



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

Q4 2015 Quarterly Report

January 2016



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Wando Welch Terminal**

Q4 2015 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 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 19th quarterly data report (fourth quarterly report in year five 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 October 1, 2015 through December 31, 2015.

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}), 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 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 or to document changes in the air quality standards. 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. An update was also performed on October 17, 2013, to reflect changes to the National Ambient Air Quality Standards (NAAQS) for PM_{2.5}. 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.



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 is influenced by local sources and 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, NO₂, NO_x, and SO₂ and the maximum daily values for NO₂ (1-hr average) and SO₂ (1-hr and 3-hr average) 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, with the corresponding NAAQS shown in Table 2-3. Note that many of the NAAQS values are based on annual or 3-year monitoring periods and the quarterly data presented here should not be used for direct comparison. 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 2-4.

Table 2-1. 24-Hour Averages and NAAQS daily maximums

Date	24-hour Averages					Daily Max 1-hr Avg.		Daily Max 3-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)	SO ₂ (ppb)
10/1/15	4.02	6.06	4.46	10.5	0.00	8.65	0.00	0.00
10/2/15	3.12	5.12	4.34	10.4	0.00	10.07	0.00	0.00
10/3/15	5.88	0.66	1.57	2.17	0.00	5.33	0.00	0.00
10/4/15	4.01	0.15	1.64	1.73	0.00	6.38	0.00	0.00
10/5/15	2.50	2.33	2.67	4.96	0.00	6.40	0.00	0.00
10/6/15	6.28	4.82	6.13	10.9	0.00	12.1	0.00	0.00
10/7/15	5.78	3.70	7.01	10.7	0.00	14.6	0.00	0.00
10/8/15	8.92	2.32	7.31	9.61	0.00	14.3	0.00	0.00
10/9/15	11.0	5.61	9.51	15.1	0.00	22.6	0.00	0.00
10/10/15	8.52	9.38	8.34	17.7	0.00	26.2	0.01	0.00
10/11/15	5.33	0.40	1.46	1.80	0.00	4.18	0.01	0.00
10/12/15	10.4	5.36	9.39	14.7	0.01	23.2	0.22	0.07
10/13/15	10.6	8.08	14.5	22.5	0.00	22.8	0.00	0.00
10/14/15	13.6	10.12	14.8	24.9	0.01	23.6	0.24	0.11
10/15/15	9.96	5.88	11.3	17.2	0.00	22.7	0.00	0.00
10/16/15	13.0	1.49	14.2	15.7	0.00	14.2	0.00	0.00
10/17/15	*	*	*	*	*	*	*	*

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Date	24-hour Averages					Daily Max 1-hr Avg.		Daily Max 3-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)	SO ₂ (ppb)
10/18/15	5.06	0.46	2.35	2.78	0.00	4.89	0.00	0.00
10/19/15	6.20	2.38	6.50	8.85	0.00	10.1	0.00	0.00
10/20/15	6.20	2.84	6.22	9.00	0.00	16.9	0.00	0.00
10/21/15	7.88	4.19	7.30	11.4	0.00	21.5	0.00	0.00
10/22/15	4.00	0.03	1.01	0.89	0.11	1.37	0.55	0.18
10/23/15	*	*	*	*	*	*	*	*
10/24/15	10.2	0.29	0.92	1.18	0.00	6.21	0.00	0.00
10/25/15	6.75	0.15	1.13	1.25	0.00	6.12	0.00	0.00
10/26/15	5.36	2.53	4.15	6.67	0.00	10.9	0.00	0.00
10/27/15	7.40	4.91	5.85	10.7	0.00	16.4	0.00	0.00
10/28/15	2.48	5.72	6.09	11.8	0.00	17.5	0.00	0.00
10/29/15	9.17	8.14	9.51	17.7	0.00	16.3	0.00	0.00
10/30/15	12.0	6.05	9.56	15.6	0.00	20.8	0.00	0.00
10/31/15	12.2	0.99	1.95	2.92	0.00	9.57	0.00	0.00
11/1/15	9.82	0.24	2.61	2.82	0.00	16.9	0.00	0.00
11/2/15	7.62	1.84	2.61	4.43	0.00	14.3	0.00	0.00
11/3/15	3.28	6.77	6.44	13.2	0.00	17.8	0.00	0.00
11/4/15	6.70	5.52	4.03	9.54	0.00	11.9	0.00	0.00
11/5/15	7.65	5.94	3.94	9.86	0.00	7.49	0.00	0.00
11/6/15	10.2	8.21	6.73	14.9	0.00	15.9	0.00	0.00
11/7/15	5.11	4.70	5.04	9.73	0.00	12.4	0.00	0.00
11/8/15	*	*	*	*	*	*	*	*
11/9/15	11.7	18.4	13.4	31.9	0.00	25.0	0.00	0.00
11/10/15	*	*	*	*	*	*	*	*
11/11/15	*	*	*	*	*	*	*	*
11/12/15	*	*	*	*	*	*	*	*
11/13/15	9.86	7.21	16.0	23.2	0.54	22.9	2.37	1.54

