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

Q2 2013 Quarterly Report

July 2013

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

Q2 2013 Quarterly Report

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

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RN006310

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ARCADIS

Table of Contents

Tables

Figures

Appendices

ARCADIS

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 data. This report is the ninth quarterly data report (first quarterly report in year three 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 April 1, 2013 through June 30, 2013.

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. An update was performed on September 20, 2012, following the annual maintenance program and an on-site audit by the S.C. Department of Health and Environmental Control (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. ARCADIS has been able to remotely access the control computer and reliably interact with the instruments. The instruments are very responsive 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 the archived data any time in the future.

2. Quarterly Results

The 24-hr daily averages for $PM_{2.5}$, NO, NO_2, NO_X, and SO_2 and the maximum daily value (1-hr average) for NO_2 and SO_2 for this period are shown in Table 2-1. No exceedances were indicated this quarter. 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 NO_2 and SO_2 are shown in Figure 2-2. Statistics are broken down by months and summarized in Table 2-3.

Table 2-1. 24-Hour Averages

24-hour Averages						Daily Max 1-hr Avg.	
Date	$PM_{2.5}$ ($\mu g/m^3$)	NO (ppb)	NO_2 (ppb)	NO_X (ppb)	SO_2 (ppb)	NO_2 (ppb)	SO_2 (ppb)
4/1/13	10.88	8.49	13.80	22.28	1.37	28.90	5.91
4/2/13	11.07	2.86	9.20	12.06	0.56	22.40	2.93
4/3/13	11.26	2.31	7.76	10.05	0.27	29.06	1.05
4/4/13	9.34	1.56	8.10	9.63	0.30	16.66	1.34
4/5/13	5.60	3.60	8.97	12.56	0.52	20.20	3.03
4/6/13	8.58	0.40	3.29	3.67	0.48	11.31	2.52
4/7/13	10.30	0.03	1.63	1.63	0.05	4.33	0.46
4/8/13	10.90	15.95	12.60	28.55	0.18	40.57	0.96
4/9/13	5.45	13.97	12.78	26.75	0.18	47.33	1.17
4/10/13	5.51	9.20	10.08	19.27	0.09	26.78	0.65
4/11/13	9.43	10.31	8.34	18.65	0.10	26.07	0.68
4/12/13	12.02	3.91	4.70	8.60	0.04	10.71	0.50
4/13/13	8.05	0.34	3.55	3.88	0.23	7.26	2.64
4/14/13	11.70	0.62	3.90	4.50	0.07	12.27	0.76
4/15/13	7.85	2.60	7.48	10.05	0.04	21.33	0.75
4/16/13	6.50	3.38	6.23	9.60	0.05	15.42	0.85
4/17/13	8.20	3.93	5.50	9.43	0.05	13.49	0.82
4/18/13	4.54	4.24	5.52	9.75	0.04	17.50	0.70
4/19/13	6.73	6.91	6.66	13.57	0.12	14.85	0.83
4/20/13	5.18	1.50	4.32	5.78	0.55	18.97	6.02
4/21/13	7.74	0.01	1.03	0.94	0.12	2.16	0.85
4/22/13	7.68	2.05	5.30	7.30	0.13	12.16	1.07

