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

Q2 2012 Quarterly Report

July 2012

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

Q2 2012 Quarterly Report

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ARCADIS

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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 fifth quarterly data report (first 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 April 1, 2012 through June 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 ($PM_{2.5}$), 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 if needed.

2. Quarterly Results

The 24-hr daily averages for PM, 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 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 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 ($\mu g/m^3$)	NO (ppb)	NO_2 (ppb)	NO_X (ppb)	SO_2 (ppb)	NO_2 ppb)	SO_2 (ppb)
4/1/12	9.74	0.70	4.78	5.48	0.97	13.28	7.20
4/2/12	13.39	4.32	10.53	14.83	3.58	20.44	24.19
4/3/12	7.47	2.22	6.82	9.02	0.04	17.02	0.30
4/4/12	12.16	6.23	10.94	17.17	1.68	24.05	5.60
4/5/12	13.43	9.31	13.71	23.02	4.60	26.56	22.04
4/6/12	4.18	0.51	6.14	6.64	0.06	19.91	0.70
4/7/12	7.84	0.43	6.00	6.41	0.25	24.92	1.86
4/8/12	8.97	1.12	6.09	7.19	1.59	15.90	15.20
4/9/12	11.79	3.59	11.00	14.58	1.42	26.30	12.01
4/10/12	15.39	7.24	15.07	22.30	3.87	33.00	24.16
4/11/12	9.50	3.01	11.95	14.95	1.03	27.52	3.17
4/12/12	18.12	2.14	10.77	12.91	0.29	17.19	1.03
4/13/12	13.16	9.31	14.60	23.91	0.22	30.17	2.13
4/14/12	11.77	0.19	6.21	6.40	0.08	14.77	0.87
4/15/12	5.88	0.13	3.81	3.94	0.11	6.95	1.26
4/16/12	6.95	7.20	12.48	19.68	1.58	35.80	11.18
4/17/12	9.57	9.34	11.69	21.03	1.49	30.08	14.41
4/18/12	7.38	15.41	12.68	28.08	0.18	24.74	0.97
4/19/12	15.40	5.46	9.66	15.12	0.24	14.82	2.98
4/20/12	14.00	2.74	8.11	10.84	0.02	13.72	0.41
4/21/12	6.90	1.66	8.59	10.24	0.06	20.17	0.55
4/22/12	1.72	0.13	5.04	5.16	0.11	6.74	0.99

24-hour Averages						Daily Max 1-hr Avg.	
Date	**PM ($\mu g/m^3$)**	**NO (ppb)**	**NO_2 (ppb)**	**NO_X (ppb)**	**SO_2 (ppb)**	**NO_2 ppb)**	**SO_2 (ppb)**
4/23/12	6.92	3.69	11.05	14.73	1.53	21.50	21.47
4/24/12	10.78	8.33	18.34	26.67	10.23	38.87	57.95
4/25/12	18.92	6.21	18.02	24.23	4.55	36.15	24.25
4/26/12	11.74	2.60	12.19	14.80	0.84	19.47	7.01
4/27/12	15.90	5.76	14.49	20.26	3.82	25.98	19.11
4/28/12	12.40	0.56	8.36	8.92	0.96	20.13	6.25
4/29/12	7.45	0.59	4.16	4.76	0.73	8.87	4.89
4/30/12	12.05	4.26	5.91	10.17	0.04	13.40	0.44
5/1/12	10.19	12.02	7.52	19.53	0.05	21.83	0.62
5/2/12	8.43	5.87	6.15	12.01	0.10	13.51	0.94
5/3/12	8.84	6.88	8.60	15.48	1.30	16.30	8.65
5/4/12	8.77	11.67	11.39	23.06	3.77	18.58	10.99
5/5/12	11.30	1.77	5.66	7.43	3.27	15.79	23.77
5/6/12	8.29	0.12	2.75	2.86	0.09	8.87	0.65
5/7/12	6.97	1.29	4.30	5.58	0.01	10.22	0.29
5/8/12	6.86	3.21	6.18	9.38	0.03	19.68	0.20
5/9/12	5.93	11.36	13.13	24.49	1.53	34.71	15.04
5/10/12	14.99	4.46	10.49	14.94	1.47	21.71	5.49
5/11/12	10.90	1.25	7.33	8.58	0.41	19.26	1.65
5/12/12	9.65	0.28	7.51	7.77	0.03	26.27	0.47
5/13/12	8.40	0.06	2.24	2.28	0.02	3.73	0.34
5/14/12	12.62	7.61	7.93	15.52	0.03	19.08	0.28
5/15/12	13.50	5.63	7.50	13.11	0.38	18.96	2.91
5/16/12	13.25	5.55	9.16	14.71	0.31	21.70	2.32
5/17/12	9.90	4.68	9.56	14.21	0.14	30.58	1.71
5/18/12	9.61	1.22	4.54	5.73	0.03	11.46	0.46
5/19/12	6.61	0.07	2.21	2.22	0.05	3.34	0.18
5/20/12	9.08	0.03	1.48	1.46	0.04	2.08	0.38
5/21/12	10.00	6.36	5.18	11.51	0.05	17.73	0.46
5/22/12	10.07	9.11	11.20	20.28	0.61	27.48	4.18
5/23/12	10.91	7.69	11.61	19.29	0.33	32.53	1.70
5/24/12	12.15	6.28	8.06	14.33	0.72	31.18	8.38

