81873	16.66
4/25/2012 14:44	0	0	1.4	1251	1229	1245	1248	1252	5	28	72	0.058	81938	16.66
4/25/2012 14:45	0	0	1.4	1252	1228	1245	1248	1252	5	28	73	0.058	81982	16.67
4/25/2012 14:46	0	0	1.4	1252	1229	1245	1248	1252	6	29	70	0.058	81969	16.68
4/25/2012 14:47	0	0	1.4	1251	1228	1244	1249	1252	7	29	75	0.058	81952	16.66
4/25/2012 14:48	0	0	1.3	1251	1227	1244	1248	1252	9	29	74	0.058	81940	16.65
4/25/2012 14:49	0	0	1.3	1251	1229	1244	1248	1252	10	29	72	0.058	81942	16.66
4/25/2012 14:50	0	0	1.4	1250	1229	1244	1248	1252	10	29	70	0.058	81946	16.64
4/25/2012 14:51	0	0	1.4	1250	1227	1244	1248	1251	9	30	70	0.058	81950	16.69
4/25/2012 14:52	0	0	1.5	1250	1228	1244	1248	1252	8	29	71	0.058	81889	16.68
4/25/2012 14:53	0	0	1.5	1251	1229	1245	1248	1252	7	29	75	0.058	81657	16.65
4/25/2012 14:54	0	0	1.3	1252	1229	1246	1249	1253	6	29	65	0.058	81766	16.67
4/25/2012 14:55	0	0	1.2	1252	1230	1247	1250	1253	6	29	67	0.058	81829	16.75
4/25/2012 14:56	0	0	1.1	1253	1230	1247	1250	1254	6	29	67	0.058	81605	16.77
4/25/2012 14:57	0	0	1.2	1253	1230	1246	1250	1254	5	29	62	0.058	81667	16.72
4/25/2012 14:58	0	0	1.3	1253	1229	1246	1250	1255	5	29	65	0.058	81749	16.69
4/25/2012 14:59	0	0	1.3	1253	1229	1246	1251	1255	5	29	69	0.058	81727	16.71
4/25/2012 15:00	0	0	1.3	1254	1230	1244	1251	1254	5	30	72	0.058	81692	16.69
4/25/2012 15:01	0	0	1.3	1253	1230	1245	1250	1253	5	30	72	0.058	81681	16.63
4/25/2012 15:02	0	0	1.2	1252	1231	1246	1250	1254	5	29	75	0.058	81809	16.62
4/25/2012 15:03	0	0	1.2	1253	1230	1246	1250	1254	5	28	78	0.058	81960	16.55
4/25/2012 15:04	0	0	1.2	1253	1230	1247	1250	1254	4	28	78	0.058	82112	16.61
4/25/2012 15:05	0	0	1.1	1252	1230	1247	1250	1254	5	29	71	0.058	82199	16.68
4/25/2012 15:06	0	0	1.2	1252	1231	1247	1251	1254	6	29	77	0.058	81960	16.56
4/25/2012 15:07	0	0	1.3	1253	1231	1248	1251	1254	8	30	69	0.058	82072	16.54
4/25/2012 15:08	0	0	1.3	1254	1231	1246	1250	1254	9	30	69	0.058	81881	16.56
4/25/2012 15:09	0	0	1.4	1254	1230	1245	1250	1254	9	31	72	0.058	81864	16.58
4/25/2012 15:10	0	0	1.3	1253	1229	1244	1250	1254	9	30	75	0.058	81896	16.56
4/25/2012 15:11	0	0	1.3	1253	1229	1245	1250	1254	8	29	80	0.058	81924	16.50
4/25/2012 15:12	0	0	1.3	1253	1231	1246	1250	1253	7	28	79	0.058	81917	16.58
4/25/2012 15:13	0	0	1.4	1253	1231	1247	1250	1253	7	29	72	0.058	81902	16.65
4/25/2012 15:14	0	0	1.3	1252	1231	1246	1250	1253	6	29	72	0.058	81888	16.64
4/25/2012 15:15	0	0	1.3	1251	1230	1245	1250	1253	6	29	73	0.058	81874	16.62

	Arcs/min on TR2	Arcs/min on TR3	Inst Opacity %	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	CORRECTED REGEN SO2 ppm	CORRECTED REGEN NOX ppm	CORRECTED REGEN CO ppm	FCC Feed Sulfur wt%	Wet Air rate to regen mscfd	Flue gas CO2 %
	11XA0068B	11XA0069B	11A0889	11T0520	11T0521	11T0522	11T0523	11T0524	11M0812	11M0813	11M0814	11CFSLFR.LD	11F0175	11A0815
4/25/2012 15:16	0	0	1.3	1252	1231	1246	1250	1253	6	29	72	0.058	81860	16.65
4/25/2012 15:17	0	0	1.3	1252	1232	1247	1250	1254	5	29	71	0.058	81845	16.56
4/25/2012 15:18	0	0	1.3	1253	1232	1247	1250	1254	5	29	77	0.058	81831	16.60
4/25/2012 15:19	0	0	1.4	1253	1232	1246	1250	1254	5	28	81	0.058	81817	16.55
4/25/2012 15:20	0	0	1.4	1253	1231	1245	1250	1254	5	28	79	0.058	81803	16.56
4/25/2012 15:21	0	0	1.3	1253	1232	1246	1250	1253	5	29	79	0.058	81788	16.58
4/25/2012 15:22	0	0	1.4	1252	1232	1246	1250	1254	5	29	84	0.058	81774	16.50
4/25/2012 15:23	0	0	1.4	1252	1231	1245	1249	1254	4	29	78	0.058	81760	16.52

	Flue gas O2 %	Flue gas O2 %	fresh catalyst		fresh catalyst setpoint		SuperSoygeter lb/d		SuperSoygeter setpoint		NOx additive lb/d		Ammonia injection		riser temp	ht outlet temp
			11A0816	11A0816	11FC0670	11FC0670 SP	11W0686	11W0686 SP	11W0687 SP	11W0689	11FC2032	11TCRXTR	11TC0025			
4/25/2012 8:40	1.52	1.51	2987	3000	35	30	0	8				954.75	575.58			
4/25/2012 8:41	1.52	1.51	2987	3000	35	30	0	8				954.78	575.59			
4/25/2012 8:42	1.52	1.53	2987	3000	35	30	0	8				954.81	575.59			
4/25/2012 8:43	1.52	1.51	2987	3000	35	30	0	8				954.85	575.60			
4/25/2012 8:44	1.52	1.46	2987	3000	35	30	0	8				954.89	575.61			
4/25/2012 8:45	1.52	1.43	2987	3000	35	30	0	8				954.92	575.62			
4/25/2012 8:46	1.52	1.40	2987	3000	35	30	0	8				954.96	575.63			
4/25/2012 8:47	1.52	1.48	2987	3000	35	30	0	8				955.00	575.64			
4/25/2012 8:48	1.52	1.51	2987	3000	35	30	0	8				955.03	575.65			
4/25/2012 8:49	1.52	1.52	2987	3000	35	30	0	8				955.07	575.66			
4/25/2012 8:50	1.53	1.50	2987	3000	35	30	0	8				955.15	575.67			
4/25/2012 8:51	1.53	1.54	2987	3000	35	30	0	8				955.47	575.67			
4/25/2012 8:52	1.53	1.51	2987	3000	35	30	0	8				955.44	575.68			
4/25/2012 8:53	1.53	1.50	2987	3000	35	30	0	8				955.33	575.69			
4/25/2012 8:54	1.53	1.60	2987	3000	35	30	0	8				955.21	575.70			
4/25/2012 8:55	1.53	1.58	2987	3000	35	30	0	8				955.10	575.71			
4/25/2012 8:56	1.53	1.51	2987	3000	35	30	0	8				954.99	575.72			
4/25/2012 8:57	1.53	1.44	2987	3000	35	30	0	8				954.89	575.73			
4/25/2012 8:58	1.53	1.46	2987	3000	35	30	0	8				954.87	575.74			
4/25/2012 8:59	1.53	1.43	2987	3000	35	30	0	8				955.08	575.75			
4/25/2012 9:00	1.53	1.52	2987	3000	35	30	0	8				955.30	575.75			
4/25/2012 9:01	1.53	1.48	2987	3000	35	30	0	8				955.49	575.76			
4/25/2012 9:02	1.53	1.47	2987	3000	35	30	0	8				955.43	575.77			
4/25/2012 9:03	1.53	1.55	2987	3000	35	30	0	8				955.31	575.78			
4/25/2012 9:04	1.53	1.61	2987	3000	35	30	0	8				955.28	575.79			
4/25/2012 9:05	1.53	1.58	2987	3000	35	30	0	8				955.28	575.80			
4/25/2012 9:06	1.53	1.53	2987	3000	35	30	0	8				955.22	575.81			
4/25/2012 9:07	1.53	1.54	2987	3000	35	30	0	8				955.10	575.82			
4/25/2012 9:08	1.53	1.54	2987	3000	35	30	0	8				955.11	575.82			
4/25/2012 9:09	1.53	1.50	2987	3000	35	30	0	8				955.24	575.83			
4/25/2012 9:10	1.53	1.49	2987	3000	35	30	0	8				955.37	575.84			
4/25/2012 9:11	1.53	1.49	2987	3000	35	30	0	8				955.51	575.85			
4/25/2012 9:12	1.53	1.49	2987	3000	35	30	0	8				955.62	575.86			
4/25/2012 9:13	1.53	1.50	2987	3000	35	30	0	8				955.69	575.87			
4/25/2012 9:14	1.53	1.51	2987	3000	35	30	0	8				955.75	575.88			
4/25/2012 9:15	1.53	1.63	2987	3000	35	30	0	8				955.78	575.89			
4/25/2012 9:16	1.53	1.63	2987	3000	35	30	0	8				955.56	575.90			
4/25/2012 9:17	1.53	1.58	2987	3000	35	30	0	8				955.26	575.90			
4/25/2012 9:18	1.53	1.55	2987	3000	35	30	0	8				954.96	575.91			
4/25/2012 9:19	1.53	1.60	2987	3000	35	30	0	8				954.65	575.92			
4/25/2012 9:20	1.53	1.57	2987	3000	35	30	0	8				954.38	575.93			
4/25/2012 9:21	1.53	1.58	2987	3000	35	30	0	8				954.45	575.94			
4/25/2012 9:22	1.53	1.59	2987	3000	35	30	0	8				954.62	575.95			
4/25/2012 9:23	1.53	1.63	2987	3000	35	30	0	8				954.88	575.96			

Flue gas O2 %	Flue gas O2 %	fresh catalyst		fresh catalyst		SuperSovexgeter		SuperSovexgeter		SuperSovexgeter		NOx additive		Ammonia Injection		riser temp	ht outlet temp
		lb/d	11FC0670	lb/d	11FC0670 SP	lb/d	11W06868	lb/d	11W06868	lb/d	11W06868	lb/d	11W06868	lb/d	11FC2032		
4/25/2012 9:24	1.53	11AC0816	1.66	2987	3000	35	30	0	8	11TC0025	575.97	11TC0025	575.97	11TC0025	575.97	955.15	575.97
4/25/2012 9:25	1.53	11AC0816	1.62	2987	3000	35	30	0	8	11TC0025	575.98	11TC0025	575.98	11TC0025	575.98	955.21	575.98
4/25/2012 9:26	1.53	11AC0816	1.65	2987	3000	35	30	0	8	11TC0025	575.98	11TC0025	575.98	11TC0025	575.98	955.22	575.98
4/25/2012 9:27	1.54	11AC0816	1.66	2987	3000	35	30	0	8	11TC0025	575.99	11TC0025	575.99	11TC0025	575.99	955.22	575.99
4/25/2012 9:28	1.54	11AC0816	1.53	2987	3000	35	30	0	8	11TC0025	576.00	11TC0025	576.00	11TC0025	576.00	955.23	576.00
4/25/2012 9:29	1.54	11AC0816	1.56	2987	3000	35	30	0	8	11TC0025	576.01	11TC0025	576.01	11TC0025	576.01	955.23	576.01
4/25/2012 9:30	1.54	11AC0816	1.58	2987	3000	35	30	0	8	11TC0025	576.02	11TC0025	576.02	11TC0025	576.02	955.24	576.02
4/25/2012 9:31	1.54	11AC0816	1.53	2987	3000	35	30	0	8	11TC0025	576.03	11TC0025	576.03	11TC0025	576.03	955.24	576.03
4/25/2012 9:32	1.54	11AC0816	1.45	2987	3000	35	30	0	8	11TC0025	576.04	11TC0025	576.04	11TC0025	576.04	955.20	576.04
4/25/2012 9:33	1.54	11AC0816	1.53	2987	3000	35	30	0	8	11TC0025	576.05	11TC0025	576.05	11TC0025	576.05	955.14	576.05
4/25/2012 9:34	1.54	11AC0816	1.40	2987	3000	35	30	0	8	11TC0025	576.05	11TC0025	576.05	11TC0025	576.05	955.23	576.05
4/25/2012 9:35	1.53	11AC0816	1.49	2987	3000	35	30	0	8	11TC0025	576.06	11TC0025	576.06	11TC0025	576.06	955.38	576.06
4/25/2012 9:36	1.53	11AC0816	1.48	2987	3000	35	30	0	8	11TC0025	576.07	11TC0025	576.07	11TC0025	576.07	955.51	576.07
4/25/2012 9:37	1.53	11AC0816	1.53	2987	3000	35	30	0	8	11TC0025	576.08	11TC0025	576.08	11TC0025	576.08	955.55	576.08
4/25/2012 9:38	1.53	11AC0816	1.46	2987	3000	35	30	0	8	11TC0025	576.09	11TC0025	576.09	11TC0025	576.09	955.63	576.09
4/25/2012 9:39	1.53	11AC0816	1.48	2987	3000	35	30	0	8	11TC0025	576.10	11TC0025	576.10	11TC0025	576.10	955.77	576.10
4/25/2012 9:40	1.53	11AC0816	1.47	2987	3000	35	30	0	8	11TC0025	576.11	11TC0025	576.11	11TC0025	576.11	955.66	576.11
4/25/2012 9:41	1.53	11AC0816	1.51	2987	3000	35	30	0	8	11TC0025	576.12	11TC0025	576.12	11TC0025	576.12	955.47	576.12
4/25/2012 9:42	1.53	11AC0816	1.56	2987	3000	35	30	0	8	11TC0025	576.13	11TC0025	576.13	11TC0025	576.13	955.27	576.13
4/25/2012 9:43	1.53	11AC0816	1.67	2987	3000	35	30	0	8	11TC0025	576.13	11TC0025	576.13	11TC0025	576.13	955.11	576.13
4/25/2012 9:44	1.53	11AC0816	1.63	2987	3000	35	30	0	8	11TC0025	576.14	11TC0025	576.14	11TC0025	576.14	954.97	576.14
4/25/2012 9:45	1.53	11AC0816	1.60	2987	3000	35	30	0	8	11TC0025	576.15	11TC0025	576.15	11TC0025	576.15	954.84	576.15
4/25/2012 9:46	1.53	11AC0816	1.58	2987	3000	35	30	0	8	11TC0025	576.16	11TC0025	576.16	11TC0025	576.16	954.70	576.16
4/25/2012 9:47	1.53	11AC0816	1.58	2987	3000	35	30	0	8	11TC0025	576.17	11TC0025	576.17	11TC0025	576.17	954.59	576.17
4/25/2012 9:48	1.53	11AC0816	1.62	2987	3000	35	30	0	8	11TC0025	576.18	11TC0025	576.18	11TC0025	576.18	954.82	576.18
4/25/2012 9:49	1.53	11AC0816	1.59	2987	3000	35	30	0	8	11TC0025	576.19	11TC0025	576.19	11TC0025	576.19	955.12	576.19
4/25/2012 9:50	1.53	11AC0816	1.65	2987	3000	35	30	0	8	11TC0025	576.20	11TC0025	576.20	11TC0025	576.20	955.29	576.20
4/25/2012 9:51	1.53	11AC0816	1.64	2987	3000	35	30	0	8	11TC0025	576.21	11TC0025	576.21	11TC0025	576.21	955.56	576.21
4/25/2012 9:52	1.53	11AC0816	1.75	2987	3000	35	30	0	8	11TC0025	576.21	11TC0025	576.21	11TC0025	576.21	955.63	576.21
4/25/2012 9:53	1.53	11AC0816	1.67	2987	3000	35	30	0	8	11TC0025	576.22	11TC0025	576.22	11TC0025	576.22	955.35	576.22
4/25/2012 9:54	1.53	11AC0816	1.69	2987	3000	35	30	0	8	11TC0025	576.23	11TC0025	576.23	11TC0025	576.23	955.01	576.23
4/25/2012 9:55	1.53	11AC0816	1.72	2987	3000	35	30	0	8	11TC0025	576.24	11TC0025	576.24	11TC0025	576.24	954.53	576.24
4/25/2012 9:56	1.53	11AC0816	1.56	2987	3000	35	30	0	8	11TC0025	576.25	11TC0025	576.25	11TC0025	576.25	954.27	576.25
4/25/2012 9:57	1.53	11AC0816	1.51	2987	3000	35	30	0	8	11TC0025	576.26	11TC0025	576.26	11TC0025	576.26	954.36	576.26
4/25/2012 9:58	1.52	11AC0816	1.52	2987	3000	35	30	0	8	11TC0025	576.27	11TC0025	576.27	11TC0025	576.27	954.44	576.27
4/25/2012 9:59	1.52	11AC0816	1.53	2987	3000	35	30	0	8	11TC0025	576.28	11TC0025	576.28	11TC0025	576.28	954.52	576.28
4/25/2012 10:00	1.52	11AC0816	1.53	2987	3000	35	30	0	8	11TC0025	576.28	11TC0025	576.28	11TC0025	576.28	954.61	576.28
4/25/2012 10:01	1.52	11AC0816	1.50	2987	3000	35	30	0	8	11TC0025	576.29	11TC0025	576.29	11TC0025	576.29	954.73	576.29
4/25/2012 10:02	1.52	11AC0816	1.61	2987	3000	35	30	0	8	11TC0025	576.30	11TC0025	576.30	11TC0025	576.30	954.88	576.30
4/25/2012 10:03	1.52	11AC0816	1.62	2987	3000	35	30	0	8	11TC0025	576.31	11TC0025	576.31	11TC0025	576.31	955.23	576.31
4/25/2012 10:04	1.52	11AC0816	1.59	2987	3000	35	30	0	8	11TC0025	576.32	11TC0025	576.32	11TC0025	576.32	955.55	576.32
4/25/2012 10:05	1.52	11AC0816	1.60	2987	3000	35	30	0	8	11TC0025	576.33	11TC0025	576.33	11TC0025	576.33	955.46	576.33
4/25/2012 10:06	1.52	11AC0816	1.57	2987	3000	35	30	0	8	11TC0025	576.34	11TC0025	576.34	11TC0025	576.34	955.30	576.34
4/25/2012 10:07	1.52	11AC0816	1.51	2987	3000	35	30	0	8	11TC0025	576.35	11TC0025	576.35	11TC0025	576.35	955.15	576.35

	Flue gas O2 %	Flue gas O2 %	fresh catalyst				SuperSovagetter				SuperSovagetter				NOx additive				riser temp	ht outlet temp
			11FC0670	lb/d	setpoint	11FC0670 SP	lb/d	11W0666	lb/d	setpoint	11W0667 SP	lb/d	11W0667 SP	lb/d	11W0669	lb/d	11FC2032			
4/25/2012 10:08	1.52	1.51	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.36	
4/25/2012 10:09	1.52	1.51	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.36	
4/25/2012 10:10	1.52	1.51	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.37	
4/25/2012 10:11	1.52	1.50	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.38	
4/25/2012 10:12	1.52	1.56	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.39	
4/25/2012 10:13	1.52	1.51	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.40	
4/25/2012 10:14	1.52	1.49	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.41	
4/25/2012 10:15	1.52	1.51	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.42	
4/25/2012 10:16	1.52	1.45	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.43	
4/25/2012 10:17	1.52	1.48	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.44	
4/25/2012 10:18	1.52	1.49	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.44	
4/25/2012 10:19	1.52	1.48	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.45	
4/25/2012 10:20	1.52	1.52	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.46	
4/25/2012 10:21	1.52	1.50	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.47	
4/25/2012 10:22	1.52	1.59	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.48	
4/25/2012 10:23	1.52	1.56	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.49	
4/25/2012 10:24	1.52	1.57	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.50	
4/25/2012 10:25	1.52	1.68	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.51	
4/25/2012 10:26	1.52	1.56	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.51	
4/25/2012 10:27	1.52	1.54	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.52	
4/25/2012 10:28	1.52	1.58	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.53	
4/25/2012 10:29	1.52	1.53	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.54	
4/25/2012 10:30	1.52	1.52	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.55	
4/25/2012 10:31	1.52	1.59	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.55	
4/25/2012 10:32	1.52	1.52	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.56	
4/25/2012 10:33	1.52	1.48	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.57	
4/25/2012 10:34	1.52	1.51	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.58	
4/25/2012 10:35	1.52	1.55	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.59	
4/25/2012 10:36	1.52	1.52	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.59	
4/25/2012 10:37	1.52	1.52	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.60	
4/25/2012 10:38	1.52	1.54	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.61	
4/25/2012 10:39	1.52	1.61	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.62	
4/25/2012 10:40	1.52	1.64	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.63	
4/25/2012 10:41	1.52	1.69	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.64	
4/25/2012 10:42	1.52	1.68	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.65	
4/25/2012 10:43	1.52	1.69	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.66	
4/25/2012 10:44	1.52	1.65	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.67	
4/25/2012 10:45	1.52	1.58	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.68	
4/25/2012 10:46	1.52	1.53	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.69	
4/25/2012 10:47	1.52	1.55	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.70	
4/25/2012 10:48	1.52	1.58	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.71	
4/25/2012 10:49	1.52	1.50	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.75	
4/25/2012 10:50	1.52	1.45	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.90	
4/25/2012 10:51	1.52	1.51	2987	3000		3000	35	35	30		30	0	0	0	0	0	8	11TC0025	576.81	

Flue gas O2 %	11AC0816	fresh catalyst		SuperSoxgetter		SuperSoxgetter		NOX additive		riser temp	hr outlet temp
		lb/d	setpoint	lb/d	setpoint	lb/d	setpoint	lb/d	setpoint		
	11AC0816	11FC0870	11FC0870 SP	11W0866	11W0867 SP	11W0869	11FC0832			11TCRXTR	11TC0025
4/25/2012 10:52	1.52	2987	3000	35	30	0	8			954.36	576.72
4/25/2012 10:53	1.52	2987	3000	35	30	0	8			954.62	576.62
4/25/2012 10:54	1.52	2987	3000	35	30	0	8			954.88	576.52
4/25/2012 10:55	1.52	2987	3000	35	30	0	8			955.07	576.42
4/25/2012 10:56	1.52	2987	3000	35	30	0	8			955.10	576.33
4/25/2012 10:57	1.52	2987	3000	35	30	0	8			955.13	576.23
4/25/2012 10:58	1.52	2987	3000	35	30	0	8			955.13	576.13
4/25/2012 10:59	1.52	2987	3000	35	30	0	8			955.09	576.03
4/25/2012 11:00	1.52	2987	3000	35	30	0	8			955.04	575.93
4/25/2012 11:01	1.52	2987	3000	35	30	0	8			955.00	575.84
4/25/2012 11:02	1.52	2987	3000	35	30	0	8			955.20	575.74
4/25/2012 11:03	1.52	2987	3000	35	30	0	8			955.39	575.64
4/25/2012 11:04	1.52	2987	3000	35	30	0	8			955.42	575.54
4/25/2012 11:05	1.52	2987	3000	35	30	0	8			955.44	575.45
4/25/2012 11:06	1.52	2987	3000	35	30	0	8			955.46	575.35
4/25/2012 11:07	1.52	2987	3000	35	30	0	8			955.49	575.25
4/25/2012 11:08	1.52	2987	3000	35	30	0	8			955.51	575.14
4/25/2012 11:09	1.52	2987	3000	35	30	0	8			955.49	574.95
4/25/2012 11:10	1.52	2987	3000	35	30	0	8			955.45	574.91
4/25/2012 11:11	1.52	2987	3000	35	30	0	8			955.41	574.90
4/25/2012 11:12	1.52	2987	3000	35	30	0	8			955.36	574.90
4/25/2012 11:13	1.52	2987	3000	35	30	0	8			955.33	574.90
4/25/2012 11:14	1.52	2987	3000	35	30	0	8			955.42	574.90
4/25/2012 11:15	1.52	2987	3000	35	30	0	8			955.19	574.90
4/25/2012 11:16	1.52	2987	3000	35	30	0	8			954.80	574.90
4/25/2012 11:17	1.53	2987	3000	35	30	0	8			954.81	574.90
4/25/2012 11:18	1.53	2987	3000	35	30	0	8			954.84	574.89
4/25/2012 11:19	1.53	2987	3000	35	30	0	8			954.86	574.89
4/25/2012 11:20	1.53	2987	3000	35	30	0	8			954.83	574.89
4/25/2012 11:21	1.53	2987	3000	35	30	0	8			954.75	574.89
4/25/2012 11:22	1.53	2987	3000	35	30	0	8			954.67	574.89
4/25/2012 11:23	1.53	2987	3000	35	30	0	8			954.58	574.89
4/25/2012 11:24	1.53	2987	3000	35	30	0	8			954.47	574.89
4/25/2012 11:25	1.54	2987	3000	35	30	0	8			954.55	574.88
4/25/2012 11:26	1.54	2987	3000	35	30	0	8			954.62	574.88
4/25/2012 11:27	1.54	2987	3000	35	30	0	8			954.63	574.88
4/25/2012 11:28	1.54	2987	3000	35	30	0	8			954.65	574.88
4/25/2012 11:29	1.54	2987	3000	35	30	0	8			954.66	574.88
4/25/2012 11:30	1.54	2987	3000	35	30	0	8			954.53	574.88
4/25/2012 11:31	1.54	2987	3000	35	30	0	8			954.40	574.88
4/25/2012 11:32	1.54	2987	3000	35	30	0	8			954.76	574.87
4/25/2012 11:33	1.55	2987	3000	35	30	0	8			954.98	574.87
4/25/2012 11:34	1.55	2987	3000	35	30	0	8			954.92	574.87
4/25/2012 11:35	1.55	2987	3000	35	30	0	8			954.86	574.87

Flue gas O2 %	Flue gas O2 %	fresh catalyst		fresh catalyst setpoint		SuperSoxgater		SuperSoxgater setpoint		NOX additive		Ammonia Injection	riser temp	hr outlet temp
		11FC0870 lb/d	11FC0870.SP lb/d	11W0868 lb/d	11W0868 lb/d	11W0867.SP lb/d	11W0869 lb/d							
11A0816	11A0816	2987	3000	35	30	0	8	11TCRXTR	11TC0025	574.81	574.81	574.81	574.81	574.81
1.60	1.58	2987	3000	35	30	0	8	955.43	574.81	574.81	574.81	574.81	574.81	574.81
1.60	1.47	2987	3000	35	30	0	8	955.51	574.81	574.81	574.81	574.81	574.81	574.81
1.60	1.40	2987	3000	35	30	0	8	955.55	574.80	574.80	574.80	574.80	574.80	574.80
1.61	1.51	2987	3000	35	30	0	8	955.46	574.80	574.80	574.80	574.80	574.80	574.80
1.61	1.47	2987	3000	35	30	0	8	955.36	574.80	574.80	574.80	574.80	574.80	574.80
1.61	1.62	2987	3000	35	30	0	8	955.26	574.80	574.80	574.80	574.80	574.80	574.80
1.61	1.60	2987	3000	35	30	0	8	955.41	574.80	574.80	574.80	574.80	574.80	574.80
1.61	1.67	2987	3000	35	30	0	8	955.58	574.80	574.80	574.80	574.80	574.80	574.80
1.61	1.68	2987	3000	35	30	0	8	955.47	574.80	574.80	574.80	574.80	574.80	574.80
1.60	1.73	2987	3000	35	30	0	8	955.28	574.79	574.79	574.79	574.79	574.79	574.79
1.59	1.67	2987	3000	35	30	0	8	955.08	574.79	574.79	574.79	574.79	574.79	574.79
1.59	1.68	2987	3000	35	30	0	8	954.85	574.79	574.79	574.79	574.79	574.79	574.79
1.58	1.73	2987	3000	35	30	0	8	954.56	574.79	574.79	574.79	574.79	574.79	574.79
1.58	1.69	2987	3000	35	30	0	8	954.27	574.79	574.79	574.79	574.79	574.79	574.79
1.57	1.62	2987	3000	35	30	0	8	954.12	574.79	574.79	574.79	574.79	574.79	574.79
1.56	1.56	2987	3000	35	30	0	8	954.02	574.79	574.79	574.79	574.79	574.79	574.79
1.56	1.61	2987	3000	35	30	0	8	954.07	574.78	574.78	574.78	574.78	574.78	574.78
1.55	1.51	2987	3000	35	30	0	8	954.27	574.78	574.78	574.78	574.78	574.78	574.78
1.55	1.57	2987	3000	35	30	0	8	954.47	574.78	574.78	574.78	574.78	574.78	574.78
1.54	1.59	2987	3000	35	30	0	8	954.52	574.78	574.78	574.78	574.78	574.78	574.78
1.54	1.57	2987	3000	35	30	0	8	954.42	574.78	574.78	574.78	574.78	574.78	574.78
1.53	1.60	2987	3000	35	30	0	8	954.33	574.78	574.78	574.78	574.78	574.78	574.78
1.52	1.60	2987	3000	35	30	0	8	954.30	574.78	574.78	574.78	574.78	574.78	574.78
1.52	1.58	2987	3000	35	30	0	8	954.30	574.77	574.77	574.77	574.77	574.77	574.77
1.52	1.52	2987	3000	35	30	0	8	954.30	574.77	574.77	574.77	574.77	574.77	574.77
1.51	1.51	2987	3000	35	30	0	8	954.30	574.77	574.77	574.77	574.77	574.77	574.77
1.51	1.60	2987	3000	35	30	0	8	954.30	574.77	574.77	574.77	574.77	574.77	574.77
1.50	1.53	2987	3000	35	30	0	8	954.30	574.77	574.77	574.77	574.77	574.77	574.77
1.50	1.49	2987	3000	35	30	0	8	954.32	574.77	574.77	574.77	574.77	574.77	574.77
1.51	1.44	2987	3000	35	30	0	8	954.65	574.77	574.77	574.77	574.77	574.77	574.77
1.51	1.47	2987	3000	35	30	0	8	955.08	574.77	574.77	574.77	574.77	574.77	574.77
1.51	1.50	2987	3000	35	30	0	8	955.00	574.77	574.77	574.77	574.77	574.77	574.77
1.52	1.47	2987	3000	35	30	0	8	954.85	574.76	574.76	574.76	574.76	574.76	574.76
1.52	1.49	2987	3000	35	30	0	8	954.85	574.76	574.76	574.76	574.76	574.76	574.76
1.52	1.55	2987	3000	35	30	0	8	954.86	574.76	574.76	574.76	574.76	574.76	574.76
1.53	1.55	2987	3000	35	30	0	8	954.88	574.76	574.76	574.76	574.76	574.76	574.76
1.53	1.53	2987	3000	35	30	0	8	955.04	574.76	574.76	574.76	574.76	574.76	574.76
1.53	1.49	2987	3000	35	30	0	8	955.02	574.76	574.76	574.76	574.76	574.76	574.76
1.54	1.48	2987	3000	35	30	0	8	954.92	574.76	574.76	574.76	574.76	574.76	574.76
1.54	1.50	2987	3000	35	30	0	8	955.11	574.75	574.75	574.75	574.75	574.75	574.75
1.54	1.48	2987	3000	35	30	0	8	955.25	574.75	574.75	574.75	574.75	574.75	574.75
1.55	1.51	2987	3000	35	30	0	8	955.20	574.75	574.75	574.75	574.75	574.75	574.75
1.55	1.48	2987	3000	35	30	0	8	955.14	574.75	574.75	574.75	574.75	574.75	574.75
1.55	1.52	2987	3000	35	30	0	8	955.01	574.75	574.75	574.75	574.75	574.75	574.75
1.55	1.55	2987	3000	35	30	0	8	954.99	574.75	574.75	574.75	574.75	574.75	574.75

	Flue gas O2 %	Flue gas O2 %	fresh catalyst		setpoint		SuperSocgetter		setpoint		NOx additive		Ammonia injection	riser temp	hr outlet temp
			lb/d	11FC0670	lb/d	11FC0670.SP	lb/d	11W0968	lb/d	11W0867.SP	lb/d	11W0869			
	11A0816	11A0816	2987	3000	35	35	30	0	8	11TCRXTR	955.26	11TC0025	574.75		
			2987	3000	35	35	30	0	8		955.53		574.74		
			2987	3000	35	35	30	0	8		955.53		574.74		
			2987	3000	35	35	30	0	8		955.19		574.74		
			2987	3000	35	35	30	0	8		954.85		574.74		
			2987	3000	35	35	30	0	8		954.56		574.74		
			2987	3000	35	35	30	0	8		954.36		574.74		
			2987	3000	35	35	30	0	8		954.49		574.74		
			2987	3000	35	35	30	0	8		954.65		574.73		
			2987	3000	35	35	30	0	8		954.80		574.73		
			2987	3000	35	35	30	0	8		954.96		574.73		
			2987	3000	35	35	30	0	8		955.12		574.73		
			2987	3000	35	35	30	0	8		955.25		574.73		
			2987	3000	35	35	30	0	8		955.31		574.73		
			2987	3000	35	35	30	0	8		955.02		574.73		
			2987	3000	35	35	30	0	8		954.85		574.72		
			2987	3000	35	35	30	0	8		954.88		574.72		
			2987	3000	35	35	30	0	8		954.76		574.72		
			2987	3000	35	35	30	0	8		954.96		574.72		
			2987	3000	35	35	30	0	8		955.29		574.72		
			2987	3000	35	35	30	0	8		955.52		574.72		
			2987	3000	35	35	30	0	8		955.69		574.72		
			2987	3000	35	35	30	0	8		955.62		574.71		
			2987	3000	35	35	30	0	8		955.45		574.71		
			2987	3000	35	35	30	0	8		955.28		574.71		
			2987	3000	35	35	30	0	8		955.11		574.71		
			2987	3000	35	35	30	0	8		955.19		574.71		
			2987	3000	35	35	30	0	8		955.58		574.71		
			2987	3000	35	35	30	0	8		955.21		574.71		
			2987	3000	35	35	30	0	8		955.00		574.70		
			2987	3000	35	35	30	0	8		955.00		574.70		
			2987	3000	35	35	30	0	8		954.99		574.70		
			2987	3000	35	35	30	0	8		954.99		574.70		
			2987	3000	35	35	30	0	8		954.98		574.70		
			2987	3000	35	35	30	0	8		955.07		574.70		
			2987	3000	35	35	30	0	8		955.29		574.70		
			2987	3000	35	35	30	0	8		955.51		574.70		
			2987	3000	35	35	30	0	8		955.65		574.69		
			2987	3000	35	35	30	0	8		955.40		574.69		
			2987	3000	35	35	30	0	8		955.12		574.69		
			2987	3000	35	35	30	0	8		954.83		574.69		
			2987	3000	35	35	30	0	8		954.54		574.69		
			2987	3000	35	35	30	0	8		954.44		574.69		
			2987	3000	35	35	30	0	8		954.60		574.69		

Flue gas O2 %	Flue gas O2 %	fresh catalyst				SuperSovGether		SuperSovGether		NOx additive		riser temp	htr outlet temp
		11FC0670	11FC0670 SP	11W0666	11W0666 SP	11W0666	11W0666 SP	11W0666	11W0666 SP	11W0666	11W0666 SP		
11A0816	11A0816	11A0816	11A0816	11A0816	11A0816	11A0816	11A0816	11A0816	11A0816	11A0816	11A0816	11A0816	11A0816
1.57	1.57	2987	3000	35	30	35	30	0	0	0	0	954.76	574.68
1.57	1.57	2987	3000	35	30	35	30	0	0	0	0	954.97	574.68
1.57	1.57	2987	3000	35	30	35	30	0	0	0	0	955.17	574.68
1.53	1.53	2987	3000	35	30	35	30	0	0	0	0	955.38	574.68
1.57	1.57	2987	3000	35	30	35	30	0	0	0	0	955.59	574.68
1.61	1.61	2987	3000	35	30	35	30	0	0	0	0	955.61	574.68
1.51	1.51	2987	3000	35	30	35	30	0	0	0	0	955.36	574.68
1.43	1.43	2987	3000	35	30	35	30	0	0	0	0	955.11	574.67
1.47	1.47	2987	3000	35	30	35	30	0	0	0	0	954.93	574.67
1.54	1.54	2987	3000	35	30	35	30	0	0	0	0	954.79	574.67
1.55	1.55	2987	3000	35	30	35	30	0	0	0	0	954.90	574.67
1.54	1.54	2987	3000	35	30	35	30	0	0	0	0	955.11	574.67
1.53	1.53	2987	3000	35	30	35	30	0	0	0	0	955.29	574.67
1.57	1.57	2987	3000	35	30	35	30	0	0	0	0	955.39	574.67
1.60	1.60	2987	3000	35	30	35	30	0	0	0	0	955.14	574.66
1.51	1.51	2987	3000	35	30	35	30	0	0	0	0	954.86	574.66
1.51	1.51	2987	3000	35	30	35	30	0	0	0	0	954.57	574.66
1.57	1.57	2987	3000	35	30	35	30	0	0	0	0	954.29	574.66
1.56	1.56	2987	3000	35	30	35	30	0	0	0	0	954.20	574.66
1.58	1.58	2987	3000	35	30	35	30	0	0	0	0	954.24	574.66
1.53	1.53	2987	3000	35	30	35	30	0	0	0	0	954.45	574.66
1.48	1.48	2987	3000	35	30	35	30	0	0	0	0	954.69	574.65
1.59	1.59	2987	3000	35	30	35	30	0	0	0	0	954.93	574.65
1.54	1.54	2987	3000	35	30	35	30	0	0	0	0	955.07	574.65
1.55	1.55	2987	3000	35	30	35	30	0	0	0	0	955.04	574.65
1.53	1.53	2987	3000	35	30	35	30	0	0	0	0	955.02	574.65
1.60	1.60	2987	3000	35	30	35	30	0	0	0	0	954.99	574.65
1.59	1.59	2987	3000	35	30	35	30	0	0	0	0	954.97	574.65
1.59	1.59	2987	3000	35	30	35	30	0	0	0	0	954.94	574.64
1.58	1.58	2987	3000	35	30	35	30	0	0	0	0	954.94	574.64
1.60	1.60	2987	3000	35	30	35	30	0	0	0	0	954.94	574.64
1.55	1.55	2987	3000	35	30	35	30	0	0	0	0	954.94	574.64
1.57	1.57	2987	3000	35	30	35	30	0	0	0	0	954.88	574.64
1.53	1.53	2987	3000	35	30	35	30	0	0	0	0	954.74	574.64
1.53	1.53	2987	3000	35	30	35	30	0	0	0	0	954.60	574.64
1.52	1.52	2987	3000	35	30	35	30	0	0	0	0	954.45	574.63
1.51	1.51	2987	3000	35	30	35	30	0	0	0	0	954.32	574.63
1.53	1.53	2987	3000	35	30	35	30	0	0	0	0	954.36	574.63
1.48	1.48	2987	3000	35	30	35	30	0	0	0	0	954.48	574.63
1.48	1.48	2987	3000	35	30	35	30	0	0	0	0	954.60	574.63
1.56	1.56	2987	3000	35	30	35	30	0	0	0	0	954.67	574.63
1.61	1.61	2987	3000	35	30	35	30	0	0	0	0	954.63	574.63
1.65	1.65	2987	3000	35	30	35	30	0	0	0	0	954.52	574.63
1.67	1.67	2987	3000	35	30	35	30	0	0	0	0	954.42	574.62

Flue gas O2 %	Flue gas O2 %	fresh catalyst		fresh catalyst serpoint		SuperSogetter		SuperSogetter serpoint		NOX additive		Ammonia Injection	riser temp	hr outlet temp
		lb/d	11FC0870	lb/d	11FC0870.SP	lb/d	11W0866	lb/d	11W0867.SP	lb/d	11W0869			
11AC0816	11A0816	2987	3000	35	30	0	8	11TCRTR	11TC0025	574.62	574.62	574.62	574.62	574.62
1.60	1.53	2987	3000	35	30	0	8	954.31	574.62	574.62	574.62	574.62	574.62	574.62
1.60	1.50	2987	3000	35	30	0	8	954.24	574.62	574.62	574.62	574.62	574.62	574.62
1.60	1.49	2987	3000	35	30	0	8	954.24	574.62	574.62	574.62	574.62	574.62	574.62
1.60	1.51	2987	3000	35	30	0	8	954.42	574.62	574.62	574.62	574.62	574.62	574.62
1.60	1.57	2987	3000	35	30	0	8	954.63	574.62	574.62	574.62	574.62	574.62	574.62
1.60	1.59	2987	3000	35	30	0	8	954.56	574.62	574.62	574.62	574.62	574.62	574.62
1.60	1.55	2987	3000	35	30	0	8	954.43	574.61	574.61	574.61	574.61	574.61	574.61
1.60	1.54	2987	3000	35	30	0	8	954.04	574.61	574.61	574.61	574.61	574.61	574.61
1.60	1.47	2987	3000	35	30	0	8	953.74	574.61	574.61	574.61	574.61	574.61	574.61
1.59	1.47	2987	3000	35	30	0	8	953.90	574.61	574.61	574.61	574.61	574.61	574.61
1.59	1.45	2987	3000	35	30	0	8	954.19	574.61	574.61	574.61	574.61	574.61	574.61
1.59	1.44	2987	3000	35	30	0	8	954.53	574.61	574.61	574.61	574.61	574.61	574.61
1.59	1.45	2987	3000	35	30	0	8	954.90	574.61	574.61	574.61	574.61	574.61	574.61
1.59	1.39	2987	3000	35	30	0	8	955.28	574.60	574.60	574.60	574.60	574.60	574.60
1.59	1.48	2987	3000	35	30	0	8	955.64	574.60	574.60	574.60	574.60	574.60	574.60
1.59	1.45	2987	3000	35	30	0	8	955.56	574.60	574.60	574.60	574.60	574.60	574.60
1.59	1.42	2987	3000	35	30	0	8	955.21	574.60	574.60	574.60	574.60	574.60	574.60
1.59	1.45	2987	3000	35	30	0	8	955.11	574.60	574.60	574.60	574.60	574.60	574.60
1.58	1.44	2987	3000	35	30	0	8	955.16	574.60	574.60	574.60	574.60	574.60	574.60
1.58	1.41	2987	3000	35	30	0	8	955.22	574.60	574.60	574.60	574.60	574.60	574.60
1.58	1.40	2987	3000	35	30	0	8	955.27	574.59	574.59	574.59	574.59	574.59	574.59
1.58	1.35	2987	3000	35	30	0	8	955.32	574.59	574.59	574.59	574.59	574.59	574.59
1.58	1.30	2987	3000	35	30	0	8	955.36	574.59	574.59	574.59	574.59	574.59	574.59
1.58	1.32	2987	3000	35	30	0	8	955.40	574.59	574.59	574.59	574.59	574.59	574.59
1.58	1.35	2987	3000	35	30	0	8	955.46	574.59	574.59	574.59	574.59	574.59	574.59
1.58	1.35	2987	3000	35	30	0	8	955.73	574.59	574.59	574.59	574.59	574.59	574.59
1.58	1.40	2987	3000	35	30	0	8	955.81	574.59	574.59	574.59	574.59	574.59	574.59
1.57	1.39	2987	3000	35	30	0	8	955.68	574.58	574.58	574.58	574.58	574.58	574.58
1.57	1.44	2987	3000	35	30	0	8	955.55	574.58	574.58	574.58	574.58	574.58	574.58
1.57	1.46	2987	3000	35	30	0	8	955.42	574.58	574.58	574.58	574.58	574.58	574.58
1.57	1.52	2987	3000	35	30	0	8	955.32	574.58	574.58	574.58	574.58	574.58	574.58
1.57	1.57	2987	3000	35	30	0	8	955.31	574.58	574.58	574.58	574.58	574.58	574.58
1.57	1.41	2987	3000	35	30	0	8	955.31	574.58	574.58	574.58	574.58	574.58	574.58
1.57	1.46	2987	3000	35	30	0	8	955.31	574.58	574.58	574.58	574.58	574.58	574.58
1.57	1.54	2987	3000	35	30	0	8	955.23	574.57	574.57	574.57	574.57	574.57	574.57
1.57	1.45	2987	3000	35	30	0	8	955.13	574.57	574.57	574.57	574.57	574.57	574.57
1.56	1.49	2987	3000	35	30	0	8	955.07	574.57	574.57	574.57	574.57	574.57	574.57
1.56	1.50	2987	3000	35	30	0	8	955.15	574.57	574.57	574.57	574.57	574.57	574.57
1.56	1.58	2987	3000	35	30	0	8	955.24	574.57	574.57	574.57	574.57	574.57	574.57
1.56	1.55	2987	3000	35	30	0	8	955.33	574.57	574.57	574.57	574.57	574.57	574.57
1.56	1.51	2987	3000	35	30	0	8	955.43	574.57	574.57	574.57	574.57	574.57	574.57
1.56	1.43	2987	3000	35	30	0	8	955.52	574.56	574.56	574.56	574.56	574.56	574.56
1.56	1.46	2987	3000	35	30	0	8	955.52	574.56	574.56	574.56	574.56	574.56	574.56
1.56	1.44	2987	3000	35	30	0	8	955.35	574.56	574.56	574.56	574.56	574.56	574.56

	Flue gas O2 %	Flue gas O2 %	fresh catalyst		fresh catalyst setpoint		SuperSovagetter		SuperSovagetter setpoint		NOx additive		Ammonia injection		riser temp	hr outlet temp
			lb/d	11FC0870	lb/d	11FC0870.SP	lb/d	11W0868	lb/d	11WY867.SP	lb/d	11W0869	lb/d	11FC2032		
4/25/2012 15:16	1.56	1.46	2987	11A0816	3000	3000	35	30	0	8	11TCRXTR	11TC0025	574.56	574.56	955.19	574.56
4/25/2012 15:17	1.55	1.53	2987	11A0816	3000	3000	35	30	0	8	11TCRXTR	11TC0025	574.56	574.56	955.02	574.56
4/25/2012 15:18	1.55	1.55	2987	11A0816	3000	3000	35	30	0	8	11TCRXTR	11TC0025	574.56	574.56	954.95	574.56
4/25/2012 15:19	1.55	1.54	2987	11A0816	3000	3000	35	30	0	8	11TCRXTR	11TC0025	574.56	574.56	955.06	574.56
4/25/2012 15:20	1.55	1.51	2987	11A0816	3000	3000	35	30	0	8	11TCRXTR	11TC0025	574.56	574.56	955.15	574.56
4/25/2012 15:21	1.55	1.52	2987	11A0816	3000	3000	35	30	0	8	11TCRXTR	11TC0025	574.55	574.55	955.06	574.55
4/25/2012 15:22	1.55	1.56	2987	11A0816	3000	3000	35	30	0	8	11TCRXTR	11TC0025	574.55	574.55	954.94	574.55
4/25/2012 15:23	1.54	1.54	2987	11A0816	3000	3000	35	30	0	8	11TCRXTR	11TC0025	574.55	574.55	954.83	574.55

Feed rate bpd	coke burn lb/hr	Primary current to Primary current to Primary current to Primary current to				Primary power to Primary power to Primary power to Primary power to				Secondary current to TR1 mA	Secondary current to TR2 mA	Secondary current to TR3 mA	Primary voltage to Primary voltage to Primary voltage to		
		TR1 A	TR2 A	TR3 A	TR1 A	TR2 A	TR3 A	TR1 kW	TR2 kW	TR3 kW			TR1 V	TR2 V	TR3 V
11FC0118	11micbcr	11I0032A	11I0033A	11I0034A	11J0032A	11J0033A	11J0034A	11I0032B	11I0033B	11I0034B	11E0032A	11E0033A	11E0034A		
4/26/2012 8:02	32527	69	66	66	12	10	10	304	285	285	236	232	237		
4/26/2012 8:03	32535	69	66	66	12	10	10	303	285	285	235	232	237		
4/26/2012 8:04	32543	68	66	66	12	10	10	297	285	285	234	232	237		
4/26/2012 8:05	32546	69	66	66	12	10	10	302	285	285	234	232	237		
4/26/2012 8:06	32538	69	66	66	12	10	10	305	285	285	234	232	237		
4/26/2012 8:07	32530	68	66	66	12	10	10	296	285	285	233	232	237		
4/26/2012 8:08	32521	68	66	66	12	10	10	296	285	285	233	232	237		
4/26/2012 8:09	32513	70	66	66	12	10	10	309	285	285	238	232	237		
4/26/2012 8:10	32504	69	66	66	11	10	10	302	285	285	236	232	237		
4/26/2012 8:11	32496	70	66	66	11	10	10	309	285	285	237	232	237		
4/26/2012 8:12	32487	68	66	66	11	10	10	299	285	285	234	232	237		
4/26/2012 8:13	32479	69	66	66	11	10	10	306	285	285	236	232	237		
4/26/2012 8:14	32470	66	66	66	11	10	10	290	285	285	232	232	237		
4/26/2012 8:15	32465	67	66	66	12	10	10	294	285	285	232	232	237		
4/26/2012 8:16	32469	67	66	66	12	10	10	291	285	285	232	232	237		
4/26/2012 8:17	32473	71	66	66	13	10	10	311	285	285	238	232	237		
4/26/2012 8:18	32478	69	66	66	13	10	10	300	285	285	235	232	237		
4/26/2012 8:19	32483	68	66	66	12	10	10	296	285	285	235	232	237		
4/26/2012 8:20	32488	70	66	66	13	10	10	313	285	285	239	232	237		
4/26/2012 8:21	32493	72	66	66	14	10	10	322	285	285	240	232	237		
4/26/2012 8:22	32497	69	66	66	12	10	10	307	285	285	236	232	237		
4/26/2012 8:23	32502	70	66	66	12	10	10	315	285	285	238	232	237		
4/26/2012 8:24	32507	71	66	66	12	10	10	316	285	285	239	232	237		
4/26/2012 8:25	32508	69	66	66	12	10	10	304	285	285	236	232	237		
4/26/2012 8:26	32500	70	66	66	12	10	10	311	285	285	236	232	237		
4/26/2012 8:27	32491	68	66	66	13	10	10	297	285	285	233	232	237		
4/26/2012 8:28	32482	70	66	66	13	10	10	308	285	285	236	232	237		
4/26/2012 8:29	32473	69	66	66	13	10	10	307	285	285	236	232	237		
4/26/2012 8:30	32464	70	66	66	13	10	10	314	285	285	237	232	237		
4/26/2012 8:31	32455	72	66	66	13	10	10	322	285	285	239	232	237		
4/26/2012 8:32	32446	72	66	66	14	10	10	325	285	285	241	232	237		
4/26/2012 8:33	32437	69	66	66	13	10	10	308	285	285	236	232	237		
4/26/2012 8:34	32427	73	66	66	14	10	10	324	285	285	241	232	237		
4/26/2012 8:35	32423	70	66	66	14	10	10	311	285	285	237	232	237		
4/26/2012 8:36	32441	69	66	66	13	10	10	299	285	285	236	232	237		
4/26/2012 8:37	32461	68	66	66	12	10	10	301	285	285	235	232	237		
4/26/2012 8:38	32481	71	66	66	13	10	10	317	285	285	240	232	237		
4/26/2012 8:39	32500	68	66	66	13	10	10	298	285	285	234	232	237		
4/26/2012 8:40	32520	68	66	66	12	10	10	302	285	285	235	232	237		
4/26/2012 8:41	32540	71	66	66	12	10	10	317	285	285	240	233	237		
4/26/2012 8:42	32560	72	66	66	12	10	10	317	285	285	240	233	237		
4/26/2012 8:43	32580	67	66	66	13	10	10	294	285	285	232	233	237		
4/26/2012 8:44	32600	67	66	66	13	10	10	296	285	285	234	233	237		
4/26/2012 8:45	32616	71	66	66	13	10	10	313	285	285	238	233	237		

