42-079-00014

UGI Development Company

390 Route 11
P.O. Box 224
Hunlock Creek, PA 18621-0224
(570) 830-1269

County:
SEP 22 2008
Facility:
Permit:
File #:

September 19, 2008

Mr. Norm Frederick
PA Department of Environmental Protection
Northeast Regional Office
2 Public Square
Wilkes-Barre, PA 18711-0790

RE: UGI DEVELOPMENT COMPANY
HUNLOCK POWER STATION
BOILER NO. 6 TEOM TEST RESULTS

Dear Mr. Frederick,

UGI Development Company, Hunlock Power Station is submitting, in duplicate, the TEOM Test results as required by the PA DEP. The results show the particulate emissions are well below the permit emission limit of 0.1 lbs./MBTU for Boiler No. 6. Also under the full range of Boiler Operations (high, mid and low) the data fully supports an opacity limit of 30%.

If you should have any questions, please don't hesitate to call me at (570) 830-1267.

Sincerely,

Jeffrey T. Steeber

Jeffrey T. Steeber
Staff Engineer
Hunlock Power Station

JTS:chet

Enclosure

CATALYST
AIR MANAGEMENT, INC.

STATEMENT OF VALIDITY

UGI Development Company
Catalyst Report 124-037
September 3, 2008

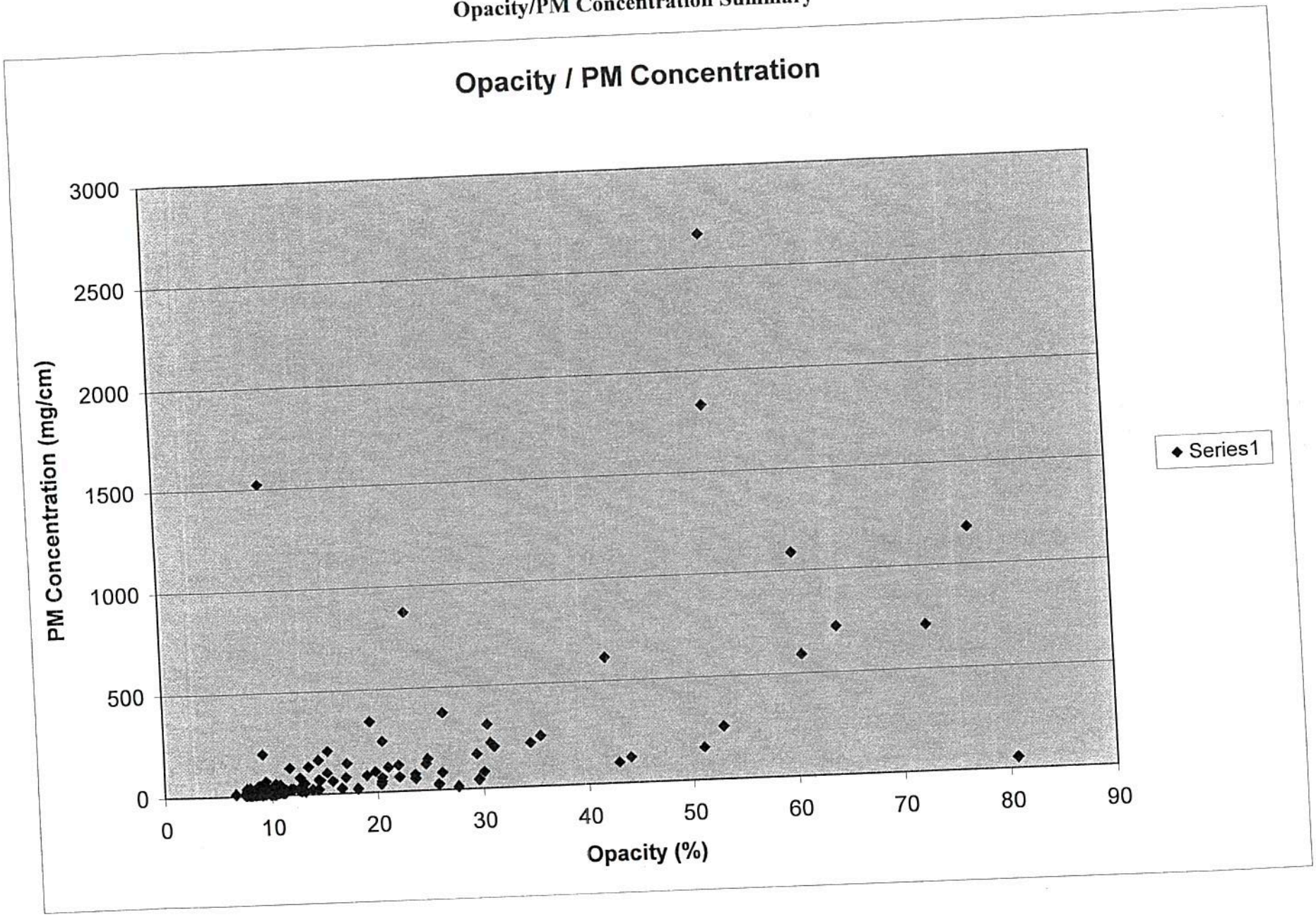
To the extent practical, information and data provided in this test report has been verified as true and correct.

To the best of our knowledge the source test report has been checked for completeness and the results presented therein are accurate, error-free, legible, and representative of the actual emissions measured during the testing.

Michael J. Taylor
Catalyst Air Management, Inc. - Principal
2505 Byington-Solway Road
Knoxville, TN 37931
(865) 531-0075

Jeff Steeber
UGI Development Company
Hunlock Station
PO Box 224
Hunlock Creek, PA 18621
(570) 830-1267

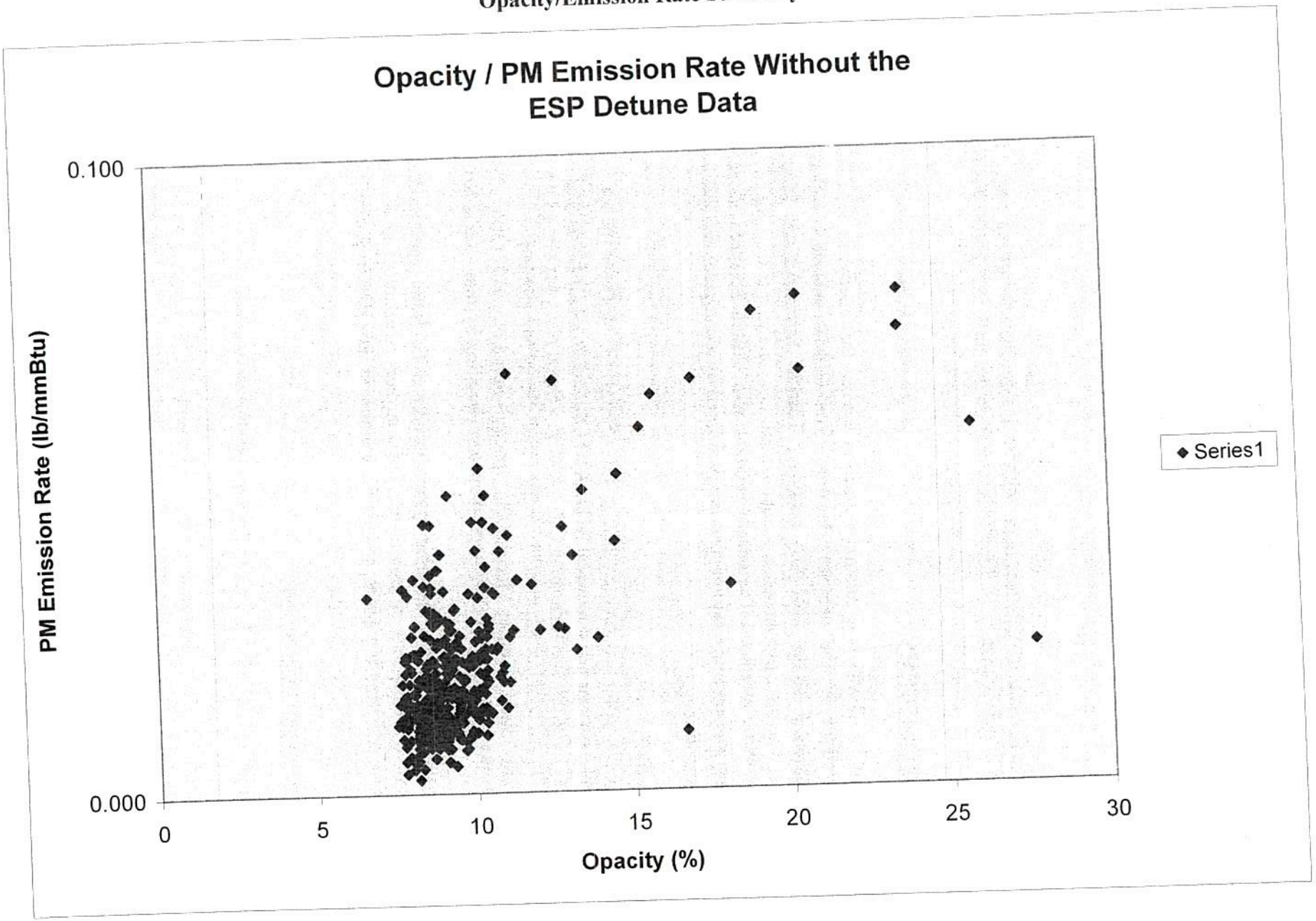
TABLE 2
Opacity/PM Concentration Summary



PROJECT SUMMARY

NAME OF SOURCE OWNER:	UGI Development Company
SOURCE IDENTIFICATION:	Hunlock Station Unit 6
LOCATION OF SOURCE:	Route 11, PO Box 224 Hunlock Creek, PA 18621
TYPE OF OPERATION:	Coal Fired Utility Steam Generator
TYPES OF TESTS PERFORMED:	Sample Traverse-EPA Method 1 Volumetric Flow Rate-EPA Method 2F Oxygen/Carbon Dioxide-EPA Method 3A Particulate-ASTM D6831-02
SOURCE ANALYZERS:	Air Monitor Mastron Electronic Flow - B26354 Thermo Environmental SO_2 - 43C-69110-362 Thermo Environmental NOx - 42C-69062-362 Thermo Environmental CO_2 - CHL-68209-359 United Sciences Model 500C Opacity VIM Technologies DAHS - 14787WIN
TEST COMPANY:	Catalyst Air Management, Inc. 10 Mill Road Morgantown, PA 19543 PA Lab Registration Number 6-3118 Mike Taylor - President (865) 531-0075
SITE SUPERVISOR:	Jeff Ferguson - Principal
TEST PERSONNEL:	Dustin Urban - Technician Jack McKeever - Clean Air Engineering
TEST DATE:	May 1, 2008
OWNERS REPRESENTATIVE:	Jeff Steeber
TEST OBSERVER:	Darren Lauer – PADEP

TABLE 3.1
Opacity/Emission Rate Summary



ASTM D6831-02 Standard Test Method for Sampling and Determining Particulate Matter in Stack Gases Using an In-Stack, Inertial Microbalance

6.1 Volumetric Flow Rate - EPA Method 2F

A three (3) load flow RATA on April 29 and 30, 2008 prior to the TEOM testing. The flow data was used to determine a representative point using average velocity for each load to perform the TEOM testing. The TEOM probe was positioned at Point D-3 located 22.1 inches from the stack wall.

The velocity and volumetric flow rate was determined in accordance with procedures outlined in EPA Method 2F. A DAT Prism 3-D probe was connected to a series of calibrated magnehelics and manometers to determine the yaw and pitch angles, static pressure and pitch coefficient of the flue gas at each traverse point. The temperature of the flue gas was also determined at each traverse point. Ten (10) flow relative accuracy runs were conducted at the high load condition. Nine (9) were conducted at the mid and low load conditions.

6.1 TEOM 7000

The TEOM testing was performed continuously from 0700 to 1400 hours. The TEOM sample time was synchronized with the Unit 6 CEMS time prior to starting. The testing was performed with the unit operating at full load steady state conditions, full load with ESP T-R sets manually de-energized to create elevated opacity conditions, load changing, mid and low loads.

The TEOM was configured to utilize an averaging time of 60 seconds. A discussion of the test configuration is included in Appendix 5.

7.0 Operating Conditions

Operating conditions were monitored throughout the duration of the sampling program by UGI personnel. The testing was performed May 1, 2008 as follows:

TABLE 4
Operating Summary

Load	Conditions	MW	Date	Duration
High	Steady State	45	5/1/08	120 mins
High	ESP Detune	45	5/1/08	60
Mid	Steady State	35	5/1/08	60
Low	Steady State	25	5/1/08	60

APPENDIX 1

3D VELOCITY PROFILE

APPENDIX 2

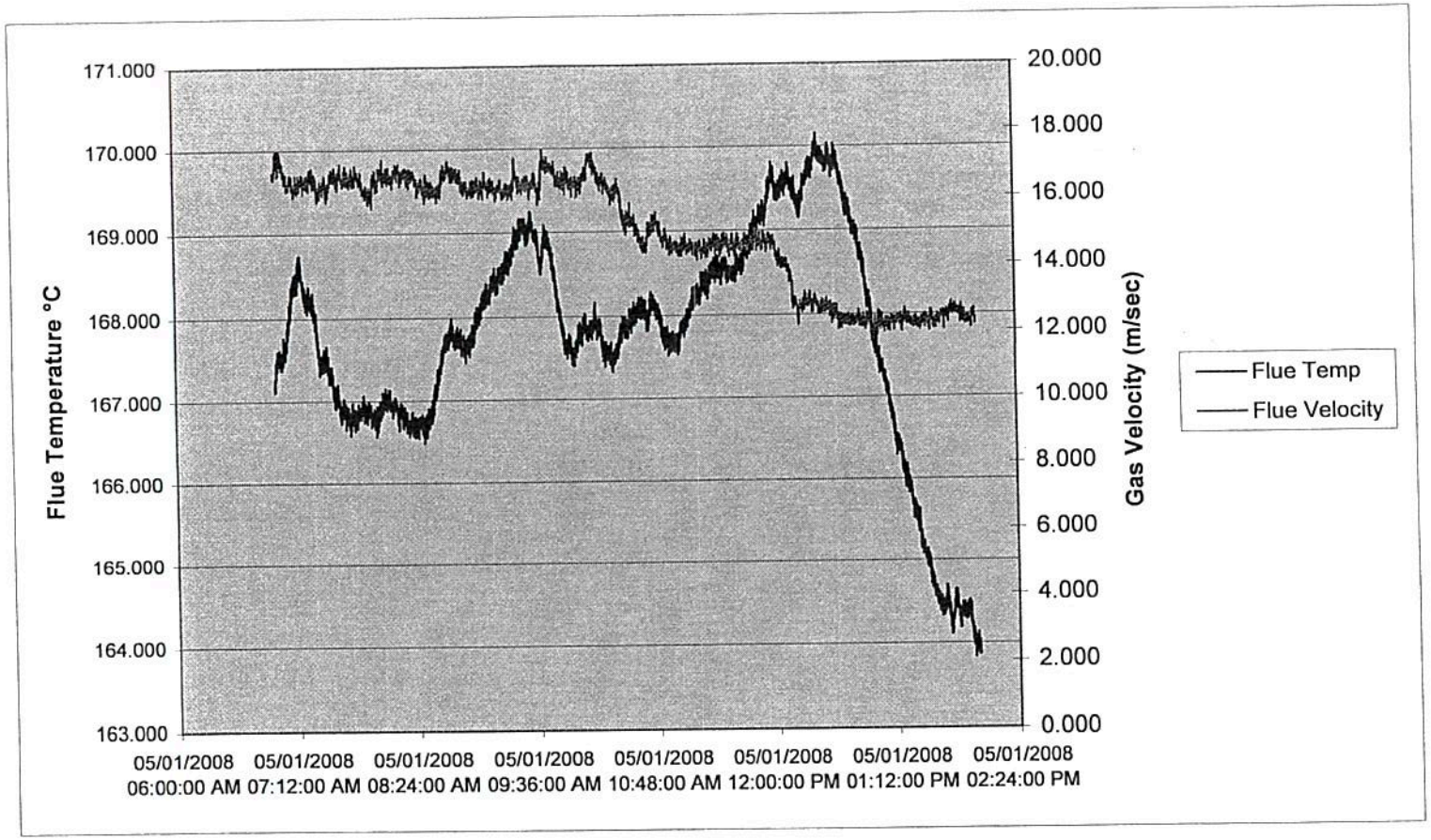
TEOM TEST RESULTS

Particulate - Data Sheet (CONTINUOUS Mode)