24-hour Averages						Daily Max 1-hr Avg.	
Date	**$PM_{2.5}$ ($\mu g/m^3$)**	**NO (ppb)**	**NO_2 (ppb)**	**NO_X (ppb)**	**SO_2 (ppb)**	**NO_2 (ppb)**	**SO_2 (ppb)**
4/23/13	6.35	3.65	6.55	10.16	0.40	14.41	8.78
4/24/13	9.18	10.29	12.22	22.50	0.01	22.87	0.17
4/25/13	14.21	4.51	10.12	14.63	0.64	23.50	3.62
4/26/13	7.73	1.25	4.98	6.20	0.09	13.30	2.04
4/27/13	9.38	0.33	3.16	3.43	0.01	11.72	0.27
4/28/13	7.51	0.03	1.94	1.90	0.01	4.92	0.16
4/29/13	8.29	5.86	8.96	14.79	0.25	23.82	1.08
4/30/13	8.16	3.28	6.28	9.54	0.39	16.61	4.53
5/1/13	5.92	1.85	4.44	6.26	0.00	10.78	0.10
5/2/13	6.11	1.07	2.84	3.85	0.00	7.59	0.08
5/3/13	8.23	1.92	3.84	5.73	0.00	12.47	0.00
5/4/13	7.57	0.01	0.65	0.58	0.00	0.81	0.03
5/5/13	5.87	0.00	0.82	0.75	0.00	2.08	0.00
5/6/13	6.98	4.58	7.44	11.98	7.54	19.60	31.78
5/7/13	10.61	12.21	12.92	25.11	0.25	36.79	2.42
5/8/13	9.70	5.03	10.06	15.09	0.34	19.03	3.36
5/9/13	10.57	6.78	12.77	19.54	0.43	31.28	3.40
5/10/13	12.65	5.13	10.60	15.69	0.12	31.38	0.89
5/11/13	11.58	0.08	1.97	1.99	0.03	3.43	0.24
5/12/13	5.68	2.94	7.33	10.23	1.60	24.49	7.62
5/13/13	8.65	1.97	7.47	9.39	0.08	14.76	0.35
5/14/13	11.02	3.63	11.53	15.14	0.01	27.19	0.19
5/15/13	11.94	3.77	9.61	13.33	0.49	23.49	4.62
5/16/13	14.11	5.35	13.14	18.44	1.94	32.33	8.59
5/17/13	10.09	4.85	9.24	14.06	0.62	26.28	7.89
5/18/13	7.25	0.48	3.53	3.96	0.19	13.14	1.64
5/19/13	7.85	0.10	1.10	1.12	0.00	2.09	0.03
5/20/13	6.86	9.09	7.82	16.85	0.01	19.71	0.21
5/21/13	4.09	11.74	11.58	23.27	0.00	36.93	0.11
5/22/13	7.04	14.41	9.81	24.16	0.01	20.51	0.23
5/23/13	4.08	13.24	11.09	24.30	0.04	24.93	0.80
5/24/13	4.93	3.90	9.50	13.37	0.08	21.32	1.79

24-hour Averages						Daily Max 1-hr Avg.	
Date	**$PM_{2.5}$ ($\mu g/m^3$)**	**NO (ppb)**	**NO_2 (ppb)**	**NO_X (ppb)**	**SO_2 (ppb)**	**NO_2 (ppb)**	**SO_2 (ppb)**
5/25/13	5.57	0.20	2.82	2.97	0.04	8.76	0.51
5/26/13	10.50	0.26	3.64	3.85	0.34	13.38	3.05
5/27/13	9.19	0.35	4.20	4.51	0.09	16.64	1.55
5/28/13	5.75	9.27	9.83	19.06	0.01	23.43	0.22
5/29/13	8.24	9.01	9.56	18.51	0.01	26.33	0.27
5/30/13	9.11	12.52	8.47	20.92	0.01	16.43	0.18
5/31/13	3.67	6.07	4.73	10.73	0.02	12.46	0.51
6/1/13	4.45	0.20	1.16	1.30	0.02	3.79	0.45
6/2/13	3.95	0.08	0.74	0.74	0.01	2.17	0.30
6/3/13	6.33	8.65	8.29	16.89	0.02	25.00	0.59
6/4/13	10.44	4.07	6.28	10.30	0.29	18.54	2.50
6/5/13	8.08	2.63	5.18	7.77	0.05	16.40	1.31
6/6/13	7.53	14.41	8.61	22.95	0.22	22.91	5.02
6/7/13	3.49	5.09	4.76	9.81	0.79	14.23	4.87
6/8/13	8.48	0.33	2.14	2.40	0.06	5.21	1.37
6/9/13	4.72	0.18	1.47	1.58	0.05	5.18	1.26
6/10/13	4.16	6.55	4.52	11.02	0.06	10.73	1.44
6/11/13	11.08	4.12	5.49	9.58	0.00	11.59	0.00
6/12/13	15.15	4.05	9.64	13.67	0.99	26.48	8.24
6/13/13	19.78	4.05	10.68	14.71	1.01	20.80	3.06
6/14/13	8.93	1.76	6.12	7.82	0.17	14.03	2.31
6/15/13	6.27	0.09	2.03	2.03	0.06	11.59	1.36
6/16/13	5.76	0.07	0.91	0.86	0.01	2.33	0.30
6/17/13	8.33	8.08	9.18	17.19	0.13	26.31	0.69
6/18/13	8.88	6.80	8.29	15.03	0.95	26.43	5.14
6/19/13	8.29	4.13	7.31	11.37	0.81	17.94	4.90
6/20/13	6.73	1.71	5.46	7.12	0.00	10.48	0.02
6/21/13	7.09	1.60	3.85	5.39	0.13	9.06	1.22
6/22/13	6.46	1.01	2.81	3.76	0.55	14.15	5.58
6/23/13	9.86	0.27	1.64	1.80	0.16	9.93	2.61
6/24/13	11.65	9.17	5.76	14.84	0.26	16.13	2.46
6/25/13	5.49	10.95	5.81	16.68	0.27	13.70	2.16