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Date	24-hour Averages					Daily Max 1-hr Avg.		Daily Max 3-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)	SO ₂ (ppb)
11/14/15	7.58	2.45	7.55	9.97	0.00	27.1	0.00	0.00
11/15/15	9.39	0.93	4.19	5.09	0.00	22.6	0.00	0.00
11/16/15	6.64	1.26	6.87	8.11	0.00	12.4	0.00	0.00
11/17/15	7.81	2.66	7.34	9.98	0.00	17.3	0.00	0.00
11/18/15	6.39	19.1	16.3	35.8	0.16	26.6	0.88	0.01
11/19/15	4.81	12.1	10.3	22.5	0.00	16.5	0.00	0.00
11/20/15	4.64	1.97	4.24	6.06	0.00	8.35	0.00	0.00
11/21/15	8.00	0.46	2.80	3.11	0.00	6.56	0.00	0.00
11/22/15	8.26	0.42	3.48	3.77	0.07	6.11	0.75	0.25
11/23/15	6.39	5.43	8.25	13.6	0.12	15.9	0.62	0.41
11/24/15	*	*	*	*	*	*	*	*
11/25/15	7.32	1.51	6.09	7.56	0.00	9.34	0.00	0.00
11/26/15	7.31	0.08	1.51	1.49	0.00	4.49	0.00	0.00
11/27/15	5.67	1.33	3.50	4.74	0.00	9.19	0.00	0.00
11/28/15	4.82	0.72	2.45	3.05	0.00	6.65	0.00	0.00
11/29/15	*	*	*	*	*	*	*	*
11/30/15	*	*	*	*	*	*	*	*
12/1/15	9.08	3.09	7.33	10.4	0.00	10.4	0.00	0.00
12/2/15	5.29	14.1	12.1	26.2	0.00	29.6	0.04	0.01
12/3/15	5.84	6.13	7.59	13.7	0.02	16.7	0.41	0.17
12/4/15	5.93	4.27	5.15	9.39	0.00	10.1	0.00	0.00
12/5/15	*	*	*	*	*	*	*	*
12/6/15	*	*	*	*	*	*	*	*
12/7/15	*	*	*	*	*	*	*	*
12/8/15	13.1	2.94	12.5	15.4	0.00	21.5	0.00	0.00
12/9/15	14.2	19.0	18.5	37.5	0.11	37.7	1.23	0.71
12/10/15	22.7	45.1	23.5	68.5	0.44	45.4	2.37	1.74

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Date	24-hour Averages					Daily Max 1-hr Avg.		Daily Max 3-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)	SO ₂ (ppb)
12/11/15	15.5	12.7	16.5	29.1	0.00	31.8	0.01	0.00
12/12/15	*	*	*	*	*	*	*	*
12/13/15	*	*	*	*	*	*	*	*
12/14/15	2.53	2.42	7.24	9.66	0.00	11.4	0.00	0.00
12/15/15	7.15	14.6	15.8	30.4	0.01	27.6	0.13	0.04
12/16/15	15.3	36.9	19.9	56.8	0.02	42.4	0.24	0.08
12/17/15	12.1	17.0	10.4	27.4	0.00	32.7	0.03	0.01
12/18/15	3.15	4.60	6.29	10.9	0.00	12.8	0.02	0.01
12/19/15	10.6	5.53	6.95	12.4	0.00	22.4	0.02	0.01
12/20/15	14.8	2.51	4.42	6.91	0.00	17.8	0.04	0.02
12/21/15	9.78	19.0	14.5	33.4	0.00	44.8	0.00	0.00
12/22/15	6.98	14.9	11.7	26.6	0.00	30.1	0.00	0.00
12/23/15	6.59	10.0	6.38	16.4	0.00	19.4	0.00	0.00
12/24/15	7.81	2.71	2.27	4.97	0.00	11.5	0.00	0.00
12/25/15	3.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12/26/15	*	*	*	*	*	*	*	*
12/27/15	*	*	*	*	*	*	*	*
12/28/15	8.98	4.56	3.70	8.22	0.00	14.0	0.00	0.00
12/29/15	10.9	7.03	6.64	13.7	0.00	17.0	0.00	0.00
12/30/15	7.85	7.69	6.89	14.6	0.00	17.7	0.00	0.00
12/31/15	7.44	9.02	8.48	17.5	0.00	18.7	0.00	0.00

* System down/system offline for maintenance.