24-hour Averages						Daily Max 1-hr Avg.	
Date	**PM ($\mu g/m^3$)**	**NO (ppb)**	**NO_2 (ppb)**	**NO_X (ppb)**	**SO_2 (ppb)**	**NO_2 ppb)**	**SO_2 (ppb)**
5/25/12	10.81	2.25	3.47	5.70	0.06	7.85	0.85
5/26/12	7.81	0.46	3.04	3.49	0.20	11.27	1.92
5/27/12	10.82	0.04	1.11	1.14	0.09	2.45	1.14
5/28/12	7.46	0.08	0.98	1.04	0.03	2.77	0.65
5/29/12	5.45	5.71	5.53	11.21	0.06	14.95	0.70
5/30/12	7.38	4.08	8.73	12.78	2.27	22.31	12.06
5/31/12	10.90	9.22	12.84	22.03	1.15	33.54	9.26
6/1/12	8.03	6.59	8.49	15.06	0.37	21.63	2.02
6/2/12	5.55	1.55	5.65	7.18	3.79	14.25	10.41
6/3/12	11.73	0.30	4.84	5.12	1.11	11.69	3.68
6/4/12	11.50	3.88	9.19	13.05	2.13	18.99	9.34
6/5/12	10.02	2.24	7.00	9.22	1.47	16.61	16.30
6/6/12	3.86	1.28	5.12	6.39	0.02	15.69	0.40
6/7/12	5.57	1.87	5.72	7.58	0.12	12.45	0.45
6/8/12	8.32	1.36	5.38	6.73	0.28	9.85	2.07
6/9/12	7.04	0.27	3.28	3.52	0.25	14.30	0.96
6/10/12	7.51	0.02	0.70	0.68	0.07	0.99	0.41
6/11/12	4.70	8.39	6.68	15.03	1.50	16.21	24.54
6/12/12	6.14	6.06	6.91	12.96	0.24	16.61	1.80
6/13/12	9.58	6.14	10.46	16.58	1.54	26.70	13.36
6/14/12	3.08	0.19	1.28	1.47	0.07	7.74	0.70
6/15/12	4.68	0.44	0.00	0.07	0.11	0.05	0.61
6/16/12	5.40	0.15	1.26	1.33	0.26	4.32	1.08
6/17/12	10.61	0.02	1.28	1.23	0.23	4.82	0.86
6/18/12	19.63	4.27	6.14	10.36	0.39	13.43	0.99
6/19/12	15.73	6.39	7.88	14.23	0.82	18.02	4.63
6/20/12	3.81	3.68	5.06	8.72	0.11	13.57	0.69
6/21/12	5.85	5.38	7.15	12.51	0.16	15.63	0.87
6/22/12	4.59	8.84	8.14	16.96	0.38	17.24	1.36
6/23/12	6.95	0.98	2.29	3.20	0.95	9.14	5.51
6/24/12	3.18	0.13	1.09	1.09	0.16	4.01	1.74
6/25/12	7.43	11.42	6.81	18.10	0.05	18.37	0.79

24-hour Averages						Daily Max 1-hr Avg.	
Date	PM ($\mu g/m^3$)	NO (ppb)	NO_2 (ppb)	NO_X (ppb)	SO_2 (ppb)	NO_2 ppb)	SO_2 (ppb)
6/26/12	12.38	0.00	0.40	0.17	0.47	0.45	1.40
6/28/12	14.55	9.65	1.47	144.13	0.38	6.79	0.90
6/29/12	21.47	6.74	3.53	8.26	0.26	14.79	0.92
6/30/12	23.62	5.58	0.72	1.99	0.00	11.45	0.00

Table 2-2. Quarterly Statistics

24-hour Averages						Daily Max 1-hr Avg.	
Date	PM ($\mu g/m^3$)	NO (ppb)	NO_2 (ppb)	NO_X (ppb)	SO_2 (ppb)	NO_2 (ppb)	SO_2 (ppb)
Average	9.79	4.05	7.12	12.55	0.92	17.18	5.80
Minimum	1.72	0.00	0.00	0.07	0.00	0.05	0.00
Maximum	23.62	15.41	18.34	144.13	10.23	38.87	57.95

