

US EPA ARCHIVE DOCUMENT

APPENDIX B

USEPA UV-DOAS REPORT

004844  
USEPA Report  
6/9/2010

Ferrara, Thomas

**From:** Secrest.Cary@epamail.epa.gov  
**Sent:** Wednesday, June 09, 2010 10:47 AM  
**To:** Patel.Harish@epamail.epa.gov; Ferrara, Thomas; Rod.Robinson@npl.co.uk; Rami Hashmonay  
**Subject:** Tonawanda Coke: UV DOAS Report for DIAL Report



TCC UV DOAS  
Report - Secrest.d...



Attachment 1  
Calibration Recor...



Attachment 2 UV  
DOAS Path Site...



UV DOAS Analyzer  
Data TCC May ...



UV DOAS Analyzer  
Cabliration R...

All:

For the DIAL-DOAS inter-comparison.

(See attached file: TCC UV DOAS Report - Secrest.doc) (See attached file: Attachment 1 Calibration Records.pdf) (See attached file: Attachment 2 UV DOAS Path Site Location Drawing.pdf)

(See attached file: UV DOAS Analyzer Data TCC May 2010 Validated Public.xls) (See attached file: UV DOAS Analyzer Cabliration Results TCC May 2010.xls)

Note: as described in the Report, the weather station I put up on the landfill did not record data. Also, the time stamp changed. I suspect the station could not run properly on the inverter power, even though it seemed to run fine when we set it up.

Regards,  
Cary

"If it weren't for the last minute, a lot of things wouldn't get done."  
- Michael S. Traylor

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US EPA ARCHIVE DOCUMENT

Tonawanda Coke DIAL Project  
Report on Data and Operations  
Cary Secrest, UV DOAS Specialist  
U.S. EPA Air Enforcement Division  
June 8, 2010

#### Quality Assurance and Quality Control

The UV DOAS ("DOAS") analyzer was initially calibrated for benzene on July 31, 2009, using an 8-point span and offset calibration ("multi-point calibration"). Adjustments were made for spectral fitting and linearity. Such multi-point calibrations are done annually, or when the need is indicated by subsequent 4-point span and offset calibration checks, or following major instrument repairs. For this project, the quality of the DOAS data was assured by conducting 4-point point span and offset gas calibration checks at the Air Enforcement Division (AED) Laboratory, located at the EPA Environmental Science Center, Ft. Meade, Maryland prior to departure to Tonawanda, New York; a field test to check the analyzer response to an in-path gas cell; and daily before each measurement event. Four-point calibration checks were also conducted on-site at the end of measurements, and after returning the equipment to the AED laboratory.

The calibration checks were done using a 2% accuracy, NIST-traceable benzene reference gas standard. The calibration checks indicated that the measurement bias ranged from 0 to +6% during laboratory calibration checks, and 0 to +15% during field calibration checks over a span range of 0 ppbV to 197.5 ppbV. The calibration checks were acceptable and indicated that a new multi-point calibration was not required.

The calibration checks were conducted in volumetric units, corrected to standard temperature and pressure (STP) for consistency with the reference gas standard. Field measurement data was acquired in units of in-situ (not corrected to STP) micrograms per cubic meter.

Daily quality control checks, including detection System Checks and benzene Wavelength Precision Checks indicated that the DOAS analyzer operated normally during the field measurement campaign.

The DOAS analyzer clock was checked daily to ensure that the data time stamp was within 5 seconds of agreement with GPS time.

#### UV DOAS Data Validation

The validated one-minute integrated benzene concentration data are included in the spreadsheet entitled "UV DOAS Analyzer Data TCC May 2010 Validated Public.xls" which is sent electronically with this report. During field measurements there were seven one-minute periods when an object blocked the light path, rendering the 1-minute integrated concentration data invalid because of insufficient light levels; that data is flagged as indicated on the spreadsheet. Highlighted on the spreadsheet are

measurement values where the ratio of the concentration to the deviation was less than 10:1, which is EPA's threshold minimum for acceptance of the data as a concentration measurement. These measurement values were generally at or below 20 micrograms per cubic meter, or about 6 ppbV (Note: measurement values with ratios less than 10:1 but greater than 2:1 generally indicate a detection). Of the 898 one-minute mean measurements, 99 had concentration-deviation ratios of less than 10:1.

#### Climatronics Meteorological Station

On May 25<sup>th</sup> and 26<sup>th</sup>, AED's weather station was set up on a hill at the NRG landfill located to the north of Tonawanda Coke. The purposed was to collect wind speed data at a higher elevation than was being collected at the plant location for informational purposes. The weather station consisted of a Climatronics 2-axis sonic anemometer, temperature and pressure sensors, and a CR3000 data logger. The sensors were elevated to 10 m using a telescoping mast secured to a base that was held to the ground by the wheel of a vehicle. We powered the weather station with an inverter plugged in to the vehicle's 12-V outlet.

Before collecting data on May 25<sup>th</sup>, I set the CR3000 data logger clock to GPS time. The logger functions appeared to be normal. However, on May 26<sup>th</sup>, at the conclusion of the data collection period, there was no data stored in the logger, and the logger date and time were wrong. Upon testing at the AED Laboratory on June 1, 2010, the logger collected data normally. It is likely that the inverter power supply was not sufficient to properly operate the CR3000 logger.

#### Measurement Site Notes

Date: May 25, 2010

Site: The 99 m measurement path was oriented south to north. The emitter telescope was located 33 m due east of the active quench tower, or 93 m due east of the east end of the coke oven battery. This measurement path is referred to as "Path 1" in the data spreadsheet. The receiver telescope was located 99 m due north (magnetic) of the emitter.

Lat/Long of telescope locations:

Emitter	North 42 degrees, 59 minutes, 01.8 seconds West 78 degrees, 55 minutes, 30.6 seconds
Receiver	North 42 degrees, 59 minutes, 05.0 seconds West 78 degrees, 55 minutes, 31.1 seconds

Between 16:45 and 17:00, near the conclusion of measurements for the day, the laboratory trailer temperature reached 90F and I noticed a few 25-second measurements with negative deviations, which did not materially affect the 1-minute

integrated data. The negative deviations indicated the need to run the trailer air conditioner on subsequent days.

Date: May 26 and 27, 2010.

Site: The 180 m measurement path was oriented west to east, and was stationed to the north of the coke oven batteries. This measurement path is referred to as "Path 2" and "Path 2 Repeated" on the data spreadsheet.

Lat/Long of telescope locations:

Emitter	North 42 degrees, 59 minutes, 05.8 seconds West 78 degrees, 55 minutes, 39.1 seconds
Receiver	North 42 degrees, 59 minutes, 05.0 seconds West 78 degrees, 55 minutes, 31.1 seconds

At 12:16 on May 26, I noticed that the light levels had declined to approximately 21%, approaching the minimum levels for data acquisition. I stopped the measurements at 12:17 to manually operate the telescope automatic alignment devices, however between 12:19 and 12:22 a facility water truck was wetting down the plant grounds for dust control, blocking the light. This occurred during a period when the DIAL was taking measurements parallel to and just above the DOAS optical path. Measurements resumed at 12:22.

Between 15:44 and 15:47 on May 26<sup>th</sup>, I shut off the laboratory trailer generator for refueling. Measurements resumed on 15:48.

#### Attachments

1. Calibration Records
2. UV DOAS Path Site Location Drawing (Note: drawing indicates Path 1 was 100 m. Actual path length was 99 m.)

#### By Electronic Transmittal

1. UV DOAS Analyzer Data TCC May 2010 Validated Public.xls
2. UV DOAS Analyzer Calibration Results TCC May 2010.xls

**Attachment 1. Calibration Records**

### Opsis Analyzer for Air Quality Monitoring

#### SPAN/OFFSET CALIBRATION CHECK

**Project:** Erie Coke Pre Trip Cal Check; Tonawanda Coke pre-trip check

Analyzer S/N E466

Site Location FE. meade

Date 4-22-10

Gas Cylinder ID CAL016898  
exp 6-30-10

Test Gas benzene  
127ppm

Last Calibration 2-12-10  
@ City of Houston Lab

**Calibration Setup Data**

Cell length(s)  $L_0$ .....  $L_{01} = 0.1006m .03998$   
 $L_{02} = 0.2488m .10006$   
 $L_{03} = 0.5045m .248.8$   
 Temperature..... 73.2 F  
 Pressure..... 29.59 in Hg  
 Light Int..... Lux... 1720  
 GG 400?..... Yes  No   
 LF 215/220?..... Yes  No

*T/P = constant, values from CR3000*

Normal Path Measurement Time 00:25

**Initial Analyzer Data**

Reference path length L..... 250  
 Reference ID..... 090729  
 Emitter lamp ID..... BS  
 Span setting (existing)..... 1.00  
 Offset setting (existing)..... 0.00  
N.L. Correction Active

Field offset -1.12

**Preparations**

Cal. Measurement Time..... 35 sec  
30  
 Initial System Name..... SPAN.CAL  
 System Name Changed..... ok   
 Cal. System Name "SPAN.CAL"..... ok

**System check**

All ok? Yes  No   
 Repeated? Yes  No   
 Correction P4? Yes  No

**Final setting**

P1 -3  
 P2 3905  
 P3 29  
 P4 4  
 P5 46.75

**Calibration lamp CA:004 test**

Shift..... 0 ch.  
 Adjusted..... Yes  No   
 Final shift.... 0 ch.

**AF = 93.028**

Cal. Gas conc. C/ppm	Cell conc. C <sub>c</sub> /ppm	Cal cell length L <sub>cm</sub>	(X) Length Correction C <sub>c</sub> ' = (C <sub>c</sub> ) x (L <sub>c</sub> /L) / ppb	(Y) Analyzer resp. / ppb	Standard dev. / ppb
		0.0000	<u>20.3 0.0</u>	<u>0.3</u>	<u>0.1</u>
L <sub>C1</sub>	<u>0.03998</u>	0.1006	<u>20.3</u>	<u>20.3</u>	<u>0.3</u>
L <sub>C1</sub> + L <sub>C2</sub>	<u>0.14004</u>	0.3494	<u>71.1</u>	<u>71.5</u>	<u>1.0</u>
L <sub>C1</sub> + L <sub>C2</sub> + L <sub>C3</sub>	<u>0.38884</u>	0.8509	<u>197.5</u>	<u>194.3</u>	<u>2.9</u>

r =

Final settings:

Span  
Offset

1

**Operator comments**

*set measurement time to 00:25 based on 4-21 to 4-22-10 overnight run test. See Service Notes.  
 Changed E110 lamp from B7 to BS. See Service Notes.*

Cam Squest  
Operator Signature



## Multipoint Span Calibration/Calibration Check/Lamp Comparison

Date: 4-22-10 Operator: Sevest  
 Gas: benzene Active Reference: 090729  
 127 ppm

Gas Cyl. No. CAL 016898  
 Gas Exp. 6-30-10

Cells		1	2	3	4	5	6	7	8	Average
0	Conc.									
	Dev.									
1	Conc.									
	Dev.									
2	Conc.									
	Dev.									
1+2	Conc.									
	Dev.									
3	Conc.									
	Dev.									
1+3	Conc.									
	Dev.									
2+3	Conc.									
	Dev.									
1+2+3	Conc.									
	Dev.									