Table 2-2. Quarterly Statistics

Date	24-hour Averages					Daily Max 1-hr Avg.		Daily Max 3-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)	SO ₂ (ppb)
Average	8.05	6.39	7.39	13.8	0.02	16.8	0.13	0.07
Minimum	2.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum	22.7	45.1	23.5	68.5	0.54	45.4	2.37	1.74

Table 2-3. National Ambient Air Quality Standards

Pollutant	Primary/ Secondary	Averaging Time	Level	Form
NO ₂	Primary	1-hour	100 ppb	98th Percentile, averaged over 3 years
	Primary and Secondary	Annual	53 ppb ⁽¹⁾	Annual Mean
SO ₂	Primary	1-hour	75 ppb ⁽²⁾	99th Percentile of 1-hour daily maximum concentrations, averaged over 3 years
	Secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year
PM _{2.5}	Primary	Annual	12 µg/m ³	Annual mean, averaged over 3 years
	Secondary	Annual	15 µg/m ³	Annual mean, averaged over 3 years
	Primary and Secondary	24-hour	35 µg/m ³	98th Percentile, averaged over 3 years

- (1) The official level of the annual NO₂ standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.
- (2) Final rule signed June 2, 2010. The 1971 annual and 24-hour SO₂ standards were revoked in that same rulemaking. However, these standards remain in effect until one year after an area is designated for the 2010 standard, except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.

