



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

Q4 2012 Quarterly Report

January 2013



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Monitoring Station for the
Wando Welch Terminal**

Q4 2012 Quarterly Report

Prepared for:

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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 Charleston. 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 seventh quarterly data report (third 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 the period from October 1, 2012 through December 31, 2012.

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 avoided. 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.

As required, periodically the QAP and procedures are updated to reflect improvements to the basic operating procedures (as was done 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 seen, 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, 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. No exceedances were indicated this quarter. Quarterly statistics showing the 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. Statistics are broken down by months and summarized in Table 2-3.

Table 2-1. 24-Hour Averages

Date	24-hour Averages					Daily Max 1-hr Avg.	
	PM (µg/m ³)	NO (ppb)	NO ₂ (ppb)	NO _x (ppb)	SO ₂ (ppb)	NO ₂ (ppb)	SO ₂ (ppb)
10/1/12	6.21	11.50	8.75	20.21	0.03	22.78	0.53
10/2/12	7.09	7.65	7.00	14.61	0.12	18.74	1.56
10/3/12	5.09	6.85	10.34	17.17	0.25	24.52	1.31
10/4/12	10.91	4.18	9.30	13.47	0.44	21.12	3.03
10/5/12	9.21	2.58	8.00	10.57	0.08	16.41	0.88
10/6/12	13.83	0.62	4.74	5.33	0.80	11.71	6.22
10/7/12	8.06	0.49	3.27	3.73	0.16	9.71	1.28
10/8/12	6.34	3.19	5.33	8.49	0.01	10.03	0.12
10/9/12	5.81	3.53	5.52	9.03	0.19	9.56	0.58
10/10/12	15.22	5.65	11.00	16.64	1.87	20.87	5.99
10/11/12	11.83	2.70	9.38	12.07	0.36	22.36	3.31
10/12/12	13.42	11.91	13.06	24.94	1.07	49.89	7.24
10/13/12	8.88	0.13	2.70	2.79	0.09	5.56	0.39
10/14/12	6.92	0.03	1.68	1.66	0.01	3.43	0.22
10/15/12	7.60	11.79	10.01	21.77	0.20	27.65	1.72
10/16/12	8.49	1.69	6.47	8.13	0.10	13.81	0.82
10/17/12	9.12	3.82	10.16	13.95	0.03	23.25	0.31
10/18/12	9.19	12.21	12.02	24.21	0.03	27.10	0.39
10/19/12	7.63	4.55	10.74	15.28	1.35	20.98	5.68
10/20/12	10.88	2.99	10.32	13.30	1.38	27.38	4.65
10/21/12	9.85	0.67	5.16	5.80	0.34	23.68	2.01
10/22/12	8.83	4.03	8.48	12.49	0.33	21.54	1.98



**SCSPA - Continuous
Air Monitoring Station
for the Wando Welch
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Date	24-hour Averages					Daily Max 1-hr Avg.	
	PM ($\mu\text{g}/\text{m}^3$)	NO (ppb)	NO ₂ (ppb)	NO _x (ppb)	SO ₂ (ppb)	NO ₂ (ppb)	SO ₂ (ppb)
10/23/12	10.03	3.38	8.61	11.98	0.06	22.66	0.42
10/24/12	8.13	3.26	6.70	9.95	0.03	20.35	0.58
10/25/12	7.08	1.77	5.46	7.21	0.02	19.17	0.51
10/26/12	8.47	1.79	4.80	6.57	0.03	11.31	0.55
10/27/12	4.53	0.22	1.88	2.07	0.04	3.20	0.30
10/28/12	6.13	0.13	2.79	2.87	0.45	9.21	2.84
10/29/12	2.26	2.67	5.33	7.96	0.22	8.91	0.91
10/30/12	6.27	3.48	6.85	10.30	0.32	16.68	2.11
10/31/12	8.41	5.64	13.40	19.01	2.43	37.90	12.34
11/1/12	12.60	12.50	21.25	33.75	4.89	35.06	9.55
11/2/12	11.82	7.57	16.07	23.63	2.18	30.60	6.46
11/3/12	12.20	1.13	6.60	7.71	0.93	16.53	2.87
11/4/12	15.43	1.81	7.40	9.20	0.66	24.61	3.91
11/5/12	10.38	2.25	6.47	8.71	0.11	12.22	0.89
11/6/12	11.91	2.91	6.28	9.16	0.13	11.94	0.72
11/7/12	11.97	6.01	12.15	18.14	1.60	24.60	4.36
11/8/12	18.17	10.39	20.28	30.67	2.19	40.96	4.84
11/9/12	16.46	7.89	19.81	27.69	2.21	35.81	8.29
11/10/12	22.80	6.02	13.80	19.80	1.26	26.99	4.33
11/11/12	13.66	0.05	2.59	2.61	0.17	8.87	1.02
11/12/12	9.26	0.93	4.39	5.31	0.04	17.09	0.51
11/13/12	10.30	11.64	12.21	23.84	0.76	32.67	3.25
11/14/12	9.24	3.42	6.24	9.63	0.02	14.07	0.26
11/15/12	8.62	4.40	7.67	12.06	0.13	15.50	1.01
11/16/12	10.99	5.13	9.77	14.89	0.09	20.05	0.58
11/17/12	9.63	0.67	4.43	5.06	0.07	6.18	0.40
11/18/12	7.72	0.57	2.84	3.37	0.02	7.91	0.29
11/19/12	8.44	4.71	7.29	11.97	0.07	18.02	0.83
11/20/12	10.51	7.28	10.76	18.03	0.43	29.80	3.41
11/21/12	10.10	3.72	7.86	11.56	0.35	16.16	1.87
11/22/12	9.92	1.41	6.65	8.03	0.30	10.78	1.17
11/23/12	15.89	9.50	16.88	26.36	2.08	32.75	8.42



