



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

Q3 2012 Quarterly Report

October 2012



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Wando Welch Terminal**

Q3 2012 Quarterly Report

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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 sixth quarterly data report (second 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 July 1, 2012 through September 30, 2012.

1.2 Project Description

SCSPA asked for technical support that will provide ambient air quality data including particulate matter less than 2.5 microns (PM_{2.5}), SO₂, and NO₂ 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 SO₂ 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 if needed.

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 ($\mu\text{g}/\text{m}^3$)	NO (ppb)	NO ₂ (ppb)	NO _x (ppb)	SO ₂ (ppb)	NO ₂ (ppb)	SO ₂ (ppb)
7/1/12	16.26	6.33	0.41	2.20	0.00	2.90	0.00
7/2/12	15.03	11.70	7.61	17.52	1.54	18.72	10.31
7/3/12	16.18	12.74	5.35	15.13	0.00	16.72	0.00
7/4/12	9.74	7.04	0.40	2.72	0.00	1.03	0.00
7/5/12	16.31	13.38	4.07	14.91	0.00	11.46	0.01
7/6/12	19.23	13.08	6.63	17.28	0.09	21.55	1.71
7/7/12	14.39	7.43	0.38	57.05	0.00	6.49	0.00
7/8/12	18.10	2.47	1.11	2.97	1.93	6.96	9.36
7/9/12	18.39	4.07	2.17	5.76	0.14	13.80	2.21
7/10/12	13.98	4.75	1.92	6.25	0.02	8.23	0.18
7/11/12	12.27	6.25	6.16	12.22	0.15	33.11	0.99
7/12/12	9.76	5.56	0.61	4.68	0.00	3.79	0.00
7/13/12	9.56	6.65	1.45	7.21	0.06	6.04	1.48
7/14/12	5.22	0.30	0.01	0.11	0.06	0.17	1.36
7/15/12	4.01	0.07	0.02	0.04	0.04	0.37	1.07
7/16/12	3.29	9.32	3.29	12.24	0.11	20.07	0.93
7/17/12	5.64	6.23	2.42	8.21	0.98	11.86	12.02
7/18/12	7.27	7.91	5.68	13.40	2.25	16.56	16.07
7/19/12	8.43	6.39	4.28	10.46	0.60	33.16	4.32
7/20/12	7.46	3.44	1.27	4.27	0.42	6.82	2.43
7/21/12	11.36	1.56	0.62	1.79	1.65	4.12	12.72
7/22/12	6.87	0.08	0.00	0.02	0.07	0.00	1.58



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

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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)
7/23/12	15.94	10.29	1.64	11.33	0.85	12.38	6.87
7/24/12	6.57	3.79	5.87	9.65	0.03	14.78	0.42
7/25/12	12.58	5.38	8.95	14.31	3.16	19.33	26.69
7/26/12	12.74	5.80	9.85	15.62	0.62	32.05	6.30
7/27/12	15.60	5.38	10.82	16.17	2.50	24.36	13.62
7/28/12	12.25	4.51	7.01	11.50	2.27	21.08	14.42
7/29/12	12.46	1.01	4.67	5.65	0.57	19.14	9.30
7/30/12	11.56	6.08	11.55	17.61	0.37	27.23	2.14
7/31/12	13.34	4.85	10.27	15.10	0.31	24.38	2.32
8/1/12	12.36	2.69	8.53	11.20	0.21	17.77	2.07
8/2/12	12.41	5.35	12.34	17.67	0.58	22.29	4.88
8/3/12	13.46	6.36	10.28	16.62	0.02	25.46	0.46
8/4/12	4.76	0.21	1.20	1.37	0.01	4.94	0.18
8/5/12	6.31	0.80	1.50	2.25	0.05	4.82	1.16
8/6/12	7.88	13.94	6.84	20.71	0.11	15.76	2.20
8/7/12	8.02	8.51	7.09	15.58	0.28	20.60	3.64
8/8/12	6.78	12.84	11.37	24.20	0.70	28.27	3.83
8/9/12	9.66	6.45	8.86	15.28	0.63	20.63	3.61
8/10/12	10.41	5.43	5.95	11.37	0.10	11.40	0.95
8/11/12	10.49	1.50	4.98	6.46	0.40	22.94	2.14
8/12/12	11.11	0.34	2.04	2.35	0.11	4.75	0.90
8/13/12	12.86	6.10	9.57	15.65	0.31	28.28	2.68
8/14/12	13.55	4.24	9.32	13.55	0.54	20.95	2.73
8/15/12	10.97	4.16	7.90	12.05	1.15	17.06	5.21
8/16/12	13.36	7.52	13.67	21.18	3.38	27.03	27.57
8/17/12	13.01	6.61	12.95	19.55	1.50	27.34	8.50
8/18/12	14.40	2.33	6.27	8.56	1.46	16.33	5.14
8/19/12	8.58	0.36	2.55	2.86	0.21	6.81	2.26
8/20/12	6.93	3.87	6.87	10.71	0.98	17.63	5.07
8/21/12	4.98	6.70	8.41	15.07	0.21	20.05	1.07
8/22/12	6.34	8.55	9.98	18.51	0.71	23.87	3.27
8/23/12	4.06	3.93	6.02	9.92	0.10	17.83	1.03