Feed rate bpd	coke burn lb/hr	Primary current to Primary current to Primary current to				Primary power to Primary power to Primary power to				Secondary current to TR1 mA	Secondary current to TR2 mA	Secondary current to TR3 mA	Primary voltage to Primary voltage to Primary voltage to		
		TR1 A	TR2 A	TR3 A	TR1 kW	TR2 kW	TR3 kW	TR1 kW	TR2 kW	TR3 kW			TR1 V	TR2 V	TR3 V
11FC0118	11midcbr	11I0032A	11I0033A	11I0034A	11J0032A	11J0033A	11J0034A	11J0032B	11I0033B	11I0034B	11E0032A	11E0033A	11E0034A		
32609	18020	73	66	66	14	10	10	324	285	285	241	233	237		
32599	18059	68	66	66	12	10	10	298	285	285	234	233	237		
32589	18106	66	66	66	12	10	10	288	285	285	231	233	237		
32579	18093	69	66	66	13	10	10	308	285	285	237	233	237		
32569	18098	68	66	66	13	10	10	298	285	285	236	233	237		
32559	18086	67	66	66	13	10	10	284	285	285	232	233	237		
32549	18084	67	67	66	13	10	10	285	285	285	231	233	237		
32539	18090	68	67	66	13	10	10	289	284	285	230	233	237		
32529	18094	68	67	66	13	10	10	290	284	285	230	233	237		
32521	18145	68	67	66	13	10	10	302	284	285	234	233	237		
32522	18147	71	67	66	13	10	10	315	284	285	238	233	237		
32524	18100	69	67	66	13	10	10	307	284	285	236	233	236		
32527	18093	71	67	66	13	10	10	312	284	285	238	233	236		
32530	18136	69	67	66	12	10	10	308	284	285	236	233	236		
32532	18114	72	67	66	13	10	10	319	284	285	240	233	236		
32535	18080	70	67	66	13	10	10	310	284	285	238	233	236		
32537	18084	68	67	66	12	10	10	297	284	285	234	233	236		
32540	18037	69	67	66	12	10	10	303	284	285	236	233	236		
32542	18070	67	67	66	12	10	10	293	284	285	232	233	236		
32544	18144	67	67	66	12	10	10	293	284	285	232	233	236		
32535	18178	63	67	66	12	10	10	271	284	285	226	233	236		
32525	18101	67	67	66	12	10	10	295	284	285	233	233	236		
32515	18071	67	67	66	12	10	10	293	284	285	233	233	236		
32505	18087	65	67	66	12	10	10	276	284	285	228	233	236		
32495	18093	65	67	66	12	10	10	283	284	285	230	233	236		
32485	18104	67	67	66	12	10	10	296	284	285	233	233	236		
32475	18085	66	67	66	11	11	10	283	284	285	229	233	236		
32465	18003	66	67	66	11	11	11	287	284	285	230	233	236		
32455	17953	68	67	67	11	11	11	297	284	285	232	233	236		
32446	17984	68	67	67	12	11	11	301	284	285	234	233	236		
32445	18029	67	67	67	12	11	11	297	284	285	233	233	236		
32446	18017	69	67	67	13	11	11	307	284	285	235	233	236		
32447	17951	71	67	67	13	11	11	315	284	285	239	233	236		
32449	17958	70	67	67	13	11	11	307	284	285	236	233	236		
32450	17989	68	67	67	12	11	11	299	284	285	233	233	236		
32451	17997	67	67	67	12	11	11	294	284	285	231	233	236		
32453	17997	65	67	67	11	11	11	282	284	285	229	233	236		
32454	18006	66	67	67	11	11	11	291	284	285	231	233	236		
32455	18055	67	66	67	11	11	11	290	282	285	231	232	236		
32457	18062	66	62	67	11	11	11	289	259	285	229	223	236		
32464	18015	66	66	67	11	11	11	288	279	285	228	230	236		
32473	18043	65	67	67	11	11	11	283	285	285	227	232	236		
32482	18032	64	67	67	11	11	11	272	285	285	225	232	236		
32491	18030	64	67	67	11	11	11	276	285	285	227	232	236		

Feed rate bpd	coke burn lb/hr	Primary current to Primary current to Primary current to			Primary power to Primary power to Primary power to			Secondary current to TR1 mA	Secondary current to TR2 mA	Secondary current to TR3 mA	Primary voltage to Primary voltage to Primary voltage to		
		TR1 A	TR2 A	TR3 A	TR1 kW	TR2 kW	TR3 kW				TR1 V	TR2 V	TR3 V
11FC0118	11mtckbr	11I0032A	11I0033A	11I0034A	11J0032A	11J0033A	11J0034A	11I0032B	11I0033B	11I0034B	11E0032A	11E0033A	11E0034A
32500	18044	68	67	67	12	11	11	302	285	285	235	232	236
4/26/2012 9:30													
32509	18001	70	67	67	13	11	11	312	285	285	239	232	236
4/26/2012 9:31													
32518	18009	70	67	67	13	11	11	307	285	285	236	232	236
4/26/2012 9:32													
32527	18062	65	67	67	11	11	11	280	285	285	229	232	236
4/26/2012 9:33													
32536	18052	64	67	67	11	11	11	273	285	285	226	232	236
4/26/2012 9:34													
32545	18036	63	67	67	11	11	11	273	285	285	226	232	236
4/26/2012 9:35													
32547	18095	64	67	67	11	11	11	277	285	285	226	232	236
4/26/2012 9:36													
32546	18160	68	67	67	13	11	11	304	285	285	235	232	236
4/26/2012 9:37													
32546	18113	71	67	67	13	11	11	313	285	285	238	232	236
4/26/2012 9:38													
32545	18185	67	67	67	13	11	11	295	285	285	233	232	236
4/26/2012 9:39													
32545	18139	68	67	67	13	11	11	297	285	285	233	232	236
4/26/2012 9:40													
32544	18136	69	67	67	13	11	11	304	285	285	235	232	236
4/26/2012 9:41													
32543	18161	69	67	67	13	11	11	307	285	285	236	232	236
4/26/2012 9:42													
32543	18108	66	67	67	12	11	11	290	285	285	230	232	236
4/26/2012 9:43													
32542	18045	71	67	67	13	11	11	316	285	285	239	232	236
4/26/2012 9:44													
32541	18048	68	67	67	12	11	11	300	285	285	234	232	236
4/26/2012 9:45													
32539	18043	68	67	67	12	11	11	302	285	285	236	232	236
4/26/2012 9:46													
32536	18011	66	67	67	12	11	11	291	285	285	231	232	236
4/26/2012 9:47													
32533	18057	65	67	67	12	11	11	286	285	285	229	232	236
4/26/2012 9:48													
32530	18036	69	67	67	12	11	11	305	285	285	236	232	236
4/26/2012 9:49													
32527	18026	71	67	67	13	11	11	315	285	285	239	232	236
4/26/2012 9:50													
32523	18035	67	67	67	13	11	11	294	285	285	232	232	236
4/26/2012 9:51													
32520	18048	67	67	67	13	11	11	287	285	285	231	232	236
4/26/2012 9:52													
32517	17996	69	67	67	13	11	11	304	285	285	236	232	236
4/26/2012 9:53													
32514	17988	71	67	67	13	11	11	317	285	285	239	232	236
4/26/2012 9:54													
32511	18032	67	67	67	12	11	11	291	285	285	232	232	236
4/26/2012 9:55													
32506	18027	67	67	67	12	11	11	296	285	285	235	232	236
4/26/2012 9:56													
32501	18064	71	67	67	12	11	11	315	285	285	239	232	236
4/26/2012 9:57													
32495	18131	68	67	67	12	11	11	303	285	285	234	232	236
4/26/2012 9:58													
32489	18112	69	67	67	12	11	11	297	285	285	235	232	236
4/26/2012 9:59													
32484	18083	69	67	67	12	11	11	302	285	285	236	232	236
4/26/2012 10:00													
32478	18210	65	67	67	12	11	11	278	285	285	227	232	236
4/26/2012 10:01													
32472	18205	66	67	67	12	11	11	287	285	285	230	232	236
4/26/2012 10:02													
32467	18194	62	67	67	11	11	11	269	285	285	225	232	236
4/26/2012 10:03													
32461	18189	67	67	67	12	11	11	291	285	285	232	232	236
4/26/2012 10:04													
32455	18146	71	67	67	12	11	11	316	285	285	238	232	236
4/26/2012 10:05													
32454	18110	72	67	67	12	11	11	320	285	285	239	232	236
4/26/2012 10:06													
32458	18074	70	67	67	12	11	11	310	285	285	236	232	236
4/26/2012 10:07													
32461	18066	72	67	67	13	11	11	322	285	285	240	232	236
4/26/2012 10:08													
32465	18078	68	67	67	12	11	11	299	286	285	234	231	236
4/26/2012 10:09													
32469	18071	71	67	67	13	11	11	319	286	285	240	231	236
4/26/2012 10:10													
32473	18040	71	67	67	13	11	11	317	286	285	240	231	236
4/26/2012 10:11													
32477	18029	68	67	67	12	11	11	295	286	285	234	231	236
4/26/2012 10:12													
32480	18053	69	67	67	13	11	11	304	286	285	237	231	236
4/26/2012 10:13													

Feed rate bpd	coke burn lb/hr	Primary current to Primary current to				Primary power to				Secondary current to TR1 mA	Secondary current to TR2 mA	Secondary current to TR3 mA	Primary voltage to Primary voltage to			
		TR1 A	TR2 A	TR3 A	TR1 kW	TR2 kW	TR3 kW	TR1 V	TR2 V				TR3 V			
11FC0118	11micbdr	11I0032A	11I0033A	11I0034A	11J0032A	11J0033A	11J0034A	11I0032B	11I0033B	11I0034B	11E0032A	11E0033A	11E0034A			
4/26/2012 10:14	18043	72	67	67	14	11	11	317	286	285	241	231	236			
4/26/2012 10:15	18061	69	67	67	13	11	11	305	286	285	237	231	236			
4/26/2012 10:16	18080	73	67	67	14	11	11	321	286	285	242	231	236			
4/26/2012 10:17	18088	69	67	67	12	11	11	300	286	285	235	231	236			
4/26/2012 10:18	18080	68	67	67	12	11	11	298	286	285	233	231	236			
4/26/2012 10:19	18080	69	67	67	13	11	11	306	286	285	236	231	236			
4/26/2012 10:20	18089	72	67	67	14	11	11	321	286	285	240	231	236			
4/26/2012 10:21	18133	70	67	67	13	11	11	310	286	285	236	231	236			
4/26/2012 10:22	18164	65	67	67	12	11	11	286	286	285	229	231	236			
4/26/2012 10:23	18134	69	67	67	13	11	11	301	286	285	234	231	236			
4/26/2012 10:24	18149	68	67	67	13	11	11	292	286	285	233	231	236			
4/26/2012 10:25	18113	69	67	67	13	11	11	301	286	285	235	231	236			
4/26/2012 10:26	18107	68	67	67	13	11	11	296	286	285	234	231	236			
4/26/2012 10:27	18096	72	67	67	13	11	11	318	286	285	240	231	236			
4/26/2012 10:28	18080	69	67	67	13	11	11	304	286	285	236	231	236			
4/26/2012 10:29	18087	69	67	67	13	11	11	303	286	285	235	231	236			
4/26/2012 10:30	18179	68	67	67	13	11	11	298	286	285	235	231	236			
4/26/2012 10:31	18188	70	67	67	13	11	11	312	286	285	237	231	236			
4/26/2012 10:32	18167	67	67	67	12	11	11	296	286	285	232	231	236			
4/26/2012 10:33	18147	73	67	67	13	11	11	324	286	285	241	231	236			
4/26/2012 10:34	18123	72	67	67	13	11	11	321	286	285	239	231	236			
4/26/2012 10:35	18079	69	67	67	12	11	11	302	286	285	234	231	236			
4/26/2012 10:36	18091	70	67	67	12	11	11	311	286	285	237	231	236			
4/26/2012 10:37	18045	66	67	67	12	11	11	287	286	285	230	231	236			
4/26/2012 10:38	18047	67	67	67	13	11	11	293	286	285	233	231	236			
4/26/2012 10:39	18091	70	67	67	13	11	11	310	286	285	238	231	236			
4/26/2012 10:40	18082	72	67	67	14	11	11	323	286	285	241	231	236			
4/26/2012 10:41	18087	70	67	67	13	11	11	312	286	285	237	231	236			
4/26/2012 10:42	18106	67	67	67	12	11	11	292	286	285	233	231	236			
4/26/2012 10:43	18064	71	67	67	13	11	11	317	286	285	240	231	236			
4/26/2012 10:44	18080	65	67	67	12	11	11	279	286	285	229	231	236			
4/26/2012 10:45	18134	69	67	67	13	11	11	304	286	285	235	231	236			
4/26/2012 10:46	18044	73	67	67	13	11	11	330	286	285	244	231	236			
4/26/2012 10:47	18027	72	67	67	13	11	11	327	286	285	243	231	236			
4/26/2012 10:48	17994	70	67	67	13	11	11	309	286	285	237	231	236			
4/26/2012 10:49	17933	67	67	67	13	11	11	292	286	285	233	231	236			
4/26/2012 10:50	18026	67	67	67	13	11	11	296	286	285	234	231	236			
4/26/2012 10:51	18125	69	67	67	13	11	11	306	284	285	237	230	236			
4/26/2012 10:52	18087	68	61	67	13	11	11	296	255	285	235	221	236			
4/26/2012 10:53	18071	67	65	67	13	11	11	290	275	285	232	229	236			
4/26/2012 10:54	18095	70	67	67	13	11	11	311	285	285	237	232	236			
4/26/2012 10:55	18067	73	67	67	14	11	11	324	285	285	242	232	236			
4/26/2012 10:56	18019	70	67	67	13	11	11	304	285	285	237	232	236			
4/26/2012 10:57	18047	68	67	67	12	11	11	289	285	285	234	232	236			

Feed rate bpd	coke burn lb/hr	Primary current to Primary current to Primary current to			Primary power to Primary power to Primary power to			Secondary current to TR1 mA	Secondary current to TR2 mA	Secondary current to TR3 mA	Primary voltage to Primary voltage to Primary voltage to		
		TR1 A	TR2 A	TR3 A	TR1 kW	TR2 kW	TR3 kW				TR1 V	TR2 V	TR3 V
11FC0118	11mickbr	11I0032A	11I0033A	11I0034A	11J0032A	11J0033A	11J0034A	11I0032B	11I0033B	11I0034B	11E0032A	11E0033A	11E0034A
32593	18080	69	67	67	12	11	11	299	285	285	237	232	236
32579	18075	70	67	67	13	11	11	307	285	285	238	232	236
32566	18077	70	67	67	13	11	11	311	285	285	238	232	236
32552	18031	72	67	67	14	11	11	321	285	285	242	232	236
32539	18068	70	67	67	13	11	11	311	285	285	237	232	236
32525	18148	65	67	67	11	11	11	282	285	285	229	232	236
32512	18148	68	67	67	12	11	11	298	285	285	233	232	236
32498	18095	72	67	67	14	11	11	321	285	285	240	232	236
32486	18016	70	67	67	14	11	11	309	285	285	237	232	236
32479	17913	70	67	67	13	11	11	314	285	285	239	232	236
32472	17973	69	67	67	12	11	11	304	285	285	237	232	236
32465	18107	67	67	67	12	11	11	297	285	285	233	232	236
32458	18126	71	67	67	13	11	11	315	285	285	239	232	236
32451	18088	73	67	67	14	11	11	328	285	285	243	232	236
32444	18052	70	67	67	13	11	11	311	285	285	237	232	236
32437	18031	72	67	67	14	11	11	321	285	285	240	232	236
32430	18034	69	67	67	13	11	11	304	285	285	237	232	236
32423	18055	65	67	67	12	11	11	284	285	285	230	232	236
32418	18031	70	67	67	13	11	11	306	285	285	238	232	236
32423	18062	74	67	67	13	11	11	329	285	285	244	232	236
32428	18091	70	67	67	13	11	11	311	285	285	238	232	236
32433	18042	71	67	67	13	11	11	313	285	285	238	232	236
32438	18010	68	67	67	13	11	11	297	285	285	233	232	236
32442	18060	67	67	67	13	11	11	296	285	285	233	232	236
32447	18141	68	67	67	13	11	11	299	285	285	236	232	236
32452	18137	67	67	67	13	11	11	294	285	285	232	232	236
32457	18098	68	67	67	13	11	11	296	285	285	234	232	236
32462	18049	71	67	67	13	11	11	314	285	285	239	232	236
32466	18050	69	67	67	12	11	11	305	285	285	236	232	236
32467	18010	70	67	67	13	11	11	308	285	285	236	232	236
32467	17992	74	67	67	14	11	11	332	285	285	244	232	236
32467	18030	72	67	67	14	11	11	320	285	285	240	232	236
32467	18068	72	67	67	13	11	11	319	285	285	241	232	236
32467	18042	72	67	67	13	11	11	316	285	285	240	232	236
32468	17938	71	67	67	13	11	11	312	285	285	238	232	236
32468	17962	72	67	67	13	11	11	321	285	285	240	232	236
32468	17989	69	67	67	12	11	11	303	285	285	236	232	236
32468	18037	70	67	67	12	11	11	306	285	285	238	232	236
32469	18071	69	67	67	12	11	11	300	285	285	236	232	236
32473	18039	69	67	67	12	11	11	307	285	285	237	232	236
32477	18015	68	67	67	12	11	11	295	285	285	234	232	236
32481	17965	69	67	67	12	11	11	296	285	285	234	232	236
32485	17987	72	67	67	13	11	11	317	285	285	240	232	236
32489	18021	69	67	67	12	11	11	307	285	285	237	232	236

Feed rate bpd	coke burn lb/hr	Primary current to Primary current to Primary current to Primary current to				Primary power to Primary power to Primary power to Primary power to				Secondary current to TR1 mA	Secondary current to TR2 mA	Secondary current to TR3 mA	Primary voltage to Primary voltage to Primary voltage to		
		TR1 A	TR2 A	TR3 A	TR1 kW	TR2 kW	TR3 kW	TR1 kW	TR2 kW	TR3 kW			TR1 V	TR2 V	TR3 V
11FC0118	11mickbr	11I0032A	11I0033A	11I0034A	11I0032A	11I0033A	11I0034A	11I0032B	11I0033B	11I0034B	11E0032A	11E0033A	11E0034A		
32493	17964	70	67	67	12	11	11	314	285	285	239	232	236		
32497	17984	71	67	67	12	11	11	315	285	285	238	232	236		
32501	18071	67	67	67	12	11	11	296	285	285	232	232	236		
32505	18141	68	67	67	13	11	11	303	285	285	236	232	236		
32508	18159	68	67	67	13	11	11	302	285	285	235	232	236		
32508	18118	71	67	67	13	11	11	315	285	285	238	232	236		
32508	18033	73	67	67	14	11	11	331	285	285	243	232	236		
32508	18048	70	67	67	13	11	11	313	285	285	238	232	236		
32508	18075	70	67	67	12	11	11	312	285	285	238	232	236		
32508	18046	68	67	67	12	11	11	294	285	285	235	232	236		
32508	18010	67	67	67	13	11	11	292	285	285	233	232	236		
32508	18038	69	67	67	13	11	11	299	285	285	236	232	236		
32508	18158	70	67	67	13	11	11	308	285	285	237	232	236		
32508	18142	72	67	67	14	11	11	322	285	285	241	232	236		
32508	18110	71	67	67	14	11	11	314	285	285	240	232	236		
32507	18130	71	67	67	14	11	11	314	285	285	239	232	236		
32505	18166	72	67	67	14	11	11	323	285	285	241	232	236		
32504	18132	71	67	67	14	11	11	310	285	285	239	232	236		
32502	18120	70	67	67	14	11	11	305	285	285	238	232	236		
32500	18137	71	67	67	14	11	11	313	285	285	237	232	236		
32499	18118	72	67	67	14	11	11	321	285	285	240	232	236		
32497	18099	69	67	67	13	11	11	304	285	285	236	232	236		
32496	18058	72	67	67	13	11	11	318	285	285	241	232	236		
32494	18032	70	67	67	12	11	11	312	285	285	237	232	236		
32493	18059	73	67	67	13	11	11	330	285	285	242	232	236		
32496	18071	71	67	67	13	11	11	318	285	285	240	232	236		
32499	18009	67	67	67	12	11	11	298	285	285	233	232	236		
32503	17957	68	67	67	12	11	11	300	285	285	234	232	236		
32506	17947	70	67	67	12	11	11	309	285	285	237	232	236		
32510	18001	70	67	67	12	11	11	299	285	285	236	232	236		
32514	18000	70	67	67	13	11	11	303	285	285	236	232	236		
32517	18005	70	67	67	13	11	11	314	282	285	238	231	236		
32521	18025	70	63	67	13	11	11	318	259	285	239	224	236		
32524	18023	73	66	67	14	11	11	330	278	285	244	229	236		
32527	17983	71	67	67	14	11	11	318	284	285	240	231	236		
32524	18117	70	67	67	14	11	11	313	284	285	238	231	236		
32520	18140	75	67	67	14	11	11	336	284	285	245	231	236		
32516	18108	73	67	67	14	11	11	320	284	285	241	231	235		
32512	18094	75	67	67	13	11	11	334	284	285	244	231	235		
32508	18056	76	67	67	13	11	11	344	284	285	247	231	235		
32504	18026	72	67	67	13	11	11	319	284	285	240	231	235		
32500	17957	72	67	67	13	11	11	315	284	285	242	231	235		
32496	17962	70	67	67	13	11	11	309	284	285	238	231	235		
32492	18045	69	67	67	12	11	11	305	284	285	235	231	235		

Feed rate bpd	coke burn lb/hr	Primary current to Primary current to				Primary power to				Secondary current to TR1	Secondary current to TR2	Secondary current to TR3	Primary voltage to Primary voltage to			
		TR1 A	TR2 A	TR3 A	TR1 kW	TR2 kW	TR3 kW	TR1 mA	TR2 mA	TR3 mA	TR1 V	TR2 V	TR3 V			
11FC0118	11micbkr	11I0032A	11I0033A	11I0034A	11J0032A	11J0033A	11J0034A	11I0032B	11I0033B	11I0034B	11E0032A	11E0033A	11E0034A			
4/26/2012 12:26	18051	75	67	67	14	11	11	335	284	285	243	231	235			
32488	18060	72	67	67	14	11	11	323	284	285	240	231	235			
32488	18134	70	67	67	14	11	11	310	284	285	238	231	235			
32490	18149	72	67	67	14	11	11	316	284	285	240	231	235			
32490	18108	72	67	67	14	11	11	326	284	285	241	231	235			
32491	18121	68	67	67	12	11	11	293	284	285	233	231	235			
32492	18122	68	67	67	12	11	11	298	284	285	233	231	235			
32493	18150	67	67	67	11	11	11	292	284	285	230	231	235			
32493	18114	74	67	67	14	11	11	333	284	285	241	231	235			
32494	18101	75	67	67	14	11	11	338	284	285	243	231	235			
32495	18119	72	67	67	14	11	11	317	284	285	240	231	235			
32500	18031	73	67	67	14	11	11	323	284	285	241	231	235			
32506	18013	75	67	67	14	11	11	342	284	285	245	231	235			
32512	18056	76	67	67	14	11	11	342	284	285	246	231	235			
32518	18072	72	67	67	14	11	11	317	284	285	239	231	235			
32524	18104	74	67	67	14	11	11	331	284	285	241	231	235			
32530	18107	67	67	67	12	11	11	293	284	285	229	231	235			
32535	18056	70	67	67	13	11	11	316	285	285	237	230	235			
32541	18091	70	67	67	13	11	11	314	285	285	237	230	235			
32547	18057	70	67	67	13	11	11	311	285	285	238	230	235			
32553	18017	71	67	67	13	11	11	321	285	285	240	230	235			
32556	18084	71	67	67	13	11	11	315	285	285	238	230	235			
32557	18147	70	67	67	13	11	11	305	285	285	236	230	235			
32559	18038	68	67	67	14	11	11	301	285	285	233	230	235			
32560	18003	72	67	67	14	11	11	322	285	285	239	230	235			
32562	18059	73	67	67	14	11	11	324	285	285	241	230	235			
32563	18117	68	67	67	14	11	11	302	285	285	233	230	235			
32565	18165	73	67	67	14	11	11	324	285	285	241	230	235			
32566	18118	71	67	67	13	11	11	314	285	285	238	230	235			
32568	18101	70	67	67	13	11	11	311	285	285	239	230	235			
32569	18149	74	67	67	13	11	11	331	285	285	242	230	235			
32563	18234	74	67	67	13	11	11	334	285	285	242	230	235			
32555	18268	73	67	67	13	11	11	330	285	285	240	230	235			
32546	18262	74	67	67	14	11	11	331	285	285	241	230	235			
32538	18217	72	67	67	14	11	11	322	285	285	240	230	235			
32529	18154	70	67	67	14	11	11	314	285	285	238	230	235			
32521	18131	70	67	67	14	11	11	311	285	285	236	230	235			
32513	18106	73	67	67	14	11	11	333	285	285	241	230	235			
32504	18141	76	67	67	15	11	11	345	285	285	245	230	235			
32496	18133	72	67	67	13	11	11	324	285	285	239	230	235			
32488	18098	71	67	67	13	11	11	318	285	285	238	230	235			
32489	18102	76	67	67	14	11	11	340	285	285	244	230	235			
32495	18073	73	67	67	14	12	11	321	285	285	241	230	235			
32501	18055	75	67	67	13	12	11	332	284	285	244	230	235			

Feed rate bpd	coke burn lb/hr	Primary current to Primary current to			Primary power to			Secondary current to TR1 mA	Secondary current to TR2 mA	Secondary current to TR3 mA	Primary voltage to Primary voltage to		
		TR1 A	TR2 A	TR3 A	TR1 kW	TR2 kW	TR3 kW				TR1 V	TR2 V	TR3 V
11FC0118	11mickbr	11I0032A	11I0033A	11I0034A	11J0032A	11J0033A	11J0034A	11I0032B	11I0033B	11I0034B	11E0032A	11E0033A	11E0034A
4/26/2012 13:10	18023	72	62	67	13	12	11	318	260	285	241	221	235
4/26/2012 13:11	18015	71	65	67	13	12	11	307	276	285	238	227	235
4/26/2012 13:12	18046	72	67	68	13	12	12	311	284	285	237	230	235
4/26/2012 13:13	18090	72	67	68	14	12	12	321	284	285	239	230	235
4/26/2012 13:14	18071	74	67	68	14	12	12	331	284	285	242	230	235
4/26/2012 13:15	18043	73	67	68	14	12	12	332	284	285	243	230	235
4/26/2012 13:16	18123	69	67	68	14	12	12	303	284	285	235	230	235
4/26/2012 13:17	18122	72	67	68	14	12	12	322	284	285	240	230	235

	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1	Arcs/min on TR2	Arcs/min on TR3	Primary current to Primary power to			
										TR1	TR2	TR3	TR1
	kV	kV	kV	11XA0032A	11XA0033A	11XA0034A	11XA0032B	11XA0033B	11XA0034B	A	A	A	kW
4/26/2012 8:02	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:03	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:04	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:05	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:06	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:07	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:08	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:09	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:10	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:11	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:12	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:13	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:14	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:15	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:16	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:17	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:18	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:19	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:20	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:21	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:22	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:23	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:24	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:25	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:26	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:27	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:28	26	24	21	17	0	0	0	0	0	72	60	55	13
4/26/2012 8:29	26	24	21	17	0	0	0	0	0	75	60	55	13
4/26/2012 8:30	26	24	21	17	0	0	0	0	0	76	60	55	13
4/26/2012 8:31	26	24	21	17	0	0	0	0	0	76	60	55	13
4/26/2012 8:32	26	24	21	17	0	0	0	0	0	76	60	55	13
4/26/2012 8:33	26	24	21	17	0	0	0	0	0	76	60	55	13
4/26/2012 8:34	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:35	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:36	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:37	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:38	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:39	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:40	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:41	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:42	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:43	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:44	26	24	21	17	0	0	0	0	0	76	60	55	14
4/26/2012 8:45	26	24	21	17	0	0	0	0	0	76	60	55	14

	Secondary voltage to TR1 kV	Secondary voltage to TR2 kV	Secondary voltage to TR3 kV	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1	Arcs/min on TR2	Arcs/min on TR3	Primary current to TR1 A	Primary current to TR2 A	Primary current to TR3 A	Primary power to TR1 kW	Primary power to TR2 kW	Primary power to TR3 kW
4/26/2012 8:46	11E10032B 26	11E10033B 24	11E10034B 21	11XA0032A 17	11XA0033A 0	11XA0034A 0	11XA0032B 0	11XA0033B 0	11XA0034B 0	11I10067A 76	11I10068A 60	11I10069A 55	11J10067A 14	11J10068A 10	11J10069A 10
4/26/2012 8:47	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 8:48	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 8:49	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 8:50	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 8:51	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 8:52	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 8:53	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 8:54	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 8:55	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 8:56	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 8:57	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 8:58	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 8:59	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:00	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:01	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:02	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:03	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:04	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:05	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:06	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:07	26	24	21	17	0	0	0	0	0	75	60	55	14	10	10
4/26/2012 9:08	26	24	21	17	0	0	0	0	0	75	60	55	14	10	10
4/26/2012 9:09	26	24	21	17	0	0	0	0	0	75	60	55	14	10	10
4/26/2012 9:10	26	24	21	17	0	0	0	0	0	75	60	55	14	10	10
4/26/2012 9:11	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:12	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:13	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:14	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:15	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:16	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:17	26	24	21	17	0	0	0	0	0	75	60	55	14	10	10
4/26/2012 9:18	26	24	21	17	0	0	0	0	0	75	60	55	14	10	10
4/26/2012 9:19	26	24	21	17	0	0	0	0	0	75	60	55	14	10	10
4/26/2012 9:20	26	24	21	17	0	0	0	0	0	75	60	55	14	10	10
4/26/2012 9:21	26	24	21	17	0	0	0	0	0	75	60	55	14	10	10
4/26/2012 9:22	26	24	21	17	0	0	0	0	0	75	60	55	14	10	10
4/26/2012 9:23	26	24	21	17	0	0	0	0	0	75	60	55	14	10	10
4/26/2012 9:24	26	24	21	17	0	0	0	0	0	75	60	55	14	10	10
4/26/2012 9:25	26	24	21	17	0	0	0	0	0	75	60	55	14	10	10
4/26/2012 9:26	26	24	21	17	0	0	0	0	0	75	60	55	14	10	10
4/26/2012 9:27	26	24	21	17	0	0	0	0	0	75	60	55	14	10	10
4/26/2012 9:28	26	24	21	17	0	0	0	0	0	75	60	55	14	10	10
4/26/2012 9:29	26	24	21	17	0	0	0	0	0	75	60	55	14	10	10

	Secondary voltage to TR1 kV	Secondary voltage to TR2 kV	Secondary voltage to TR3 kV	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1	Arcs/min on TR2	Arcs/min on TR3	A TR1 11I0067A	A TR2 11I0068A	A TR3 11I0069A	kW TR1 11J0067A	kW TR2 11J0068A	Primary power to TR2
4/26/2012 9:30	26	24	21	17	0	0	0	0	0	75	60	55	14	10	10
4/26/2012 9:31	26	24	21	17	0	0	0	0	0	75	60	55	14	10	10
4/26/2012 9:32	26	24	21	17	0	0	0	0	0	75	60	55	14	10	10
4/26/2012 9:33	26	24	21	17	0	0	0	0	0	75	60	55	14	10	10
4/26/2012 9:34	26	24	21	17	0	0	0	0	0	75	60	55	14	10	10
4/26/2012 9:35	26	24	21	17	0	0	0	0	0	75	60	55	14	10	10
4/26/2012 9:36	26	24	21	17	0	0	0	0	0	75	60	55	14	10	10
4/26/2012 9:37	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:38	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:39	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:40	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:41	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:42	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:43	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:44	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:45	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:46	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:47	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:48	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:49	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:50	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:51	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:52	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:53	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:54	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:55	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:56	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:57	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:58	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 9:59	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 10:00	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 10:01	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 10:02	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 10:03	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 10:04	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 10:05	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 10:06	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 10:07	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 10:08	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 10:09	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 10:10	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 10:11	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 10:12	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10
4/26/2012 10:13	26	24	21	17	0	0	0	0	0	76	60	55	14	10	10

	Secondary voltage to TR1		Secondary voltage to TR2		Secondary voltage to TR3		Sparks/min on TR1		Sparks/min on TR2		Sparks/min on TR3		Arcs/min on TR1		Arcs/min on TR2		Arcs/min on TR3		Primary current to Primary power to									
	KV		KV		KV		TR1		TR2		TR3		TR1		TR2		TR3		A	KW	TR1	KW	TR2	KW				
4/26/2012 10:58	26	11E0032B	25	11E0033B	21	11E0034B	17	11XA0032A	0	11XA0033A	0	11XA0034A	0	11XA0032B	0	11XA0033B	0	11XA0034B	76	11I0067A	60	11I0068A	55	11I0069A	14	11J0067A	10	11J0068A
4/26/2012 10:59	26		25		21		17		0		0		0		0		0		76		60		55		14		10	
4/26/2012 11:00	26		25		21		17		0		0		0		0		0		76		60		55		14		10	
4/26/2012 11:01	26		25		21		17		0		0		0		0		0		76		60		55		14		10	
4/26/2012 11:02	26		25		21		17		0		0		0		0		0		76		60		55		14		10	
4/26/2012 11:03	26		25		21		17		0		0		0		0		0		76		60		55		14		10	
4/26/2012 11:04	26		25		21		17		0		0		0		0		0		76		60		55		14		10	
4/26/2012 11:05	26		25		21		17		0		0		0		0		0		76		60		55		14		10	
4/26/2012 11:06	26		25		21		17		0		0		0		0		0		76		60		55		14		10	
4/26/2012 11:07	26		25		21		17		0		0		0		0		0		76		60		55		14		10	
4/26/2012 11:08	26		25		21		17		0		0		0		0		0		76		60		55		14		10	
4/26/2012 11:09	26		25		21		18		0		0		0		0		0		76		60		55		14		10	
4/26/2012 11:10	26		25		21		18		0		0		0		0		0		76		60		55		14		10	
4/26/2012 11:11	26		25		21		18		0		0		0		0		0		76		60		55		14		10	
4/26/2012 11:12	26		25		21		18		0		0		0		0		0		76		60		55		14		10	
4/26/2012 11:13	26		25		21		18		0		0		0		0		0		76		60		54		14		10	
4/26/2012 11:14	26		25		21		18		0		0		0		0		0		76		60		54		14		10	
4/26/2012 11:15	26		25		21		18		0		0		0		0		0		76		60		54		14		10	
4/26/2012 11:16	26		25		21		15		0		0		0		0		0		76		60		54		14		10	
4/26/2012 11:17	26		25		21		15		0		0		0		0		0		76		60		54		14		10	
4/26/2012 11:18	26		25		21		15		0		0		0		0		0		76		60		54		14		10	
4/26/2012 11:19	26		25		21		15		0		0		0		0		0		76		60		54		14		10	
4/26/2012 11:20	26		25		21		16		0		0		0		0		0		76		60		54		14		10	
4/26/2012 11:21	26		25		21		16		0		0		0		0		0		76		60		54		14		10	
4/26/2012 11:22	26		25		21		16		0		0		0		0		0		76		60		54		14		10	
4/26/2012 11:23	26		25		21		16		0		0		0		0		0		76		60		54		14		10	
4/26/2012 11:24	26		25		21		16		0		0		0		0		0		76		60		54		14		10	
4/26/2012 11:25	26		25		21		16		0		0		0		0		0		76		60		54		14		10	
4/26/2012 11:26	26		25		21		16		0		0		0		0		0		75		60		54		14		10	
4/26/2012 11:27	26		25		21		16		0		0		0		0		0		75		60		54		14		10	
4/26/2012 11:28	26		25		21		17		0		0		0		0		0		75		60		54		14		10	
4/26/2012 11:29	26		25		21		17		0		0		0		0		0		75		60		54		14		10	
4/26/2012 11:30	26		25		21		17		0		0		0		0		0		75		60		54		14		10	
4/26/2012 11:31	26		25		21		17		0		0		0		0		0		76		60		54		14		10	
4/26/2012 11:32	26		25		21		17		0		0		0		0		0		76		60		54		14		10	
4/26/2012 11:33	26		25		21		17		0		0		0		0		0		76		60		54		14		10	
4/26/2012 11:34	26		25		21		17		0		0		0		0		0		76		60		54		14		10	
4/26/2012 11:35	26		25		21		18		0		0		0		0		0		76		60		54		14		10	
4/26/2012 11:36	26		25		21		18		0		0		0		0		0		76		60		54		14		10	
4/26/2012 11:37	26		25		21		18		0		0		0		0		0		76		60		54		14		10	
4/26/2012 11:38	26		25		21		18		0		0		0		0		0		76		60		54		14		10	
4/26/2012 11:39	26		25		21		18		0		0		0		0		0		76		60		54		14		10	
4/26/2012 11:40	26		25		21		18		0		0		0		0		0		76		60		54		14		10	
4/26/2012 11:41	26		25		21		18		0		0		0		0		0		76		60		54		14		10	

	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1	Arcs/min on TR2	Arcs/min on TR3	Primary current to Primary current to Primary current to Primary power to					
										TR1	TR2	TR3	TR2		
	kV	kV	kV							A	A	A	kW	kW	kW
4/26/2012 11:42	11E0032B	11E0033B	11E0034B	11XA0032A	11XA0033A	11XA0034A	11XA0032B	11XA0033B	11XA0034B	11I0067A	11I0068A	11I0069A	11J0067A	11J0068A	
	26	25	21	18	0	0	0	0	0	76	60	54	14	10	
4/26/2012 11:43	26	25	21	18	0	0	0	0	0	76	60	54	14	10	
4/26/2012 11:44	26	25	21	18	0	0	0	0	0	76	60	54	14	10	
4/26/2012 11:45	26	25	21	18	0	0	0	0	0	76	60	54	14	10	
4/26/2012 11:46	26	25	21	18	0	0	0	0	0	76	60	54	14	10	
4/26/2012 11:47	26	25	21	18	0	0	0	0	0	76	60	54	14	10	
4/26/2012 11:48	26	25	21	18	0	0	0	0	0	76	60	54	14	10	
4/26/2012 11:49	26	25	21	18	0	0	0	0	0	76	60	54	14	10	
4/26/2012 11:50	26	25	21	17	0	0	0	0	0	76	60	54	14	10	
4/26/2012 11:51	26	25	21	17	0	0	0	0	0	76	60	54	14	10	
4/26/2012 11:52	26	25	21	17	0	0	0	0	0	76	60	54	14	10	
4/26/2012 11:53	26	25	21	17	0	0	0	0	0	76	60	54	14	10	
4/26/2012 11:54	26	25	21	17	0	0	0	0	0	76	60	54	14	10	
4/26/2012 11:55	26	25	21	17	0	0	0	0	0	76	60	54	14	10	
4/26/2012 11:56	26	25	21	17	0	0	0	0	0	76	60	54	14	10	
4/26/2012 11:57	26	25	21	17	0	0	0	0	0	76	60	54	14	10	
4/26/2012 11:58	26	25	21	17	0	0	0	0	0	76	60	54	14	10	
4/26/2012 11:59	26	25	21	17	0	0	0	0	0	76	60	54	14	10	
4/26/2012 12:00	26	25	21	17	0	0	0	0	0	76	60	54	14	10	
4/26/2012 12:01	26	25	21	17	0	0	0	0	0	76	60	54	14	10	
4/26/2012 12:02	26	25	21	17	0	0	0	0	0	76	60	54	14	10	
4/26/2012 12:03	26	25	21	17	0	0	0	0	0	76	60	54	14	10	
4/26/2012 12:04	26	25	21	17	0	0	0	0	0	76	60	54	14	10	
4/26/2012 12:05	26	25	21	17	0	0	0	0	0	76	60	54	14	10	
4/26/2012 12:06	26	25	21	17	0	0	0	0	0	76	60	54	14	10	
4/26/2012 12:07	26	25	21	17	0	0	0	0	0	76	60	54	14	10	
4/26/2012 12:08	26	25	21	17	0	0	0	0	0	76	60	54	14	10	
4/26/2012 12:09	26	25	21	17	0	0	0	0	0	76	60	54	14	10	
4/26/2012 12:10	26	25	21	17	0	0	0	0	0	76	60	54	14	10	
4/26/2012 12:11	26	25	21	17	0	0	0	0	0	76	60	54	14	10	
4/26/2012 12:12	26	25	21	16	0	0	0	0	0	76	60	54	14	10	
4/26/2012 12:13	26	25	21	16	0	0	0	0	0	76	60	54	14	10	
4/26/2012 12:14	26	25	21	16	0	0	0	0	0	76	60	54	14	10	
4/26/2012 12:15	26	25	21	16	0	0	0	0	0	76	60	54	14	10	
4/26/2012 12:16	26	25	21	16	0	0	0	0	0	76	60	54	14	10	
4/26/2012 12:17	26	25	21	16	0	0	0	0	0	76	60	54	14	10	
4/26/2012 12:18	26	25	21	16	0	0	0	0	0	76	60	54	14	10	
4/26/2012 12:19	26	25	21	16	0	0	0	0	0	76	60	54	14	10	
4/26/2012 12:20	26	25	21	16	0	0	0	0	0	76	60	54	14	10	
4/26/2012 12:21	26	25	21	16	0	0	0	0	0	76	60	54	14	10	
4/26/2012 12:22	26	25	21	16	0	0	0	0	0	76	60	54	14	10	
4/26/2012 12:23	26	25	21	16	0	0	0	0	0	76	60	54	14	10	
4/26/2012 12:24	26	25	21	16	0	0	0	0	0	76	60	54	14	10	
4/26/2012 12:25	26	25	21	16	0	0	0	0	0	76	60	54	14	10	

	Secondary voltage to TR1 KV	Secondary voltage to TR2 KV	Secondary voltage to TR3 KV	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1	Arcs/min on TR2	Arcs/min on TR3	Primary current to Primary current to Primary current to Primary power to				
										TR1 A	TR2 A	TR3 A	TR1 KW	TR2 KW
4/26/2012 12:26	11E0032B 26	11E0033B 25	11E0034B 21	11XA0032A 16	11XA0033A 0	11XA0034A 0	11XA0032B 0	11XA0033B 0	11XA0034B 0	11I0067A 76	11I0068A 60	11I0069A 54	11J0067A 14	11J0068A 10
4/26/2012 12:27	26	25	21	16	0	0	0	0	0	76	60	54	14	10
4/26/2012 12:28	26	25	21	16	0	0	0	0	0	76	60	54	14	10
4/26/2012 12:29	26	25	21	16	0	0	0	0	0	76	60	54	14	10
4/26/2012 12:30	26	25	21	16	0	0	0	0	0	76	60	54	14	10
4/26/2012 12:31	26	25	21	16	0	0	0	0	0	76	60	54	14	10
4/26/2012 12:32	26	25	21	16	0	0	0	0	0	76	60	54	14	10
4/26/2012 12:33	26	25	21	16	0	0	0	0	0	76	60	54	14	10
4/26/2012 12:34	26	25	21	16	0	0	0	0	0	76	60	54	14	10
4/26/2012 12:35	26	25	21	16	0	0	0	0	0	75	60	54	14	10
4/26/2012 12:36	26	25	21	16	0	0	0	0	0	75	60	54	14	10
4/26/2012 12:37	26	25	21	16	0	0	0	0	0	75	60	54	14	10
4/26/2012 12:38	26	25	21	16	0	0	0	0	0	75	60	54	14	10
4/26/2012 12:39	26	25	21	16	0	0	0	0	0	75	60	54	14	10
4/26/2012 12:40	26	25	21	16	0	0	0	0	0	75	60	54	14	10
4/26/2012 12:41	26	25	21	16	0	0	0	0	0	76	60	54	14	10
4/26/2012 12:42	26	25	21	16	0	0	0	0	0	76	60	54	14	10
4/26/2012 12:43	26	25	21	16	0	0	0	0	0	76	60	54	14	10
4/26/2012 12:44	26	25	21	16	0	0	0	0	0	76	60	54	14	10
4/26/2012 12:45	26	25	21	16	0	0	0	0	0	76	60	54	14	10
4/26/2012 12:46	26	25	21	16	0	0	0	0	0	75	60	54	14	10
4/26/2012 12:47	26	25	21	16	0	0	0	0	0	75	60	54	14	10
4/26/2012 12:48	26	25	21	16	0	0	0	0	0	75	60	54	14	10
4/26/2012 12:49	26	25	21	16	0	0	0	0	0	75	60	54	14	10
4/26/2012 12:50	26	25	21	16	0	0	0	0	0	75	60	54	14	10
4/26/2012 12:51	26	25	21	16	0	0	0	0	0	75	60	54	14	10
4/26/2012 12:52	26	25	21	16	0	0	0	0	0	76	60	54	14	10
4/26/2012 12:53	26	25	21	16	0	0	0	0	0	76	60	54	14	10
4/26/2012 12:54	26	25	21	16	0	0	0	0	0	76	60	54	14	10
4/26/2012 12:55	26	25	21	16	0	0	0	0	0	76	60	54	14	10
4/26/2012 12:56	26	25	21	16	0	0	0	0	0	76	60	54	14	10
4/26/2012 12:57	26	25	21	16	0	0	0	0	0	76	60	54	14	10
4/26/2012 12:58	26	25	21	16	0	0	0	0	0	76	60	54	14	10
4/26/2012 12:59	26	25	21	14	0	0	0	0	0	76	60	54	14	10
4/26/2012 13:00	26	25	21	14	0	0	0	0	0	76	60	54	14	10
4/26/2012 13:01	26	25	21	15	0	0	0	0	0	76	60	54	14	10
4/26/2012 13:02	26	25	21	16	0	0	0	0	0	76	60	54	14	10
4/26/2012 13:03	26	25	21	15	0	0	0	0	0	76	60	54	14	10
4/26/2012 13:04	26	25	21	13	0	0	0	0	0	76	60	54	14	10
4/26/2012 13:05	26	25	21	12	0	0	0	0	0	76	60	54	14	10
4/26/2012 13:06	26	25	21	14	0	0	0	0	0	76	60	54	14	10
4/26/2012 13:07	26	25	21	12	0	0	0	0	0	76	60	54	14	10
4/26/2012 13:08	26	25	21	12	0	0	0	0	0	76	60	54	14	10
4/26/2012 13:09	26	25	21	13	0	0	0	0	0	76	60	54	14	10

	Secondary voltage to TR1 KV	Secondary voltage to TR2 KV	Secondary voltage to TR3 KV	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1	Arcs/min on TR2	Arcs/min on TR3	Primary current to Primary current to Primary current to			Primary power to Primary power to Primary power to		
										TR1 A	TR2 A	TR3 A	TR1 KW	TR2 KW	TR3 KW
4/26/2012 13:10	11E0032B 26	11E0033B 25	11E0034B 21	11XA0032A 15	11XA0033A 0	11XA0034A 0	11XA0032B 0	11XA0033B 0	11XA0034B 0	11I0067A 76	11I0068A 60	11I0069A 54	11J0067A 14	11J0068A 10	
4/26/2012 13:11	26	25	21	16	0	0	0	0	0	76	60	54	14	10	
4/26/2012 13:12	26	25	21	16	0	0	0	0	0	76	60	54	14	10	
4/26/2012 13:13	26	25	21	16	0	0	0	0	0	76	60	54	14	10	
4/26/2012 13:14	26	25	21	16	0	0	0	0	0	76	60	54	14	10	
4/26/2012 13:15	26	25	21	16	0	0	0	0	0	76	60	54	14	10	
4/26/2012 13:16	26	25	21	16	0	0	0	0	0	76	60	54	14	10	
4/26/2012 13:17	26	25	21	16	0	0	0	0	0	76	60	54	14	10	

Primary power to TR3	Primary power to TR1	Secondary current to TR1	Secondary current to TR2	Secondary current to TR3	Primary voltage to Primary voltage to TR1	Primary voltage to Primary voltage to TR2	Primary voltage to Primary voltage to TR3	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1
kW	mA	mA	mA	mA	V	V	V	kV	kV	kV	11XA0067A	11XA0068A	11XA0069A	11XA0067B
11JU0069A	11U0067B	11U0068B	11U0069B	11U0067A	11E0068A	11E0069A	11E0067B	11E0068B	11E0069B	11E0067A	11XA0067A	11XA0068A	11XA0069A	11XA0067B
9	351	250	250	245	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:02														
9	351	250	250	245	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:03														
9	351	250	250	245	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:04														
9	351	250	250	245	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:05														
9	351	250	250	245	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:06														
9	351	250	250	245	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:07														
9	351	250	250	245	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:08														
9	351	250	250	245	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:09														
9	351	250	250	245	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:10														
9	351	250	250	245	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:11														
9	351	250	250	245	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:12														
9	351	250	250	245	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:13														
9	351	250	250	245	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:14														
9	351	250	250	245	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:15														
9	351	250	250	245	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:16														
9	351	250	250	245	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:17														
9	351	250	250	245	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:18														
9	351	250	250	245	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:19														
9	351	250	250	245	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:20														
9	351	250	250	245	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:21														
9	351	250	250	245	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:22														
9	351	250	250	245	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:23														
9	351	250	250	245	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:24														
9	351	250	250	245	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:25														
9	351	250	250	245	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:26														
9	351	250	250	245	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:27														
9	349	250	250	245	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:28														
9	335	250	250	240	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:29														
9	346	250	250	243	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:30														
9	350	250	250	244	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:31														
9	350	250	250	244	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:32														
9	350	250	250	244	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:33														
9	350	250	250	244	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:34														
9	350	250	250	244	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:35														
9	350	250	250	244	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:36														
9	350	250	250	244	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:37														
9	350	250	250	244	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:38														
9	350	250	250	244	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:39														
9	350	250	250	244	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:40														
9	350	250	250	244	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:41														
9	350	250	250	244	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:42														
9	350	250	250	244	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:43														
9	350	250	250	244	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:44														
9	350	250	250	244	221	212	31	24	20	0	0	0	0	0
4/26/2012 8:45														
9	350	250	250	244	221	212	31	24	20	0	0	0	0	0