24-hour Averages						Daily Max 1-hr Avg.	
Date	$PM_{2.5}$ ($\mu g/m^3$)	NO (ppb)	NO_2 (ppb)	NO_X (ppb)	SO_2 (ppb)	NO_2 (ppb)	SO_2 (ppb)
6/26/13	1.73	5.43	3.32	17.17	1.49	20.96	8.48
6/27/13	7.23	28.11	11.47	3.05	15.12	12.61	1.62
6/28/13	10.19	5.57	4.65	10.12	1.28	13.09	4.60
6/29/13	10.72	0.17	0.33	0.40	0.36	2.70	3.77
6/30/13	8.43	1.00	0.92	1.68	0.19	8.00	2.25

Table 2-2. Quarterly Statistics

24-hour Averages						Daily Max 1-hr Avg.	
Date	$PM_{2.5}$ ($\mu g/m^3$)	NO (ppb)	NO_2 (ppb)	NO_X (ppb)	SO_2 (ppb)	NO_2 (ppb)	SO_2 (ppb)
Average	8.20	4.61	6.35	10.61	0.52	16.96	2.41
Minimum	1.73	0.00	0.33	0.40	0.00	0.81	0.00
Maximum	19.78	28.11	13.80	28.55	15.12	47.33	31.78

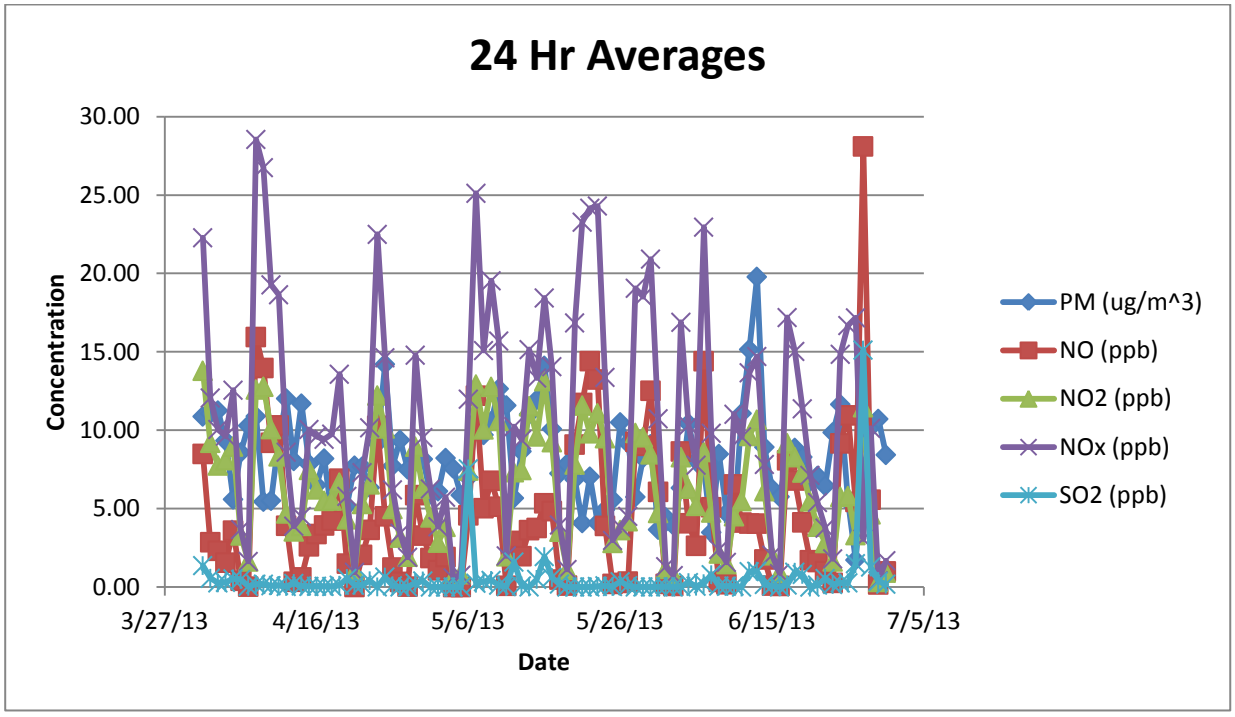

Figure 2-1. 24-hour Averages

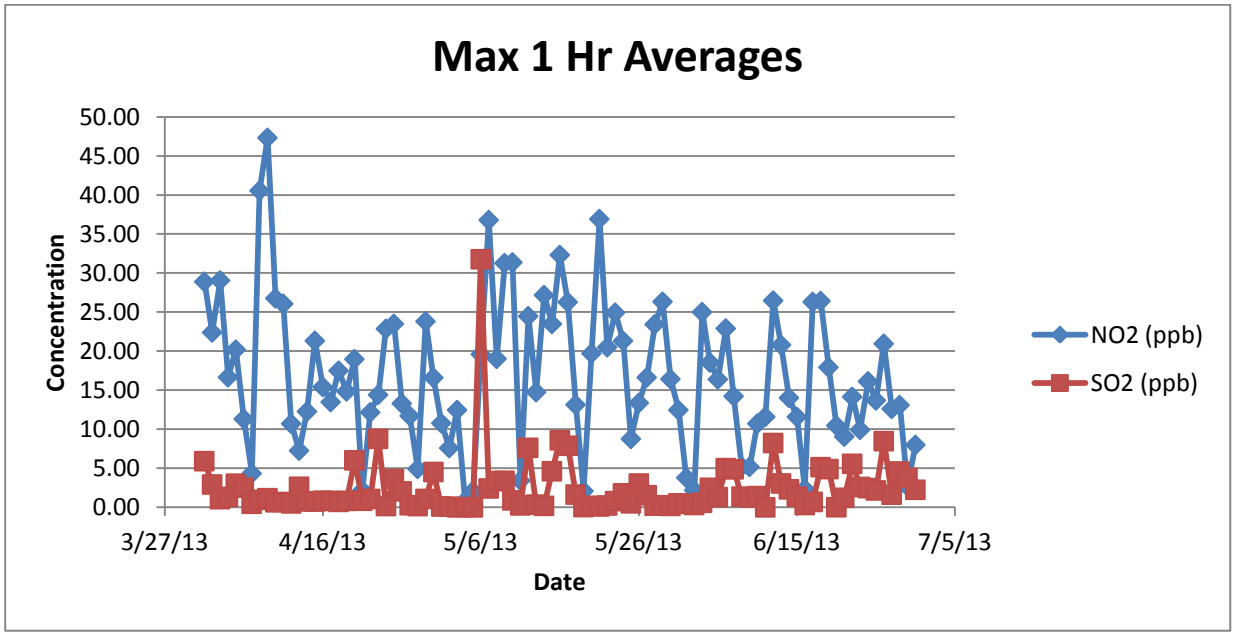

Figure 2-2. Max 1-hour Averages

Table 2-3. Monthly Statistics

Monthly Averages						Monthly Daily Max 1-hr Avg.	
Month	**$PM_{2.5}$ ($\mu g/m^3$)**	**NO (ppb)**	**NO_2 (ppb)**	**NO_X (ppb)**	**SO_2 (ppb)**	**NO_2 (ppb)**	**SO_2 (ppb)**
April 2013	8.51	4.25	6.83	11.06	0.25	18.36	1.90
May 2013	8.11	4.90	7.24	12.09	0.46	18.70	2.67
June 2013	7.99	4.68	4.96	8.63	0.85	13.75	2.66

2.1 Specific Data Notes

Normal maintenance and instrument calibration procedures were performed several times this quarter, and the annual maintenance program was conducted on June 26-27, 2013. Additional notes can be found in the QA/QC Daily Comment Sheet summary shown in Table 3-1.

