



**South Carolina State Ports
Authority – Continuous Air
Monitoring Station for the Wando
Welch Terminal**

Q1 2013 Quarterly Report and Annual Summary

April 2013



**South Carolina State Ports
Authority - Continuous Air
Monitoring Station for the
Wando Welch Terminal**

Q1 2013 Quarterly Report and
Annual Summary

Prepared for:

South Carolina State Ports Authority
176 Concord Street
Charleston
South Carolina 29401

Prepared by:

ARCADIS U.S., Inc.
4915 Prospectus Drive
Suite F
Durham
North Carolina 27713
Tel 919 544 4535
Fax 919 544 5690

Our Ref.:

RN006310

Date:

April 2013

This document is intended only for the use of the individual or entity for which it was prepared and may contain information that is privileged, confidential and exempt from disclosure under applicable law. Any dissemination, distribution or copying of this document is strictly prohibited.

1. Introduction	1
1.1 Scope	1
1.2 Project Description	1
2. Quarterly Results	3
2.1 Specific Data Notes	10
3. Quality Assurance/Quality Control	11
3.1 Daily QC/Validation	11
3.2 Quarterly Data Validation	12
3.3 Equipment Calibration	12
3.4 Meteorological Data	12

Tables

Table 2-1.	24-Hour Averages	3
Table 2-2.	Quarterly Statistics	6
Table 2-3.	Monthly Statistics for All Four Quarters of the Second Monitoring Year	8

Figures

Figure 2-1.	24-hour Averages	7
Figure 2-2.	Max 1-hour Averages	7
Figure 2-3.	Monthly 24-hour Averages	8
Figure 2-4.	Monthly Max 1-hour Averages	9

Appendices

A	Quality Assurance Plan for Continuous Air Monitoring Station for the Wando Welch Terminal
---	---



1. Introduction

1.1 Scope

ARCADIS U.S., Inc. (ARCADIS) was contracted in late December 2010 to provide Continuous Air Monitoring Services to the South Carolina State Ports Authority (SCSPA) at the Wando Welch Terminal in Mt. Pleasant, SC. ARCADIS has followed through on the planned schedule and activities since that award. The major accomplishments were to complete the Quality Assurance Plan (QAP), purchase the instruments, complete the site setup, and then to begin acquiring the data. This report is the eighth quarterly data report (fourth quarterly report in year two of operations) and presents the data summaries requested by SCSPA and described in the work scope. The data acquisition was started on May 6, 2011 in line with the court mandated start date. This report encompasses a period corresponding to data taken during the period from January 1, 2013 through March 31, 2013, and includes a summary of the second year of operations.

1.2 Project Description

SCSPA requested a system to provide ambient air quality data including particulate matter less than 2.5 microns ($PM_{2.5}$), SO_2 , and NO_2 for a period of 5 years at the Wando Welch Terminal of the port of Charleston. ARCADIS will maintain the monitoring instruments, stock consumables such as filters and calibration gases, and order spare parts such that downtime will be minimized. ARCADIS has established standard operating procedures to perform daily downloads and to provide Level 1 data validation for the resulting data. This monitoring project setup was relatively straightforward and has proven to be reliable and is generating valid high quality data suitable for use in dispersion modeling or other potential purposes.

The QAP is updated periodically to reflect improvements to the basic operating procedures. The last update was performed on September 20, 2012, following the annual maintenance program and on-site audit (conducted June 14-15, 2012) to reflect actual procedures at the end of the first year of operation. This QAP is written consistent with the current ambient air quality standards for PM, NO_x and SO_2 as defined by the U.S. Environmental Protection Agency. Excursions beyond these standards have not been observed, but a few daily spikes and rises have been noted and correlating local conditions are investigated in local media outlets and recorded when seen. These observations are tabulated and presented in the quarterly reports.



The location selected for sampling and the sampling equipment has proven to be well-suited for the project as it is centrally located to the port activities and has proven to be very responsive to local equipment air emissions and the local meteorological conditions. Although this is not a typical fence line site, it has shown high value in permitting the evaluation of port activities and related air quality effects. We have been able to remotely access the control computer and reliably interact with the instruments. We can see immediate reaction from the instruments in response to events such as container handling equipment and the morning openings of the front gates to entering truck traffic. These patterns can be reviewed in details in the archived data any time in the future.