Primary power to TR3	Primary voltage to Primary voltage to Primary voltage to	Secondary current to TR1	Secondary current to TR2	Secondary current to TR3	Primary voltage to TR1	Primary voltage to TR2	Primary voltage to TR3	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcls/min on TR1
kW	TR3	mA	mA	mA	V	V	V	kV	kV	kV	11XA0067A	11XA0068A	11XA0069A	11XA0067B
11JU0069A	11JU0067B	11JU0068B	11JU0069B	11JU0067A	11JU0068A	11JU0069A	11JU0067B	11JU0068B	11JU0069B	11JU0067A	11JU0068A	11JU0069A	11JU0067B	11JU0068B
9	350	250	250	244	221	212	31	24	20	1	0	0	0	0
4/26/2012 8:46														
9	350	250	250	244	221	212	31	24	20	1	0	0	0	0
4/26/2012 8:47														
9	350	250	250	244	221	212	31	24	20	1	0	0	0	0
4/26/2012 8:48														
9	350	250	250	244	221	212	31	24	20	1	0	0	0	0
4/26/2012 8:49														
9	350	250	250	244	221	212	31	24	20	1	0	0	0	0
4/26/2012 8:50														
9	350	250	250	244	221	212	31	24	20	1	0	0	0	0
4/26/2012 8:51														
9	350	250	250	244	221	212	31	24	20	1	0	0	0	0
4/26/2012 8:52														
9	350	250	250	244	221	212	31	24	20	1	0	0	0	0
4/26/2012 8:53														
9	350	250	250	244	221	212	31	24	20	1	0	0	0	0
4/26/2012 8:54														
9	350	250	250	244	221	212	31	24	20	1	0	0	0	0
4/26/2012 8:55														
9	350	250	250	244	221	212	31	24	20	1	0	0	0	0
4/26/2012 8:56														
9	351	250	250	244	221	212	31	24	20	1	0	0	0	0
4/26/2012 8:57														
9	351	250	250	244	221	212	31	24	20	1	0	0	0	0
4/26/2012 8:58														
9	351	250	250	244	221	212	31	24	20	1	0	0	0	0
4/26/2012 8:59														
9	351	250	250	244	221	212	31	24	20	1	0	0	0	0
4/26/2012 9:00														
9	351	250	250	244	221	212	31	24	20	1	0	0	0	0
4/26/2012 9:01														
9	351	250	250	244	221	212	31	24	20	1	0	0	0	0
4/26/2012 9:02														
9	351	250	250	244	221	212	31	24	20	1	0	0	0	0
4/26/2012 9:03														
9	351	250	250	244	221	212	31	24	20	1	0	0	0	0
4/26/2012 9:04														
9	351	250	250	244	221	212	31	24	20	1	0	0	0	0
4/26/2012 9:05														
9	351	250	250	244	221	212	31	24	20	1	0	0	0	0
4/26/2012 9:06														
9	351	250	250	244	221	212	31	24	20	1	0	0	0	0
4/26/2012 9:07														
9	351	250	250	244	221	212	31	24	20	1	0	0	0	0
4/26/2012 9:08														
9	351	250	250	244	221	212	31	24	20	1	0	0	0	0
4/26/2012 9:09														
9	351	250	250	244	221	212	31	24	20	1	0	0	0	0
4/26/2012 9:10														
9	351	250	250	244	221	212	31	24	20	1	0	0	0	0
4/26/2012 9:11														
9	351	250	250	244	221	212	31	24	20	1	0	0	0	0
4/26/2012 9:12														
9	351	250	250	244	221	212	31	24	20	1	0	0	0	0
4/26/2012 9:13														
9	351	250	250	244	221	212	31	24	20	1	0	0	0	0
4/26/2012 9:14														
9	351	250	250	244	221	212	31	24	20	1	0	0	0	0
4/26/2012 9:15														
9	351	250	250	244	220	213	31	24	20	1	0	0	0	0
4/26/2012 9:16														
9	351	250	250	244	220	213	31	24	20	1	0	0	0	0
4/26/2012 9:17														
9	351	250	250	244	220	213	31	24	20	1	0	0	0	0
4/26/2012 9:18														
9	351	250	250	244	220	213	31	24	20	1	0	0	0	0
4/26/2012 9:19														
9	351	250	250	244	220	213	31	24	20	1	0	0	0	0
4/26/2012 9:20														
9	351	250	250	244	220	213	31	24	20	1	0	0	0	0
4/26/2012 9:21														
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4/26/2012 9:22														
9	351	250	250	245	220	213	31	24	20	1	0	0	0	0
4/26/2012 9:23														
9	351	250	250	245	220	213	31	24	20	1	0	0	0	0
4/26/2012 9:24														
9	351	250	250	245	220	213	31	24	20	1	0	0	0	0
4/26/2012 9:25														
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4/26/2012 9:26														
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4/26/2012 9:27														
9	351	250	250	245	220	213	31	24	20	1	0	0	0	0
4/26/2012 9:28														
9	351	250	250	245	220	213	31	24	20	1	0	0	0	0
4/26/2012 9:29														
9	351	250	250	245	220	213	31	24	20	1	0	0	0	0

Primary power to TR3	Secondary current to TR1	Secondary current to TR2	Secondary current to TR3	Primary voltage to TR1	Primary voltage to TR2	Primary voltage to TR3	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1
kW	mA	mA	mA	V	V	V	kV	kV	kV				
11JU0069A	11IU0067B	11IU0068B	11IU0069B	11IE0067A	11IE0068A	11IE0069A	11E0067B	11E0068B	11E0069B	11XA0067A	11XA0068A	11XA0069A	11XA0067B
9	351	250	250	245	220	213	31	24	20	1	0	0	0
4/26/2012 9:30													
9	351	250	250	245	220	213	31	24	20	0	0	0	0
4/26/2012 9:31													
9	351	250	250	245	220	213	31	24	20	0	0	0	0
4/26/2012 9:32													
9	351	250	250	245	220	213	31	24	20	0	0	0	0
4/26/2012 9:33													
9	351	250	250	245	220	213	31	24	20	0	0	0	0
4/26/2012 9:34													
9	351	250	250	245	220	213	31	24	20	0	0	0	0
4/26/2012 9:35													
9	351	250	250	245	220	213	31	24	20	0	0	0	0
4/26/2012 9:36													
9	351	250	250	245	220	213	31	24	20	0	0	0	0
4/26/2012 9:37													
9	351	250	250	245	220	213	31	24	20	0	0	0	0
4/26/2012 9:38													
9	351	250	250	245	220	213	31	24	20	0	0	0	0
4/26/2012 9:39													
9	351	250	250	245	220	213	31	24	20	0	0	0	0
4/26/2012 9:40													
9	351	250	250	245	220	213	31	24	20	0	0	0	0
4/26/2012 9:41													
9	351	250	250	245	220	213	31	24	20	0	0	0	0
4/26/2012 9:42													
9	351	250	250	245	220	213	31	24	20	0	0	0	0
4/26/2012 9:43													
9	351	250	250	245	220	213	31	24	20	0	0	0	0
4/26/2012 9:44													
9	351	250	250	245	220	213	31	24	20	0	0	0	0
4/26/2012 9:45													
9	351	250	250	245	220	213	31	24	20	0	0	0	0
4/26/2012 9:46													
9	351	250	250	245	220	213	31	24	20	0	0	0	0
4/26/2012 9:47													
9	352	250	250	245	220	213	31	24	20	0	0	0	0
4/26/2012 9:48													
9	352	250	250	245	220	213	31	24	20	0	0	0	0
4/26/2012 9:49													
9	352	250	250	245	220	213	31	24	20	0	0	0	0
4/26/2012 9:50													
9	352	250	250	245	220	213	31	24	20	0	0	0	0
4/26/2012 9:51													
9	352	250	250	245	220	213	31	24	20	0	0	0	0
4/26/2012 9:52													
9	352	250	250	245	220	213	31	24	20	0	0	0	0
4/26/2012 9:53													
9	352	250	250	245	220	213	31	24	20	0	0	0	0
4/26/2012 9:54													
9	352	250	250	245	220	213	31	24	20	0	0	0	0
4/26/2012 9:55													
9	352	250	250	245	220	213	31	24	20	0	0	0	0
4/26/2012 9:56													
9	352	250	250	245	222	213	31	24	20	0	0	0	0
4/26/2012 9:57													
9	352	250	250	245	223	213	31	24	20	0	0	0	0
4/26/2012 9:58													
9	352	250	250	245	223	213	31	24	20	0	0	0	0
4/26/2012 9:59													
9	352	250	250	245	223	213	31	24	20	0	0	0	0
4/26/2012 10:00													
9	352	250	250	245	223	213	31	24	20	0	0	0	0
4/26/2012 10:01													
9	352	250	250	245	223	213	31	24	20	0	0	0	0
4/26/2012 10:02													
9	352	250	250	245	223	213	31	24	20	0	0	0	0
4/26/2012 10:03													
9	352	250	250	245	223	213	31	24	20	0	0	0	0
4/26/2012 10:04													
9	352	250	250	245	223	213	31	24	20	0	0	0	0
4/26/2012 10:05													
9	352	250	250	245	223	213	31	24	20	0	0	0	0
4/26/2012 10:06													
9	352	250	250	245	223	213	31	24	20	0	0	0	0
4/26/2012 10:07													
9	352	250	250	245	223	213	31	24	20	0	0	0	0
4/26/2012 10:08													
9	352	250	250	245	223	213	31	24	20	0	0	0	0
4/26/2012 10:09													
9	352	250	250	245	223	213	31	24	20	0	0	0	0
4/26/2012 10:10													
9	352	250	250	245	223	213	31	24	20	0	0	0	0
4/26/2012 10:11													
9	352	250	250	245	223	213	31	24	20	0	0	0	0
4/26/2012 10:12													
9	352	250	250	245	223	213	31	24	20	0	0	0	0
4/26/2012 10:13													
9	352	250	250	245	223	213	31	24	20	0	0	0	0

Primary power to TR3	Secondary current to TR1	Secondary current to TR2	Secondary current to TR3	Primary voltage to TR1	Primary voltage to Primary voltage to TR2	Primary voltage to Primary voltage to TR3	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1
kW	mA	mA	mA	V	V	V	kV	kV	kV	11XA0067A	11XA0068A	11XA0069A	11XA0067B
11JU069A	11IU067B	11IU068B	11IU069B	11E10067A	11E10068A	11E10069A	11E10067B	11E10068B	11E10069B				
9	344	250	250	243	223	213	31	24	20	0	0	0	0
4/26/2012 10:14													
9	348	250	250	243	223	213	31	24	20	0	0	0	0
4/26/2012 10:15													
9	350	250	250	243	223	213	31	24	20	0	0	0	0
4/26/2012 10:16													
9	350	250	250	244	223	213	31	24	20	0	0	0	0
4/26/2012 10:17													
9	350	250	250	245	223	213	31	24	20	0	0	0	0
4/26/2012 10:18													
9	350	250	250	246	223	213	31	24	20	0	0	0	0
4/26/2012 10:19													
9	350	250	250	246	223	213	31	24	20	0	0	0	0
4/26/2012 10:20													
9	350	250	250	246	223	213	31	24	20	0	0	0	0
4/26/2012 10:21													
9	350	250	250	246	223	213	31	24	20	0	0	0	0
4/26/2012 10:22													
9	350	250	250	246	223	213	31	24	20	0	0	0	0
4/26/2012 10:23													
9	350	250	250	246	223	213	31	24	20	0	0	0	0
4/26/2012 10:24													
9	350	250	250	246	223	213	31	24	20	0	0	0	0
4/26/2012 10:25													
9	350	250	250	246	223	213	31	24	20	0	0	0	0
4/26/2012 10:26													
9	350	250	250	246	223	213	31	24	20	0	0	0	0
4/26/2012 10:27													
9	350	250	250	246	223	213	31	24	20	0	0	0	0
4/26/2012 10:28													
9	350	250	250	246	223	213	31	24	20	0	0	0	0
4/26/2012 10:29													
9	350	250	250	246	223	213	31	24	20	0	0	0	0
4/26/2012 10:30													
9	350	250	250	246	223	213	31	24	20	0	0	0	0
4/26/2012 10:31													
9	350	250	250	246	223	213	31	24	20	0	0	0	0
4/26/2012 10:32													
9	350	250	250	246	223	213	31	24	20	0	0	0	0
4/26/2012 10:33													
9	350	250	250	246	222	213	31	24	20	0	0	0	0
4/26/2012 10:34													
9	350	250	250	246	222	213	31	24	20	0	0	0	0
4/26/2012 10:35													
9	350	250	250	246	222	213	31	24	20	0	0	0	0
4/26/2012 10:36													
9	350	250	250	246	222	213	31	24	20	0	0	0	0
4/26/2012 10:37													
9	350	250	250	246	222	213	31	24	20	0	0	0	0
4/26/2012 10:38													
9	350	250	250	246	222	213	31	24	20	0	0	0	0
4/26/2012 10:39													
9	350	250	250	246	222	213	31	24	20	0	0	0	0
4/26/2012 10:40													
9	350	250	250	246	222	213	31	24	20	0	0	0	0
4/26/2012 10:41													
9	350	250	250	246	222	213	31	24	20	0	0	0	0
4/26/2012 10:42													
9	350	250	250	246	222	213	31	24	20	0	0	0	0
4/26/2012 10:43													
9	350	250	250	245	222	213	31	24	20	0	0	0	0
4/26/2012 10:44													
9	350	250	250	245	222	213	31	24	20	0	0	0	0
4/26/2012 10:45													
9	350	250	250	245	222	213	31	24	20	0	0	0	0
4/26/2012 10:46													
9	350	250	250	245	222	213	31	24	20	0	0	0	0
4/26/2012 10:47													
9	350	250	250	245	222	213	31	24	20	0	0	0	0
4/26/2012 10:48													
9	350	250	250	245	222	213	31	24	20	0	0	0	0
4/26/2012 10:49													
9	350	250	250	245	222	213	31	24	20	0	0	0	0
4/26/2012 10:50													
9	350	250	250	245	222	213	31	24	20	0	0	0	0
4/26/2012 10:51													
9	350	250	250	245	222	213	31	24	20	0	0	0	0
4/26/2012 10:52													
9	350	250	250	245	222	213	31	24	20	0	0	0	0
4/26/2012 10:53													
9	350	250	250	245	222	213	31	24	20	0	0	0	0
4/26/2012 10:54													
9	350	250	250	245	222	213	31	24	20	0	0	0	0
4/26/2012 10:55													
9	350	250	250	245	222	213	31	24	20	0	0	0	0
4/26/2012 10:56													
9	350	250	250	245	222	213	31	24	20	0	0	0	0
4/26/2012 10:57													
9	350	250	250	245	222	213	31	24	20	0	0	0	0

Primary power to TR3	Primary power to TR1	Secondary current to TR1	Secondary current to TR2	Secondary current to TR3	Primary voltage to Primary voltage to TR1	Primary voltage to Primary voltage to TR2	Primary voltage to Primary voltage to TR3	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1
kW	mA	mA	mA	mA	V	V	V	kV	kV	kV	11XA0067A	11XA0068A	11XA0069A	11XA0067B
11JU0069A	11JU0067B	11JU0068B	11JU0069B	11JU0067A	11JU0068A	11JU0069A	11JU0067B	11JU0068B	11JU0069B	11JU0067A	11JU0068A	11JU0069A	11JU0067B	11JU0068B
9	350	250	250	245	222	213	31	24	20	0	0	0	0	0
4/26/2012 10:58														
9	350	250	250	245	222	213	31	24	20	0	0	0	0	0
4/26/2012 10:59														
9	350	250	250	245	222	213	31	24	20	0	0	0	0	0
4/26/2012 11:00														
9	350	250	250	245	222	213	31	24	20	0	0	0	0	0
4/26/2012 11:01														
9	350	250	250	245	222	213	31	24	20	0	0	0	0	0
4/26/2012 11:02														
9	350	250	250	245	222	213	31	24	20	0	0	0	0	0
4/26/2012 11:03														
9	350	250	250	245	222	213	31	24	20	0	0	0	0	0
4/26/2012 11:04														
9	350	250	250	245	222	213	31	24	20	0	0	0	0	0
4/26/2012 11:05														
9	350	250	250	245	222	213	31	24	20	0	0	0	0	0
4/26/2012 11:06														
9	350	250	250	245	222	213	31	24	20	0	0	0	0	0
4/26/2012 11:07														
9	350	250	250	245	222	213	31	24	20	0	0	0	0	0
4/26/2012 11:08														
9	350	250	250	245	222	213	31	24	20	0	0	0	0	0
4/26/2012 11:09														
9	350	250	250	245	222	213	31	24	20	0	0	0	0	0
4/26/2012 11:10														
9	350	250	250	245	222	213	31	24	20	0	0	0	0	0
4/26/2012 11:11														
9	350	250	250	245	222	213	31	24	20	0	0	0	0	0
4/26/2012 11:12														
9	350	250	250	245	222	213	31	24	20	0	0	0	0	0
4/26/2012 11:13														
9	350	250	250	245	222	212	31	24	20	0	0	0	0	0
4/26/2012 11:14														
9	350	250	250	245	222	212	31	24	20	0	0	0	0	0
4/26/2012 11:15														
9	350	250	250	245	222	212	31	24	20	0	0	0	0	0
4/26/2012 11:16														
9	350	250	250	245	222	212	31	24	20	0	0	0	0	0
4/26/2012 11:17														
9	350	250	250	245	222	212	31	24	20	0	0	0	0	0
4/26/2012 11:18														
9	350	250	250	245	222	212	31	24	20	0	0	0	0	0
4/26/2012 11:19														
9	350	250	250	245	222	212	31	24	20	0	0	0	0	0
4/26/2012 11:20														
9	350	250	250	245	222	212	31	24	20	0	0	0	0	0
4/26/2012 11:21														
9	350	250	250	245	222	212	31	24	20	0	0	0	0	0
4/26/2012 11:22														
9	350	250	250	245	222	212	31	24	20	0	0	0	0	0
4/26/2012 11:23														
9	350	250	250	245	222	212	31	24	20	0	0	0	0	0
4/26/2012 11:24														
9	350	250	250	245	222	212	31	24	20	0	0	0	0	0
4/26/2012 11:25														
9	350	250	250	245	222	212	31	24	20	0	0	0	0	0
4/26/2012 11:26														
9	350	250	250	245	222	212	31	24	20	0	0	0	0	0
4/26/2012 11:27														
9	350	250	250	245	222	212	31	24	20	0	0	0	0	0
4/26/2012 11:28														
9	350	250	250	245	222	212	31	24	20	0	0	0	0	0
4/26/2012 11:29														
9	350	250	250	244	222	212	31	24	20	0	0	0	0	0
4/26/2012 11:30														
9	350	250	250	244	222	212	31	24	20	0	0	0	0	0
4/26/2012 11:31														
9	350	250	250	244	222	212	31	24	20	0	0	0	0	0
4/26/2012 11:32														
9	350	250	250	244	222	212	31	24	20	0	0	0	0	0
4/26/2012 11:33														
9	350	250	250	244	222	212	31	24	20	0	0	0	0	0
4/26/2012 11:34														
9	350	250	250	244	222	212	31	24	20	0	0	0	0	0
4/26/2012 11:35														
9	350	250	250	244	222	212	31	24	20	0	0	0	0	0
4/26/2012 11:36														
9	350	250	250	244	222	212	31	24	20	0	0	0	0	0
4/26/2012 11:37														
9	350	250	250	244	222	212	31	24	20	0	0	0	0	0
4/26/2012 11:38														
9	350	250	250	244	222	212	31	24	20	0	0	0	0	0
4/26/2012 11:39														
9	350	250	250	244	222	212	31	24	20	0	0	0	0	0
4/26/2012 11:40														
9	350	250	250	244	222	212	31	24	20	0	0	0	0	0
4/26/2012 11:41														
9	350	250	250	244	222	212	31	24	20	0	0	0	0	0

Primary power to TR3	Primary power to TR1	Secondary current to TR2	Secondary current to TR3	Primary voltage to Primary voltage to TR2	Primary voltage to Primary voltage to TR3	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1
kW	mA	mA	mA	V	V	kV	kV	kV	11XA0067A	11XA0068A	11XA0069A	11XA0067B
11JU069A	11JU067B	11JU068B	11JU069B	11E0067A	11E0068A	11E0067B	11E0068B	11E0069B				
9	350	250	250	244	222	212	24	20	0	0	0	0
4/26/2012 11:42												
9	350	250	250	244	222	212	24	20	0	0	0	0
4/26/2012 11:43												
9	350	250	250	244	222	212	24	20	0	0	0	0
4/26/2012 11:44												
9	350	250	250	244	222	212	24	20	0	0	0	0
4/26/2012 11:45												
9	350	250	250	244	222	212	24	20	0	0	0	0
4/26/2012 11:46												
9	350	250	250	244	222	212	24	20	0	0	0	0
4/26/2012 11:47												
9	350	250	250	244	222	212	24	20	0	0	0	0
4/26/2012 11:48												
9	350	250	250	244	221	212	24	20	0	0	0	0
4/26/2012 11:49												
9	350	250	250	244	221	212	24	20	0	0	0	0
4/26/2012 11:50												
9	350	250	250	244	221	212	24	20	0	0	0	0
4/26/2012 11:51												
9	350	250	250	244	221	212	24	20	0	0	0	0
4/26/2012 11:52												
9	350	250	250	244	221	212	24	20	0	0	0	0
4/26/2012 11:53												
9	350	250	250	244	221	212	24	20	0	0	0	0
4/26/2012 11:54												
9	350	250	250	244	221	212	24	20	0	0	0	0
4/26/2012 11:55												
9	350	250	250	244	221	212	24	20	0	0	0	0
4/26/2012 11:56												
9	350	250	250	244	221	212	24	20	0	0	0	0
4/26/2012 11:57												
9	350	250	250	244	221	212	24	20	0	0	0	0
4/26/2012 11:58												
9	350	250	250	244	221	212	24	20	0	0	0	0
4/26/2012 11:59												
9	350	250	250	244	221	212	24	20	0	0	0	0
4/26/2012 12:00												
9	350	250	250	245	221	212	24	20	0	0	0	0
4/26/2012 12:01												
9	350	250	250	245	221	212	24	20	0	0	0	0
4/26/2012 12:02												
9	350	250	250	245	221	212	24	20	0	0	0	0
4/26/2012 12:03												
9	350	250	250	245	221	212	24	20	0	0	0	0
4/26/2012 12:04												
9	350	250	250	245	221	212	24	20	0	0	0	0
4/26/2012 12:05												
9	350	250	250	245	221	212	24	20	0	0	0	0
4/26/2012 12:06												
9	350	250	250	245	221	212	24	20	0	0	0	0
4/26/2012 12:07												
9	350	250	250	245	221	211	24	20	0	0	0	0
4/26/2012 12:08												
9	350	250	250	245	221	211	24	20	0	0	0	0
4/26/2012 12:09												
9	350	250	250	245	221	211	24	20	0	0	0	0
4/26/2012 12:10												
9	350	250	250	245	221	211	24	20	0	0	0	0
4/26/2012 12:11												
9	350	250	250	245	221	211	24	20	0	0	0	0
4/26/2012 12:12												
9	350	250	250	245	221	211	24	20	0	0	0	0
4/26/2012 12:13												
9	350	250	250	245	221	211	24	20	0	0	0	0
4/26/2012 12:14												
9	350	250	250	245	221	211	24	20	0	0	0	0
4/26/2012 12:15												
9	350	250	250	245	221	211	24	20	0	0	0	0
4/26/2012 12:16												
9	350	250	250	246	221	211	24	20	0	0	0	0
4/26/2012 12:17												
9	350	250	250	246	221	211	24	20	0	0	0	0
4/26/2012 12:18												
9	350	250	250	246	221	211	24	20	0	0	0	0
4/26/2012 12:19												
9	350	250	250	246	221	211	24	20	0	0	0	0
4/26/2012 12:20												
9	350	250	250	246	221	211	24	20	0	0	0	0
4/26/2012 12:21												
9	350	250	250	246	221	211	24	20	0	0	0	0
4/26/2012 12:22												
9	350	250	250	246	221	211	24	20	0	0	0	0
4/26/2012 12:23												
9	351	250	250	246	221	211	24	20	0	0	0	0
4/26/2012 12:24												
9	351	250	250	244	221	211	24	20	0	0	0	0
4/26/2012 12:25												
9	351	250	250	243	221	211	24	20	0	0	0	0

Primary power to TR3	Primary power to TR3	Secondary current to TR1	Secondary current to TR2	Secondary current to TR3	Primary voltage to Primary voltage to Primary voltage to TR1	Primary voltage to Primary voltage to Primary voltage to TR2	Primary voltage to Primary voltage to Primary voltage to TR3	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1
kW	mA	mA	mA	mA	V	V	V	kV	kV	kV	11XA0067A	11XA0068A	11XA0069A	11XA0067B
11JU0069A	11U0067B	11U0068B	11U0069B	11U0067A	11E0068A	11E0069A	11E0067B	11E0068B	11E0069B	11E0067A	11XA0067A	11XA0068A	11XA0069A	11XA0067B
9	351	250	250	243	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:26														
9	351	250	250	243	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:27														
9	351	250	250	243	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:28														
9	351	250	250	243	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:29														
9	351	250	250	243	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:30														
9	351	250	250	243	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:31														
9	351	250	250	243	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:32														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:33														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:34														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:35														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:36														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:37														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:38														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:39														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:40														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:41														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:42														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:43														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:44														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:45														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:46														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:47														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:48														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:49														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:50														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:51														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:52														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:53														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:54														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:55														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:56														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:57														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:58														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 12:59														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 13:00														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 13:01														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 13:02														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 13:03														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 13:04														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 13:05														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 13:06														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 13:07														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 13:08														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0
4/26/2012 13:09														
9	351	250	250	244	221	211	31	24	20	0	0	0	0	0

Primary power to TR3	Secondary current to TR1	Secondary current to TR2	Secondary current to TR3	Primary voltage to TR1	Primary voltage to TR2	Primary voltage to TR3	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1
kW	mA	mA	mA	V	V	V	kV	kV	kV				
11JU069A	11IU067B	11IU068B	11IU069B	11EI0067A	11EI0068A	11EI0069A	11EI0067B	11EI0068B	11EI0069B	11XA0067A	11XA0068A	11XA0069A	11XA0067B
9	351	250	250	244	221	211	31	24	20	0	0	0	0
4/26/2012 13:10													
9	351	250	250	244	221	211	31	24	20	0	0	0	0
4/26/2012 13:11													
9	351	250	250	244	221	211	31	24	20	0	0	0	0
4/26/2012 13:12													
9	351	250	250	244	221	211	31	24	20	0	0	0	0
4/26/2012 13:13													
9	351	250	250	244	221	211	31	24	20	0	0	0	0
4/26/2012 13:14													
9	351	250	250	244	221	211	31	24	20	0	0	0	0
4/26/2012 13:15													
9	351	250	250	244	221	211	31	24	20	0	0	0	0
4/26/2012 13:16													
9	351	250	250	244	221	211	31	24	20	0	0	0	0
4/26/2012 13:17													
9	351	250	250	244	221	211	31	24	20	0	0	0	0

	Arcc/min on TR2	Arcc/min on TR3	Inst Opacity %	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	CORRECTED REGEN SO2 ppm	CORRECTED REGEN NOX ppm	CORRECTED REGEN CO ppm	FCC Feed Sulfur wt%	Wet Air rate to regen mscfd	Flue gas CO2 %
	11XA0068B	11XA0069B	11A0889	11T0520	11T0521	11T0522	11T0523	11T0524	11M0812	11M0813	11M0814	11CFSFLRLD	11F0175	11A0815
4/26/2012 8:02	0	0	1.2	1255	1232	1249	1252	1256	10	29	79	0.060	82588	16.64
4/26/2012 8:03	0	0	1.3	1254	1233	1249	1252	1256	9	29	78	0.060	82593	16.62
4/26/2012 8:04	0	0	1.3	1253	1233	1248	1252	1256	9	29	80	0.060	82599	16.61
4/26/2012 8:05	0	0	1.4	1254	1233	1248	1252	1255	8	29	87	0.060	82604	16.56
4/26/2012 8:06	0	0	1.4	1255	1233	1247	1252	1255	7	29	87	0.060	82609	16.57
4/26/2012 8:07	0	0	1.3	1255	1233	1248	1252	1255	6	29	82	0.060	82614	16.61
4/26/2012 8:08	0	0	1.3	1255	1233	1248	1252	1255	6	29	82	0.060	82617	16.64
4/26/2012 8:09	0	0	1.4	1254	1232	1248	1251	1255	6	29	86	0.060	82619	16.55
4/26/2012 8:10	0	0	1.5	1254	1231	1247	1251	1255	5	29	89	0.060	82620	16.54
4/26/2012 8:11	0	0	1.5	1254	1231	1246	1252	1255	5	29	88	0.060	82621	16.52
4/26/2012 8:12	0	0	1.5	1254	1231	1246	1251	1255	5	29	86	0.060	82622	16.53
4/26/2012 8:13	0	0	1.5	1253	1231	1245	1251	1254	5	29	86	0.060	82623	16.56
4/26/2012 8:14	0	0	1.5	1253	1230	1245	1251	1254	5	29	84	0.060	82624	16.59
4/26/2012 8:15	0	0	1.5	1254	1230	1245	1251	1254	5	29	85	0.060	82625	16.50
4/26/2012 8:16	0	0	1.4	1253	1230	1245	1251	1255	5	28	81	0.060	82626	16.61
4/26/2012 8:17	0	0	1.5	1253	1230	1245	1251	1255	5	29	78	0.060	82628	16.57
4/26/2012 8:18	0	0	1.5	1253	1231	1246	1251	1254	7	29	86	0.060	82629	16.57
4/26/2012 8:19	0	0	1.4	1253	1231	1247	1251	1254	9	29	85	0.060	82630	16.62
4/26/2012 8:20	0	0	1.4	1252	1232	1246	1251	1254	10	29	83	0.060	82631	16.61
4/26/2012 8:21	0	0	1.4	1252	1232	1246	1251	1254	10	29	77	0.060	82632	16.67
4/26/2012 8:22	0	0	1.4	1252	1232	1247	1251	1255	9	29	75	0.060	82633	16.68
4/26/2012 8:23	0	0	1.4	1253	1232	1247	1251	1255	8	29	80	0.060	82634	16.63
4/26/2012 8:24	0	0	1.4	1254	1232	1247	1251	1255	7	29	74	0.060	82635	16.70
4/26/2012 8:25	0	0	1.4	1255	1232	1246	1251	1255	7	30	74	0.060	82636	16.69
4/26/2012 8:26	0	0	1.3	1255	1231	1246	1252	1255	6	29	76	0.060	82638	16.63
4/26/2012 8:27	0	0	1.3	1255	1231	1246	1252	1255	6	29	78	0.060	82639	16.63
4/26/2012 8:28	0	0	1.4	1254	1231	1246	1252	1255	6	29	77	0.060	82640	16.58
4/26/2012 8:29	0	0	1.3	1254	1231	1247	1251	1255	5	29	80	0.060	82641	16.61
4/26/2012 8:30	0	0	1.3	1253	1231	1248	1252	1255	5	29	86	0.060	82642	16.60
4/26/2012 8:31	0	0	1.2	1253	1232	1249	1252	1255	5	28	80	0.060	82643	16.63
4/26/2012 8:32	0	0	1.3	1253	1233	1248	1252	1255	5	28	80	0.060	82644	16.57
4/26/2012 8:33	0	0	1.4	1254	1232	1247	1251	1255	5	29	85	0.060	82645	16.58
4/26/2012 8:34	0	0	1.4	1254	1233	1248	1252	1255	5	29	85	0.060	82646	16.61
4/26/2012 8:35	0	0	1.5	1253	1232	1247	1252	1256	4	29	77	0.060	82648	16.60
4/26/2012 8:36	0	0	1.4	1253	1231	1246	1252	1256	5	30	79	0.060	82649	16.61
4/26/2012 8:37	0	0	1.3	1253	1231	1247	1252	1256	7	30	74	0.060	82650	16.63
4/26/2012 8:38	0	0	1.3	1253	1232	1249	1251	1254	9	30	76	0.060	82651	16.65
4/26/2012 8:39	0	0	1.4	1253	1233	1248	1251	1255	10	30	78	0.060	82652	16.61
4/26/2012 8:40	0	0	1.5	1253	1233	1248	1251	1256	9	30	81	0.060	82653	16.57
4/26/2012 8:41	0	0	1.5	1254	1232	1247	1251	1255	8	30	81	0.060	82654	16.50
4/26/2012 8:42	0	0	1.6	1254	1230	1246	1251	1254	7	30	88	0.060	82655	16.53
4/26/2012 8:43	0	0	1.4	1253	1230	1245	1251	1253	7	31	76	0.060	82656	16.48
4/26/2012 8:44	0	0	1.4	1253	1231	1245	1250	1254	6	30	83	0.060	82658	16.46
4/26/2012 8:45	0	0	1.4	1253	1230	1246	1250	1254	6	30	89	0.060	82659	16.55

	Arcs/min on TR2	Arcs/min on TR3	Inst Opacity %	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	CORRECTED REGEN SO2 ppm	CORRECTED REGEN NOX ppm	CORRECTED REGEN CO ppm	FCC Feed Sulfur wt%	Wet Air rate to regen mscfd	Flue gas CO2 %
	11XA0068B	11XA0069B	11AI00689	11TI00520	11TI00521	11TI00522	11TI00523	11TI00524	11MI0812	11MI0813	11MI0814	11CFSLFLD	11FI0175	11AI0815
4/26/2012 8:46	0	0	1.5	1253	1230	1246	1250	1254	6	30	83	0.060	82660	16.56
4/26/2012 8:47	0	0	1.5	1253	1230	1246	1251	1254	5	29	81	0.060	82661	16.62
4/26/2012 8:48	0	0	1.4	1252	1230	1245	1251	1254	5	30	74	0.060	82662	16.64
4/26/2012 8:49	0	0	1.3	1252	1230	1246	1251	1254	5	30	73	0.060	82663	16.64
4/26/2012 8:50	0	0	1.4	1253	1231	1247	1251	1254	5	29	78	0.060	82664	16.63
4/26/2012 8:51	0	0	1.5	1253	1231	1247	1251	1254	5	29	81	0.060	82665	16.61
4/26/2012 8:52	0	0	1.6	1254	1231	1247	1251	1254	5	29	79	0.060	82666	16.63
4/26/2012 8:53	0	0	1.7	1254	1232	1247	1251	1255	5	30	76	0.060	82668	16.62
4/26/2012 8:54	0	0	1.5	1253	1232	1246	1251	1255	5	30	70	0.060	82669	16.66
4/26/2012 8:55	0	0	1.3	1253	1232	1246	1251	1254	7	29	72	0.060	82670	16.70
4/26/2012 8:56	0	0	1.5	1253	1231	1247	1251	1254	9	30	76	0.060	82671	16.69
4/26/2012 8:57	0	0	1.5	1253	1232	1248	1251	1254	10	30	79	0.060	82672	16.66
4/26/2012 8:58	0	0	1.5	1254	1232	1248	1251	1255	10	30	80	0.060	82675	16.67
4/26/2012 8:59	0	0	1.6	1255	1232	1248	1252	1255	9	30	77	0.060	82685	16.69
4/26/2012 9:00	0	0	1.7	1254	1232	1249	1252	1255	8	30	71	0.060	82696	16.64
4/26/2012 9:01	0	0	1.7	1254	1233	1249	1252	1256	7	30	74	0.060	82708	16.63
4/26/2012 9:02	0	0	1.7	1255	1233	1249	1252	1256	6	30	79	0.060	82719	16.59
4/26/2012 9:03	0	0	1.5	1255	1233	1248	1252	1256	6	29	85	0.060	82731	16.56
4/26/2012 9:04	0	0	1.4	1254	1232	1248	1252	1255	6	29	81	0.060	82742	16.61
4/26/2012 9:05	0	0	1.3	1255	1233	1247	1252	1255	6	29	72	0.060	82753	16.67
4/26/2012 9:06	0	0	1.4	1255	1234	1247	1252	1256	5	29	71	0.060	82765	16.67
4/26/2012 9:07	0	0	1.7	1255	1232	1247	1252	1256	5	30	77	0.060	82776	16.62
4/26/2012 9:08	0	0	1.6	1254	1232	1248	1252	1256	5	30	75	0.060	82788	16.60
4/26/2012 9:09	0	0	1.7	1254	1233	1248	1253	1256	5	29	76	0.060	82799	16.62
4/26/2012 9:10	0	0	1.7	1253	1234	1248	1252	1256	5	29	73	0.060	82810	16.63
4/26/2012 9:11	0	0	1.5	1254	1233	1248	1252	1256	5	29	73	0.060	82822	16.63
4/26/2012 9:12	0	0	1.4	1254	1232	1248	1252	1256	5	29	77	0.060	82830	16.58
4/26/2012 9:13	0	0	1.4	1254	1232	1248	1252	1256	4	30	85	0.060	82813	16.52
4/26/2012 9:14	0	0	1.5	1254	1232	1248	1252	1256	6	30	85	0.060	82792	16.51
4/26/2012 9:15	0	0	1.6	1255	1231	1248	1252	1255	8	30	85	0.060	82770	16.54
4/26/2012 9:16	0	0	1.5	1254	1231	1247	1251	1255	9	30	79	0.060	82749	16.58
4/26/2012 9:17	0	0	1.7	1252	1231	1246	1252	1255	10	30	86	0.060	82727	16.57
4/26/2012 9:18	0	0	1.7	1253	1231	1246	1251	1255	10	31	87	0.060	82705	16.52
4/26/2012 9:19	0	0	1.4	1254	1232	1246	1251	1254	9	30	82	0.060	82684	16.54
4/26/2012 9:20	0	0	1.5	1254	1232	1246	1251	1254	8	30	80	0.060	82662	16.56
4/26/2012 9:21	0	0	1.5	1254	1232	1246	1250	1253	7	30	86	0.060	82641	16.57
4/26/2012 9:22	0	0	1.5	1253	1230	1245	1250	1254	6	30	83	0.060	82619	16.58
4/26/2012 9:23	0	0	1.7	1253	1231	1245	1251	1254	6	29	84	0.060	82597	16.57
4/26/2012 9:24	0	0	1.5	1253	1231	1246	1251	1255	6	29	83	0.060	82577	16.61
4/26/2012 9:25	0	0	1.5	1253	1230	1246	1250	1255	6	30	78	0.060	82571	16.60
4/26/2012 9:26	0	0	1.5	1252	1230	1246	1250	1255	5	29	80	0.060	82569	16.56
4/26/2012 9:27	0	0	1.3	1253	1230	1246	1251	1254	5	29	81	0.060	82566	16.56
4/26/2012 9:28	0	0	1.2	1253	1231	1246	1251	1254	5	29	85	0.060	82564	16.57
4/26/2012 9:29	0	0	1.2	1252	1231	1246	1250	1254	5	29	80	0.060	82561	16.59

	Arcs/min on TR2	Arcs/min on TR3	Inst Opacity	DENSE BED TEMP	DENSE BED TEMP	DENSE BED TEMP	DENSE BED TEMP	DENSE BED TEMP	DENSE BED TEMP	CORRECTED REGEN SO2	CORRECTED REGEN NOX	CORRECTED REGEN CO	FCC Feed Sulfur	Wet Air rate to regen	Flue gas CO2 %
	11XA0068B	11XA0069B	11A00889	11T00520	11T00521	11T00522	11T00523	11T00524	11M00812	11M00813	11M00814	11CFSLR.LD	wt%	mscfd	11A00815
4/26/2012 9:30	0	0	1.1	1253	1230	1246	1251	1254	5	29	88	0.060	0.060	82559	16.60
4/26/2012 9:31	0	0	1.2	1253	1231	1246	1251	1254	5	29	83	0.060	0.060	82556	16.58
4/26/2012 9:32	0	0	1.3	1251	1232	1247	1251	1253	5	29	81	0.060	0.060	82554	16.59
4/26/2012 9:33	0	0	1.3	1252	1231	1247	1250	1253	7	30	76	0.060	0.060	82551	16.63
4/26/2012 9:34	0	0	1.1	1253	1230	1247	1250	1254	9	30	71	0.060	0.060	82549	16.60
4/26/2012 9:35	0	0	1.0	1254	1229	1245	1250	1255	9	30	73	0.060	0.060	82547	16.59
4/26/2012 9:36	0	0	1.0	1254	1229	1245	1250	1255	10	30	74	0.060	0.060	82544	16.70
4/26/2012 9:37	0	0	1.0	1253	1230	1246	1251	1255	10	30	72	0.060	0.060	82542	16.66
4/26/2012 9:38	0	0	1.0	1253	1232	1248	1252	1255	9	31	67	0.060	0.060	82539	16.75
4/26/2012 9:39	0	0	1.1	1253	1232	1247	1252	1255	8	30	68	0.060	0.060	82537	16.69
4/26/2012 9:40	0	0	1.0	1253	1232	1248	1252	1255	7	29	77	0.060	0.060	82534	16.68
4/26/2012 9:41	0	0	0.9	1254	1232	1248	1252	1255	7	30	71	0.060	0.060	82532	16.72
4/26/2012 9:42	0	0	0.9	1254	1232	1247	1252	1255	6	30	74	0.060	0.060	82529	16.68
4/26/2012 9:43	0	0	1.0	1254	1232	1248	1252	1255	6	29	72	0.060	0.060	82527	16.63
4/26/2012 9:44	0	0	0.9	1254	1231	1247	1252	1255	6	29	73	0.060	0.060	82524	16.62
4/26/2012 9:45	0	0	0.9	1254	1231	1246	1251	1254	6	29	72	0.060	0.060	82522	16.61
4/26/2012 9:46	0	0	0.9	1254	1229	1246	1252	1255	6	32	74	0.060	0.060	82519	16.55
4/26/2012 9:47	0	0	0.9	1254	1230	1247	1252	1255	6	30	72	0.060	0.060	82517	16.62
4/26/2012 9:48	0	0	0.9	1254	1230	1247	1252	1255	5	30	75	0.060	0.060	82514	16.60
4/26/2012 9:49	0	0	0.9	1254	1231	1247	1252	1255	5	29	77	0.060	0.060	82512	16.58
4/26/2012 9:50	0	0	1.0	1254	1232	1247	1252	1255	5	29	76	0.060	0.060	82509	16.59
4/26/2012 9:51	0	0	1.0	1255	1231	1248	1252	1256	5	30	76	0.060	0.060	82507	16.61
4/26/2012 9:52	0	0	1.1	1254	1232	1247	1252	1256	7	30	77	0.060	0.060	82504	16.59
4/26/2012 9:53	0	0	1.0	1253	1231	1247	1252	1255	8	30	78	0.060	0.060	82502	16.55
4/26/2012 9:54	0	0	0.9	1253	1230	1246	1251	1255	9	30	79	0.060	0.060	82499	16.58
4/26/2012 9:55	0	0	1.0	1254	1230	1247	1251	1254	10	29	84	0.060	0.060	82497	16.59
4/26/2012 9:56	0	0	0.9	1254	1231	1248	1251	1254	9	29	82	0.060	0.060	82495	16.65
4/26/2012 9:57	0	0	0.9	1254	1231	1248	1252	1254	9	30	80	0.060	0.060	82492	16.70
4/26/2012 9:58	0	0	0.8	1254	1232	1247	1252	1254	8	29	70	0.060	0.060	82490	16.74
4/26/2012 9:59	0	0	0.8	1255	1232	1247	1251	1255	7	30	70	0.060	0.060	82487	16.66
4/26/2012 10:00	0	0	0.9	1255	1232	1246	1251	1255	7	29	70	0.060	0.060	82485	16.72
4/26/2012 10:01	0	0	0.8	1255	1232	1246	1252	1256	6	30	65	0.060	0.060	82482	16.76
4/26/2012 10:02	0	0	0.8	1255	1232	1247	1252	1257	6	29	66	0.060	0.060	82480	16.75
4/26/2012 10:03	0	0	0.8	1255	1233	1247	1253	1257	6	29	70	0.060	0.060	82473	16.73
4/26/2012 10:04	0	0	0.9	1254	1233	1248	1253	1257	6	29	66	0.060	0.060	82465	16.72
4/26/2012 10:05	0	0	0.9	1255	1232	1248	1253	1257	6	29	69	0.060	0.060	82457	16.68
4/26/2012 10:06	0	0	0.9	1255	1231	1247	1253	1257	6	29	69	0.060	0.060	82448	16.66
4/26/2012 10:07	0	0	0.9	1255	1233	1248	1253	1256	5	29	69	0.060	0.060	82431	16.68
4/26/2012 10:08	0	0	0.9	1255	1233	1248	1253	1256	5	29	67	0.060	0.060	82410	16.69
4/26/2012 10:09	0	0	0.9	1255	1232	1247	1253	1256	5	29	67	0.060	0.060	82389	16.69
4/26/2012 10:10	0	0	1.0	1255	1232	1247	1253	1256	6	29	72	0.060	0.060	82367	16.66
4/26/2012 10:11	0	0	1.2	1255	1232	1248	1253	1256	8	29	73	0.060	0.060	82346	16.62
4/26/2012 10:12	0	0	1.1	1255	1233	1248	1253	1256	9	29	76	0.060	0.060	82349	16.62
4/26/2012 10:13	0	0	1.0	1255	1233	1249	1253	1256	10	30	74	0.060	0.060	82366	16.63

4/26/2012 10:14	11XA0068B	11XA0068B	ArCs/min on TR2	ArCs/min on TR3	Inst Opacity %	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	CORRECTED REGEN SO2 ppm	CORRECTED REGEN NOX ppm	CORRECTED REGEN CO ppm	FCC Feed Sulfur wt%	Wet Air rate to regen mscfd	Flue gas CO2 %
						11TI0520	11TI0521	11TI0522	11TI0523	11TI0524	11MI0512	11MI0513	11MI0514	11CFSLR.LD	11FI0175	11A0815
4/26/2012 10:15	0	0	0	0	1.1	1256	1233	1249	1253	1257	10	28	75	0.060	82382	16.63
4/26/2012 10:16	0	0	0	0	1.0	1256	1233	1248	1253	1257	9	30	73	0.060	82398	16.63
4/26/2012 10:17	0	0	0	0	1.2	1255	1233	1248	1253	1257	8	29	76	0.060	82415	16.65
4/26/2012 10:18	0	0	0	0	1.2	1255	1233	1249	1253	1256	7	30	80	0.060	82431	16.63
4/26/2012 10:19	0	0	0	0	1.2	1255	1233	1248	1253	1256	7	29	83	0.060	82448	16.62
4/26/2012 10:20	0	0	0	0	1.2	1254	1233	1248	1253	1256	6	29	77	0.060	82464	16.61
4/26/2012 10:21	0	0	0	0	1.1	1254	1233	1247	1253	1256	6	29	74	0.060	82480	16.62
4/26/2012 10:22	0	0	0	0	1.1	1254	1233	1247	1253	1256	6	28	80	0.060	82497	16.69
4/26/2012 10:23	0	0	0	0	0.9	1255	1233	1247	1253	1256	6	29	80	0.060	82513	16.67
4/26/2012 10:24	0	0	0	0	1.0	1256	1233	1248	1253	1256	6	29	72	0.060	82519	16.70
4/26/2012 10:25	0	0	0	0	1.0	1256	1232	1249	1253	1256	6	29	70	0.060	82517	16.68
4/26/2012 10:26	0	0	0	0	1.0	1256	1233	1249	1253	1256	5	29	71	0.060	82515	16.68
4/26/2012 10:27	0	0	0	0	1.0	1256	1232	1248	1253	1257	5	29	74	0.060	82513	16.65
4/26/2012 10:28	0	0	0	0	1.1	1256	1232	1248	1253	1257	5	28	80	0.060	82511	16.64
4/26/2012 10:29	0	0	0	0	1.2	1256	1232	1248	1253	1257	5	29	72	0.060	82509	16.60
4/26/2012 10:30	0	0	0	0	1.1	1256	1232	1249	1253	1256	6	29	74	0.060	82507	16.66
4/26/2012 10:31	0	0	0	0	0.9	1256	1231	1249	1253	1256	8	28	72	0.060	82505	16.70
4/26/2012 10:32	0	0	0	0	0.9	1256	1232	1249	1253	1256	9	29	69	0.060	82503	16.71
4/26/2012 10:33	0	0	0	0	1.1	1256	1234	1250	1253	1257	10	29	72	0.060	82501	16.68
4/26/2012 10:34	0	0	0	0	1.1	1256	1234	1250	1254	1257	10	29	68	0.060	82499	16.69
4/26/2012 10:35	0	0	0	0	1.1	1257	1233	1250	1253	1257	9	29	78	0.060	82497	16.63
4/26/2012 10:36	0	0	0	0	1.1	1257	1233	1249	1253	1256	8	29	76	0.060	82495	16.65
4/26/2012 10:37	0	0	0	0	1.2	1257	1233	1248	1253	1256	7	29	75	0.060	82494	16.57
4/26/2012 10:38	0	0	0	0	1.2	1257	1233	1250	1253	1256	7	29	80	0.060	82492	16.53
4/26/2012 10:39	0	0	0	0	1.3	1256	1233	1250	1253	1256	6	29	75	0.060	82490	16.57
4/26/2012 10:40	0	0	0	0	1.2	1256	1232	1248	1253	1256	6	29	75	0.060	82488	16.58
4/26/2012 10:41	0	0	0	0	1.2	1257	1233	1248	1253	1256	6	30	76	0.060	82486	16.57
4/26/2012 10:42	0	0	0	0	1.1	1257	1233	1248	1254	1256	6	29	76	0.060	82484	16.61
4/26/2012 10:43	0	0	0	0	1.2	1256	1233	1248	1254	1257	5	28	73	0.060	82482	16.62
4/26/2012 10:44	0	0	0	0	1.3	1256	1234	1249	1253	1257	6	29	78	0.060	82480	16.58
4/26/2012 10:45	0	0	0	0	1.2	1255	1235	1250	1253	1257	5	29	78	0.060	82469	16.71
4/26/2012 10:46	0	0	0	0	1.2	1256	1235	1250	1254	1258	5	29	73	0.060	82448	16.71
4/26/2012 10:47	0	0	0	0	1.3	1256	1233	1249	1254	1257	5	29	77	0.060	82428	16.63
4/26/2012 10:48	0	0	0	0	1.2	1256	1231	1248	1253	1256	5	28	75	0.060	82408	16.61
4/26/2012 10:49	0	0	0	0	1.4	1255	1230	1247	1253	1256	6	30	73	0.060	82387	16.53
4/26/2012 10:50	0	0	0	0	1.4	1254	1230	1247	1253	1256	7	30	77	0.060	82367	16.54
4/26/2012 10:51	0	0	0	0	1.4	1254	1231	1247	1253	1256	9	29	80	0.060	82357	16.62
4/26/2012 10:52	0	0	0	0	1.3	1254	1233	1248	1253	1256	10	30	81	0.060	82357	16.63
4/26/2012 10:53	0	0	0	0	1.3	1256	1233	1249	1253	1257	10	30	80	0.060	82358	16.58
4/26/2012 10:54	0	0	0	0	1.4	1257	1234	1250	1253	1257	10	30	76	0.060	82359	16.62
4/26/2012 10:55	0	0	0	0	1.4	1257	1235	1250	1253	1256	9	29	72	0.060	82359	16.65
4/26/2012 10:56	0	0	0	0	1.3	1256	1234	1249	1253	1256	8	30	78	0.060	82360	16.62
4/26/2012 10:57	0	0	0	0	1.5	1256	1233	1249	1253	1256	7	29	83	0.060	82361	16.57
4/26/2012 10:57	0	0	0	0	1.5	1255	1233	1249	1253	1256	6	29	84	0.060	82361	16.61