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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)
8/24/12	4.22	1.89	4.73	6.60	0.05	13.89	1.04
8/25/12	11.03	0.22	2.94	3.13	0.03	8.43	0.41
8/26/12	7.23	0.02	1.57	1.55	0.12	3.82	0.90
8/27/12	3.99	3.68	3.22	6.86	0.05	9.59	1.22
8/28/12	3.69	8.16	8.96	17.10	0.06	27.89	1.33
8/29/12	5.55	4.30	6.25	10.51	0.23	13.51	2.43
8/30/12	6.10	5.78	7.96	13.73	0.23	19.02	1.44
8/31/12	7.82	7.25	9.63	16.88	0.78	15.00	4.26
9/1/12	8.48	4.48	8.07	12.54	2.61	23.50	7.04
9/2/12	10.08	0.48	2.83	3.28	0.29	5.59	0.94
9/3/12	8.15	0.01	1.16	1.10	0.04	1.64	0.90
9/4/12	5.38	9.79	8.06	17.81	0.02	22.86	0.41
9/5/12	8.49	9.09	8.12	17.17	0.11	22.38	0.85
9/6/12	11.36	5.75	8.81	14.54	1.55	22.29	4.80
9/7/12	13.27	5.16	9.16	14.31	0.83	17.61	3.96
9/8/12	6.38	0.29	1.82	2.07	0.11	5.22	0.94
9/9/12	7.18	0.19	2.16	2.32	0.37	4.75	1.99
9/10/12	6.03	2.07	7.44	9.49	0.05	13.99	0.60
9/11/12	7.57	1.57	5.84	7.38	0.04	14.93	0.38
9/12/12	9.12	1.25	4.66	5.88	0.04	12.55	0.26
9/13/12	9.26	2.13	5.01	7.13	0.04	12.17	0.41
9/14/12	6.38	2.23	5.78	7.99	0.05	13.14	0.56
9/15/12	3.54	0.48	3.07	3.53	0.03	6.92	0.65
9/16/12	5.09	0.73	2.77	3.46	0.04	10.74	0.84
9/17/12	4.18	18.75	8.24	26.90	0.05	18.43	0.64
9/18/12	3.48	4.21	4.69	8.84	0.03	11.40	0.71
9/19/12	10.04	5.09	6.82	11.87	1.03	16.12	5.78
9/20/12	7.45	2.37	5.11	7.44	0.02	10.32	0.28
9/21/12	8.27	2.45	6.04	8.46	0.03	16.56	0.33
9/22/12	10.30	0.70	5.58	6.25	0.41	13.88	4.44
9/23/12	15.78	0.00	2.56	2.49	0.19	3.79	0.52
9/24/12	8.46	2.03	6.10	8.09	0.07	10.79	0.53



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)
9/25/12	7.84	2.64	6.89	9.50	0.02	20.77	0.25
9/26/12	6.91	3.35	6.64	9.96	0.02	19.19	0.37
9/27/12	7.04	2.65	7.40	10.03	0.07	19.79	0.79
9/28/12	9.24	3.36	9.11	12.46	0.55	17.73	2.06
9/29/12	10.38	1.11	6.62	7.71	0.46	19.27	2.66
9/30/12	14.48	2.22	6.86	9.07	0.82	26.17	4.09