2. Quarterly Results

The 24-hr daily averages for PM_{2.5}, NO, NO₂, NO_x, and SO₂ and the maximum daily value (1-hr average) for NO₂ and SO₂ for this period are shown in Table 2-1.

Quarterly statistics showing averages, minimums and maximums for all parameters are summarized in Table 2-2. 24-hr averages for all constituents are also shown graphically in Figure 2-1. Maximum 1-hr averages for NO₂ and SO₂ are shown in Figure 2-2. No exceedances were indicated this quarter.

Statistics for the second monitoring year are broken down by months and summarized in Table 2-3. Annual summaries are provided in Figures 2-3 and 2-4 showing the monthly 24-hr averages for all constituents and the daily maximum 1-hr averages for NO₂ and SO₂ averaged across the respective month.

Table 2-1. 24-Hour Averages

Date	24-hour Averages					Daily Max 1-hr Avg.	
	PM _{2.5} (µg/m ³)	NO (ppb)	NO ₂ (ppb)	NO _x (ppb)	SO ₂ (ppb)	NO ₂ (ppb)	SO ₂ (ppb)
1/1/13	14.44	0.16	3.81	3.90	1.17	6.99	4.50
1/2/13	9.02	7.59	9.30	16.85	0.18	29.64	1.22
1/3/13	9.53	10.07	9.37	19.40	0.18	23.23	1.47
1/4/13	14.60	8.80	12.28	21.05	0.48	25.37	2.63
1/5/13	14.11	1.80	7.68	9.43	0.62	21.86	3.85
1/6/13	11.68	0.95	7.65	8.55	0.73	15.12	3.57
1/7/13	8.55	2.98	7.73	10.66	0.20	13.55	1.42
1/8/13	12.15	3.02	7.63	10.58	0.30	16.49	0.79
1/9/13	3.59	2.71	9.80	12.48	0.04	20.88	0.29
1/10/13	7.52	4.67	8.78	13.43	0.11	19.30	1.41
1/11/13	5.70	13.57	10.39	23.93	0.07	25.51	0.40
1/12/13	7.59	1.99	5.47	7.44	0.36	13.84	1.85
1/13/13	5.43	2.72	4.23	6.93	0.08	10.74	0.67
1/14/13	8.64	11.93	9.74	21.65	0.51	33.72	2.50
1/15/13	7.00	10.88	10.06	20.92	0.43	25.61	1.93
1/16/13	7.20	6.17	8.62	14.76	0.33	17.67	2.14
1/17/13	8.06	17.20	12.84	30.01	0.73	36.07	4.35
1/18/13	4.85	3.09	6.52	9.53	0.07	15.90	0.41