	Arct/min on TR2	Arct/min on TR3	Inst Opacity %	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	CORRECTED REGEN SO2 ppm	CORRECTED REGEN NOX ppm	CORRECTED REGEN CO ppm	FCC Feed Sulfur wt%	Wet Air rate to regen mscfd	Flue gas CO2 %
	11XA0068B	11XA0069B	11A100689	11T10520	11T10521	11T10522	11T10523	11T10524	11M10812	11M10813	11M10814	11CFLSFLRLD	11F10175	11A10816
4/26/2012 10:58	0	0	1.4	1256	1232	1249	1253	1256	6	28	79	0.060	82362	16.60
4/26/2012 10:59	0	0	1.4	1256	1233	1249	1253	1256	6	29	74	0.060	82363	16.61
4/26/2012 11:00	0	0	1.4	1255	1234	1249	1253	1256	6	29	76	0.060	82363	16.60
4/26/2012 11:01	0	0	1.3	1254	1234	1249	1253	1256	6	29	71	0.060	82364	16.62
4/26/2012 11:02	0	0	1.3	1254	1234	1248	1253	1257	6	29	72	0.060	82364	16.66
4/26/2012 11:03	0	0	1.3	1255	1234	1247	1253	1257	6	29	73	0.060	82365	16.69
4/26/2012 11:04	0	0	1.4	1256	1233	1249	1253	1256	5	29	71	0.060	82366	16.70
4/26/2012 11:05	0	0	1.4	1256	1234	1250	1253	1256	5	29	68	0.060	82366	16.66
4/26/2012 11:06	0	0	1.3	1256	1233	1248	1253	1257	5	29	71	0.060	82320	16.57
4/26/2012 11:07	0	0	1.2	1257	1232	1247	1253	1257	6	29	71	0.060	82206	16.64
4/26/2012 11:08	0	0	1.2	1257	1233	1248	1253	1256	8	28	77	0.060	82181	16.61
4/26/2012 11:09	0	0	1.3	1257	1234	1249	1253	1256	9	28	73	0.060	82290	16.69
4/26/2012 11:10	0	0	1.3	1257	1235	1250	1254	1257	10	29	73	0.060	82360	16.69
4/26/2012 11:11	0	0	1.2	1256	1235	1250	1254	1257	10	28	79	0.060	82364	16.66
4/26/2012 11:12	0	0	1.3	1256	1234	1248	1253	1257	10	28	74	0.060	82368	16.64
4/26/2012 11:13	0	0	1.3	1255	1234	1247	1253	1257	9	29	74	0.060	82372	16.59
4/26/2012 11:14	0	0	1.4	1256	1233	1248	1253	1257	8	29	76	0.060	82376	16.61
4/26/2012 11:15	0	0	1.4	1256	1232	1249	1253	1256	7	29	73	0.060	82380	16.61
4/26/2012 11:16	0	0	1.4	1256	1233	1249	1253	1256	7	29	80	0.060	82383	16.58
4/26/2012 11:17	0	0	1.4	1256	1233	1247	1253	1257	6	29	77	0.060	82387	16.66
4/26/2012 11:18	0	0	1.4	1256	1233	1249	1253	1257	6	29	78	0.060	82391	16.67
4/26/2012 11:19	0	0	1.3	1256	1233	1249	1253	1257	6	29	73	0.060	82395	16.62
4/26/2012 11:20	0	0	1.5	1256	1233	1250	1253	1257	5	29	76	0.060	82392	16.59
4/26/2012 11:21	0	0	1.5	1256	1234	1250	1253	1257	5	28	76	0.060	82376	16.64
4/26/2012 11:22	0	0	1.4	1256	1233	1250	1253	1257	5	28	73	0.060	82360	16.70
4/26/2012 11:23	0	0	1.3	1257	1233	1250	1253	1257	5	29	73	0.060	82345	16.70
4/26/2012 11:24	0	0	1.3	1257	1233	1249	1253	1256	5	29	73	0.060	82329	16.65
4/26/2012 11:25	0	0	1.4	1257	1234	1249	1254	1257	5	29	75	0.060	82313	16.63
4/26/2012 11:26	0	0	1.3	1257	1233	1249	1254	1257	6	29	75	0.060	82297	16.62
4/26/2012 11:27	0	0	1.2	1257	1232	1249	1254	1256	8	29	78	0.060	82281	16.60
4/26/2012 11:28	0	0	1.1	1257	1233	1249	1253	1256	9	29	80	0.060	82266	16.60
4/26/2012 11:29	0	0	1.3	1256	1234	1250	1253	1256	10	29	79	0.060	82250	16.64
4/26/2012 11:30	0	0	1.4	1257	1234	1250	1253	1256	10	30	78	0.060	82234	16.67
4/26/2012 11:31	0	0	1.5	1256	1234	1250	1252	1256	9	29	73	0.060	82218	16.59
4/26/2012 11:32	0	0	1.5	1255	1234	1250	1252	1256	8	29	80	0.060	82202	16.54
4/26/2012 11:33	0	0	1.4	1254	1234	1250	1252	1256	7	30	82	0.060	82187	16.55
4/26/2012 11:34	0	0	1.4	1255	1234	1250	1252	1256	7	28	72	0.060	82171	16.62
4/26/2012 11:35	0	0	1.3	1255	1234	1249	1252	1256	7	28	72	0.060	82155	16.69
4/26/2012 11:36	0	0	1.4	1256	1233	1249	1252	1256	6	28	76	0.060	82139	16.68
4/26/2012 11:37	0	0	1.4	1256	1233	1248	1252	1256	6	30	68	0.060	82123	16.67
4/26/2012 11:38	0	0	1.5	1256	1232	1248	1252	1256	6	29	78	0.060	82107	16.62
4/26/2012 11:39	0	0	1.5	1256	1232	1248	1253	1256	6	28	81	0.060	82092	16.61
4/26/2012 11:40	0	0	1.4	1255	1232	1248	1252	1255	6	28	74	0.060	82076	16.66
4/26/2012 11:41	0	0	1.5	1255	1231	1248	1252	1255	6	29	76	0.060	82060	16.63

Date/Time	11XA0068B	11XA0069B	Inst Opacity %	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	CORRECTED REGEN SO2 ppm	CORRECTED REGEN NOX ppm	CORRECTED REGEN CO ppm	FCC Feed Sulfur wt%	Wet Air rate to regen mscfd	Flue gas CO2 %
4/26/2012 11:42	0	0	1.5	1255	1248	1252	1255	1170524	5	29	74	0.060	82044	16.59
4/26/2012 11:43	0	0	1.5	1255	1249	1252	1255	1170523	5	29	68	0.060	82028	16.63
4/26/2012 11:44	0	0	1.4	1255	1249	1252	1255	1170522	6	29	72	0.060	82013	16.71
4/26/2012 11:45	0	0	1.4	1256	1248	1252	1255	1170521	8	29	74	0.060	81997	16.76
4/26/2012 11:46	0	0	1.4	1256	1249	1252	1255	1170520	9	29	72	0.060	81981	16.78
4/26/2012 11:47	0	0	1.3	1255	1249	1252	1256	1170519	10	30	67	0.060	81965	16.73
4/26/2012 11:48	0	0	1.3	1255	1247	1252	1256	1170518	10	30	66	0.060	81988	16.67
4/26/2012 11:49	0	0	1.3	1256	1246	1252	1256	1170517	10	30	69	0.060	82110	16.64
4/26/2012 11:50	0	0	1.4	1256	1247	1252	1255	1170516	9	31	73	0.060	82238	16.61
4/26/2012 11:51	0	0	1.5	1255	1247	1252	1255	1170515	8	28	78	0.060	82239	16.60
4/26/2012 11:52	0	0	1.5	1255	1248	1251	1255	1170514	7	29	70	0.060	82006	16.60
4/26/2012 11:53	0	0	1.4	1255	1248	1251	1256	1170513	7	29	73	0.060	82011	16.72
4/26/2012 11:54	0	0	1.2	1255	1248	1252	1255	1170512	7	29	63	0.060	82029	16.79
4/26/2012 11:55	0	0	1.3	1255	1248	1252	1255	1170511	6	29	70	0.060	82047	16.76
4/26/2012 11:56	0	0	1.3	1256	1247	1252	1255	1170510	6	28	65	0.060	82066	16.74
4/26/2012 11:57	0	0	1.1	1256	1248	1252	1256	1170509	6	28	61	0.060	82084	16.75
4/26/2012 11:58	0	0	1.2	1255	1249	1252	1256	1170508	6	30	62	0.060	82102	16.77
4/26/2012 11:59	0	0	1.2	1255	1250	1253	1256	1170507	6	28	64	0.060	82120	16.74
4/26/2012 12:00	0	0	1.1	1256	1249	1253	1257	1170506	6	29	68	0.061	82115	16.73
4/26/2012 12:01	0	0	1.2	1257	1249	1253	1258	1170505	5	29	68	0.061	82048	16.76
4/26/2012 12:02	0	0	1.2	1257	1250	1253	1258	1170504	5	29	63	0.061	82002	16.77
4/26/2012 12:03	0	0	1.2	1256	1250	1253	1257	1170503	7	29	66	0.061	82030	16.72
4/26/2012 12:04	0	0	1.2	1256	1251	1253	1257	1170502	9	29	76	0.061	82061	16.66
4/26/2012 12:05	0	0	1.3	1256	1251	1254	1257	1170501	10	29	76	0.061	82093	16.66
4/26/2012 12:06	0	0	1.2	1256	1250	1253	1257	1170500	10	29	75	0.061	82125	16.70
4/26/2012 12:07	0	0	1.2	1257	1248	1253	1257	1170499	10	29	69	0.061	82156	16.67
4/26/2012 12:08	0	0	1.3	1257	1249	1253	1257	1170498	9	28	71	0.061	82188	16.61
4/26/2012 12:09	0	0	1.3	1257	1250	1253	1257	1170497	8	29	77	0.061	82220	16.53
4/26/2012 12:10	0	0	1.4	1256	1249	1253	1257	1170496	7	29	82	0.061	82242	16.55
4/26/2012 12:11	0	0	1.4	1256	1249	1253	1257	1170495	7	29	77	0.061	82232	16.61
4/26/2012 12:12	0	0	1.3	1256	1249	1253	1256	1170494	6	29	77	0.061	82139	16.61
4/26/2012 12:13	0	0	1.3	1256	1249	1253	1256	1170493	6	29	75	0.061	81919	16.63
4/26/2012 12:14	0	0	1.4	1256	1248	1253	1256	1170492	6	30	71	0.061	82146	16.69
4/26/2012 12:15	0	0	1.4	1257	1248	1253	1256	1170491	6	29	70	0.061	82124	16.58
4/26/2012 12:16	0	0	1.4	1257	1249	1253	1256	1170490	6	29	69	0.061	82074	16.71
4/26/2012 12:17	0	0	1.4	1256	1249	1253	1256	1170489	5	28	70	0.061	82024	16.76
4/26/2012 12:18	0	0	1.4	1255	1249	1253	1256	1170488	5	27	81	0.061	81974	16.75
4/26/2012 12:19	0	0	1.4	1255	1250	1253	1256	1170487	5	28	72	0.061	81925	16.71
4/26/2012 12:20	0	0	1.4	1255	1251	1253	1256	1170486	5	27	76	0.061	81875	16.69
4/26/2012 12:21	0	0	1.5	1255	1250	1253	1257	1170485	5	28	69	0.061	81825	16.66
4/26/2012 12:22	0	0	1.4	1255	1248	1253	1256	1170484	7	29	72	0.061	81775	16.62
4/26/2012 12:23	0	0	1.4	1255	1248	1252	1256	1170483	9	28	76	0.061	81759	16.61
4/26/2012 12:24	0	0	1.5	1255	1248	1252	1255	1170482	10	28	72	0.061	81873	16.65
4/26/2012 12:25	0	0	1.4	1255	1248	1252	1255	1170481	10	29	71	0.061	81899	16.70

	Arcs/min on TR2	Arcs/min on TR3	Inst Opacity %	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	CORRECTED REGEN SO2 ppm	CORRECTED REGEN NOX ppm	CORRECTED REGEN CO ppm	FCC Feed Sulfur wt%	Wet Air rate to regen mscfd	Flue gas CO2 %
	11XA0068B	11XA0069B	11A0889	11T0520	11T0521	11T0522	11T0523	11T0524	11M0812	11M0813	11M0814	11CFLSLR.LD	11F0175	11A0815
4/26/2012 13:10	0	0	1.3	1256	1235	1250	1252	1256	6	28	83	0.061	82090	16.62
4/26/2012 13:11	0	0	1.4	1256	1234	1249	1252	1256	6	28	83	0.061	82184	16.63
4/26/2012 13:12	0	0	1.3	1255	1233	1249	1252	1255	6	28	83	0.061	82279	16.64
4/26/2012 13:13	0	0	1.4	1255	1234	1249	1252	1255	5	28	86	0.061	82332	16.67
4/26/2012 13:14	0	0	1.3	1254	1234	1249	1252	1256	5	29	86	0.061	81951	16.63
4/26/2012 13:15	0	0	1.2	1253	1234	1248	1252	1255	5	28	89	0.061	81940	16.64
4/26/2012 13:16	0	0	1.3	1254	1234	1248	1252	1255	5	28	77	0.061	82073	16.71
4/26/2012 13:17	0	0	1.3	1255	1233	1248	1252	1255	5	28	82	0.061	82185	16.66

	Flue gas O2 %	Flue gas O2 %	fresh catalyst		SuperSoxgetter		SuperSoxgetter		SuperSoxgetter		NOx additive		riser temp	htr outlet temp
			11AC0816	11AC0816	11FC0670	11FC0670 SP	11WD0666	11WD0666	11WY0657 SP	11WY0657 SP	11WD0669	11FC2032		
4/26/2012 8:02	1.42	1.42	11A0816	2987	3000	33	30	30	0	8	8	11TCR025	574.42	574.42
4/26/2012 8:03	1.42	1.50	2987	3000	3000	33	30	30	0	8	8	11TCR025	574.45	574.45
4/26/2012 8:04	1.42	1.54	2987	3000	3000	33	30	30	0	8	8	11TCR025	574.48	574.48
4/26/2012 8:05	1.42	1.52	2987	3000	3000	33	30	30	0	8	8	11TCR025	574.51	574.51
4/26/2012 8:06	1.42	1.54	2987	3000	3000	33	30	30	0	8	8	11TCR025	574.54	574.54
4/26/2012 8:07	1.42	1.53	2987	3000	3000	33	30	30	0	8	8	11TCR025	574.57	574.57
4/26/2012 8:08	1.42	1.52	2987	3000	3000	33	30	30	0	8	8	11TCR025	574.61	574.61
4/26/2012 8:09	1.42	1.56	2987	3000	3000	33	30	30	0	8	8	11TCR025	574.64	574.64
4/26/2012 8:10	1.42	1.50	2987	3000	3000	33	30	30	0	8	8	11TCR025	574.67	574.67
4/26/2012 8:11	1.42	1.52	2987	3000	3000	33	30	30	0	8	8	11TCR025	574.70	574.70
4/26/2012 8:12	1.42	1.52	2987	3000	3000	33	30	30	0	8	8	11TCR025	574.73	574.73
4/26/2012 8:13	1.42	1.50	2987	3000	3000	33	30	30	0	8	8	11TCR025	574.76	574.76
4/26/2012 8:14	1.42	1.53	2987	3000	3000	33	30	30	0	8	8	11TCR025	574.79	574.79
4/26/2012 8:15	1.42	1.55	2987	3000	3000	33	30	30	0	8	8	11TCR025	574.82	574.82
4/26/2012 8:16	1.42	1.46	2987	3000	3000	33	30	30	0	8	8	11TCR025	574.86	574.86
4/26/2012 8:17	1.42	1.49	2987	3000	3000	33	30	30	0	8	8	11TCR025	574.89	574.89
4/26/2012 8:18	1.42	1.51	2987	3000	3000	33	30	30	0	8	8	11TCR025	574.92	574.92
4/26/2012 8:19	1.42	1.49	2987	3000	3000	33	30	30	0	8	8	11TCR025	574.95	574.95
4/26/2012 8:20	1.42	1.45	2987	3000	3000	33	30	30	0	8	8	11TCR025	574.98	574.98
4/26/2012 8:21	1.42	1.42	2987	3000	3000	33	30	30	0	8	8	11TCR025	575.01	575.01
4/26/2012 8:22	1.42	1.39	2987	3000	3000	33	30	30	0	8	8	11TCR025	575.04	575.04
4/26/2012 8:23	1.42	1.37	2987	3000	3000	33	30	30	0	8	8	11TCR025	575.07	575.07
4/26/2012 8:24	1.42	1.39	2987	3000	3000	33	30	30	0	8	8	11TCR025	575.11	575.11
4/26/2012 8:25	1.42	1.45	2987	3000	3000	33	30	30	0	8	8	11TCR025	575.14	575.14
4/26/2012 8:26	1.42	1.47	2987	3000	3000	33	30	30	0	8	8	11TCR025	575.17	575.17
4/26/2012 8:27	1.42	1.47	2987	3000	3000	33	30	30	0	8	8	11TCR025	575.20	575.20
4/26/2012 8:28	1.42	1.43	2987	3000	3000	33	30	30	0	8	8	11TCR025	575.23	575.23
4/26/2012 8:29	1.42	1.44	2987	3000	3000	33	30	30	0	8	8	11TCR025	575.26	575.26
4/26/2012 8:30	1.42	1.52	2987	3000	3000	33	30	30	0	8	8	11TCR025	575.29	575.29
4/26/2012 8:31	1.43	1.47	2987	3000	3000	33	30	30	0	8	8	11TCR025	575.32	575.32
4/26/2012 8:32	1.43	1.52	2987	3000	3000	33	30	30	0	8	8	11TCR025	575.36	575.36
4/26/2012 8:33	1.43	1.49	2987	3000	3000	33	30	30	0	8	8	11TCR025	575.39	575.39
4/26/2012 8:34	1.43	1.47	2987	3000	3000	33	30	30	0	8	8	11TCR025	575.42	575.42
4/26/2012 8:35	1.43	1.43	2987	3000	3000	33	30	30	0	8	8	11TCR025	575.45	575.45
4/26/2012 8:36	1.43	1.50	2987	3000	3000	33	30	30	0	8	8	11TCR025	575.48	575.48
4/26/2012 8:37	1.43	1.47	2987	3000	3000	33	30	30	0	8	8	11TCR025	575.51	575.51
4/26/2012 8:38	1.43	1.46	2987	3000	3000	33	30	30	0	8	8	11TCR025	575.54	575.54
4/26/2012 8:39	1.43	1.47	2987	3000	3000	33	30	30	0	8	8	11TCR025	575.57	575.57
4/26/2012 8:40	1.43	1.55	2987	3000	3000	33	30	30	0	8	8	11TCR025	575.61	575.61
4/26/2012 8:41	1.43	1.62	2987	3000	3000	33	30	30	0	8	8	11TCR025	575.64	575.64
4/26/2012 8:42	1.43	1.58	2987	3000	3000	33	30	30	0	8	8	11TCR025	575.68	575.68
4/26/2012 8:43	1.43	1.58	2987	3000	3000	33	30	30	0	8	8	11TCR025	575.72	575.72
4/26/2012 8:44	1.43	1.58	2987	3000	3000	33	30	30	0	8	8	11TCR025	575.76	575.76
4/26/2012 8:45	1.43	1.53	2987	3000	3000	33	30	30	0	8	8	11TCR025	575.80	575.80

	Flue gas O2 %	Flue gas O2 %	fresh catalyst		SuperSoxgetter		SuperSoxgetter		NOx additive		Ammonia Injection	riser temp	ht outlet temp
			lb/d	11FC0670	lb/d	11W0666	lb/d	11W0667 SP	lb/d	11W0669			
11AC0816	1.43	1.51	2987	3000	33	30	0	8	11TCRXTR	11TC0025			
4/26/2012 8:46	1.43	1.50	2987	3000	33	30	0	8	954.79	575.82			
4/26/2012 8:47	1.43	1.49	2987	3000	33	30	0	8	954.74	575.79			
4/26/2012 8:48	1.43	1.43	2987	3000	33	30	0	8	954.73	575.76			
4/26/2012 8:49	1.43	1.46	2987	3000	33	30	0	8	954.78	575.73			
4/26/2012 8:50	1.43	1.49	2987	3000	33	30	0	8	954.83	575.71			
4/26/2012 8:51	1.43	1.46	2987	3000	33	30	0	8	954.88	575.68			
4/26/2012 8:52	1.43	1.43	2987	3000	33	30	0	8	954.94	575.65			
4/26/2012 8:53	1.43	1.43	2987	3000	33	30	0	8	954.99	575.62			
4/26/2012 8:54	1.43	1.43	2987	3000	33	30	0	8	955.03	575.59			
4/26/2012 8:55	1.43	1.43	2987	3000	33	30	0	8	955.07	575.57			
4/26/2012 8:56	1.43	1.38	2987	3000	33	30	0	8	955.08	575.54			
4/26/2012 8:57	1.43	1.45	2987	3000	33	30	0	8	955.08	575.51			
4/26/2012 8:58	1.43	1.45	2987	3000	33	30	0	8	955.14	575.48			
4/26/2012 8:59	1.43	1.46	2987	3000	33	30	0	8	955.25	575.45			
4/26/2012 9:00	1.43	1.48	2987	3000	33	30	0	8	955.44	575.42			
4/26/2012 9:01	1.43	1.48	2987	3000	33	30	0	8	955.66	575.40			
4/26/2012 9:02	1.43	1.50	2987	3000	33	30	0	8	955.69	575.37			
4/26/2012 9:03	1.43	1.58	2987	3000	33	30	0	8	955.58	575.34			
4/26/2012 9:04	1.43	1.54	2987	3000	33	30	0	8	955.47	575.31			
4/26/2012 9:05	1.43	1.43	2987	3000	33	30	0	8	955.36	575.28			
4/26/2012 9:06	1.43	1.48	2987	3000	33	30	0	8	955.26	575.26			
4/26/2012 9:07	1.43	1.48	2987	3000	33	30	0	8	955.29	575.23			
4/26/2012 9:08	1.43	1.54	2987	3000	33	30	0	8	955.23	575.20			
4/26/2012 9:09	1.43	1.53	2987	3000	33	30	0	8	955.07	575.17			
4/26/2012 9:10	1.43	1.49	2987	3000	33	30	0	8	955.02	575.14			
4/26/2012 9:11	1.43	1.51	2987	3000	33	30	0	8	955.00	575.11			
4/26/2012 9:12	1.43	1.59	2987	3000	33	30	0	8	955.19	575.09			
4/26/2012 9:13	1.43	1.61	2987	3000	33	30	0	8	955.31	575.06			
4/26/2012 9:14	1.43	1.62	2987	3000	33	30	0	8	955.12	575.03			
4/26/2012 9:15	1.43	1.56	2987	3000	33	30	0	8	954.90	575.00			
4/26/2012 9:16	1.44	1.57	2987	3000	33	30	0	8	954.69	574.97			
4/26/2012 9:17	1.44	1.59	2987	3000	33	30	0	8	954.47	574.95			
4/26/2012 9:18	1.44	1.61	2987	3000	33	30	0	8	954.28	574.92			
4/26/2012 9:19	1.44	1.64	2987	3000	33	30	0	8	954.16	574.89			
4/26/2012 9:20	1.44	1.57	2987	3000	33	30	0	8	954.22	574.86			
4/26/2012 9:21	1.44	1.61	2987	3000	33	30	0	8	954.44	574.83			
4/26/2012 9:22	1.44	1.56	2987	3000	33	30	0	8	954.61	574.81			
4/26/2012 9:23	1.44	1.54	2987	3000	33	30	0	8	954.70	574.78			
4/26/2012 9:24	1.44	1.45	2987	3000	33	30	0	8	954.92	574.75			
4/26/2012 9:25	1.44	1.48	2987	3000	33	30	0	8	955.15	574.72			
4/26/2012 9:26	1.44	1.49	2987	3000	33	30	0	8	955.36	574.69			
4/26/2012 9:27	1.44	1.51	2987	3000	33	30	0	8	955.31	574.66			
4/26/2012 9:28	1.44	1.54	2987	3000	33	30	0	8	955.20	574.64			
4/26/2012 9:29	1.44	1.50	2987	3000	33	30	0	8	955.12	574.61			

Flue gas O2 %	Flue gas O2 %	fresh catalyst		fresh catalyst setpoint		SuperSovagetter lb/d		SuperSovagetter setpoint		NOx additive lb/d		Ammonia injection		riser temp	ht outlet temp
		11FC0670 lb/d	11FC0670 lb/d	11FC0670 SP lb/d	11FC0670 SP lb/d	11W0866 lb/d	11W0866 lb/d	11W0867 SP lb/d	11W0867 SP lb/d	11W0869 lb/d	11W0869 lb/d	11FC2032 lb/d	11FC2032 lb/d		
11A0816	1.44	2987	3000	3000	3000	33	33	30	30	0	0	8	8	11TC0025	574.58
11A0816	1.44	2987	3000	3000	3000	33	33	30	30	0	0	8	8	955.08	574.55
11A0816	1.44	2987	3000	3000	3000	33	33	30	30	0	0	8	8	955.06	574.52
11A0816	1.44	2987	3000	3000	3000	33	33	30	30	0	0	8	8	955.05	574.50
11A0816	1.44	2987	3000	3000	3000	33	33	30	30	0	0	8	8	955.03	574.47
11A0816	1.44	2987	3000	3000	3000	33	33	30	30	0	0	8	8	955.02	574.44
11A0816	1.44	2987	3000	3000	3000	33	33	30	30	0	0	8	8	955.04	574.41
11A0816	1.44	2987	3000	3000	3000	33	33	30	30	0	0	8	8	955.13	574.38
11A0816	1.43	2987	3000	3000	3000	33	33	30	30	0	0	8	8	955.23	574.35
11A0816	1.43	2987	3000	3000	3000	33	33	30	30	0	0	8	8	955.35	574.33
11A0816	1.43	2987	3000	3000	3000	33	33	30	30	0	0	8	8	955.64	574.30
11A0816	1.42	2987	3000	3000	3000	33	33	30	30	0	0	8	8	955.69	574.27
11A0816	1.42	2987	3000	3000	3000	33	33	30	30	0	0	8	8	955.53	574.24
11A0816	1.41	2987	3000	3000	3000	33	33	30	30	0	0	8	8	955.37	574.21
11A0816	1.41	2987	3000	3000	3000	33	33	30	30	0	0	8	8	955.20	574.19
11A0816	1.40	2987	3000	3000	3000	33	33	30	30	0	0	8	8	954.98	574.16
11A0816	1.40	2987	3000	3000	3000	33	33	30	30	0	0	8	8	954.58	574.13
11A0816	1.40	2987	3000	3000	3000	33	33	30	30	0	0	8	8	954.33	574.10
11A0816	1.39	2987	3000	3000	3000	33	33	30	30	0	0	8	8	954.49	573.96
11A0816	1.39	2987	3000	3000	3000	33	33	30	30	0	0	8	8	954.66	573.98
11A0816	1.39	2987	3000	3000	3000	33	33	30	30	0	0	8	8	954.74	574.00
11A0816	1.38	2987	3000	3000	3000	33	33	30	30	0	0	8	8	954.06	574.02
11A0816	1.38	2987	3000	3000	3000	33	33	30	30	0	0	8	8	954.28	574.04
11A0816	1.37	2987	3000	3000	3000	33	33	30	30	0	0	8	8	954.87	574.06
11A0816	1.37	2987	3000	3000	3000	33	33	30	30	0	0	8	8	955.42	574.08
11A0816	1.37	2987	3000	3000	3000	33	33	30	30	0	0	8	8	955.61	574.10
11A0816	1.36	2987	3000	3000	3000	33	33	30	30	0	0	8	8	955.69	574.12
11A0816	1.36	2987	3000	3000	3000	33	33	30	30	0	0	8	8	955.76	574.14
11A0816	1.36	2987	3000	3000	3000	33	33	30	30	0	0	8	8	955.67	574.16
11A0816	1.35	2987	3000	3000	3000	33	33	30	30	0	0	8	8	955.54	574.17
11A0816	1.35	2987	3000	3000	3000	33	33	30	30	0	0	8	8	955.40	574.19
11A0816	1.35	2987	3000	3000	3000	33	33	30	30	0	0	8	8	955.27	574.21
11A0816	1.35	2987	3000	3000	3000	33	33	30	30	0	0	8	8	955.14	574.23
11A0816	1.36	2987	3000	3000	3000	33	33	30	30	0	0	8	8	954.94	574.25
11A0816	1.36	2987	3000	3000	3000	33	33	30	30	0	0	8	8	954.69	574.27
11A0816	1.37	2987	3000	3000	3000	33	33	30	30	0	0	8	8	954.67	574.29
11A0816	1.37	2987	3000	3000	3000	33	33	30	30	0	0	8	8	954.86	574.31
11A0816	1.37	2987	3000	3000	3000	33	33	30	30	0	0	8	8	955.05	574.33
11A0816	1.38	2987	3000	3000	3000	33	33	30	30	0	0	8	8	955.10	574.33

	Flue gas O2		fresh catalyst lb/d	fresh catalyst setpoint lb/d	SuperSoxGetter		SuperSoxGetter		NOx additive		riser temp	hr outlet temp
	11AC0816	11AO816	11FC0870	11FC0870.SP	11W0866	11W0866	11W0867	11W0867.SP	11W0869	11FC2832		
4/26/2012 10:14	1.38	1.47	2987	3000	33	30	30	30	0	8	955.02	574.35
4/26/2012 10:15	1.38	1.46	2987	3000	33	30	30	30	0	8	954.83	574.37
4/26/2012 10:16	1.39	1.50	2987	3000	33	30	30	30	0	8	954.57	574.39
4/26/2012 10:17	1.39	1.54	2987	3000	33	30	30	30	0	8	954.50	574.41
4/26/2012 10:18	1.40	1.55	2987	3000	33	30	30	30	0	8	954.61	574.42
4/26/2012 10:19	1.40	1.50	2987	3000	33	30	30	30	0	8	954.73	574.44
4/26/2012 10:20	1.40	1.53	2987	3000	33	30	30	30	0	8	954.84	574.46
4/26/2012 10:21	1.41	1.46	2987	3000	33	30	30	30	0	8	954.96	574.48
4/26/2012 10:22	1.41	1.44	2987	3000	33	30	30	30	0	8	955.11	574.50
4/26/2012 10:23	1.41	1.41	2987	3000	33	30	30	30	0	8	955.27	574.52
4/26/2012 10:24	1.42	1.47	2987	3000	33	30	30	30	0	8	955.43	574.54
4/26/2012 10:25	1.42	1.43	2987	3000	33	30	30	30	0	8	955.59	574.56
4/26/2012 10:26	1.43	1.44	2987	3000	33	30	30	30	0	8	955.75	574.58
4/26/2012 10:27	1.43	1.46	2987	3000	33	30	30	30	0	8	955.83	574.60
4/26/2012 10:28	1.43	1.47	2987	3000	33	30	30	30	0	8	955.67	574.62
4/26/2012 10:29	1.44	1.44	2987	3000	33	30	30	30	0	8	955.86	574.64
4/26/2012 10:30	1.44	1.41	2987	3000	33	30	30	30	0	8	955.81	574.66
4/26/2012 10:31	1.44	1.41	2987	3000	33	30	30	30	0	8	955.32	574.67
4/26/2012 10:32	1.45	1.44	2987	3000	33	30	30	30	0	8	955.21	574.69
4/26/2012 10:33	1.45	1.42	2987	3000	33	30	30	30	0	8	955.25	574.71
4/26/2012 10:34	1.46	1.48	2987	3000	33	30	30	30	0	8	955.62	574.73
4/26/2012 10:35	1.46	1.46	2987	3000	33	30	30	30	0	8	955.67	574.75
4/26/2012 10:36	1.46	1.51	2987	3000	33	30	30	30	0	8	955.63	574.77
4/26/2012 10:37	1.47	1.55	2987	3000	33	30	30	30	0	8	955.73	574.79
4/26/2012 10:38	1.47	1.48	2987	3000	33	30	30	30	0	8	955.53	574.81
4/26/2012 10:39	1.47	1.48	2987	3000	33	30	30	30	0	8	955.23	574.83
4/26/2012 10:40	1.48	1.51	2987	3000	33	30	30	30	0	8	955.06	574.85
4/26/2012 10:41	1.48	1.46	2987	3000	33	30	30	30	0	8	955.12	574.87
4/26/2012 10:42	1.49	1.52	2987	3000	33	30	30	30	0	8	955.42	574.89
4/26/2012 10:43	1.49	1.53	2987	3000	33	30	30	30	0	8	954.87	574.90
4/26/2012 10:44	1.49	1.42	2987	3000	33	30	30	30	0	8	954.58	574.92
4/26/2012 10:45	1.49	1.39	2987	3000	33	30	30	30	0	8	954.80	574.94
4/26/2012 10:46	1.49	1.55	2987	3000	33	30	30	30	0	8	954.74	574.96
4/26/2012 10:47	1.49	1.49	2987	3000	33	30	30	30	0	8	954.81	574.98
4/26/2012 10:48	1.49	1.52	2987	3000	33	30	30	30	0	8	954.79	575.00
4/26/2012 10:49	1.49	1.55	2987	3000	33	30	30	30	0	8	954.78	575.02
4/26/2012 10:50	1.49	1.47	2987	3000	33	30	30	30	0	8	954.93	575.04
4/26/2012 10:51	1.49	1.51	2987	3000	33	30	30	30	0	8	955.17	575.06
4/26/2012 10:52	1.49	1.52	2987	3000	33	30	30	30	0	8	955.64	575.08
4/26/2012 10:53	1.49	1.50	2987	3000	33	30	30	30	0	8	955.91	575.10
4/26/2012 10:54	1.49	1.51	2987	3000	33	30	30	30	0	8	955.46	575.12
4/26/2012 10:55	1.49	1.57	2987	3000	33	30	30	30	0	8	954.95	575.14
4/26/2012 10:56	1.49	1.54	2987	3000	33	30	30	30	0	8	954.47	575.15
4/26/2012 10:57	1.49	1.51	2987	3000	33	30	30	30	0	8	954.53	575.17

Flue gas O2 %	Flue gas O2 %	fresh catalyst lb/d	fresh catalyst setpoint lb/d	SuperSovagetter lb/d	SuperSovagetter setpoint lb/d	NOX additive lb/d	Ammonia injection lb/d	riser temp	htr outlet temp
		11FC0670	11FC0670 SP	11W00866	11W00867 SP	11W00869	11FC2032	11TCRTR	11TC0025
1.49	1.49	2987	3000	33	30	0	8	954.77	575.19
1.49	1.48	2987	3000	33	30	0	8	955.02	575.21
1.49	1.50	2987	3000	33	30	0	8	955.25	575.23
1.49	1.47	2987	3000	33	30	0	8	955.29	575.25
1.49	1.47	2987	3000	33	30	0	8	955.27	575.27
1.49	1.45	2987	3000	33	30	0	8	955.24	575.29
1.49	1.45	2987	3000	33	30	0	8	955.21	575.31
1.49	1.47	2987	3000	33	30	0	8	955.04	575.33
1.49	1.53	2987	3000	33	30	0	8	954.99	575.35
1.48	1.44	2987	3000	33	30	0	8	954.91	575.37
1.48	1.47	2987	3000	33	30	0	8	954.67	575.39
1.48	1.43	2987	3000	33	30	0	8	954.46	575.40
1.48	1.39	2987	3000	33	30	0	8	954.88	575.42
1.48	1.46	2987	3000	33	30	0	8	955.08	575.58
1.48	1.47	2987	3000	33	30	0	8	955.08	575.86
1.48	1.49	2987	3000	33	30	0	8	955.08	575.81
1.48	1.53	2987	3000	33	30	0	8	955.13	575.76
1.48	1.50	2987	3000	33	30	0	8	955.21	575.70
1.48	1.52	2987	3000	33	30	0	8	955.29	575.64
1.48	1.47	2987	3000	33	30	0	8	955.36	575.58
1.48	1.53	2987	3000	33	30	0	8	955.44	575.52
1.48	1.47	2987	3000	33	30	0	8	955.52	575.46
1.48	1.48	2987	3000	33	30	0	8	955.59	575.40
1.48	1.46	2987	3000	33	30	0	8	955.67	575.34
1.48	1.43	2987	3000	33	30	0	8	955.60	575.28
1.48	1.42	2987	3000	33	30	0	8	955.35	575.22
1.48	1.50	2987	3000	33	30	0	8	955.20	575.16
1.48	1.49	2987	3000	33	30	0	8	955.07	575.10
1.48	1.48	2987	3000	33	30	0	8	954.94	575.05
1.48	1.54	2987	3000	33	30	0	8	954.80	574.99
1.48	1.51	2987	3000	33	30	0	8	954.67	574.93
1.48	1.51	2987	3000	33	30	0	8	954.55	574.87
1.48	1.50	2987	3000	33	30	0	8	954.65	574.81
1.48	1.50	2987	3000	33	30	0	8	954.82	574.75
1.48	1.54	2987	3000	33	30	0	8	954.86	574.69
1.48	1.55	2987	3000	33	30	0	8	954.87	574.63
1.48	1.42	2987	3000	33	30	0	8	954.98	574.57
1.47	1.47	2987	3000	33	30	0	8	955.14	574.51
1.47	1.45	2987	3000	33	30	0	8	955.21	574.45
1.47	1.46	2987	3000	33	30	0	8	954.98	574.39
1.47	1.52	2987	3000	33	30	0	8	955.00	574.34
1.47	1.54	2987	3000	33	30	0	8	955.04	574.28
1.47	1.48	2987	3000	33	30	0	8	954.56	574.22
1.47	1.51	2987	3000	33	30	0	8	954.16	574.16

	Flue gas O2 %	Flue gas O2 %	fresh catalyst		fresh catalyst		SuperSovGetter		SuperSovGetter		NOx additive		Ammonia injection	riser temp	htr outlet temp
			lb/d	setpoint	lb/d	setpoint	lb/d	setpoint	lb/d	setpoint					
	11AC0816	11A0816	11FC0670	11FC0670.SP	11W0866	11W0867.SP	13W0869	11FC2032							
4/26/2012 11:42	1.47	1.48	2987	3000	33	30	0	8	11TCRXTR	954.27	574.10	11TC0025			
4/26/2012 11:43	1.47	1.46	2987	3000	33	30	0	8	954.39	574.02					
4/26/2012 11:44	1.47	1.44	2987	3000	33	30	0	8	954.52	573.94					
4/26/2012 11:45	1.47	1.41	2987	3000	33	30	0	8	954.64	573.88					
4/26/2012 11:46	1.47	1.41	2987	3000	33	30	0	8	954.78	573.96					
4/26/2012 11:47	1.47	1.41	2987	3000	33	30	0	8	954.91	574.06					
4/26/2012 11:48	1.47	1.38	2987	3000	33	30	0	8	955.02	574.16					
4/26/2012 11:49	1.47	1.42	2987	3000	33	30	0	8	955.33	574.27					
4/26/2012 11:50	1.47	1.49	2987	3000	33	30	0	8	955.65	574.37					
4/26/2012 11:51	1.47	1.50	2987	3000	33	30	0	8	955.55	574.48					
4/26/2012 11:52	1.47	1.44	2987	3000	33	30	0	8	955.40	574.58					
4/26/2012 11:53	1.47	1.36	2987	3000	33	30	0	8	955.25	574.69					
4/26/2012 11:54	1.47	1.31	2987	3000	33	30	0	8	955.09	574.79					
4/26/2012 11:55	1.47	1.37	2987	3000	33	30	0	8	954.98	574.89					
4/26/2012 11:56	1.47	1.33	2987	3000	33	30	0	8	955.07	575.00					
4/26/2012 11:57	1.47	1.34	2987	3000	33	30	0	8	955.23	575.10					
4/26/2012 11:58	1.47	1.38	2987	3000	33	30	0	8	955.45	575.21					
4/26/2012 11:59	1.47	1.36	2987	3000	33	30	0	8	955.67	575.31					
4/26/2012 12:00	1.47	1.36	2987	3000	33	30	0	8	955.90	575.42					
4/26/2012 12:01	1.47	1.31	2987	3000	33	30	0	8	956.10	575.52					
4/26/2012 12:02	1.47	1.38	2987	3000	33	30	0	8	955.81	575.63					
4/26/2012 12:03	1.46	1.44	2987	3000	33	30	0	8	955.33	575.61					
4/26/2012 12:04	1.46	1.49	2987	3000	33	30	0	8	955.22	575.49					
4/26/2012 12:05	1.46	1.52	2987	3000	33	30	0	8	955.16	575.38					
4/26/2012 12:06	1.46	1.46	2987	3000	33	30	0	8	955.10	575.26					
4/26/2012 12:07	1.46	1.46	2987	3000	33	30	0	8	955.00	575.15					
4/26/2012 12:08	1.46	1.46	2987	3000	33	30	0	8	954.77	575.03					
4/26/2012 12:09	1.46	1.55	2987	3000	33	30	0	8	954.88	574.92					
4/26/2012 12:10	1.46	1.53	2987	3000	33	30	0	8	955.01	574.80					
4/26/2012 12:11	1.45	1.47	2987	3000	33	30	0	8	954.94	574.69					
4/26/2012 12:12	1.45	1.46	2987	3000	33	30	0	8	954.85	574.57					
4/26/2012 12:13	1.45	1.43	2987	3000	33	30	0	8	955.08	574.45					
4/26/2012 12:14	1.44	1.45	2987	3000	33	30	0	8	955.12	574.34					
4/26/2012 12:15	1.44	1.53	2987	3000	33	30	0	8	955.00	574.22					
4/26/2012 12:16	1.43	1.43	2987	3000	33	30	0	8	954.87	574.10					
4/26/2012 12:17	1.43	1.36	2987	3000	33	30	0	8	954.74	573.91					
4/26/2012 12:18	1.43	1.41	2987	3000	33	30	0	8	954.53	573.87					
4/26/2012 12:19	1.42	1.37	2987	3000	33	30	0	8	954.37	573.88					
4/26/2012 12:20	1.42	1.41	2987	3000	33	30	0	8	954.45	573.90					
4/26/2012 12:21	1.41	1.43	2987	3000	33	30	0	8	954.76	573.91					
4/26/2012 12:22	1.41	1.48	2987	3000	33	30	0	8	954.89	573.92					
4/26/2012 12:23	1.41	1.46	2987	3000	33	30	0	8	954.87	573.93					
4/26/2012 12:24	1.40	1.43	2987	3000	33	30	0	8	954.84	573.95					
4/26/2012 12:25	1.40	1.39	2987	3000	33	30	0	8	954.82	573.96					

	Flue gas O2 %	Flue gas O2 %	fresh catalyst		fresh catalyst		SuperSoxgeter		SuperSoxgeter		SuperSoxgeter		NOx additive		Ammonia Injection		riser temp	hr outlet temp
			lb/d	setpoint	lb/d	setpoint	lb/d	setpoint	lb/d	setpoint	lb/d	setpoint	lb/d	setpoint	lb/d	setpoint		
	11A0816	11A0816	11FC0670	11FC0670.SP	11W0866	11W0867.SP	11W0869	11FC0670	11FC0670.SP	11W0866	11W0867.SP	11W0869	11FC0670	11FC0670.SP	11FC0670	11FC0670.SP	11TCRTR	11TC0025
4/26/2012 12:26	1.40	1.31	2987	3000	33	30	0	8									954.88	573.97
4/26/2012 12:27	1.39	1.36	2987	3000	33	30	0	8									954.96	573.99
4/26/2012 12:28	1.39	1.39	2987	3000	33	30	0	8									955.03	574.00
4/26/2012 12:29	1.38	1.41	2987	3000	33	30	0	8									955.05	574.01
4/26/2012 12:30	1.38	1.42	2987	3000	33	30	0	8									954.96	574.03
4/26/2012 12:31	1.38	1.36	2987	3000	33	30	0	8									954.85	574.04
4/26/2012 12:32	1.37	1.33	2987	3000	33	30	0	8									954.68	574.05
4/26/2012 12:33	1.37	1.38	2987	3000	33	30	0	8									954.51	574.06
4/26/2012 12:34	1.36	1.36	2987	3000	33	30	0	8									954.35	574.08
4/26/2012 12:35	1.36	1.37	2987	3000	33	30	0	8									954.39	574.09
4/26/2012 12:36	1.36	1.44	2987	3000	33	30	0	8									954.81	574.10
4/26/2012 12:37	1.35	1.44	2987	3000	33	30	0	8									955.07	574.12
4/26/2012 12:38	1.35	1.46	2987	3000	33	30	0	8									955.06	574.13
4/26/2012 12:39	1.35	1.46	2987	3000	33	30	0	8									955.05	574.14
4/26/2012 12:40	1.34	1.50	2987	3000	33	30	0	8									955.03	574.15
4/26/2012 12:41	1.34	1.44	2987	3000	33	30	0	8									954.96	574.17
4/26/2012 12:42	1.33	1.45	2987	3000	33	30	0	8									954.87	574.18
4/26/2012 12:43	1.33	1.43	2987	3000	33	30	0	8									954.79	574.19
4/26/2012 12:44	1.33	1.49	2987	3000	33	30	0	8									954.70	574.21
4/26/2012 12:45	1.32	1.43	2987	3000	33	30	0	8									954.52	574.22
4/26/2012 12:46	1.32	1.39	2987	3000	33	30	0	8									954.45	574.23
4/26/2012 12:47	1.32	1.39	2987	3000	33	30	0	8									954.67	574.24
4/26/2012 12:48	1.31	1.43	2987	3000	33	30	0	8									954.89	574.26
4/26/2012 12:49	1.31	1.42	2987	3000	33	30	0	8									955.12	574.27
4/26/2012 12:50	1.30	1.53	2987	3000	33	30	0	8									955.30	574.28
4/26/2012 12:51	1.30	1.48	2987	3000	33	30	0	8									955.20	574.30
4/26/2012 12:52	1.30	1.49	2987	3000	33	30	0	8									955.06	574.31
4/26/2012 12:53	1.29	1.49	2987	3000	33	30	0	8									955.01	574.32
4/26/2012 12:54	1.29	1.45	2987	3000	33	30	0	8									954.97	574.33
4/26/2012 12:55	1.28	1.35	2987	3000	33	30	0	8									954.79	574.35
4/26/2012 12:56	1.28	1.32	2987	3000	33	30	0	8									954.39	574.36
4/26/2012 12:57	1.28	1.28	2987	3000	33	30	0	8									954.66	574.37
4/26/2012 12:58	1.28	1.25	2987	3000	33	30	0	8									955.07	574.39
4/26/2012 12:59	1.29	1.34	2987	3000	33	30	0	8									955.58	574.40
4/26/2012 13:00	1.29	1.37	2987	3000	33	30	0	8									955.73	574.41
4/26/2012 13:01	1.30	1.32	2987	3000	33	30	0	8									955.64	574.42
4/26/2012 13:02	1.31	1.36	2987	3000	33	30	0	8									955.56	574.44
4/26/2012 13:03	1.32	1.35	2987	3000	33	30	0	8									955.47	574.45
4/26/2012 13:04	1.33	1.40	2987	3000	33	30	0	8									955.39	574.46
4/26/2012 13:05	1.34	1.39	2987	3000	33	30	0	8									955.30	574.48
4/26/2012 13:06	1.34	1.37	2987	3000	33	30	0	8									955.23	574.49
4/26/2012 13:07	1.35	1.46	2987	3000	33	30	0	8									955.29	574.50
4/26/2012 13:08	1.36	1.48	2987	3000	33	30	0	8									955.43	574.51
4/26/2012 13:09	1.37	1.54	2987	3000	33	30	0	8									955.68	574.53

	Flue gas O2 %	Flue gas O2 %	fresh catalyst		fresh catalyst		SuperSoxgeter		SuperSoxgeter		NOX additive		Ammonia injection	riser temp	htr outlet temp
			lb/d	11FC0870 SP	lb/d	11W0686	lb/d	11W0687 SP	lb/d	11W0689					
11AC0816	1.38	1.52	2987	3000	33	30	0	8	11TCRXTR	955.71	574.54				
4/26/2012 13:10	1.39	1.49	2987	3000	33	30	0	8		955.60	574.55				
4/26/2012 13:11	1.39	1.47	2987	3000	33	30	0	8		955.49	574.57				
4/26/2012 13:12	1.40	1.50	2987	3000	33	30	0	8		955.37	574.58				
4/26/2012 13:13	1.41	1.51	2987	3000	33	30	0	8		955.26	574.59				
4/26/2012 13:14	1.42	1.47	2987	3000	33	30	0	8		955.09	574.60				
4/26/2012 13:15	1.43	1.43	2987	3000	33	30	0	8		954.56	574.62				
4/26/2012 13:16	1.44	1.50	2987	3000	33	30	0	8		954.62	574.63				
4/26/2012 13:17															

Feed rate bpd	coke burn lb/hr	Primary current to Primary current to Primary current to Primary current to				Primary power to Primary power to Primary power to Primary power to				Secondary current to Secondary current to Secondary current to Secondary current to				Primary voltage to Primary voltage to Primary voltage to Primary voltage to			
		TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3	TR3
11FC0118	11mickbr	11I0032A	11I0033A	11I0034A	11I0032A	11I0033A	11I0034A	11I0032A	11I0033A	11I0034A	11I0032B	11I0033B	11I0034B	11E0032A	11E0033A	11E0034A	
4/27/2012 8:15	32561	64	66	68	11	12	12	12	12	12	273	278	286	226	231	237	
4/27/2012 8:16	32561	66	67	68	12	12	12	12	12	12	290	284	286	231	233	237	
4/27/2012 8:17	32562	67	67	68	12	12	12	12	12	12	298	284	286	234	233	237	
4/27/2012 8:18	32562	66	67	68	11	12	12	12	12	12	289	284	286	231	233	237	
4/27/2012 8:19	32562	64	67	68	11	12	12	12	12	12	276	284	286	227	233	237	
4/27/2012 8:20	32560	61	67	68	10	12	12	12	12	12	263	284	286	224	233	237	
4/27/2012 8:21	32558	55	67	68	9	12	12	12	12	12	230	285	286	211	232	237	
4/27/2012 8:22	32555	60	67	68	10	12	12	12	12	12	249	285	286	219	232	237	
4/27/2012 8:23	32553	63	67	68	10	12	12	12	12	12	273	285	280	227	232	234	
4/27/2012 8:24	32551	63	67	68	10	12	12	12	12	12	269	285	282	227	232	235	
4/27/2012 8:25	32548	62	67	68	10	12	12	12	12	12	265	283	284	226	231	236	
4/27/2012 8:26	32546	62	65	68	10	12	12	12	12	12	267	272	284	225	228	236	
4/27/2012 8:27	32544	61	67	68	10	12	12	12	12	12	266	283	284	224	232	236	
4/27/2012 8:28	32541	61	67	68	10	12	12	12	12	12	262	285	284	222	233	236	
4/27/2012 8:29	32540	61	67	68	10	12	12	12	12	12	260	285	284	222	233	236	
4/27/2012 8:30	32541	64	67	68	11	12	12	12	12	12	283	285	284	229	232	236	
4/27/2012 8:31	32544	65	67	68	12	12	12	12	12	12	284	285	284	230	232	236	
4/27/2012 8:32	32548	63	67	68	11	12	12	12	12	12	276	285	284	228	232	236	
4/27/2012 8:33	32551	63	67	68	11	12	12	12	12	12	273	284	284	225	232	236	
4/27/2012 8:34	32554	61	67	68	10	12	12	12	12	12	265	284	284	223	232	236	
4/27/2012 8:35	32557	61	67	68	10	12	12	12	12	12	261	284	284	223	231	236	
4/27/2012 8:36	32560	58	67	68	10	12	12	12	12	12	244	284	284	217	231	236	
4/27/2012 8:37	32563	60	67	68	10	12	12	12	12	12	258	283	284	221	231	236	
4/27/2012 8:38	32566	62	67	68	10	12	12	12	12	12	267	277	284	225	229	237	
4/27/2012 8:39	32568	56	67	68	9	12	12	12	12	12	240	281	284	215	231	237	
4/27/2012 8:40	32564	59	67	68	9	12	12	12	12	12	253	284	284	219	232	237	
4/27/2012 8:41	32558	61	67	68	9	12	12	12	12	12	262	284	284	222	232	237	
4/27/2012 8:42	32552	61	67	68	9	12	12	12	12	12	262	284	284	222	232	237	
4/27/2012 8:43	32546	57	67	68	9	12	12	12	12	12	242	285	284	216	232	237	
4/27/2012 8:44	32540	61	67	68	11	12	12	12	12	12	260	285	284	221	232	237	
4/27/2012 8:45	32534	61	66	68	11	12	12	12	12	12	263	282	284	221	231	237	
4/27/2012 8:46	32529	64	62	68	11	12	12	12	12	12	279	258	284	227	223	237	
4/27/2012 8:47	32523	65	65	68	11	12	12	12	12	12	284	276	284	229	229	237	
4/27/2012 8:48	32517	66	67	68	11	12	12	12	12	12	285	285	284	230	232	237	
4/27/2012 8:49	32510	62	67	68	11	12	12	12	12	12	266	285	284	225	232	237	
4/27/2012 8:50	32497	64	67	68	11	12	12	12	12	12	275	285	284	227	233	237	
4/27/2012 8:51	32482	64	67	68	11	12	12	12	12	12	280	285	284	228	233	237	
4/27/2012 8:52	32466	62	67	68	11	12	12	12	12	12	274	285	284	227	233	237	
4/27/2012 8:53	32451	62	67	68	11	12	12	12	12	12	269	285	284	225	233	237	
4/27/2012 8:54	32436	61	67	68	11	12	12	12	12	12	263	285	284	223	233	237	
4/27/2012 8:55	32420	57	67	68	10	12	12	12	12	12	241	285	284	215	234	237	
4/27/2012 8:56	32405	64	67	68	11	12	12	12	12	12	278	285	284	227	234	237	
4/27/2012 8:57	32390	67	67	68	12	12	12	12	12	12	294	285	284	233	234	237	
4/27/2012 8:58	32374	66	63	68	12	12	12	12	12	12	292	265	284	232	226	237	