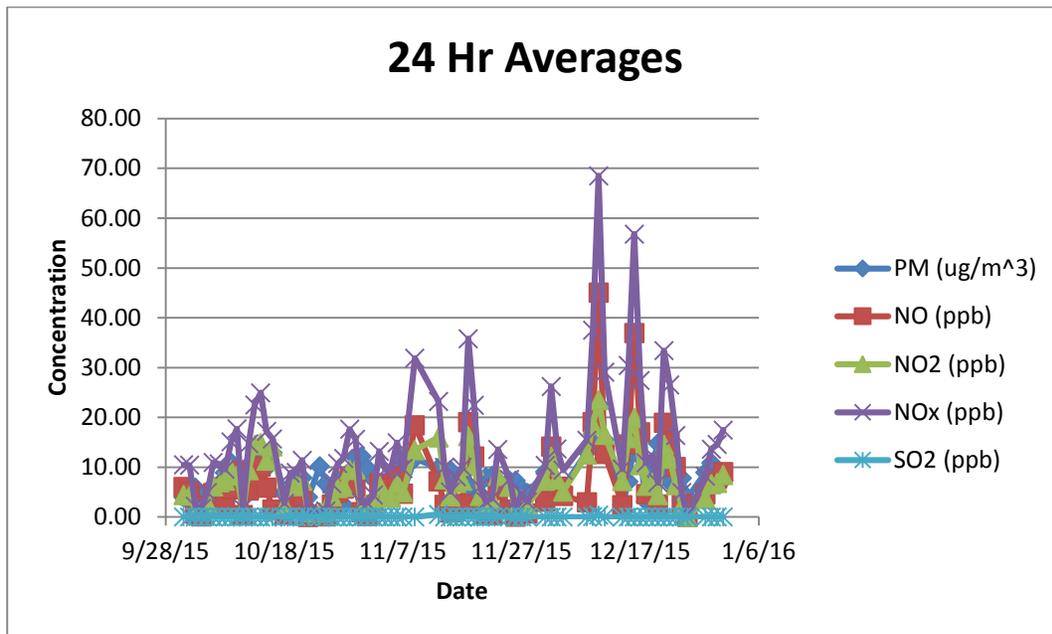


Figure 2-1. 24-hour Averages

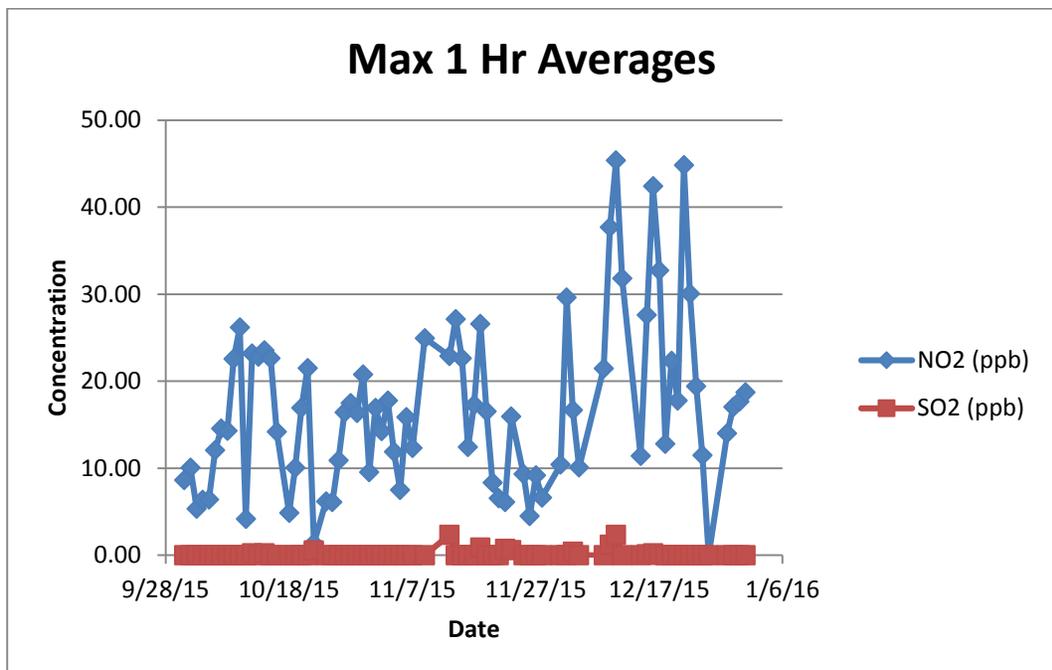


Figure 2-2. Max 1-hour Averages



Table 2-4. Monthly Statistics

Monthly Averages						Monthly Daily Max 1-hr Avg.		Daily Max 3-hr Avg.
Month	PM _{2.5} (µg/m ³)	NO (ppb)	NO ₂ (ppb)	NO _x (ppb)	SO ₂ (ppb)	NO ₂ (ppb)	SO ₂ (ppb)	SO ₂ (ppb)
October 2015	7.50	3.80	6.25	10.0	0.00	13.7	0.04	0.01
November 2015	7.26	4.75	6.34	11.1	0.04	14.5	0.20	0.10
December 2015	9.48	11.08	9.78	20.8	0.03	22.7	0.19	0.12

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* (October 17, 2013, Revision 3).

3.1 Daily and Quarterly Data Validation Procedures

According to the QAPP prepared for this work, results were reviewed for anomalies and validated on a daily basis and recorded on QA/QC Daily Comment Sheets for quarterly data review and assessments. The occurrence and duration of normal calibration and maintenance activities was also recorded.

Daily QC checks were performed in accordance with section 5.1 of the QAPP. The data acquisition system (Opto 22's PAC Display) was remotely accessed from the ARCADIS office located in Durham, NC, where instrumentation and trends were monitored for alarms and other irregularities. NO_x and SO₂ zero and calibration values displayed by the system from the previous calibration event were recorded in the QC Log Book. After checking for irregularities, the data file from the previous day was sent via email to the Durham, NC office. The file was saved to a common folder on the Durham office's server and then post processed with a Microsoft Excel macro. The resulting Excel file provides values for daily averages and maxima, and also alarm and calibration information. This information was recorded on the daily QC log sheet. Comments and observations regarding data quality were noted on the QC log sheet, and were also entered into the SCSPA QA/QC Daily Comment Sheet. The Project Manager was notified of any issues immediately.



Percent completeness for Quarter 4 was calculated by dividing both the number of hours flagged by the macro as “Insufficient Data” as well as hours for which no data was obtained by the total number of hours in the quarter. Each of the three instruments (5014i, 42i, and 43i) typically produces 24 hours of data each day, for a total of 72 hours per day of recorded data. Several calibration issues with the NO_x and SO₂ instruments and power supply outages due to building renovations during Quarter 4 resulted in multiple instances of incomplete or invalid data. This resulted in a reduced percent completeness for this quarter.

The quarterly data were assessed as follows:

- 100% of the validated Quarter 4 data were flagged as “good”.
- Percent completeness for Quarter 4 was 68.3%.