**SCSPA - Continuous
Air Monitoring Station
for the Wando Welch
Terminal**



Q1 2013 Report

Date	24-hour Averages					Daily Max 1-hr Avg.	
	PM _{2.5} (µg/m ³)	NO (ppb)	NO ₂ (ppb)	NO _x (ppb)	SO ₂ (ppb)	NO ₂ (ppb)	SO ₂ (ppb)
1/19/13	8.65	0.19	2.97	3.06	0.21	9.16	0.93
1/20/13	12.07	5.38	14.26	19.61	0.90	27.70	2.97
1/21/13	13.57	0.81	8.85	9.58	0.93	21.29	3.63
1/22/13	11.59	6.53	15.91	22.39	2.55	29.50	8.43
1/23/13	13.38	11.69	14.40	26.04	1.85	35.23	7.20
1/24/13	25.95	4.40	11.08	15.46	2.17	30.35	13.75
1/25/13	9.52	5.92	14.48	20.38	2.32	26.66	6.31
1/26/13	22.20	2.08	8.87	10.94	2.06	20.19	5.02
1/27/13	13.98	0.07	2.31	2.31	0.42	3.20	0.82
1/28/13	14.86	8.16	11.87	20.00	0.44	39.09	1.62
1/29/13	17.33	33.66	18.28	51.94	0.38	39.47	3.21
1/30/13	5.62	7.76	8.51	16.26	0.03	24.29	0.37
1/31/13	5.78	10.70	15.37	26.07	3.51	39.47	24.18
2/1/13	11.75	8.33	15.18	23.49	1.56	28.78	4.24
2/2/13	6.05	0.79	7.33	8.10	0.53	29.44	4.24
2/3/13	15.58	12.88	23.87	36.75	7.49	47.60	13.79
2/4/13	11.00	9.40	14.80	24.17	0.31	28.40	0.99
2/5/13	13.71	29.36	17.20	46.54	0.51	71.69	1.90
2/6/13	22.80	11.20	17.87	29.05	1.15	34.09	3.99
2/7/13	22.73	1.83	11.27	13.08	0.11	22.02	0.47
2/8/13	9.71	1.62	13.38	15.00	1.70	24.32	6.21
2/9/13	8.02	0.36	5.56	5.89	0.23	22.30	0.72
2/10/13	10.06	0.83	4.74	5.54	0.10	23.14	0.50
2/11/13	7.85	7.35	13.23	20.57	0.06	27.07	0.48
2/12/13	3.97	6.51	11.60	18.11	0.13	27.46	1.01
2/13/13	8.54	12.02	15.61	27.62	2.41	32.43	9.40
2/14/13	8.55	8.72	14.07	22.79	0.53	31.66	3.44
2/15/13	14.28	10.42	14.73	25.13	0.50	20.39	1.49
2/16/13	11.68	0.38	5.34	5.54	0.68	12.10	2.44
2/17/13	7.02	0.96	6.13	6.95	1.16	22.96	7.36
2/18/13	9.86	0.76	7.76	8.34	1.00	19.35	4.74
2/19/13	9.35	24.97	19.01	43.89	0.35	65.76	1.50

**SCSPA - Continuous
Air Monitoring Station
for the Wando Welch
Terminal**



Q1 2013 Report

Date	24-hour Averages					Daily Max 1-hr Avg.	
	PM _{2.5} (µg/m ³)	NO (ppb)	NO ₂ (ppb)	NO _x (ppb)	SO ₂ (ppb)	NO ₂ (ppb)	SO ₂ (ppb)
2/20/13	6.24	7.08	14.97	21.99	0.58	27.20	2.16
2/21/13	10.78	13.10	18.38	31.45	0.86	33.26	7.31
2/22/13	10.10	2.24	7.83	9.95	0.13	17.69	0.64
2/23/13	7.97	2.30	6.44	8.67	0.32	12.11	1.48
2/24/13	7.58	1.93	6.04	7.93	0.83	18.05	3.01
2/25/13	10.53	4.86	10.35	15.14	0.12	18.64	0.89
2/26/13	8.91	3.98	6.32	10.17	0.06	12.80	0.50
2/27/13	9.54	6.23	13.53	19.72	1.95	25.80	7.51
2/28/13	9.62	11.94	18.79	30.67	5.48	35.15	16.30
3/1/13	11.22	6.40	16.36	22.69	2.50	28.76	7.77
3/2/13	11.06	4.10	8.95	12.94	2.67	23.37	11.84
3/3/13	9.95	4.31	9.65	13.88	2.66	24.18	10.27
3/4/13	13.05	5.86	12.52	18.31	1.77	25.12	7.29
3/5/13	14.14	7.20	12.49	19.56	1.31	36.86	4.49
3/6/13	8.32	3.71	7.77	11.34	1.25	14.69	3.78
3/7/13	10.45	6.74	15.08	21.74	1.18	32.44	2.87
3/8/13	16.78	3.98	11.67	15.61	0.69	21.92	1.96
3/9/13	14.14	1.32	6.63	7.94	0.53	30.65	3.96
3/10/13	12.79	1.46	5.31	6.75	0.37	21.13	2.62
3/11/13	6.57	8.09	11.71	19.78	0.11	29.49	0.46
3/12/13	7.30	4.94	9.12	14.05	0.07	21.14	0.39
3/13/13	9.27	7.86	14.41	22.27	2.20	31.83	8.36
3/14/13	12.12	3.75	10.07	13.80	0.78	22.85	2.01
3/15/13	25.49	7.14	13.91	21.04	0.96	30.83	6.61
3/16/13	16.72	3.01	9.12	12.11	2.24	35.10	8.82
3/17/13	11.89	0.07	1.95	2.00	0.40	4.87	3.07
3/18/13	11.35	4.32	7.52	11.84	0.08	33.19	0.35
3/19/13	7.60	5.87	12.28	18.15	0.72	20.02	3.24
3/20/13	4.41	2.05	6.98	9.01	0.30	19.31	3.34
3/21/13	9.24	7.49	14.82	22.30	1.98	25.72	6.33
3/22/13	9.16	3.83	9.14	12.95	0.44	21.68	1.03
3/23/13	14.37	0.27	5.63	5.89	0.28	16.26	2.00