Feed rate bpd	coke burn lb/hr	Primary current to Primary current to Primary current to						Secondary current to			Primary voltage to Primary voltage to Primary voltage to		
		TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3
		A	A	A	kW	kW	kW	mA	mA	mA	V	V	V
11FC0118	11mickbr	11I0032A	11I0033A	11I0034A	11J0032A	11J0033A	11J0034A	11I0032B	11I0033B	11I0034B	11E0032A	11E0033A	11E0034A
32360	17926	66	65	68	11	12	12	289	276	284	232	229	237
4/27/2012 8:59													
32371	17985	64	67	68	11	12	12	271	285	284	226	232	237
4/27/2012 9:00													
32390	17960	60	67	68	10	12	12	258	285	284	223	232	237
4/27/2012 9:01													
32409	17893	62	67	68	11	12	12	268	285	284	226	232	237
4/27/2012 9:02													
32428	17918	65	67	68	12	12	12	279	285	284	228	232	237
4/27/2012 9:03													
32448	17954	61	67	68	11	12	12	258	285	284	222	232	237
4/27/2012 9:04													
32467	17940	65	67	68	12	12	12	280	284	284	228	231	237
4/27/2012 9:05													
32486	17901	62	67	68	11	12	12	269	284	284	225	231	237
4/27/2012 9:06													
32505	17894	61	67	68	10	12	12	263	284	284	223	231	237
4/27/2012 9:07													
32524	17913	61	67	68	10	12	12	263	284	284	223	231	237
4/27/2012 9:08													
32543	17902	62	67	68	10	12	12	267	284	284	223	231	237
4/27/2012 9:09													
32548	17869	62	67	68	10	12	12	268	284	284	223	231	237
4/27/2012 9:10													
32546	17900	62	65	68	10	12	12	267	275	284	223	228	237
4/27/2012 9:11													
32545	17887	63	66	68	11	12	12	271	282	284	223	231	237
4/27/2012 9:12													
32543	17869	62	67	68	11	12	12	268	285	284	223	232	237
4/27/2012 9:13													
32542	17883	61	67	68	11	12	12	264	285	284	223	232	237
4/27/2012 9:14													
32540	17927	60	67	68	11	12	12	262	285	284	222	232	237
4/27/2012 9:15													
32539	17969	63	67	68	11	12	12	268	285	285	225	232	237
4/27/2012 9:16													
32537	17991	64	67	68	11	12	12	276	285	285	227	232	237
4/27/2012 9:17													
32536	17971	63	67	68	11	12	12	273	285	285	226	231	237
4/27/2012 9:18													
32534	17957	63	67	68	11	12	12	272	285	285	226	231	237
4/27/2012 9:19													
32525	17962	64	67	68	11	12	12	273	285	285	225	231	237
4/27/2012 9:20													
32512	17944	62	67	68	11	12	12	269	285	285	225	231	237
4/27/2012 9:21													
32498	17974	62	67	68	11	12	12	262	285	285	224	231	237
4/27/2012 9:22													
32485	17971	62	67	68	11	12	12	261	285	285	223	231	237
4/27/2012 9:23													
32472	17922	61	67	68	11	12	12	261	284	285	223	231	237
4/27/2012 9:24													
32458	17861	61	67	68	11	12	12	262	284	285	223	231	237
4/27/2012 9:25													
32445	17830	63	67	68	11	12	12	274	284	285	225	231	237
4/27/2012 9:26													
32432	17858	65	67	68	11	12	12	281	284	285	228	231	237
4/27/2012 9:27													
32418	17920	60	67	68	10	12	12	256	284	285	220	231	237
4/27/2012 9:28													
32405	17905	63	67	68	10	12	12	272	284	285	226	230	236
4/27/2012 9:29													
32403	17842	64	67	68	11	12	12	280	284	285	228	230	236
4/27/2012 9:30													
32409	17776	63	67	68	11	12	12	274	284	285	226	230	236
4/27/2012 9:31													
32415	17806	63	67	68	11	12	12	269	284	285	224	230	236
4/27/2012 9:32													
32420	17858	63	67	68	11	12	12	272	284	285	224	230	236
4/27/2012 9:33													
32426	17877	62	67	68	11	12	12	272	284	285	225	230	236
4/27/2012 9:34													
32432	17839	62	67	68	11	12	12	269	281	285	225	229	236
4/27/2012 9:35													
32437	17790	64	67	68	11	12	12	278	284	285	228	232	236
4/27/2012 9:36													
32443	17807	62	67	68	11	12	12	261	285	285	223	232	236
4/27/2012 9:37													
32449	17837	59	67	68	11	12	12	249	285	285	218	232	236
4/27/2012 9:38													
32455	17900	63	67	68	11	12	12	272	285	285	223	232	236
4/27/2012 9:39													
32461	18020	65	67	68	12	12	12	282	285	285	230	232	236
4/27/2012 9:40													
32469	18050	63	67	68	11	12	12	270	285	285	226	232	236
4/27/2012 9:41													
32476	18042	60	67	68	10	12	12	255	285	285	220	232	236
4/27/2012 9:42													

Feed rate bpd	coke burn lb/hr	Primary current to Primary current to Primary power to				Secondary current to				Primary voltage to Primary voltage to			
		TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR1	TR2	TR3	TR3
		A	A	A	11J0032A	11J0033A	11J0034A	11J0032A	11J0033A	11J0032A	11J0033A	11J0034A	
11FC0118	11micbkr	65	67	68	12	12	12	12	12	230	232	236	
32483	18035	66	67	68	12	12	12	12	12	229	232	236	
32490	17951	66	67	68	12	12	12	12	12	230	232	236	
32498	17978	62	67	68	11	12	12	12	12	224	232	236	
32505	18034	61	67	68	10	12	12	12	12	222	232	236	
32512	18026	61	67	68	10	12	12	12	12	223	232	236	
32520	18071	62	67	68	10	12	12	12	12	225	232	236	
32527	18095	62	67	68	10	12	12	12	12	223	232	236	
32530	18109	62	67	68	11	12	12	12	12	223	232	236	
32529	18081	63	67	68	11	12	12	12	12	224	232	236	
32527	17986	63	67	68	11	12	12	12	12	225	232	236	
32526	17931	64	67	68	11	12	12	12	12	226	232	236	
32525	17947	64	67	68	11	12	12	12	12	226	232	236	
32524	17924	60	67	68	10	12	12	12	12	221	232	236	
32523	17920	64	67	68	11	12	12	12	12	227	232	236	
32522	17977	62	67	68	11	12	12	12	12	224	232	236	
32521	17908	65	67	68	11	12	12	12	12	230	232	236	
32520	17894	61	67	68	10	12	12	12	12	222	232	236	
32518	17886	59	67	68	10	12	12	12	12	218	232	236	
32517	17852	60	67	68	10	12	12	12	12	219	232	236	
32515	17911	60	67	68	10	12	12	12	12	222	232	236	
32513	17886	61	67	68	10	12	12	12	12	223	232	236	
32511	17870	61	67	68	10	12	12	12	12	222	232	236	
32509	17847	59	67	68	10	12	12	12	12	218	232	236	
32507	17759	58	67	68	10	12	12	12	12	218	232	236	
32506	17857	59	67	68	10	12	12	12	12	218	232	236	
32504	17841	59	67	68	10	12	12	12	12	219	232	236	
32502	17810	60	64	68	10	12	12	12	12	220	227	236	
32503	17851	60	66	68	10	12	12	12	12	221	231	236	
32507	17829	61	67	68	10	12	12	12	12	221	233	236	
32511	17816	61	67	68	10	12	12	12	12	222	233	236	
32515	17919	62	67	68	10	12	12	12	12	223	233	236	
32519	17961	62	67	68	10	12	12	12	12	224	233	236	
32523	17940	62	67	68	11	12	12	12	12	226	233	236	
32527	17981	63	67	68	11	12	12	12	12	224	233	236	
32531	17935	63	67	68	11	12	12	12	12	226	233	236	
32535	17879	64	67	68	11	12	12	12	12	229	233	236	
32539	17901	65	67	68	12	12	12	12	12	230	233	236	
32543	17976	66	67	68	12	12	12	12	12	231	233	236	
32547	18056	64	67	68	12	12	12	12	12	228	233	236	
32551	18007	66	67	68	12	12	12	12	12	231	233	236	
32554	18000	65	67	68	11	12	12	12	12	228	233	236	
32558	18011	60	67	68	10	12	12	12	12	220	232	236	
32562	18125	64	67	68	11	12	12	12	12	229	232	236	
32566	18091		67	68									

Feed rate	coke burn lb/hr	Primary current to Primary current to Primary current to			Primary power to			Secondary current to TR1	Secondary current to TR2	Secondary current to TR3	Primary voltage to Primary voltage to Primary voltage to		
		TR1	TR2	TR3	TR1	TR2	TR3				TR1	TR2	TR3
bpd		A	A	A	kW	kW	kW	mA	mA	mA	V	V	V
11FC0118	11mickbr	11I0032A	11I0033A	11I0034A	11I0032A	11I0033A	11I0034A	11I0032B	11I0033B	11I0034B	11E0032A	11E0033A	11E0034A
4/27/2012 10:27	17982	65	67	68	11	12	12	273	285	285	230	232	236
4/27/2012 10:28	17953	61	67	68	10	12	12	264	285	285	225	232	236
4/27/2012 10:29	17909	66	67	68	11	12	12	290	285	285	231	232	236
4/27/2012 10:30	17961	68	67	68	12	12	12	299	285	285	233	232	236
4/27/2012 10:31	17933	62	67	68	10	12	12	265	285	285	224	232	236
4/27/2012 10:32	17966	61	67	68	10	12	12	261	285	285	224	232	236
4/27/2012 10:33	17937	65	67	68	11	12	12	287	285	285	230	232	236
4/27/2012 10:34	17840	62	67	68	11	12	12	266	285	285	224	232	237
4/27/2012 10:35	17835	65	67	68	12	12	12	285	285	285	229	232	237
4/27/2012 10:36	17815	62	67	68	11	12	12	270	285	285	224	232	237
4/27/2012 10:37	17852	61	67	68	10	12	12	264	285	285	223	232	237
4/27/2012 10:38	17762	61	67	68	10	12	12	268	284	285	224	232	237
4/27/2012 10:39	17841	61	63	68	10	12	12	266	265	285	223	225	237
4/27/2012 10:40	17876	61	65	68	10	12	12	264	276	285	223	228	237
4/27/2012 10:41	17837	60	67	68	10	12	12	264	285	285	222	231	237
4/27/2012 10:42	17807	60	67	68	11	12	12	261	285	285	222	231	237
4/27/2012 10:43	17882	60	67	68	11	12	12	260	285	285	221	231	237
4/27/2012 10:44	17916	60	67	68	11	12	12	256	285	285	221	231	237
4/27/2012 10:45	17962	59	67	68	11	12	12	253	285	285	219	231	237
4/27/2012 10:46	18001	62	67	68	11	12	12	266	285	285	223	232	237
4/27/2012 10:47	18017	62	67	68	10	12	12	266	285	285	225	232	237
4/27/2012 10:48	17945	61	67	68	10	12	12	262	285	285	224	232	237
4/27/2012 10:49	17906	61	67	68	10	12	12	262	285	285	224	232	237
4/27/2012 10:50	17966	65	67	68	11	12	12	285	285	285	230	232	237
4/27/2012 10:51	17933	61	67	68	11	12	12	264	285	285	222	232	237
4/27/2012 10:52	17928	64	67	68	12	12	12	278	285	285	227	232	237
4/27/2012 10:53	17925	64	67	68	11	12	12	277	285	285	228	232	237
4/27/2012 10:54	17984	58	67	68	10	12	12	247	285	285	216	232	237
4/27/2012 10:55	17993	62	67	68	11	12	12	272	285	285	224	232	237
4/27/2012 10:56	18033	66	67	68	11	12	12	290	285	285	230	232	237
4/27/2012 10:57	18029	62	67	68	11	12	12	270	285	285	225	232	237
4/27/2012 10:58	18056	59	67	68	11	12	12	254	285	285	219	232	237
4/27/2012 10:59	18128	65	67	68	11	12	12	284	285	286	229	232	237
4/27/2012 11:00	18103	66	67	68	10	12	12	292	285	286	231	232	237
4/27/2012 11:01	18102	65	67	68	10	12	12	287	285	286	229	232	237
4/27/2012 11:02	18057	64	67	68	10	12	12	282	285	286	227	232	237
4/27/2012 11:03	18076	62	67	68	10	12	12	274	285	286	225	232	237
4/27/2012 11:04	18098	61	67	68	10	12	12	266	285	286	223	232	237
4/27/2012 11:05	18104	61	67	68	10	12	12	263	285	286	222	232	237
4/27/2012 11:06	18111	64	67	68	10	12	12	278	285	286	227	232	237
4/27/2012 11:07	18049	64	67	68	10	12	12	278	285	286	228	232	237
4/27/2012 11:08	17987	63	67	68	11	12	12	269	285	286	226	232	237
4/27/2012 11:09	17909	62	67	68	11	12	12	265	285	286	225	232	237
4/27/2012 11:10	17879	66	67	68	12	12	12	292	285	286	233	232	237

Feed rate bpd	coke burn lb/hr	Primary current to Primary current to Primary current to						Secondary current to TR1						Primary voltage to Primary voltage to Primary voltage to					
		TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3
11FC0118	11mickbr	11I0032A	11I0033A	11I0034A	11J0032A	11J0033A	11J0034A	11I0032B	11I0033B	11I0034B	11E0032A	11E0033A	11E0034A	11E0032A	11E0033A	11E0034A	11E0032A	11E0033A	11E0034A
4/27/2012 11:11	17996	68	67	68	12	12	12	299	285	286	235	232	237	235	232	237	235	232	237
4/27/2012 11:12	18050	66	67	68	12	12	12	293	285	286	233	232	237	233	232	237	233	232	237
4/27/2012 11:13	17939	66	67	68	12	12	12	289	285	286	231	232	237	231	232	237	231	232	237
4/27/2012 11:14	17923	64	67	68	11	12	12	280	285	286	227	232	237	227	232	237	227	232	237
4/27/2012 11:15	17943	64	67	68	11	12	12	275	285	286	226	232	237	226	232	237	226	232	237
4/27/2012 11:16	17827	64	67	68	11	12	12	283	285	286	229	231	237	229	231	237	229	231	237
4/27/2012 11:17	17847	64	67	68	11	12	12	284	285	286	229	231	237	229	231	237	229	231	237
4/27/2012 11:18	17964	62	67	68	10	12	12	265	285	286	223	231	237	223	231	237	223	231	237
4/27/2012 11:19	32363	62	67	68	10	12	12	266	285	286	224	231	237	224	231	237	224	231	237
4/27/2012 11:20	32358	62	67	68	10	12	12	265	285	286	224	231	237	224	231	237	224	231	237
4/27/2012 11:21	17984	61	67	68	10	12	12	259	285	286	223	231	237	223	231	237	223	231	237
4/27/2012 11:22	17949	61	67	68	10	12	12	258	285	286	222	231	237	222	231	237	222	231	237
4/27/2012 11:23	17939	61	67	68	11	12	12	258	285	286	220	231	237	220	231	237	220	231	237
4/27/2012 11:24	17891	59	67	68	11	12	12	254	285	286	219	231	237	219	231	237	219	231	237
4/27/2012 11:25	17847	60	67	68	11	12	12	256	285	286	220	231	237	220	231	237	220	231	237
4/27/2012 11:26	17776	61	67	68	11	12	12	264	285	286	222	231	237	222	231	237	222	231	237
4/27/2012 11:27	17786	61	67	68	11	12	12	268	285	286	223	231	237	223	231	237	223	231	237
4/27/2012 11:28	17811	61	67	68	10	12	12	262	285	286	222	231	237	222	231	237	222	231	237
4/27/2012 11:29	17895	61	67	68	10	12	12	259	285	286	221	231	237	221	231	237	221	231	237
4/27/2012 11:30	17933	60	67	68	10	12	12	258	285	286	221	231	237	221	231	237	221	231	237
4/27/2012 11:31	17893	60	67	68	10	12	12	257	285	286	221	231	237	221	231	237	221	231	237
4/27/2012 11:32	17991	60	67	68	10	12	12	256	285	286	220	231	237	220	231	237	220	231	237
4/27/2012 11:33	18034	59	67	68	10	12	12	255	285	286	220	231	237	220	231	237	220	231	237
4/27/2012 11:34	18079	59	67	68	10	12	12	255	285	286	220	231	237	220	231	237	220	231	237
4/27/2012 11:35	18014	60	67	68	10	12	12	257	285	286	220	231	237	220	231	237	220	231	237
4/27/2012 11:36	17988	62	67	68	10	12	12	267	285	286	223	231	237	223	231	237	223	231	237
4/27/2012 11:37	18064	62	67	68	10	12	12	266	285	286	223	231	237	223	231	237	223	231	237
4/27/2012 11:38	17980	61	67	68	10	12	12	261	285	286	222	231	237	222	231	237	222	231	237
4/27/2012 11:39	17941	60	67	68	10	12	12	258	285	286	221	231	237	221	231	237	221	231	237
4/27/2012 11:40	18050	62	67	68	11	12	12	263	284	286	226	231	237	226	231	237	226	231	237
4/27/2012 11:41	17981	66	64	68	12	12	12	288	267	286	232	226	237	232	226	237	232	226	237
4/27/2012 11:42	17946	65	66	68	12	12	12	288	279	286	229	230	237	229	230	237	229	230	237
4/27/2012 11:43	17959	65	67	68	12	12	12	287	285	286	228	232	237	228	232	237	228	232	237
4/27/2012 11:44	17950	65	67	68	11	12	12	283	285	286	229	232	237	229	232	237	229	232	237
4/27/2012 11:45	17975	62	67	68	11	12	12	268	285	286	224	232	237	224	232	237	224	232	237
4/27/2012 11:46	17982	57	67	68	10	12	12	244	285	286	215	232	237	215	232	237	215	232	237
4/27/2012 11:47	18003	63	67	68	11	12	12	276	285	286	225	232	237	225	232	237	225	232	237
4/27/2012 11:48	17979	65	67	68	12	12	12	276	285	286	228	232	237	228	232	237	228	232	237
4/27/2012 11:49	18016	64	67	68	12	12	12	267	285	286	226	232	237	226	232	237	226	232	237
4/27/2012 11:50	32508	65	67	68	12	12	12	281	285	286	227	232	237	227	232	237	227	232	237
4/27/2012 11:51	32504	66	67	68	12	12	12	287	285	286	229	232	237	229	232	237	229	232	237
4/27/2012 11:52	18055	66	67	68	12	12	12	288	285	286	230	232	237	230	232	237	230	232	237
4/27/2012 11:53	18006	66	67	68	12	12	12	288	285	286	231	232	237	231	232	237	231	232	237
4/27/2012 11:54	17929	65	67	68	12	12	12	288	285	286	230	232	237	230	232	237	230	232	237
4/27/2012 11:55	32517	65	67	68	12	12	12	282	285	286	230	232	237	230	232	237	230	232	237
4/27/2012 11:56	32525	64	67	68	12	12	12	282	285	286	230	232	237	230	232	237	230	232	237
4/27/2012 11:57	32533	64	67	68	12	12	12	282	285	286	230	232	237	230	232	237	230	232	237

Feed rate	coke burn	Primary current to Primary current to Primary power to			Primary power to			Secondary current to			Secondary current to			Primary voltage to Primary voltage to		
		TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3
bpd	lb/hr	A	A	A	kW	kW	kW	mA	mA	mA	mA	mA	mA	V	V	V
11FC0118	11micbcr	11I0032A	11I0033A	11I0034A	11J0032A	11J0033A	11J0034A	11I0032B	11I0033B	11I0034B	11E0032A	11E0033A	11E0034A			
32540	18059	60	67	68	10	12	12	254	285	286	220	232	237			
4/27/2012 11:55																
32548	18029	65	67	68	11	12	12	278	285	286	228	232	237			
4/27/2012 11:56																
32555	17999	67	67	68	12	12	12	295	285	286	233	232	237			
4/27/2012 11:57																
32563	17948	66	67	68	12	12	12	294	285	286	233	232	237			
4/27/2012 11:58																
32570	17927	66	67	68	11	12	12	291	285	286	233	231	237			
4/27/2012 11:59																
32576	17983	64	67	68	11	12	12	283	285	286	230	231	237			
4/27/2012 12:00																
32572	18029	63	67	68	11	12	12	274	285	286	226	231	237			
4/27/2012 12:01																
32565	18046	61	67	68	10	12	12	266	285	286	223	231	237			
4/27/2012 12:02																
32559	18002	61	67	68	10	12	12	267	285	286	224	231	237			
4/27/2012 12:03																
32552	17950	61	67	68	10	12	12	264	285	286	222	231	237			
4/27/2012 12:04																
32546	17901	62	67	68	10	12	12	264	285	286	222	231	237			
4/27/2012 12:05																
32539	17812	65	67	68	10	12	12	284	285	286	230	231	237			
4/27/2012 12:06																
32533	17794	63	67	68	10	12	12	271	285	286	227	231	237			
4/27/2012 12:07																
32527	17890	61	67	68	10	12	12	263	285	286	222	231	237			
4/27/2012 12:08																
32520	17900	60	67	68	10	12	12	260	285	286	220	231	237			
4/27/2012 12:09																
32514	17850	61	67	68	10	12	12	259	285	286	222	231	237			
4/27/2012 12:10																
32510	17889	60	67	68	10	12	12	253	285	286	221	231	237			
4/27/2012 12:11																
32507	17934	61	67	68	10	12	12	256	285	286	221	231	237			
4/27/2012 12:12																
32504	17996	65	67	68	12	12	12	285	285	286	229	231	237			
4/27/2012 12:13																
32500	17984	66	67	68	12	12	12	288	285	286	230	231	237			
4/27/2012 12:14																
32497	17872	63	67	68	11	12	12	274	285	286	226	231	237			
4/27/2012 12:15																
32494	17950	61	67	68	10	12	12	259	285	286	222	231	237			
4/27/2012 12:16																
32490	17874	64	67	68	11	12	12	278	285	286	228	231	237			
4/27/2012 12:17																
32487	17846	61	67	68	10	12	12	260	285	286	220	231	237			
4/27/2012 12:18																
32484	17884	63	67	68	10	12	12	273	285	286	225	231	237			
4/27/2012 12:19																
32481	17890	64	67	68	11	12	12	279	285	286	228	231	237			
4/27/2012 12:20																
32482	17809	63	67	68	11	12	12	277	285	286	226	231	237			
4/27/2012 12:21																
32484	17831	63	67	68	11	12	12	279	285	286	227	231	237			
4/27/2012 12:22																
32486	17972	63	67	68	11	12	12	273	285	286	225	231	237			
4/27/2012 12:23																
32488	17995	62	67	68	12	12	12	271	285	286	224	231	237			
4/27/2012 12:24																
32490	17985	62	67	68	12	12	12	270	285	286	224	231	237			
4/27/2012 12:25																
32492	17992	62	67	68	12	12	12	272	285	286	225	231	237			
4/27/2012 12:26																
32494	17957	65	67	68	12	12	12	285	285	286	229	231	237			
4/27/2012 12:27																
32496	17950	60	67	68	10	12	12	258	285	286	220	231	237			
4/27/2012 12:28																
32497	17986	62	67	68	10	12	12	270	285	286	224	231	237			
4/27/2012 12:29																
32499	17991	62	67	68	11	12	12	275	285	286	226	231	237			
4/27/2012 12:30																
32501	17963	61	67	68	11	12	12	266	285	286	223	231	237			
4/27/2012 12:31																
32502	17965	61	67	68	11	12	12	263	285	286	223	230	237			
4/27/2012 12:32																
32504	17919	64	67	68	11	12	12	277	285	286	229	230	237			
4/27/2012 12:33																
32505	17874	65	67	68	11	12	12	281	285	286	229	230	237			
4/27/2012 12:34																
32507	17947	64	67	68	11	12	12	285	285	286	229	230	237			
4/27/2012 12:35																
32508	17904	64	67	68	11	12	12	283	285	286	228	230	237			
4/27/2012 12:36																
32510	17916	67	67	68	11	12	12	293	285	286	232	230	237			
4/27/2012 12:37																
32511	17973	65	67	68	11	12	12	280	285	286	228	230	237			
4/27/2012 12:38																

Feed rate bpd	coke burn lb/hr	Primary current to Primary current to Primary current to			Primary power to Primary power to Primary power to			Secondary current to TR1 mA	Secondary current to TR2 mA	Secondary current to TR3 mA	Primary voltage to Primary voltage to Primary voltage to		
		TR1 A	TR2 A	TR3 A	TR1 kW	TR2 kW	TR3 kW				TR1 V	TR2 V	TR3 V
11FC0118	11mickbr	11J0032A	11J0033A	11J0034A	11J0032A	11J0033A	11J0034A	11J0032B	11J0033B	11J0034B	11E0032A	11E0033A	11E0034A
32513	18003	65	67	68	12	12	12	284	285	286	229	230	237
4/27/2012 12:39													
32514	18002	65	67	68	12	12	12	283	285	286	228	230	237
4/27/2012 12:40													
32520	18047	63	67	68	11	12	12	275	285	286	224	230	237
4/27/2012 12:41													
32527	18061	61	67	68	10	12	12	263	285	287	221	230	237
4/27/2012 12:42													
32535	17981	60	67	68	10	12	12	256	285	287	220	230	237
4/27/2012 12:43													
32542	17949	59	67	68	10	12	12	254	285	287	217	230	237
4/27/2012 12:44													
32549	17958	64	67	68	11	12	12	279	285	287	226	230	237
4/27/2012 12:45													
32556	17901	63	67	68	11	12	12	273	285	287	224	230	237
4/27/2012 12:46													
32564	17941	65	67	68	12	12	12	283	285	287	228	230	237
4/27/2012 12:47													
32571	18012	64	67	68	11	12	12	278	285	287	227	232	237
4/27/2012 12:48													
32578	18061	62	67	68	10	12	12	270	285	287	224	233	237
4/27/2012 12:49													
32585	18083	63	67	68	10	12	12	270	285	287	227	233	237
4/27/2012 12:50													
32577	18154	64	67	68	10	12	12	272	285	287	227	233	237
4/27/2012 12:51													
32563	17991	64	67	68	10	12	12	278	285	287	227	232	237
4/27/2012 12:52													
32548	17967	63	67	68	10	12	12	276	285	287	226	232	237
4/27/2012 12:53													
32534	17916	63	67	68	10	12	12	266	285	287	225	232	237
4/27/2012 12:54													
32519	17861	60	67	68	10	12	12	254	285	287	220	232	237
4/27/2012 12:55													
32505	17855	56	67	68	9	12	12	234	285	287	211	232	237
4/27/2012 12:56													
32490	17852	57	67	68	9	12	12	245	285	287	215	232	237
4/27/2012 12:57													
32476	17823	64	67	68	11	12	12	276	285	287	227	231	237
4/27/2012 12:58													
32461	17832	66	67	68	12	12	12	285	285	287	230	231	237
4/27/2012 12:59													
32447	17819	60	67	68	11	12	12	256	285	287	221	231	237
4/27/2012 13:00													
32445	17884	62	67	68	10	12	12	265	285	287	222	231	237
4/27/2012 13:01													
32452	17861	61	67	68	10	12	12	262	285	287	222	231	237
4/27/2012 13:02													
32458	17770	60	67	68	10	12	12	260	285	287	221	231	237
4/27/2012 13:03													
32465	17806	64	67	68	10	12	12	282	285	287	227	230	237
4/27/2012 13:04													
32471	17830	64	67	68	11	12	12	281	285	287	226	230	237
4/27/2012 13:05													
32478	17888	61	67	68	11	12	12	270	285	287	224	230	237
4/27/2012 13:06													
32485	17906	61	67	68	11	12	12	271	285	287	224	230	237
4/27/2012 13:07													
32491	17841	62	67	68	11	12	12	265	285	287	225	230	237
4/27/2012 13:08													
32498	17839	65	67	68	12	12	12	280	285	287	229	230	237
4/27/2012 13:09													
32504	17860	65	67	68	12	12	12	284	285	287	228	230	237
4/27/2012 13:10													
32504	17895	63	67	68	11	12	12	274	285	287	225	230	237
4/27/2012 13:11													
32499	17883	61	67	68	10	12	12	263	285	287	222	230	237
4/27/2012 13:12													
32493	17889	64	67	68	11	12	12	273	285	287	228	230	237
4/27/2012 13:13													
32488	17916	66	67	68	12	12	12	288	285	287	230	231	237
4/27/2012 13:14													
32482	17923	63	67	68	11	12	12	278	285	287	226	231	237
4/27/2012 13:15													
32477	17994	61	67	68	10	12	12	265	285	287	222	231	237
4/27/2012 13:16													
32471	17991	62	67	68	10	12	12	271	285	287	223	231	237
4/27/2012 13:17													
32466	17820	61	67	68	11	12	12	265	285	287	222	231	237
4/27/2012 13:18													
32460	17768	64	67	68	11	12	12	275	285	287	227	231	237
4/27/2012 13:19													
32455	17890	65	67	68	12	12	12	285	285	287	230	231	237
4/27/2012 13:20													
32454	17898	59	67	68	10	12	12	254	285	287	220	231	237
4/27/2012 13:21													
32457	18034	61	67	68	11	12	12	263	285	287	223	231	237
4/27/2012 13:22													

Feed rate bpd	coke burn lb/hr	Primary current to Primary current to			Primary power to			Secondary current to			Primary voltage to Primary voltage to		
		TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3	TR1	TR2	TR3
A	A	A	A	A	kW	kW	kW	mA	mA	mA	V	V	V
11I0032A	11I0033A	11I0034A	11J0032A	11J0033A	11J0034A	11I0032B	11I0033B	11I0034B	11E0032A	11E0033A	11E0034A		
66	67	68	11	12	12	287	285	287	230	231	237		
18185	18185	18185	18150	18061	17985	17903	17913	17932	18017	17970	17944		
18000	17988	17959	18023	17975	17931	17910	17914	17896	17865	17889	17876		
32460	32468	32475	32482	32489	32496	32504	32511	32518	32525	32715	32949		
32910	32869	32827	32785	32744	32702	32660	32618						
4/27/2012 13:23	4/27/2012 13:24	4/27/2012 13:25	4/27/2012 13:26	4/27/2012 13:27	4/27/2012 13:28	4/27/2012 13:29	4/27/2012 13:30	4/27/2012 13:31	4/27/2012 13:32	4/27/2012 13:33	4/27/2012 13:34	4/27/2012 13:35	4/27/2012 13:36
4/27/2012 13:37	4/27/2012 13:38	4/27/2012 13:39	4/27/2012 13:40	4/27/2012 13:41	4/27/2012 13:42	4/27/2012 13:43	4/27/2012 13:44	4/27/2012 13:45	4/27/2012 13:46	4/27/2012 13:47	4/27/2012 13:48	4/27/2012 13:49	4/27/2012 13:50
4/27/2012 13:51	4/27/2012 13:52	4/27/2012 13:53	4/27/2012 13:54	4/27/2012 13:55	4/27/2012 13:56	4/27/2012 13:57	4/27/2012 13:58	4/27/2012 13:59	4/27/2012 14:00				

	Secondary voltage to TR1 KV	Secondary voltage to TR2 KV	Secondary voltage to TR3 KV	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1	Arcs/min on TR2	Arcs/min on TR3	Primary current to Primary current to Primary current to Primary power to			
										TR1	TR2	TR3	TR2
4/27/2012 8:15	11E0032B 26	11E0033B 25	11E0034B 22	11XA0032A 17	11XA0033A 2	11XA0034A 0	11XA0032B 0	11XA0033B 0	11XA0034B 0	11I0067A 70	11I0068A 60	11I0069A 54	11I0068A 60
4/27/2012 8:16	26	25	22	17	2	0	0	0	0	69	60	54	60
4/27/2012 8:17	26	25	22	17	2	0	0	0	0	69	60	54	60
4/27/2012 8:18	26	25	22	17	2	0	0	0	0	74	60	54	60
4/27/2012 8:19	26	25	22	17	2	0	0	0	0	71	60	54	60
4/27/2012 8:20	26	25	22	17	2	0	0	0	0	70	60	54	60
4/27/2012 8:21	26	25	22	17	2	0	0	0	0	73	60	54	60
4/27/2012 8:22	26	25	22	17	2	0	0	0	0	70	60	54	60
4/27/2012 8:23	26	25	22	17	2	0	0	0	0	70	60	54	60
4/27/2012 8:24	26	25	22	17	2	0	0	0	0	69	60	54	60
4/27/2012 8:25	26	25	22	17	2	0	0	0	0	68	60	54	60
4/27/2012 8:26	26	25	22	17	2	0	0	0	0	72	60	54	60
4/27/2012 8:27	26	25	22	17	2	0	0	0	0	73	60	54	60
4/27/2012 8:28	26	25	22	17	2	0	0	0	0	71	60	54	60
4/27/2012 8:29	26	25	22	17	2	0	0	0	0	70	60	54	60
4/27/2012 8:30	26	25	22	17	2	0	0	0	0	67	60	54	60
4/27/2012 8:31	26	25	22	17	2	0	0	0	0	69	60	54	60
4/27/2012 8:32	26	25	22	17	2	0	0	0	0	65	60	54	60
4/27/2012 8:33	26	25	22	17	2	0	0	0	0	56	60	54	60
4/27/2012 8:34	26	25	22	17	2	0	0	0	0	63	60	54	60
4/27/2012 8:35	26	25	22	17	2	0	0	0	0	65	60	54	60
4/27/2012 8:36	26	25	22	17	2	0	0	0	0	67	60	54	60
4/27/2012 8:37	26	25	22	17	2	0	0	0	0	71	60	54	60
4/27/2012 8:38	26	25	22	17	2	0	0	0	0	67	60	54	60
4/27/2012 8:39	26	25	22	17	3	0	0	0	0	65	60	54	60
4/27/2012 8:40	26	25	22	17	2	0	0	0	0	68	60	54	60
4/27/2012 8:41	26	25	22	17	1	0	0	0	0	68	60	54	60
4/27/2012 8:42	26	25	22	17	1	0	0	0	0	68	60	54	60
4/27/2012 8:43	26	25	22	17	1	0	0	0	0	70	60	54	60
4/27/2012 8:44	26	25	22	17	1	0	0	0	0	69	60	54	60
4/27/2012 8:45	26	25	22	17	1	0	0	0	0	66	60	54	60
4/27/2012 8:46	26	25	22	17	1	0	0	0	0	67	60	54	60
4/27/2012 8:47	26	25	22	17	1	0	0	0	0	71	60	54	60
4/27/2012 8:48	26	25	22	17	1	0	0	0	0	69	60	54	60
4/27/2012 8:49	26	25	22	17	1	0	0	0	0	72	60	54	60
4/27/2012 8:50	26	25	22	17	3	0	0	0	0	69	60	54	60
4/27/2012 8:51	26	25	22	17	3	0	0	0	0	71	60	54	60
4/27/2012 8:52	26	25	22	17	2	0	0	0	0	68	60	54	60
4/27/2012 8:53	26	25	22	17	0	0	0	0	0	68	60	54	60
4/27/2012 8:54	26	25	22	17	0	0	0	0	0	70	60	54	60
4/27/2012 8:55	26	25	22	17	0	0	0	0	0	70	60	54	60
4/27/2012 8:56	26	25	22	17	0	0	0	0	0	68	60	54	60
4/27/2012 8:57	26	25	22	17	0	0	0	0	0	68	60	54	60
4/27/2012 8:58	26	25	22	17	0	0	0	0	0	68	60	54	60

	Secondary voltage to TR1 KV	Secondary voltage to TR2 KV	Secondary voltage to TR3 KV	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1	Arcs/min on TR2	Arcs/min on TR3	Primary current to Primary current to Primary current to Primary power to Primary power to					
										TR1	TR2	TR3	TR1	TR2	TR3
4/27/2012 8:59	11E0032B 26	11E0033B 25	11E0034B 22	11XA0032A 17	11XA0033A 0	11XA0034A 0	11XA0032B 0	11XA0033B 0	11XA0034B 0	11I0067A 67	11I0068A 60	11I0069A 54	11J0067A 12	11J0068A 10	11J0069A 10
4/27/2012 9:00	26	25	22	17	0	0	0	0	0	55	60	54	9	10	10
4/27/2012 9:01	26	25	22	17	0	0	0	0	0	55	60	54	9	10	10
4/27/2012 9:02	26	25	22	17	0	0	0	0	0	65	60	54	12	10	10
4/27/2012 9:03	26	25	22	17	0	0	0	0	0	71	60	54	13	10	10
4/27/2012 9:04	26	25	22	17	0	0	0	0	0	69	60	54	13	10	10
4/27/2012 9:05	26	25	22	17	0	0	0	0	0	70	60	54	13	10	10
4/27/2012 9:06	26	25	22	17	0	0	0	0	0	72	60	54	13	10	10
4/27/2012 9:07	26	25	22	17	0	0	0	0	0	72	60	54	13	10	10
4/27/2012 9:08	26	25	22	17	0	0	0	0	0	70	60	54	12	10	10
4/27/2012 9:09	26	25	22	17	0	0	0	0	0	70	60	54	12	10	10
4/27/2012 9:10	26	25	22	17	0	0	0	0	0	73	60	54	12	10	10
4/27/2012 9:11	26	25	22	17	0	0	0	0	0	72	60	54	12	10	10
4/27/2012 9:12	26	25	22	17	0	0	0	0	0	69	60	54	12	10	10
4/27/2012 9:13	26	25	22	17	0	0	0	0	0	70	60	54	13	10	10
4/27/2012 9:14	26	25	22	17	0	0	0	0	0	69	60	54	13	10	10
4/27/2012 9:15	26	25	22	17	0	0	0	0	0	69	60	54	13	10	10
4/27/2012 9:16	26	25	22	17	0	0	0	0	0	71	60	54	13	10	10
4/27/2012 9:17	26	25	22	17	0	0	0	0	0	69	60	54	13	10	10
4/27/2012 9:18	26	25	22	17	0	0	0	0	0	73	60	54	14	10	10
4/27/2012 9:19	26	25	22	17	0	0	0	0	0	69	60	54	14	10	10
4/27/2012 9:20	26	25	22	17	0	0	0	0	0	68	60	54	14	10	10
4/27/2012 9:21	26	25	22	17	0	0	0	0	0	68	60	54	14	10	10
4/27/2012 9:22	26	25	22	17	0	0	0	0	0	73	60	54	14	10	10
4/27/2012 9:23	26	25	22	17	0	0	0	0	0	68	60	54	12	10	10
4/27/2012 9:24	26	25	22	17	0	0	0	0	0	70	60	54	12	10	10
4/27/2012 9:25	26	25	22	17	0	0	0	0	0	71	60	54	13	10	10
4/27/2012 9:26	26	25	22	17	0	0	0	0	0	70	60	54	13	10	10
4/27/2012 9:27	26	25	22	17	0	0	0	0	0	74	60	54	13	10	10
4/27/2012 9:28	26	25	22	17	0	0	0	0	0	74	60	54	13	10	10
4/27/2012 9:29	26	25	22	17	0	0	0	0	0	73	60	54	13	10	10
4/27/2012 9:30	26	25	22	17	0	0	0	0	0	70	60	54	14	10	10
4/27/2012 9:31	26	25	22	17	0	0	0	0	0	70	60	54	14	10	10
4/27/2012 9:32	26	25	22	17	0	0	0	0	0	71	60	54	14	10	10
4/27/2012 9:33	26	25	22	17	0	0	0	0	0	69	60	54	14	10	10
4/27/2012 9:34	26	25	22	17	0	0	0	0	0	72	60	54	14	10	10
4/27/2012 9:35	26	25	22	17	0	0	0	0	0	64	60	54	11	10	10
4/27/2012 9:36	26	25	22	17	0	0	0	0	0	67	60	54	12	10	10
4/27/2012 9:37	26	25	22	17	0	0	0	0	0	71	60	54	13	10	10
4/27/2012 9:38	26	25	22	17	0	0	0	0	0	72	60	54	14	10	10
4/27/2012 9:39	26	25	22	17	0	0	0	0	0	68	60	54	12	10	10
4/27/2012 9:40	26	25	22	17	0	0	0	0	0	64	60	54	12	10	10
4/27/2012 9:41	26	25	22	17	0	0	0	0	0	69	60	54	12	10	10
4/27/2012 9:42	26	25	22	17	0	0	0	0	0	67	60	54	12	10	10

Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1	Arcs/min on TR2	Arcs/min on TR3	Primary current to Primary current to Primary current to Primary power to			
									TR1	TR2	TR3	TR1
11E0032B	11E0033B	11E0034B	11X0032A	11X0033A	11X0034A	11X0032B	11X0033B	11X0034B	A	A	A	11J0067A
4/27/2012 9:43	26	25	22	17	0	0	0	0	63	60	54	11
4/27/2012 9:44	26	25	22	17	0	0	0	0	67	60	54	11
4/27/2012 9:45	26	25	22	17	0	0	0	0	70	60	54	12
4/27/2012 9:46	26	25	22	17	0	0	0	0	69	60	54	12
4/27/2012 9:47	26	25	22	17	0	0	0	0	73	60	54	13
4/27/2012 9:48	26	25	22	17	0	0	0	0	70	60	54	12
4/27/2012 9:49	26	25	22	17	0	0	0	0	69	60	54	12
4/27/2012 9:50	26	25	22	17	0	0	0	0	69	60	54	12
4/27/2012 9:51	26	25	22	17	0	0	0	0	72	60	54	13
4/27/2012 9:52	26	25	22	17	0	0	0	0	72	60	54	13
4/27/2012 9:53	26	25	22	17	0	0	0	0	69	60	54	12
4/27/2012 9:54	26	25	22	17	0	0	0	0	69	60	54	13
4/27/2012 9:55	26	25	22	17	0	0	0	0	74	60	54	14
4/27/2012 9:56	26	25	22	17	0	0	0	0	70	60	54	13
4/27/2012 9:57	26	25	22	17	0	0	0	0	68	60	54	12
4/27/2012 9:58	26	25	22	17	0	0	0	0	69	60	54	12
4/27/2012 9:59	26	25	22	17	0	0	0	0	69	60	54	12
4/27/2012 10:00	26	25	22	17	0	0	0	0	66	60	54	13
4/27/2012 10:01	26	25	22	17	0	0	0	0	68	60	54	13
4/27/2012 10:02	26	25	22	17	0	0	0	0	70	60	54	13
4/27/2012 10:03	26	25	22	17	0	0	0	0	73	60	54	14
4/27/2012 10:04	26	25	22	17	0	0	0	0	64	60	54	11
4/27/2012 10:05	26	25	22	17	0	0	0	0	71	60	54	13
4/27/2012 10:06	26	25	22	17	0	0	0	0	71	60	54	14
4/27/2012 10:07	26	25	22	17	0	0	0	0	73	60	54	14
4/27/2012 10:08	26	25	22	17	0	0	0	0	73	60	54	14
4/27/2012 10:09	26	25	22	17	0	0	0	0	70	60	54	12
4/27/2012 10:10	26	25	22	17	0	0	0	0	69	60	54	12
4/27/2012 10:11	26	25	22	17	0	0	0	0	69	60	54	12
4/27/2012 10:12	26	25	22	17	0	0	0	0	71	60	54	13
4/27/2012 10:13	26	25	22	17	0	0	0	0	71	60	54	13
4/27/2012 10:14	26	25	22	17	0	0	0	0	74	60	54	14
4/27/2012 10:15	26	25	22	17	0	0	0	0	71	60	54	13
4/27/2012 10:16	26	25	22	17	0	0	0	0	70	60	54	12
4/27/2012 10:17	26	26	22	17	0	0	0	0	75	60	54	14
4/27/2012 10:18	26	26	22	17	0	0	0	0	76	60	54	14
4/27/2012 10:19	26	26	22	17	0	0	0	0	75	60	54	14
4/27/2012 10:20	26	26	22	17	0	0	0	0	71	60	54	12
4/27/2012 10:21	26	26	22	17	0	0	0	0	74	60	54	13
4/27/2012 10:22	26	26	22	17	0	0	0	0	71	60	54	13
4/27/2012 10:23	26	26	22	17	0	0	0	0	72	60	54	13
4/27/2012 10:24	26	26	22	17	0	0	0	0	71	60	54	13
4/27/2012 10:25	26	26	22	17	0	0	0	0	74	60	54	14
4/27/2012 10:26	26	26	22	17	0	0	0	0	76	60	54	14

Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1	Arcs/min on TR2	Arcs/min on TR3	Primary current to Primary current to Primary current to Primary power to						
									TR1	TR2	TR3	TR1	TR2	TR3	TR1
kV	kV	kV							A	A	A	kW	kW	kW	kW
11E0032B	11E0033B	11E0034B	11XA0032A	11XA0033A	11XA0034A	11XA0032B	11XA0033B	11XA0034B	11I00067A	11I00068A	11I00069A	11J00067A	11J00068A	11J00069A	11J00068A
26	26	22	17	0	0	0	0	0	72	60	54	14	10	10	10
4/27/2012 10:27	4/27/2012 10:28	4/27/2012 10:28	17	0	0	0	0	0	74	60	54	14	10	10	10
4/27/2012 10:28	4/27/2012 10:29	4/27/2012 10:29	17	0	0	0	0	0	72	60	54	13	10	10	10
4/27/2012 10:29	4/27/2012 10:30	4/27/2012 10:30	17	0	0	0	0	0	74	60	54	13	10	10	10
4/27/2012 10:30	4/27/2012 10:31	4/27/2012 10:31	17	0	0	0	0	0	71	60	54	13	10	10	10
4/27/2012 10:31	4/27/2012 10:32	4/27/2012 10:32	17	0	0	0	0	0	68	60	54	12	10	10	10
4/27/2012 10:32	4/27/2012 10:33	4/27/2012 10:33	17	0	0	0	0	0	67	60	54	12	10	10	10
4/27/2012 10:33	4/27/2012 10:34	4/27/2012 10:34	17	0	0	0	0	0	69	60	54	12	10	10	10
4/27/2012 10:34	4/27/2012 10:35	4/27/2012 10:35	17	0	0	0	0	0	69	60	54	12	10	10	10
4/27/2012 10:35	4/27/2012 10:36	4/27/2012 10:36	17	0	0	0	0	0	68	60	54	12	10	10	10
4/27/2012 10:36	4/27/2012 10:37	4/27/2012 10:37	17	0	0	0	0	0	68	60	54	12	10	10	10
4/27/2012 10:37	4/27/2012 10:38	4/27/2012 10:38	17	0	0	0	0	0	70	60	54	12	10	10	10
4/27/2012 10:38	4/27/2012 10:39	4/27/2012 10:39	17	0	0	0	0	0	74	60	54	13	10	10	10
4/27/2012 10:39	4/27/2012 10:40	4/27/2012 10:40	17	0	0	0	0	0	70	60	54	12	10	10	10
4/27/2012 10:40	4/27/2012 10:41	4/27/2012 10:41	17	0	0	0	0	0	72	60	54	13	10	10	10
4/27/2012 10:41	4/27/2012 10:42	4/27/2012 10:42	17	0	0	0	0	0	73	60	54	14	10	10	10
4/27/2012 10:42	4/27/2012 10:43	4/27/2012 10:43	17	0	0	0	0	0	75	60	54	14	10	10	10
4/27/2012 10:43	4/27/2012 10:44	4/27/2012 10:44	17	0	0	0	0	0	75	60	54	14	10	10	10
4/27/2012 10:44	4/27/2012 10:45	4/27/2012 10:45	17	0	0	0	0	0	70	60	54	13	10	10	10
4/27/2012 10:45	4/27/2012 10:46	4/27/2012 10:46	17	0	0	0	0	0	74	60	54	14	10	10	10
4/27/2012 10:46	4/27/2012 10:47	4/27/2012 10:47	17	0	0	0	0	0	74	60	54	14	10	10	10
4/27/2012 10:47	4/27/2012 10:48	4/27/2012 10:48	17	0	0	0	0	0	75	60	54	14	10	10	10
4/27/2012 10:48	4/27/2012 10:49	4/27/2012 10:49	17	0	0	0	0	0	75	60	54	14	10	10	10
4/27/2012 10:49	4/27/2012 10:50	4/27/2012 10:50	17	0	0	0	0	0	71	60	54	14	10	10	10
4/27/2012 10:50	4/27/2012 10:51	4/27/2012 10:51	17	0	0	0	0	0	74	60	54	14	10	10	10
4/27/2012 10:51	4/27/2012 10:52	4/27/2012 10:52	17	0	0	0	0	0	74	60	54	14	10	10	10
4/27/2012 10:52	4/27/2012 10:53	4/27/2012 10:53	17	0	0	0	0	0	74	60	54	14	10	10	10
4/27/2012 10:53	4/27/2012 10:54	4/27/2012 10:54	17	0	0	0	0	0	71	60	54	14	10	10	10
4/27/2012 10:54	4/27/2012 10:55	4/27/2012 10:55	17	0	0	0	0	0	72	60	54	14	10	10	10
4/27/2012 10:55	4/27/2012 10:56	4/27/2012 10:56	17	0	0	0	0	0	74	60	55	14	10	10	10
4/27/2012 10:56	4/27/2012 10:57	4/27/2012 10:57	17	0	0	0	0	0	72	60	55	13	10	10	10
4/27/2012 10:57	4/27/2012 10:58	4/27/2012 10:58	17	0	0	0	0	0	74	60	55	14	10	10	10
4/27/2012 10:58	4/27/2012 10:59	4/27/2012 10:59	17	0	0	0	0	0	65	60	55	12	10	10	10
4/27/2012 10:59	4/27/2012 11:00	4/27/2012 11:00	17	0	0	0	0	0	70	60	55	13	10	10	10
4/27/2012 11:00	4/27/2012 11:01	4/27/2012 11:01	17	0	0	0	0	0	71	60	55	13	10	10	10
4/27/2012 11:01	4/27/2012 11:02	4/27/2012 11:02	17	0	0	0	0	0	74	60	55	13	10	10	10
4/27/2012 11:02	4/27/2012 11:03	4/27/2012 11:03	17	0	0	0	0	0	71	60	55	13	10	10	10
4/27/2012 11:03	4/27/2012 11:04	4/27/2012 11:04	17	0	0	0	0	0	70	60	55	13	10	10	10
4/27/2012 11:04	4/27/2012 11:05	4/27/2012 11:05	17	0	0	0	0	0	67	60	55	12	10	10	10
4/27/2012 11:05	4/27/2012 11:06	4/27/2012 11:06	17	0	0	0	0	0	73	60	55	13	10	10	10
4/27/2012 11:06	4/27/2012 11:07	4/27/2012 11:07	17	0	0	0	0	0	73	60	55	14	10	10	10
4/27/2012 11:07	4/27/2012 11:08	4/27/2012 11:08	17	0	0	0	0	0	69	60	55	13	10	10	10
4/27/2012 11:08	4/27/2012 11:09	4/27/2012 11:09	17	0	0	0	0	0	72	60	55	14	10	10	10
4/27/2012 11:09	4/27/2012 11:10	4/27/2012 11:10	17	0	0	0	0	0	71	60	55	14	10	10	10
4/27/2012 11:10															