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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.

Table 3-1. QA/QC Daily Comment Sheet

Date	Comment
4/20/2013	Insufficient data 4:00 - 6:00 due to NOx calibration
4/21/2013	Insufficient data 4:00 - 6:00 due to NOx calibration
4/23/2013	Insufficient data 2:00 - 4:00 due to SO_2 calibration
5/3/2013	Insufficient data 2:00 - 4:00 due to SO_2 calibration
5/5/2013	Insufficient data 2:00 - 4:00 due to SO_2 calibration
5/6/2013	Insufficient data 2:00 - 6:00 due to SO_2 and NOx calibrations. SO_2 exceedance due to calibration forced by Project Manager (11:45 - 14:30)
5/9/2013	Insufficient data 4:00 - 6:00 due to NOx calibration
5/11/2013	Insufficient data 10:00 - 18:00 due to "phantom" 1999 time stamp line in data file. Line deleted and macro re-run successfully.
5/21/2013	SO_2 calibration likely due to heavy rains in the Charleston area*
5/22/2013	Insufficient data 2:00 - 4:00 due to SO_2 calibration*
5/23/2013	Insufficient data 2:00 - 4:00 due to SO_2 calibration*
5/24/2013	Insufficient data 2:00 - 4:00 due to SO_2 calibration*
5/25/2013	Insufficient data 2:00 - 4:00 due to SO_2 calibration*
6/10/2013	Insufficient data 2:00 - 4:00 due to SO_2 calibration. SO_2 calibration likely due to water infiltrating sample lines*