24-hour Averages						Daily Max 1-hr Avg.	
Date	PM _{2.5} (µg/m ³)	NO (ppb)	NO ₂ (ppb)	NO _x (ppb)	SO ₂ (ppb)	NO ₂ (ppb)	SO ₂ (ppb)
3/24/13	7.85	0.51	4.07	4.56	0.36	13.95	2.74
3/25/13	8.85	4.63	7.98	12.60	0.83	20.13	5.49
3/26/13	7.24	6.25	10.98	17.22	1.36	19.95	4.11
3/27/13	9.82	5.64	12.37	18.01	2.10	24.90	7.06
3/28/13	9.56	3.63	12.35	15.97	0.79	26.89	2.79
3/29/13	14.33	0.85	6.51	7.34	0.44	26.71	0.71
3/30/13	13.55	0.69	4.45	5.12	0.44	14.03	1.05
3/31/13	13.20	0.03	1.46	1.47	0.28	2.19	0.70

Table 2-2. Quarterly Statistics

24-hour Averages						Daily Max 1-hr Avg.	
Date	PM _{2.5} (µg/m ³)	NO (ppb)	NO ₂ (ppb)	NO _x (ppb)	SO ₂ (ppb)	NO ₂ (ppb)	SO ₂ (ppb)
Average	10.89	5.96	10.37	16.29	0.97	24.77	3.89
Minimum	3.59	0.03	1.46	1.47	0.03	2.19	0.29
Maximum	25.95	33.66	23.87	51.94	7.49	71.69	24.18