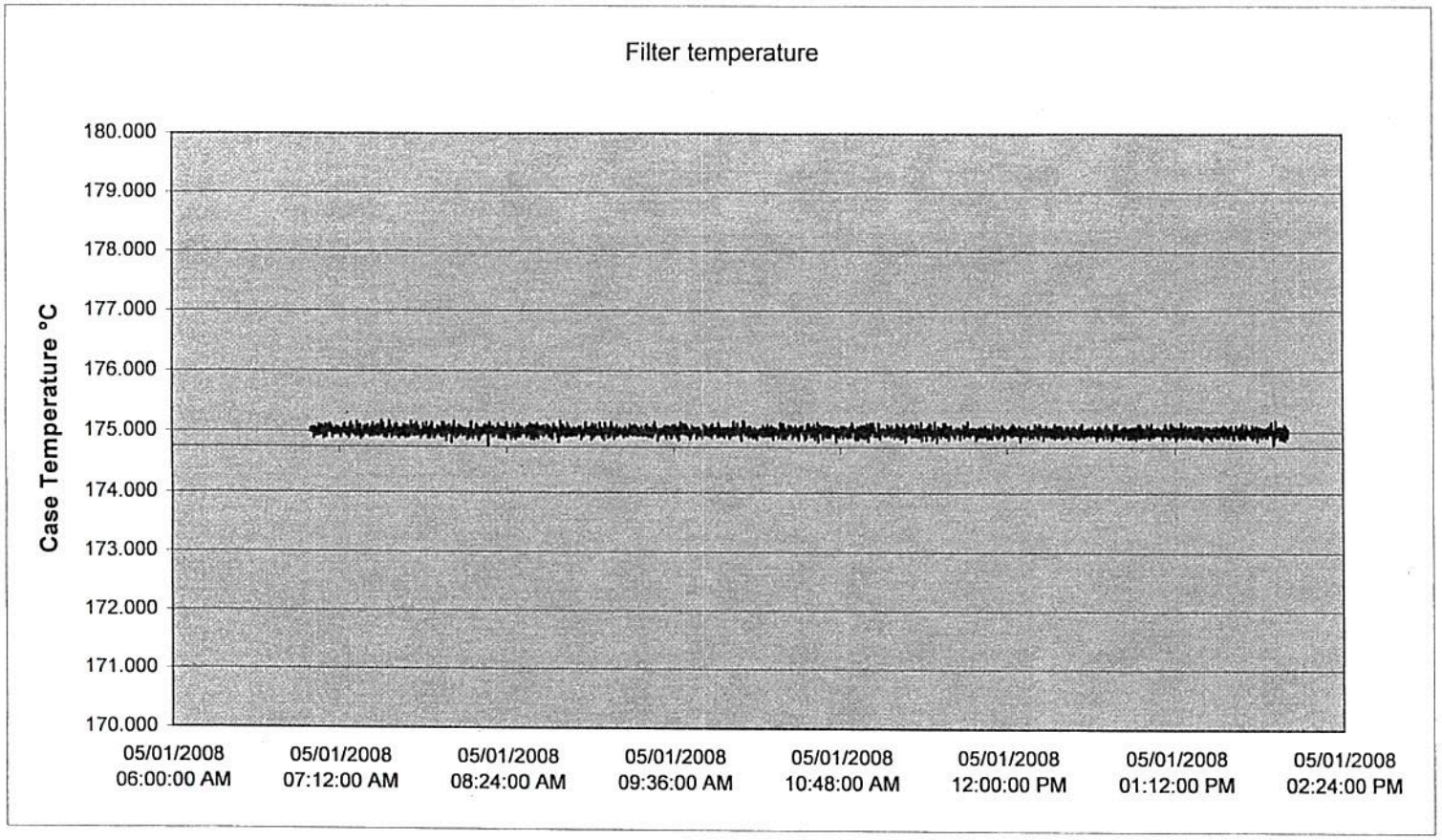
Project Number:	10442	Sampling Location:	Unit 6 - Stack Port 4 - Point 29.5 inches
Plant Name:	UGI - Hunlock Power Station	Control Unit SN:	7000A201240308
Company Name:	UGI Development Corporation	Start Time:	6:59:26
Test Company:	Clean Air Engineering	Stop Time:	14:00:40
Test Operator:	Jason McKeever - Project Engineer	Results File Name:	R0501061.9
Test Date:	5/1/2008		

Total Mass of Run Before Desiccation:	21174.06 µg
Total Mass of Run After Desiccation:	21182.03 µg
Total Volume:	0.3980 l
Mass Concentration of Run:	53.217 mg/m3
Inlet TM:	
Total Mass of Inlet + Run:	
MC of Inlet + Run:	

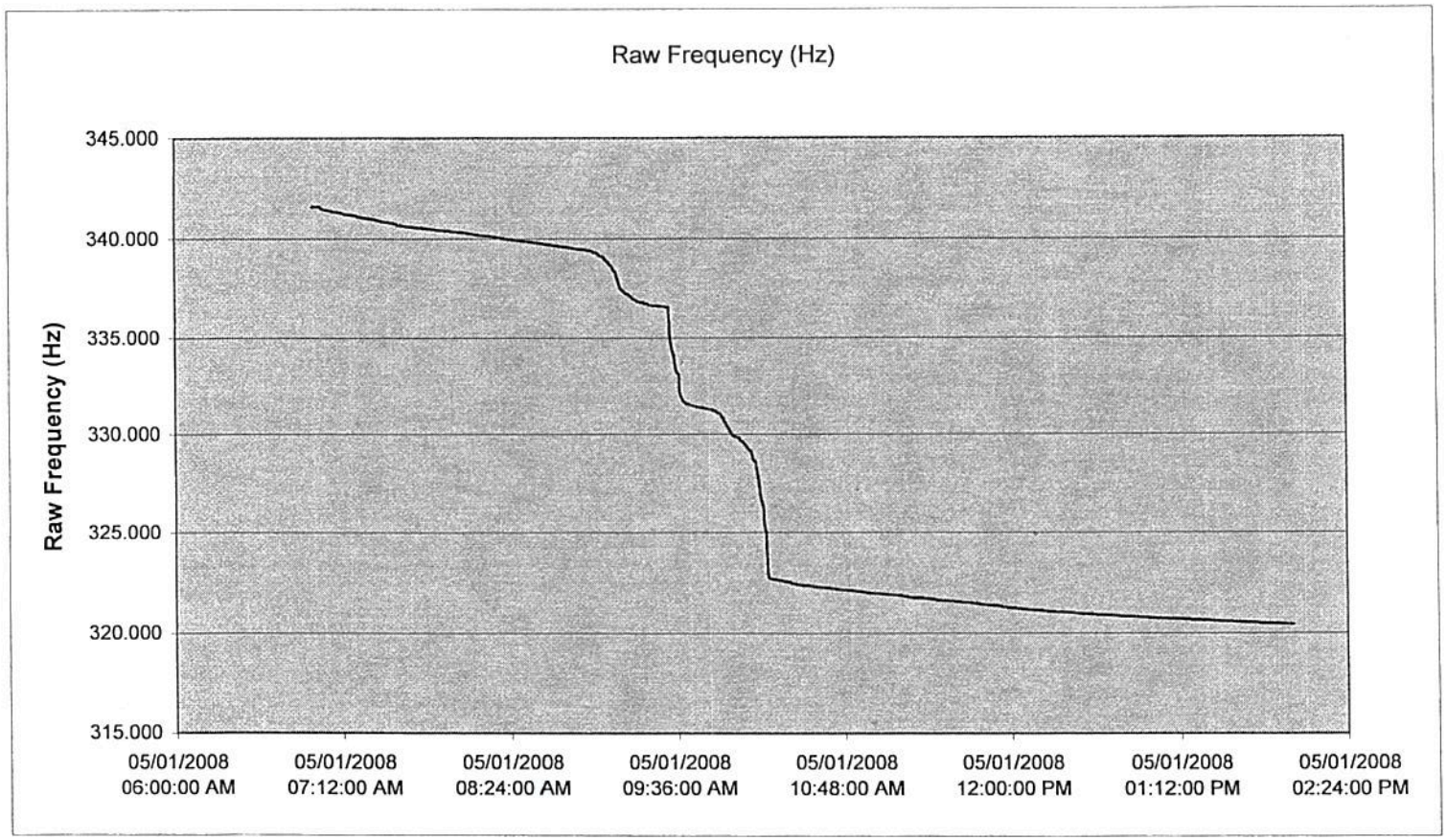
Start Time: 06:59:26
Stop Time: 14:00:40
Test Date: 5/1/2008



Start Time: 06:59:26
Stop Time: 14:00:40
Test Date: 5/1/2008



Start Time: 06:59:26
Stop Time: 14:00:40
Test Date: 5/1/2008



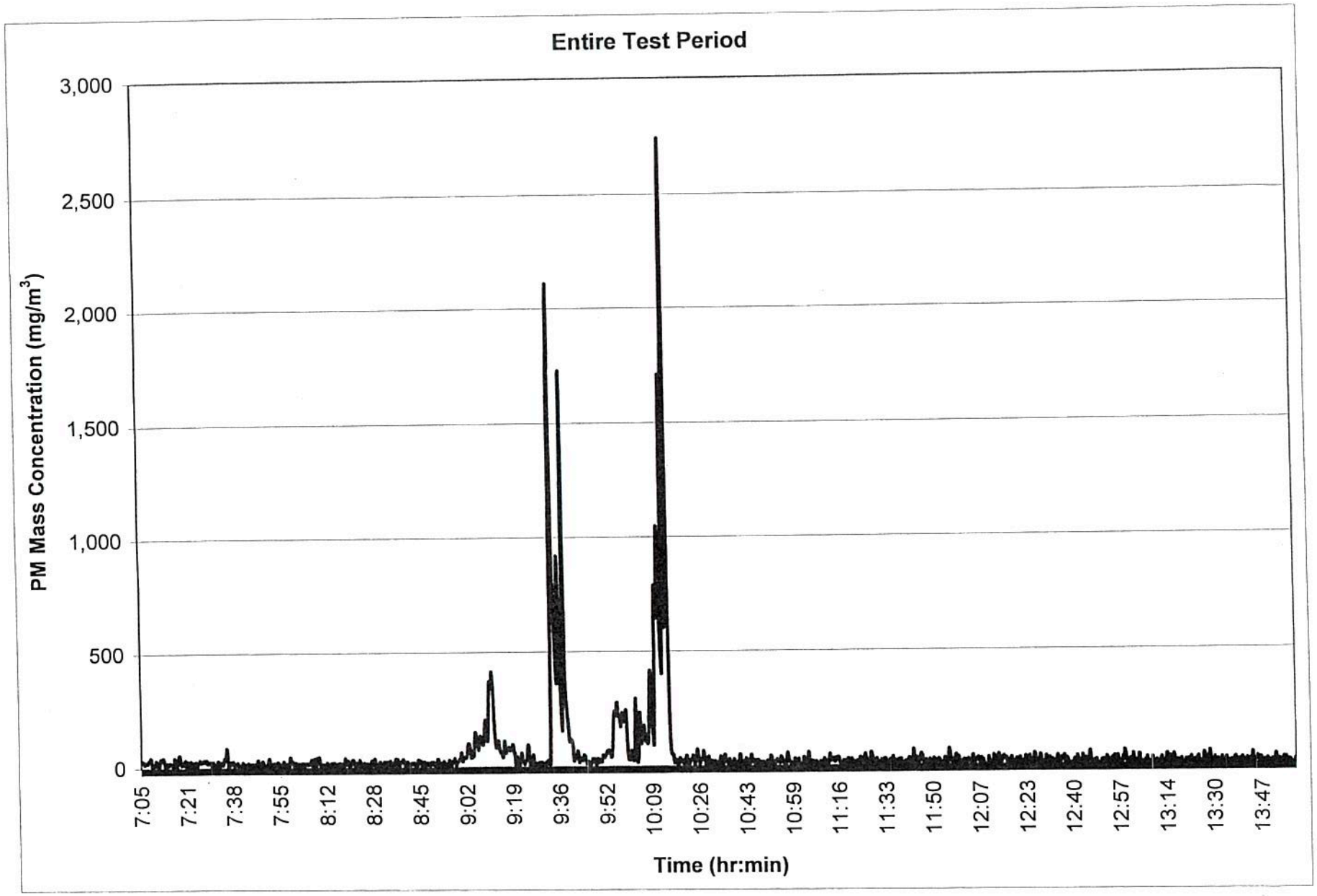
Gas Sensor Calibration and Verification Report

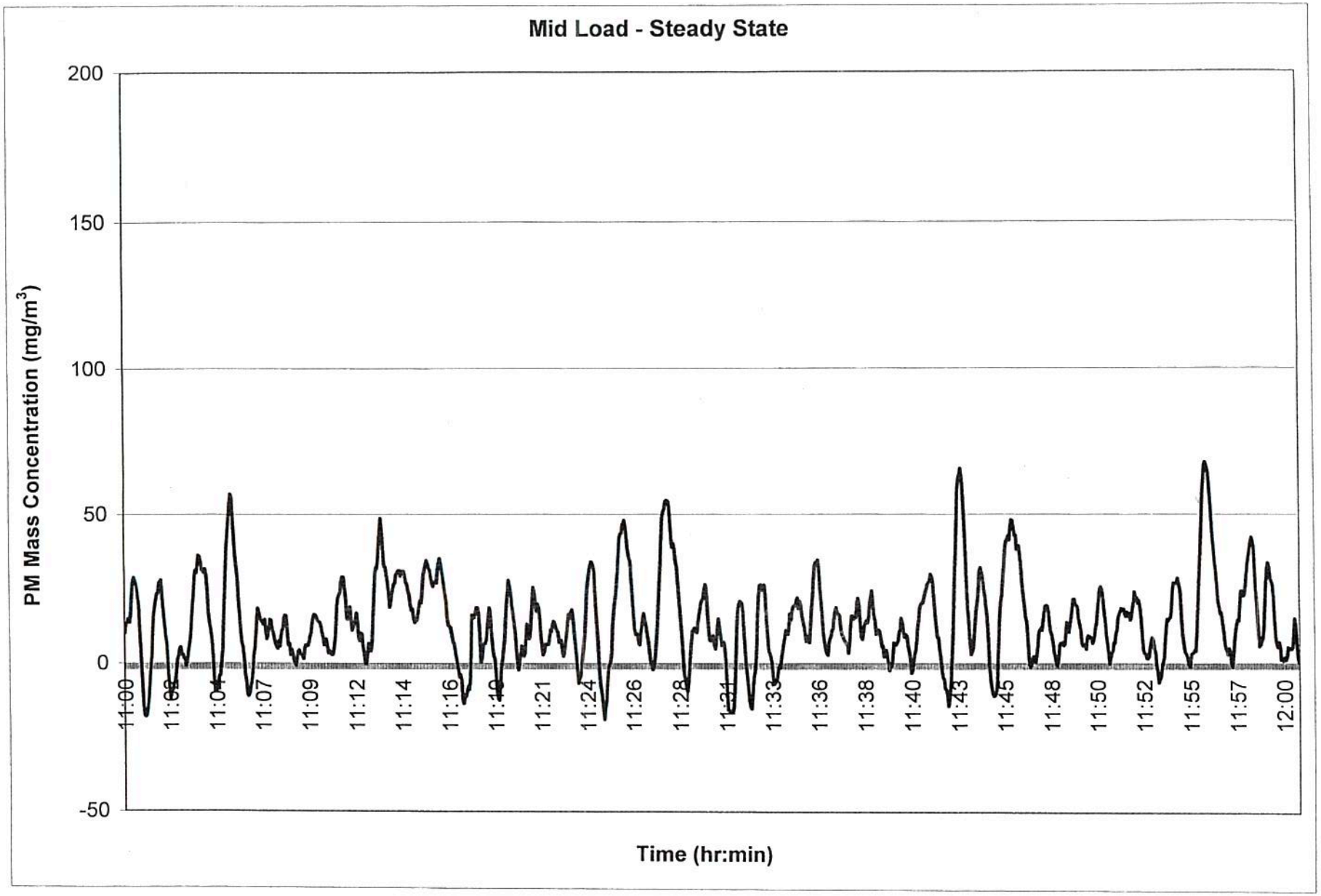
Project Number:	10442	Sampling Location:	Unit 6 - Stack Port 4 - Point 29.5 inches
Plant Name:	UGI - Hunlock Power Station	Control Unit SN:	7000A201240308
Company Name:	UGI Development Corporation	Start Time:	6:59:26
Test Company:	Clean Air Engineering	Stop Time:	14:00:40
Test Operator:	Jason McKeever - Project Engineer	Results File Name:	R0501061.9
Test Date:	5/1/2008		