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Date	24-hour Averages					Daily Max 1-hr Avg.	
	PM ($\mu\text{g}/\text{m}^3$)	NO (ppb)	NO ₂ (ppb)	NO _x (ppb)	SO ₂ (ppb)	NO ₂ (ppb)	SO ₂ (ppb)
11/24/12	13.69	2.90	9.08	11.97	1.49	22.85	3.45
11/25/12	11.72	0.10	3.38	3.43	0.40	8.44	1.13
11/26/12	18.20	17.88	17.02	34.89	0.80	41.60	2.62
11/27/12	23.03	36.90	28.60	65.49	0.99	51.16	2.77
11/28/12	15.72	4.35	11.85	16.19	0.23	18.98	1.35
11/29/12	12.48	4.41	8.96	13.31	0.26	20.48	0.87
11/30/12	9.58	6.77	11.20	17.91	0.08	30.19	0.34
12/1/12	8.73	0.13	3.79	3.86	0.05	10.53	0.38
12/2/12	7.65	0.05	3.52	3.52	0.02	9.75	0.38
12/3/12	13.42	20.64	16.54	37.17	0.46	33.35	3.03
12/4/12	8.76	14.16	14.55	28.70	0.12	32.29	0.43
12/5/12	8.17	22.09	22.02	44.10	0.35	36.70	2.02
12/6/12	8.32	3.01	8.38	11.35	0.09	17.80	0.68
12/7/12	12.31	6.47	8.38	14.81	0.50	17.41	2.80
12/8/12	17.45	2.11	9.26	11.37	1.49	27.50	5.41
12/9/12	13.04	2.15	6.47	8.60	0.09	18.44	0.59
12/10/12	9.36	12.08	13.68	25.75	0.19	63.00	1.09
12/11/12	4.93	11.16	11.05	22.19	5.35	26.97	66.78
12/12/12	3.92	6.63	6.08	12.70	0.06	11.13	0.80
12/13/12	6.88	4.80	6.80	11.55	0.08	14.29	1.49
12/14/12	10.03	6.54	10.99	17.50	0.04	27.51	0.52
12/15/12	11.26	1.67	5.44	7.09	0.13	12.01	0.41
12/16/12	11.48	3.87	6.28	10.14	0.18	12.64	1.27
12/17/12	5.94	14.80	11.52	26.28	0.19	34.69	1.42
12/18/12	4.67	4.62	8.60	13.16	0.40	17.43	2.63
12/19/12	11.86	12.75	18.26	30.97	1.86	36.44	8.97
12/20/12	11.82	44.12	22.45	66.57	0.32	84.66	2.33
12/21/12	5.80	9.74	11.89	21.63	4.09	23.49	12.60
12/22/12	5.33	27.57	20.40	47.96	10.07	23.71	12.43
12/24/12	9.56	1.23	6.86	8.05	1.26	22.21	3.78
12/25/12	8.53	0.03	2.09	2.05	0.19	4.20	0.87
12/26/12	6.89	7.21	9.06	16.21	1.73	18.76	8.28



24-hour Averages						Daily Max 1-hr Avg.	
Date	PM ($\mu\text{g}/\text{m}^3$)	NO (ppb)	NO ₂ (ppb)	NO _x (ppb)	SO ₂ (ppb)	NO ₂ (ppb)	SO ₂ (ppb)
12/27/12	7.08	11.57	13.21	24.74	0.70	35.89	2.91
12/28/12	11.56	8.35	13.21	21.55	0.41	23.24	1.57
12/29/12	7.79	8.52	9.16	17.64	1.91	16.86	6.02
12/30/12	8.76	1.27	5.99	7.19	0.41	28.01	1.91
12/31/12	21.31	11.11	14.02	25.12	1.00	31.18	4.89