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	9.60	4.68	5.65	10.56	0.50	15.29	3.41
Minimum	3.29	0.00	0.00	0.02	0.00	0.00	0.00
Maximum	19.23	18.75	13.67	57.05	3.38	33.16	27.57

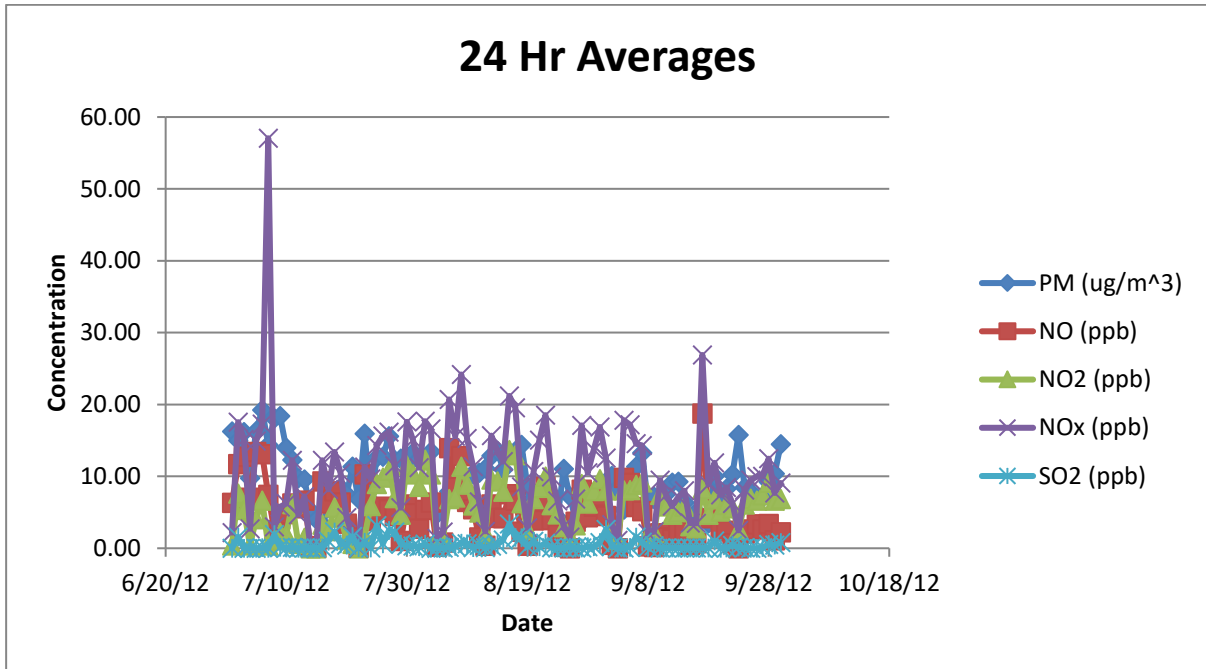


Figure 2-1. 24-hour Averages

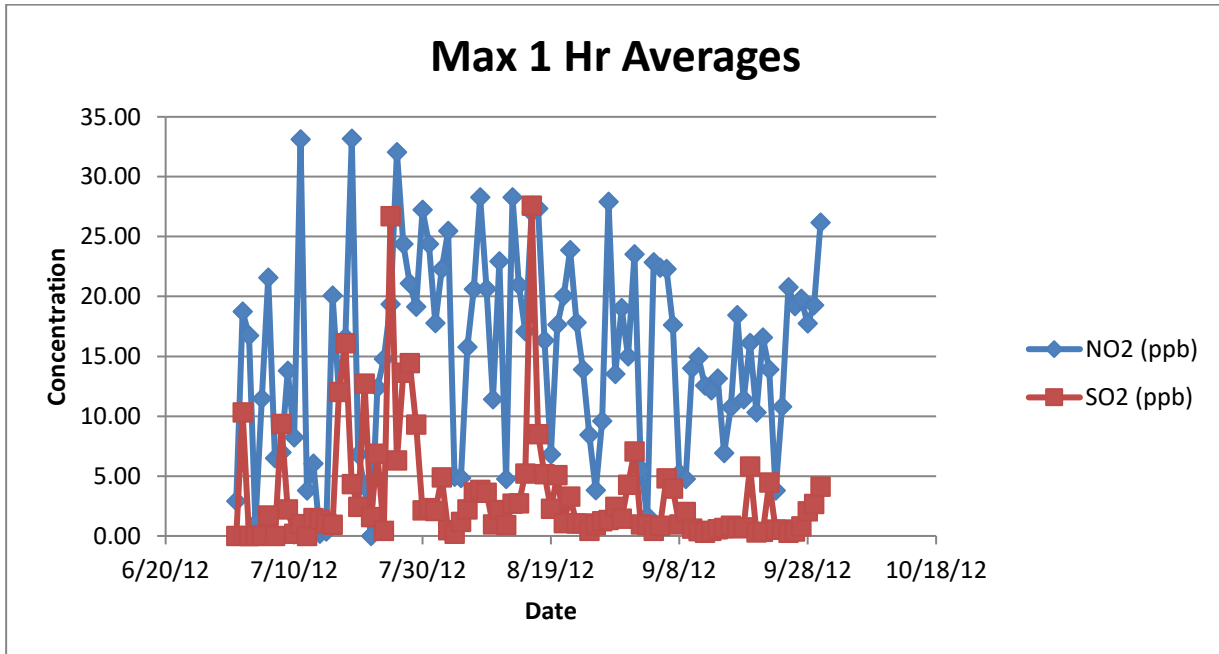


Figure 2-2. Max 1-hour Averages



Table 2-3. Monthly Statistics

Month	Monthly Averages					Monthly 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)
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

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.

System maintenance and instrument calibration procedures were implemented several times this quarter. Cooler temperature alarms for the 42i occurred from 6/28 to 7/7/2012 when the cooler was replaced. For the period 7/8 to 8/4/2012, intermittent insufficient data periods were caused by instrument calibration and linearity checks. Although the systems passed the daily QC checks, the project manager wanted to improve the accuracy of the results. There were a few power failures and computer shutdowns noted from 8/15 to 9/24/2012 that were due to suspected power quality/failure issues.

Table 3-1. QA/QC Daily Comment Sheet

Date	Comment
7/1/2012	Cooler temp alarm on. SO ₂ QC failed, calibration triggered. 42i alarm. Insufficient data 2:00 - 4:00. Power failure on 6/29/12 showing up on alarm screen.
7/2/2012	Cooler temp alarm displaying "1". Insufficient data 2:00 - 4:00. 42i alarm.
7/3/2012	Insufficient data 2:00 - 4:00. 42i alarm.
7/4/2012	42i cooler temp alarm. Power monitor alarm 10:08 on 7/5/12. Insufficient data 2:00 - 6:00. No data after 8:00.