Calibration Gas Data

O2 Analyzer Range(Full Scale -100.00 %):		CO2 Analyzer Range(Full Scale -25.00 %):	
Mid Gas		Span Gas	
% O2:	12.08	% O2:	19.79
% CO2:	12.24	% CO2:	19.92
Cert. Date:	12/19/2010	Cert. Date:	12/19/2010
Cylinder ID:	LL10121	Cylinder ID:	XL000142B

Pre-Test Analyzer Calibration:			US EPA Acceptable Error (Pt.60, App.A, Meth.6C, Sec.4)
	Mid Range	Error(%)	
O2:	12.05	-0.03	+-2% of Analyzer Range
CO2:	12.50	1.05	+-2% of Analyzer Range
Pre-Test System Bias Results:			
	Zero	Error(%)	
O2:	0.21	0.21	+-5% of Analyzer Range
CO2:	0.35	1.42	+-5% of Analyzer Range
	Mid Range	Error(%)	
O2:	12.18	0.10	+-5% of Analyzer Range
CO2:	12.48	0.94	+-5% of Analyzer Range
	Span	Error(%)	
O2:	19.92	0.13	+-5% of Analyzer Range
CO2:	20.07	0.59	+-5% of Analyzer Range
Post-Test System Drift Results:			
Zero Drift	Zero	Error(%)	
O2:	0.08	-0.13	+-3% of Range Over Period of Each Run
CO2:	0.05	-1.21	+-3% of Range Over Period of Each Run
Mid Level Drift	Mid Range	Error(%)	
O2:	11.99	-0.19	+-3% of Range Over Period of Each Run
CO2:	12.50	0.09	+-3% of Range Over Period of Each Run


Entire Test Period
PM Mass Concentration (mg/m3)
3,000
2,500
2,000
1,500
1,000
500
0
7:05
7:21
7:38
7:55
8:12
8:28
8:45
9:02
9:19
9:36
9:52
10:09
10:26
10:43
10:59
11:16
11:33
11:50
12:07
12:23
12:40
12:57
13:14
13:30
13:47
Time (hr:min)


Mid Load - Steady State
PM Mass Concentration (mg/m3)
200
150
100
50
0
-50
11:00
11:04
11:07
11:09
11:12
11:14
11:16
11:21
11:24
11:26
11:28
11:33
11:36
11:38
11:40
11:43
11:45
11:48
11:50
11:52
11:55
11:57
12:00
Time (hr:min)

APPENDIX 3
PLANT DATA

							exp min					
5/1/08 7:54 AM	8.74	218.9	1340.5	12.32	129.5	44.5	1939	0.411	203.1	3.502	1729	646.7
5/1/08 7:55 AM	8.53	215.3	1345.7	12.35	127	44.5	1939	0.404	195.9	3.507	1702.2	635.7
5/1/08 7:56 AM	8.84	215.5	1347.7	12.33	124.7	44.5	1939	0.405	192.5	3.518	1673.9	623.3
5/1/08 7:57 AM	9.68	215.5	1347.7	12.33	124.8	44.6	1939	0.405	192.7	3.518	1675.2	623.8
5/1/08 7:58 AM	8.77	161.4	675.9	7.62	129.7	44.6	1939	0.49	150	2.855	873.1	400.6
5/1/08 7:59 AM	9.87	217.7	1262.3	12.14	130.6	44.6	1939	0.415	203.7	3.347	1642	642.7
5/1/08 8:00 AM	8.97	221.7	1371.8	12.54	130	44.6	1939	0.409	206.5	3.521	1776.2	660.8
5/1/08 8:01 AM	8.61	220.2	1391.2	12.62	130.6	44.6	1939	0.404	206	3.548	1809.6	668.1
5/1/08 8:02 AM	8.72	222.4	1376.9	12.46	130.6	44.5	1939	0.413	208.1	3.557	1791	659.6
5/1/08 8:03 AM	8.75	218.5	1378	12.53	130.6	44.7	1939	0.404	204.4	3.54	1792.5	663.4
5/1/08 8:04 AM	8.6	221.4	1360.9	12.36	131.8	44.7	1939	0.415	209	3.544	1786.5	660.4
5/1/08 8:05 AM	9.05	217.8	1369.2	12.43	130.1	44.6	1939	0.406	203	3.546	1774.2	655.5
5/1/08 8:06 AM	9.53	218.4	1373	12.4	130.4	44.6	1939	0.408	204	3.564	1783.2	655.4
5/1/08 8:07 AM	9.4	218.7	1363.1	12.31	129.2	44.7	1939	0.411	202.4	3.564	1754.1	644.7
5/1/08 8:08 AM	9.81	219.3	1366.9	12.34	129.7	44.8	1939	0.411	203.8	3.565	1765.8	648.8
5/1/08 8:09 AM	11.09	217.1	1378.6	12.42	129.1	44.9	1939	0.405	200.8	3.573	1772.7	650
5/1/08 8:10 AM	8.41	214.9	1394.3	12.42	129.6	44.8	1939	0.401	199.5	3.613	1799.8	652.5
5/1/08 8:11 AM	9.04	218.5	1381.9	12.41	130.1	44.8	1939	0.408	203.6	3.584	1790.7	654.5
5/1/08 8:12 AM	8.54	219.9	1374.7	12.36	130.2	44.8	1939	0.412	205.1	3.58	1782.7	652.4
5/1/08 8:13 AM	8.85	220.9	1364.5	12.26	129.1	44.5	1939	0.417	204.3	3.582	1754.5	641.6
5/1/08 8:14 AM	8.89	216.8	1379.5	12.35	130.9	44.8	1939	0.406	203.3	3.595	1798.5	655.3
5/1/08 8:15 AM	9.79	220	1369.5	12.18	129.9	44.7	1939	0.418	204.7	3.619	1771.9	641.4
5/1/08 8:16 AM	8.78	206.9	1403.6	12.41	130.2	44.7	1939	0.386	193	3.64	1820.2	655
5/1/08 8:17 AM	8.33	215.1	1412.3	12.23	130.7	44.6	1939	0.407	201.4	3.717	1838.5	647.9
5/1/08 8:18 AM	8.93	226.3	1350.6	12.07	129.2	44.6	1939	0.434	209.5	3.602	1738	632.2
5/1/08 8:19 AM	10.24	225	1350.4	12.14	129.5	44.5	1939	0.429	208.7	3.58	1741.8	637.3
5/1/08 8:20 AM	9.49	222.1	1365.9	12.26	128.6	44.4	1939	0.419	204.6	3.586	1749.5	639.1
5/1/08 8:21 AM	9.24	221.1	1375.8	12.31	129.9	44.5	1939	0.416	205.8	3.597	1780	648.2
5/1/08 8:22 AM	9.92	219.5	1373.6	12.23	129.9	44.4	1939	0.416	204.3	3.615	1777.2	644
5/1/08 8:23 AM	8.98	218.9	1374.4	12.28	131.2	44.3	1939	0.413	205.7	3.602	1796	653
5/1/08 8:24 AM	9.37	217.3	1380.8	12.33	129.4	44.4	1939	0.408	201.4	3.605	1779.6	646.7
5/1/08 8:25 AM	9.49	221.1	1367.5	12.21	129.2	44.3	1939	0.419	204.6	3.605	1759.7	639.4
5/1/08 8:26 AM	8.81	220.2	1372.2	12.26	128.5	44.3	1939	0.416	202.7	3.603	1756.2	638.6
5/1/08 8:27 AM	8.66	218	1387.9	12.36	129.1	44.4	1939	0.408	201.6	3.614	1784.6	646.9
5/1/08 8:28 AM	9.07	220.9	1369.7	12.2	129.4	44.4	1939	0.419	204.8	3.614	1765.3	639.9
5/1/08 8:29 AM	9.98	217.8	1381.9	12.31	130.3	44.5	1939	0.41	203.3	3.613	1793.4	650.2
5/1/08 8:30 AM	9	220.3	1390.8	12.31	129.1	44.7	1939	0.414	203.7	3.637	1788.3	644.3
5/1/08 8:31 AM	9.44	221.4	1384.1	12.3	127.8	44.8	1939	0.417	202.7	3.622	1761.8	637.2
5/1/08 8:32 AM	8.45	218.7	1394.4	12.41	129.4	44.7	1939	0.408	202.7	3.617	1797.1	650.9
5/1/08 8:33 AM	9.46	219.1	1397.7	12.35	130.4	44.8	1939	0.411	204.7	3.643	1815.3	652.8
5/1/08 8:34 AM	8.55	218.7	1391.7	12.31	129.4	44.8	1939	0.411	202.7	3.639	1793.7	645.7
5/1/08 8:35 AM	9.16	218.6	1397.1	12.38	130.7	44.8	1939	0.409	204.7	3.632	1818.7	655.9
5/1/08 8:36 AM	8.58	221	1399	12.37	131.3	44.8	1939	0.414	207.9	3.64	1829.5	658.4
5/1/08 8:37 AM	10.12	221	1402.6	12.37	129.6	44.8	1939	0.414	205.2	3.65	1810.5	649.9
5/1/08 8:38 AM	8.89	218.8	1412.3	12.46	129.5	44.7	1939	0.407	203	3.648	1821.6	654.1
5/1/08 8:39 AM	10.42	221.7	1397.8	12.29	129.9	44.8	1939	0.418	206.3	3.661	1808.5	647.1
5/1/08 8:40 AM	9.12	218.6	1403.8	12.41	130.3	44.8	1939	0.408	204.1	3.641	1821.8	655.5
5/1/08 8:41 AM	9.01	219.5	1416.5	12.39	130.4	45.1	1939	0.41	205.1	3.68	1839.7	654.9
5/1/08 8:42 AM	8.72	220.7	1401.6	12.28	128.4	45	1939	0.416	203	3.674	1792.5	639.1
5/1/08 8:43 AM	8.32	217.9	1413.2	12.41	128.8	45	1939	0.407	201.1	3.665	1812.9	647.9

ex min

5/1/08 9:34 AM	72.56	204.7	1434.7	12.36	130.7	44.2	1939	0.383	191.7	3.736	1867.7	654.9
5/1/08 9:35 AM	53.03	206.7	1415.7	12.2	130.7	44.3	1939	0.392	193.5	3.735	1842.9	646.4
5/1/08 9:36 AM	60.14	206.3	1418.9	12.27	130.8	44.4	1939	0.389	193.3	3.722	1848.5	650.5
5/1/08 9:37 AM	35.59	204.6	1431.1	12.27	130.8	44.4	1939	0.386	191.7	3.754	1864.4	650.5
5/1/08 9:38 AM	44.13	209.1	1410.8	12.19	130.8	44.2	1939	0.397	195.9	3.725	1837.9	646.4
5/1/08 9:39 AM	26.15	207.1	1423.5	12.32	131.8	44.2	1939	0.389	195.5	3.719	1868.7	658.3
5/1/08 9:40 AM	20.4	207.2	1436.7	12.32	131	44.4	1939	0.389	194.5	3.754	1874.5	654.2
5/1/08 9:41 AM	10.37	211.2	1413	12.19	132	44.3	1939	0.401	199.7	3.731	1857.7	652.2
5/1/08 9:42 AM	10.33	206.5	1426.8	12.34	131.3	44.2	1939	0.387	194.2	3.722	1865.9	656.8
5/1/08 9:43 AM	9.37	207.2	1433.2	12.28	130.7	44.5	1939	0.391	194	3.757	1865.7	650.5
5/1/08 9:44 AM	9.98	209.9	1419.4	12.28	130.8	44.3	1939	0.396	196.7	3.72	1849.1	651.1
5/1/08 9:45 AM	11.06	206.1	1439.3	12.42	131	44.5	1939	0.384	193.4	3.73	1877.9	659.6
5/1/08 9:46 AM	9.41	209.1	1432.2	12.3	131.1	44.6	1939	0.394	196.4	3.748	1870.1	653.7
5/1/08 9:47 AM	9.37	208.6	1428.8	12.35	131.5	44.4	1939	0.391	196.5	3.724	1871.4	658.3
5/1/08 9:48 AM	10.51	207.3	1444.5	12.46	131.3	44.3	1939	0.385	195	3.732	1889	663.1
5/1/08 9:49 AM	10.65	209.9	1431.5	12.35	131.5	44.4	1939	0.393	197.7	3.731	1874.9	658.3
5/1/08 9:50 AM	10.36	206.2	1441.6	12.47	132.4	44.4	1939	0.383	195.6	3.721	1901	669.3
5/1/08 9:51 AM	13.13	209.5	1441.7	12.38	131.9	44.5	1939	0.392	198	3.748	1894	661.9
5/1/08 9:52 AM	14.6	211.1	1423.2	12.32	131.4	44.5	1939	0.397	198.7	3.718	1862.6	656.2
5/1/08 9:53 AM	15.77	205.8	1439.3	12.44	132	44.6	1939	0.383	194.6	3.724	1892.3	665.6
5/1/08 9:54 AM	15.37	210.3	1436.4	12.36	130.3	44.6	1939	0.394	196.3	3.741	1864.1	652.9
5/1/08 9:55 AM	20.59	209.7	1430.4	12.38	132	44.5	1939	0.392	198.3	3.719	1880.6	662.5
5/1/08 9:56 AM	31.13	207.8	1447	12.51	131.3	44.5	1939	0.385	195.5	3.723	1892.3	665.9
5/1/08 9:57 AM	34.61	210.1	1444	12.42	131.7	44.4	1939	0.392	198.2	3.742	1894.1	663.1
5/1/08 9:58 AM	30.79	208.6	1445.9	12.51	132.2	44.4	1939	0.386	197.6	3.72	1903.8	670.5
5/1/08 9:59 AM	30.13	210.4	1449.5	12.47	130.7	44.5	1939	0.391	197	3.741	1886.9	660.6
5/1/08 10:00 AM	29.62	212.4	1435.4	12.41	131.2	44.6	1939	0.396	199.6	3.723	1875.7	660
5/1/08 10:01 AM	10.44	208.4	1445.7	12.5	132	44.7	1939	0.386	197.1	3.723	1900.7	668.9
5/1/08 10:02 AM	14.46	209.7	1445.7	12.45	131	44.5	1939	0.39	196.8	3.738	1886.3	661.2
5/1/08 10:03 AM	15.3	206.6	1446.5	12.48	130.6	44.6	1939	0.383	193.3	3.731	1881.6	660.6
5/1/08 10:04 AM	11.74	206.3	1455.3	12.53	131.9	44.6	1939	0.381	194.9	3.738	1911.9	669.9
5/1/08 10:05 AM	17.16	210.3	1434.5	12.33	130.1	44.7	1939	0.395	196	3.745	1858.8	650.3
5/1/08 10:06 AM	21.07	211	1428.7	12.39	130.8	44.7	1939	0.394	197.7	3.712	1861.3	657
5/1/08 10:07 AM	19.46	209.9	1441.2	12.47	132.2	44.6	1939	0.39	198.8	3.72	1897.6	668.2
5/1/08 10:08 AM	29.48	207.9	1448.2	12.49	132.3	44.7	1939	0.385	197	3.732	1908.3	669.8
5/1/08 10:09 AM	41.98	210.3	1438.5	12.4	130.7	44.5	1939	0.393	196.9	3.734	1872.6	657
5/1/08 10:10 AM	23.15	209.4	1447.1	12.49	131.1	44.8	1939	0.388	196.7	3.729	1889.6	663.8
5/1/08 10:11 AM	60.67	208.2	1457.6	12.54	131	45	1939	0.384	195.4	3.741	1901.8	665.9
5/1/08 10:12 AM	76.85	206.1	1459.2	12.55	131.6	45	1939	0.38	194.3	3.742	1912.6	669.5
5/1/08 10:13 AM	52.42	199.4	1483.9	12.56	130.9	44.9	1939	0.368	187	3.803	1934.7	666.4
5/1/08 10:14 AM	64.08	200.3	1480.8	12.25	131.2	44.7	1939	0.379	188.3	3.891	1935	651.5
5/1/08 10:15 AM	80.66	210.3	1438.2	12.17	131.2	44.5	1939	0.4	197.7	3.804	1879.4	647.3
5/1/08 10:16 AM	14.44	214.5	1409.5	12.27	131.7	44.5	1939	0.405	202.4	3.697	1848.9	655
5/1/08 10:17 AM	10.26	214.4	1421.1	12.33	130.2	44.5	1939	0.403	200	3.71	1842.9	650.8
5/1/08 10:18 AM	9.63	212.4	1426.7	12.41	130.3	44.5	1939	0.396	198.3	3.7	1851.6	655.5
5/1/08 10:19 AM	10.69	208.5	1447.3	12.52	131.8	44.6	1939	0.386	196.9	3.721	1899.9	668.9
5/1/08 10:20 AM	9.19	212.5	1435.6	12.34	131.7	44.7	1939	0.399	200.5	3.745	1883.1	658.8
5/1/08 10:21 AM	10.33	211	1428.1	12.39	131.1	44.3	1939	0.394	198.2	3.71	1864.8	658.4
5/1/08 10:22 AM	10.05	208.4	1450.9	12.52	130.8	43.6	1939	0.385	195.3	3.73	1890.2	663.8
5/1/08 10:23 AM	9.02	213.7	1427.7	12.29	130.8	43.3	1939	0.403	200.2	3.739	1860	651.6