L = 60.5

Check		1	2	3	4	5	6	7	8	Average
0	Conc.	0.1	0.2	0.7						0.3
	Dev.	0.1	0.1	0.1						0.1
1	Conc.	20.1	20.6	20.1						20.3
	Dev.	0.3	0.3	0.3						0.3
1+2	Conc.	71.4	71.3	71.9						71.5
	Dev.	1.0	1.1	1.0						1.0
1+2+3	Conc.	194.4	194.3	194.2						194.3
	Dev.	2.9	2.9	2.9						2.9

Fibers  
 Cal Lamp: 2mS 940  
 Cal Recvr: CALR7-02

Hg Lamp: 2mS 944  
 Telescope Receiver: CALR7-02

Lamp ID: R8

# Opsis Analyser for Air Quality Monitoring

FUNCTION TEST/PRECISION TEST/ACCURACY AUDIT TEST

*Projects: Tonawanda Coke, Erie Coke*

Analysers S/N E466 Site Location ft meade Date 5-20-10  
 Test Gas benzene Test Path 218m Last Test \_\_\_\_\_  
 Cylinder ID CAL 016 898 exp. 6-30-10  
127 ppm

Initial Analyser Data:  
 Path Length L..... 218 m  
 Temperature T..... 72.0F  
 Ligh intensity..... 300 lux  
 System name..... Span.cal

Std. Times:	gas	gas	gas	gas	gas	gas	gas	gas	gas	gas
name	<u>ben</u>									
Path 1	<u>00:25</u>									
Path 2										
Path 3										
Path 4										

Cell length L<sub>c</sub>..... 49.9 mm  
 Cell temp T<sub>c</sub>..... 72.0  
 Cal. gas conc..... 127 ppm  
 Effective conc..... 29.1 ppb

Preparation:  
 Change system name to "Span.Cal".. ok

test gas		interferences		
Gas name.....	<u>benzene</u>			
Unit.....	<u>PpbV</u>			
Meas. Time.....	<u>00:25</u>			
Light Level.....	<u>48.4 %</u>			
Pre conc, dev1.....	<u>0.5, 0.4</u>			
Pre conc, dev2.....	<u>0.0, 0.4</u>			
Pre conc, dev3.....	<u>1.0, 0.4</u>			
Average conc, dev..	<u>0.5, 0.4</u>			
Test conc, dev1.....	<u>30.1, 0.5</u>			
Test conc, dev2.....	<u>30.5, 0.6</u>			
Test conc, dev3.....	<u>30.8, 0.5</u>			
Average conc, dev..	<u>30.5, 0.5</u>			
Post conc, dev1.....	<u>-0.3, 0.4</u>			
Post conc, dev2.....	<u>0.6, 0.3</u>			
Post conc, dev3.....	<u>-0.3, 0.5</u>			
Average conc, dev..	<u>0.0, 0.4</u>			
Effective conc.....	<u>29.1</u>			
Baseline diff.....	<u>0.5 %</u>			
Corrected conc.....	<u>30.0</u>			
Error.....	<u>3 %</u>			

Operator Comments 12:15. Start measurements for zero offset check, spans = 1.0, offset = -2.1 per previous path offset check.

13:08. Range = +1.3 to -1.1 ppb, dev = 0.4. Change offset to -2.2. Start measurements. OK

Operator Signature Cary Julest  
Greg Fried

PS - 51.09	49.31	218 path length
P4 - -4	0	
P3 - 26	26	
P2 - 3926	3927	
P1 - 5	0	

Wang precision check  
Chamel Shift 1  
Accuracy factor 92.499%

Lamp I.D. = BS

Project:

Tonawanda Cove  
Daily Check

Opsis Analyzer for Air Quality Monitoring

SPAN/OFFSET CALIBRATION CHECK

Analyzer S/N E466

Site Location Path 1 - TCC

Date 5-25-10

Gas Cylinder ID CA1016898  
exp. 6-30-110

Test Gas benzene  
127 ppm

Last Calibration 4-22-10

Calibration Setup Data

Cell length(s)  $L_0$ .....  $L_{01} = 0.1006 \text{ m} \cdot 0.3998$   
 $L_{02} = 0.2488 \text{ m} \cdot 0.10106$   
 $L_{03} = 0.5045 \text{ m} \cdot 2.488$   
 Temperature..... 83 F (per NAP)  
 Pressure..... 29.92  
 Light Int..... Lux... 1670  
 GG 400?..... Yes  No   
 LF 215/220?..... Yes  No

Initial Analyzer Data

Reference path length L..... 250m  
 Reference ID..... 090729  
 Emitter lamp ID..... BS  
 Span setting (existing)..... 1.00  
 Offset setting (existing)..... 0.00

M.I. Active

Field offset -2.2 per 5-20-10

Preparations

Cal. Measurement Time..... 00:25  
 Initial System Name..... Span.CAL  
 System Name Changed..... ok   
 Cal. System Name "SPAN.CAL"..... ok

Normal Path Measurement Time 00:25

System check

P1 4  
 P2 3901  
 P3 29  
 P4 1  
 P5 47.19

All ok? Yes  No   
 Repeated? Yes  No   
 Correction P4? Yes  No

Final setting  
 P1 8  
 P2 3909  
 P3 29  
 P4 1  
 P5 45.65

Calibration lamp CA:004 test

Shift..... 2 ch.  
 Adjusted..... Yes  No   
 Final shift.... 2 ch.

A.F. = 91.819

Cal. Gas conc. C/ppm	Cell conc. C <sub>c</sub> /ppm	Cal cell length L <sub>cm</sub>	(X) Length Correction C <sub>c</sub> ' = (C <sub>c</sub> ) x (L <sub>c</sub> /L) / ppb	(Y) Analyzer resp. / ppb	Standard dev. / ppb
		0.0000	0.0	1.1	0.1
L <sub>C1</sub>	0.03998	-0.1006	20.3	-0.1 22.8	0.2
L <sub>C1</sub> + L <sub>C2</sub>	0.14004	0.3494	71.1	73.3	0.7
L <sub>C1</sub> + L <sub>C2</sub> + L <sub>C3</sub>	0.38884	0.8500	197.5	196.1	2.5

r =

Final settings:

Span  
Offset

Operator comments

Pressure set by std p (29.92) minus 0.6" Hg for 630' elevation.  
Temp set per NAP met.

Cary Swest  
Operator Signature

## Multipoint Span Calibration/Calibration Check/Lamp Comparison

Date: 5-25-10 Operator: Seneet / Patel  
 Gas: benzene Active Reference: 090729

Gas Cyl. No. CAL 016898  
 Gas Exp. 6-30-10

Cells		1	2	3	4	5	6	7	8	Average
0	Conc.									
	Dev.									
1	Conc.									
	Dev.									
2	Conc.									
	Dev.									
1+2	Conc.									
	Dev.									
3	Conc.									
	Dev.									
1+3	Conc.									
	Dev.									
2+3	Conc.									
	Dev.									
1+2+3	Conc.									
	Dev.									

**Check**

0	Conc.	0.9	0.5	1.9						1.1
	Dev.	0.1	0.1	0.1						0.1
1	Conc.	22.9	23.0	22.5						22.8
	Dev.	0.2	0.2	0.2						0.2
1+2	Conc.	74.9	72.7	72.4						73.3
	Dev.	0.4	0.9	0.9						0.7
1+2+3	Conc.	195.7	196.4	196.1						196.1
	Dev.	2.5	2.5	2.5						2.5

**Fibers**

Cal Lamp: 2m5 940  
 Cal Recvr: CALR7-02

Hg Lamp: 2m5 944  
 Telescope Receiver: CALR7-02

Lamp ID: R8

Opsis Analyzer for Air Quality Monitoring

SPAN/OFFSET CALIBRATION CHECK

Project: Tonawanda Coke - Daily Check

Analyzer S/N E466

Site Location Path 2 - TCL

Date 5-26-10

Gas Cylinder ID CAL-016898  
exp. 6-30-10

Test Gas Benzene  
127 ppm

Last Calibration 5-26-10  
08

Calibration Setup Data

Cell length(s)  $L_0$ .....  $L_{01} = \frac{0.1000 \text{ m}}{0.03998}$   
 $L_{02} = \frac{0.2488 \text{ m}}{0.01006}$   
 $L_{03} = \frac{0.5015 \text{ m}}{0.2488}$   
 Temperature..... 74 F  
 Pressure..... 29.62  
 Light Int..... Lux... 1410  
 GG 400?..... Yes  No   
 LF 215/220?..... Yes  No

Initial Analyzer Data

Reference path length L..... 250 m  
 Reference ID..... 090729  
 Emitter lamp ID..... B5  
 Span setting (existing)..... 1.00  
 Offset setting (existing)..... 0.00  
N.L. Active

Field offset -2.2ppb per 5-20-10  
Function Test

Preparations

Cal. Measurement Time..... 00:25  
 Initial System Name..... span-cal  
 System Name Changed..... ok   
 Cal. System Name "SPAN.CAL"..... ok

Normal Path Measurement Time 00:25

System check

P1 6  
 P2 4006  
 P3 29  
 P4 1  
 P5 51.94

All ok? Yes  No   
 Repeated? Yes  No   
 Correction P4? Yes  No

Final setting  
 P1 9  
 P2 4008  
 P3 30  
 P4 1  
 P5 51.74

Calibration lamp CA:004 test

Shift..... 2 ch.  
 Adjusted..... Yes  No   
 Final shift.... 2 ch.  
AK = 92.44

Cal. Gas conc. C/ppm	Cell conc. C <sub>c</sub> /ppm	Cal cell length L <sub>cm</sub>	(X) Length Correction C <sub>c</sub> ' = (C <sub>c</sub> ) x (L <sub>c</sub> /L) / ppb	(Y) Analyzer resp. / ppb	Standard dev. / ppb
	<u>0.0</u>	<u>0.0000</u>	<u>0.0</u>	<u>0.6</u>	<u>0.1</u>
<u>L<sub>C1</sub></u>	<u>0.03998</u>	<u>0.1006</u>	<u>20.3</u>	<u>21.3</u>	<u>0.2</u>
<u>L<sub>C1</sub> + L<sub>C2</sub></u>	<u>0.14004</u>	<u>0.3494</u>	<u>71.1</u>	<u>71.6</u>	<u>0.7</u>
<u>L<sub>C1</sub> + L<sub>C2</sub> + L<sub>C3</sub></u>	<u>0.38884</u>	<u>0.8509</u>	<u>197.5</u>	<u>192.8</u>	<u>2.5</u>

r =

Final settings:

Span  
Offset

Operator comments

Camy Jones  
Operator Signature

## Multipoint Span Calibration/Calibration Check/Lamp Comparison

Date: 5-26-10 Operator: Secrest  
 Gas: benzene Active Reference: 090729  
127ppm

Gas Cyl. No. CAL016898  
 Gas Exp. 6-30-10

Cells		1	2	3	4	5	6	7	8	Average
0	Conc.									
	Dev.									
1	Conc.									
	Dev.									
2	Conc.									
	Dev.									
1+2	Conc.									
	Dev.									
3	Conc.									
	Dev.									
1+3	Conc.									
	Dev.									
2+3	Conc.									
	Dev.									
1+2+3	Conc.									
	Dev.									

**Check**

0	Conc.	1.1	0.7	0.6						0.6
	Dev.	0.1	0.1	0.1						0.1
1	Conc.	21.5	21.3	21.1						21.3
	Dev.	0.2	0.2	0.2						0.2
1+2	Conc.	71.5	71.7	71.6						71.6
	Dev.	0.7	0.7	0.7						0.7
1+2+3	Conc.	193.4	192.3	192.8						192.8
	Dev.	2.2	3.2	2.2						2.5

**Fibers**

Cal Lamp: 2mS 940  
 Cal Recvr: CAL R 7-02

Hg Lamp: 2mS 944  
 Telescope Receiver: CAL R 7-02

Lamp ID: R8

# Opsis Analyzer for Air Quality Monitoring

## SPAN/OFFSET CALIBRATION CHECK

Project: Tonawanda Lake Daily Check

Analyzer S/N E466

Site Location Path 2 - TCC

Date 5-27-10

Gas Cylinder ID CAL016898  
Exp 6-30-10

Test Gas benzene  
127ppm

Last Calibration 5-26-10

### Calibration Setup Data

Cell length(s)  $L_0$ .....  $L_{01} = 0.4000\text{m } 0.03998$   
 $L_{02} = 0.2488\text{m } 0.010006$   
 $L_{03} = 0.5015\text{m } 0.2488$   
 Temperature..... 76F  
 Pressure..... 29.62  
 Light Int..... Lux... 1630  
 GG 400?..... Yes  No   
 LF 215/220?..... Yes  No

### Initial Analyzer Data

Reference path length  $L$ ..... 250 m  
 Reference ID..... 090727  
 Emitter lamp ID..... B5  
 Span setting (existing)..... 1.00  
 Offset setting (existing)..... 0.00

M.L. Active

Path offset = -2.2ppb per 5-20-10  
Function Test

### Preparations

Cal. Measurement Time..... 00:25  
 Initial System Name..... span.cal  
 System Name Changed..... ok   
 Cal. System Name "SPAN.CAL"..... ok

Normal Path Measurement Time 00:25

### System check

P1 11  
 P2 40/16  
 P3 29  
 P4 0  
 P5 53.92

All ok? Yes  No   
 Repeated? Yes  No   
 Correction P4? Yes  No

Final setting  
 P1 1  
 P2 4019  
 P3 29  
 P4 -1  
 P5 53.10

### Calibration lamp CA:004 test

Shift..... 3 ch.  
 Adjusted..... Yes  No   
 Final shift.... 3 ch.