7/5/2012	42i cooler temp alarm. Insufficient data 0:00 - 10:00.
7/6/2012	Insufficient data 2:00 - 6:00. 42i alarm.
7/7/2012	Insufficient data 2:00 - 6:00. Intermittent 42i alarm.

Date	Comment
7/8/2012	42i calibration and zero values not displayed on PAC display. 43i values not displayed. Insufficient data 2:00 - 4:00.
7/9/2012	Insufficient data 4:00 - 6:00. NOx calibration triggered.
7/10/2012	Project manager set 43i zero tolerance to +/- 1ppb to force calibration. Insufficient data 2:00 - 4:00.
7/12/2012	Insufficient data 2:00 - 8:00.
7/23/2012	NOx and SO ₂ zero failed (7/24/12) on PAC display.
7/24/2012	Insufficient data 2:00 - 6:00. Calibrations triggered by project manager.
8/4/2012	Insufficient data 2:00 - 4:00. SO ₂ cal triggered.
8/15/2012	Insufficient data 3:00 - 12:00 due to possible power failure.
9/11/2012	Computer appeared to have shut down at approximately 3:15 am according to when H05 file stopped logging data. Computer was started back up at 11:50 am on 9/12/2012.
9/12/2012	Insufficient data 3:00 - 12:00 (see yesterdays comment).
9/23/2012	Computer was down upon login on 9/24/12. Appears as if data stopped collecting at 3:14 am on 9/23/12. Computer/programs began running again at 9:30 am 9/24/12. Insufficient data 3:00 am onward.
9/24/2012	Insufficient data 0:00 - 11:00 due to computer being off.

3.2 Quarterly Data Validation

The quarterly data were assessed as follows: 100% of the validated Quarter 3 data were flagged as "good". Percent completeness for Quarter 3 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 3 was 94.97%.