							exp min					
5/1/08 11:14 AM	9.06	265.2	777.8	12.02	111.2	34.4	1939	0.511	211.3	2.083	861.5	541.8
5/1/08 11:15 AM	9.19	268.5	768.1	11.81	113.2	34.5	1939	0.526	217.7	2.093	866	541.9
5/1/08 11:16 AM	10.18	267.4	765.6	11.82	113.3	34.5	1939	0.524	217	2.085	864	542.9
5/1/08 11:17 AM	8.66	262.9	785.7	12.02	113.2	34.7	1939	0.506	213.2	2.104	885.9	551.5
5/1/08 11:18 AM	8.41	261.8	787.2	12.04	114.3	34.9	1939	0.503	214.4	2.104	896.2	557.8
5/1/08 11:19 AM	8.54	259.7	792.5	12.15	114.6	34.8	1939	0.495	213.2	2.099	904.6	564.5
5/1/08 11:20 AM	8.99	256.8	801.8	12.18	112.9	34.7	1939	0.488	207.7	2.119	901.6	557.4
5/1/08 11:21 AM	8.88	261.7	786.9	11.95	113	34.8	1939	0.507	211.9	2.12	885.6	547.3
5/1/08 11:22 AM	9.4	260	786.2	11.96	113.4	34.7	1939	0.503	211.2	2.116	888	549.8
5/1/08 11:23 AM	8.74	253.1	804.9	12.22	114.2	34.9	1939	0.48	207.1	2.12	915.5	565.7
5/1/08 11:24 AM	9.5	258.9	785.4	11.96	113.2	35	1939	0.501	210	2.114	885.5	548.8
5/1/08 11:25 AM	8.59	260.1	775.1	11.88	111.7	35	1939	0.507	208.1	2.1	862.3	537.9
5/1/08 11:26 AM	10.35	260.4	775.9	11.88	111.7	35	1939	0.507	208.4	2.102	863.2	537.9
5/1/08 11:27 AM	8.75	213.4	588.7	9.07	112	35	1939	0.545	171.2	2.089	656.7	411.7
5/1/08 11:28 AM	10.42	224.5	566.2	10.18	112.8	35.1	1939	0.511	181.4	1.79	636.1	465.4
5/1/08 11:29 AM	8.55	250.4	784.5	12.19	113.7	35.1	1939	0.476	204	2.071	888.4	561.9
5/1/08 11:30 AM	8.97	253.2	794.9	12.08	114.9	35.2	1939	0.485	208.4	2.118	909.7	562.6
5/1/08 11:31 AM	8.45	243.8	814.1	12.35	113.7	35.1	1939	0.457	198.6	2.122	921.9	569.2
5/1/08 11:32 AM	8.32	239.8	828.4	12.38	113.9	35	1939	0.448	195.7	2.154	939.8	571.6
5/1/08 11:33 AM	8.97	246.6	796.2	11.85	113	35	1939	0.482	199.6	2.163	896.1	542.9
5/1/08 11:34 AM	8.36	250	759.9	11.67	113.7	34.9	1939	0.496	203.6	2.096	860.6	537.9
5/1/08 11:35 AM	8.55	242.2	786.4	12.05	113.4	35.1	1939	0.465	196.8	2.101	888.2	553.9
5/1/08 11:36 AM	9.84	243.1	785.3	11.93	114.3	34.9	1939	0.472	199.1	2.119	894	552.7
5/1/08 11:37 AM	9.19	241.2	787.1	12.06	113.5	34.9	1939	0.463	196.1	2.101	889.8	554.9
5/1/08 11:38 AM	8.64	236.5	800.5	12.18	113.8	34.9	1939	0.45	192.8	2.115	907.3	561.9
5/1/08 11:39 AM	8.76	242.1	783.5	11.91	114.5	34.9	1939	0.471	198.6	2.117	893.5	552.8
5/1/08 11:40 AM	9.04	238.6	778.9	11.93	113	34.7	1939	0.463	193.2	2.101	876.6	546.5
5/1/08 11:41 AM	9.31	234.5	788.7	12.07	115.1	34.7	1939	0.45	193.4	2.103	904.2	563.2
5/1/08 11:42 AM	8.83	242.2	770.4	11.78	113.5	35	1939	0.476	196.9	2.105	870.9	541.9
5/1/08 11:43 AM	10.07	239.3	780.4	11.92	112.9	35.1	1939	0.465	193.5	2.107	877.5	545.5
5/1/08 11:44 AM	9.56	232.5	794.1	12.06	115.2	35	1939	0.446	191.9	2.119	911.1	563.2
5/1/08 11:45 AM	9.33	237.6	774.1	11.77	114.6	34.9	1939	0.467	195.1	2.117	883.6	546.8
5/1/08 11:46 AM	10.63	238.3	775.6	11.85	114.2	34.9	1939	0.466	195	2.107	882.2	548.6
5/1/08 11:47 AM	8.8	232.3	795.8	12.1	113.5	34.9	1939	0.444	188.9	2.117	899.6	556.8
5/1/08 11:48 AM	8.7	238.3	774.1	11.8	114.4	35	1939	0.468	195.3	2.112	882	547.2
5/1/08 11:49 AM	8.45	235.2	766.8	11.74	113.8	34.7	1939	0.464	191.7	2.102	869.1	541.6
5/1/08 11:50 AM	8.93	230.4	787.1	12	114.5	34.8	1939	0.445	189	2.111	897.6	557
5/1/08 11:51 AM	9.44	238.8	774.1	11.83	114.6	34.7	1939	0.467	196.1	2.106	883.6	549.5
5/1/08 11:52 AM	9.91	236.9	780	11.9	114.8	34.6	1939	0.461	194.8	2.11	891.9	553.7
5/1/08 11:53 AM	9.31	232	798.8	12.12	113	34.8	1939	0.443	187.8	2.121	899	555.2
5/1/08 11:54 AM	8.71	238.9	771.3	11.75	113.9	34.9	1939	0.471	194.9	2.113	875	542.5
5/1/08 11:55 AM	9.45	239.3	768.4	11.8	113.6	34.7	1939	0.47	194.7	2.096	869.4	543.4
5/1/08 11:56 AM	11.1	233.2	787.2	12.09	114.1	34.5	1939	0.447	190.6	2.096	894.6	559.2
5/1/08 11:57 AM	9.37	238.8	767.6	11.8	113.8	34.7	1939	0.469	194.7	2.094	870	544.3
5/1/08 11:58 AM	10.37	237.8	765.6	11.84	114.7	34.7	1939	0.465	195.4	2.081	874.6	550.5
5/1/08 11:59 AM	10.33	232.8	794.4	12.15	114.7	34.4	1939	0.444	191.3	2.104	907.5	564.9
5/1/08 12:00 PM	9.08	235.8	788.2	11.93	113.8	33.4	1939	0.458	192.2	2.127	893.4	550.3
5/1/08 12:01 PM	8.86	234.4	781.4	11.93	110.5	33.4	1939	0.455	185.6	2.108	860	534.3
5/1/08 12:02 PM	8.62	225.6	799.9	12.16	110.8	33.4	1939	0.43	179.1	2.117	882.7	546.1
5/1/08 12:03 PM	8.45	225.4	787.5	11.92	109.2	33.5	1939	0.438	176.3	2.126	856.5	527.7

30

							exr	min				
5/1/08 12:54 PM	8.01	210.1	516.4	11.27	94.1	25.4	1939	0.432	141.6	1.475	484	429.9
5/1/08 12:55 PM	9	211	514.8	11.03	94.8	25.1	1939	0.443	143.3	1.502	486.1	423.9
5/1/08 12:56 PM	7.78	211	501.5	10.83	94.2	25.1	1939	0.451	142.4	1.49	470.5	413.6
5/1/08 12:57 PM	9.14	210.3	486.7	10.51	95.6	25.1	1939	0.463	144	1.491	463.4	407.3
5/1/08 12:58 PM	7.98	207.7	470.5	10.27	95.1	25.1	1939	0.468	141.5	1.475	445.7	395.9
5/1/08 12:59 PM	8.67	203.6	465.3	10.21	91.5	24.9	1939	0.462	133.5	1.467	424	378.7
5/1/08 1:00 PM	7.75	204.9	470.8	10.28	92.1	24.9	1939	0.461	135.2	1.474	431.9	383.8
5/1/08 1:01 PM	8.17	205.6	483.5	10.39	93.3	24.9	1939	0.458	137.4	1.498	449.3	393
5/1/08 1:02 PM	7.91	206.6	494.7	10.59	93.4	24.8	1939	0.452	138.2	1.504	460.2	401
5/1/08 1:03 PM	7.89	207.7	511.4	10.86	94.4	24.7	1939	0.443	140.5	1.516	480.8	415.5
5/1/08 1:04 PM	7.88	207.9	520.3	10.93	94.1	24.8	1939	0.44	140.2	1.532	487.6	417
5/1/08 1:05 PM	8.09	208.9	522.9	10.97	94.5	24.7	1939	0.441	141.4	1.534	492.2	420.2
5/1/08 1:06 PM	7.91	208	546.8	11.3	95.2	24.9	1939	0.426	141.9	1.558	518.5	436.1
5/1/08 1:07 PM	8.2	206.4	562.1	11.32	94.9	25	1939	0.422	140.3	1.598	531.3	435.4
5/1/08 1:08 PM	8.43	207.6	558.7	11.17	93.7	25	1939	0.43	139.4	1.61	521.4	424.3
5/1/08 1:09 PM	7.79	206.6	553.5	11.05	94.3	25.1	1939	0.433	139.6	1.612	519.9	422.3
5/1/08 1:10 PM	8.16	206.1	526.6	10.58	94.2	25.1	1939	0.451	139.1	1.602	494.1	404
5/1/08 1:11 PM	7.73	205.3	524.4	10.63	93.7	25	1939	0.447	137.8	1.588	489.4	403.7
5/1/08 1:12 PM	7.75	203.6	522.8	10.49	94	25	1939	0.449	137.1	1.604	489.5	399.7
5/1/08 1:13 PM	7.73	203	510.1	10.26	93.7	25	1939	0.458	136.3	1.6	476.1	389.7
5/1/08 1:14 PM	9.17	203.4	514.8	10.37	94	25	1939	0.454	137	1.598	482	395.1
5/1/08 1:15 PM	8.42	202.3	509.8	10.24	94.5	24.9	1939	0.457	137	1.602	479.8	392.2
5/1/08 1:16 PM	8.63	202.7	518.5	10.41	95	24.9	1939	0.451	138	1.603	490.6	400.9
5/1/08 1:17 PM	8.26	202.1	546.8	10.76	95	24.9	1939	0.435	137.5	1.636	517.4	414.4
5/1/08 1:18 PM	7.69	202.4	547.6	10.61	95.4	24.7	1939	0.442	138.3	1.661	520.3	410.3
5/1/08 1:19 PM	7.73	201.4	567	10.93	94.7	24.6	1939	0.427	136.6	1.67	534.8	419.6
5/1/08 1:20 PM	7.74	201	580	11.07	94.6	24.7	1939	0.42	136.2	1.686	546.5	424.6
5/1/08 1:21 PM	8.03	201.5	585.5	11.09	95.1	24.9	1939	0.421	137.3	1.699	554.6	427.6
5/1/08 1:22 PM	7.85	200.1	613.8	11.34	94.6	25	1939	0.409	135.6	1.742	578.3	434.9
5/1/08 1:23 PM	8.2	197	613.8	11.1	95	25	1939	0.411	134.1	1.78	580.8	427.5
5/1/08 1:24 PM	8.37	196.3	594.9	10.83	95.1	25	1939	0.42	133.7	1.768	563.5	417.5
5/1/08 1:25 PM	8.03	196	583.6	10.62	95.2	25	1939	0.427	133.7	1.769	553.4	409.8
5/1/08 1:26 PM	7.98	196.7	563.4	10.35	93.9	25	1939	0.44	132.3	1.752	526.9	393.9
5/1/08 1:27 PM	8.61	196.4	558.4	10.35	94.2	24.9	1939	0.439	132.5	1.737	523.9	395.2
5/1/08 1:28 PM	7.66	193.2	564.2	10.29	94.8	24.8	1939	0.435	131.2	1.765	532.7	395.5
5/1/08 1:29 PM	8.94	191.9	553.7	10.16	95.7	24.8	1939	0.437	131.6	1.754	527.8	394.2
5/1/08 1:30 PM	7.79	189.8	568.6	10.32	94.3	24.9	1939	0.426	128.2	1.773	534	394.4
5/1/08 1:31 PM	8.07	192.5	572.8	10.34	94.2	24.9	1939	0.431	129.9	1.783	537.4	394.8
5/1/08 1:32 PM	7.79	193.7	589.6	10.58	93.6	24.9	1939	0.424	129.9	1.794	549.7	401.4
5/1/08 1:33 PM	7.58	192.1	610.4	10.8	94	24.8	1939	0.412	129.4	1.819	571.5	411.5
5/1/08 1:34 PM	7.75	190.1	625.6	10.88	94.8	24.7	1939	0.405	129.1	1.851	590.7	418.2
5/1/08 1:35 PM	7.75	189.3	648.5	11.14	94.3	24.8	1939	0.393	127.9	1.874	609.1	425.9
5/1/08 1:36 PM	7.73	192.1	645.2	11.01	93.9	24.7	1939	0.404	129.2	1.886	603.4	419.1
5/1/08 1:37 PM	8.46	193.1	660.7	11.2	94.3	25	1939	0.399	130.5	1.899	620.5	428.1
5/1/08 1:38 PM	7.76	189.6	664.2	11.03	95.3	25	1939	0.398	129.4	1.938	630.5	426.1
5/1/08 1:39 PM	8.13	188.5	637.9	10.67	95.1	25	1939	0.409	128.4	1.924	604.2	411.3
5/1/08 1:40 PM	7.97	186.9	630.8	10.57	95	25.1	1939	0.409	127.2	1.921	596.9	407
5/1/08 1:41 PM	8.43	190.6	608.4	10.34	95.5	25.1	1939	0.427	130.4	1.894	578.7	400.3
5/1/08 1:42 PM	7.81	192.5	613.6	10.52	94.3	24.9	1939	0.424	130	1.877	576.3	402.2
5/1/08 1:43 PM	8.03	189.3	629.7	10.55	94.7	24.7	1939	0.415	128.4	1.921	593.9	405.1