AF = 91.093

Cal. Gas conc. C/ppm	Cell conc. $C_c$ /ppm	Cal cell length $L_{cm}$	(X) Length Correction $C_c' = (C_c) \times (L_c/L) / \text{ppb}$	(Y) Analyzer resp. / ppb	Standard dev. / ppb
		0.0000	0	0.6	0.1
$L_{C1}$	<u>0.03998</u>	0.4000	<u>20.3</u>	<u>22.7</u>	<u>0.2</u>
$L_{C1} + L_{C2}$	<u>0.14004</u>	0.3494	<u>71.1</u>	<u>74.6</u>	<u>0.5</u>
$L_{C1} + L_{C2} + L_{C3}$	<u>0.38884</u>	0.8509	<u>197.5</u>	<u>200.5</u>	<u>1.2</u>

r =

Final settings:

Span /  
 Offset /

Operator comments

Cary Sewest  
Operator Signature

Multipoint Span Calibration/Calibration Check/Lamp Comparison

Date: 5-27-10 Operator: Selrest  
 Gas: benzene Active Reference: 090729  
 127ppm

Gas Cyl. No. CAL016898  
 Gas Exp. 6-30-10

Cells		1	2	3	4	5	6	7	8	Average
0	Conc.									
	Dev.									
1	Conc.									
	Dev.									
2	Conc.									
	Dev.									
1+2	Conc.									
	Dev.									
3	Conc.									
	Dev.									
1+3	Conc.									
	Dev.									
2+3	Conc.									
	Dev.									
1+2+3	Conc.									
	Dev.									

Check		1	2	3	4	5	6	7	8	Average
0	Conc.	1.0	0.4	0.5						0.6
	Dev.	0.1	0.1	0.1						0.1
1	Conc.	22.8	22.7	22.6						22.7
	Dev.	0.3	0.3	0.3						0.3
1+2	Conc.	74.3	75.1	74.3						74.6
	Dev.	0.4	0.6	0.6						0.5
1+2+3	Conc.	200.4	200.4	200.8						200.5
	Dev.	1.2	1.1	1.2						1.2

Fibers

Cal Lamp: 2m5940  
 Cal Recvr: CAL R 7-02

Hg Lamp: 2m5944  
 Telescope Receiver: CAL R 7-02

Lamp ID: R8



Opsis Analyzer for Air Quality Monitoring

SPAN/OFFSET CALIBRATION CHECK

Project: Tonawanda Coke - End of measurements Check

16:00

Analyzer S/N E466

Site Location PATH 2 - TCC

Date 5-27-10 pm

Gas Cylinder ID CAL016898  
exp. 6-30-10

Test Gas benzene  
127 Ppm

Last Calibration 5-27-10 11:00 am

Calibration Setup Data

Cell length(s)  $L_0$ .....  $L_{01} = 0.1000\text{m } 0.03998$   
 $L_{02} = 0.2488\text{m } 0.010006$   
 $L_{03} = 0.5015\text{m } 0.2488$   
Temperature..... 72.5F  
Pressure..... 29.62 29.27  
Light Int..... Lux... 1.420  
GG 400?..... Yes  No   
LF 215/220?..... Yes  No

Initial Analyzer Data

Reference path length  $L_r$ ..... 250 m  
Reference ID..... 090729  
Emitter lamp ID..... B5  
Span setting (existing)..... 1.00  
Offset setting (existing)..... 0.00  
N.I. Active

Preparations

Cal. Measurement Time..... 00:25  
Initial System Name..... span.cal  
System Name Changed..... ok   
Cal. System Name "SPAN.CAL"..... ok

Normal Path Measurement Time 00:25

System check

P1 <u>-20</u>	All ok? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Final setting P1 <u>-12</u>
P2 <u>3982</u>	Repeated? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	P2 <u>3995</u>
P3 <u>29</u>	Correction P4? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	P3 <u>28</u>
P4 <u>-2</u>		P4 <u>-2</u>
P5 <u>51.24</u>		P5 <u>51.30</u>

Calibration lamp CA 004 test

Shift..... -2 /ch.  
Adjusted..... Yes  No   
Final shift.... -2 /ch.  
AF = 92.192

Cal. Gas conc. C/ppm	Cell conc. $C_c$ /ppm	Cal cell length $L_{cm}$	(X) Length Correction $C_c' = (C_c) \times (L_c/L) / \text{ppb}$	(Y) Analyzer resp. / ppb	Standard dev. / ppb
		0.0000	0.0	0.9	0.1
	<u>0.03998</u>	<u>0.1000</u>	<u>20.3</u>	<u>23.4</u>	<u>0.2</u>
	<u>0.14004</u>	<u>0.3494</u>	<u>71.1</u>	<u>77.3</u>	<u>0.4</u>
	<u>0.38984</u>	<u>0.8569</u>	<u>147.5</u>	<u>210.1</u>	<u>1.2</u>

r = \_\_\_\_\_ Final settings: Span 1 Offset \_\_\_\_\_

Operator comments \*NWS Buffalo station reporting 29.87" Hg; 29.87 - 0.6 = 29.27 actual pressure, based on 1" Hg per 1000' elevation msl. T from Omega Model #H205

Cam Sweet  
Operator Signature

Ind. me. ser. 2  
 Multipoint Span Calibration/Calibration Check/Lamp Comparison

Start: 15:50

Date: 5-27-10 Operator: Seacrest  
 Gas: benzene Active Reference: 090729  
127 ppm

Gas Cyl. No. CAL016898  
 Gas Exp. 6-30-10

Cells		1	2	3	4	5	6	7	8	Average
0	Conc.									
	Dev.									
1	Conc.									
	Dev.									
2	Conc.									
	Dev.									
1+2	Conc.									
	Dev.									
3	Conc.									
	Dev.									
1+3	Conc.									
	Dev.									
2+3	Conc.									
	Dev.									
1+2+3	Conc.									
	Dev.									

Check		1	2	3	4	5	6	7	8	Average
0	Conc.	1.1	-0.3	2.0						0.9
	Dev.	0.2	0.1	0.1						0.1
1	Conc.	23.5	23.0	23.4						23.4
	Dev.	0.2	0.2	0.2						0.2
1+2	Conc.	77.0	77.6	77.4						77.3
	Dev.	0.5	0.4	0.4						0.4
1+2+3	Conc.	202.7	201.7	201.5	210.3	209.7	210.4			210.1
	Dev.	1.1	1.0	1.0	1.2	1.2	1.2			1.2

cells not filled

Fibers  
 Cal Lamp: 2m5940  
 Cal Recvr: CAL R7-02

Hg Lamp: 2m5944  
 Telescope Receiver: CAL R7-02

Lamp ID: R8

Opsis Analyzer for Air Quality Monitoring

SPAN/OFFSET CALIBRATION CHECK

Projects: Erie Coke, Tonawanda Coke

Analyzer S/N E466

Site Location FT. Meade

Date 6-1-10

Gas Cylinder ID CAL016898

Test Gas Benzene  
127 ppm

Last Calibration 5-27-10

Calibration Setup Data

Cell length(s)  $L_0$ .....  $L_{01} = 0.1006$  m 0.03998  
 $L_{02} = 0.2488$  m 0.010006  
 $L_{03} = 0.5015$  m 0.2488  
 Temperature..... 1099.9  
 Pressure..... 1099.9  
 Light Int..... Lux... 11440  
 GG 400?..... Yes  No   
 LF 215/220?..... Yes  No

Initial Analyzer Data

Reference path length  $L_r$ ..... 250 m  
 Reference ID..... 090729  
 Emitter lamp ID..... BS  
 Span setting (existing)..... 1.00  
 Offset setting (existing)..... 0.00  
N.L. Active

Normal Path Measurement Time 00:25

Preparations

Cal. Measurement Time..... 00:25  
 Initial System Name..... SPAN.CAL  
 System Name Changed..... ok   
 Cal. System Name "SPAN.CAL"..... ok

System check

P1 0  
 P2 3918  
 P3 29  
 P4 -1  
 P5 41.08

All ok? Yes  No   
 Repeated? Yes  No   
 Correction P4? Yes  No

Final setting  
 P1 -9  
 P2 3910  
 P3 29  
 P4 -1  
 P5 41.06

Calibration lamp CA:004 test

Shift..... -3 ch.  
 Adjusted..... Yes  No   
 Final shift..... -3 ch.  
AF = 92.489

Cal. Gas conc. C/ppm	Cell conc. $C_c$ /ppm	Cal cell length $L_{cm}$	(X) Length Correction $C_c' = (C_c) \times (L_c/L) / \text{ppb}$	(Y) Analyzer resp. / ppb	Standard dev. / ppb
		0.0000	0.0	1.8	0.1
$L_{C1}$	<u>0.03998</u>	<del>0.1006</del>	<u>20.3</u>	<u>22.5</u>	<u>0.2</u>
$L_{C1} + L_{C2}$	<u>0.14004</u>	<del>0.3494</del>	<u>71.1</u>	<u>25.1</u>	<u>0.4</u>
$L_{C1} + L_{C2} + L_{C3}$	<u>0.38884</u>	<del>0.9509</del>	<u>197.5</u>	<u>203.9</u>	<u>1.1</u>

r =

Final settings:

Span       
 Offset     

Operator comments

Post-transport check.

Craig Jensen  
 Operator Signature

## Multipoint Span Calibration/Calibration Check/Lamp Comparison

Date: 6-1-10 Operator: Sevest  
 Gas: benzene Active Reference: 090729  
 127ppm

Gas Cyl. No. CAL 016898  
 Gas Exp. 6-30-10

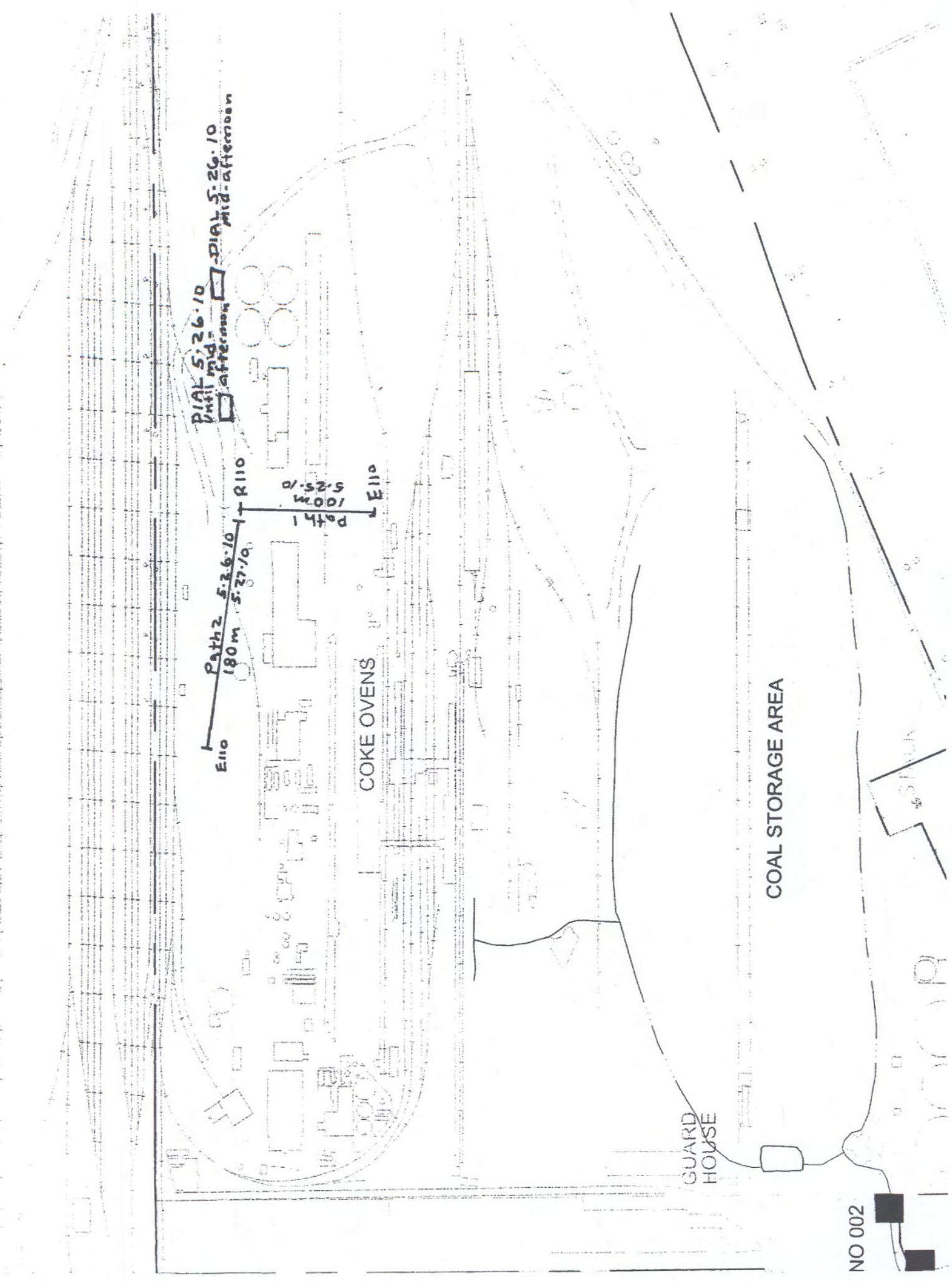
Cells		1	2	3	4	5	6	7	8	Average
0	Conc.									
	Dev.									
1	Conc.									
	Dev.									
2	Conc.									
	Dev.									
1+2	Conc.									
	Dev.									
3	Conc.									
	Dev.									
1+3	Conc.									
	Dev.									
2+3	Conc.									
	Dev.									
1+2+3	Conc.									
	Dev.									
<b>Check</b>										
0	Conc.	1.8	1.7	1.8						1.8
	Dev.	0.1	0.1	0.1						0.1
1	Conc.	22.4	22.4	22.6						22.5
	Dev.	0.2	0.2	0.2						0.2
1+2	Conc.	74.9	75.1	75.2						75.1
	Dev.	0.4	0.4	0.4						0.4
1+2+3	Conc.	204.1	204.1	203.5						203.9
	Dev.	1.1	1.1	1.2						1.1