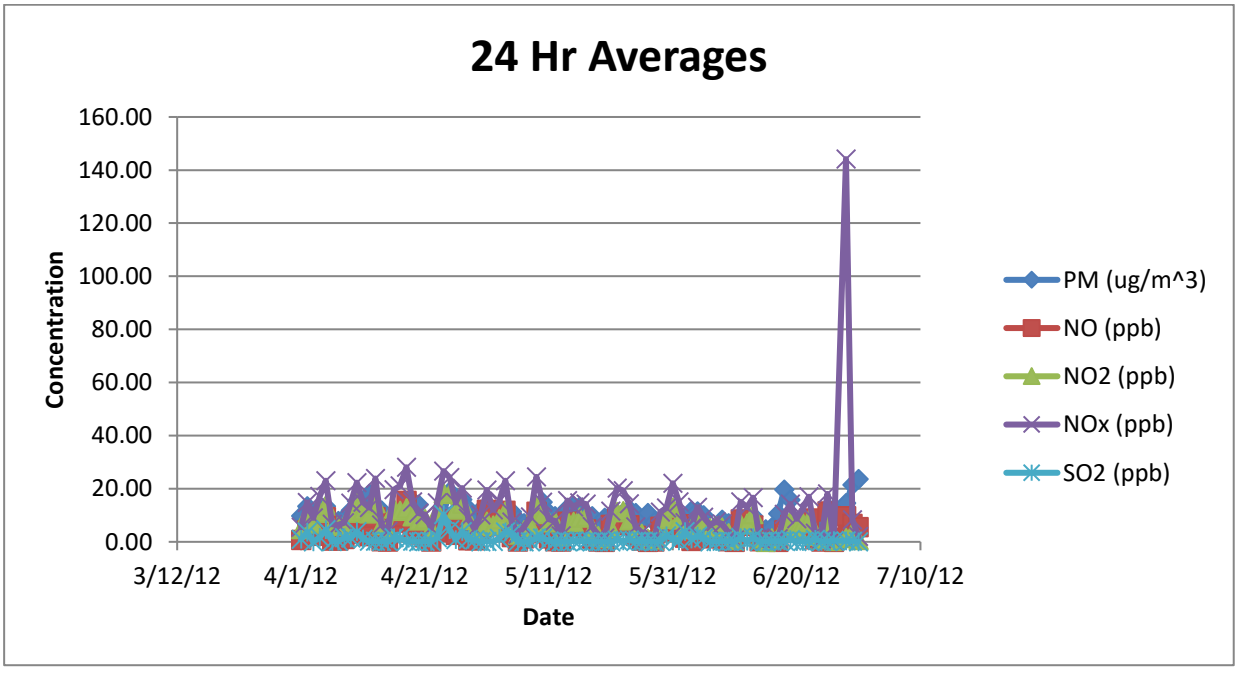

Figure 2-1. 24-hour Averages

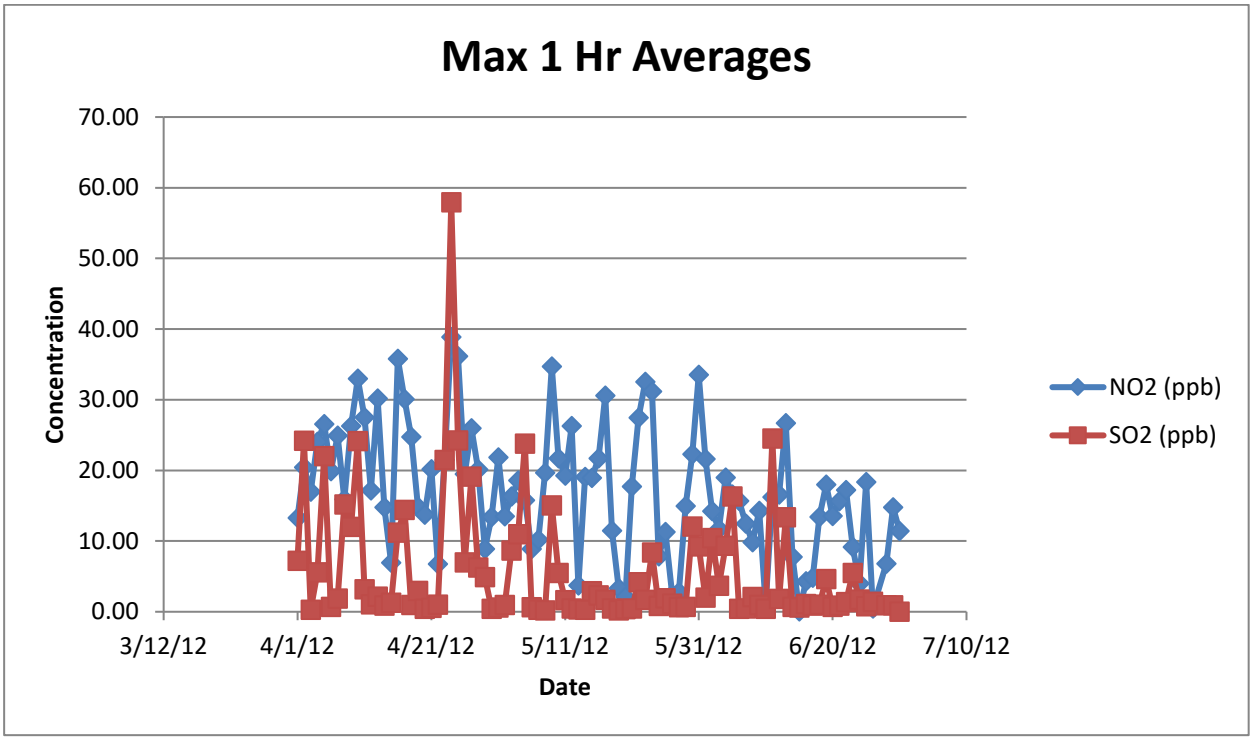

Figure 2-2. Max 1-hour Averages

Table 2-3. Monthly Statistics

Monthly Averages						Monthly Daily Max 1-hr Avg.	
Month	**PM ($\mu g/m^3$)**	**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

2.1 Specific Data Notes

System maintenance steps were implemented at several periods within this quarter, and the annual maintenance program was conducted on June 14-15, 2012. For several days in April, a high SO_2 concentration alarm internal to the instrument activated during the calibration gas injection. This issue has not recurred. A number of

Alarms (starting on 5/6/2012) were caused by the filter roll needing to be replaced. After inspection, it was determined that the roll would last until the scheduled maintenance in June. Alarms starting on 6/3/2012 and continuing until the annual maintenance on 6/14-15/2012 were due to a failing pressure transducer which was repaired at that time. Cooler temperature alarms started on 6/28/2012, and the cooler was replaced in early July.

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. Exceedances of the EPA Ambient Air Quality guidelines found in the daily validations were logged and are summarized in Table 3-1. The table contains the date the anomaly occurred and the reason/comment.

Table 3-1. QA/QC Daily Comment Sheet

Date	Comment
4/12/2012	43i alarm at 2:05. Voicemail from Jeanne Adame indicating presence of wildfires in the area.
4/24/2012	43i alarm 2:04:22 - 2:05:52 during calibration period (high SO_2 caused by calibration gas injection).
4/25/2012	43i alarm 2:03:49 - 2:06:04 during calibration period.
4/26/2012	43i alarm 2:04:31 - 2:06:01 during calibration period.