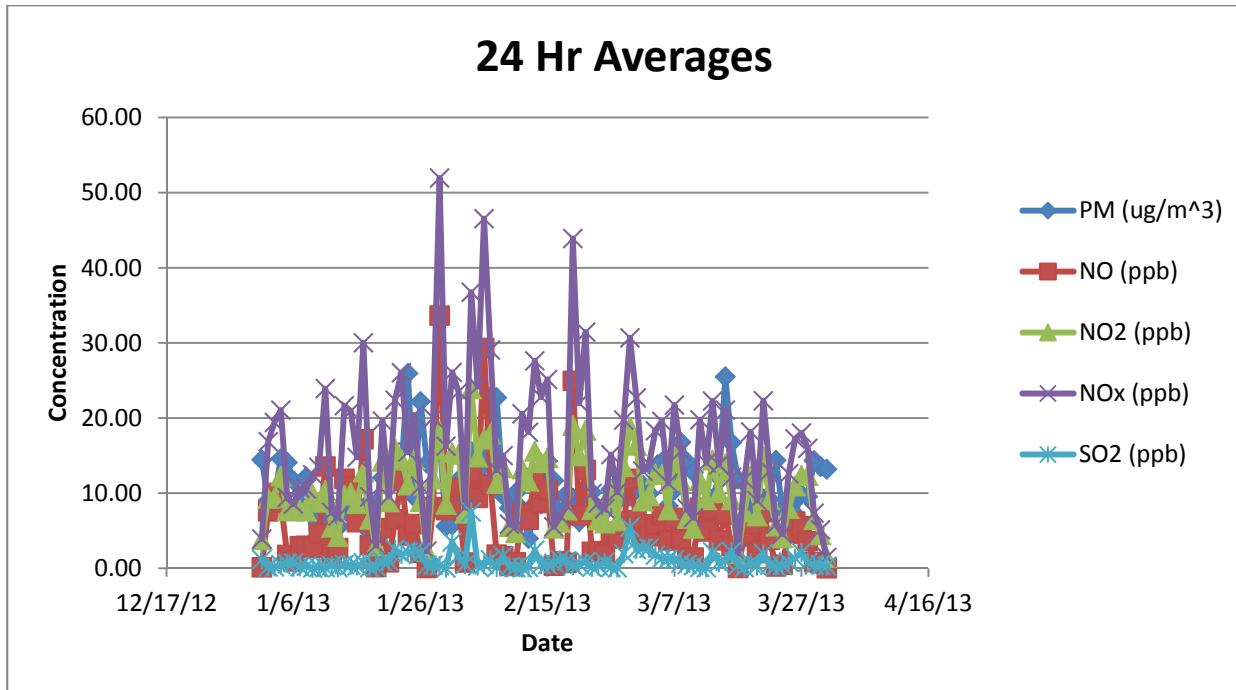


Figure 2-1. 24-hour Averages

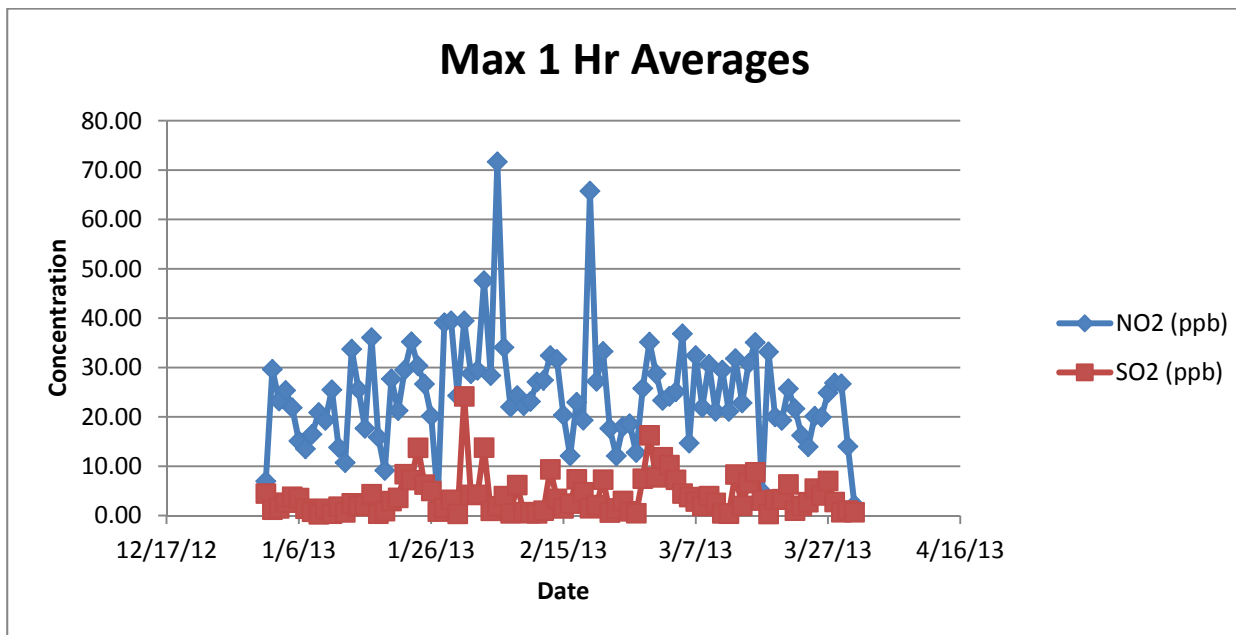


Figure 2-2. Max 1-hour Averages



Table 2-3. Monthly Statistics for All Four Quarters of the Second Monitoring Year