Fibers  
 Cal Lamp: 2ms 940  
 Cal Recvr: CAL R7-02

Hg Lamp: 2ms 944  
 Telescope Receiver: CAL R7-02

Lamp ID: R8

**Attachment 2. UV DOAS Path Site Location Drawing**



NO 002

Minute No.	Date	GPS Time	Benzene Conc. (ug/mE3)	Benzene Dev. (ug/mE3)	Light Level (%)	C:D
1	5/25/2010	14:55	30.7	1.8	57	16.7
2	5/25/2010	14:56	60.3	1.8	56	33.1
3	5/25/2010	14:57	25.1	1.7	56	15.2
4	5/25/2010	14:58	51.6	1.7	56	29.7
5	5/25/2010	14:59	59.1	3.1	56	19.3
6	5/25/2010	15:00	65.5	2.4	56	27.2
7	5/25/2010	15:01	46.7	2.2	56	21.0
8	5/25/2010	15:02	30.2	2.1	56	14.2
9	5/25/2010	15:03	18.1	1.6	56	11.7
10	5/25/2010	15:04	15.4	1.8	55	8.7
11	5/25/2010	15:05	43.7	3.0	55	14.5
12	5/25/2010	15:06	69.1	2.4	55	29.0
13	5/25/2010	15:07	38.9	2.2	55	17.6
14	5/25/2010	15:08	31.3	1.8	55	17.6
15	5/25/2010	15:09	19.6	1.9	54	10.4
16	5/25/2010	15:10	16.3	1.8	55	9.2
17	5/25/2010	15:11	23.2	1.7	55	13.8
18	5/25/2010	15:12	18.5	1.6	54	11.5
19	5/25/2010	15:13	14.7	1.7	54	8.6
20	5/25/2010	15:14	38.8	1.9	54	20.3
21	5/25/2010	15:15	49.0	2.6	54	19.1
22	5/25/2010	15:16	31.3	2.2	54	14.5
23	5/25/2010	15:17	29.9	2.2	54	13.5
24	5/25/2010	15:18	22.9	2.0	54	11.6
25	5/25/2010	15:19	11.9	2.0	54	6.0
26	5/25/2010	15:20	30.7	2.0	54	15.1
27	5/25/2010	15:21	36.7	2.4	55	15.2
28	5/25/2010	15:22	29.9	2.5	54	12.2
29	5/25/2010	15:23	60.1	3.6	54	16.7
30	5/25/2010	15:24	44.7	2.3	54	19.1
31	5/25/2010	15:25	66.9	2.3	55	28.6
32	5/25/2010	15:26	42.7	2.2	55	19.8
33	5/25/2010	15:27	54.2	2.4	55	23.0
34	5/25/2010	15:28	51.1	3.2	55	15.8
35	5/25/2010	15:29	23.1	1.8	55	13.1
36	5/25/2010	15:30	13.7	1.5	55	8.9
37	5/25/2010	15:31	11.6	1.8	55	6.3
38	5/25/2010	15:32	6.9	1.7	55	4.0
39	5/25/2010	15:33	9.1	1.6	55	5.6
40	5/25/2010	15:34	9.7	1.6	55	6.0
41	5/25/2010	15:35	7.8	1.7	55	4.5
42	5/25/2010	15:36	12.7	1.5	56	8.5
43	5/25/2010	15:37	8.6	1.6	56	5.5
44	5/25/2010	15:38	11.4	1.2	56	9.3
45	5/25/2010	15:40	29.4	2.1	56	14.2
46	5/25/2010	15:41	34.6	2.0	56	17.5
47	5/25/2010	15:42	26.5	1.8	56	14.6
48	5/25/2010	15:43	39.1	1.8	56	22.3
49	5/25/2010	15:44	29.1	1.8	56	16.5




Indicates C:D < 10:1

50	5/25/2010	15:45	31.3	1.8	56	17.8
51	5/25/2010	15:46	16.4	1.9	56	8.9
52	5/25/2010	15:47	11.5	1.5	56	7.5
53	5/25/2010	15:48	21.6	1.8	56	12.3
54	5/25/2010	15:49	27.6	2.0	56	13.6
55	5/25/2010	15:50	18.2	1.6	56	11.3
56	5/25/2010	15:51	22.9	2.0	56	11.5
57	5/25/2010	15:52	33.4	1.9	56	17.6
58	5/25/2010	15:53	20.5	1.7	56	12.4
59	5/25/2010	15:54	27.2	2.1	56	13.2
60	5/25/2010	15:55	61.5	2.3	56	26.6
61	5/25/2010	15:56	29.3	2.3	56	12.9
62	5/25/2010	15:57	44.3	3.4	56	13.1
63	5/25/2010	15:58	39.5	2.3	56	17.3
64	5/25/2010	15:59	27.9	1.7	56	16.7
65	5/25/2010	16:00	16.4	1.7	56	9.9
66	5/25/2010	16:01	13.4	1.4	56	9.9
67	5/25/2010	16:02	6.8	1.6	56	4.2
68	5/25/2010	16:03	6.6	1.4	56	4.7
69	5/25/2010	16:04	10.7	1.7	56	6.3
70	5/25/2010	16:05	12.8	1.5	56	8.8
71	5/25/2010	16:06	8.9	1.6	56	5.5
72	5/25/2010	16:07	22.9	1.7	56	13.4
73	5/25/2010	16:08	27.1	1.6	56	17.2
74	5/25/2010	16:09	36.9	2.2	56	16.5
75	5/25/2010	16:10	14.4	1.9	55	7.5
76	5/25/2010	16:11	12.8	1.8	55	7.0
77	5/25/2010	16:12	10.3	1.8	55	5.6
78	5/25/2010	16:13	7.9	1.8	56	4.5
79	5/25/2010	16:14	12.1	2.0	56	6.2
80	5/25/2010	16:15	12.3	1.8	55	6.8
81	5/25/2010	16:16	18.4	1.7	55	10.7
82	5/25/2010	16:17	13.7	1.9	56	7.1
83	5/25/2010	16:18	11.2	1.7	56	6.7
84	5/25/2010	16:19	11.2	1.8	56	6.4
85	5/25/2010	16:20	19.5	1.8	55	10.6
86	5/25/2010	16:21	18.1	1.9	53	9.7
87	5/25/2010	16:22	11.3	1.9	54	5.9
88	5/25/2010	16:23	22.5	1.9	55	11.7
89	5/25/2010	16:24	19.9	2.0	55	9.8
90	5/25/2010	16:25	19.1	2.1	55	9.1
91	5/25/2010	16:26	23.3	2.4	55	9.9
92	5/25/2010	16:27	30.9	2.3	55	13.7
93	5/25/2010	16:28	24.8	2.1	55	11.7
94	5/25/2010	16:29	14.1	2.0	55	7.0
95	5/25/2010	16:30	18.1	1.8	55	10.1
96	5/25/2010	16:31	12.9	2.0	55	6.5
97	5/25/2010	16:32	13.0	1.9	55	6.9
98	5/25/2010	16:33	10.2	2.0	54	5.2
99	5/25/2010	16:34	9.1	1.8	54	5.0
100	5/25/2010	16:35	12.4	1.6	54	7.9
101	5/25/2010	16:36	9.4	1.9	54	5.0



102	5/25/2010	16:37	18.8	1.7	54	10.9
103	5/25/2010	16:38	30.8	1.9	54	16.1
104	5/25/2010	16:39	20.2	2.0	54	10.0
105	5/25/2010	16:40	26.3	2.0	54	13.3
106	5/25/2010	16:41	20.2	1.8	54	11.0
107	5/25/2010	16:42	18.7	1.8	54	10.5
108	5/25/2010	16:43	12.0	1.7	54	7.3
109	5/25/2010	16:44	24.4	2.0	54	12.2
110	5/25/2010	16:45	19.3	1.8	54	10.8
111	5/25/2010	16:46	24.7	2.0	54	12.3
112	5/25/2010	16:47	20.6	2.1	54	9.7
113	5/25/2010	16:48	14.3	1.9	54	7.6
114	5/25/2010	16:49	8.9	2.3	54	3.9
115	5/25/2010	16:50	10.8	1.7	54	6.3
116	5/25/2010	16:51	10.4	1.7	54	6.0
117	5/25/2010	16:52	9.3	2.0	54	4.6
118	5/25/2010	16:53	17.9	1.7	54	10.6
119	5/25/2010	16:54	22.9	2.3	54	10.0
120	5/25/2010	16:55	15.2	2.1	54	7.4
121	5/25/2010	16:56	8.8	1.9	54	4.7
122	5/25/2010	16:57	22.4	2.2	54	10.4
123	5/25/2010	16:58	18.5	2.0	54	9.3
124	5/25/2010	16:59	14.7	1.9	53	7.6
125	5/25/2010	17:00	8.3	1.9	53	4.4
126	5/25/2010	17:01	10.3	2.0	53	5.1
127	5/25/2010	17:02	8.8	2.0	53	4.4
128	5/25/2010	17:03	14.7	2.1	53	7.2
129	5/25/2010	17:04	9.7	1.9	53	5.2
130	5/25/2010	17:05	19.8	2.0	54	9.9
131	5/25/2010	17:06	4.1	1.7	54	2.4