6/11/2013	Water found in SO_2 instrument inlet filter*
6/12/2013	NOx and SO_2 calibrations triggered*

Date	Comment
6/13/2013	Insufficient data 4:00 - 6:00 due to NOx calibration*
6/20/2013	SO_2 QC failed, calibration triggered*
6/21/2013	SO_2 QC failed, calibration triggered*
6/26/2013	Insufficient data 13:00 - 17:00 due to annual system maintenance
6/28/2013	PM exceedance on 6/27/2013 due to routine system maintenance. Insufficient data 2:00 - 6:00 and 15:00 - 17:00 due to system maintenance. Ongoing annual system maintenance
6/29/2013	Insufficient data 4:00 - 6:00 due to NOx calibration
6/30/2013	Insufficient data 2:00 - 4:00 due to SO_2 calibration

* Heavy rains and high winds in the area caused water to be drawn into the sample inlet at least twice this quarter. The interaction of the water and the gas used for the daily quality control check caused the instruments to fail their calibration checks. This triggered multiple calibrations during the quarter, especially on the SO_2 instrument. As part of the annual maintenance efforts, additional weatherproofing was added to the sample inlet and additional insulation was added to the sample line.

3.2 Quarterly Data Validation

The quarterly data were assessed as follows: 100% of the validated Quarter 2 data were flagged as “good”. Percent completeness for Quarter 2 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 2 was 97.80%.