APPENDIX 4

CORRELATION ANALYSIS

Opacity/Mass Concentration

DATE TIME	Opacity	MC (mg/m^3)
5/1/08 7:05 AM	9.2	27.8468
5/1/08 7:06 AM	9.76	20.7780
5/1/08 7:07 AM	9.41	23.9474
5/1/08 7:08 AM	6.62	32.2579
5/1/08 7:09 AM	16.63	9.5289
5/1/08 7:10 AM	27.65	22.8525
5/1/08 7:11 AM	10.46	13.0938
5/1/08 7:12 AM	11.36	34.8184
5/1/08 7:13 AM	13.19	23.1832
5/1/08 7:14 AM	9.46	14.3402
5/1/08 7:15 AM	10.29	17.7262
5/1/08 7:16 AM	10.16	13.8595
5/1/08 7:17 AM	10.42	26.9267
5/1/08 7:18 AM	10.1	32.0411
5/1/08 7:19 AM	13.87	25.0615
5/1/08 7:20 AM	10.11	21.8119
5/1/08 7:21 AM	10.77	15.0950
5/1/08 7:22 AM	9.63	18.7311
5/1/08 7:23 AM	10.31	13.0316
5/1/08 7:24 AM	9.45	16.3220
5/1/08 7:25 AM	9.88	16.0181
5/1/08 7:26 AM	11.22	26.5907
5/1/08 7:27 AM	12.06	26.5537
5/1/08 7:28 AM	12.63	26.9679
5/1/08 7:29 AM	10.9	20.3239
5/1/08 7:30 AM	9.81	13.9600
5/1/08 7:31 AM	9.41	16.4825
5/1/08 7:32 AM	9.67	15.6970
5/1/08 7:33 AM	10.29	13.6887
5/1/08 7:34 AM	10.86	18.0375
5/1/08 7:35 AM	10.67	42.5736
5/1/08 7:36 AM	18.13	32.7140
5/1/08 7:37 AM	9.61	18.1191
5/1/08 7:38 AM	9.29	17.0463
5/1/08 7:39 AM	9.98	15.6728
5/1/08 7:40 AM	10.29	9.1653
5/1/08 7:41 AM	8.98	11.5059
5/1/08 7:42 AM	8.54	11.4041
5/1/08 7:43 AM	8.81	10.5023
5/1/08 7:44 AM	8.89	10.6663
5/1/08 7:45 AM	9.43	12.3503
5/1/08 7:46 AM	8.76	8.2387
5/1/08 7:47 AM	9.15	16.6545
5/1/08 7:48 AM	8.72	15.1291
5/1/08 7:49 AM	9.85	9.9487
5/1/08 7:50 AM	8.58	9.1645
5/1/08 7:51 AM	10.18	22.5950
5/1/08 7:52 AM	8.84	11.8977
5/1/08 7:53 AM	9.41	14.8580
5/1/08 7:54 AM	8.74	16.5159
5/1/08 7:55 AM	8.53	7.3194
5/1/08 7:56 AM	8.84	15.4683
5/1/08 7:57 AM	9.68	7.1663
5/1/08 7:58 AM	8.77	17.5824
5/1/08 7:59 AM	9.87	26.9922
5/1/08 8:00 AM	8.97	11.8246
5/1/08 8:01 AM	8.61	9.7276
5/1/08 8:02 AM	8.72	8.0298
5/1/08 8:03 AM	8.75	12.0889
5/1/08 8:04 AM	8.6	13.9579
5/1/08 8:05 AM	9.05	15.5896

5/1/08 9:13 AM	22.09	97.2378
5/1/08 9:14 AM	20.48	67.2988
5/1/08 9:15 AM	17.04	66.3235
5/1/08 9:16 AM	23.58	73.6941
5/1/08 9:17 AM	19.04	76.9665
5/1/08 9:18 AM	23.61	79.6179
5/1/08 9:19 AM	25.8	57.2447
5/1/08 9:20 AM	12.82	26.2353
5/1/08 9:21 AM	9.54	16.5089
5/1/08 9:22 AM	10.83	38.8531
5/1/08 9:23 AM	9.46	18.9120
5/1/08 9:24 AM	11.24	67.3915
5/1/08 9:25 AM	9.54	11.6156
5/1/08 9:26 AM	8.76	27.7151
5/1/08 9:27 AM	8.88	8.4875
5/1/08 9:28 AM	8.63	12.7582
5/1/08 9:29 AM	8.46	14.6271
5/1/08 9:30 AM	8.04	4.7838
5/1/08 9:31 AM	9.24	19.6995
5/1/08 9:32 AM	9.98	201.1733
5/1/08 9:33 AM	52.86	1523.5539
5/1/08 9:34 AM	72.56	2668.0000
5/1/08 9:35 AM	53.03	709.1902
5/1/08 9:36 AM	60.14	255.8399
5/1/08 9:37 AM	35.59	1087.7117
5/1/08 9:38 AM	44.13	244.0466
5/1/08 9:39 AM	26.15	121.8212
5/1/08 9:40 AM	20.4	80.9806
5/1/08 9:41 AM	10.37	35.7415
5/1/08 9:42 AM	10.33	43.3709
5/1/08 9:43 AM	9.37	29.3858
5/1/08 9:44 AM	9.98	43.1971
5/1/08 9:45 AM	11.06	17.7970
5/1/08 9:46 AM	9.41	12.7217
5/1/08 9:47 AM	9.37	21.5213
5/1/08 9:48 AM	10.51	23.2250
5/1/08 9:49 AM	10.65	22.7925
5/1/08 9:50 AM	10.36	25.2711
5/1/08 9:51 AM	13.13	37.8283
5/1/08 9:52 AM	14.6	50.5269
5/1/08 9:53 AM	15.77	63.7354
5/1/08 9:54 AM	15.37	58.0772
5/1/08 9:55 AM	20.59	206.7221
5/1/08 9:56 AM	31.13	246.1952
5/1/08 9:57 AM	34.61	199.7396
5/1/08 9:58 AM	30.79	211.0699
5/1/08 9:59 AM	30.13	220.4281
5/1/08 10:00 AM	29.62	78.0679
5/1/08 10:01 AM	10.44	41.8087
5/1/08 10:02 AM	14.46	33.1414
5/1/08 10:03 AM	15.3	164.4214
5/1/08 10:04 AM	11.74	98.7056
5/1/08 10:05 AM	17.16	130.6715
5/1/08 10:06 AM	21.07	143.6374
5/1/08 10:07 AM	19.46	117.0450
5/1/08 10:08 AM	29.48	344.2073
5/1/08 10:09 AM	41.98	166.4968
5/1/08 10:10 AM	23.15	611.3905
5/1/08 10:11 AM	60.67	869.4616
5/1/08 10:12 AM	76.85	590.3081
5/1/08 10:13 AM	52.42	1181.4785
5/1/08 10:14 AM	64.08	1828.6947
5/1/08 10:15 AM	80.66	718.3574
5/1/08 10:16 AM	14.44	49.0988
5/1/08 10:17 AM	10.26	21.5436
5/1/08 10:18 AM	9.63	12.8442
5/1/08 10:19 AM	10.69	23.5955

5/1/08 11:27 AM	8.75	17.2473
5/1/08 11:28 AM	10.42	39.3264
5/1/08 11:29 AM	8.55	11.3827
5/1/08 11:30 AM	8.97	13.1814
5/1/08 11:31 AM	8.45	10.5498
5/1/08 11:32 AM	8.32	14.7276
5/1/08 11:33 AM	8.97	15.3557
5/1/08 11:34 AM	8.36	13.4559
5/1/08 11:35 AM	8.55	18.0353
5/1/08 11:36 AM	9.84	13.7557
5/1/08 11:37 AM	9.19	11.3686
5/1/08 11:38 AM	8.64	16.2112
5/1/08 11:39 AM	8.76	7.0305
5/1/08 11:40 AM	9.04	8.0500
5/1/08 11:41 AM	9.31	21.0089
5/1/08 11:42 AM	8.83	10.3322
5/1/08 11:43 AM	10.07	37.4762
5/1/08 11:44 AM	9.56	20.5043
5/1/08 11:45 AM	9.33	27.9001
5/1/08 11:46 AM	10.63	30.4836
5/1/08 11:47 AM	8.8	10.4582
5/1/08 11:48 AM	8.7	7.2232
5/1/08 11:49 AM	8.45	13.4513
5/1/08 11:50 AM	8.93	15.0448
5/1/08 11:51 AM	9.44	11.2943
5/1/08 11:52 AM	9.91	15.8452
5/1/08 11:53 AM	9.31	4.2942
5/1/08 11:54 AM	8.71	19.6657
5/1/08 11:55 AM	9.45	15.6129
5/1/08 11:56 AM	11.1	40.3233
5/1/08 11:57 AM	9.37	10.7393
5/1/08 11:58 AM	10.37	26.7954
5/1/08 11:59 AM	10.33	18.0894
5/1/08 12:00 PM	9.08	4.9299
5/1/08 12:01 PM	8.86	11.6922
5/1/08 12:02 PM	8.62	15.1173
5/1/08 12:03 PM	8.45	16.5480
5/1/08 12:04 PM	9.22	21.7695
5/1/08 12:05 PM	9.54	13.7259
5/1/08 12:06 PM	10.31	21.3898
5/1/08 12:07 PM	8.45	16.8517
5/1/08 12:08 PM	8.95	10.7224
5/1/08 12:09 PM	8.38	9.1346
5/1/08 12:10 PM	8.81	16.9575
5/1/08 12:11 PM	8.58	17.4616
5/1/08 12:12 PM	8.8	22.8107
5/1/08 12:13 PM	8.45	27.9804
5/1/08 12:14 PM	10.33	10.6527
5/1/08 12:15 PM	8.71	28.3616
5/1/08 12:16 PM	10.12	19.0526
5/1/08 12:17 PM	8.63	12.4446
5/1/08 12:18 PM	8.18	17.8565
5/1/08 12:19 PM	8.28	3.8341
5/1/08 12:20 PM	8.23	16.5652
5/1/08 12:21 PM	8.86	15.8821
5/1/08 12:22 PM	8.71	8.8495
5/1/08 12:23 PM	9.1	20.4247
5/1/08 12:24 PM	8.38	23.9130
5/1/08 12:25 PM	9.06	12.8352
5/1/08 12:26 PM	8.64	29.4209
5/1/08 12:27 PM	9.06	8.1674
5/1/08 12:28 PM	8.61	26.7106
5/1/08 12:29 PM	9.63	6.5613
5/1/08 12:30 PM	7.95	17.9413
5/1/08 12:31 PM	8.79	13.3166
5/1/08 12:32 PM	8.45	14.2345
5/1/08 12:33 PM	8.1	10.5338

5/1/08 12:34 PM	8.08	19.7030
5/1/08 12:35 PM	8.84	11.6951
5/1/08 12:36 PM	8.99	20.5204
5/1/08 12:37 PM	9.04	23.7850
5/1/08 12:38 PM	9.1	15.5192
5/1/08 12:39 PM	8.15	2.2026
5/1/08 12:40 PM	8.52	7.9858
5/1/08 12:41 PM	8.68	14.1637
5/1/08 12:42 PM	8.46	19.0165
5/1/08 12:43 PM	8.09	22.8772
5/1/08 12:44 PM	9.01	10.8284
5/1/08 12:45 PM	8.67	13.9185
5/1/08 12:46 PM	8.47	37.0434
5/1/08 12:47 PM	9.85	7.7962
5/1/08 12:48 PM	7.99	11.6310
5/1/08 12:49 PM	7.88	5.0787
5/1/08 12:50 PM	7.82	11.8910
5/1/08 12:51 PM	8.41	12.6416
5/1/08 12:52 PM	8.49	18.7708
5/1/08 12:53 PM	8.62	12.2746
5/1/08 12:54 PM	8.01	14.5705
5/1/08 12:55 PM	9	18.2435
5/1/08 12:56 PM	7.78	19.2460
5/1/08 12:57 PM	9.14	6.0971
5/1/08 12:58 PM	7.98	20.9177
5/1/08 12:59 PM	8.67	35.5732
5/1/08 1:00 PM	7.75	11.5338
5/1/08 1:01 PM	8.17	18.0074
5/1/08 1:02 PM	7.91	17.2009
5/1/08 1:03 PM	7.89	7.5488
5/1/08 1:04 PM	7.88	28.0270
5/1/08 1:05 PM	8.09	5.4092
5/1/08 1:06 PM	7.91	10.7948
5/1/08 1:07 PM	8.2	10.2287
5/1/08 1:08 PM	8.43	9.1582
5/1/08 1:09 PM	7.79	11.1714
5/1/08 1:10 PM	8.16	8.0955
5/1/08 1:11 PM	7.73	4.4640
5/1/08 1:12 PM	7.75	18.1099
5/1/08 1:13 PM	7.73	12.1888
5/1/08 1:14 PM	9.17	22.0833
5/1/08 1:15 PM	8.42	15.7242
5/1/08 1:16 PM	8.63	27.7889
5/1/08 1:17 PM	8.26	8.9550
5/1/08 1:18 PM	7.69	10.0435
5/1/08 1:19 PM	7.73	13.6267
5/1/08 1:20 PM	7.74	7.4686
5/1/08 1:21 PM	8.03	12.1568
5/1/08 1:22 PM	7.85	10.8198
5/1/08 1:23 PM	8.2	6.1270
5/1/08 1:24 PM	8.37	10.8853
5/1/08 1:25 PM	8.03	19.2374
5/1/08 1:26 PM	7.98	3.2910
5/1/08 1:27 PM	8.61	29.2976
5/1/08 1:28 PM	7.66	14.6250
5/1/08 1:29 PM	8.94	31.4972
5/1/08 1:30 PM	7.79	8.7380
5/1/08 1:31 PM	8.07	13.2788
5/1/08 1:32 PM	7.79	9.3782
5/1/08 1:33 PM	7.58	12.5231
5/1/08 1:34 PM	7.75	2.8801
5/1/08 1:35 PM	7.75	13.3797
5/1/08 1:36 PM	7.73	6.7985
5/1/08 1:37 PM	8.46	7.8812
5/1/08 1:38 PM	7.76	17.1757
5/1/08 1:39 PM	8.13	8.7198
5/1/08 1:40 PM	7.97	11.7210