Minute No.	Date	GPS Time	Benzene Conc. (ug/mE3)	Benzene Dev. (ug/mE3)	Light Level (%)	C:D
1	5/26/2010	10:05	78.4	2.1	39	37.7
2	5/26/2010	10:06	58.5	2.0	39	29.0
3	5/26/2010	10:07	64.4	2.1	39	30.4
4	5/26/2010	10:08	54.8	2.3	39	24.0
5	5/26/2010	10:09	44.4	2.6	37	16.8
6	5/26/2010	10:10	60.2	2.1	36	28.9
7	5/26/2010	10:11	54.2	2.0	37	27.1
8	5/26/2010	10:12	83.5	2.1	38	39.4
9	5/26/2010	10:13	89.5	2.3	38	39.8
10	5/26/2010	10:14	100.0	2.2	38	45.5
11	5/26/2010	10:15	67.7	1.7	38	39.1
12	5/26/2010	10:16	88.2	2.3	37	39.2
13	5/26/2010	10:17	96.3	2.0	38	47.9
14	5/26/2010	10:18	84.0	1.9	39	44.4
15	5/26/2010	10:19	29.8	2.6	36	11.4
16	5/26/2010	10:20	21.6	1.9	39	11.4
17	5/26/2010	10:21	67.2	2.2	39	30.5
18	5/26/2010	10:22	46.8	2.0	39	22.9
19	5/26/2010	10:23	67.5	2.1	40	32.3
20	5/26/2010	10:24	62.3	1.9	40	32.3
21	5/26/2010	10:25	87.0	1.9	39	47.0
22	5/26/2010	10:26	79.0	2.5	39	32.1
23	5/26/2010	10:27	85.5	2.5	39	34.5
24	5/26/2010	10:28	35.4	1.9	39	18.4
25	5/26/2010	10:29	91.9	2.3	39	40.1
26	5/26/2010	10:30	43.2	1.9	39	22.9
27	5/26/2010	10:31	71.5	3.0	30	23.8
28	5/26/2010	10:32	116.0	3.0	33	39.1
29	5/26/2010	10:33	56.4	2.5	38	22.7
30	5/26/2010	10:34	64.7	3.1	37	21.0
31	5/26/2010	10:35	22.3	2.2	29	10.0
32	5/26/2010	10:36	30.9	2.2	35	14.2
33	5/26/2010	10:37	23.0	2.3	35	9.8
34	5/26/2010	10:38	58.0	2.8	35	20.9
35	5/26/2010	10:39	90.3	2.8	35	32.6
36	5/26/2010	10:40	62.5	2.7	35	22.9
37	5/26/2010	10:41	58.1	2.8	25	21.1
38	5/26/2010	10:42	40.9	2.3	36	18.1
39	5/26/2010	10:43	33.6	2.6	37	13.1
40	5/26/2010	10:44	77.0	2.4	38	32.0
41	5/26/2010	10:45	93.3	2.6	38	35.3
42	5/26/2010	10:46	112.0	3.3	38	33.9
43	5/26/2010	10:47	98.0	2.2	37	44.1
44	5/26/2010	10:48	35.6	1.9	37	18.4
45	5/26/2010	10:49	28.5	2.1	37	13.8
46	5/26/2010	10:50	29.7	2.0	37	14.9
47	5/26/2010	10:51	59.5	2.8	34	21.1
48	5/26/2010	10:52	53.1	2.7	35	20.0
49	5/26/2010	10:53	51.5	2.3	35	22.4
50	5/26/2010	10:54	69.2	2.7	36	25.9
51	5/26/2010	10:55	116.0	3.1	34	37.9
52	5/26/2010	10:56	63.0	2.7	34	23.2
53	5/26/2010	10:57	81.0	3.6	34	22.7
54	5/26/2010	10:58	74.0	3.1	33	23.7
55	5/26/2010	10:59	57.1	2.8	33	20.4
56	5/26/2010	11:00	120.0	3.6	34	33.4
57	5/26/2010	11:01	204.0	5.8	34	35.1
58	5/26/2010	11:02	121.0	3.6	32	33.4
59	5/26/2010	11:03	103.0	3.2	33	32.1
60	5/26/2010	11:04	40.3	2.9	32	13.8
61	5/26/2010	11:05	37.6	2.9	32	12.9
62	5/26/2010	11:06	69.8	2.6	32	27.4

 Indicates C:D < 10:1  
 Indicates shut-down for generator refueling  
 Indicates blocked light

63	5/26/2010	11:07	79.1	3.3	32	23.8
64	5/26/2010	11:08	128.0	3.5	33	36.9
65	5/26/2010	11:09	108.0	3.1	30	35.1
66	5/26/2010	11:10	80.5	2.7	34	30.0
67	5/26/2010	11:11	51.0	2.3	33	22.2
68	5/26/2010	11:12	64.4	3.1	33	20.8
69	5/26/2010	11:13	79.5	3.2	31	25.1
70	5/26/2010	11:14	29.5	2.6	31	11.5
71	5/26/2010	11:15	54.1	2.8	33	19.0
72	5/26/2010	11:18	56.2	3.7	30	15.1
73	5/26/2010	11:19	98.0	3.5	29	28.0
74	5/26/2010	11:20	54.0	3.0	29	17.9
75	5/26/2010	11:21	41.8	3.1	28	13.4
76	5/26/2010	11:22	45.7	3.7	30	12.2
77	5/26/2010	11:23	33.3	3.3	29	10.0
78	5/26/2010	11:24	6.4	2.7	30	2.4
79	5/26/2010	11:25	33.6	2.7	30	12.3
80	5/26/2010	11:26	59.7	2.6	31	23.1
81	5/26/2010	11:27	65.0	3.0	31	21.8
82	5/26/2010	11:28	65.9	2.8	31	23.9
83	5/26/2010	11:29	69.1	3.1	31	22.1
84	5/26/2010	11:30	47.0	2.3	31	20.9
85	5/26/2010	11:31	61.9	2.8	33	22.5
86	5/26/2010	11:32	51.2	2.8	34	18.4
87	5/26/2010	11:33	54.6	3.1	32	17.7
88	5/26/2010	11:34	35.5	2.8	32	12.8
89	5/26/2010	11:35	27.5	2.7	33	10.2
90	5/26/2010	11:36	40.2	3.5	30	11.5
91	5/26/2010	11:37	58.5	2.7	33	21.5
92	5/26/2010	11:38	42.3	2.8	33	15.3
93	5/26/2010	11:39	23.2	2.4	34	9.9
94	5/26/2010	11:40	91.3	2.7	35	33.3
95	5/26/2010	11:41	43.2	3.4	33	12.9
96	5/26/2010	11:42	26.3	1.9	26	13.9
97	5/26/2010	11:43	66.7	2.6	31	25.6
98	5/26/2010	11:44	57.9	2.8	32	20.7
99	5/26/2010	11:45	104.0	3.0	32	34.9
100	5/26/2010	11:46	78.1	2.3	32	34.3
101	5/26/2010	11:47	70.4	2.9	32	24.3
102	5/26/2010	11:48	123.0	3.7	32	33.2
103	5/26/2010	11:49	116.0	3.5	32	33.6
104	5/26/2010	11:50	112.0	3.1	32	35.9
105	5/26/2010	11:51	78.2	3.2	32	24.8
106	5/26/2010	11:52	90.7	3.1	31	29.1
107	5/26/2010	11:53	85.0	3.2	30	26.6
108	5/26/2010	11:54	137.0	3.5	30	38.7
109	5/26/2010	11:55	113.0	3.5	29	32.2
110	5/26/2010	11:56	89.9	3.9	29	23.4
111	5/26/2010	11:57	139.0	4.1	29	34.2
112	5/26/2010	11:58	88.5	3.5	28	25.3
113	5/26/2010	11:59	79.1	3.5	28	22.6
114	5/26/2010	12:00	60.2	3.4	28	17.6
115	5/26/2010	12:01	35.1	3.7	28	9.4
116	5/26/2010	12:02	59.9	3.3	27	18.0
117	5/26/2010	12:03	73.1	4.1	26	17.8
118	5/26/2010	12:04	37.8	3.3	27	11.6
119	5/26/2010	12:05	13.9	3.6	28	3.9
120	5/26/2010	12:06	14.0	3.4	26	4.1
121	5/26/2010	12:07	16.6	3.3	25	5.0
122	5/26/2010	12:08	55.6	5.1	24	10.9
123	5/26/2010	12:09	46.7	4.5	25	10.3
124	5/26/2010	12:11	57.6	4.4	23	13.2
125	5/26/2010	12:12	130.0	5.6	22	23.4
126	5/26/2010	12:13	80.8	5.6	21	14.4
127	5/26/2010	12:14	85.3	5.8	20	14.7

128	5/26/2010	12:15	25.0	4.9	22	5.1
129	5/26/2010	12:16	50.7	4.8	23	10.6
130	5/26/2010	12:17	ND	ND	ND	
131	5/26/2010	12:18	ND	ND	ND	
132	5/26/2010	12:19	ND	ND	ND	
133	5/26/2010	12:20	ND	ND	ND	
134	5/31/2010	12:21	ND	ND	ND	
135	5/26/2010	12:22	28.1	2.7	35	10.5
136	5/26/2010	12:23	29.8	2.5	35	11.8
137	5/26/2010	12:24	64.9	2.7	34	24.1
138	5/26/2010	12:25	100.0	3.9	33	25.4
139	5/26/2010	12:26	113.0	2.7	33	42.5
140	5/26/2010	12:27	153.0	3.6	32	43.0
141	5/26/2010	12:28	90.6	2.4	34	37.8
142	5/26/2010	12:29	138.0	3.2	34	43.0
143	5/26/2010	12:30	134.0	3.3	33	40.4
144	5/26/2010	12:31	160.0	3.4	32	47.6
145	5/26/2010	12:32	54.4	2.4	33	22.5
146	5/26/2010	12:33	158.0	3.8	32	41.1
147	5/26/2010	12:34	238.0	4.4	31	54.1
148	5/26/2010	12:35	224.0	4.3	31	52.7
149	5/26/2010	12:36	101.0	2.9	34	34.6
150	5/26/2010	12:37	137.0	4.0	33	34.1
151	5/26/2010	12:38	80.8	3.3	34	24.5
152	5/26/2010	12:39	62.1	2.6	34	24.1
153	5/26/2010	12:40	140.0	3.8	32	37.1
154	5/26/2010	12:41	133.0	3.6	31	36.9
155	5/26/2010	12:42	115.0	3.7	31	31.5
156	5/26/2010	12:43	131.0	3.4	29	38.8
157	5/26/2010	12:44	74.3	3.1	31	24.0
158	5/26/2010	12:45	55.2	2.8	32	19.4
159	5/26/2010	12:46	60.4	2.5	32	23.9
160	5/26/2010	12:47	22.7	2.7	33	8.5
161	5/26/2010	12:48	50.2	3.0	32	16.8
162	5/26/2010	12:49	113.0	3.4	32	32.8
163	5/26/2010	12:50	101.0	2.9	32	35.3
164	5/26/2010	12:51	64.9	2.7	31	23.7
165	5/26/2010	12:52	110.0	3.6	31	31.0
166	5/26/2010	12:53	167.0	4.1	27	40.9
167	5/26/2010	12:54	145.0	3.4	28	42.4
168	5/26/2010	12:55	118.0	3.2	30	37.3
169	5/26/2010	12:56	98.2	3.1	30	31.9
170	5/26/2010	12:57	106.0	3.2	30	33.1
171	5/26/2010	12:58	136.0	3.8	29	36.3
172	5/26/2010	12:59	20.9	2.8	31	7.6
173	5/26/2010	13:00	11.4	2.3	32	4.9
174	5/26/2010	13:01	17.5	2.6	32	6.8
175	5/26/2010	13:02	10.9	2.6	32	4.2
176	5/26/2010	13:03	10.8	2.9	32	3.7
177	5/26/2010	13:04	26.8	2.9	32	9.4
178	5/26/2010	13:05	105.0	3.4	31	30.6
179	5/26/2010	13:06	65.2	2.9	31	22.4
180	5/26/2010	13:07	126.0	3.7	31	34.1
181	5/26/2010	13:08	57.7	2.7	23	21.7
182	5/26/2010	13:09	79.8	2.9	31	28.0
183	5/26/2010	13:10	124.0	3.6	31	34.2
184	5/26/2010	13:11	141.0	4.1	32	34.1
185	5/26/2010	13:12	93.7	2.9	32	32.0
186	5/26/2010	13:13	99.2	3.5	33	28.0
187	5/26/2010	13:14	106.0	4.3	34	24.5
188	5/26/2010	13:15	4.9	1.9	25	2.6
189	5/26/2010	13:16	14.8	2.3	34	6.4
190	5/26/2010	13:17	16.1	2.8	34	5.8
191	5/26/2010	13:18	50.7	2.4	34	21.4
192	5/26/2010	13:20	45.8	2.5	34	18.7