	Secondary voltage to TR1 kV	Secondary voltage to TR2 kV	Secondary voltage to TR3 kV	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1	Arcs/min on TR2	Arcs/min on TR3	Primary current to					Primary power to	
										TR1 A	TR2 A	TR3 A	TR1 kW	TR2 kW		
4/27/2012 11:11	11E0032B	11E0033B	11E0034B	11XA0032A	11XA0033A	11XA0034A	11XA0032B	11XA0033B	11XA0034B	11I0067A	11I0068A	11I0069A	11J0067A	11J0068A		
	26	26	22	17	0	0	0	0	0	74	60	55	14	10		
4/27/2012 11:12	26	26	22	17	0	0	0	0	0	73	60	55	14	10		
4/27/2012 11:13	26	26	22	17	0	0	0	0	0	73	60	55	14	10		
4/27/2012 11:14	26	26	22	17	0	0	0	0	0	73	60	55	13	10		
4/27/2012 11:15	26	26	22	17	0	0	0	0	0	74	60	55	13	10		
4/27/2012 11:16	26	26	22	17	0	0	0	0	0	71	60	55	13	10		
4/27/2012 11:17	26	26	22	17	0	0	0	0	0	74	60	55	13	10		
4/27/2012 11:18	26	26	22	17	0	0	0	0	0	72	60	55	13	10		
4/27/2012 11:19	26	26	22	17	0	0	0	0	0	70	60	55	12	10		
4/27/2012 11:20	26	26	22	17	0	0	0	0	0	73	60	55	14	10		
4/27/2012 11:21	26	26	22	17	0	0	0	0	0	75	60	55	14	10		
4/27/2012 11:22	26	26	22	17	0	0	0	0	0	76	60	55	14	10		
4/27/2012 11:23	26	26	22	17	0	0	0	0	0	71	60	55	13	10		
4/27/2012 11:24	26	26	22	17	0	0	0	0	0	69	60	55	12	10		
4/27/2012 11:25	26	26	22	17	0	0	0	0	0	69	60	55	12	10		
4/27/2012 11:26	26	26	22	17	0	0	0	0	0	74	60	55	14	10		
4/27/2012 11:27	26	26	22	17	0	0	0	0	0	76	60	55	14	10		
4/27/2012 11:28	26	26	22	17	0	0	0	0	0	73	60	55	13	10		
4/27/2012 11:29	26	26	22	17	0	0	0	0	0	71	60	55	13	10		
4/27/2012 11:30	26	26	22	17	0	0	0	0	0	70	60	55	12	10		
4/27/2012 11:31	26	26	22	17	0	0	0	0	0	71	60	55	12	10		
4/27/2012 11:32	26	26	22	17	0	0	0	0	0	71	60	55	13	10		
4/27/2012 11:33	26	26	22	17	0	0	0	0	0	73	60	55	14	10		
4/27/2012 11:34	26	26	22	17	0	0	0	0	0	74	60	55	14	10		
4/27/2012 11:35	26	26	22	17	0	0	0	0	0	71	60	55	13	10		
4/27/2012 11:36	26	26	22	17	0	0	0	0	0	68	60	55	12	10		
4/27/2012 11:37	26	26	22	17	0	0	0	0	0	74	60	55	14	10		
4/27/2012 11:38	26	26	22	17	0	0	0	0	0	75	60	55	14	10		
4/27/2012 11:39	26	26	22	17	0	0	0	0	0	74	60	55	14	10		
4/27/2012 11:40	26	26	22	17	0	0	0	0	0	69	60	55	12	10		
4/27/2012 11:41	26	26	22	17	0	0	0	0	0	72	60	55	13	10		
4/27/2012 11:42	26	26	22	17	0	0	0	0	0	74	60	55	14	10		
4/27/2012 11:43	26	26	22	17	0	0	0	0	0	75	60	55	14	10		
4/27/2012 11:44	26	26	22	17	0	0	0	0	0	74	60	55	13	10		
4/27/2012 11:45	26	26	22	17	0	0	0	0	0	72	60	55	13	10		
4/27/2012 11:46	26	26	22	17	0	0	0	0	0	70	60	55	12	10		
4/27/2012 11:47	26	26	22	17	0	0	0	0	0	75	60	55	14	10		
4/27/2012 11:48	25	26	22	17	0	0	0	0	0	75	60	55	14	10		
4/27/2012 11:49	25	26	22	17	0	0	0	0	0	71	60	55	13	10		
4/27/2012 11:50	25	26	22	17	0	0	0	0	0	67	60	55	12	10		
4/27/2012 11:51	25	26	21	17	0	0	0	0	0	73	60	55	13	10		
4/27/2012 11:52	25	26	21	17	0	0	0	0	0	75	60	55	14	10		
4/27/2012 11:53	25	26	21	17	1	0	0	0	0	76	60	55	14	10		
4/27/2012 11:54	25	26	21	17	1	0	0	0	0	72	60	55	14	10		

	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1	Arcs/min on TR2	Arcs/min on TR3	Primary current to				Primary power to			
										TR1	TR2	TR3	A	TR1	TR2	TR3	kW
	11E0032B	11E0033B	11E0034B	11XA0032A	11XA0033A	11XA0034A	11XA0032B	11XA0033B	11XA0034B	11I0067A	11I0068A	11I0069A	11J0067A	11J0068A	11J0069A		
4/27/2012 11:55	25	26	21	17	1	0	0	0	0	73	60	55	14	10			
4/27/2012 11:56	25	26	21	17	1	0	0	0	0	75	60	55	14	10			
4/27/2012 11:57	25	26	21	17	1	0	0	0	0	70	60	55	12	10			
4/27/2012 11:58	25	26	21	17	1	0	0	0	0	69	60	55	12	10			
4/27/2012 11:59	25	26	21	17	1	0	0	0	0	71	60	55	13	10			
4/27/2012 12:00	25	26	21	17	1	0	0	0	0	72	60	55	13	10			
4/27/2012 12:01	25	26	21	17	1	0	0	0	0	75	60	55	14	10			
4/27/2012 12:02	25	26	21	17	1	0	0	0	0	75	60	55	14	10			
4/27/2012 12:03	25	26	21	17	1	0	0	0	0	71	60	55	14	10			
4/27/2012 12:04	25	26	21	17	1	0	0	0	0	72	60	55	13	10			
4/27/2012 12:05	25	26	21	17	1	1	0	0	0	72	60	55	13	10			
4/27/2012 12:06	25	26	21	17	1	1	0	0	0	70	60	55	12	10			
4/27/2012 12:07	25	26	21	17	1	1	0	0	0	69	60	55	12	10			
4/27/2012 12:08	25	26	21	17	1	1	0	0	0	70	60	55	12	10			
4/27/2012 12:09	25	26	21	17	1	1	0	0	0	69	60	55	12	10			
4/27/2012 12:10	25	26	21	17	1	1	0	0	0	70	60	55	11	10			
4/27/2012 12:11	25	26	21	17	1	1	0	0	0	70	60	55	11	10			
4/27/2012 12:12	25	26	21	17	1	1	0	0	0	65	60	55	11	10			
4/27/2012 12:13	25	26	21	17	1	1	0	0	0	70	60	55	13	10			
4/27/2012 12:14	25	26	21	17	1	1	0	0	0	72	60	55	14	10			
4/27/2012 12:15	25	26	21	17	1	1	0	0	0	71	60	55	13	10			
4/27/2012 12:16	25	26	21	17	1	1	0	0	0	70	60	55	13	10			
4/27/2012 12:17	25	26	21	17	1	1	0	0	0	66	60	55	11	10			
4/27/2012 12:18	25	26	21	17	1	1	0	0	0	66	60	55	11	10			
4/27/2012 12:19	25	26	21	17	1	1	0	0	0	73	60	55	14	10			
4/27/2012 12:20	25	26	21	17	1	1	0	0	0	74	60	55	14	10			
4/27/2012 12:21	25	26	21	17	1	1	0	0	0	75	60	55	14	10			
4/27/2012 12:22	25	26	21	17	1	1	0	0	0	73	60	55	14	10			
4/27/2012 12:23	25	26	21	17	1	1	0	0	0	73	60	55	14	10			
4/27/2012 12:24	25	26	21	17	1	1	0	0	0	70	60	55	13	10			
4/27/2012 12:25	25	26	21	17	1	1	0	0	0	71	60	55	13	10			
4/27/2012 12:26	25	26	21	17	1	1	0	0	0	64	60	55	11	10			
4/27/2012 12:27	25	26	21	17	1	1	0	0	0	68	60	55	12	10			
4/27/2012 12:28	25	26	21	17	1	1	0	0	0	69	60	55	13	10			
4/27/2012 12:29	25	26	21	17	1	1	0	0	0	70	60	55	13	10			
4/27/2012 12:30	25	26	21	17	1	1	0	0	0	70	60	55	13	10			
4/27/2012 12:31	25	26	21	17	1	1	0	0	0	69	60	55	13	10			
4/27/2012 12:32	25	26	21	17	1	1	0	0	0	72	60	55	13	10			
4/27/2012 12:33	25	26	21	17	1	1	0	0	0	70	60	55	13	10			
4/27/2012 12:34	25	26	21	17	1	1	0	0	0	70	60	55	13	10			
4/27/2012 12:35	25	26	21	17	1	1	0	0	0	74	60	55	13	10			
4/27/2012 12:36	25	26	21	17	1	1	0	0	0	71	60	55	13	10			
4/27/2012 12:37	25	26	21	17	1	1	0	0	0	64	60	55	11	10			
4/27/2012 12:38	25	26	21	17	1	1	0	0	0	72	60	55	13	10			

Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1	Arcs/min on TR2	Arcs/min on TR3	Primary current to Primary current to Primary current to TR1 TR2 TR3	TR1 A	TR2 A	TR3 A	TR1 kW	TR2 kW	Primary power to TR2
11E0032B	11E0033B	11E0034B	11XA0032A	11XA0033A	11XA0034A	11XA0032B	11XA0033B	11XA0034B	11I0068A	11I0067A	11I0068A	11I0069A	11J0067A	11J0068A	
4/27/2012 13:23	25	21	17	1	1	0	0	0	71	60	55	55	13	10	
4/27/2012 13:24	25	21	17	1	1	0	0	0	71	60	55	55	12	10	
4/27/2012 13:25	25	21	17	1	1	0	0	0	68	60	55	55	12	10	
4/27/2012 13:26	25	21	17	1	1	0	0	0	71	60	55	55	13	10	
4/27/2012 13:27	25	21	17	1	1	0	0	0	71	60	55	55	13	10	
4/27/2012 13:28	25	21	17	1	1	0	0	0	69	60	55	55	12	10	
4/27/2012 13:29	25	21	17	1	1	0	0	0	68	60	55	55	12	10	
4/27/2012 13:30	25	21	17	1	1	0	0	0	69	60	55	55	12	10	
4/27/2012 13:31	25	21	17	1	1	0	0	0	69	60	55	55	13	10	
4/27/2012 13:32	25	21	17	1	1	0	0	0	65	60	55	55	13	10	
4/27/2012 13:33	25	21	17	1	1	0	0	0	69	60	55	55	13	10	
4/27/2012 13:34	25	21	17	1	1	0	0	0	74	60	55	55	14	10	
4/27/2012 13:35	25	21	17	1	1	0	0	0	73	60	55	55	13	10	
4/27/2012 13:36	25	21	17	1	1	0	0	0	69	60	55	55	12	10	
4/27/2012 13:37	25	21	17	1	1	0	0	0	73	60	55	55	14	10	
4/27/2012 13:38	25	21	17	1	1	0	0	0	73	60	55	55	14	10	
4/27/2012 13:39	25	21	17	1	1	0	0	0	74	60	55	55	14	10	
4/27/2012 13:40	25	21	17	1	1	0	0	0	73	60	55	55	14	10	
4/27/2012 13:41	25	21	17	1	1	0	0	0	71	60	55	55	14	10	
4/27/2012 13:42	25	21	17	1	1	0	0	0	72	60	55	55	14	10	
4/27/2012 13:43	25	21	17	1	1	0	0	0	73	60	55	55	14	10	
4/27/2012 13:44	25	21	17	1	1	0	0	0	75	60	55	55	14	10	
4/27/2012 13:45	25	21	17	1	1	0	0	0	74	60	55	55	14	10	
4/27/2012 13:46	25	21	17	1	1	0	0	0	75	60	55	55	14	10	
4/27/2012 13:47	25	21	17	1	1	0	0	0	75	60	55	55	14	10	
4/27/2012 13:48	25	21	17	1	1	0	0	0	68	60	55	55	12	10	
4/27/2012 13:49	25	21	17	1	1	0	0	0	64	60	55	55	12	10	
4/27/2012 13:50	25	21	17	1	1	0	0	0	68	60	55	55	12	10	
4/27/2012 13:51	25	21	17	1	1	0	0	0	69	60	55	55	12	10	
4/27/2012 13:52	25	21	17	1	1	0	0	0	69	60	55	55	12	10	
4/27/2012 13:53	25	21	17	1	1	0	0	0	68	60	55	55	13	10	
4/27/2012 13:54	25	21	17	1	1	0	0	0	68	60	55	55	13	10	
4/27/2012 13:55	25	21	17	1	1	0	0	0	68	60	55	55	13	10	
4/27/2012 13:56	25	21	17	1	1	0	0	0	71	60	55	55	13	10	
4/27/2012 13:57	25	21	17	1	1	0	0	0	73	60	55	55	14	10	
4/27/2012 13:58	25	21	17	1	1	0	0	0	75	60	55	55	14	10	
4/27/2012 13:59	25	21	17	1	1	0	0	0	74	60	55	55	14	10	
4/27/2012 14:00	25	21	17	1	1	0	0	0	73	60	55	55	14	10	

Primary power to TR3	Secondary current to TR1	Secondary current to TR2	Secondary current to TR3	Primary voltage to TR1	Primary voltage to TR2	Primary voltage to TR3	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1
kW	mA	mA	mA	V	V	V	kV	kV	kV	11XA0067A	11XA0068A	11XA0069A	11XA0067B
11JU069A	11JU067B	11JU068B	11JU069B	11E0067A	11E0068A	11E0069A	11E0067B	11E0068B	11E0069B				
9	316	250	249	237	222	214	28	24	19	12	0	0	0
4/27/2012 8:15													
9	311	250	249	235	222	214	28	24	19	7	0	0	0
4/27/2012 8:16													
9	316	250	249	236	222	214	28	24	19	9	0	0	0
4/27/2012 8:17													
9	341	250	249	242	222	214	28	24	19	12	0	0	0
4/27/2012 8:18													
9	323	250	249	237	222	214	28	24	19	14	0	0	0
4/27/2012 8:19													
9	315	250	249	235	222	214	28	24	19	15	0	0	0
4/27/2012 8:20													
9	338	250	249	241	222	214	28	24	19	16	0	0	0
4/27/2012 8:21													
9	323	250	249	237	222	214	28	24	19	16	0	0	0
4/27/2012 8:22													
9	323	250	249	239	222	214	28	24	19	16	0	0	0
4/27/2012 8:23													
9	314	250	249	236	222	214	28	24	19	16	0	0	0
4/27/2012 8:24													
9	303	250	249	234	222	214	28	24	19	17	0	0	0
4/27/2012 8:25													
9	327	250	249	239	222	214	28	24	19	17	0	0	0
4/27/2012 8:26													
9	337	250	249	240	222	214	28	24	19	17	0	0	0
4/27/2012 8:27													
9	328	250	249	239	222	214	28	24	19	17	0	0	0
4/27/2012 8:28													
9	323	250	249	237	222	214	28	24	19	17	0	0	0
4/27/2012 8:29													
9	302	250	249	231	222	214	28	24	19	17	0	0	0
4/27/2012 8:30													
9	312	250	249	234	222	214	28	24	19	18	0	0	0
4/27/2012 8:31													
9	289	250	249	226	222	214	28	24	19	18	0	0	0
4/27/2012 8:32													
9	246	250	249	213	222	214	28	24	19	18	0	0	0
4/27/2012 8:33													
9	279	250	249	226	222	214	28	24	19	16	0	0	0
4/27/2012 8:34													
9	290	250	249	228	222	214	28	24	19	15	0	0	0
4/27/2012 8:35													
9	304	250	249	232	222	214	28	24	19	15	0	0	0
4/27/2012 8:36													
9	322	250	249	237	222	214	28	24	19	15	0	0	0
4/27/2012 8:37													
9	300	250	249	231	222	214	28	24	19	15	0	0	0
4/27/2012 8:38													
9	285	250	249	228	222	214	28	24	19	16	0	0	0
4/27/2012 8:39													
9	311	250	249	233	222	214	28	24	19	16	0	0	0
4/27/2012 8:40													
9	306	250	249	231	222	214	28	24	19	16	0	0	0
4/27/2012 8:41													
9	312	250	249	233	222	214	28	24	19	16	0	0	0
4/27/2012 8:42													
9	320	250	249	238	222	214	28	24	19	16	0	0	0
4/27/2012 8:43													
9	306	250	249	234	222	214	28	24	19	16	0	0	0
4/27/2012 8:44													
9	296	250	249	229	222	214	28	24	19	16	0	0	0
4/27/2012 8:45													
9	304	250	249	230	222	214	28	24	19	16	0	0	0
4/27/2012 8:46													
9	329	250	249	239	222	214	28	24	19	16	0	0	0
4/27/2012 8:47													
9	314	250	249	235	222	214	28	24	19	17	0	0	0
4/27/2012 8:48													
9	331	250	249	240	222	214	28	24	19	17	0	0	0
4/27/2012 8:49													
9	314	250	249	234	222	214	28	24	19	17	0	0	0
4/27/2012 8:50													
9	313	250	249	235	222	214	28	24	19	17	0	0	0
4/27/2012 8:51													
9	325	250	249	238	222	214	28	24	19	17	0	0	0
4/27/2012 8:52													
9	305	250	249	233	222	214	28	24	19	17	0	0	0
4/27/2012 8:53													
9	309	250	249	233	222	214	28	24	19	17	0	0	0
4/27/2012 8:54													
9	321	250	249	236	222	214	28	24	19	17	0	0	0
4/27/2012 8:55													
9	318	250	249	235	222	214	28	24	19	18	0	0	0
4/27/2012 8:56													
9	303	250	249	233	222	214	28	24	19	18	0	0	0
4/27/2012 8:57													
9	304	250	249	232	222	214	28	24	19	18	0	0	0
4/27/2012 8:58													

Primary power to TR3	Primary power to TR3	Secondary current to TR1	Secondary current to TR2	Secondary current to TR3	Primary voltage to Primary voltage to TR1	Primary voltage to Primary voltage to TR2	Primary voltage to Primary voltage to TR3	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1
kW	kW	mA	mA	mA	V	V	V	kV	kV	kV	11XA0067A	11XA0068A	11XA0069A	11XA0067B
11J0069A	11J0069A	11I0067B	11I0068B	11I0069B	11E0067A	11E0068A	11E0069A	11E0067B	11E0068B	11E0069B	11XA0067A	11XA0068A	11XA0069A	11XA0067B
9	9	303	250	249	232	222	214	28	24	19	18	0	0	0
4/27/2012 8:59	4/27/2012 8:59													
9	9	237	250	249	209	222	214	28	24	19	18	0	0	0
4/27/2012 9:00	4/27/2012 9:00													
9	9	234	250	249	209	222	214	28	24	19	18	0	0	0
4/27/2012 9:01	4/27/2012 9:01													
9	9	296	250	249	229	222	214	28	24	19	18	0	0	0
4/27/2012 9:02	4/27/2012 9:02													
9	9	325	250	249	238	222	214	28	24	19	18	0	0	0
4/27/2012 9:03	4/27/2012 9:03													
9	9	315	250	249	234	222	214	28	24	19	18	0	0	0
4/27/2012 9:04	4/27/2012 9:04													
9	9	321	250	249	236	222	214	28	24	19	18	0	0	0
4/27/2012 9:05	4/27/2012 9:05													
9	9	333	250	249	239	222	214	28	24	19	18	0	0	0
4/27/2012 9:06	4/27/2012 9:06													
9	9	333	250	249	239	222	214	28	24	19	18	0	0	0
4/27/2012 9:07	4/27/2012 9:07													
9	9	323	250	249	237	222	214	28	24	19	18	0	0	0
4/27/2012 9:08	4/27/2012 9:08													
9	9	312	250	249	236	222	214	28	24	19	18	0	0	0
4/27/2012 9:09	4/27/2012 9:09													
9	9	338	250	249	242	222	214	28	24	19	18	0	0	0
4/27/2012 9:10	4/27/2012 9:10													
9	9	335	250	249	241	222	214	28	24	19	18	0	0	0
4/27/2012 9:11	4/27/2012 9:11													
9	9	312	250	249	234	222	214	28	24	19	17	0	0	0
4/27/2012 9:12	4/27/2012 9:12													
9	9	320	250	249	237	222	214	28	24	19	17	0	0	0
4/27/2012 9:13	4/27/2012 9:13													
9	9	315	250	249	235	222	214	28	24	19	17	0	0	0
4/27/2012 9:14	4/27/2012 9:14													
9	9	314	250	249	234	222	214	28	24	19	17	0	0	0
4/27/2012 9:15	4/27/2012 9:15													
9	9	322	250	249	238	222	214	28	24	19	17	0	0	0
4/27/2012 9:16	4/27/2012 9:16													
9	9	313	250	249	234	222	214	28	24	19	17	0	0	0
4/27/2012 9:17	4/27/2012 9:17													
9	9	337	250	249	241	222	214	28	24	19	17	0	0	0
4/27/2012 9:18	4/27/2012 9:18													
9	9	313	250	249	236	222	214	28	24	19	17	0	0	0
4/27/2012 9:19	4/27/2012 9:19													
9	9	307	250	249	233	222	214	28	24	19	17	0	0	0
4/27/2012 9:20	4/27/2012 9:20													
9	9	308	250	249	235	222	214	28	24	19	17	0	0	0
4/27/2012 9:21	4/27/2012 9:21													
9	9	333	250	249	240	222	214	28	24	19	17	0	0	0
4/27/2012 9:22	4/27/2012 9:22													
9	9	307	250	249	232	222	214	28	24	19	17	0	0	0
4/27/2012 9:23	4/27/2012 9:23													
9	9	319	250	249	236	222	214	28	24	19	16	0	0	0
4/27/2012 9:24	4/27/2012 9:24													
9	9	324	250	249	237	222	214	28	24	19	15	0	0	0
4/27/2012 9:25	4/27/2012 9:25													
9	9	320	250	249	234	222	214	28	24	19	15	0	0	0
4/27/2012 9:26	4/27/2012 9:26													
9	9	342	250	249	242	222	214	28	24	19	15	0	0	0
4/27/2012 9:27	4/27/2012 9:27													
9	9	338	250	249	241	222	214	28	24	19	15	0	0	0
4/27/2012 9:28	4/27/2012 9:28													
9	9	335	250	249	240	222	214	28	24	19	14	0	0	0
4/27/2012 9:29	4/27/2012 9:29													
9	9	322	250	249	236	222	214	28	24	19	14	0	0	0
4/27/2012 9:30	4/27/2012 9:30													
9	9	322	250	249	237	222	214	28	24	19	14	0	0	0
4/27/2012 9:31	4/27/2012 9:31													
9	9	330	250	249	239	222	214	28	24	19	14	0	0	0
4/27/2012 9:32	4/27/2012 9:32													
9	9	314	250	249	235	222	214	28	24	19	16	0	0	0
4/27/2012 9:33	4/27/2012 9:33													
9	9	325	250	249	238	222	214	28	24	19	17	0	0	0
4/27/2012 9:34	4/27/2012 9:34													
9	9	283	250	249	225	222	214	28	24	19	16	0	0	0
4/27/2012 9:35	4/27/2012 9:35													
9	9	297	250	249	230	222	214	28	24	19	15	0	0	0
4/27/2012 9:36	4/27/2012 9:36													
9	9	327	250	249	237	222	214	28	24	19	15	0	0	0
4/27/2012 9:37	4/27/2012 9:37													
9	9	328	250	249	240	222	214	28	24	19	14	0	0	0
4/27/2012 9:38	4/27/2012 9:38													
9	9	302	250	249	233	222	214	28	24	19	15	0	0	0
4/27/2012 9:39	4/27/2012 9:39													
9	9	290	250	249	227	222	214	28	24	19	17	0	0	0
4/27/2012 9:40	4/27/2012 9:40													
9	9	316	250	249	235	222	213	28	24	19	17	0	0	0
4/27/2012 9:41	4/27/2012 9:41													
9	9	306	250	249	232	222	213	28	24	19	17	0	0	0
4/27/2012 9:42	4/27/2012 9:42													

Primary power to TR3	kW	Secondary current to TR1	mA	Secondary current to TR2	mA	Secondary current to TR3	Primary voltage to Primary voltage to				Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1
							TR1	TR2	TR3	V	kV	kV	kV				
11J0069A	11I0067B	11I0068B	11I0069B	11E0067A	11E0068A	11E0069A	11E0067B	11E0068B	11E0069B	11XA0067A	11XA0068A	11XA0069A	11XA0067B				
4/27/2012 9:43	9	278	250	249	223	222	213	28	24	19	17	0	0				
4/27/2012 9:44	9	303	250	249	231	222	213	28	24	19	16	0	0				
4/27/2012 9:45	9	323	250	249	237	222	213	28	24	19	16	0	0				
4/27/2012 9:46	9	317	250	249	235	222	213	28	24	19	16	0	0				
4/27/2012 9:47	9	339	250	249	241	222	213	28	24	19	15	0	0				
4/27/2012 9:48	9	321	250	249	236	222	213	28	24	19	15	0	0				
4/27/2012 9:49	9	308	250	249	234	222	213	28	24	19	15	0	0				
4/27/2012 9:50	9	317	250	249	235	222	213	28	24	19	14	0	0				
4/27/2012 9:51	9	330	250	249	239	222	213	28	24	19	14	0	0				
4/27/2012 9:52	9	332	250	249	239	222	213	28	24	19	13	0	0				
4/27/2012 9:53	9	310	250	249	234	222	213	28	24	19	13	0	0				
4/27/2012 9:54	9	315	250	249	235	222	213	28	24	19	13	0	0				
4/27/2012 9:55	9	341	250	249	242	222	213	28	24	19	12	0	0				
4/27/2012 9:56	9	323	250	249	239	222	213	28	24	19	12	0	0				
4/27/2012 9:57	9	303	250	249	232	222	213	28	24	19	15	0	0				
4/27/2012 9:58	9	309	250	249	233	222	213	28	24	19	13	0	0				
4/27/2012 9:59	9	315	250	249	235	222	213	28	24	19	13	0	0				
4/27/2012 10:00	9	296	250	249	229	222	213	28	24	19	14	0	0				
4/27/2012 10:01	9	309	250	249	232	222	213	28	24	19	16	0	0				
4/27/2012 10:02	9	325	250	249	236	222	213	28	24	19	16	0	0				
4/27/2012 10:03	9	334	250	249	240	222	213	28	24	19	16	0	0				
4/27/2012 10:04	9	285	250	249	225	222	213	28	24	19	15	0	0				
4/27/2012 10:05	9	326	250	249	237	222	213	28	24	19	15	0	0				
4/27/2012 10:06	9	326	250	249	237	222	213	28	24	19	12	0	0				
4/27/2012 10:07	9	336	250	249	241	222	213	28	24	19	15	0	0				
4/27/2012 10:08	9	336	250	249	241	222	213	28	24	19	14	0	0				
4/27/2012 10:09	9	316	250	249	236	222	213	28	24	19	13	0	0				
4/27/2012 10:10	9	311	250	249	235	222	213	28	24	19	13	0	0				
4/27/2012 10:11	9	313	250	249	235	222	213	28	24	19	13	0	0				
4/27/2012 10:12	9	325	250	249	238	222	213	28	24	19	14	0	0				
4/27/2012 10:13	9	323	250	249	237	222	213	28	24	19	14	0	0				
4/27/2012 10:14	9	341	250	249	242	222	213	28	24	19	11	0	0				
4/27/2012 10:15	9	330	250	249	239	222	213	28	24	19	12	0	0				
4/27/2012 10:16	9	318	250	249	235	222	213	28	24	19	10	0	0				
4/27/2012 10:17	9	343	250	249	243	222	213	28	24	19	12	0	0				
4/27/2012 10:18	9	349	250	249	245	222	213	28	24	19	7	0	0				
4/27/2012 10:19	9	347	250	249	243	222	213	28	24	19	13	0	0				
4/27/2012 10:20	9	322	250	249	236	222	213	28	24	19	14	0	0				
4/27/2012 10:21	9	341	250	249	242	222	213	28	24	19	14	0	0				
4/27/2012 10:22	9	328	250	249	238	222	213	28	24	19	14	0	0				
4/27/2012 10:23	9	335	250	249	240	222	213	28	24	19	14	0	0				
4/27/2012 10:24	9	320	250	249	238	222	213	28	24	19	10	0	0				
4/27/2012 10:25	9	341	250	249	243	222	213	28	24	19	11	0	0				
4/27/2012 10:26	9	348	250	249	244	222	213	28	24	19	13	0	0				

Primary power to TR3	Primary power to TR3	Secondary current to TR1	Secondary current to TR2	Secondary current to TR3	Primary voltage to Primary voltage to TR1	Primary voltage to Primary voltage to TR2	Primary voltage to Primary voltage to TR3	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	ArCs/min on TR1
11J0069A	11I0067B	11I0068B	11I0068B	11I0069B	11E0067A	11E0068A	11E0069A	11E0067B	11E0068B	11E0069B	11XA0067A	11XA0068A	11XA0069A	11XA0067B
4/27/2012 10:27	9	329	250	249	238	222	213	28	24	19	11	0	0	0
4/27/2012 10:28	9	343	250	249	243	222	213	28	24	19	9	0	0	0
4/27/2012 10:29	9	332	250	249	240	222	213	28	24	19	11	0	0	0
4/27/2012 10:30	9	343	250	249	243	222	213	28	24	19	8	0	0	0
4/27/2012 10:31	9	322	250	249	239	222	213	28	24	19	9	0	0	0
4/27/2012 10:32	9	307	250	249	234	222	213	28	24	19	10	0	0	0
4/27/2012 10:33	9	305	250	249	231	222	213	28	24	19	11	0	0	0
4/27/2012 10:34	9	317	250	249	235	222	213	28	24	19	9	0	0	0
4/27/2012 10:35	9	311	250	249	235	222	213	28	24	19	12	0	0	0
4/27/2012 10:36	9	310	250	249	234	222	213	28	24	19	13	0	0	0
4/27/2012 10:37	9	314	250	249	234	222	213	28	24	19	12	0	0	0
4/27/2012 10:38	9	317	250	249	236	222	213	28	24	19	9	0	0	0
4/27/2012 10:39	9	341	250	249	243	222	213	28	24	19	10	0	0	0
4/27/2012 10:40	9	324	250	249	236	222	213	28	24	19	9	0	0	0
4/27/2012 10:41	9	333	250	249	239	222	213	28	24	19	7	0	0	0
4/27/2012 10:42	9	338	250	249	240	222	213	28	24	19	9	0	0	0
4/27/2012 10:43	9	346	250	249	244	222	213	28	24	19	13	0	0	0
4/27/2012 10:44	9	348	250	249	245	222	213	28	24	19	14	0	0	0
4/27/2012 10:45	9	320	250	249	237	222	213	28	24	19	15	0	0	0
4/27/2012 10:46	9	340	250	249	243	222	213	28	24	19	15	0	0	0
4/27/2012 10:47	9	342	250	249	245	222	213	28	24	19	13	0	0	0
4/27/2012 10:48	9	348	250	249	245	222	213	28	24	19	11	0	0	0
4/27/2012 10:49	9	350	250	249	244	222	213	28	24	19	9	0	0	0
4/27/2012 10:50	9	348	250	249	243	222	213	28	24	19	10	0	0	0
4/27/2012 10:51	9	334	250	249	239	222	213	28	24	19	11	0	0	0
4/27/2012 10:52	9	343	250	249	242	222	213	28	24	19	12	0	0	0
4/27/2012 10:53	9	339	250	249	242	222	213	28	24	19	12	0	0	0
4/27/2012 10:54	9	320	250	249	238	222	213	28	24	19	12	0	0	0
4/27/2012 10:55	9	330	250	249	240	222	213	28	24	19	12	0	0	0
4/27/2012 10:56	9	345	250	250	244	222	213	28	24	19	9	0	0	0
4/27/2012 10:57	9	334	250	250	241	222	213	28	24	19	12	0	0	0
4/27/2012 10:58	9	341	250	250	242	222	213	28	24	19	10	0	0	0
4/27/2012 10:59	9	295	250	250	228	222	213	28	24	19	13	0	0	0
4/27/2012 11:00	9	316	250	250	236	222	213	28	24	19	12	0	0	0
4/27/2012 11:01	9	327	250	250	239	222	213	28	24	19	10	0	0	0
4/27/2012 11:02	9	341	250	250	242	222	213	28	24	19	12	0	0	0
4/27/2012 11:03	9	322	250	250	237	222	213	28	24	19	13	0	0	0
4/27/2012 11:04	9	323	250	250	236	222	213	28	24	19	12	0	0	0
4/27/2012 11:05	9	303	250	250	231	222	213	28	24	19	13	0	0	0
4/27/2012 11:06	9	336	250	250	240	222	213	28	24	19	14	0	0	0
4/27/2012 11:07	9	339	250	250	241	222	213	28	24	19	12	0	0	0
4/27/2012 11:08	9	319	250	250	235	222	213	28	24	19	11	0	0	0
4/27/2012 11:09	9	333	250	250	238	222	213	28	24	19	12	0	0	0
4/27/2012 11:10	9	326	250	250	237	222	213	28	24	19	10	0	0	0

Primary power to TR3	Primary power to TR3	Secondary current to TR1	Secondary current to TR2	Secondary current to TR3	Primary voltage to Primary voltage to TR1	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1
kW	kW	mA	mA	mA	V	kV	kV	kV	11XA0067A	11XA0068A	11XA0069A	11XA0067B
11J0069A	11J0069A	11I0067B	11I0068B	11I0069B	11E0067A	11E0067B	11E0068B	11E0069B				
9	9	337	250	250	241	28	24	19	13	0	0	0
4/27/2012 11:11					222	213	24	19	12	0	0	0
4/27/2012 11:12	9	336	250	250	240	28	24	19	12	0	0	0
4/27/2012 11:13	9	338	250	250	241	28	24	19	12	0	0	0
4/27/2012 11:14	9	336	250	250	239	28	24	19	9	0	0	0
4/27/2012 11:15	9	344	250	250	242	28	24	19	10	0	0	0
4/27/2012 11:16	9	328	250	250	238	28	24	19	13	0	0	0
4/27/2012 11:17	9	342	250	250	242	28	24	19	12	0	0	0
4/27/2012 11:18	9	331	250	250	238	28	24	19	10	0	0	0
4/27/2012 11:19	9	319	250	250	237	28	24	19	10	0	0	0
4/27/2012 11:20	9	337	250	250	240	28	24	19	10	0	0	0
4/27/2012 11:21	9	348	250	250	243	28	24	19	11	0	0	0
4/27/2012 11:22	9	349	250	250	244	28	24	19	12	0	0	0
4/27/2012 11:23	9	324	250	250	238	28	24	19	12	0	0	0
4/27/2012 11:24	9	318	250	250	235	28	24	19	13	0	0	0
4/27/2012 11:25	9	314	250	250	235	28	24	19	14	0	0	0
4/27/2012 11:26	9	341	250	250	242	28	24	19	13	0	0	0
4/27/2012 11:27	9	348	250	250	245	28	24	19	11	0	0	0
4/27/2012 11:28	9	332	250	250	242	28	24	19	10	0	0	0
4/27/2012 11:29	9	328	250	250	238	28	24	19	8	0	0	0
4/27/2012 11:30	9	314	250	250	235	28	24	19	10	0	0	0
4/27/2012 11:31	9	325	250	250	238	28	24	19	12	0	0	0
4/27/2012 11:32	9	323	250	250	237	28	24	19	13	0	0	0
4/27/2012 11:33	9	335	250	250	239	28	24	19	12	0	0	0
4/27/2012 11:34	9	342	250	250	242	28	24	19	12	0	0	0
4/27/2012 11:35	9	322	250	250	238	28	24	19	12	0	0	0
4/27/2012 11:36	9	304	250	250	232	28	24	19	11	0	0	0
4/27/2012 11:37	9	338	250	250	242	28	24	19	11	0	0	0
4/27/2012 11:38	9	346	250	250	244	28	24	19	13	0	0	0
4/27/2012 11:39	9	336	250	250	241	28	24	19	14	0	0	0
4/27/2012 11:40	9	315	250	250	235	28	24	19	14	0	0	0
4/27/2012 11:41	9	325	250	250	239	28	24	19	14	0	0	0
4/27/2012 11:42	9	338	250	250	241	28	24	19	10	0	0	0
4/27/2012 11:43	9	347	250	250	244	28	24	19	10	0	0	0
4/27/2012 11:44	9	342	250	250	242	28	24	19	12	0	0	0
4/27/2012 11:45	9	332	250	250	238	28	24	19	12	0	0	0
4/27/2012 11:46	9	319	250	250	235	28	24	19	11	0	0	0
4/27/2012 11:47	9	342	250	250	243	28	24	19	9	0	0	0
4/27/2012 11:48	9	347	250	250	245	28	24	19	8	0	0	0
4/27/2012 11:49	9	321	250	250	236	28	24	19	9	0	0	0
4/27/2012 11:50	9	307	250	250	231	28	24	19	11	0	0	0
4/27/2012 11:51	9	337	250	250	241	28	24	19	12	0	0	0
4/27/2012 11:52	9	350	250	250	245	28	24	19	7	0	0	0
4/27/2012 11:53	9	349	250	250	245	28	24	19	4	0	0	0
4/27/2012 11:54	9	334	250	250	240	28	24	19	7	0	0	0

Primary power to TR3	Secondary current to TR1	Secondary current to TR2	Secondary current to TR3	Primary voltage to TR1	Primary voltage to Primary voltage to TR2	Primary voltage to Primary voltage to TR3	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR3
11J0069A	11H0067B	11H0068B	11H0069B	11E0067A	11E0068A	11E0069A	11E0067B	11E0068B	11E0069B	11XA0067A	11XA0068A	11XA0069A	11XA0067B
9	338	250	250	240	222	213	28	24	19	7	0	0	0
9	346	250	250	243	222	213	28	24	19	9	0	0	0
9	323	250	250	236	222	213	28	24	19	10	0	0	0
9	315	250	250	236	222	213	28	24	19	10	0	0	0
9	330	250	250	238	222	213	28	24	19	10	0	0	0
9	328	250	250	239	222	213	28	24	19	14	0	0	0
9	343	250	250	243	222	213	28	24	19	12	0	0	0
9	339	250	250	242	222	213	28	24	19	13	0	0	0
9	324	250	250	237	222	213	28	24	19	15	0	0	0
9	331	250	250	239	222	213	28	24	19	15	0	0	0
9	330	250	250	240	222	213	28	24	19	14	0	0	0
9	314	250	250	236	222	213	28	24	19	12	0	0	0
9	314	250	250	237	222	213	28	24	19	12	0	0	0
9	324	250	250	238	222	213	28	24	19	14	0	0	0
9	312	250	250	234	222	213	28	24	19	15	0	0	0
9	320	250	250	234	222	213	28	24	19	14	0	0	0
9	321	250	250	235	222	213	28	24	19	14	0	0	0
9	285	250	250	227	222	213	28	24	19	14	0	0	0
9	315	250	250	235	222	213	28	24	19	13	0	0	0
9	332	250	250	239	222	213	28	24	19	13	0	0	0
9	322	250	250	236	222	213	28	24	19	12	0	0	0
9	324	250	250	237	222	213	28	24	19	11	0	0	0
9	301	250	250	230	222	213	28	24	19	14	0	0	0
9	295	250	250	229	222	213	28	24	19	15	0	0	0
9	333	250	250	240	222	213	28	24	19	15	0	0	0
9	343	250	250	243	222	213	28	24	19	15	0	0	0
9	348	250	250	244	222	213	28	24	19	15	0	0	0
9	338	250	250	241	223	213	28	24	19	15	0	0	0
9	337	250	250	241	223	213	28	24	19	15	0	0	0
9	317	250	250	235	223	213	28	24	19	15	0	0	0
9	328	250	250	237	223	213	28	24	19	15	0	0	0
9	291	250	250	226	223	213	28	24	19	15	0	0	0
9	306	250	250	233	223	213	28	24	19	15	0	0	0
9	311	250	250	234	223	213	28	24	19	15	0	0	0
9	320	250	250	235	223	213	28	24	19	15	0	0	0
9	318	250	250	236	223	213	28	24	19	15	0	0	0
9	315	250	250	235	223	213	28	24	19	15	0	0	0
9	329	250	250	238	223	213	28	24	19	15	0	0	0
9	320	250	250	236	223	213	28	24	19	14	0	0	0
9	319	250	250	234	223	213	28	24	19	15	0	0	0
9	341	250	250	241	223	213	28	24	19	16	0	0	0
9	323	250	250	234	223	213	28	24	19	17	0	0	0
9	285	250	250	225	223	213	28	24	19	18	0	0	0
9	330	250	250	239	223	213	28	24	19	15	0	0	0

Primary power to TR3	Primary voltage to TR1	Secondary current to TR1	Secondary current to TR2	Secondary current to TR3	Primary voltage to Primary voltage to TR2	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1
kW	V	mA	mA	mA	V	kV	kV	kV				
11J0069A	11E0067A	11I0068B	11I0068B	11I0069B	11E0068A	11E0067B	11E0068B	11E0069B	11XA0067A	11XA0068A	11XA0069A	11XA0067B
9	232	250	250	250	223	28	24	19	15	0	0	0
4/27/2012 12:39		308	250	250	223	28	24	19	13	0	0	0
4/27/2012 12:40		291	250	250	223	28	24	19	12	0	0	0
4/27/2012 12:41		309	250	250	223	28	24	19	15	0	0	0
4/27/2012 12:42		312	250	250	223	28	24	19	13	0	0	0
4/27/2012 12:43		319	250	250	223	28	24	19	13	0	0	0
4/27/2012 12:44		339	250	250	223	28	24	19	13	0	0	0
4/27/2012 12:45		322	250	250	223	28	24	19	14	0	0	0
4/27/2012 12:46		298	250	250	223	28	24	19	15	0	0	0
4/27/2012 12:47		305	250	250	223	28	24	19	16	0	0	0
4/27/2012 12:48		324	250	250	223	28	24	19	14	0	0	0
4/27/2012 12:49		326	250	250	223	28	24	19	15	0	0	0
4/27/2012 12:50		326	250	250	223	28	24	19	15	0	0	0
4/27/2012 12:51		343	250	250	223	28	24	19	14	0	0	0
4/27/2012 12:52		340	250	250	223	28	24	19	13	0	0	0
4/27/2012 12:53		326	250	250	223	28	24	19	14	0	0	0
4/27/2012 12:54		313	250	250	223	28	24	19	16	0	0	0
4/27/2012 12:55		327	250	250	223	28	24	19	16	0	0	0
4/27/2012 12:56		320	250	250	223	28	24	19	16	0	0	0
4/27/2012 12:57		287	250	250	223	28	24	19	16	0	0	0
4/27/2012 12:58		321	250	250	223	28	24	19	16	0	0	0
4/27/2012 12:59		337	250	250	223	28	24	19	16	0	0	0
4/27/2012 13:00		322	250	250	223	28	24	19	16	0	0	0
4/27/2012 13:01		317	250	250	223	28	24	19	16	0	0	0
4/27/2012 13:02		332	250	250	223	28	24	19	15	0	0	0
4/27/2012 13:03		323	250	250	223	28	24	19	15	0	0	0
4/27/2012 13:04		332	250	250	223	28	24	19	15	0	0	0
4/27/2012 13:05		332	250	250	223	28	24	19	15	0	0	0
4/27/2012 13:06		342	250	250	223	28	24	19	15	0	0	0
4/27/2012 13:07		320	250	250	223	28	24	19	15	0	0	0
4/27/2012 13:08		314	250	250	223	28	24	19	15	0	0	0
4/27/2012 13:09		337	250	250	223	28	24	19	15	0	0	0
4/27/2012 13:10		321	250	250	223	28	24	19	11	0	0	0
4/27/2012 13:11		339	250	250	223	28	24	19	12	0	0	0
4/27/2012 13:12		312	250	250	223	28	24	19	14	0	0	0
4/27/2012 13:13		311	250	250	223	28	24	19	15	0	0	0
4/27/2012 13:14		313	250	250	223	28	24	19	16	0	0	0
4/27/2012 13:15		331	250	250	223	28	24	19	16	0	0	0
4/27/2012 13:16		329	250	250	223	28	24	19	14	0	0	0
4/27/2012 13:17		313	250	250	223	28	24	19	13	0	0	0
4/27/2012 13:18		319	250	250	223	28	24	19	14	0	0	0
4/27/2012 13:19		332	250	250	223	28	24	19	14	0	0	0
4/27/2012 13:20		344	250	250	223	28	24	19	14	0	0	0
4/27/2012 13:21		323	250	250	223	28	24	19	15	0	0	0
4/27/2012 13:22		337	250	250	223	28	24	19	12	0	0	0

Primary power to TR3	Primary voltage to Primary voltage to Primary voltage to TR3	Secondary current to TR1	Secondary current to TR2	Secondary current to TR3	Primary voltage to TR1	Primary voltage to TR2	Primary voltage to TR3	Secondary voltage to TR1	Secondary voltage to TR2	Secondary voltage to TR3	Sparks/min on TR1	Sparks/min on TR2	Sparks/min on TR3	Arcs/min on TR1
kW	V	mA	mA	mA	V	V	V	kV	kV	kV	11XA0067A	11XA0068A	11XA0069A	11XA0067B
11J0069A	11E0067A	11I0068B	11I0068B	11I0069B	11E0068A	11E0069A	11E0067B	11E0068B	11E0069B	11E0067B	11XA0067A	11XA0068A	11XA0069A	11XA0067B
9	237	250	250	250	223	212	28	24	19	19	15	0	0	0
4/27/2012 13:23														
9	236	250	250	250	223	212	28	24	19	19	16	0	0	0
4/27/2012 13:24														
9	232	250	250	250	223	212	28	24	19	19	16	0	0	0
4/27/2012 13:25														
9	237	250	250	250	223	212	28	24	19	19	16	0	0	0
4/27/2012 13:26														
9	237	250	250	250	223	212	28	24	19	19	16	0	0	0
4/27/2012 13:27														
9	234	250	250	250	223	212	28	24	19	19	16	0	0	0
4/27/2012 13:28														
9	234	250	250	250	223	212	28	24	19	19	16	0	0	0
4/27/2012 13:29														
9	235	250	250	250	223	212	28	24	19	19	16	0	0	0
4/27/2012 13:30														
9	235	250	250	250	223	212	28	24	19	19	16	0	0	0
4/27/2012 13:31														
9	227	250	250	250	223	212	28	24	19	19	15	0	0	0
4/27/2012 13:32														
9	233	250	250	250	223	212	28	24	19	19	15	0	0	0
4/27/2012 13:33														
9	242	250	250	250	223	212	28	24	19	19	15	0	0	0
4/27/2012 13:34														
9	240	250	250	250	223	212	28	24	19	19	15	0	0	0
4/27/2012 13:35														
9	235	250	250	250	223	212	28	24	19	19	15	0	0	0
4/27/2012 13:36														
9	241	250	250	250	223	212	28	24	19	19	15	0	0	0
4/27/2012 13:37														
9	240	250	250	250	223	212	28	24	19	19	15	0	0	0
4/27/2012 13:38														
9	244	250	250	250	223	212	28	24	19	19	15	0	0	0
4/27/2012 13:39														
9	241	250	250	250	223	212	28	24	19	19	13	0	0	0
4/27/2012 13:40														
9	237	250	250	250	223	212	28	24	19	19	14	0	0	0
4/27/2012 13:41														
9	239	250	250	250	223	212	28	24	19	19	15	0	0	0
4/27/2012 13:42														
9	240	250	250	250	223	212	28	24	19	19	16	0	0	0
4/27/2012 13:43														
9	243	250	250	250	223	212	28	24	19	19	15	0	0	0
4/27/2012 13:44														
9	242	250	250	250	223	212	28	24	19	19	15	0	0	0
4/27/2012 13:45														
9	245	250	250	250	223	212	28	24	19	19	15	0	0	0
4/27/2012 13:46														
9	244	250	250	250	223	212	28	24	19	19	14	0	0	0
4/27/2012 13:47														
9	235	250	250	250	223	212	28	24	19	19	13	0	0	0
4/27/2012 13:48														
9	228	250	250	250	223	212	28	24	19	19	13	0	0	0
4/27/2012 13:49														
9	234	250	250	250	223	212	28	24	19	19	16	0	0	0
4/27/2012 13:50														
9	236	250	250	250	223	212	28	24	19	19	12	0	0	0
4/27/2012 13:51														
9	234	250	250	250	223	212	28	24	19	19	13	0	0	0
4/27/2012 13:52														
9	233	250	250	250	223	212	28	24	19	19	13	0	0	0
4/27/2012 13:53														
9	233	250	250	250	223	212	28	24	19	19	14	0	0	0
4/27/2012 13:54														
9	233	250	250	250	223	212	28	24	19	19	15	0	0	0
4/27/2012 13:55														
9	239	250	250	250	223	212	28	24	19	19	15	0	0	0
4/27/2012 13:56														
9	242	250	250	250	223	212	28	24	19	19	15	0	0	0
4/27/2012 13:57														
9	244	250	250	250	223	212	28	24	19	19	15	0	0	0
4/27/2012 13:58														
9	244	250	250	250	223	212	28	24	19	19	15	0	0	0
4/27/2012 13:59														
9	242	250	250	250	223	212	28	24	19	19	15	0	0	0
4/27/2012 14:00														