Month	Monthly Averages					Monthly Daily Max 1-hr Avg.	
	PM _{2.5} (µg/m ³)	NO (ppb)	NO ₂ (ppb)	NO _x (ppb)	SO ₂ (ppb)	NO ₂ (ppb)	SO ₂ (ppb)
April 2012	10.70	4.15	9.97	14.12	1.54	21.61	9.82
May 2012	9.61	4.40	6.69	11.07	0.60	17.48	3.83
June 2012	9.05	3.58	4.62	12.51	0.61	12.27	3.75
July 2012	11.67	5.93	4.08	10.75	0.67	14.15	5.19
August 2012	8.78	4.84	7.09	11.90	0.49	17.22	3.34
September 2012	8.32	3.22	5.78	8.97	0.33	14.48	1.63
October 2012	8.44	4.04	7.39	11.41	0.41	18.76	2.28
November 2012	12.75	6.17	10.66	16.81	0.83	22.76	2.73
December 2012	9.42	9.35	10.66	19.98	1.13	25.74	5.29
January 2013	10.78	6.70	9.65	16.31	0.79	23.13	3.67
February 2013	10.49	7.23	12.19	19.37	1.10	28.27	3.88
March 2013	11.35	4.06	9.46	13.49	1.03	23.23	4.11

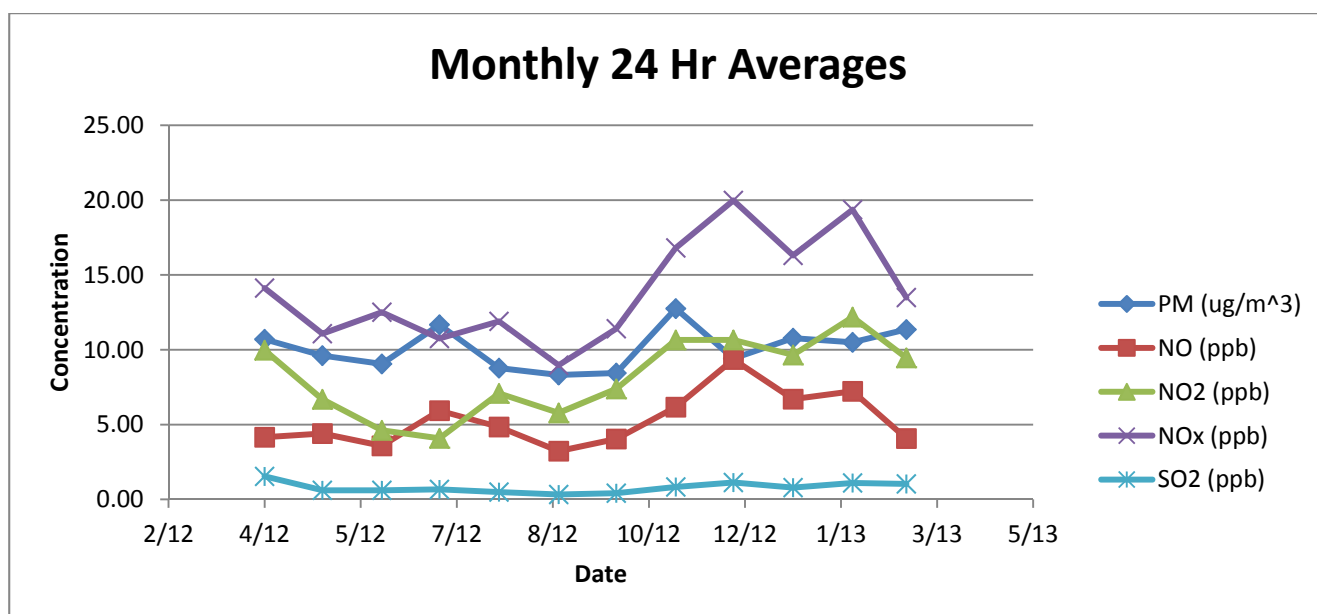


Figure 2-3. Monthly 24-hour Averages

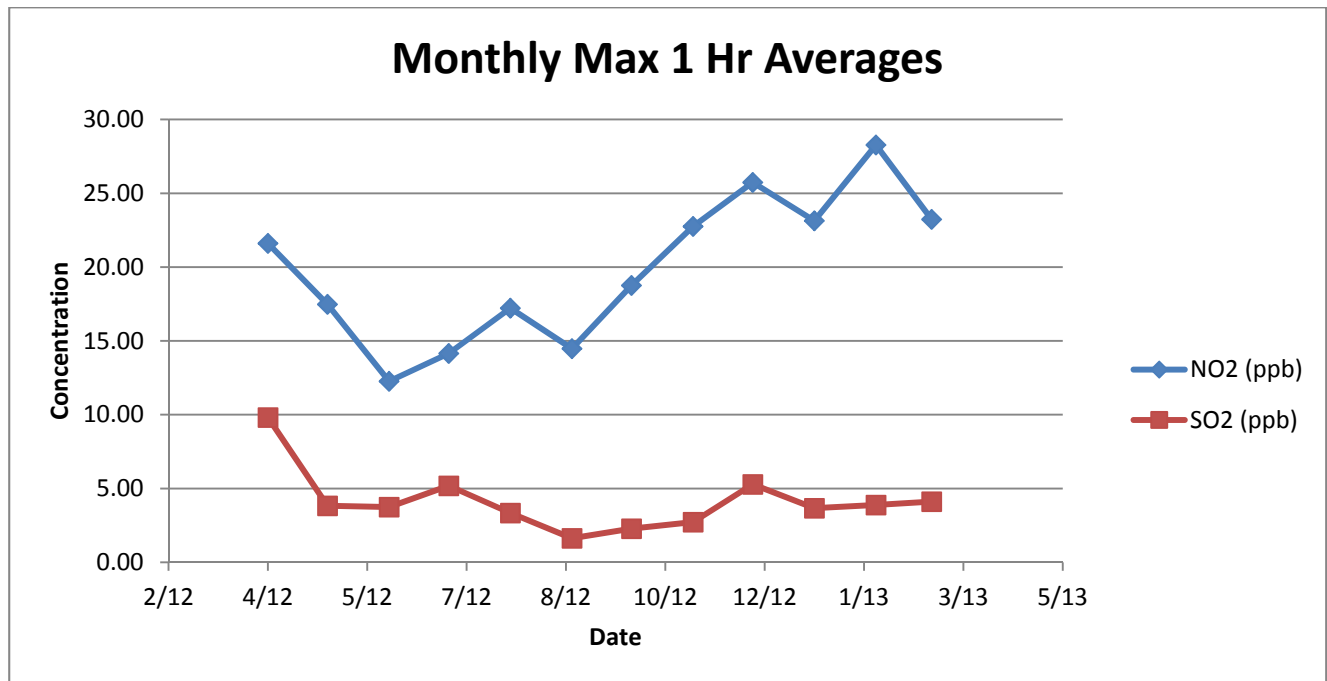


Figure 2-4. Monthly Max 1-hour Averages

The National Ambient Air Quality Standards (NAAQS) for NO₂, SO₂, and PM_{2.5} are being met at the Wando Welch Terminal.