193	5/26/2010	13:21	20.2	2.0	36	10.0
194	5/26/2010	13:22	10.1	1.8	37	5.5
195	5/26/2010	13:23	9.8	2.0	37	4.9
196	5/26/2010	13:24	12.4	2.2	37	5.6
197	5/26/2010	13:25	72.1	2.3	37	31.2
198	5/26/2010	13:26	203.0	3.3	36	61.7
199	5/26/2010	13:27	135.0	2.6	35	52.1
200	5/26/2010	13:28	185.0	2.9	35	62.9
201	5/26/2010	13:29	287.0	3.7	35	78.4
202	5/26/2010	13:30	168.0	3.5	35	47.5
203	5/26/2010	13:31	108.0	2.6	35	41.7
204	5/26/2010	13:32	62.5	2.4	36	26.6
205	5/26/2010	13:33	152.0	3.4	35	44.4
206	5/26/2010	13:34	127.0	2.8	35	44.9
207	5/26/2010	13:35	88.6	2.1	35	41.4
208	5/26/2010	13:36	63.9	2.2	36	28.7
209	5/26/2010	13:37	127.0	2.8	35	45.2
210	5/26/2010	13:38	125.0	2.7	36	46.1
211	5/26/2010	13:39	79.3	2.4	37	32.8
212	5/26/2010	13:40	139.0	3.3	36	42.0
213	5/26/2010	13:41	90.4	2.8	37	32.9
214	5/26/2010	13:42	139.0	3.3	37	42.1
215	5/26/2010	13:43	112.0	3.4	37	32.9
216	5/26/2010	13:44	84.6	2.7	36	31.8
217	5/26/2010	13:45	86.8	1.9	38	44.7
218	5/26/2010	13:46	70.9	2.1	40	33.9
219	5/26/2010	13:47	91.1	1.9	41	47.2
220	5/26/2010	13:48	114.0	2.4	39	47.1
221	5/26/2010	13:49	167.0	2.5	37	66.3
222	5/26/2010	13:50	135.0	2.3	37	59.2
223	5/26/2010	13:51	112.0	2.4	37	46.3
224	5/26/2010	13:52	86.7	2.2	37	39.4
225	5/26/2010	13:53	93.4	2.1	37	44.5
226	5/26/2010	13:54	64.1	2.1	37	30.1
227	5/26/2010	13:55	120.0	2.4	37	51.1
228	5/26/2010	13:56	88.0	2.2	37	39.8
229	5/26/2010	13:57	152.0	2.4	37	64.1
230	5/26/2010	13:58	173.0	2.5	37	68.1
231	5/26/2010	13:59	245.0	2.8	37	86.6
232	5/26/2010	14:00	101.0	2.6	37	39.5
233	5/26/2010	14:01	135.0	2.7	35	49.6
234	5/26/2010	14:02	101.0	2.5	36	41.1
235	5/26/2010	14:03	125.0	2.3	37	54.3
236	5/26/2010	14:04	168.0	3.4	37	49.9
237	5/26/2010	14:05	139.0	3.1	37	45.1
238	5/26/2010	14:06	74.3	2.2	37	33.8
239	5/26/2010	14:07	144.0	2.8	31	51.6
240	5/26/2010	14:08	136.0	2.7	36	50.4
241	5/26/2010	14:09	149.0	2.9	37	51.0
242	5/26/2010	14:10	34.2	2.3	37	14.7
243	5/26/2010	14:11	80.4	2.6	36	30.6
244	5/26/2010	14:12	83.1	2.3	37	36.0
245	5/26/2010	14:13	38.3	2.1	37	18.3
246	5/26/2010	14:14	47.5	2.1	38	22.4
247	5/26/2010	14:15	82.5	2.2	38	37.5
248	5/26/2010	14:16	35.6	2.0	38	18.1
249	5/26/2010	14:17	34.5	2.1	39	16.1
250	5/26/2010	14:18	69.0	2.3	39	29.9
251	5/26/2010	14:19	46.2	2.2	39	21.1
252	5/26/2010	14:20	127.0	2.3	37	56.2
253	5/26/2010	14:21	129.0	2.5	38	51.2
254	5/26/2010	14:22	133.0	2.2	38	59.4
255	5/26/2010	14:23	122.0	2.3	39	54.2
256	5/26/2010	14:24	88.4	2.2	39	39.5
257	5/26/2010	14:25	56.6	2.4	37	23.7

258	5/26/2010	14:26	129.0	2.2	37	59.4
259	5/26/2010	14:27	107.0	2.5	37	43.3
260	5/26/2010	14:28	132.0	2.4	37	55.7
261	5/26/2010	14:29	101.0	2.2	37	45.5
262	5/26/2010	14:30	121.0	2.5	36	48.2
263	5/26/2010	14:31	88.6	2.2	36	41.0
264	5/26/2010	14:32	80.8	2.9	37	28.2
265	5/26/2010	14:33	89.2	2.4	37	37.0
266	5/26/2010	14:34	166.0	3.1	38	54.1
267	5/26/2010	14:35	51.3	2.4	37	21.3
268	5/26/2010	14:36	41.0	2.3	37	17.7
269	5/26/2010	14:37	88.8	2.2	38	40.7
270	5/26/2010	14:38	109.0	2.7	38	40.4
271	5/26/2010	14:39	58.4	2.3	38	25.7
272	5/26/2010	14:40	105.0	2.6	38	41.2
273	5/26/2010	14:41	101.0	2.9	38	35.2
274	5/26/2010	14:42	80.4	2.8	38	28.5
275	5/26/2010	14:43	114.0	3.2	33	36.0
276	5/26/2010	14:44	125.0	3.1	34	39.9
277	5/26/2010	14:45	108.0	2.8	34	38.8
278	5/26/2010	14:46	107.0	3.1	34	34.4
279	5/26/2010	14:47	182.0	3.8	35	47.9
280	5/26/2010	14:48	140.0	3.0	35	46.5
281	5/26/2010	14:49	138.0	2.7	36	51.9
282	5/26/2010	14:50	151.0	3.3	34	45.6
283	5/26/2010	14:51	124.0	3.3	35	37.8
284	5/26/2010	14:52	145.0	3.0	35	48.0
285	5/26/2010	14:53	104.0	2.7	35	38.7
286	5/26/2010	14:54	139.0	3.4	35	40.8
287	5/26/2010	14:55	58.1	3.5	35	16.5
288	5/26/2010	14:56	ND	ND	ND	
289	5/26/2010	14:57	90.0	2.5	34	35.4
290	5/26/2010	14:58	57.2	2.1	34	27.4
291	5/26/2010	14:59	54.7	2.8	35	19.8
292	5/26/2010	15:00	77.3	2.5	34	30.7
293	5/26/2010	15:01	99.7	2.8	34	35.5
294	5/26/2010	15:02	99.5	2.3	34	43.1
295	5/26/2010	15:03	56.1	2.6	35	21.7
296	5/26/2010	15:04	102.0	2.6	35	39.7
297	5/26/2010	15:05	86.5	2.4	35	35.6
298	5/26/2010	15:06	122.0	2.7	34	44.9
299	5/26/2010	15:07	151.0	3.4	36	44.2
300	5/26/2010	15:08	94.0	2.6	36	36.7
301	5/26/2010	15:09	57.8	2.5	36	23.0
302	5/26/2010	15:10	55.8	2.3	36	24.2
303	5/26/2010	15:11	103.0	2.9	36	35.9
304	5/26/2010	15:12	51.5	2.5	35	20.7
305	5/26/2010	15:13	54.5	2.2	35	24.7
306	5/26/2010	15:14	84.1	2.9	35	29.5
307	5/26/2010	15:15	55.9	2.4	35	23.7
308	5/26/2010	15:16	91.2	2.3	36	40.0
309	5/26/2010	15:17	167.0	2.8	35	59.4
310	5/26/2010	15:18	106.0	2.3	37	46.1
311	5/26/2010	15:19	150.0	2.9	36	52.1
312	5/26/2010	15:20	83.6	2.5	37	33.7
313	5/26/2010	15:22	195.0	4.3	35	45.7
314	5/26/2010	15:23	169.0	3.8	34	44.9
315	5/26/2010	15:24	200.0	3.8	34	52.9
316	5/26/2010	15:25	109.0	3.1	35	35.5
317	5/26/2010	15:26	142.0	3.1	36	46.1
318	5/26/2010	15:27	62.9	2.5	36	25.4
319	5/26/2010	15:28	114.0	2.8	35	41.5
320	5/26/2010	15:29	103.0	2.8	34	36.8
321	5/26/2010	15:30	58.9	2.4	34	24.3
322	5/26/2010	15:31	89.6	2.6	35	33.9

323	5/26/2010	15:32	39.7	2.1	35	18.9
324	5/26/2010	15:33	82.4	2.7	35	30.3
325	5/26/2010	15:34	91.4	2.5	35	36.7
326	5/26/2010	15:35	122.0	2.4	35	50.0
327	5/26/2010	15:36	58.2	2.7	35	21.5
328	5/26/2010	15:37	115.0	2.5	35	46.0
329	5/26/2010	15:38	73.2	2.5	35	29.5
330	5/26/2010	15:39	61.0	2.5	35	24.2
331	5/26/2010	15:40	136.0	2.3	34	59.9
332	5/26/2010	15:41	88.6	2.2	35	39.6
333	5/26/2010	15:42	64.6	2.4	35	26.5
334	5/26/2010	15:43	44.2	2.4	36	18.3
335	5/26/2010	15:44	ND	ND	ND	ND
336	5/26/2010	15:45	ND	ND	ND	ND
337	5/26/2010	15:46	ND	ND	ND	ND
338	5/26/2010	15:47	ND	ND	ND	ND
339	5/26/2010	15:48	61.7	2.2	38	27.9
340	5/26/2010	15:50	113.0	3.1	37	37.0
341	5/26/2010	15:51	93.8	2.6	36	35.5
342	5/26/2010	15:52	77.3	2.6	36	29.5
343	5/26/2010	15:53	108.0	2.6	37	42.0
344	5/26/2010	15:54	74.8	2.9	37	26.2
345	5/26/2010	15:55	64.6	3.0	33	21.8
346	5/26/2010	15:56	108.0	2.7	36	39.7
347	5/26/2010	15:57	116.0	2.9	35	39.5
348	5/26/2010	15:58	103.0	2.9	36	36.1
349	5/26/2010	15:59	133.0	2.1	35	64.3
350	5/26/2010	16:00	106.0	2.2	36	48.2
351	5/26/2010	16:01	65.5	2.2	37	30.0
352	5/26/2010	16:02	94.3	2.2	37	43.7
353	5/26/2010	16:03	115.0	2.2	38	51.8
354	5/26/2010	16:04	84.3	2.7	38	30.9
355	5/26/2010	16:05	107.0	2.1	38	51.0
356	5/26/2010	16:06	117.0	1.9	38	60.6
357	5/26/2010	16:07	61.5	2.2	37	28.6
358	5/26/2010	16:08	56.2	2.4	37	23.7
359	5/26/2010	16:09	93.8	2.9	36	32.0
360	5/26/2010	16:10	108.0	2.7	36	39.4
361	5/26/2010	16:11	86.2	2.4	33	35.5
362	5/26/2010	16:12	63.9	2.7	36	24.0
363	5/26/2010	16:13	93.2	2.6	36	35.3
364	5/26/2010	16:14	50.0	2.1	36	23.9
365	5/26/2010	16:15	41.2	2.7	36	15.4
366	5/26/2010	16:16	50.5	2.6	37	19.6
367	5/26/2010	16:17	74.7	2.5	36	29.6
368	5/26/2010	16:18	105.0	2.8	36	37.9
369	5/26/2010	16:19	118.0	2.7	35	43.1
370	5/26/2010	16:20	100.0	3.0	36	33.4
371	5/26/2010	16:21	86.6	2.5	37	34.6
372	5/26/2010	16:22	106.0	2.8	36	37.3
373	5/26/2010	16:23	80.2	2.7	36	29.7
374	5/26/2010	16:24	23.9	2.4	35	10.2
375	5/26/2010	16:25	38.5	2.1	36	18.2
376	5/26/2010	16:26	83.7	2.4	36	34.6
377	5/26/2010	16:27	106.0	3.0	35	35.7
378	5/26/2010	16:28	116.0	3.3	36	35.3
379	5/26/2010	16:29	112.0	3.9	35	28.5
380	5/26/2010	16:30	135.0	4.3	35	31.5
381	5/26/2010	16:31	94.1	3.2	35	29.3
382	5/26/2010	16:32	84.4	3.1	35	26.9
383	5/26/2010	16:33	88.3	2.9	37	30.1
384	5/26/2010	16:34	77.9	2.4	36	32.5
385	5/26/2010	16:35	74.4	2.5	37	29.9
386	5/26/2010	16:36	88.5	2.5	37	36.1
387	5/26/2010	16:37	146.0	2.7	37	54.7