Opacity/Emission Rate

DATE TIME	Opacity	PM (lb/mmBtu)	MC (mg/m^3)	CO2 (%)
5/1/08 7:05 AM	9.2	0.027	27.8468	12.66
5/1/08 7:06 AM	9.76	0.020	20.7780	12.69
5/1/08 7:07 AM	9.41	0.023	23.9474	12.54
5/1/08 7:08 AM	6.62	0.031	32.2579	12.65
5/1/08 7:09 AM	16.63	0.009	9.5289	12.65
5/1/08 7:10 AM	27.65	0.022	22.8525	12.65
5/1/08 7:11 AM	10.46	0.013	13.0938	12.65
5/1/08 7:12 AM	11.36	0.033	34.8184	12.65
5/1/08 7:13 AM	13.19	0.022	23.1832	12.65
5/1/08 7:14 AM	9.46	0.014	14.3402	12.65
5/1/08 7:15 AM	10.29	0.017	17.7262	12.65
5/1/08 7:16 AM	10.16	0.013	13.8595	12.65
5/1/08 7:17 AM	10.42	0.026	26.9267	12.65
5/1/08 7:18 AM	10.1	0.031	32.0411	12.65
5/1/08 7:19 AM	13.87	0.024	25.0615	12.65
5/1/08 7:20 AM	10.11	0.021	21.8119	12.65
5/1/08 7:21 AM	10.77	0.014	15.0950	12.65
5/1/08 7:22 AM	9.63	0.018	18.7311	12.65
5/1/08 7:23 AM	10.31	0.012	13.0316	12.65
5/1/08 7:24 AM	9.45	0.016	16.3220	12.65
5/1/08 7:25 AM	9.88	0.015	16.0181	12.65
5/1/08 7:26 AM	11.22	0.025	26.5907	12.65
5/1/08 7:27 AM	12.06	0.025	26.5537	12.65
5/1/08 7:28 AM	12.63	0.026	26.9679	12.65
5/1/08 7:29 AM	10.9	0.020	20.3239	12.35
5/1/08 7:30 AM	9.81	0.014	13.9600	12.45
5/1/08 7:31 AM	9.41	0.016	16.4825	12.56
5/1/08 7:32 AM	9.67	0.015	15.6970	12.56
5/1/08 7:33 AM	10.29	0.013	13.6887	12.39
5/1/08 7:34 AM	10.86	0.017	18.0375	12.54
5/1/08 7:35 AM	10.67	0.042	42.5736	12.4
5/1/08 7:36 AM	18.13	0.032	32.7140	12.42
5/1/08 7:37 AM	9.61	0.018	18.1191	12.48
5/1/08 7:38 AM	9.29	0.017	17.0463	12.41
5/1/08 7:39 AM	9.98	0.015	15.6728	12.48
5/1/08 7:40 AM	10.29	0.009	9.1653	12.23
5/1/08 7:41 AM	8.98	0.011	11.5059	12.27
5/1/08 7:42 AM	8.54	0.011	11.4041	12.42
5/1/08 7:43 AM	8.81	0.010	10.5023	12.31
5/1/08 7:44 AM	8.89	0.010	10.6663	12.39
5/1/08 7:45 AM	9.43	0.012	12.3503	12.39
5/1/08 7:46 AM	8.76	0.008	8.2387	12.34
5/1/08 7:47 AM	9.15	0.016	16.6545	12.44
5/1/08 7:48 AM	8.72	0.015	15.1291	12.35
5/1/08 7:49 AM	9.85	0.010	9.9487	12.32
5/1/08 7:50 AM	8.58	0.009	9.1645	12.43
5/1/08 7:51 AM	10.18	0.022	22.5950	12.36
5/1/08 7:52 AM	8.84	0.012	11.8977	12.3
5/1/08 7:53 AM	9.41	0.014	14.8580	12.4
5/1/08 7:54 AM	8.74	0.016	16.5159	12.32
5/1/08 7:55 AM	8.53	0.007	7.3194	12.35
5/1/08 7:56 AM	8.84	0.015	15.4683	12.33
5/1/08 7:57 AM	9.68	0.007	7.1663	12.33
5/1/08 7:58 AM	8.77	0.028	17.5824	7.62
5/1/08 7:59 AM	9.87	0.027	26.9922	12.14
5/1/08 8:00 AM	8.97	0.011	11.8246	12.54
5/1/08 8:01 AM	8.61	0.009	9.7276	12.62
5/1/08 8:02 AM	8.72	0.008	8.0298	12.46
5/1/08 8:03 AM	8.75	0.012	12.0889	12.53
5/1/08 8:04 AM	8.6	0.014	13.9579	12.36
5/1/08 8:05 AM	9.05	0.015	15.5896	12.43

5/1/08 9:13 AM	22.09	0.095	97.2378	12.35
5/1/08 9:14 AM	20.48	0.065	67.2988	12.47
5/1/08 9:15 AM	17.04	0.064	66.3235	12.47
5/1/08 9:16 AM	23.58	0.072	73.6941	12.44
5/1/08 9:17 AM	19.04	0.075	76.9665	12.45
5/1/08 9:18 AM	23.61	0.078	79.6179	12.42
5/1/08 9:19 AM	25.8	0.056	57.2447	12.34
5/1/08 9:20 AM	12.82	0.025	26.2353	12.46
5/1/08 9:21 AM	9.54	0.016	16.5089	12.4
5/1/08 9:22 AM	10.83	0.038	38.8531	12.42
5/1/08 9:23 AM	9.46	0.018	18.9120	12.44
5/1/08 9:24 AM	11.24	0.066	67.3915	12.39
5/1/08 9:25 AM	9.54	0.011	11.6156	12.71
5/1/08 9:26 AM	8.76	0.027	27.7151	12.6
5/1/08 9:27 AM	8.88	0.008	8.4875	12.51
5/1/08 9:28 AM	8.63	0.012	12.7582	12.47
5/1/08 9:29 AM	8.46	0.014	14.6271	12.55
5/1/08 9:30 AM	8.04	0.005	4.7838	12.23
5/1/08 9:31 AM	9.24	0.019	19.6995	12.25
5/1/08 9:32 AM	9.98	0.198	201.1733	12.32
5/1/08 9:33 AM	52.86	1.491	1523.5539	12.36
5/1/08 9:34 AM	72.56	2.612	2668.0000	12.36
5/1/08 9:35 AM	53.03	0.703	709.1902	12.2
5/1/08 9:36 AM	60.14	0.252	255.8399	12.27
5/1/08 9:37 AM	35.59	1.073	1087.7117	12.27
5/1/08 9:38 AM	44.13	0.242	244.0466	12.19
5/1/08 9:39 AM	26.15	0.120	121.8212	12.32
5/1/08 9:40 AM	20.4	0.080	80.9806	12.32
5/1/08 9:41 AM	10.37	0.035	35.7415	12.19
5/1/08 9:42 AM	10.33	0.043	43.3709	12.34
5/1/08 9:43 AM	9.37	0.029	29.3858	12.28
5/1/08 9:44 AM	9.98	0.043	43.1971	12.28
5/1/08 9:45 AM	11.06	0.017	17.7970	12.42
5/1/08 9:46 AM	9.41	0.013	12.7217	12.3
5/1/08 9:47 AM	9.37	0.021	21.5213	12.35
5/1/08 9:48 AM	10.51	0.023	23.2250	12.46
5/1/08 9:49 AM	10.65	0.022	22.7925	12.35
5/1/08 9:50 AM	10.36	0.025	25.2711	12.47
5/1/08 9:51 AM	13.13	0.037	37.8283	12.38
5/1/08 9:52 AM	14.6	0.050	50.5269	12.32
5/1/08 9:53 AM	15.77	0.062	63.7354	12.44
5/1/08 9:54 AM	15.37	0.057	58.0772	12.36
5/1/08 9:55 AM	20.59	0.202	206.7221	12.38
5/1/08 9:56 AM	31.13	0.238	246.1952	12.51
5/1/08 9:57 AM	34.61	0.195	199.7396	12.42
5/1/08 9:58 AM	30.79	0.204	211.0699	12.51
5/1/08 9:59 AM	30.13	0.214	220.4281	12.47
5/1/08 10:00 AM	29.62	0.076	78.0679	12.41
5/1/08 10:01 AM	10.44	0.040	41.8087	12.5
5/1/08 10:02 AM	14.46	0.032	33.1414	12.45
5/1/08 10:03 AM	15.3	0.159	164.4214	12.48
5/1/08 10:04 AM	11.74	0.095	98.7056	12.53
5/1/08 10:05 AM	17.16	0.128	130.6715	12.33
5/1/08 10:06 AM	21.07	0.140	143.6374	12.39
5/1/08 10:07 AM	19.46	0.114	117.0450	12.47
5/1/08 10:08 AM	29.48	0.333	344.2073	12.49
5/1/08 10:09 AM	41.98	0.162	166.4968	12.4
5/1/08 10:10 AM	23.15	0.592	611.3905	12.49
5/1/08 10:11 AM	60.67	0.839	869.4616	12.54
5/1/08 10:12 AM	76.85	0.569	590.3081	12.55
5/1/08 10:13 AM	52.42	1.138	1181.4785	12.56
5/1/08 10:14 AM	64.08	1.806	1828.6947	12.25
5/1/08 10:15 AM	80.66	0.714	718.3574	12.17
5/1/08 10:16 AM	14.44	0.048	49.0988	12.27
5/1/08 10:17 AM	10.26	0.021	21.5436	12.33
5/1/08 10:18 AM	9.63	0.013	12.8442	12.41
5/1/08 10:19 AM	10.69	0.023	23.5955	12.52

5/1/08 11:27 AM	8.75	0.023	17.2473	9.07
5/1/08 11:28 AM	10.42	0.047	39.3264	10.18
5/1/08 11:29 AM	8.55	0.011	11.3827	12.19
5/1/08 11:30 AM	8.97	0.013	13.1814	12.08
5/1/08 11:31 AM	8.45	0.010	10.5498	12.35
5/1/08 11:32 AM	8.32	0.014	14.7276	12.38
5/1/08 11:33 AM	8.97	0.016	15.3557	11.85
5/1/08 11:34 AM	8.36	0.014	13.4559	11.67
5/1/08 11:35 AM	8.55	0.018	18.0353	12.05
5/1/08 11:36 AM	9.84	0.014	13.7557	11.93
5/1/08 11:37 AM	9.19	0.011	11.3686	12.06
5/1/08 11:38 AM	8.64	0.016	16.2112	12.18
5/1/08 11:39 AM	8.76	0.007	7.0305	11.91
5/1/08 11:40 AM	9.04	0.008	8.0500	11.93
5/1/08 11:41 AM	9.31	0.021	21.0089	12.07
5/1/08 11:42 AM	8.83	0.011	10.3322	11.78
5/1/08 11:43 AM	10.07	0.038	37.4762	11.92
5/1/08 11:44 AM	9.56	0.021	20.5043	12.06
5/1/08 11:45 AM	9.33	0.029	27.9001	11.77
5/1/08 11:46 AM	10.63	0.031	30.4836	11.85
5/1/08 11:47 AM	8.8	0.010	10.4582	12.1
5/1/08 11:48 AM	8.7	0.007	7.2232	11.8
5/1/08 11:49 AM	8.45	0.014	13.4513	11.74
5/1/08 11:50 AM	8.93	0.015	15.0448	12
5/1/08 11:51 AM	9.44	0.012	11.2943	11.83
5/1/08 11:52 AM	9.91	0.016	15.8452	11.9
5/1/08 11:53 AM	9.31	0.004	4.2942	12.12
5/1/08 11:54 AM	8.71	0.020	19.6657	11.75
5/1/08 11:55 AM	9.45	0.016	15.6129	11.8
5/1/08 11:56 AM	11.1	0.040	40.3233	12.09
5/1/08 11:57 AM	9.37	0.011	10.7393	11.8
5/1/08 11:58 AM	10.37	0.027	26.7954	11.84
5/1/08 11:59 AM	10.33	0.018	18.0894	12.15
5/1/08 12:00 PM	9.08	0.005	4.9299	11.93
5/1/08 12:01 PM	8.86	0.012	11.6922	11.93
5/1/08 12:02 PM	8.62	0.015	15.1173	12.16
5/1/08 12:03 PM	8.45	0.017	16.5480	11.92
5/1/08 12:04 PM	9.22	0.023	21.7695	11.63
5/1/08 12:05 PM	9.54	0.014	13.7259	11.49
5/1/08 12:06 PM	10.31	0.023	21.3898	11.41
5/1/08 12:07 PM	8.45	0.018	16.8517	11.6
5/1/08 12:08 PM	8.95	0.011	10.7224	11.68
5/1/08 12:09 PM	8.38	0.010	9.1346	11.62
5/1/08 12:10 PM	8.81	0.017	16.9575	11.83
5/1/08 12:11 PM	8.58	0.018	17.4616	11.73
5/1/08 12:12 PM	8.8	0.024	22.8107	11.66
5/1/08 12:13 PM	8.45	0.029	27.9804	11.78
5/1/08 12:14 PM	10.33	0.011	10.6527	11.7
5/1/08 12:15 PM	8.71	0.028	28.3616	12.12
5/1/08 12:16 PM	10.12	0.019	19.0526	12.24
5/1/08 12:17 PM	8.63	0.013	12.4446	11.99
5/1/08 12:18 PM	8.18	0.018	17.8565	12.06
5/1/08 12:19 PM	8.28	0.004	3.8341	11.91
5/1/08 12:20 PM	8.23	0.017	16.5652	11.7
5/1/08 12:21 PM	8.86	0.016	15.8821	11.84
5/1/08 12:22 PM	8.71	0.009	8.8495	11.84
5/1/08 12:23 PM	9.1	0.021	20.4247	11.62
5/1/08 12:24 PM	8.38	0.025	23.9130	11.66
5/1/08 12:25 PM	9.06	0.014	12.8352	11.48
5/1/08 12:26 PM	8.64	0.031	29.4209	11.33
5/1/08 12:27 PM	9.06	0.009	8.1674	11.43
5/1/08 12:28 PM	8.61	0.028	26.7106	11.56
5/1/08 12:29 PM	9.63	0.007	6.5613	11.72
5/1/08 12:30 PM	7.95	0.019	17.9413	11.37
5/1/08 12:31 PM	8.79	0.015	13.3166	11.08
5/1/08 12:32 PM	8.45	0.017	14.2345	10.42
5/1/08 12:33 PM	8.1	0.012	10.5338	10.62

5/1/08 1:41 PM	8.43	0.015	12.8099	10.34
5/1/08 1:42 PM	7.81	0.015	13.3173	10.52
5/1/08 1:43 PM	8.03	0.012	10.3700	10.55
5/1/08 1:44 PM	7.73	0.032	27.4625	10.36
5/1/08 1:45 PM	8.74	0.012	10.2564	10.07
5/1/08 1:46 PM	8.95	0.021	18.2957	10.34
5/1/08 1:47 PM	9.15	0.019	16.3136	10.63
5/1/08 1:48 PM	7.66	0.009	7.8598	11.05
5/1/08 1:49 PM	7.51	0.011	9.9375	11.24
5/1/08 1:50 PM	7.62	0.012	10.4001	10.88
5/1/08 1:51 PM	7.63	0.011	9.5094	10.87
5/1/08 1:52 PM	7.95	0.022	19.9338	11.13
5/1/08 1:53 PM	7.88	0.017	15.4270	10.85
5/1/08 1:54 PM	8.46	0.012	10.3160	10.53
5/1/08 1:55 PM	7.77	0.015	12.6685	10.44
5/1/08 1:56 PM	8.52	0.018	14.8414	10.26
5/1/08 1:57 PM	8.11	0.009	7.3246	10.27
5/1/08 1:58 PM	8.12	0.005	4.2638	10
5/1/08 1:59 PM	7.59	0.011	9.2976	9.87

CleanAir

CleanAir Engineering
1601 Parkway View Drive
Pittsburgh, PA 15205-1409
800-632-1619
www.cleanair.com

May 16, 2008

Mr. Jeff Ferguson
Catalyst Air Management, Inc.
2505 Byington Solway Road
Knoxville, TN 37931

Subject: **Transmittal of TEOM® 7000 Test Data for UGI's Hunlock Boiler No. 6 Compliance Assurance Monitoring (CAM) Predictive Indicator Test**