- The primary standard for **NO₂** is 53 ppb (annual arithmetic average) or 100 ppb (3-year average of the 98th percentile of the daily maximum 1-hour average must not exceed 100 ppb). Table 2-3 and Figures 2-3 and 2-4 show that the monthly 24-hr averages and monthly daily maximum 1-hr averages were below 53 ppb for this second year of monitoring (as they were for the first year of monitoring).
- The primary standard for **SO₂** is 30 ppb (annual arithmetic average) or 140 ppb (24-hour average, not to be exceeded more than once per year). Table 2-3 and Figures 2-3 and 2-4 show that the monthly 24-hr averages and monthly daily maximum 1-hr averages were below 30 ppb for this second year of monitoring (as they were for the first year of monitoring).
- The primary standard for **PM_{2.5}** is 15.0 µg/m³ (annual arithmetic average; 3-year average of the weighted annual mean PM_{2.5} concentration must not

exceed $15.0 \mu\text{g}/\text{m}^3$) or $35.0 \mu\text{g}/\text{m}^3$ (24-hour average; 3-year average of the 98th percentile of the 24-hour concentrations must not exceed $35.0 \mu\text{g}/\text{m}^3$). Table 2-3 and Figure 2-3 show that all monthly 24-hr averages were below $15.0 \mu\text{g}/\text{m}^3$ for this second year of monitoring (as they were for the first year of monitoring).