388	5/26/2010	16:38	143.0	2.6	36	55.9
389	5/26/2010	16:39	46.3	3.2	37	14.7
390	5/26/2010	16:40	90.5	2.2	36	40.6
391	5/26/2010	16:41	97.4	2.4	37	40.4
392	5/26/2010	16:42	110.0	2.7	36	41.4
393	5/26/2010	16:43	58.4	2.5	37	23.5
394	5/26/2010	16:44	141.0	3.3	35	43.0
395	5/26/2010	16:45	65.3	2.2	37	29.7
396	5/26/2010	16:46	80.0	2.4	37	33.9
397	5/26/2010	16:47	99.9	2.8	38	36.2
398	5/26/2010	16:48	69.1	2.1	38	33.5
399	5/26/2010	16:49	58.6	2.2	38	26.6
400	5/26/2010	16:50	74.8	2.7	37	27.6
401	5/26/2010	16:51	44.4	2.8	37	16.1
402	5/26/2010	16:52	90.1	2.6	37	34.3
403	5/26/2010	16:53	99.5	2.6	37	38.6
404	5/26/2010	16:54	107.0	3.2	36	34.0
405	5/26/2010	16:55	96.6	2.4	36	39.9
406	5/26/2010	16:56	139.0	2.5	37	54.9
407	5/26/2010	16:57	118.0	2.8	37	42.0
408	5/26/2010	16:58	88.6	2.4	36	36.5
409	5/26/2010	16:59	131.0	2.7	35	48.3
410	5/26/2010	17:00	129.0	2.7	37	48.1
411	5/26/2010	17:01	141.0	2.9	38	48.8
412	5/26/2010	17:02	134.0	2.9	38	46.0
413	5/26/2010	17:03	75.9	2.2	38	33.9
414	5/26/2010	17:04	146.0	2.7	37	54.9
415	5/26/2010	17:05	175.0	2.6	37	66.3
416	5/26/2010	17:06	115.0	2.3	34	49.6
417	5/26/2010	17:07	101.0	2.5	36	39.9
418	5/26/2010	17:08	111.0	2.5	34	44.6
419	5/26/2010	17:09	96.9	3.0	35	32.4
420	5/26/2010	17:10	86.5	2.4	36	35.7
421	5/26/2010	17:11	93.5	2.5	36	37.0
422	5/26/2010	17:12	99.6	2.2	36	44.5
423	5/26/2010	17:13	78.0	2.8	36	27.9
424	5/26/2010	17:14	130.0	2.3	35	56.3
425	5/26/2010	17:15	120.0	2.7	36	45.3
426	5/26/2010	17:16	87.1	2.9	36	30.5
427	5/26/2010	17:17	95.5	2.3	37	40.8
428	5/26/2010	17:18	79.7	2.7	37	29.7
429	5/26/2010	17:19	64.9	2.6	37	24.7
430	5/26/2010	17:20	43.2	2.1	37	20.4
431	5/26/2010	17:21	49.0	2.2	37	22.8
432	5/26/2010	17:22	66.6	2.3	37	28.5
433	5/26/2010	17:23	47.1	2.7	37	17.6
434	5/26/2010	17:25	79.9	2.8	35	28.3
435	5/26/2010	17:26	60.0	2.8	35	21.3
436	5/26/2010	17:27	90.3	2.7	35	33.8
437	5/26/2010	17:28	75.0	2.2	34	34.2
438	5/26/2010	17:29	89.1	2.6	34	34.7
439	5/26/2010	17:30	71.2	2.2	35	31.9
440	5/26/2010	17:31	129.0	3.2	35	40.1
441	5/26/2010	17:32	114.0	3.0	35	37.9
442	5/26/2010	17:33	132.0	3.0	34	44.4
443	5/26/2010	17:34	107.0	3.1	34	34.3
444	5/26/2010	17:35	137.0	2.7	33	51.5
445	5/26/2010	17:36	102.0	2.9	35	35.2
446	5/26/2010	17:37	59.6	2.5	34	23.7
447	5/26/2010	17:38	82.2	2.5	34	33.4
448	5/26/2010	17:39	88.6	2.6	34	33.9
449	5/26/2010	17:40	48.9	3.1	34	15.7
450	5/26/2010	17:41	66.9	2.7	33	24.8
451	5/26/2010	17:42	216.0	2.9	34	73.7
452	5/26/2010	17:43	116.0	3.0	33	38.7



453	5/26/2010	17:44	120.0	2.8	33	42.7
454	5/26/2010	17:45	66.1	2.9	33	23.0
455	5/26/2010	17:46	63.7	2.6	33	24.6
456	5/26/2010	17:47	107.0	3.2	33	33.4
457	5/26/2010	17:48	65.3	2.8	32	23.5
458	5/26/2010	17:49	61.9	2.9	32	21.3
459	5/26/2010	17:50	66.6	3.1	31	21.8
460	5/26/2010	17:51	60.5	3.0	31	20.1
461	5/26/2010	17:52	114.0	3.4	31	33.9
462	5/26/2010	17:53	104.0	3.7	31	28.3
463	5/26/2010	17:54	73.1	2.8	32	26.0
464	5/26/2010	17:55	144.0	3.4	31	42.4
465	5/26/2010	17:56	136.0	3.9	32	34.6
466	5/26/2010	17:57	85.6	3.1	32	27.5
467	5/26/2010	17:58	118.0	4.0	32	29.4
468	5/26/2010	17:59	86.2	2.9	32	30.1
469	5/26/2010	18:00	98.3	3.0	33	33.3
470	5/26/2010	18:01	88.2	2.9	33	30.4
471	5/26/2010	18:02	83.3	3.3	33	24.9
472	5/26/2010	18:03	102.0	3.8	33	27.1
473	5/26/2010	18:04	79.7	3.0	32	26.9
474	5/26/2010	18:05	83.6	2.7	32	30.6
475	5/26/2010	18:06	85.2	3.1	32	27.7
476	5/26/2010	18:07	137.0	3.1	32	44.2
477	5/26/2010	18:08	136.0	3.3	32	41.2
478	5/26/2010	18:09	123.0	3.4	32	36.3
479	5/26/2010	18:10	124.0	3.3	32	37.9
480	5/26/2010	18:11	83.4	2.7	33	30.7
481	5/26/2010	18:12	72.6	2.9	33	24.9
482	5/26/2010	18:13	68.3	3.0	33	22.9
483	5/26/2010	18:14	107.0	2.9	32	36.6
484	5/26/2010	18:15	54.0	2.8	33	19.1
485	5/26/2010	18:16	66.0	2.8	33	23.3
486	5/26/2010	18:17	169.0	3.1	33	54.5
487	5/26/2010	18:18	157.0	2.7	32	58.1
488	5/26/2010	18:19	88.1	3.1	32	28.5
489	5/26/2010	18:20	92.6	2.9	32	32.0
490	5/26/2010	18:21	101.0	2.8	32	35.9
491	5/26/2010	18:22	98.8	3.2	33	31.3
492	5/26/2010	18:23	81.0	3.1	33	26.2
493	5/26/2010	18:24	57.6	2.7	33	21.0
494	5/26/2010	18:25	63.5	2.6	32	24.3
495	5/26/2010	18:26	108.0	3.5	32	30.7
496	5/26/2010	18:27	126.0	4.1	32	30.7
497	5/26/2010	18:28	67.8	3.2	32	21.2
498	5/26/2010	18:29	65.8	2.8	32	23.7

Minute No.	Date	GPS Time	Benzene Conc. (ug/mE3)	Benzene Dev. (ug/mE3)	Light Level (%)	C:D
1	5/27/2010	11:23	106.0	2.1	47	51.2
2	5/27/2010	11:24	62.9	4.3	47	14.5
3	5/27/2010	11:25	23.1	2.0	47	11.3
4	5/27/2010	11:26	23.9	1.7	47	13.8
5	5/27/2010	11:27	82.9	2.1	47	39.9
6	5/27/2010	11:28	58.5	3.0	47	19.4
7	5/27/2010	11:29	41.4	3.4	47	12.0
8	5/27/2010	11:30	29.3	2.5	47	11.7
9	5/27/2010	11:31	60.2	4.2	44	14.2
10	5/27/2010	11:32	69.9	4.3	46	16.3
11	5/27/2010	11:33	22.9	2.1	42	10.7
12	5/27/2010	11:34	49.4	3.8	44	13.0
13	5/27/2010	11:35	73.6	2.8	45	26.0
14	5/27/2010	11:36	22.2	2.3	45	9.6
15	5/27/2010	11:37	17.3	2.1	45	8.2
16	5/27/2010	11:38	38.3	2.9	45	13.2
17	5/27/2010	11:39	29.8	2.6	45	11.4
18	5/27/2010	11:40	42.3	3.4	45	12.5
19	5/27/2010	11:41	51.8	2.8	44	18.4
20	5/27/2010	11:42	37.1	2.8	45	13.1
21	5/27/2010	11:43	48.0	3.5	44	13.8
22	5/27/2010	11:44	47.0	3.6	44	13.0
23	5/27/2010	11:45	117.0	2.1	44	56.3
24	5/27/2010	11:46	169.0	1.8	45	94.4
25	5/27/2010	11:47	147.0	1.7	46	87.0
26	5/27/2010	11:48	39.4	3.4	46	11.6
27	5/27/2010	11:49	60.8	2.0	46	30.4
28	5/27/2010	11:50	149.0	2.0	46	73.0
29	5/27/2010	11:51	113.0	2.4	46	47.5
30	5/27/2010	11:52	87.4	2.4	46	36.4
31	5/27/2010	11:53	164.0	2.3	46	72.2
32	5/27/2010	11:54	68.7	2.4	46	28.2
33	5/27/2010	11:55	73.0	2.9	47	25.1
34	5/27/2010	11:56	59.1	2.4	47	24.7
35	5/27/2010	11:57	67.7	2.6	47	26.0
36	5/27/2010	11:58	124.0	2.2	47	56.9
37	5/27/2010	11:59	76.6	3.5	47	22.2
38	5/27/2010	12:00	43.6	3.1	47	14.2
39	5/27/2010	12:01	90.0	3.2	47	28.4
40	5/27/2010	12:02	162.0	2.4	47	67.8
41	5/27/2010	12:03	218.0	2.7	47	80.4
42	5/27/2010	12:04	62.9	3.3	47	19.1
43	5/27/2010	12:05	53.2	2.7	47	20.0
44	5/27/2010	12:06	79.1	3.1	47	25.9
45	5/27/2010	12:07	42.0	2.8	47	14.9
46	5/27/2010	12:10	35.4	2.6	47	13.8
47	5/27/2010	12:11	79.0	2.6	47	30.6
48	5/27/2010	12:12	74.2	2.3	47	33.0
49	5/27/2010	12:13	32.7	1.9	47	17.5
50	5/27/2010	12:14	37.7	2.5	47	15.1
51	5/27/2010	12:15	57.0	2.0	47	28.4
52	5/27/2010	12:16	102.0	2.1	47	47.7
53	5/27/2010	12:17	98.6	2.1	47	47.9
54	5/27/2010	12:18	86.7	2.1	47	41.3
55	5/27/2010	12:19	39.6	2.1	47	19.0