Reference: **Catalyst Air Management Contract No. CAM08-UGI**

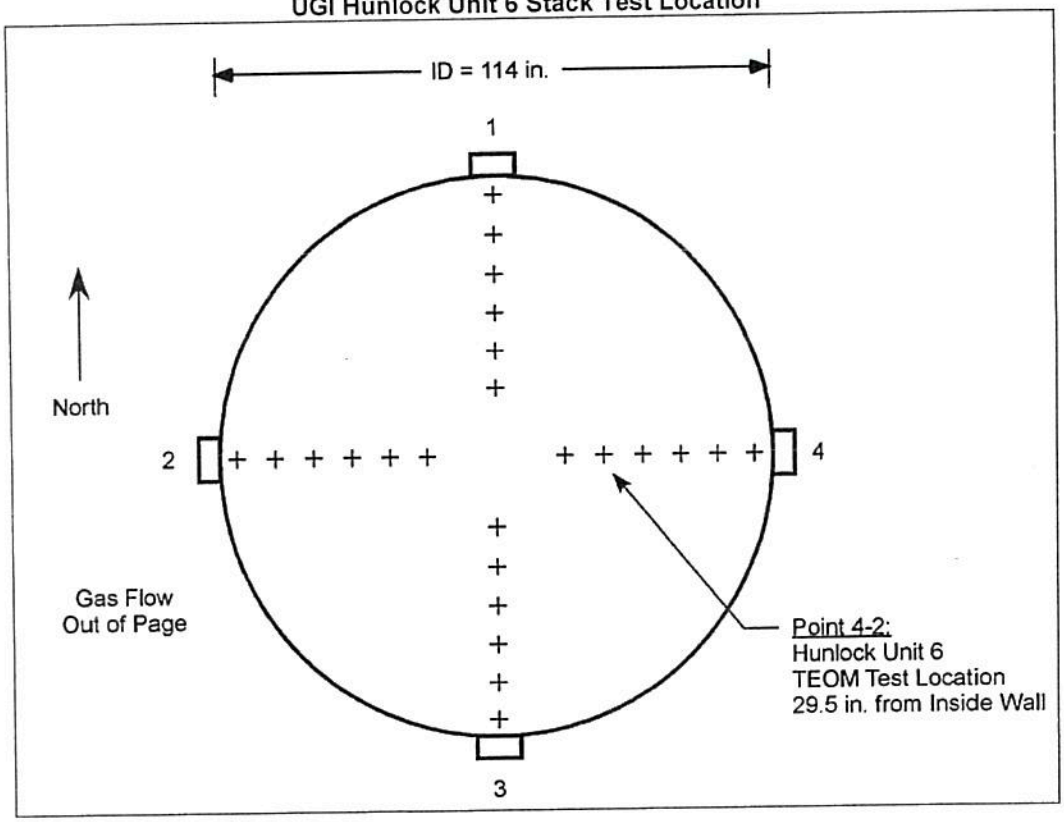
Dear Mr. Ferguson:

The enclosed CD contains the data file for the recently completed source particulate monitoring test program using the Tapered Element Oscillating Microbalance (TEOM®) 7000 sampling system performed at the UGI Hunlock Generating Station. The testing was conducted in general accordance with Clean Air Engineering's (CleanAir) Proposal No. 34644 (Revision 1) dated January 15, 2008, and the ASTM Procedure D6831-02, entitled "Standard Test Method for Sampling and Determining Particulate Matter in Stack Gases Using an In-Stack, Inertial Microbalance", as well as the 40 CFR Part 64 Compliance Assurance Monitoring (CAM) test program protocol document dated October 25, 2007, prepared by Catalyst Air Management (*Catalyst*). The Hunlock Unit 6 stack was tested on May 1, 2008.

The data CD contains one (1) Microsoft Excel workbook. The Excel workbook contains a thirteen (13) worksheet report generated by the RPComm 7000 software. As per the terms of CleanAir's Proposal No. 34644, this automatically generated report shall constitute CleanAir's reporting requirements to *Catalyst*. Analysis of the data for determination of the statistical correlation between TSP and opacity shall be the responsibility of *Catalyst*.

Table 1 provides a description of each worksheet. The data of most interest to *Catalyst* is the particulate mass concentration results. This data, reported in the units of milligrams per cubic meter (mg/m^3), can be found in the "User Defined Data Report" which is Worksheet No. 12.

Figure 1
UGI Hunlock Unit 6 Stack Test Location



Preliminary Testing and Setup

Catalyst performed a 3-load Relative Accuracy Test Audit (RATA) of the stack flow conditions immediately prior to CleanAir's arrival on-site. This flow RATA test data was reviewed by *Catalyst*, and an average velocity point was determined. The TEOM was positioned at Point 2 in Port 4 during the testing on Unit 6, as per the instruction of *Catalyst*. Point 4-2 was located 29.5 inches from the inside of the stack wall of Port 4 (see Figure 1). Accordingly, the TEOM probe was positioned at this location for the TEOM test run performed during the test program.

Single point sampling was expected to provide a representative sample of the emissions from the source. This assertion is made considering the relative uniformity of the gas velocity at the stack sampling location. Additionally, characterizing the temporal variation in mass concentrations was critical to the success of the test program. Coplanar sampling could cause a shift in concentration producing a confounding variable in the correlation of the Continuous Opacity Monitor (COM) output to the total suspended particulate (TSP) mass concentration.

The data acquisition system clock for the TEOM 7000 was synchronized to the Hunlock plant opacity monitor data acquisition time prior to the start of testing on May 1, 2008.

TEOM Test Results

The TEOM test run (UGI U6_R05010619) on Hunlock Unit 6 was conducted in continuous mode. The instrument was started at 07:00 hours on May 1, 2008. Instrument stabilization was complete at approximately 07:05 hours. The TEOM ran in continuous mode until it was manually stopped at 14:00 hours. Unit No. 6 was tested at three different load conditions, including high, mid, and low loads. ESP T-R sets were manually de-energized by UGI personnel at high load only in order to artificially induce elevated opacity readings. Table 3 provides a summary of the conditions, approximately times, and resulting particulate matter mass concentrations determined by the TEOM.

Table 3
Summary of TEOM 7000 Test Results

Load	Condition	Start Time	End Time	Average Mass Concentration (mg/m^3)
Full Load	Steady State	07:00	09:00	17.1
Full Load	Induced Opacity	09:02	10:16	203.3
Mid Load	Steady State	11:00	12:00	17.2
Low Load	Steady State	13:00	14:00	14.4

Note: Average mass concentration values do not include negative readings.

Figure 2 shows the 30-second average particulate mass concentration as a function of time for the entire 7-hour test period. The cap and case (i.e. TEOM filter) temperatures were manually set at 175 °C (± 1 °C).

Figure's 3 through 5 show the 30-second average particulate mass concentration for the full, mid, and low load tests during steady state operation. The reader will note several brief periods of "negative" mass concentration, especially in Figure's 4 and 5. This anomalous data is caused by particulate matter falling of the filter. This is not a common occurrence. It is typically caused by excessive vibration of the TEOM probe, overloading of the TEOM filter, or non-agglomerative particulate.

Figure 4
UGI Hunlock Unit 6 – Mid Load Steady State
TEOM 7000 Output – 30 Second Averages

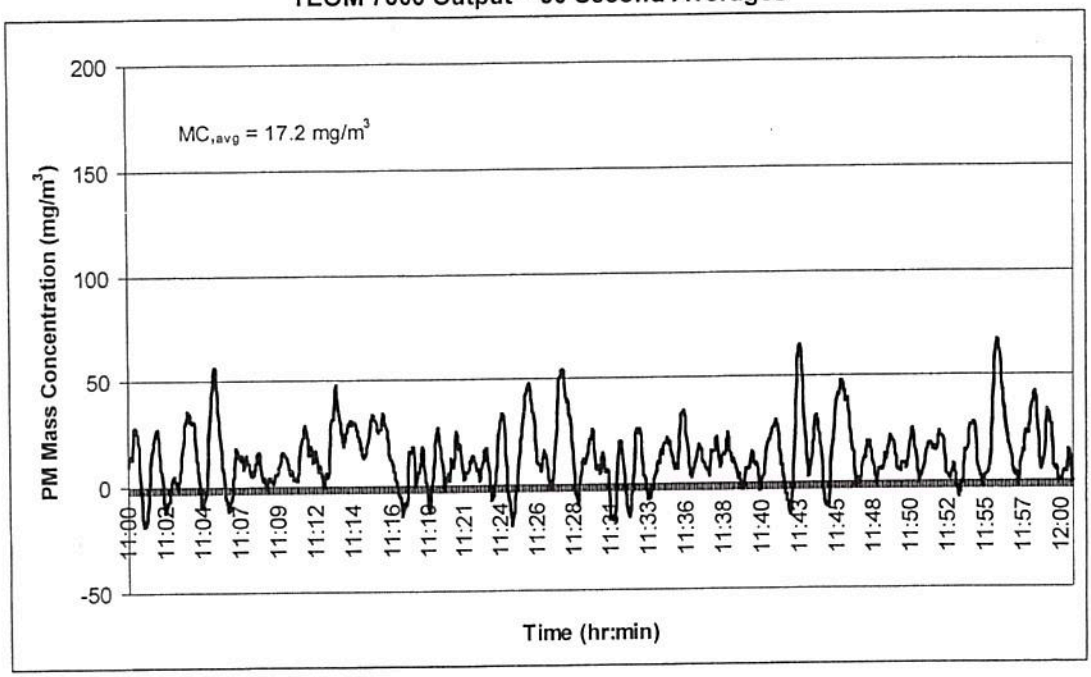


Figure 5
UGI Hunlock Unit 6 – Low Load Steady State
TEOM 7000 Output – 30 Second Averages

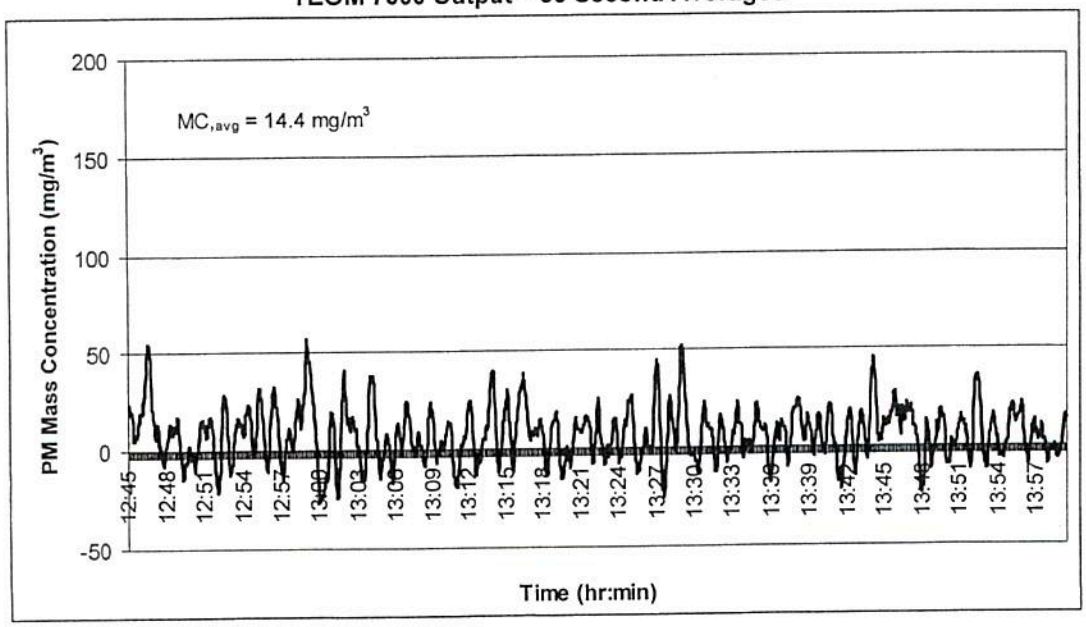
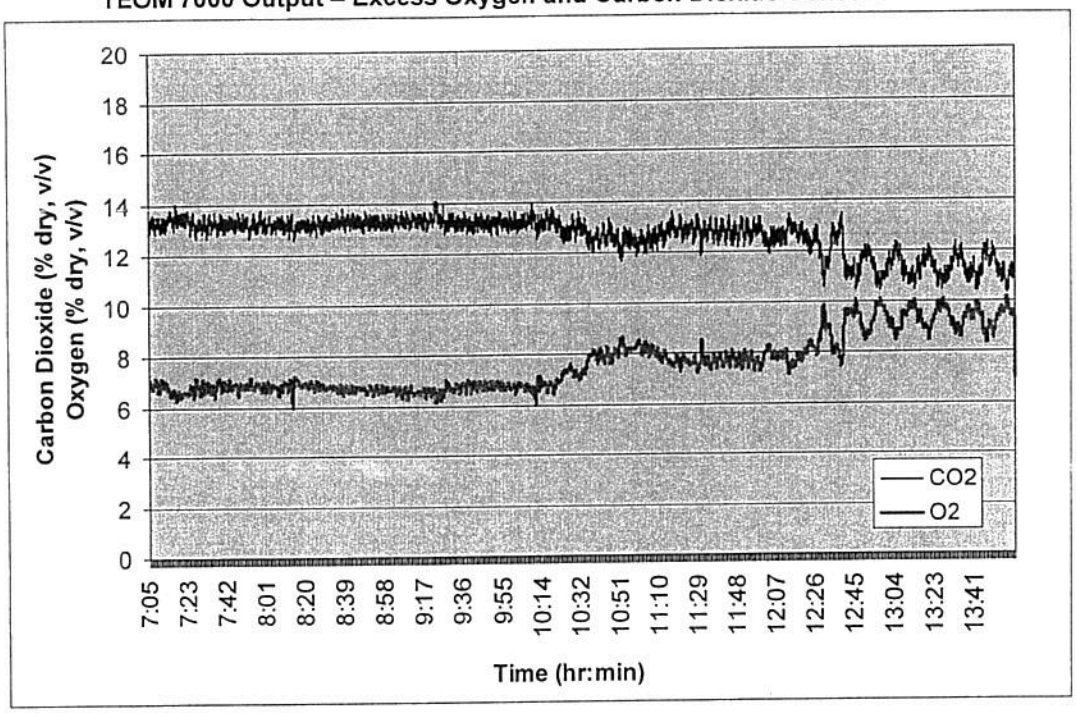


Figure 6
UGI Hunlock Unit 6
TEOM 7000 Output – Excess Oxygen and Carbon Dioxide Concentrations



Calculations Used to Convert Mass Concentration Rolling Average to 30-Second Arithmetic Average

1. Calculation of the compensated raw frequency at each gate time (Cells BN9…BN7536):

$$\text{Cell BN9} = (-0.000004*(P_{in} - P_{in,avg})*RF_{avg}) + RF_{CV}$$

Where P_{in} = the current value of PRC 149 (filter dP and the inlet dP of flow sensor Q1)

$P_{in,avg}$ = the average of the first nine readings (~30 sec) of PRC 149

RF_{avg} = the average tapered element (TE) raw frequency (PRC 6) prior to current value = average (C4:C9)

RF_{CV} = the current value of the TE raw frequency (PRC 6) = C9

2. Calculation of the compensated total mass (TM) for each gate time (Cells BO9…BO7536):

$$\text{Cell BO9} = k_0 * \left(\left(\frac{1}{RF_{comp}^2} \right) - \left(\frac{1}{RF_0^2} \right) \right) * 10^6$$

Where k_0 = the tapered element calibration constant = Cell BQ1

RF_{comp}^2 = the compensated raw frequency at the current time = Cell BN9

RF_0^2 = the compensated raw frequency at time zero = Cell BS1

3. Calculation of the 30 second compensated TM average (Cells BP17…BP7536)

Cell BP17 = (BO9:BO17)/9

4. Calculation of the 30 second compensated mass concentration MC (Cells BQ25…BQ7536)

$$\text{Cell BQ25} = \frac{TM_{10sec}}{(TV_{10sec})(1000)}$$

Where TM_{30sec} = total mass collected over 30 seconds = BP25 – BP17

TV_{30sec} = total volume (PRC 29) collected over 10 seconds = J25 – J17

1000 = conversion factor from $\mu g/m^3$ to mg/m^3

Note: Calculations provided by TEOM manufacturer (Rupprecht & Patashnick).