Table 2-2. Quarterly Statistics

24-hour Averages						Daily Max 1-hr Avg.	
Date	PM ($\mu\text{g}/\text{m}^3$)	NO (ppb)	NO ₂ (ppb)	NO _x (ppb)	SO ₂ (ppb)	NO ₂ (ppb)	SO ₂ (ppb)
Average	10.18	6.49	9.55	16.02	0.79	22.38	3.42
Minimum	2.26	0.03	1.68	1.66	0.01	3.20	0.12
Maximum	23.03	44.12	28.60	66.57	10.07	84.66	66.78

Table 2-3. Monthly Statistics

Monthly Averages						Monthly Daily Max 1-hr Avg.	
Month	PM ($\mu\text{g}/\text{m}^3$)	NO (ppb)	NO ₂ (ppb)	NO _x (ppb)	SO ₂ (ppb)	NO ₂ (ppb)	SO ₂ (ppb)
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

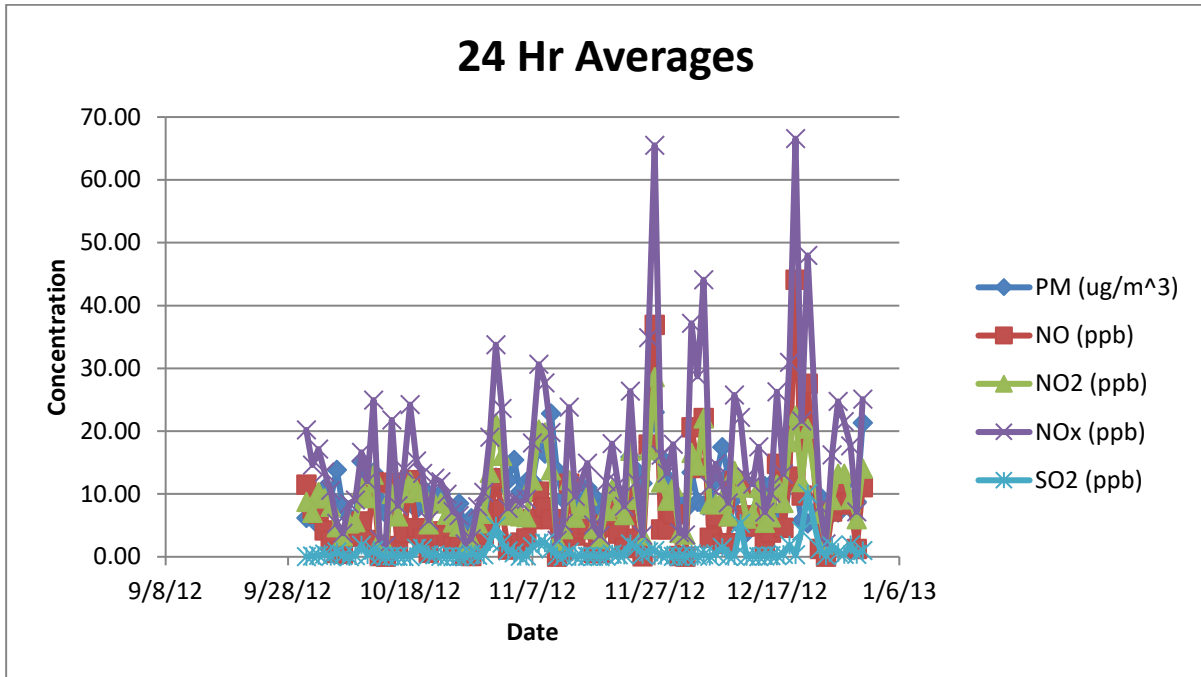


Figure 2-1. 24-hour Averages

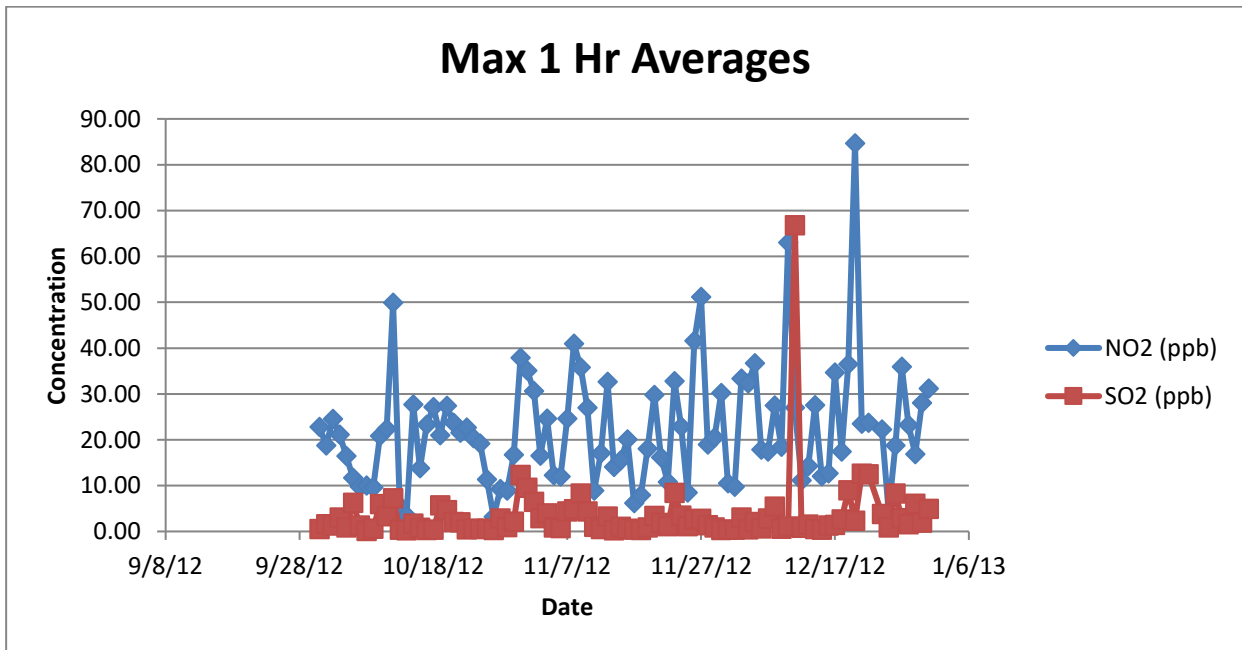


Figure 2-2. Max 1-hour Averages

3. Quality Assurance/Quality Control

QA/QC procedures applied to this project are described in a Quality Assurance Project 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 were recorded on QA/QC Daily Comment Sheets. The table contains the date the QA/QC comment occurred. Additional details related to these comments are provided in the paragraph below to provide context and history.

Normal instrument calibration procedures were performed several times this quarter. No service or maintenance activities were required this period. Mr. Rick Patterson, an auditor from the SC Department of Health and Environmental Control (DHEC), was on site December 10-11, 2012 to perform independent NO_x and SO₂ checks and validations. Both instruments passed all audit checks.

Table 3-1. QA/QC Daily Comment Sheet

Date	Comment
10/10/2012	PAC/computer was down upon remote login. Computer was restarted at approximately 10:20 am. Insufficient data 3:00 - 10:00 am.