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	Arccs/min on TR2	Arccs/min on TR3	Inst Opacity %	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	CORRECTED REGEN SO2 ppm	CORRECTED REGEN NOX ppm	CORRECTED REGEN CO ppm	FCC Feed Sulfur wt%	Wet Air rate to regen mscfd	Flue gas CO2 %
	11XA0068B	11XA0069B	11A0889	11T00520	11T00521	11T00522	11T00523	11T00524	11M0812	11M0813	11M0814	11CFLRLLD	11F0175	11A0815
4/27/2012 9:43	0	0	2.4	1250	1227	1242	1246	1249	5	29	103	0.061	82049	16.43
4/27/2012 9:44	0	0	2.3	1250	1227	1243	1246	1249	5	30	102	0.061	81944	16.49
4/27/2012 9:45	0	0	2.3	1249	1227	1243	1246	1249	4	29	100	0.061	81839	16.54
4/27/2012 9:46	0	0	2.2	1249	1227	1243	1246	1249	5	29	96	0.061	81755	16.53
4/27/2012 9:47	0	0	2.3	1249	1227	1243	1246	1250	5	28	95	0.061	82006	16.52
4/27/2012 9:48	0	0	2.2	1250	1227	1242	1247	1250	5	29	100	0.061	82373	16.51
4/27/2012 9:49	0	0	2.3	1250	1228	1243	1247	1251	4	30	108	0.061	82722	16.43
4/27/2012 9:50	0	0	2.4	1250	1229	1243	1248	1251	4	30	114	0.061	82778	16.42
4/27/2012 9:51	0	0	2.5	1250	1229	1244	1248	1251	4	29	114	0.061	82727	16.33
4/27/2012 9:52	0	0	2.4	1251	1228	1244	1247	1251	4	29	120	0.061	82676	16.29
4/27/2012 9:53	0	0	2.3	1252	1229	1243	1248	1252	6	30	120	0.061	82637	16.33
4/27/2012 9:54	0	0	2.2	1251	1229	1243	1248	1252	7	31	125	0.061	82859	16.38
4/27/2012 9:55	0	0	2.4	1251	1228	1242	1248	1252	8	32	136	0.061	82755	16.24
4/27/2012 9:56	0	0	2.5	1249	1227	1243	1247	1251	9	32	138	0.061	82883	16.24
4/27/2012 9:57	0	0	2.5	1250	1228	1242	1247	1251	9	31	132	0.061	82679	16.29
4/27/2012 9:58	0	0	2.3	1250	1228	1241	1247	1251	8	31	137	0.061	82538	16.26
4/27/2012 9:59	0	0	2.1	1249	1228	1242	1246	1250	7	31	134	0.061	82528	16.26
4/27/2012 10:00	0	0	2.2	1249	1229	1242	1246	1250	7	31	127	0.061	82166	16.35
4/27/2012 10:01	0	0	2.0	1249	1229	1242	1246	1250	6	31	121	0.061	82117	16.38
4/27/2012 10:02	0	0	2.1	1249	1229	1242	1246	1251	5	30	119	0.061	82336	16.30
4/27/2012 10:03	0	0	2.2	1249	1226	1242	1247	1251	5	30	123	0.061	82362	16.30
4/27/2012 10:04	0	0	2.4	1249	1228	1242	1247	1250	5	30	123	0.061	82282	16.29
4/27/2012 10:05	0	0	2.3	1250	1228	1243	1247	1250	4	30	133	0.061	82202	16.23
4/27/2012 10:06	0	0	2.2	1250	1228	1242	1246	1251	4	31	128	0.061	82123	16.32
4/27/2012 10:07	0	0	2.1	1250	1228	1242	1246	1251	4	30	128	0.061	82117	16.32
4/27/2012 10:08	0	0	2.1	1250	1228	1243	1246	1251	4	30	124	0.061	82152	16.32
4/27/2012 10:09	0	0	2.1	1249	1227	1243	1246	1250	4	30	130	0.061	82187	16.34
4/27/2012 10:10	0	0	2.1	1249	1226	1243	1246	1249	4	30	131	0.061	82223	16.27
4/27/2012 10:11	0	0	2.0	1248	1225	1242	1245	1249	4	30	135	0.061	82257	16.24
4/27/2012 10:12	0	0	1.9	1249	1225	1241	1245	1249	4	29	122	0.061	82220	16.38
4/27/2012 10:13	0	0	1.9	1250	1225	1241	1245	1249	4	29	106	0.061	82134	16.44
4/27/2012 10:14	0	0	1.9	1250	1226	1242	1246	1249	4	28	110	0.061	82048	16.40
4/27/2012 10:15	0	0	1.9	1250	1227	1242	1246	1249	3	28	111	0.061	81961	16.49
4/27/2012 10:16	0	0	1.9	1250	1228	1243	1246	1250	3	28	115	0.061	81926	16.42
4/27/2012 10:17	0	0	1.9	1250	1227	1242	1246	1250	4	29	121	0.061	81932	16.37
4/27/2012 10:18	0	0	1.9	1249	1227	1240	1246	1250	6	29	119	0.061	81897	16.42
4/27/2012 10:19	0	0	1.8	1250	1227	1241	1246	1250	8	29	110	0.061	81822	16.46
4/27/2012 10:20	0	0	1.7	1250	1226	1242	1246	1250	9	30	94	0.061	81883	16.51
4/27/2012 10:21	0	0	1.8	1250	1227	1243	1246	1250	9	29	99	0.061	82081	16.45
4/27/2012 10:22	0	0	1.9	1251	1227	1243	1247	1250	8	29	95	0.061	82278	16.43
4/27/2012 10:23	0	0	1.8	1251	1227	1243	1247	1251	8	29	103	0.061	82475	16.39
4/27/2012 10:24	0	0	1.7	1250	1227	1243	1248	1251	7	29	113	0.061	82672	16.42
4/27/2012 10:25	0	0	2.0	1250	1227	1243	1248	1251	6	29	113	0.061	82921	16.42
4/27/2012 10:26	0	0	2.0	1250	1228	1243	1247	1251	5	29	121	0.061	82766	16.39

	Arcs/min on TR2	Arcs/min on TR3	Inst Opacity	DENSE BED TEMP	DENSE BED TEMP	DENSE BED TEMP	DENSE BED TEMP	DENSE BED TEMP	DENSE BED TEMP	CORRECTED REGEN SO2	CORRECTED REGEN NOX	CORRECTED REGEN CO	FCC Feed Sulfur	Wei Air rate to regen	Flue gas CO2
	11XA0068B	11XA0069B	11A10889	degF	degF	degF	degF	degF	degF	ppm	ppm	ppm	wt%	mscf	%
4/27/2012 10:27	0	0	2.1	1249	1228	1242	1247	1251	11T0524	5	29	122	0.061	82421	16.38
4/27/2012 10:28	0	0	2.1	1251	1228	1242	1247	1252	11T0523	5	30	118	0.061	82347	16.34
4/27/2012 10:29	0	0	2.0	1251	1228	1243	1247	1251	11T0524	4	30	123	0.061	82299	16.34
4/27/2012 10:30	0	0	2.0	1251	1228	1243	1247	1252	11T0524	4	30	118	0.061	82518	16.37
4/27/2012 10:31	0	0	2.0	1251	1229	1244	1247	1252	11T0524	4	29	124	0.061	82569	16.39
4/27/2012 10:32	0	0	2.1	1250	1230	1244	1247	1252	11T0524	4	30	137	0.061	82696	16.30
4/27/2012 10:33	0	0	2.1	1250	1231	1242	1247	1251	11T0523	3	30	134	0.061	82500	16.26
4/27/2012 10:34	0	0	2.1	1250	1228	1241	1247	1251	11T0523	3	31	137	0.061	82301	16.22
4/27/2012 10:35	0	0	2.1	1250	1226	1241	1247	1251	11T0523	3	31	125	0.061	82392	16.23
4/27/2012 10:36	0	0	2.2	1250	1226	1241	1246	1251	11T0523	3	31	135	0.061	82581	16.22
4/27/2012 10:37	0	0	2.1	1248	1226	1241	1246	1250	11T0523	3	30	148	0.061	82159	16.21
4/27/2012 10:38	0	0	2.1	1248	1225	1240	1246	1250	11T0523	3	30	143	0.061	81954	16.25
4/27/2012 10:39	0	0	2.0	1248	1226	1241	1246	1249	11T0523	3	30	121	0.061	82117	16.33
4/27/2012 10:40	0	0	1.9	1248	1227	1242	1246	1250	11T0523	3	30	127	0.061	82193	16.32
4/27/2012 10:41	0	0	1.9	1248	1229	1241	1246	1250	11T0523	4	31	136	0.061	82101	16.29
4/27/2012 10:42	0	0	1.9	1249	1228	1241	1246	1249	11T0523	6	30	118	0.061	82004	16.33
4/27/2012 10:43	0	0	1.9	1250	1226	1242	1246	1249	11T0523	7	30	106	0.061	81908	16.41
4/27/2012 10:44	0	0	1.8	1250	1226	1243	1246	1250	11T0523	8	30	106	0.061	81950	16.44
4/27/2012 10:45	0	0	1.9	1249	1226	1242	1246	1250	11T0523	9	30	105	0.061	82139	16.45
4/27/2012 10:46	0	0	1.9	1249	1226	1242	1246	1250	11T0523	8	29	98	0.061	82055	16.47
4/27/2012 10:47	0	0	1.9	1250	1227	1242	1247	1251	11T0523	7	29	102	0.061	81981	16.51
4/27/2012 10:48	0	0	2.0	1250	1228	1243	1247	1251	11T0523	6	30	106	0.061	81949	16.41
4/27/2012 10:49	0	0	2.1	1250	1227	1243	1246	1251	11T0523	5	30	113	0.061	81841	16.39
4/27/2012 10:50	0	0	2.0	1250	1227	1243	1247	1251	11T0523	5	29	96	0.061	81660	16.50
4/27/2012 10:51	0	0	2.1	1250	1227	1244	1247	1251	11T0523	5	29	103	0.061	81760	16.48
4/27/2012 10:52	0	0	2.0	1249	1228	1244	1247	1251	11T0523	4	29	108	0.061	81874	16.45
4/27/2012 10:53	0	0	1.9	1250	1227	1244	1247	1250	11T0523	4	29	103	0.061	81989	16.45
4/27/2012 10:54	0	0	2.0	1250	1227	1244	1247	1250	11T0523	4	29	109	0.061	82103	16.46
4/27/2012 10:55	0	0	2.0	1250	1228	1245	1247	1250	11T0523	4	29	103	0.061	82218	16.44
4/27/2012 10:56	0	0	2.0	1250	1228	1244	1247	1251	11T0523	4	29	105	0.061	82333	16.45
4/27/2012 10:57	0	0	2.0	1250	1228	1243	1247	1251	11T0523	4	28	103	0.061	82382	16.43
4/27/2012 10:58	0	0	1.9	1250	1229	1243	1248	1251	11T0523	4	28	100	0.061	82220	16.53
4/27/2012 10:59	0	0	1.8	1251	1228	1243	1248	1252	11T0523	4	28	94	0.061	82205	16.56
4/27/2012 11:00	0	0	1.9	1252	1226	1243	1248	1252	11T0523	4	28	102	0.061	82557	16.48
4/27/2012 11:01	0	0	1.9	1253	1228	1243	1248	1252	11T0523	4	28	101	0.061	82373	16.46
4/27/2012 11:02	0	0	2.0	1253	1229	1244	1249	1253	11T0523	3	29	103	0.061	82601	16.42
4/27/2012 11:03	0	0	2.0	1252	1230	1244	1249	1252	11T0523	3	29	109	0.061	82807	16.41
4/27/2012 11:04	0	0	1.9	1251	1229	1245	1249	1253	11T0523	3	29	102	0.061	82740	16.46
4/27/2012 11:05	0	0	2.0	1251	1229	1246	1249	1253	11T0523	4	29	102	0.061	82643	16.49
4/27/2012 11:06	0	0	2.0	1252	1231	1246	1249	1253	11T0523	5	29	105	0.061	82545	16.47
4/27/2012 11:07	0	0	2.0	1253	1232	1245	1249	1253	11T0523	7	30	108	0.061	82448	16.43
4/27/2012 11:08	0	0	2.1	1253	1231	1245	1250	1253	11T0523	8	30	116	0.061	82351	16.36
4/27/2012 11:09	0	0	2.1	1252	1231	1245	1250	1253	11T0523	8	31	122	0.061	82321	16.29
4/27/2012 11:10	0	0	2.2	1252	1230	1245	1249	1253	11T0523	8	30	131	0.061	82645	16.31

Date/Time	Arct/min on TR2	Arct/min on TR3	Inst Opacity %	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	CORRECTED REGEN SO2 ppm	CORRECTED REGEN NOX ppm	CORRECTED REGEN CO ppm	FCC Feed Sulfur wt%	Wet Air rate to regen mscfd	Flue gas CO2 %
	11XA0068B	11XA0068B	11A00889	11T0520	11T0521	11T0522	11T0523	11T0524	11M0812	11M0813	11M0814	11CFLRDL	11F0175	11A0815
4/27/2012 11:11	0	0	2.2	1251	1230	1245	1249	1252	7	30	128	0.061	82958	16.37
4/27/2012 11:12	0	0	2.2	1253	1230	1246	1249	1252	6	30	130	0.061	82911	16.30
4/27/2012 11:13	0	0	2.2	1253	1229	1247	1249	1252	6	31	140	0.061	82810	16.23
4/27/2012 11:14	0	0	2.1	1252	1228	1246	1249	1253	5	30	131	0.061	82708	16.34
4/27/2012 11:15	0	0	2.2	1252	1229	1245	1248	1252	5	31	147	0.061	82606	16.23
4/27/2012 11:16	0	0	2.0	1252	1229	1244	1248	1252	4	30	132	0.061	82504	16.25
4/27/2012 11:17	0	0	2.1	1251	1229	1244	1248	1252	4	30	123	0.061	82413	16.36
4/27/2012 11:18	0	0	2.0	1251	1228	1244	1248	1251	4	29	115	0.061	82399	16.37
4/27/2012 11:19	0	0	1.9	1251	1228	1245	1248	1251	4	29	113	0.061	82398	16.35
4/27/2012 11:20	0	0	2.0	1252	1228	1245	1248	1251	4	29	109	0.061	82397	16.40
4/27/2012 11:21	0	0	2.1	1252	1228	1246	1248	1251	4	30	125	0.061	82397	16.33
4/27/2012 11:22	0	0	2.0	1252	1229	1246	1248	1251	3	29	122	0.061	82396	16.35
4/27/2012 11:23	0	0	1.9	1252	1230	1246	1248	1251	3	30	129	0.061	82375	16.31
4/27/2012 11:24	0	0	2.0	1251	1230	1245	1248	1251	3	30	131	0.061	82209	16.32
4/27/2012 11:25	0	0	1.9	1251	1229	1244	1247	1251	3	30	127	0.061	82038	16.28
4/27/2012 11:26	0	0	2.0	1251	1228	1243	1247	1250	3	30	127	0.061	82081	16.28
4/27/2012 11:27	0	0	2.0	1251	1228	1243	1246	1250	3	29	122	0.061	82173	16.29
4/27/2012 11:28	0	0	2.0	1251	1227	1242	1246	1250	4	30	122	0.061	82265	16.33
4/27/2012 11:29	0	0	1.8	1250	1227	1242	1247	1250	6	30	115	0.061	82318	16.38
4/27/2012 11:30	0	0	1.8	1250	1227	1243	1247	1251	7	30	118	0.061	82035	16.35
4/27/2012 11:31	0	0	1.8	1250	1228	1242	1247	1251	8	30	117	0.061	82008	16.43
4/27/2012 11:32	0	0	1.9	1251	1228	1243	1247	1250	8	29	114	0.061	82070	16.44
4/27/2012 11:33	0	0	1.8	1251	1228	1244	1248	1251	8	29	99	0.061	82132	16.50
4/27/2012 11:34	0	0	1.8	1251	1228	1244	1247	1251	7	29	99	0.061	82193	16.45
4/27/2012 11:35	0	0	1.8	1251	1228	1243	1247	1252	6	30	104	0.061	82286	16.37
4/27/2012 11:36	0	0	1.8	1252	1228	1243	1248	1251	5	29	115	0.061	82684	16.34
4/27/2012 11:37	0	0	2.0	1252	1228	1244	1248	1251	5	29	113	0.061	82400	16.37
4/27/2012 11:38	0	0	1.9	1252	1229	1244	1248	1252	4	29	116	0.061	82262	16.36
4/27/2012 11:39	0	0	1.8	1253	1229	1243	1248	1252	4	29	108	0.061	82247	16.47
4/27/2012 11:40	0	0	1.8	1252	1230	1244	1248	1252	4	29	103	0.061	82220	16.46
4/27/2012 11:41	0	0	1.8	1252	1231	1245	1249	1253	4	29	101	0.061	82002	16.47
4/27/2012 11:42	0	0	1.9	1251	1230	1246	1249	1253	4	29	105	0.061	82015	16.46
4/27/2012 11:43	0	0	1.9	1252	1229	1246	1249	1252	4	29	109	0.061	82147	16.42
4/27/2012 11:44	0	0	1.8	1252	1229	1245	1248	1252	4	29	109	0.061	82278	16.41
4/27/2012 11:45	0	0	1.7	1251	1229	1244	1248	1252	4	29	118	0.061	82409	16.39
4/27/2012 11:46	0	0	1.8	1251	1230	1244	1249	1252	3	28	113	0.061	82540	16.37
4/27/2012 11:47	0	0	2.0	1251	1231	1245	1249	1252	3	29	124	0.061	82668	16.33
4/27/2012 11:48	0	0	2.0	1252	1230	1244	1249	1252	3	29	119	0.061	82695	16.39
4/27/2012 11:49	0	0	2.0	1252	1229	1244	1249	1252	3	28	110	0.061	82676	16.36
4/27/2012 11:50	0	0	1.9	1252	1228	1244	1249	1252	3	29	106	0.061	82657	16.39
4/27/2012 11:51	0	0	2.0	1253	1229	1244	1249	1253	3	29	117	0.061	82630	16.40
4/27/2012 11:52	0	0	2.0	1253	1229	1244	1249	1252	5	29	116	0.061	82352	16.39
4/27/2012 11:53	0	0	2.1	1253	1230	1245	1249	1252	7	30	114	0.061	82250	16.40
4/27/2012 11:54	0	0	1.9	1252	1230	1245	1249	1252	8	29	108	0.061	82303	16.50

	Arct/min on TR2	Arct/min on TR3	Inst Opacity %	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	CORRECTED REGEN SO2 ppm	CORRECTED REGEN NOX ppm	CORRECTED REGEN CO ppm	FCC Feed Sulfur wt%	Wet Air rate to regen mscfd	Flue gas CO2 %
	11XA0068B	11XA0069B	11A10889	11T10520	11T10521	11T10522	11T10523	11T10524	11M10812	11M10813	11M10814	11CFSLR.LD	11F10175	11A10815
4/27/2012 12:39	0	0	1.8	1252	1231	1246	1250	1253	8	29	111	0.058	82645	16.49
4/27/2012 12:40	0	0	1.8	1253	1231	1245	1250	1254	8	30	119	0.058	82780	16.36
4/27/2012 12:41	0	0	1.8	1253	1230	1245	1250	1253	8	30	130	0.058	82644	16.41
4/27/2012 12:42	0	0	1.7	1253	1230	1246	1250	1253	7	29	121	0.058	82379	16.45
4/27/2012 12:43	0	0	1.8	1253	1231	1246	1249	1253	6	29	110	0.058	81854	16.42
4/27/2012 12:44	0	0	1.7	1253	1231	1245	1249	1253	6	29	100	0.058	81845	16.42
4/27/2012 12:45	0	0	1.6	1253	1232	1245	1250	1253	5	29	107	0.058	82006	16.43
4/27/2012 12:46	0	0	1.6	1253	1232	1245	1250	1253	5	29	103	0.058	81843	16.43
4/27/2012 12:47	0	0	1.6	1254	1232	1245	1250	1254	4	28	102	0.058	81939	16.46
4/27/2012 12:48	0	0	1.5	1254	1232	1246	1250	1254	4	28	99	0.058	82278	16.46
4/27/2012 12:49	0	0	1.5	1254	1233	1247	1250	1254	4	28	103	0.058	82454	16.41
4/27/2012 12:50	0	0	1.6	1254	1233	1247	1251	1254	4	28	103	0.058	82917	16.46
4/27/2012 12:51	0	0	1.6	1253	1232	1248	1251	1254	4	29	118	0.058	82558	16.42
4/27/2012 12:52	0	0	1.7	1253	1232	1248	1251	1254	4	29	111	0.058	82409	16.39
4/27/2012 12:53	0	0	1.7	1253	1233	1249	1251	1254	4	29	113	0.058	82419	16.33
4/27/2012 12:54	0	0	1.8	1254	1234	1247	1251	1254	4	29	127	0.058	82428	16.26
4/27/2012 12:55	0	0	1.9	1254	1233	1247	1251	1254	3	31	139	0.058	82438	16.26
4/27/2012 12:56	0	0	1.8	1254	1232	1247	1250	1254	3	31	142	0.058	82436	16.30
4/27/2012 12:57	0	0	1.8	1254	1231	1248	1250	1254	3	30	139	0.058	82330	16.31
4/27/2012 12:58	0	0	1.7	1254	1231	1248	1250	1254	3	30	124	0.058	82202	16.34
4/27/2012 12:59	0	0	1.7	1254	1231	1247	1250	1254	3	29	119	0.058	82073	16.35
4/27/2012 13:00	0	0	1.8	1253	1233	1247	1251	1254	4	29	107	0.058	81971	16.38
4/27/2012 13:01	0	0	1.7	1253	1233	1247	1251	1254	6	30	114	0.058	82121	16.36
4/27/2012 13:02	0	0	1.7	1252	1233	1246	1250	1253	7	31	126	0.058	82039	16.30
4/27/2012 13:03	0	0	1.9	1252	1232	1246	1250	1253	8	30	121	0.058	81904	16.32
4/27/2012 13:04	0	0	1.8	1253	1232	1247	1250	1253	8	31	127	0.058	82150	16.29
4/27/2012 13:05	0	0	1.7	1253	1231	1247	1250	1253	7	30	133	0.058	82317	16.34
4/27/2012 13:06	0	0	1.7	1253	1232	1247	1250	1253	6	30	124	0.058	82392	16.35
4/27/2012 13:07	1	0	1.8	1253	1232	1246	1250	1253	6	30	135	0.058	82096	16.35
4/27/2012 13:08	1	0	1.9	1253	1231	1245	1249	1253	5	30	125	0.058	81980	16.35
4/27/2012 13:09	1	0	1.8	1253	1230	1245	1249	1252	5	30	128	0.058	81981	16.35
4/27/2012 13:10	1	0	1.8	1253	1231	1244	1249	1252	5	29	123	0.058	81983	16.38
4/27/2012 13:11	1	0	1.8	1252	1230	1244	1249	1253	5	29	121	0.058	81984	16.40
4/27/2012 13:12	1	0	1.7	1251	1229	1243	1249	1253	5	29	117	0.058	81986	16.45
4/27/2012 13:13	1	0	1.7	1252	1229	1243	1249	1252	4	28	108	0.058	81987	16.46
4/27/2012 13:14	1	0	1.6	1252	1229	1244	1249	1252	4	29	105	0.058	81993	16.41
4/27/2012 13:15	1	0	1.7	1252	1230	1246	1249	1252	4	28	108	0.058	82166	16.41
4/27/2012 13:16	1	0	1.7	1252	1231	1247	1250	1253	4	29	107	0.058	82419	16.41
4/27/2012 13:17	1	0	1.7	1252	1231	1247	1249	1253	3	29	119	0.058	82314	16.33
4/27/2012 13:18	1	0	1.6	1252	1230	1246	1249	1252	3	30	118	0.058	81576	16.35
4/27/2012 13:19	1	0	1.6	1252	1229	1245	1249	1251	3	29	107	0.058	81742	16.45
4/27/2012 13:20	1	0	1.5	1251	1229	1244	1248	1251	3	28	101	0.058	81703	16.45
4/27/2012 13:21	1	0	1.4	1251	1230	1244	1248	1252	3	28	98	0.058	82159	16.50
4/27/2012 13:22	1	0	1.4	1252	1230	1245	1249	1252	3	28	91	0.058	82323	16.56

	4/27/2012 13:23	11XA0068B	11XA0069B	11A0889	Inst Opacity %	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	DENSE BED TEMP degF	CORRECTED REGEN SO2 ppm	CORRECTED REGEN NOX ppm	CORRECTED REGEN CO ppm	FCC Feed Sulfur wt%	Wet Air rate to regen mscfd	Flue gas CO2 %
						11T0620	11T0521	11T0522	11T0523	11T0524	11M0812	11M0813	11M0814	11CFLR.LD	11F0175	11A0815
		1	0	1.4	1252	1231	1247	1250	1250	1253	5	29	96	0.058	82117	16.56
	4/27/2012 13:24	1	0	1.5	1252	1231	1247	1250	1250	1253	7	28	98	0.058	82472	16.53
	4/27/2012 13:25	1	0	1.6	1253	1231	1248	1250	1250	1253	8	29	108	0.058	82119	16.48
	4/27/2012 13:26	1	0	1.7	1253	1231	1246	1250	1250	1254	9	29	113	0.058	81971	16.41
	4/27/2012 13:27	1	0	1.7	1253	1230	1246	1250	1250	1254	8	29	114	0.058	81958	16.40
	4/27/2012 13:28	1	0	1.6	1253	1230	1247	1250	1250	1253	7	30	111	0.058	82160	16.37
	4/27/2012 13:29	1	0	1.5	1253	1232	1247	1250	1250	1253	7	29	110	0.058	82365	16.43
	4/27/2012 13:30	1	0	1.5	1254	1230	1247	1251	1251	1254	6	30	112	0.058	82570	16.35
	4/27/2012 13:31	1	0	1.6	1253	1231	1247	1251	1251	1254	5	31	117	0.058	82621	16.29
	4/27/2012 13:32	1	0	1.6	1253	1231	1246	1250	1250	1253	4	29	114	0.058	82582	16.39
	4/27/2012 13:33	1	0	1.6	1253	1230	1246	1250	1250	1253	4	29	116	0.058	82639	16.36
	4/27/2012 13:34	1	0	1.6	1254	1230	1247	1250	1250	1253	4	29	119	0.058	82483	16.36
	4/27/2012 13:35	1	0	1.6	1254	1230	1246	1250	1250	1253	4	29	109	0.058	82503	16.44
	4/27/2012 13:36	1	0	1.5	1253	1231	1246	1250	1250	1254	4	29	109	0.058	82181	16.44
	4/27/2012 13:37	1	0	1.7	1253	1231	1247	1250	1250	1253	4	29	116	0.058	82138	16.41
	4/27/2012 13:38	1	0	1.7	1253	1231	1247	1250	1250	1253	4	29	103	0.058	82104	16.41
	4/27/2012 13:39	1	0	1.7	1254	1231	1247	1250	1250	1254	4	29	114	0.058	82070	16.41
	4/27/2012 13:40	1	0	1.7	1254	1231	1246	1250	1250	1254	3	29	111	0.058	82036	16.45
	4/27/2012 13:41	1	0	1.7	1254	1231	1246	1250	1250	1254	3	29	111	0.058	82002	16.40
	4/27/2012 13:42	1	0	1.6	1254	1231	1247	1250	1250	1254	3	28	104	0.058	81968	16.37
	4/27/2012 13:43	1	0	1.5	1254	1232	1247	1250	1250	1254	3	29	100	0.058	81933	16.47
	4/27/2012 13:44	1	0	1.6	1254	1234	1248	1251	1251	1254	3	28	110	0.058	82176	16.35
	4/27/2012 13:45	1	0	1.7	1254	1234	1248	1251	1251	1254	3	29	107	0.058	82641	16.41
	4/27/2012 13:46	1	0	1.5	1254	1233	1248	1250	1250	1253	4	30	114	0.058	82286	16.39
	4/27/2012 13:47	1	0	1.6	1254	1230	1247	1250	1250	1253	6	30	119	0.058	82076	16.38
	4/27/2012 13:48	1	0	1.7	1254	1232	1246	1250	1250	1254	8	30	117	0.058	82157	16.40
	4/27/2012 13:49	1	0	1.6	1254	1232	1245	1250	1250	1254	8	30	112	0.058	82245	16.36
	4/27/2012 13:50	1	0	1.6	1255	1231	1245	1251	1251	1254	8	30	120	0.058	82332	16.35
	4/27/2012 13:51	1	0	1.5	1255	1232	1246	1251	1251	1253	7	29	114	0.058	82156	16.45
	4/27/2012 13:52	1	0	1.5	1255	1233	1247	1250	1250	1253	7	29	110	0.058	81728	16.47
	4/27/2012 13:53	1	0	1.6	1254	1232	1247	1251	1251	1254	6	30	107	0.058	81826	16.42
	4/27/2012 13:54	1	0	1.6	1253	1232	1247	1251	1251	1254	5	29	111	0.058	82087	16.40
	4/27/2012 13:55	1	0	1.5	1253	1233	1247	1251	1251	1254	5	29	122	0.058	82426	16.30
	4/27/2012 13:56	1	0	1.6	1253	1233	1247	1251	1251	1254	4	30	132	0.058	82217	16.25
	4/27/2012 13:57	1	0	1.7	1253	1233	1247	1250	1250	1254	4	30	132	0.058	82081	16.29
	4/27/2012 13:58	1	0	1.7	1253	1232	1247	1250	1250	1254	4	30	130	0.058	82190	16.29
	4/27/2012 13:59	1	0	1.8	1253	1232	1247	1250	1250	1254	3	30	140	0.058	82311	16.18
	4/27/2012 14:00	1	0	2.0	1253	1233	1247	1250	1250	1254	3	31	137	0.058	82432	16.28

	Flue gas O2 %	Flue gas O2 %	fresh catalyst		SuperSoxgetter		SuperSoxgetter		NOx additive		Ammonia injection	riser temp	htr outlet temp
			lb/d	setpoint	lb/d	setpoint	lb/d	setpoint					
4/27/2012 8:15	1.78	1.76	2939	3000	230	30	0	0	0	0	11TCRXTR	955.28	588.32
4/27/2012 8:16	1.78	1.71	2939	3000	230	30	0	0	0	0	11TCRXTR	955.12	588.30
4/27/2012 8:17	1.79	1.66	2939	3000	230	30	0	0	0	0	11TCRXTR	954.95	588.28
4/27/2012 8:18	1.80	1.75	2939	3000	230	30	0	0	0	0	11TCRXTR	954.81	588.26
4/27/2012 8:19	1.80	1.71	2939	3000	230	30	0	0	0	0	11TCRXTR	954.85	588.24
4/27/2012 8:20	1.81	1.69	2939	3000	230	30	0	0	0	0	11TCRXTR	954.92	588.22
4/27/2012 8:21	1.81	1.61	2939	3000	230	30	0	0	0	0	11TCRXTR	955.00	588.20
4/27/2012 8:22	1.82	1.71	2939	3000	230	30	0	0	0	0	11TCRXTR	955.07	588.18
4/27/2012 8:23	1.83	1.73	2939	3000	230	30	0	0	0	0	11TCRXTR	955.15	588.16
4/27/2012 8:24	1.83	1.82	2939	3000	230	30	0	0	0	0	11TCRXTR	955.26	588.14
4/27/2012 8:25	1.84	1.91	2939	3000	230	30	0	0	0	0	11TCRXTR	955.39	588.12
4/27/2012 8:26	1.84	1.88	2939	3000	230	30	0	0	0	0	11TCRXTR	955.52	588.10
4/27/2012 8:27	1.84	1.89	2939	3000	230	30	0	0	0	0	11TCRXTR	955.56	588.08
4/27/2012 8:28	1.83	1.85	2939	3000	230	30	0	0	0	0	11TCRXTR	955.41	588.06
4/27/2012 8:29	1.83	1.84	2939	3000	230	30	0	0	0	0	11TCRXTR	955.24	588.04
4/27/2012 8:30	1.83	1.83	2939	3000	230	30	0	0	0	0	11TCRXTR	955.08	588.02
4/27/2012 8:31	1.83	1.85	2939	3000	230	30	0	0	0	0	11TCRXTR	954.91	588.00
4/27/2012 8:32	1.83	1.80	2939	3000	230	30	0	0	0	0	11TCRXTR	954.83	587.98
4/27/2012 8:33	1.83	1.82	2939	3000	230	30	0	0	0	0	11TCRXTR	954.99	587.96
4/27/2012 8:34	1.82	1.89	2939	3000	230	30	0	0	0	0	11TCRXTR	954.96	587.94
4/27/2012 8:35	1.82	1.91	2939	3000	230	30	0	0	0	0	11TCRXTR	954.85	587.92
4/27/2012 8:36	1.82	1.88	2939	3000	230	30	0	0	0	0	11TCRXTR	954.75	587.90
4/27/2012 8:37	1.82	1.88	2939	3000	230	30	0	0	0	0	11TCRXTR	954.64	587.88
4/27/2012 8:38	1.82	1.86	2939	3000	230	30	0	0	0	0	11TCRXTR	954.54	587.86
4/27/2012 8:39	1.82	1.82	2939	3000	230	30	0	0	0	0	11TCRXTR	954.44	587.84
4/27/2012 8:40	1.81	1.77	2939	3000	230	30	0	0	0	0	11TCRXTR	954.33	587.83
4/27/2012 8:41	1.81	1.78	2939	3000	230	30	0	0	0	0	11TCRXTR	954.24	587.81
4/27/2012 8:42	1.81	1.70	2939	3000	230	30	0	0	0	0	11TCRXTR	954.37	587.79
4/27/2012 8:43	1.81	1.66	2939	3000	230	30	0	0	0	0	11TCRXTR	954.58	587.77
4/27/2012 8:44	1.81	1.71	2939	3000	230	30	0	0	0	0	11TCRXTR	954.79	587.75
4/27/2012 8:45	1.81	1.71	2939	3000	230	30	0	0	0	0	11TCRXTR	954.91	587.73
4/27/2012 8:46	1.80	1.81	2939	3000	230	30	0	0	0	0	11TCRXTR	954.91	587.71
4/27/2012 8:47	1.80	1.78	2939	3000	230	30	0	0	0	0	11TCRXTR	954.91	587.69
4/27/2012 8:48	1.80	1.88	2939	3000	230	30	0	0	0	0	11TCRXTR	955.00	587.67
4/27/2012 8:49	1.80	1.87	2939	3000	230	30	0	0	0	0	11TCRXTR	955.12	587.65
4/27/2012 8:50	1.80	1.83	2939	3000	230	30	0	0	0	0	11TCRXTR	955.24	587.63
4/27/2012 8:51	1.80	1.87	2939	3000	230	30	0	0	0	0	11TCRXTR	955.37	587.58
4/27/2012 8:52	1.80	1.81	2939	3000	230	30	0	0	0	0	11TCRXTR	955.37	587.40
4/27/2012 8:53	1.80	1.84	2939	3000	230	30	0	0	0	0	11TCRXTR	955.16	587.33
4/27/2012 8:54	1.80	1.79	2939	3000	230	30	0	0	0	0	11TCRXTR	954.93	587.28
4/27/2012 8:55	1.80	1.84	2939	3000	230	30	0	0	0	0	11TCRXTR	954.61	587.24
4/27/2012 8:56	1.80	1.84	2939	3000	230	30	0	0	0	0	11TCRXTR	954.34	587.19
4/27/2012 8:57	1.79	1.88	2939	3000	230	30	0	0	0	0	11TCRXTR	954.50	587.15
4/27/2012 8:58	1.79	1.86	2939	3000	230	30	0	0	0	0	11TCRXTR	954.73	587.10

Flue gas O2 %	Flue gas O2 %	fresh catalyst				SuperSoxgetter				NOx additive				riser temp	htr outlet temp
		11FC0670	lb/d	setpoint	11FC0670.SP	11W0665	lb/d	setpoint	11W0665.SP	11W0669	lb/d	11FC2032	11TC0025		
4/27/2012 8:59	1.79	11AO0816	2939	3000	3000	230	230	30	30	0	0	8	587.06	954.96	11TC0025
4/27/2012 9:00	1.79		2939	3000	3000	230	230	30	30	0	0	8	587.01	955.20	
4/27/2012 9:01	1.79		2939	3000	3000	230	230	30	30	0	0	8	586.97	955.45	
4/27/2012 9:02	1.79		2939	3000	3000	230	230	30	30	0	0	8	586.92	955.51	
4/27/2012 9:03	1.79		2939	3000	3000	230	230	30	30	0	0	8	586.87	955.45	
4/27/2012 9:04	1.79		2939	3000	3000	230	230	30	30	0	0	8	586.83	955.36	
4/27/2012 9:05	1.79		2939	3000	3000	230	230	30	30	0	0	8	586.78	955.07	
4/27/2012 9:06	1.79		2939	3000	3000	230	230	30	30	0	0	8	586.74	954.74	
4/27/2012 9:07	1.79		2939	3000	3000	230	230	30	30	0	0	8	586.69	954.42	
4/27/2012 9:08	1.78		2939	3000	3000	230	230	30	30	0	0	8	586.65	954.16	
4/27/2012 9:09	1.78		2939	3000	3000	230	230	30	30	0	0	8	586.60	954.45	
4/27/2012 9:10	1.78		2939	3000	3000	230	230	30	30	0	0	8	586.56	954.81	
4/27/2012 9:11	1.78		2939	3000	3000	230	230	30	30	0	0	8	586.51	954.88	
4/27/2012 9:12	1.78		2939	3000	3000	230	230	30	30	0	0	8	586.47	954.89	
4/27/2012 9:13	1.78		2939	3000	3000	230	230	30	30	0	0	8	586.42	954.89	
4/27/2012 9:14	1.78		2939	3000	3000	230	230	30	30	0	0	8	586.37	954.90	
4/27/2012 9:15	1.78		2939	3000	3000	230	230	30	30	0	0	8	586.33	954.89	
4/27/2012 9:16	1.78		2939	3000	3000	230	230	30	30	0	0	8	586.28	954.67	
4/27/2012 9:17	1.78		2939	3000	3000	230	230	30	30	0	0	8	586.24	954.44	
4/27/2012 9:18	1.77		2939	3000	3000	230	230	30	30	0	0	8	586.19	954.54	
4/27/2012 9:19	1.77		2939	3000	3000	230	230	30	30	0	0	8	586.15	954.70	
4/27/2012 9:20	1.77		2939	3000	3000	230	230	30	30	0	0	8	586.10	954.82	
4/27/2012 9:21	1.77		2939	3000	3000	230	230	30	30	0	0	8	586.06	954.94	
4/27/2012 9:22	1.77		2939	3000	3000	230	230	30	30	0	0	8	586.01	955.05	
4/27/2012 9:23	1.77		2939	3000	3000	230	230	30	30	0	0	8	585.97	955.01	
4/27/2012 9:24	1.77		2939	3000	3000	230	230	30	30	0	0	8	585.92	954.93	
4/27/2012 9:25	1.77		2939	3000	3000	230	230	30	30	0	0	8	585.87	954.86	
4/27/2012 9:26	1.77		2939	3000	3000	230	230	30	30	0	0	8	585.83	954.78	
4/27/2012 9:27	1.77		2939	3000	3000	230	230	30	30	0	0	8	585.78	954.77	
4/27/2012 9:28	1.77		2939	3000	3000	230	230	30	30	0	0	8	585.74	954.84	
4/27/2012 9:29	1.76		2939	3000	3000	230	230	30	30	0	0	8	585.69	954.77	
4/27/2012 9:30	1.76		2939	3000	3000	230	230	30	30	0	0	8	585.65	954.55	
4/27/2012 9:31	1.76		2939	3000	3000	230	230	30	30	0	0	8	585.60	954.49	
4/27/2012 9:32	1.76		2939	3000	3000	230	230	30	30	0	0	8	585.47	954.57	
4/27/2012 9:33	1.76		2939	3000	3000	230	230	30	30	0	0	8	585.36	954.55	
4/27/2012 9:34	1.76		2939	3000	3000	230	230	30	30	0	0	8	585.37	954.33	
4/27/2012 9:35	1.76		2939	3000	3000	230	230	30	30	0	0	8	585.37	954.31	
4/27/2012 9:36	1.76		2939	3000	3000	230	230	30	30	0	0	8	585.38	954.52	
4/27/2012 9:37	1.76		2939	3000	3000	230	230	30	30	0	0	8	585.39	954.73	
4/27/2012 9:38	1.76		2939	3000	3000	230	230	30	30	0	0	8	585.39	954.88	
4/27/2012 9:39	1.76		2939	3000	3000	230	230	30	30	0	0	8	585.40	954.98	
4/27/2012 9:40	1.76		2939	3000	3000	230	230	30	30	0	0	8	585.40	955.18	
4/27/2012 9:41	1.77		2939	3000	3000	230	230	30	30	0	0	8	585.41	955.39	
4/27/2012 9:42	1.77		2939	3000	3000	230	230	30	30	0	0	8	585.42	955.60	

Flue gas O2 %	Flue gas O2 %	fresh catalyst		fresh catalyst		SuperSoxgetter		SuperSoxgetter		SuperSoxgetter		NOx additive		Ammonia		riser temp	htr outlet temp
		lb/d	11FC0670	lb/d	11FC0670 SP	lb/d	11W0666	lb/d	11W0666	lb/d	11W0657 SP	lb/d	11W0669	lb/d	11FC2032		
4/27/2012 9:43	1.77	11AC0816	2939	3000	3000	230	230	30	30	0	0	8	8	11TC0025	585.42	955.60	585.42
4/27/2012 9:44	1.78		2939	3000	3000	230	230	30	30	0	0	8	8		585.43	955.35	585.43
4/27/2012 9:45	1.78		2939	3000	3000	230	230	30	30	0	0	8	8		585.44	955.11	585.44
4/27/2012 9:46	1.78		2939	3000	3000	230	230	30	30	0	0	8	8		585.44	954.99	585.44
4/27/2012 9:47	1.79		2939	3000	3000	230	230	30	30	0	0	8	8		585.45	955.14	585.45
4/27/2012 9:48	1.79		2939	3000	3000	230	230	30	30	0	0	8	8		585.45	955.59	585.45
4/27/2012 9:49	1.80		2939	3000	3000	230	230	30	30	0	0	8	8		585.46	956.02	585.46
4/27/2012 9:50	1.80		2939	3000	3000	230	230	30	30	0	0	8	8		585.47	956.09	585.47
4/27/2012 9:51	1.80		2939	3000	3000	230	230	30	30	0	0	8	8		585.47	956.19	585.47
4/27/2012 9:52	1.80		2939	3000	3000	230	230	30	30	0	0	8	8		585.48	956.07	585.48
4/27/2012 9:53	1.80		2939	3000	3000	230	230	30	30	0	0	8	8		585.48	955.69	585.48
4/27/2012 9:54	1.80		2939	3000	3000	230	230	30	30	0	0	8	8		585.49	955.76	585.49
4/27/2012 9:55	1.80		2939	3000	3000	230	230	30	30	0	0	8	8		585.50	955.71	585.50
4/27/2012 9:56	1.80		2939	3000	3000	230	230	30	30	0	0	8	8		585.50	955.56	585.50
4/27/2012 9:57	1.79		2939	3000	3000	230	230	30	30	0	0	8	8		585.51	955.09	585.51
4/27/2012 9:58	1.79		2939	3000	3000	230	230	30	30	0	0	8	8		585.51	954.89	585.51
4/27/2012 9:59	1.79		2939	3000	3000	230	230	30	30	0	0	8	8		585.52	954.82	585.52
4/27/2012 10:00	1.79		2939	3000	3000	230	230	30	30	0	0	8	8		585.53	954.58	585.53
4/27/2012 10:01	1.78		2939	3000	3000	230	230	30	30	0	0	8	8		585.53	954.23	585.53
4/27/2012 10:02	1.78		2939	3000	3000	230	230	30	30	0	0	8	8		585.54	954.28	585.54
4/27/2012 10:03	1.78		2939	3000	3000	230	230	30	30	0	0	8	8		585.55	954.40	585.55
4/27/2012 10:04	1.78		2939	3000	3000	230	230	30	30	0	0	8	8		585.55	954.59	585.55
4/27/2012 10:05	1.77		2939	3000	3000	230	230	30	30	0	0	8	8		585.56	954.65	585.56
4/27/2012 10:06	1.77		2939	3000	3000	230	230	30	30	0	0	8	8		585.56	954.66	585.56
4/27/2012 10:07	1.77		2939	3000	3000	230	230	30	30	0	0	8	8		585.57	954.62	585.57
4/27/2012 10:08	1.77		2939	3000	3000	230	230	30	30	0	0	8	8		585.58	954.36	585.58
4/27/2012 10:09	1.76		2939	3000	3000	230	230	30	30	0	0	8	8		585.58	954.40	585.58
4/27/2012 10:10	1.76		2939	3000	3000	230	230	30	30	0	0	8	8		585.59	954.53	585.59
4/27/2012 10:11	1.76		2939	3000	3000	230	230	30	30	0	0	8	8		585.59	954.56	585.59
4/27/2012 10:12	1.76		2939	3000	3000	230	230	30	30	0	0	8	8		585.60	954.49	585.60
4/27/2012 10:13	1.76		2939	3000	3000	230	230	30	30	0	0	8	8		585.61	954.42	585.61
4/27/2012 10:14	1.76		2939	3000	3000	230	230	30	30	0	0	8	8		585.61	954.45	585.61
4/27/2012 10:15	1.76		2939	3000	3000	230	230	30	30	0	0	8	8		585.62	954.64	585.62
4/27/2012 10:16	1.76		2939	3000	3000	230	230	30	30	0	0	8	8		585.62	954.84	585.62
4/27/2012 10:17	1.76		2939	3000	3000	230	230	30	30	0	0	8	8		585.63	955.03	585.63
4/27/2012 10:18	1.77		2939	3000	3000	230	230	30	30	0	0	8	8		585.64	955.14	585.64
4/27/2012 10:19	1.77		2939	3000	3000	230	230	30	30	0	0	8	8		585.64	954.83	585.64
4/27/2012 10:20	1.77		2939	3000	3000	230	230	30	30	0	0	8	8		585.65	954.69	585.65
4/27/2012 10:21	1.77		2939	3000	3000	230	230	30	30	0	0	8	8		585.65	954.91	585.65
4/27/2012 10:22	1.77		2939	3000	3000	230	230	30	30	0	0	8	8		585.66	955.12	585.66
4/27/2012 10:23	1.78		2939	3000	3000	230	230	30	30	0	0	8	8		585.67	955.34	585.67
4/27/2012 10:24	1.78		2939	3000	3000	230	230	30	30	0	0	8	8		585.67	955.59	585.67
4/27/2012 10:25	1.78		2939	3000	3000	230	230	30	30	0	0	8	8		585.68	955.82	585.68
4/27/2012 10:26	1.78		2939	3000	3000	230	230	30	30	0	0	8	8		585.69	955.91	585.69

Flue gas O2 %	Flue gas O2 %	fresh catalyst		fresh catalyst		SuperSovagater		SuperSovagater		NOX additive		Ammonia injection		riser temp	htr outlet temp
		11AC0816	11AC0816	11FC0670	11FC0670.SP	11W0866	11W0867.SP	11W0869	11FC2032						
4/27/2012 10:27	1.78	1.80	2939	3000	3000	230	30	0	8	11TCRTR	955.72	585.69			
4/27/2012 10:28	1.78	1.82	2939	3000	3000	230	30	0	8		955.47	585.70			
4/27/2012 10:29	1.79	1.90	2939	3000	3000	230	30	0	8		955.22	585.70			
4/27/2012 10:30	1.79	1.84	2939	3000	3000	230	30	0	8		954.97	585.71			
4/27/2012 10:31	1.79	1.85	2939	3000	3000	230	30	0	8		954.78	585.72			
4/27/2012 10:32	1.79	1.96	2939	3000	3000	230	30	0	8		955.06	585.72			
4/27/2012 10:33	1.79	1.93	2939	3000	3000	230	30	0	8		955.16	585.73			
4/27/2012 10:34	1.80	1.90	2939	3000	3000	230	30	0	8		955.07	585.73			
4/27/2012 10:35	1.80	1.96	2939	3000	3000	230	30	0	8		954.98	585.74			
4/27/2012 10:36	1.80	1.94	2939	3000	3000	230	30	0	8		954.86	585.75			
4/27/2012 10:37	1.80	1.99	2939	3000	3000	230	30	0	8		954.75	585.75			
4/27/2012 10:38	1.80	1.91	2939	3000	3000	230	30	0	8		954.63	585.76			
4/27/2012 10:39	1.80	1.84	2939	3000	3000	230	30	0	8		954.36	585.76			
4/27/2012 10:40	1.81	1.90	2939	3000	3000	230	30	0	8		954.28	585.77			
4/27/2012 10:41	1.81	1.96	2939	3000	3000	230	30	0	8		954.49	585.78			
4/27/2012 10:42	1.81	1.83	2939	3000	3000	230	30	0	8		954.73	585.78			
4/27/2012 10:43	1.81	1.74	2939	3000	3000	230	30	0	8		954.96	585.79			
4/27/2012 10:44	1.81	1.70	2939	3000	3000	230	30	0	8		954.95	585.79			
4/27/2012 10:45	1.80	1.71	2939	3000	3000	230	30	0	8		954.72	585.80			
4/27/2012 10:46	1.80	1.68	2939	3000	3000	230	30	0	8		954.64	585.81			
4/27/2012 10:47	1.80	1.73	2939	3000	3000	230	30	0	8		954.71	585.81			
4/27/2012 10:48	1.80	1.78	2939	3000	3000	230	30	0	8		954.77	585.82			
4/27/2012 10:49	1.79	1.82	2939	3000	3000	230	30	0	8		954.84	585.83			
4/27/2012 10:50	1.79	1.70	2939	3000	3000	230	30	0	8		954.84	585.83			
4/27/2012 10:51	1.79	1.72	2939	3000	3000	230	30	0	8		954.68	585.84			
4/27/2012 10:52	1.79	1.72	2939	3000	3000	230	30	0	8		954.24	585.84			
4/27/2012 10:53	1.79	1.73	2939	3000	3000	230	30	0	8		954.33	585.85			
4/27/2012 10:54	1.78	1.78	2939	3000	3000	230	30	0	8		954.61	585.86			
4/27/2012 10:55	1.78	1.70	2939	3000	3000	230	30	0	8		954.89	585.86			
4/27/2012 10:56	1.78	1.71	2939	3000	3000	230	30	0	8		955.16	585.87			
4/27/2012 10:57	1.78	1.73	2939	3000	3000	230	30	0	8		955.44	585.87			
4/27/2012 10:58	1.77	1.68	2939	3000	3000	230	30	0	8		955.70	585.88			
4/27/2012 10:59	1.77	1.70	2939	3000	3000	230	30	0	8		955.74	585.89			
4/27/2012 11:00	1.77	1.74	2939	3000	3000	230	30	0	8		955.67	585.89			
4/27/2012 11:01	1.77	1.71	2939	3000	3000	230	30	0	8		955.61	585.90			
4/27/2012 11:02	1.76	1.76	2939	3000	3000	230	30	0	8		955.55	585.90			
4/27/2012 11:03	1.76	1.78	2939	3000	3000	230	30	0	8		955.58	585.91			
4/27/2012 11:04	1.76	1.73	2939	3000	3000	230	30	0	8		955.74	585.92			
4/27/2012 11:05	1.76	1.72	2939	3000	3000	230	30	0	8		955.90	585.92			
4/27/2012 11:06	1.75	1.82	2939	3000	3000	230	30	0	8		956.03	585.93			
4/27/2012 11:07	1.75	1.84	2939	3000	3000	230	30	0	8		955.99	585.94			
4/27/2012 11:08	1.75	1.86	2939	3000	3000	230	30	0	8		955.64	585.94			
4/27/2012 11:09	1.75	1.90	2939	3000	3000	230	30	0	8		955.58	585.95			
4/27/2012 11:10	1.74	1.94	2939	3000	3000	230	30	0	8		955.55	585.95			

	Flue gas O2 %	Flue gas O2 %	fresh catalyst		SuperSoxgetter		SuperSoxgetter		SuperSoxgetter		NOX additive		riser temp	htr outlet temp
			lb/d	scptpoint	lb/d	scptpoint	lb/d	scptpoint	lb/d	scptpoint	lb/d	scptpoint		
	11AC0816	11A0816	11FC0670	11FC0670 SP	11W10665	11W10657 SP	11W10669	11FC2B22					11TC0025	
4/27/2012 11:11	1.74	1.90	2939	3000	230	30	0	8					955.47	585.96
4/27/2012 11:12	1.74	1.92	2939	3000	230	30	0	8					955.39	585.97
4/27/2012 11:13	1.74	1.99	2939	3000	230	30	0	8					955.29	585.97
4/27/2012 11:14	1.74	1.88	2939	3000	230	30	0	8					955.01	585.98
4/27/2012 11:15	1.73	1.99	2939	3000	230	30	0	8					954.69	585.98
4/27/2012 11:16	1.73	1.92	2939	3000	230	30	0	8					954.37	585.99
4/27/2012 11:17	1.73	1.86	2939	3000	230	30	0	8					954.25	586.00
4/27/2012 11:18	1.73	1.80	2939	3000	230	30	0	8					954.46	586.00
4/27/2012 11:19	1.72	1.82	2939	3000	230	30	0	8					954.92	586.01
4/27/2012 11:20	1.72	1.81	2939	3000	230	30	0	8					955.04	586.01
4/27/2012 11:21	1.72	1.86	2939	3000	230	30	0	8					955.38	586.02
4/27/2012 11:22	1.72	1.88	2939	3000	230	30	0	8					955.55	586.03
4/27/2012 11:23	1.71	1.93	2939	3000	230	30	0	8					955.48	586.03
4/27/2012 11:24	1.71	1.95	2939	3000	230	30	0	8					955.23	586.04
4/27/2012 11:25	1.71	1.89	2939	3000	230	30	0	8					954.98	586.04
4/27/2012 11:26	1.71	1.91	2939	3000	230	30	0	8					954.73	586.05
4/27/2012 11:27	1.70	1.88	2939	3000	230	30	0	8					954.32	586.06
4/27/2012 11:28	1.70	1.84	2939	3000	230	30	0	8					953.82	586.06
4/27/2012 11:29	1.70	1.84	2939	3000	230	30	0	8					954.10	586.07
4/27/2012 11:30	1.70	1.86	2939	3000	230	30	0	8					954.62	586.08
4/27/2012 11:31	1.70	1.80	2939	3000	230	30	0	8					955.13	586.08
4/27/2012 11:32	1.69	1.74	2939	3000	230	30	0	8					955.65	586.09
4/27/2012 11:33	1.69	1.64	2939	3000	230	30	0	8					955.82	586.09
4/27/2012 11:34	1.69	1.74	2939	3000	230	30	0	8					955.62	586.10
4/27/2012 11:35	1.70	1.79	2939	3000	230	30	0	8					955.31	586.11
4/27/2012 11:36	1.70	1.76	2939	3000	230	30	0	8					954.87	586.11
4/27/2012 11:37	1.70	1.78	2939	3000	230	30	0	8					954.75	586.12
4/27/2012 11:38	1.70	1.81	2939	3000	230	30	0	8					954.96	586.12
4/27/2012 11:39	1.70	1.73	2939	3000	230	30	0	8					954.98	586.13
4/27/2012 11:40	1.70	1.72	2939	3000	230	30	0	8					954.60	586.14
4/27/2012 11:41	1.71	1.81	2939	3000	230	30	0	8					954.42	586.14
4/27/2012 11:42	1.71	1.72	2939	3000	230	30	0	8					954.49	586.15
4/27/2012 11:43	1.71	1.78	2939	3000	230	30	0	8					954.45	586.15
4/27/2012 11:44	1.71	1.79	2939	3000	230	30	0	8					954.40	586.16
4/27/2012 11:45	1.71	1.83	2939	3000	230	30	0	8					954.59	586.17
4/27/2012 11:46	1.72	1.77	2939	3000	230	30	0	8					955.07	586.17
4/27/2012 11:47	1.72	1.85	2939	3000	230	30	0	8					955.36	586.18
4/27/2012 11:48	1.72	1.81	2939	3000	230	30	0	8					955.33	586.18
4/27/2012 11:49	1.72	1.78	2939	3000	230	30	0	8					955.54	586.19
4/27/2012 11:50	1.72	1.82	2939	3000	230	30	0	8					955.58	586.20
4/27/2012 11:51	1.72	1.82	2939	3000	230	30	0	8					955.54	586.20
4/27/2012 11:52	1.73	1.85	2939	3000	230	30	0	8					955.49	586.21
4/27/2012 11:53	1.73	1.82	2939	3000	230	30	0	8					955.33	586.22
4/27/2012 11:54	1.73	1.78	2939	3000	230	30	0	8					955.13	586.22