Airgas PA

Airgas Specialty Gases
600 Union Landing Road
Riverton, NJ 08077
(856) 829-7878
Fax (856) 829-0571
www.airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number:	E03NI79E15A00E4	Reference Number:	82-124115800-1
Cylinder Number:	CC210725	Cylinder Volume:	151 Cu.Ft.
Laboratory:	ASG - Riverton - NJ	Cylinder Pressure:	2015 PSIG
Analysis Date:	Nov 13, 2007	Valve Outlet:	590

Expiration Date: Nov 13, 2010

Certification performed in accordance with "EPA Traceability Protocol (Sept. 1997)" using the assay procedures listed. Analytical Methodology does not require correction for analytical interferences. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder below 150 psig.i.e. 1 Mega Pascal

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainity
CARBON DIOXIDE	9.000 %	9.002 %	G1	+/- 1% NIST Traceable
OXYGEN	12.00 %	12.00 %	G1	+/- 1% NIST Traceable
NITROGEN	Balance			

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Expiration Date
NTRM	01119418	CC14317	9.72% OXYGEN/NITROGEN	Jul 05, 2010
NTRM	97050915	SG9168844BAL	8.954% CARBON DIOXIDE/NITROGEN	Jul 01, 2009

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Siemens Ultramat 6E N1-N0-0820	NDIR	Oct 24, 2007
Siemens 5E BN805	Paramagnetic	Oct 24, 2007

Triad Data Available Upon Request

Notes:

QA Approval

Flow and Moisture

Catalyst Air Management, Inc.

POST-TEST METER BOX CALIBRATION

METER BOX NUMBER: 060
DATE: 5/5/2008
CALIBRATED BY: Ferguson

PRETEST Y_i: 1.01
POST-TEST Y_i: 1.01
DIFFERENCE, % -0.26

BENCH METER CALIBRATION FACTOR: 1.000

Orifice Manometer Setting (Δ H) In. H_2O	Standard Test Meter Start: End:	(V_w) ft^3	Dry Gas Meter Start: End:	(V_d) ft^3	Standard Test Meter (T_w) °F	Dry Gas Meter Inlet (T_{di}) °F	Outlet (T_{do}) °F	Average (T_d) °F	Barometric Pressure (P_b) in. of Hg	Time (Time) min.	Y_i	ΔH@i	Q_m	K_m
1.80	424.714	7.769	17.738	7.677	61.0	62.0	61.0	61.5	29.84	10.00	1.01	1.70	0.767	0.737
	432.483		25.415											
1.80	432.483	7.745	25.415	7.690	61.0	64.0	62.0	63.0	29.84	10.00	1.01	1.70	0.768	0.737
	440.228		33.105											
1.80	440.228	7.692	33.105	7.652	61.0	67.0	64.0	65.5	29.84	10.00	1.01	1.73	0.763	0.731
	447.920		40.757											

Average: **1.01** **1.71**

FORMULAS

$$Y_i = \frac{(V_w)(P_b)(T_d + 460)}{(V_d)\left(P_b + \frac{H}{13.6}\right)(T_w + 460)}$$

$$\Delta H@i = \frac{0.9244}{K_m^{\,2}}$$

$$K_m = Q_m\sqrt{\frac{(P_b)(29)}{(T_{do} + 460)(\Delta H)}}$$

$$Q_m = \frac{(V_d)(T_{do} + 460)}{(Time)(T_{do} + 460)}$$

CATALYST AIR MANAGEMENT, INC

K-TYPE THERMOCOUPLE CALIBRATION

Post Test Calibration Check
UGI

DATE: 5/5/2008
CALIBRATED BY: Urban

AVG STACK TEMPERATURE:	322
Thermocouple No;	**DA 0043**
Std Therometer	321
Thermocouple	323
Difference	-2
Difference % Absolute	-0.3
Acceptance Criteria %	1.5

CATALYST AIR MANAGEMENT, INC

CAM 3D-02
Pressure Calibrations

DATE: 5/5/2008
CALIBRATED BY: Urban

YAW Magnehelic

Std Manometer	1.0	0.00	-1.0
YAW Magnehelic	1.0	0.00	-1.0

P1-P2 Manometer

Std Manometer	1.5	0.00
3D-2	1.5	0.00

P4-P5 Manometer

Std Manometer	1.0	0.00
3D-2	1.0	0.00

P4-P5 Manometer

Std Manometer	-0.11	0.00
3D-2	-0.11	0.00

Table 1. Summary of F1 and F2 Calibration Coefficients

Spherical Probe (DA0043) Calibration - 03/05/2008
Environmental Supply Company Wind Tunnel

	Average of 2 repetitions at each velocity					
Pitch Angle	60 ft/sec		90 ft/sec		60-90 ft/sec Average	
(degrees)	F1	F2	F1	F2	F1	F2
-30	-0.581	1.093	-0.551	1.090	-0.566	1.091
-25	-0.468	1.083	-0.453	1.085	-0.460	1.084
-20	-0.356	1.073	-0.353	1.079	-0.354	1.076
-15	-0.261	1.068	-0.253	1.069	-0.257	1.069
-10	-0.159	1.033	-0.154	1.040	-0.157	1.037
-5	-0.074	1.008	-0.072	1.023	-0.073	1.016
0	-0.013	1.001	-0.010	1.012	-0.011	1.006
5	0.038	0.999	0.036	1.007	0.037	1.003
10	0.095	1.003	0.092	1.023	0.093	1.013
15	0.166	1.017	0.166	1.030	0.166	1.024
20	0.234	0.995	0.232	1.016	0.233	1.006
25	0.315	0.980	0.315	0.975	0.315	0.978
30	0.419	0.989	0.416	0.979	0.418	0.984

Table 3. Percent Difference Between Replicates

Spherical Probe (DA0043) Calibration - 03/05/2008
Environmental Supply Company Wind Tunnel

Pitch Angle (degrees)	F2 at 60 ft/sec			F2 at 90 ft/sec		
	Rep 1	Rep 2	% Diff	Rep 1	Rep 2	% Diff
-30	1.096	1.090	0.6	1.088	1.091	0.3
-25	1.081	1.085	0.3	1.085	1.085	0.0
-20	1.072	1.074	0.2	1.074	1.084	0.9
-15	1.069	1.067	0.3	1.069	1.069	0.0
-10	1.038	1.029	0.9	1.036	1.044	0.8
-5	1.009	1.007	0.3	1.027	1.020	0.7
0	1.000	1.001	0.2	1.012	1.012	0.1
5	1.000	0.998	0.2	1.005	1.009	0.4
10	1.002	1.004	0.2	1.023	1.023	0.1
15	1.020	1.015	0.5	1.026	1.035	0.8
20	0.998	0.992	0.7	1.017	1.015	0.2
25	0.983	0.978	0.4	0.971	0.979	0.8
30	0.989	0.989	0.0	0.981	0.976	0.5

Note : Only 2 replicates are required if the % difference in F2 is < 2%.

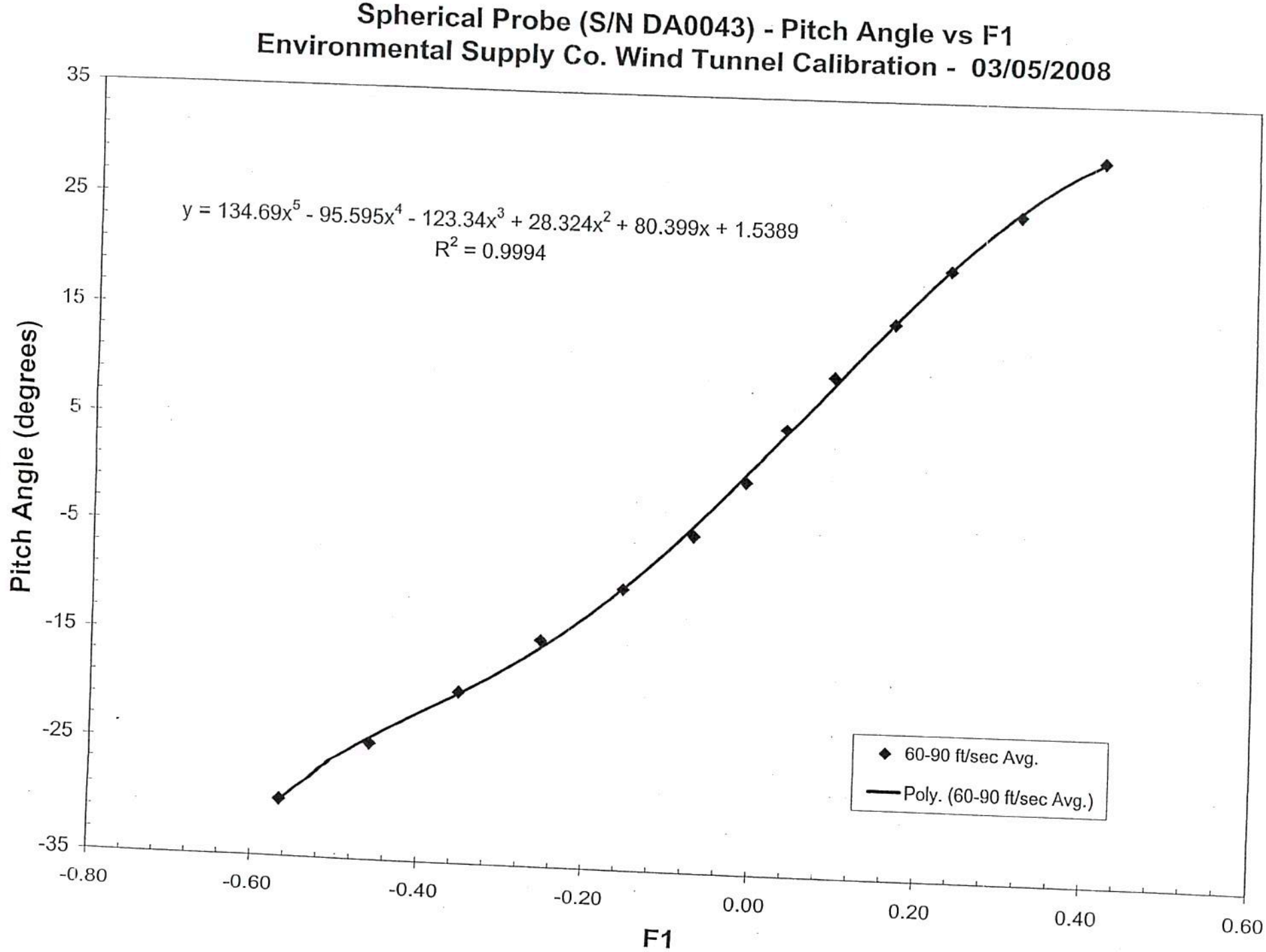
Table 4. Comparison of F2 Values Between 60 and 90 ft/sec Velocities

Spherical Probe (DA0043) Calibration - 03/05/2008
Environmental Supply Company Wind Tunnel

Pitch Angle (degrees)	% Difference in Avg. F2
-30	0.3
-25	0.2
-20	0.6
-15	0.1
-10	0.7
-5	1.5
0	1.1
5	0.8
10	2.0
15	1.3
20	2.1
25	0.5
30	1.0

% Difference = [F2(max) - F2(min) / F2(min)] x 100

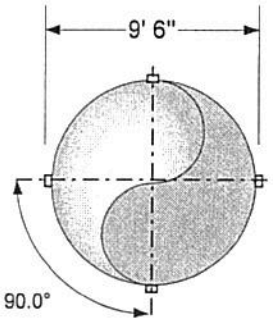
Specifications: < 3% within -15 to +15 degrees pitch
< 5% beyond -15 and +15 degrees pitch


Spherical Probe (S/N DA0043) - Pitch Angle vs F1
Environmental Supply Co. Wind Tunnel Calibration - 03/05/2008
y = 134.69x^5 - 95.595x^4 - 123.34x^3 + 28.324x^2 + 80.399x + 1.5389
R^2 = 0.9994
Pitch Angle (degrees)
35
25
15
5
-5
-15
-25
-35
-0.80
-0.60
-0.40
-0.20
0.00
0.20
0.40
0.60
F1
60-90 ft/sec Avg.
Poly. (60-90 ft/sec Avg.)

CATALYST
AIR MANAGEMENT, INC.

TRAVERSE POINTS (Typ 4 Ports)
FLOW
(Inches) from inside of stack.

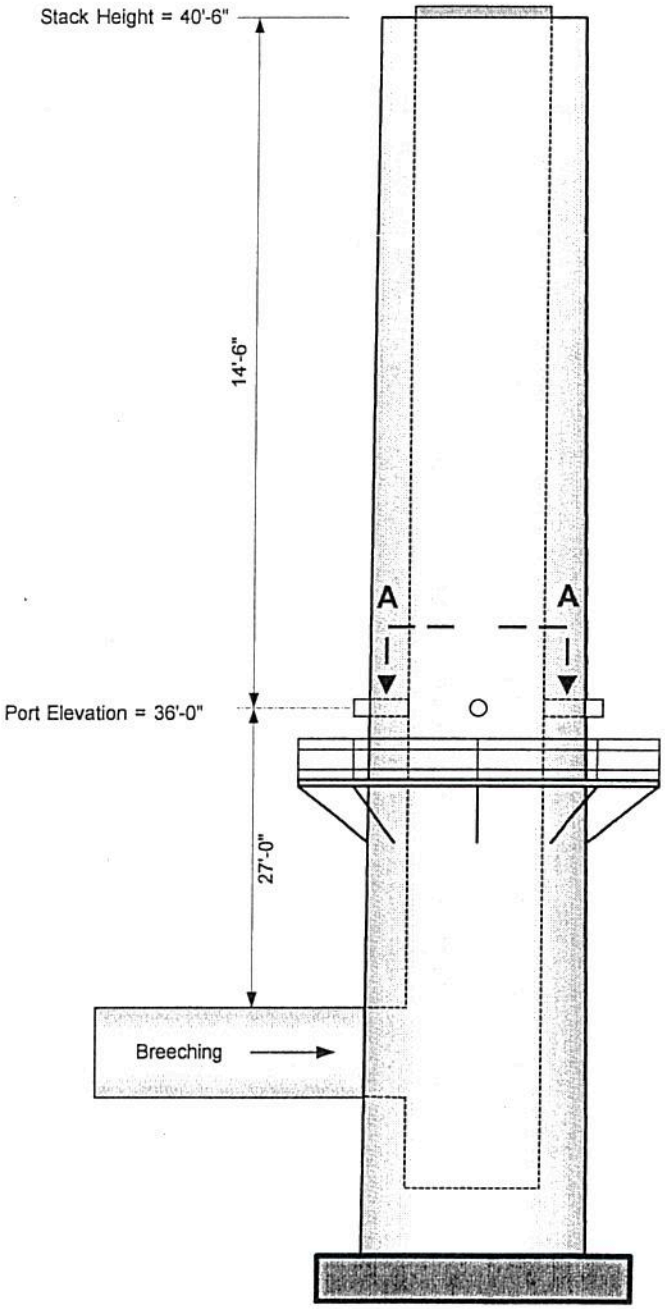
1. 3.6"
2. 12.0"
3. 22.1"
4. 36.8"



SECTION A - A

TRAVERSE POINTS
(inches) from inside of stack wall.

1. 19.0
2. 57.0
3. 95.0



TITLE		
UGI DEVELOPMENT COMPANY - HUNLOCK STATION		
DESCRIPTION		DATE
UNIT 6 TEST PORT CONFIGURATION		7/24/98
SCALE	DRAWN BY	REVISED
NONE	MJ TAYLOR	5/18/07