11/2/2012	Calibrations triggered by Project Manager. Insufficient data 4:00 - 6:00 am due to calibration event.
11/4/2012	SO ₂ and NO _x checks triggered 1 hour early due to Daylight Savings Time adjustments.
11/5/2012	Two SO ₂ checks triggered due to daylight savings time change.
11/6/2012	Project Manager forced a calibration in the morning.
11/16/2012	Data acquisition system was down upon remote login. Restarted system at 10:17 am. Insufficient data 3:00 - 10:00 am.
11/26/2012	NO _x calibration forced by Project Manager.
11/27/2012	SO ₂ calibration forced by Project Manager.
11/28/2012	Insufficient data 2:00 - 9:00 am.

Date	Comment
12/8/2012	5014i alarm began at 6:57 am.
12/10/2012	Project Manager and auditor on site. NOx instrument audited by SC DHEC from 1:39 to 3:49 pm. Both NOx and SO ₂ data is invalid during this period.
12/11/2012	Project Manager and auditor on site. SO ₂ instrument audited by SC DHEC from 9:18 - 10:55 am. Both NOx and SO ₂ data is invalid during this period. Data acquisition system was down upon login. 5014i showing "Inst Alarm" on PAC display indicating the filter paper is getting low.
12/12/2012	Insufficient data 3:00 - 11:00 am due to data acquisition system being down.
12/22/2012	Insufficient data 3:00 – 23:59 pm.
12/24/2012	Data acquisition system was down upon login. Restarted system at approximately 10:11 am. Insufficient data 0:00 - 10:00 am. Computer went down just after 3:00 am QC check on 12/22/12. No data captured on 12/23/2012.

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 95.97%.