Flue gas O2 %	11AC0816	Flue gas O2 %	11AC0816	Fresh catalyst				SuperSoxgaster				SuperSoxgaster				Ammonia injection			
				fresh catalyst lb/d	11FC0870 lb/d	setpoint lb/d	11FC0870 SP	SuperSoxgaster lb/d	11W0966	setpoint lb/d	11W0967 SP	SuperSoxgaster lb/d	11W0968	setpoint lb/d	11W0969	11FC2032			
	4/27/2012 11:55	1.73	1.74	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.23
	4/27/2012 11:56	1.73	1.72	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.23
	4/27/2012 11:57	1.73	1.78	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.24
	4/27/2012 11:58	1.74	1.86	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.25
	4/27/2012 11:59	1.74	1.94	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.25
	4/27/2012 12:00	1.74	1.92	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.26
	4/27/2012 12:01	1.74	1.88	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.26
	4/27/2012 12:02	1.74	1.97	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.27
	4/27/2012 12:03	1.75	1.89	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.28
	4/27/2012 12:04	1.75	1.86	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.28
	4/27/2012 12:05	1.75	1.93	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.29
	4/27/2012 12:06	1.75	1.98	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.29
	4/27/2012 12:07	1.75	1.95	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.30
	4/27/2012 12:08	1.75	1.90	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.31
	4/27/2012 12:09	1.76	1.94	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.31
	4/27/2012 12:10	1.76	1.81	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.32
	4/27/2012 12:11	1.76	1.81	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.33
	4/27/2012 12:12	1.76	1.82	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.33
	4/27/2012 12:13	1.76	1.81	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.34
	4/27/2012 12:14	1.77	1.91	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.34
	4/27/2012 12:15	1.77	1.86	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.35
	4/27/2012 12:16	1.77	1.88	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.36
	4/27/2012 12:17	1.77	1.88	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.36
	4/27/2012 12:18	1.77	1.84	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.37
	4/27/2012 12:19	1.77	1.78	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.37
	4/27/2012 12:20	1.78	1.83	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.38
	4/27/2012 12:21	1.78	1.81	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.39
	4/27/2012 12:22	1.79	1.71	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.39
	4/27/2012 12:23	1.79	1.72	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.40
	4/27/2012 12:24	1.80	1.72	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.40
	4/27/2012 12:25	1.80	1.77	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.41
	4/27/2012 12:26	1.80	1.79	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.42
	4/27/2012 12:27	1.81	1.86	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.42
	4/27/2012 12:28	1.81	1.79	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.43
	4/27/2012 12:29	1.82	1.78	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.43
	4/27/2012 12:30	1.82	1.80	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.44
	4/27/2012 12:31	1.83	1.83	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.45
	4/27/2012 12:32	1.83	1.85	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.45
	4/27/2012 12:33	1.84	1.84	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.46
	4/27/2012 12:34	1.84	1.84	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.47
	4/27/2012 12:35	1.84	1.81	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.47
	4/27/2012 12:36	1.85	1.81	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.48
	4/27/2012 12:37	1.85	1.79	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.48
	4/27/2012 12:38	1.86	1.78	2939	3000	3000	3000	230	230	30	30	0	0	0	0	8	8	11TCR025	586.49

Flue gas O2 %	Flue gas O2 %	fresh catalyst				SuperSoxgeter				Ammonia Injection				riser temp	htr outlet temp
		11FC0670	lb/d	setpoint	11FC0670.SP	11W0686	lb/d	setpoint	11W0687.SP	11W0689	lb/d	11FC2032	11TC0025		
4/27/2012 12:39	1.86	2939	3000	3000	3000	230	30	30	0	8	8	955.08	586.50	11TC0025	586.50
4/27/2012 12:40	1.87	2939	3000	3000	3000	230	30	30	0	8	8	955.19	586.50	11TC0025	586.50
4/27/2012 12:41	1.87	2939	3000	3000	3000	230	30	30	0	8	8	955.23	586.51	11TC0025	586.51
4/27/2012 12:42	1.88	2939	3000	3000	3000	230	30	30	0	8	8	955.24	586.51	11TC0025	586.51
4/27/2012 12:43	1.88	2939	3000	3000	3000	230	30	30	0	8	8	955.26	586.52	11TC0025	586.52
4/27/2012 12:44	1.88	2939	3000	3000	3000	230	30	30	0	8	8	955.27	586.53	11TC0025	586.53
4/27/2012 12:45	1.89	2939	3000	3000	3000	230	30	30	0	8	8	955.26	586.53	11TC0025	586.53
4/27/2012 12:46	1.89	2939	3000	3000	3000	230	30	30	0	8	8	955.33	586.54	11TC0025	586.54
4/27/2012 12:47	1.90	2939	3000	3000	3000	230	30	30	0	8	8	955.51	586.54	11TC0025	586.54
4/27/2012 12:48	1.90	2939	3000	3000	3000	230	30	30	0	8	8	955.68	586.55	11TC0025	586.55
4/27/2012 12:49	1.91	2939	3000	3000	3000	230	30	30	0	8	8	955.86	586.56	11TC0025	586.56
4/27/2012 12:50	1.91	2939	3000	3000	3000	230	30	30	0	8	8	955.95	586.56	11TC0025	586.56
4/27/2012 12:51	1.91	2939	3000	3000	3000	230	30	30	0	8	8	955.93	586.57	11TC0025	586.57
4/27/2012 12:52	1.92	2939	3000	3000	3000	230	30	30	0	8	8	955.86	586.57	11TC0025	586.57
4/27/2012 12:53	1.92	2939	3000	3000	3000	230	30	30	0	8	8	955.61	586.58	11TC0025	586.58
4/27/2012 12:54	1.93	2939	3000	3000	3000	230	30	30	0	8	8	955.23	586.59	11TC0025	586.59
4/27/2012 12:55	1.93	2939	3000	3000	3000	230	30	30	0	8	8	955.24	586.59	11TC0025	586.59
4/27/2012 12:56	1.92	2939	3000	3000	3000	230	30	30	0	8	8	955.29	586.60	11TC0025	586.60
4/27/2012 12:57	1.92	2939	3000	3000	3000	230	30	30	0	8	8	955.06	586.61	11TC0025	586.61
4/27/2012 12:58	1.91	2939	3000	3000	3000	230	30	30	0	8	8	954.72	586.61	11TC0025	586.61
4/27/2012 12:59	1.91	2939	3000	3000	3000	230	30	30	0	8	8	954.66	586.62	11TC0025	586.62
4/27/2012 13:00	1.90	2939	3000	3000	3000	230	30	30	0	8	8	954.74	586.62	11TC0025	586.62
4/27/2012 13:01	1.90	2939	3000	3000	3000	230	30	30	0	8	8	954.82	586.63	11TC0025	586.63
4/27/2012 13:02	1.89	2939	3000	3000	3000	230	30	30	0	8	8	954.90	586.64	11TC0025	586.64
4/27/2012 13:03	1.89	2939	3000	3000	3000	230	30	30	0	8	8	954.95	586.64	11TC0025	586.64
4/27/2012 13:04	1.89	2939	3000	3000	3000	230	30	30	0	8	8	954.83	586.65	11TC0025	586.65
4/27/2012 13:05	1.88	2939	3000	3000	3000	230	30	30	0	8	8	954.69	586.65	11TC0025	586.65
4/27/2012 13:06	1.88	2939	3000	3000	3000	230	30	30	0	8	8	954.60	586.66	11TC0025	586.66
4/27/2012 13:07	1.87	2939	3000	3000	3000	230	30	30	0	8	8	954.51	586.67	11TC0025	586.67
4/27/2012 13:08	1.87	2939	3000	3000	3000	230	30	30	0	8	8	954.43	586.67	11TC0025	586.67
4/27/2012 13:09	1.86	2939	3000	3000	3000	230	30	30	0	8	8	954.36	586.68	11TC0025	586.68
4/27/2012 13:10	1.86	2939	3000	3000	3000	230	30	30	0	8	8	954.31	586.68	11TC0025	586.68
4/27/2012 13:11	1.85	2939	3000	3000	3000	230	30	30	0	8	8	954.33	586.69	11TC0025	586.69
4/27/2012 13:12	1.85	2939	3000	3000	3000	230	30	30	0	8	8	954.55	586.70	11TC0025	586.70
4/27/2012 13:13	1.84	2939	3000	3000	3000	230	30	30	0	8	8	954.77	586.70	11TC0025	586.70
4/27/2012 13:14	1.84	2939	3000	3000	3000	230	30	30	0	8	8	954.77	586.71	11TC0025	586.71
4/27/2012 13:15	1.83	2939	3000	3000	3000	230	30	30	0	8	8	954.61	586.72	11TC0025	586.72
4/27/2012 13:16	1.83	2939	3000	3000	3000	230	30	30	0	8	8	954.97	586.72	11TC0025	586.72
4/27/2012 13:17	1.83	2939	3000	3000	3000	230	30	30	0	8	8	955.42	586.73	11TC0025	586.73
4/27/2012 13:18	1.82	2939	3000	3000	3000	230	30	30	0	8	8	955.23	586.73	11TC0025	586.73
4/27/2012 13:19	1.82	2939	3000	3000	3000	230	30	30	0	8	8	954.87	586.74	11TC0025	586.74
4/27/2012 13:20	1.81	2939	3000	3000	3000	230	30	30	0	8	8	954.54	586.75	11TC0025	586.75
4/27/2012 13:21	1.81	2939	3000	3000	3000	230	30	30	0	8	8	954.61	586.75	11TC0025	586.75
4/27/2012 13:22	1.80	2939	3000	3000	3000	230	30	30	0	8	8	954.83	586.76	11TC0025	586.76

Flue gas O2 %	Flue gas O2 %	fresh catalyst			SuperSovageltr			SuperSovageltr			NOx additive			riser temp	htr outlet temp
		11FC0670	lb/d	setpoint	11FC0670 SP	lb/d	setpoint	11W0666	lb/d	setpoint	11W0669	lb/d	setpoint		
11AC0816	11A0816	1.80	1.66	2939	3000	230	30	0	8	955.11	11TC0025	586.76			
4/27/2012 13:23	4/27/2012 13:24	1.79	1.65	2939	3000	230	30	0	8	955.47	586.77				
4/27/2012 13:25	4/27/2012 13:26	1.79	1.78	2939	3000	230	30	0	8	955.78	586.78				
4/27/2012 13:26	4/27/2012 13:27	1.78	1.79	2939	3000	230	30	0	8	955.83	586.78				
4/27/2012 13:27	4/27/2012 13:28	1.78	1.81	2939	3000	230	30	0	8	955.44	586.79				
4/27/2012 13:28	4/27/2012 13:29	1.77	1.80	2939	3000	230	30	0	8	955.39	586.79				
4/27/2012 13:29	4/27/2012 13:30	1.77	1.80	2939	3000	230	30	0	8	955.46	586.80				
4/27/2012 13:30	4/27/2012 13:31	1.77	1.86	2939	3000	230	30	0	8	955.48	586.81				
4/27/2012 13:31	4/27/2012 13:32	1.77	1.83	2939	3000	230	30	0	8	955.50	586.81				
4/27/2012 13:32	4/27/2012 13:33	1.78	1.83	2939	3000	230	30	0	8	955.53	586.82				
4/27/2012 13:33	4/27/2012 13:34	1.78	1.82	2939	3000	230	30	0	8	955.50	586.82				
4/27/2012 13:34	4/27/2012 13:35	1.78	1.80	2939	3000	230	30	0	8	955.27	586.83				
4/27/2012 13:35	4/27/2012 13:36	1.78	1.77	2939	3000	230	30	0	8	955.06	586.84				
4/27/2012 13:36	4/27/2012 13:37	1.78	1.82	2939	3000	230	30	0	8	955.04	586.84				
4/27/2012 13:37	4/27/2012 13:38	1.78	1.74	2939	3000	230	30	0	8	955.04	586.85				
4/27/2012 13:38	4/27/2012 13:39	1.79	1.81	2939	3000	230	30	0	8	955.03	586.86				
4/27/2012 13:39	4/27/2012 13:40	1.79	1.79	2939	3000	230	30	0	8	955.02	586.86				
4/27/2012 13:40	4/27/2012 13:41	1.79	1.81	2939	3000	230	30	0	8	955.02	586.87				
4/27/2012 13:41	4/27/2012 13:42	1.79	1.77	2939	3000	230	30	0	8	955.02	586.87				
4/27/2012 13:42	4/27/2012 13:43	1.79	1.78	2939	3000	230	30	0	8	955.02	586.88				
4/27/2012 13:43	4/27/2012 13:44	1.80	1.87	2939	3000	230	30	0	8	955.01	586.89				
4/27/2012 13:44	4/27/2012 13:45	1.80	1.75	2939	3000	230	30	0	8	955.07	586.89				
4/27/2012 13:45	4/27/2012 13:46	1.80	1.86	2939	3000	230	30	0	8	955.37	586.90				
4/27/2012 13:46	4/27/2012 13:47	1.80	1.85	2939	3000	230	30	0	8	955.66	586.90				
4/27/2012 13:47	4/27/2012 13:48	1.80	1.85	2939	3000	230	30	0	8	955.74	586.91				
4/27/2012 13:48	4/27/2012 13:49	1.81	1.84	2939	3000	230	30	0	8	955.81	586.92				
4/27/2012 13:49	4/27/2012 13:50	1.81	1.84	2939	3000	230	30	0	8	955.85	586.92				
4/27/2012 13:50	4/27/2012 13:51	1.81	1.80	2939	3000	230	30	0	8	955.58	586.93				
4/27/2012 13:51	4/27/2012 13:52	1.81	1.79	2939	3000	230	30	0	8	955.24	586.93				
4/27/2012 13:52	4/27/2012 13:53	1.81	1.79	2939	3000	230	30	0	8	955.30	586.94				
4/27/2012 13:53	4/27/2012 13:54	1.81	1.83	2939	3000	230	30	0	8	955.31	586.94				
4/27/2012 13:54	4/27/2012 13:55	1.82	1.86	2939	3000	230	30	0	8	955.12	586.95				
4/27/2012 13:55	4/27/2012 13:56	1.82	1.94	2939	3000	230	30	0	8	955.12	586.95				
4/27/2012 13:56	4/27/2012 13:57	1.82	1.93	2939	3000	230	30	0	8	955.00	586.96				
4/27/2012 13:57	4/27/2012 13:58	1.82	1.91	2939	3000	230	30	0	8	955.22	586.97				
4/27/2012 13:58	4/27/2012 13:59	1.82	1.98	2939	3000	230	30	0	8	955.39	586.97				
4/27/2012 13:59	4/27/2012 14:00	1.83	2.00	2939	3000	230	30	0	8	955.02	586.98				
4/27/2012 14:00	4/27/2012 14:00	1.83	2.00	2939	3000	230	30	0	8	954.88	586.98				
4/27/2012 14:00	4/27/2012 14:00	1.83	2.00	2939	3000	230	30	0	8	954.88	586.99				

PROTOCOL

I

I hereby certify that all pages contained within this Appendix have been reviewed and, to the best of my ability, verified as accurate.

QA/QC Initials: KRO

Date: 6/12/2012



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Marathon Petroleum Company
1300 South Fort Street
Detroit, MI 48217

**PROTOCOL FOR COMPLIANCE AND DIAGNOSTIC PARTICULATE
MATTER TESTING**

Prepared for:
MARATHON PETROLEUM COMPANY
PARTICULATE MATTER STUDY – PHASE 10
TENTATIVE TEST DATE: WEEK OF APRIL 23, 2012

**FCCU STACK
DETROIT REFINERY**

Client Reference No: SS166919
CleanAir Project No: 11423-3
Revision 0: February 13, 2012

To the best of our knowledge, the test plan and any state and federal regulations presented in this protocol have met all pre-determined program requirements. Modifications to the test plan or methodology presented in this original protocol will be performed only at the discretion of CleanAir and in accordance with all applicable parties involved. CleanAir operates in conformance with the requirements of ASTM D7036-04 Standard Practice for Competence of Air Emission Testing Bodies.

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REVISION HISTORY

ii

PROTOCOL FOR COMPLIANCE AND DIAGNOSTIC PARTICULATE MATTER TESTING

DRAFT PROTOCOL REVISION HISTORY

Revision:	Date	Pages	Comments
D0a	02/06/2012	All	Draft version of original document.

FINAL PROTOCOL REVISION HISTORY

Revision:	Date	Pages	Comments
0	02/13/2012	All	Final version of original document.

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PROJECT OVERVIEW

1-1

INTRODUCTION

Marathon Petroleum Company (MPC) contracted Clean Air Engineering (CleanAir) to perform particulate matter and ammonia testing at its facility, located in Detroit, Michigan, for compliance and diagnostic purposes. This will be the tenth test mobilization for the Fluid Catalytic Cracking Unit (FCCU) particulate matter study.

All testing will be conducted in accordance with the regulations set-forth by the United States Environmental Protection Agency (EPA) and the Michigan Department of Environmental Quality (MDEQ). These regulations are referenced in EPA Title 40 of the Code of Federal Regulations, Part 60, (40 CFR 60) Subpart J.

Project Objectives

The primary goal of the test program is to determine if the facility is in compliance with the particulate emission limit for the FCCU specified in the New Source Performance Standard (NSPS), Subpart J, during maximum operating capacity.

The secondary goals are:

- to determine the maximum operating capacity of the FCCU with reduced ESP operation that is compliant with particulate emission limits; and
- to collect additional diagnostic condensable particulate matter (CPM), ammonia (NH_3) and hydrogen cyanide (HCN) data at the FCCU Stack.

Key Project Participants

Individuals responsible for coordinating and conducting the test program are listed in Table 1-1.

Table 1-1:
Project Contact Information

Client Contact	CleanAir Contact
Tabetha Daum Marathon Petroleum Company Detroit Refinery 1300 South Fort Street Detroit, MI 48217 Phone: 313-297-4701 Email: TLDaum@marathonpetroleum.com	Kevin O'Halloren Clean Air Engineering Midwest Engineering Group 500 West Wood Street Palatine, IL 60067 Phone: 847-654-4661 Email: kohalloren@cleanair.com

PROJECT OVERVIEW

1-2

SCOPE OF WORK

Test Program Parameters

The testing will be performed at the FCCU Stack and is tentatively scheduled to occur on Tuesday, April 24 through Friday, April 27, 2012. The primary test parameters will be:

- non-sulfate filterable particulate matter (NSFPM)
- flue gas flow rate
- flue gas velocity decay (wall effects)

The following secondary test parameters will also be determined at the FCCU Stack:

- condensable particulate matter (CPM)
- ammonia (NH₃)
- hydrogen cyanide (HCN)
- flue gas composition and moisture content (O₂, CO₂, H₂O)
- flue gas temperature

Test Schedule

The anticipated test schedule is outlined in Table 1-2 on this page and the following page.

**Table 1-2:
Schedule of Activities**

Day	Date (2012)	Activity	Location	Start Time ¹	Stop Time ¹	Run Number	Method (USEPA)	Analyte(s)	Sampling Time (min)
0	4/22 (Sun)	Mobilization		12:00	18:00				
1	4/23 (Mon)	Vehicle Passes	Toronto Gate	08:00	08:30				
		Equipment Setup ²	FCCU Stack	08:30	16:30				
2	4/24 (Tue)	Equipment Setup	FCCU Stack	06:30	07:00				
		Condition 1 Testing		07:00	07:30	1	M-2H	Velocity Decay	~ 30
				08:00	09:30	1	M-5F/202	NSFPM/CPM	60
				08:00	09:30	1	M-2F	3-D Flow	~ 60
				08:00	09:00	1	Mod. CTM-027	NH ₃	60
		Sample Recovery		09:30	10:30				
		Condition 1 Testing		10:30	12:00	2	M-5F/202	NSFPM/CPM	60
				10:30	12:00	2	M-2F	3-D Flow	~ 60
				10:30	11:30	2	Mod. CTM-027	NH ₃	60
		Sample Recovery		12:00	13:00				
		Condition 1 Testing		13:00	14:30	3	M-5F/202	NSFPM/CPM	60
				13:00	14:30	3	M-2F	3-D Flow	~ 60
				13:00	14:00	3	Mod. CTM-027	NH ₃	60
		Sample Recovery		14:30	15:00				
		Cleanup		15:00	16:00				

¹ Start and stop times estimated.

² Assistance from electrician requested at specified location and start time.

PROJECT OVERVIEW

1-3

**Table 1-2 (Continued):
Schedule of Activities**

Day	Date (2012)	Activity	Location	Start Time ¹	Stop Time ¹	Run Number	Method (USEPA)	Analyte(s)	Sampling Time (min)
3	4/25 (Wed)	Equipment Setup	FCCU Stack	06:30	07:00				
		Condition 2 Testing		07:00	07:30	2	M-2H	Velocity Decay	~ 30
				08:00	09:30	4	M-5F/202	NSFPM/CPM	60
				08:00	09:30	4	M-2F	3-D Flow	~ 60
				08:00	09:00	4	Mod. CTM-027	NH ₃	60
		Sample Recovery		09:30	10:30				
		Condition 2 Testing		10:30	12:00	5	M-5F/202	NSFPM/CPM	60
				10:30	12:00	5	M-2F	3-D Flow	~ 60
				10:30	11:30	5	Mod. CTM-027	NH ₃	60
		Sample Recovery		12:00	13:00				
		Condition 2 Testing		13:00	14:30	6	M-5F/202	NSFPM/CPM	60
				13:00	14:30	6	M-2F	3-D Flow	~ 60
				13:00	14:00	6	Mod. CTM-027	NH ₃	60
		Sample Recovery		14:30	15:00				
		Cleanup		15:00	16:00				
4	4/26 (Thu)	Equipment Setup	FCCU Stack	06:30	07:00				
		Condition 3 Testing		07:00	07:30	3	M-2H	Velocity Decay	~ 30
				08:00	09:30	7	M-5F/202	NSFPM/CPM	60
				08:00	09:30	7	M-2F	3-D Flow	~ 60
				08:00	09:00	7	Mod. CTM-027	NH ₃	60
		Sample Recovery		09:30	10:30				
		Condition 3 Testing		10:30	12:00	8	M-5F/202	NSFPM/CPM	60
				10:30	12:00	8	M-2F	3-D Flow	~ 60
				10:30	11:30	8	Mod. CTM-027	NH ₃	60
		Sample Recovery		12:00	13:00				
		Condition 3 Testing		13:00	14:30	9	M-5F/202	NSFPM/CPM	60
				13:00	14:30	9	M-2F	3-D Flow	~ 60
				13:00	14:00	9	Mod. CTM-027	NH ₃	60
		Sample Recovery		14:30	15:00				
		Cleanup		15:00	16:00				
5	4/27 (Fri)	Equipment Setup	FCCU Stack	06:30	07:00				
		Condition 3 Testing		07:00	07:30	4	M-2H	Velocity Decay	~ 30
				08:00	09:30	10	OTM-29	HCN	60
				08:00	09:30	10	M-2F	3-D Flow	~ 60
				08:00	09:00	10	Mod. CTM-027	NH ₃	60
		Sample Recovery		09:30	10:30				
		Condition 3 Testing		10:30	12:00	11	OTM-29	HCN	60
				10:30	12:00	11	M-2F	3-D Flow	~ 60
				10:30	11:30	11	Mod. CTM-027	NH ₃	60
		Sample Recovery		12:00	13:00				
		Condition 3 Testing		13:00	14:30	12	OTM-29	HCN	60
				13:00	14:30	12	M-2F	3-D Flow	~ 60
				13:00	14:00	12	Mod. CTM-027	NH ₃	60
		Sample Recovery		14:30	15:00				
		Cleanup		15:00	16:00				
6	4/28 (Sat)	Equipment Breakdown ²	FCCU Stack	08:00	12:00				
		Demobilization		12:00	18:00				

¹ Start and stop times estimated.

² Assistance from electrician requested at specified location and start time.

PROJECT OVERVIEW

1-4

Emissions Limit Summary

Table 1-3 summarizes the emission standards, emission limit, reference methods and source of data relevant to the upcoming test program.

**Table 1-3:
Summary of Emission Limits**

<u>Emission Standard - Referenced Method(s)</u>	Emission Limit
Source of Data	(lb/Mlb coke burn)
<u>NSPS Subpart J / NSR (Method 5F)</u>	
NSFPM from Method 5F	0.8

General Considerations

Identical testing will be conducted at the FCCU Stack during each test condition. The test condition will be specifically defined by the following operating parameters:

- FCCU charge rate (barrels per day, or BPD)
- Coke burn rate (lb coke burn /hr or 1000 lb coke burn/hr)
- NH₃ injection rate (lb/hr)
- ESP operation (identification of ESP bays on-line or off-line during testing)

Condition 3 has been arbitrarily defined in this document as the test condition with the maximum FCCU charge rate. Sampling will occur over two (2) days to allow for HCN to be added to the test matrix (for this condition only). However, the actual date of the test condition with the maximum FCCU charge rate is subject to change.

Process Data and Samples

MPC will be responsible for collecting relevant process data over the time period of each sample run which will include:

- Coke burn rates in units of lb coke burn/hr;
- FCCU charge rates in units of bpd; and
- ESP operational data.

Mobilization, Safety Orientation, and Equipment Set-up

It is assumed that all members of the test crew will be current with the site-specific safety orientation requirements for the facility and will not require recertification.

PROJECT OVERVIEW

1-5

The entire test crew will mobilize to the Detroit area on Sunday of the selected test week. On Monday, the crew will arrive at the East Plant (Toronto Gate) at 8:00 AM to meet with the on-site representative and to obtain a vehicle pass for the truck and test trailer. They will then drive to the West Plant (Dix Gate) to obtain a work permit from the Complex 3 control room prior to initiating equipment set-up.

The trailer will be staged near the base of the FCCU Stack and made ready to be hooked up to a 480-V, single-phase power supply with the help of a facility electrician around 8:30 AM. Detailed electrical wiring instructions for wiring CleanAir trailers are included in Appendix C.

The process of equipment set-up and taking preliminary measurements at the FCCU Stack is anticipated to be completed on Monday evening. Assistance from facility personnel with initial opening of sample ports and cleaning out of accumulated debris is requested on Monday afternoon.

Testing

Testing will ideally commence on Tuesday morning of the selected test week. Work permits will be obtained daily prior to initiating any work.

Final results for all test methods will be based on the average of three (3) valid test runs, save for M-2H where one (1) test will be performed prior to testing (See Section 3 for more details). The validity of individual runs will be evaluated in the field on the acceptability criteria specified in the individual test methodology and will include:

- post-test leak rates below method specifications and
- sampling rates within the isokinetic range specifications.

Equipment Breakdown and Demobilization

Completion of the test program is estimated to occur on Friday of the selected test week, at around 4:00 PM. Once all test runs are confirmed as valid, CleanAir will begin equipment breakdown. CleanAir will replace all sample port covers and secure bolts to a “snug” level of tightness using wrenches.

The CleanAir test trailer will require power until sample recovery is completed. Barring any unforeseen delays, this is estimated to be completed at 6:00 PM on Friday. Assistance with powering down the test trailer from a facility electrician is requested at this approximate time.

End of Section 1 – Project Overview

DESCRIPTION OF INSTALLATION

2-1

PROCESS DESCRIPTION

MPC's facility in Detroit, Michigan, produces refined petroleum products from crude oil. The FCCU utilizes a primary reactor, a distillation column and a catalyst regeneration unit to continuously generate light hydrocarbon products from heavy crude oil feeds.

The FCCU is equipped with an ESP with two (2) bays and variable aqueous NH₃ injection to control emissions. The testing described in this document will be performed at the FCCU Stack.

DESCRIPTION OF SAMPLING LOCATIONS

Sampling point locations have been previously determined according to EPA Methods 1 and 2H, where applicable.

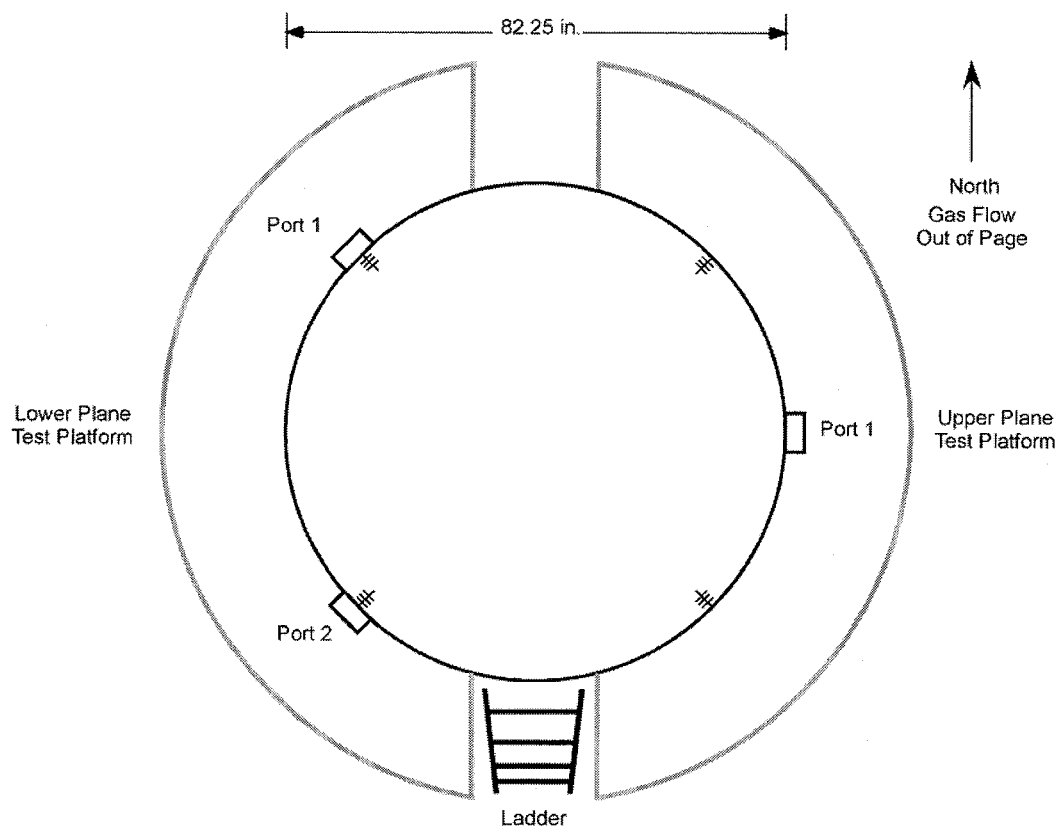
Table 2-1 outlines the sampling point configurations. Figures 2-1 through 2-3 (on pages 2-2 through 2-4) illustrate the sampling points and orientation of sampling ports for the locations to be sampled during the test program.

**Table 2-1:
Sampling Points**

<u>Source</u>							
Constituent	Method (USEPA)	Run No.	Ports	Points per Port	Minutes per Point	Total Minutes	Figure
<u>FCCU Stack</u>							
Velocity Decay	M-2H	1	2	6	Varied	Varied	2-1
NSFPM / CPM	M-5F/202	1-3	2	12	2.5	60	2-2
3-D Flow	M-2F	1-3	2	12	~ 2.5	~ 60	2-2
HCN	OTM-29	1-3	2	12	~ 2.5	~ 60	2-2
NH ₃	Mod. CTM-027	1-3	1	1	60	60	2-3

DESCRIPTION OF INSTALLATION

2-2



Note: Ports on the lower plane were used for these points.

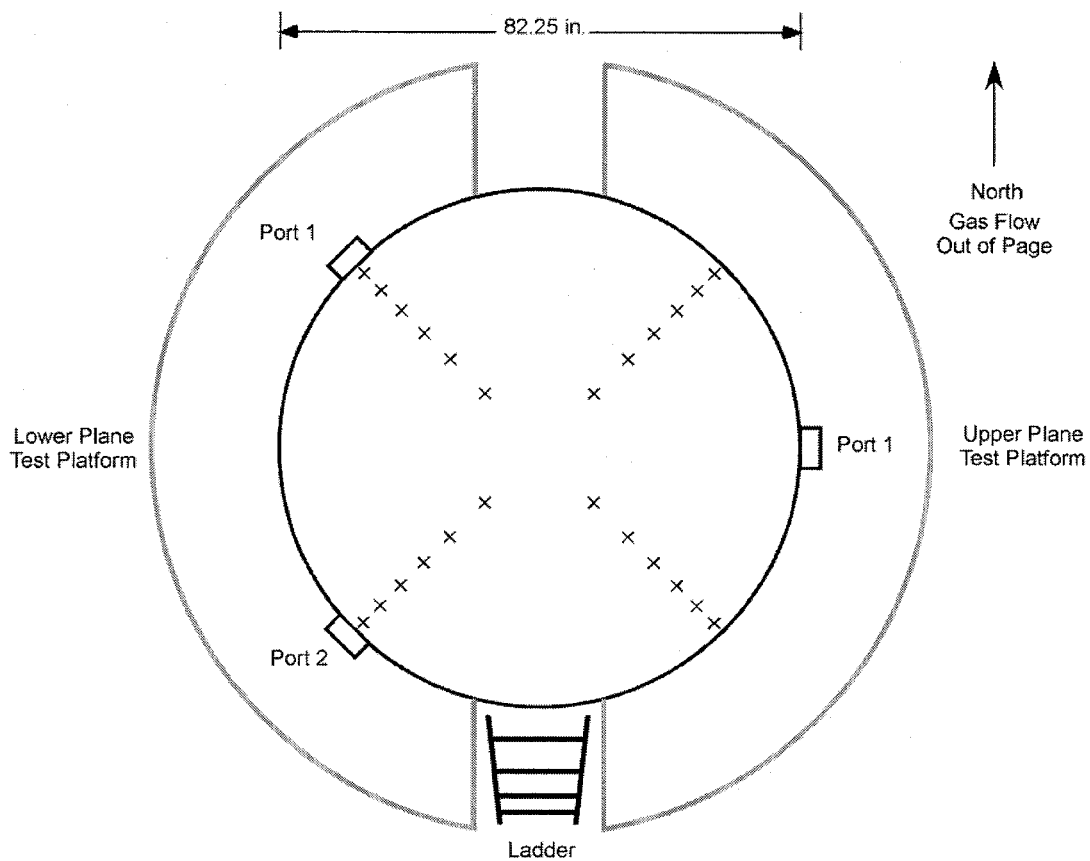
<u>Sampling Point</u>	<u>Port to Point Distance (in.)</u>
1	81.25
2	80.25
3	79.25
4	3.0
5	2.0
6	1.0

Duct diameters upstream from flow disturbance (A):	2.2	Limit: 0.5
Duct diameters downstream from flow disturbance (B):	3.4	Limit: 2.0

Figure 2-1: FCCU Stack Sampling Points (EPA M-2H)

DESCRIPTION OF INSTALLATION

2-3



Note: Ports on the lower plane will be used for these points.

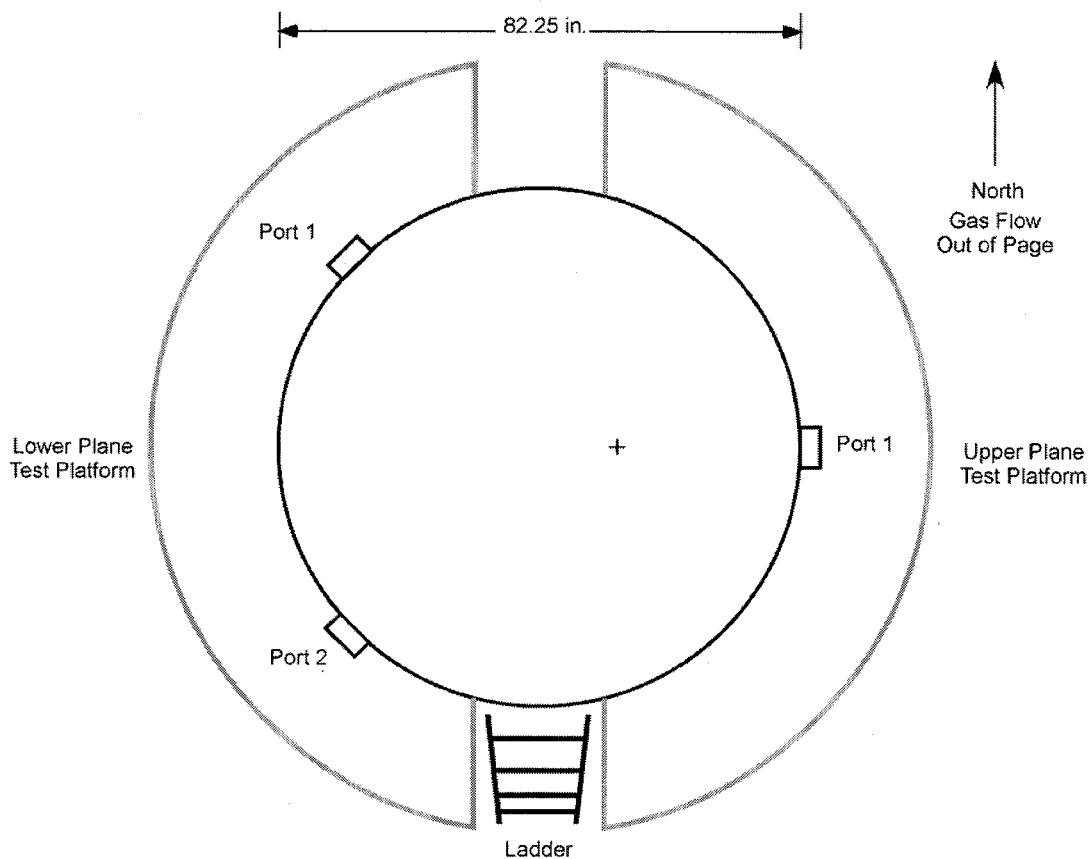
<u>Sampling Point</u>	<u>Port to Point Distance (in.)</u>
1	80.5
2	76.7
3	72.5
4	67.7
5	61.7
6	53.0
7	29.3
8	20.6
9	14.6
10	9.7
11	5.5
12	1.7

Duct diameters upstream from flow disturbance (A):	2.2	Limit: 0.5
Duct diameters downstream from flow disturbance (B):	3.4	Limit: 2.0

Figure 2-2: FCCU Stack Sampling Points (EPA M-5F/202, M-2F, and OTM-29)

DESCRIPTION OF INSTALLATION

2-4



Note: The port on the upper plane will be used for this point.

<u>Sampling Point</u>	<u>Approximate Port to Point Distance (in.)</u>	
1	36.0	
Duct diameters upstream from flow disturbance (A):	2.2	Limit: 0.5
Duct diameters downstream from flow disturbance (B):	3.4	Limit: 2.0

Figure 2-3: FCCU Stack Sampling Points (EPA Mod. CTM-027)

End of Section 2 – Description of Installation

METHODOLOGY

3-1

Clean Air Engineering will follow or reference procedures as detailed in EPA Methods 1, 2, 2F, 2H, 3, 3A, 4, 5F, 202, Conditional Test Method (CTM) 027, Alternative Method (ALT) 031, and Other Test Method (OTM) 29. The following table summarizes the methods and their respective sources.

**Table 3-1:
Summary of Sampling Procedures**

Title 40 CFR Part 60 Appendix A

Method 1	"Sample and Velocity Traverses for Stationary Sources"
Method 2	"Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)"
Method 2F	"Determination of Stack Gas Velocity And Volumetric Flow Rate with Three-Dimensional Probes"
Method 2H	"Determination of Stack Gas Velocity Taking into Account Velocity Decay near the Stack Wall"
Method 3	"Gas Analysis for the Determination of Dry Molecular Weight"
Method 3A	"Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)"
Method 4	"Determination of Moisture Content in Stack Gases"
Method 5F	"Determination of Nonsulfate Particulate Matter Emissions from Stationary Sources"

Title 40 CFR Part 51 Appendix M

Method 202	"Dry Impinger Method for Determining Condensable Particulate Emissions from Stationary Sources"

Conditional Test Methods (CTM)

CTM-027	"Procedure for Collection and Analysis of Ammonia in Stationary Sources"

Alternative Methods

ALT-031	"Approval of Method 2F, 2G and 2H as alternatives to Method 2 in 40 CFR Part 60, 61, or 63"

Other Test Methods

OTM-29	"Sampling and Analysis for Hydrogen Cyanide Emissions from Stationary Sources"

These methods appear in detail in Title 40 of the Code of Federal Regulations (CFR) and on the World Wide Web at <http://ecfr.gpoaccess.gov>.

Diagrams of the sampling apparatus and major specifications of the sampling, recovery and analytical procedures are summarized for each method in Appendix A.

CleanAir will follow specific quality assurance and quality control (QA/QC) procedures as outlined in the individual methods and as prescribed in CleanAir's internal Quality Manual.

METHODOLOGY

3-2

NSFPM/CPM Testing – FCCU Stack

Three (3) 60-minute non-sulfate filterable particulate matter/condensable particulate matter (NSFPM/CPM) test runs will be performed per EPA Method 5F/202 at the FCCU Stack during each condition. The front-half (M-5F portion) of the sampling train will consist of a glass nozzle, liner and filter holder heated to 320°F. Samples will be collected isokinetically; nozzle and probe liner recoveries will be performed using de-ionized water (DI H₂O) as the recovery solvent.

Method 202 will be used as the back-half of the sample train to determine condensable particulate matter (CPM). M-202 is typically paired with EPA Method 5 (or equivalent) to remove FPM in the front-half of the sample train prior to measurement in the impinger train.

The method is designed to mimic ambient conditions and collect only the particles that would truly form CPM in the atmosphere by minimizing the sulfur dioxide (SO₂) and nitrogen oxide (NO_x) interferences observed with earlier versions of this method, where flue gas containing these compounds was bubbled through cold water and SO₂/NO_x was absorbed and partially oxidized before it could be purged out with nitrogen (N₂).

After passing through the front half (M-5F) portion of the sample train, the flue gas passes through a coiled condenser and dry impinger system jacketed by water continually circulated at ambient temperature. Moisture is removed from the flue gas, but does not bubble through the condensed water. Flue gas then passes through a Teflon membrane filter at ambient temperature. The temperature of the flue gas at the exit of the filter is directly measured with an in-line thermocouple and maintained in the temperature range of 65 to 85°F.

After exiting the ambient filter, the flue gas will pass through two (2) additional impingers surrounded by ice in a “cold” section of the impinger bucket. The moisture collected in these impingers is not analyzed for CPM and is only collected to more accurately determine flue gas moisture and thoroughly dry the gas prior to the metering device.

The front-half portion of the sample train (nozzle, probe and heated filter) will be recovered per M-5F requirements; the back-half of the sample train (heated filter outlet, condenser, dry impingers and TFE membrane filter) will be recovered per M-202 requirements. The impinger train will be purged with nitrogen (N₂) at a rate of 14 liters per minute (lpm) for one (1) hour following each test run and prior to recovery.

METHODOLOGY

3-3

A field train blank will be assembled, purged and recovered as if it were an actual test sample. Reagent blanks will be collected to quantify background contamination. Samples and blanks will be returned to CleanAir Analytical Services for gravimetric analysis. M-202 samples will be maintained at a temperature <85°F during transport to the laboratory.

NSFPM and CPM emission results will be calculated in units of pounds per hour (lb/hr) and pounds per 1000 pounds of coke burn (lb/Mlb coke burn). The final result for each condition will be equivalent to the average of three (3) valid runs.

3-D Flow Testing – FCCU Stack

Sample flow rates as determined by EPA Method 2 (performed as part of each M-5F/202 test) will be used to calculate isokinetic sampling conditions. However, sample flow rates used to calculate emission results will be obtained by EPA Method 2F traverses. This method is used to correct a high flow bias that occurs in M-2 in the presence of swirling gas flow.

A three-dimensional (3-D) traverse will be performed concurrently with each M-5F/202 test at the FCCU Stack, and the flow results will be compared.

Using flow data from M-2F in place of Method 2 flow data has been approved by the EPA in Alternative Method 031 for test methods in any subpart to 40 CFR Part 60, 61 or 63, where M-2 is the specified flow rate measurement method.

Wall Effects Determination – FCCU Stack

To account for flue gas velocity decay near the stack walls, a wall-effect adjustment factor will be determined per EPA Method 2H at the FCCU Stack prior to M-5F/202 Run 1.

The method contains a calculation procedure, which derives an adjustment factor from velocity measurements, and a default procedure, which assigns a generic adjustment factor based on the construction of the stack or duct. A Type-S pitot tube will be used to make velocity measurements. Based on the results, the minimum acceptable wall-effect adjustment factor will be used to correct the 3-D flow rate measurements made during the test program.

Velocity correction using M-2H has also been approved by the EPA in Alternative Method 031 for test methods in any subpart to 40 CFR Part 60, 61 or 63, where Method 2 is the specified flow rate measurement method.

METHODOLOGY

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NH₃ Testing – FCCU Stack

NH₃ emissions will be quantified at the FCCU Stack for diagnostic purposes by performing three (3) 60-minute test runs of a modified version of EPA Conditional Test Method (CTM) 027 during each test condition. These runs will be performed at an isokinetic sampling rate near the center of the stack and concurrent with the other test runs.

The front-half of the sampling train will consist of a glass nozzle and in-stack glass filter holder assembly packed with quartz wool as a filter media. After passing through the nozzle and the quartz filter media, the flue gas will pass through a heated glass lined sample probe, followed by a standard CTM-027 impinger train designed to collect NH₃. Any connecting components between the sample probe and impinger train will be composed of glass or tetrafluoroethylene (TFE).

The front-half assembly will not be recovered or analyzed, as gaseous NH₃ should pass through the assembly without reacting or changing state. The glass liner and connecting components will be rinsed and recovered in one (1) sample fraction; the impinger train will be rinsed and recovered in a second sample fraction. Results from both fractions will be added together for a single analytical result for each run.

The following is a summary of the deviations that will be made from official test methodology and their anticipated effect, if any, on the final results:

- CTM-027 officially requires a traverse of the entire stack with isokinetic sampling; while the modified method involves isokinetic sampling at a single point. Given the gaseous state of NH₃ at flue gas temperatures and the absence of free water droplets in the flue gas, results from a single-point isokinetic sampling at a central point should correlate reasonably well with any future CTM-027 sampling performed while traversing the entire stack.
- Instead of heating the probe to a temperature at or above flue gas temperature, the probe will be heated to a temperature sufficient to prevent condensation in the probe liner. The probe liner will be rinsed and recovered for each run.
- The entire impinger train will be recovered and analyzed as one (1) sample fraction rather than analyzing each of the three (3) impingers separately. Previous experience has shown that 0.1 N H₂SO₄ readily absorbs NH₃, and no significant breakthrough is anticipated at the NH₃ levels of interest for this test program.

NH₃ results will be expressed in units of dry parts per million (ppmdv) and lb/Mlb coke burn.

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HCN Testing – FCCU Stack

HCN emissions will be determined using OTM-29 and an isokinetic, multi-point sample train. The sampling system will consist of a nozzle, heated probe, heated quartz filter, impinger train (for HCN collection and H₂O removal/measurement) and a dry gas meter. The HCN-collecting impingers will be charged with 6.0 N sodium hydroxide (NaOH) solution.

OTM-29 calls for the use of multiple Greenburg-Smith impingers with the standard (restricted) stems. In practice, the 6.0 N NaOH absorbing solution in the impingers forms a slurry (and occasionally solidifies) as it absorbs carbon dioxide (CO₂) from the flue gas. This can cause complete plugging of the impinger train and severely delay testing. In order to reduce the chance of plugging, all impinger stems will instead be of the modified Greenburg-Smith (unrestricted stem) design.

The sampling system will traverse all of the M-1 points during each run. A maximum volume of 0.9 dry standard cubic meters (dscm), or 31.8 dry standard cubic feet (dscf), will be sampled during each 1-hour run. The pH in the final impinger containing absorbing solution will be shown to be maintained >12.0 throughout the test using alizarin yellow indicator solution.

Per OTM-29, CO₂ concentration in the stack and at the outlet of the dry gas meter must be measured continuously throughout the test runs. Continuous CO₂ measurements will be obtained in a simplified manner by collecting two (2) integrated gas samples continuously throughout each run. One (1) sample will be collected from the meter exhaust of the OTM-29 sample train (which is known to scrub CO₂); the other sample will be collected from the meter exhaust of a nearly-concurrent CTM-027 sample train (which does not scrub CO₂). This data will be used to correct the meter volumes when calculating the final results.

The front-half portion of the sample train (nozzle, probe and heated filter) will not be recovered or analyzed. Per the method, the back-half of the heated filter outlet will also not be recovered or analyzed. Prior to recovery, the pH of each impinger preceding the final impinger will be measured and adjusted to > 12.0 if necessary. The impinger fractions will then be recovered per the method (Impingers #1 and #2 recovered together, Impinger #3 recovered separately).

METHODOLOGY

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A field train blank will be assembled, transported to the location, heated, leak-checked and recovered as if it were an actual test sample. A field spike sample will be performed by introducing a spike standard into a single impinger containing absorbing reagent and recovering the impinger following standard procedures. Reagent blanks will be collected to quantify background contamination. All samples will be stored under refrigeration or cold packs prior to analysis.

Samples and blanks will be shipped to Enthalpy Analytical in Durham, North Carolina, who performed the analysis. The sample fractions will be filtered, pre-concentrated and analyzed for CN⁻ using ion chromatography (IC).

Sample Gas Molecular Weight Determination – FCCU Stack

Sample gas molecular weight will be determined using a hybrid of EPA Method 3 and 3A. A paramagnetic/IR analyzer will be used in place of a traditional Orsat analyzer to determine oxygen (O₂) and carbon dioxide (CO₂) concentrations of an integrated gas sample collected during each Method 5F/202 and modified CTM-027 run.

Documentation of preliminary instrument calibrations and post analysis calibration checks will be included in the appendices of the final report.

To determine the moisture content of the flue gas, the weight gain of all sample train components (ambient impingers, sample train knock-out jars and purge knock-out jars) will be measured gravimetrically.

End of Section 3 – Methodology

APPENDIX

4-1

TEST METHOD SPECIFICATIONS	A
SAMPLE CALCULATIONS	B
TRANSFORMER ELECTRICAL WIRING INSTRUCTIONS	C

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