2.1 Specific Data Notes

Normal maintenance and instrument calibration procedures were performed several times this quarter. New calibration gases were installed on February 7, 2013. An adjustment for Daylight Savings Time was made on March 10, 2013. Additional notes can be found in the QA/QC Daily Comment Sheet summary shown in Table 3-1.



3. Quality Assurance/Quality Control

QA/QC procedures applied to this project are described in a Quality Assurance Plan titled *Continuous Air Monitoring Station for the Wando Welch Terminal* (September 20, 2012, Revision 2).

3.1 Daily QC/Validation

According to the QAP prepared for this work, results were reviewed for anomalies and validated on a daily basis. These validations are recorded on QA/QC Daily Comment Sheets and are summarized in Table 3-1. This table contains a description of any anomalies that occurred over the past quarter along with a record of normal calibration and maintenance activities and the date of occurrence. Additional details related to these comments are can be found in Section 2.1.

Table 3-1. QA/QC Daily Comment Sheet

Date	Comment
1/2/2013	5014i alarm stops at 10:36
1/3/2013	Camera has been moved, can no longer see gauges of cal gas tanks
1/9/2013	SCADA computer down upon login at 11:55
1/10/2013	Insufficient data from 4:00 to 12:00 due to computer being down yesterday
1/19/2013	NOx calibration forced by Project Manager
1/24/2013	Check tolerance for NOx cal set to 0.1 ppb to force calibration
1/25/2013	Insufficient data from 4:00 to 6:00 due to NOx calibration
2/7/2013	Insufficient data from 10:00 to 24:00 due to the installation of new calibration gases
2/8/2013	Insufficient data 0:00 - 18:00 due to the installation of new calibration gases
2/9/2013	Insufficient data 2:00 - 6:00 due to SO ₂ and NOx calibrations
2/10/2013	Insufficient data 4:00 - 6:00 due to NOx calibration
2/11/2013	Insufficient data 4:00 - 6:00 due to NOx calibration
2/15/2013	Insufficient data 2:00 - 4:00 due to SO ₂ calibration
3/8/2013	Insufficient data from 4:00 - 6:00 due to NOx calibration
3/10/2013	Insufficient data from 2:00 - 3:00 due to Daylight Savings Time adjustment
3/11/2013	No zero check showing on daily excel file (normally at 1 AM)



3.2 Quarterly Data Validation

The quarterly data were assessed as follows: 100% of the validated Quarter 4 data were flagged as “good”. Percent completeness for Quarter 4 was calculated by dividing the number of hours flagged by the macro as “Insufficient Data” for any parameter by the total number of hours in the quarter. Percent completeness for Quarter 4 was 97.31%.

The QAP stated a completeness goal of 90% for PM_{2.5}, SO₂ and NO_x. The data collected from January 1, 2013 through March 31, 2013 exceeded this goal.

3.3 Equipment Calibration

As stated in the QAP, daily zero/span checks were performed on the gas analyzers (SO₂ and NO₂), and a full calibration is performed if any instrument does not pass the zero/span check. Calibration of the PM_{2.5} monitor using the mass foil kit provided by the manufacturer was performed during the scheduled annual maintenance in June 2012. An automatic zero adjustment of the mass signal is performed at the start of a new measurement cycle following a filter change (every 8 hours).

3.4 Meteorological Data

The QAP stated a completeness goal of 90% for ambient temperature, relative humidity, wind speed, wind direction, and barometric pressure. The data collected from January 1, 2013 through March 31, 2013 exceeded this goal. The sensors were checked during the scheduled annual maintenance visit in June 2012 to ensure they were consistently providing accurate data.