4/27/2012	43i alarm 2:04:28 - 2:05:58 during calibration period.
4/28/2012	43i alarm 2:04:10 - 2:06:10 during calibration period.
5/4/2012	43i alarm 2:05:28 - 2:05:43. Intermittent 42i alarms 13:41:48 - 16:39:54.
5/6/2012	5014i alarm 15:59:01 - 23:59:45. Project Manager determined that this alarm would continue until the scheduled maintenance in June.
6/2/2012	42i alarm begins at 8:41:38 and continues for rest of day.
6/3/2012	Gen alarm and Pressure alarm for 42i. 42i alarm for entire day. Determined that the pressure transducer in the 42i was failing. Alarms continued until annual maintenance on 6/14.
6/14/2012	Instrumentation taken offline at 8:25am for annual maintenance. No data for any instrument after 8:25am.
6/15/2012	Instruments still offline until 14:43. Insufficient data as a result: from

Date	Comment
	3:00 - 6:00 and from 13:00 - 16:00.
6/16/2012	Insufficient data: 5:00 - 6:00. NOx cal triggered.
6/17/2012	Insufficient data: 5:00 - 6:00. NOx cal triggered.
6/18/2012	Computer froze at ~4:15 am and unfroze at ~8:31am. Insufficient data from 5:00 - 9:00 time intervals.
6/19/2012	Project manager forced SO_2 calibration. Insufficient data 5:00 - 6:00 due to SO_2 calibration event.
6/20/2012	Insufficient data from 3:00 - 4:00 due to forced calibration of the 43i.
6/26/2012	No data after 3:09:59. Insufficient data 3:00 - 24:00 due to power failure.
6/27/2012	No data file created. No data obtained today.
6/28/2012	42i cooler temp alarm (and one on 6/30): repaired in early July. Insufficient data 0:00 - 13:00. 42i alarm 12:32 - 15:44 and at 17:46.
6/29/2012	Insufficient data 3:00 - 12:00.
6/30/2012	42i alarm. Insufficient data 2:00 - 4:00. SO_2 cal triggered.

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 94.73%.