 Indicates C:D < 10:1  
 Indicates blocked light

56	5/27/2010	12:20	21.8	1.8	47	12.1
57	5/27/2010	12:21	122.0	1.8	47	67.8
58	5/27/2010	12:22	86.2	1.7	46	51.0
59	5/27/2010	12:23	59.7	2.4	47	24.9
60	5/27/2010	12:24	75.7	1.8	47	41.6
61	5/27/2010	12:25	40.4	3.0	47	13.7
62	5/27/2010	12:26	43.9	2.4	47	18.3
63	5/27/2010	12:27	94.6	1.8	47	53.1
64	5/27/2010	12:28	37.1	2.6	47	14.1
65	5/27/2010	12:29	39.2	2.1	47	19.1
66	5/27/2010	12:30	47.4	2.8	47	16.7
67	5/27/2010	12:31	106.0	1.9	47	57.3
68	5/27/2010	12:32	60.3	2.5	47	24.1
69	5/27/2010	12:33	133.0	2.2	47	59.6
70	5/27/2010	12:34	43.3	3.6	47	12.1
71	5/27/2010	12:35	38.8	2.6	47	15.1
72	5/27/2010	12:36	36.3	2.8	47	13.1
73	5/27/2010	12:37	51.6	4.1	47	12.5
74	5/27/2010	12:38	43.4	3.7	48	11.9
75	5/27/2010	12:39	35.8	1.9	48	18.5
76	5/27/2010	12:40	55.0	2.0	46	27.0
77	5/27/2010	12:41	50.2	3.8	47	13.2
78	5/27/2010	12:42	43.6	2.7	47	16.5
79	5/27/2010	12:43	47.8	3.1	47	15.3
80	5/27/2010	12:44	33.0	2.1	46	15.6
81	5/27/2010	12:45	61.1	2.3	47	26.6
82	5/27/2010	12:46	74.7	2.9	47	26.2
83	5/27/2010	12:47	43.1	2.4	47	18.2
84	5/27/2010	12:48	27.2	1.9	47	14.7
85	5/27/2010	12:49	22.8	2.2	47	10.5
86	5/27/2010	12:50	99.4	2.4	47	42.3
87	5/27/2010	12:51	75.1	1.5	47	48.8
88	5/27/2010	12:52	70.0	1.9	47	36.6
89	5/27/2010	12:53	26.6	2.0	47	13.4
90	5/27/2010	12:54	10.7	1.4	46	7.5
91	5/27/2010	12:55	5.8	1.6	46	3.5
92	5/27/2010	12:56	13.5	1.4	46	9.6
93	5/27/2010	12:57	33.7	3.0	46	11.3
94	5/27/2010	12:58	133.0	2.0	46	67.2
95	5/27/2010	12:59	22.3	1.8	45	12.7
96	5/27/2010	13:00	17.6	1.9	47	9.1
97	5/27/2010	13:01	68.3	2.7	47	25.3
98	5/27/2010	13:02	154.0	2.2	47	68.8
99	5/27/2010	13:03	78.1	3.7	46	21.3
100	5/27/2010	13:04	129.0	2.7	46	48.5
101	5/27/2010	13:05	92.9	3.2	46	29.1
102	5/27/2010	13:06	167.0	2.8	46	59.6
103	5/27/2010	13:07	121.0	2.5	45	49.4
104	5/27/2010	13:08	23.0	1.9	46	12.1
105	5/27/2010	13:09	40.4	3.3	46	12.2
106	5/27/2010	13:10	101.0	2.1	46	47.4
107	5/27/2010	13:11	70.8	2.9	45	24.3
108	5/27/2010	13:12	102.0	2.9	45	35.7
109	5/27/2010	13:13	50.4	2.3	47	22.1
110	5/27/2010	13:14	30.8	2.1	47	15.0
111	5/27/2010	13:15	45.5	2.5	47	17.9
112	5/27/2010	13:16	93.4	2.9	47	32.4
113	5/27/2010	13:17	79.7	2.5	47	32.1

114	5/27/2010	13:18	24.7	2.1	47	11.8
115	5/27/2010	13:19	39.3	2.6	47	15.3
116	5/27/2010	13:20	51.5	1.9	47	26.8
117	5/27/2010	13:21	53.1	3.1	47	17.2
118	5/27/2010	13:22	34.6	2.4	47	14.2
119	5/27/2010	13:23	13.8	1.9	47	7.1
120	5/27/2010	13:24	129.0	2.1	47	61.7
121	5/27/2010	13:25	119.0	2.1	47	56.7
122	5/27/2010	13:26	99.6	1.8	47	55.6
123	5/27/2010	13:27	109.0	1.9	47	56.2
124	5/27/2010	13:28	51.5	3.1	48	16.6
125	5/27/2010	13:29	9.5	1.8	47	5.3
126	5/27/2010	13:30	18.8	2.3	48	8.0
127	5/27/2010	13:31	63.1	1.9	48	33.4
128	5/27/2010	13:32	204.0	2.0	47	100.5
129	5/27/2010	13:33	133.0	2.0	46	65.8
130	5/27/2010	13:34	74.4	2.3	47	32.3
131	5/27/2010	13:35	26.1	1.9	47	13.6
132	5/27/2010	13:36	19.6	2.1	47	9.3
133	5/27/2010	13:37	21.6	1.9	47	11.7
134	5/27/2010	13:38	11.8	1.7	47	6.9
135	5/27/2010	13:39	82.8	2.9	46	28.2
136	5/27/2010	13:40	59.4	2.1	46	28.0
137	5/27/2010	13:41	30.9	2.7	46	11.6
138	5/27/2010	13:42	1.4	1.7	48	0.8
139	5/27/2010	13:43	-0.3	1.6	48	-0.2
140	5/27/2010	13:44	97.5	2.6	47	37.9
141	5/27/2010	13:45	49.7	3.4	47	14.6
142	5/27/2010	13:46	45.5	3.3	48	13.7
143	5/27/2010	13:47	116.0	2.4	46	47.5
144	5/27/2010	13:48	70.7	4.8	46	14.8
145	5/27/2010	13:49	90.3	1.7	46	52.8
146	5/27/2010	13:50	107.0	1.6	46	68.6
147	5/27/2010	13:51	18.2	1.6	47	11.6
148	5/27/2010	13:52	19.1	1.7	47	11.5
149	5/27/2010	13:53	47.9	2.7	48	17.5
150	5/27/2010	13:54	68.5	1.8	47	37.2
151	5/27/2010	13:55	103.0	1.6	47	65.6
152	5/27/2010	13:56	34.8	1.9	47	18.4
153	5/27/2010	13:57	46.4	3.5	48	13.4
154	5/27/2010	13:58	ND	ND	ND	
155	5/27/2010	13:59	118.0	1.8	48	66.3
156	5/27/2010	14:00	162.0	1.8	45	90.5
157	5/27/2010	14:01	61.8	2.2	47	27.7
158	5/27/2010	14:02	82.3	1.9	47	43.5
159	5/27/2010	14:03	37.6	2.4	47	15.9
160	5/27/2010	14:04	24.7	1.9	48	12.8
161	5/27/2010	14:05	7.3	1.7	48	4.3
162	5/27/2010	14:06	28.6	2.5	48	11.5
163	5/27/2010	14:07	67.2	3.1	47	21.6
164	5/27/2010	14:08	84.2	1.8	47	47.0
165	5/27/2010	14:11	103.0	2.2	46	47.5
166	5/27/2010	14:12	75.7	2.7	46	27.8
167	5/27/2010	14:13	24.5	2.0	47	12.0
168	5/27/2010	14:14	108.0	2.7	47	40.3
169	5/27/2010	14:15	142.0	2.5	46	56.1
170	5/27/2010	14:16	196.0	2.7	46	74.0
171	5/27/2010	14:17	47.8	2.8	46	16.8

172	5/27/2010	14:18	6.6	1.7	47	3.9
173	5/27/2010	14:19	21.7	2.0	48	11.1
174	5/27/2010	14:20	114.0	2.6	47	44.5
175	5/27/2010	14:21	69.2	1.4	46	48.4
176	5/27/2010	14:22	146.0	1.5	47	96.1
177	5/27/2010	14:23	148.0	1.8	46	84.6
178	5/27/2010	14:24	92.4	1.7	47	54.7
179	5/27/2010	14:25	103.0	1.7	47	61.3
180	5/27/2010	14:26	98.0	1.6	46	62.4
181	5/27/2010	14:27	17.4	2.0	47	8.6
182	5/27/2010	14:28	86.2	2.4	48	36.2
183	5/27/2010	14:29	31.7	2.6	48	12.1
184	5/27/2010	14:30	22.0	1.4	48	15.7
185	5/27/2010	14:31	123.0	2.3	47	52.6
186	5/27/2010	14:32	121.0	1.8	47	66.1
187	5/27/2010	14:33	83.8	2.6	47	31.7
188	5/27/2010	14:34	49.6	3.5	47	14.3
189	5/27/2010	14:35	97.8	1.9	47	51.2
190	5/27/2010	14:36	90.4	2.5	47	36.9
191	5/27/2010	14:37	19.9	1.6	47	12.3
192	5/27/2010	14:38	61.0	2.7	47	22.8
193	5/27/2010	14:39	49.5	2.1	47	23.1
194	5/27/2010	14:40	76.1	3.4	47	22.1
195	5/27/2010	14:41	39.7	2.6	47	15.5
196	5/27/2010	14:42	71.5	3.2	46	22.3
197	5/27/2010	14:43	29.1	2.3	46	12.9
198	5/27/2010	14:44	31.8	3.4	46	9.3
199	5/27/2010	14:45	49.5	2.8	39	17.4
200	5/27/2010	14:46	113.0	3.0	46	37.9
201	5/27/2010	14:47	49.8	3.9	47	12.9
202	5/27/2010	14:48	92.7	3.4	46	27.4
203	5/27/2010	14:49	78.9	2.0	46	39.5
204	5/27/2010	14:50	49.9	2.9	45	17.4
205	5/27/2010	14:51	41.9	2.8	45	14.8
206	5/27/2010	14:52	92.8	1.9	45	47.8
207	5/27/2010	14:53	87.0	1.6	45	53.4
208	5/27/2010	14:54	53.7	2.7	46	20.0
209	5/27/2010	14:55	26.6	2.0	46	13.4
210	5/27/2010	14:56	94.6	1.7	46	55.3
211	5/27/2010	14:57	66.4	2.3	46	28.5
212	5/27/2010	14:58	71.1	2.2	47	32.3
213	5/27/2010	14:59	52.6	1.7	47	31.5
214	5/27/2010	15:00	30.8	2.3	45	13.6
215	5/27/2010	15:01	81.8	3.8	46	21.5
216	5/27/2010	15:02	107.0	1.9	46	57.8
217	5/27/2010	15:03	100.0	3.2	46	31.5
218	5/27/2010	15:04	64.8	4.7	45	13.7
219	5/27/2010	15:05	96.1	1.7	45	56.5
220	5/27/2010	15:06	53.9	3.5	47	15.4
221	5/27/2010	15:07	64.5	2.4	47	26.4
222	5/27/2010	15:08	105.0	1.9	46	56.1
223	5/27/2010	15:09	126.0	2.1	46	59.4
224	5/27/2010	15:10	48.0	3.3	46	14.7
225	5/27/2010	15:11	39.9	2.6	47	15.2
226	5/27/2010	15:12	36.3	3.3	45	10.9
227	5/27/2010	15:13	59.9	2.2	47	27.7
228	5/27/2010	15:14	28.8	2.1	47	14.0
229	5/27/2010	15:15	39.0	2.2	47	17.6

230	5/27/2010	15:16	49.5	3.6	45	13.9
231	5/27/2010	15:17	63.5	4.9	45	13.0
232	5/27/2010	15:18	43.5	3.1	47	14.1
233	5/27/2010	15:19	51.3	4.6	47	11.2
234	5/27/2010	15:20	63.6	1.5	47	43.3
235	5/27/2010	15:21	78.3	2.2	47	35.6
236	5/27/2010	15:22	36.7	1.6	47	23.7
237	5/27/2010	15:23	53.3	2.1	47	25.9
238	5/27/2010	15:24	126.0	1.8	47	72.0
239	5/27/2010	15:25	129.0	1.5	47	86.0
240	5/27/2010	15:26	103.0	1.6	47	64.4
241	5/27/2010	15:27	110.0	1.5	47	71.9
242	5/27/2010	15:28	108.0	1.8	47	60.7
243	5/27/2010	15:29	110.0	1.6	47	67.1

Expected Concentration (ppbV)	Analyzer Response 4-22-10	Analyzer Response 5-25-10	Analyzer Response 5-26-10	Analyzer Response 5-27-10	Analyzer Response 5-27-10	Analyzer Response 6-1-10
0	0.3	1.1	0.6	0.6	0.9	1.8
20.3	20.3	22.8	21.3	22.7	23.4	22.5
71.1	71.5	73.3	71.6	74.6	77.3	75.1
197.5	194.3	196.1	192.8	200.5	210.1	203.9

Notes:

Pre- and post-trip calibration checks done at EPA lab on 4-22 and 6-1

Daily field calibration checks done before start of measurements on 5-25 and 5-26

Daily field calibration check done before start of measurements and at end of measurements on 5-27

Calibration Standard: Scott Specialty Gases, Cyl No. CAL016898, Exp. 6-30-10, 2% Accuracy NIST Traceable, 127 ppm benzene, balance N

Original calibration data sheets retained in Tonawanda Coke project file by Cary Secrest, USEPA. Contact: 202-564-8661