

# **SOUTH CAROLINA PORTS AUTHORITY**



**SOUTH  
CAROLINA  
PORTS**

Continuous Air Monitoring Station for the Union  
Pier Terminal

Q1 2021 Quarterly Report and Annual  
Summary

April 2021

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**SOUTH CAROLINA PORTS  
AUTHORITY –  
CONTINUOUS AIR  
MONITORING STATION  
FOR THE UNION PIER  
TERMINAL**

**Q1 2021 Quarterly Report and Annual  
Summary**

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## CONTENTS

|     |   |    |
|-----|---|----|
| 1   | Executive Summary .....                 | 1  |
| 2   | Project Description .....               | 2  |
| 2.1 | Quarterly Results .....                 | 2  |
| 3   | Comparison to NAAQS .....               | 9  |
| 3.1 | NO <sub>2</sub> .....                   | 9  |
| 3.2 | SO <sub>2</sub> .....                   | 9  |
| 3.3 | PM <sub>2.5</sub> .....                 | 10 |
| 4   | Quality Assurance/Quality Control ..... | 11 |
| 4.1 | Daily and Quarterly QC/Validation ..... | 11 |

## TABLES

|            |   |    |
|------------|---|----|
| Table 2-1. | 24-Hour Averages and daily maximums .....                                   | 2  |
| Table 2-2. | Quarterly Statistics .....  | 5  |
| Table 2-3. | National Ambient Air Quality Standards .....                                | 6  |
| Table 2-4. | Monthly Statistics for All Four Quarters of the Sixth Monitoring Year ..... | 7  |
| Table 2-5. | NO <sub>2</sub> NAAQS Calculations for Union Pier Terminal .....            | 9  |
| Table 2-6. | SO <sub>2</sub> NAAQS Calculations for Union Pier Terminal .....            | 9  |
| Table 2-7. | PM <sub>2.5</sub> NAAQS Calculations for Union Pier Terminal .....          | 10 |

## FIGURES

|             |                                   |   |
|-------------|-----------------------------------|---|
| Figure 2-1. | 24-hour Averages .....            | 6 |
| Figure 2-2. | Max 1-hour Averages .....         | 7 |
| Figure 2-3. | Monthly Averages.....             | 8 |
| Figure 2-4. | Monthly Max 1-hour Averages ..... | 8 |

## 1 EXECUTIVE SUMMARY

Arcadis was contracted in late October 2014 to provide Continuous Air Monitoring Services to the South Carolina Ports Authority (SCPA) at the Union Pier Terminal in Charleston, SC. Arcadis has followed through on the planned schedule and activities since that award. The major accomplishments were to complete the Quality Assurance Project Plan (QAPP), purchase the instruments, complete the site setup, and then to begin acquiring data. Installation was completed in mid-February 2015 and data acquisition began on February 25. This report is the 25th quarterly data report (first quarterly report in year seven of operations) and presents the data summaries requested by SCPA and described in the work scope. This report encompasses a period corresponding to data taken during the period from January 1, 2021 through March 31, 2021 as well as an annual summary (Quarter 2, 2020 through Quarter 1, 2021).

## 2 PROJECT DESCRIPTION

SCPA requested a system to provide ambient air quality data including particulate matter less than 2.5 microns (PM<sub>2.5</sub>), SO<sub>2</sub>, and NO<sub>2</sub> for a period of 2 years (to be decommissioned no later than February 15, 2017) at the Union Pier 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, has proven to be reliable, and is generating valid high-quality data suitable for use in dispersion modeling or other potential purposes.

The QAPP may be updated periodically to reflect improvements to the basic operating procedures or to document changes in the air quality standards. This QAPP is written consistent with the current ambient air quality standards for PM, NO<sub>x</sub> and SO<sub>2</sub> as defined by the U.S. Environmental Protection Agency.

### 2.1 Quarterly Results

The 24-hr daily averages for PM<sub>2.5</sub>, NO, NO<sub>2</sub>, NO<sub>x</sub>, and SO<sub>2</sub> and the maximum daily values for NO<sub>2</sub> (1-hr average) and SO<sub>2</sub> (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 limits shown in Table 2-3. 24-hr averages for all constituents are also shown graphically in Figure 2-1. Maximum 1-hr averages for NO<sub>2</sub> and SO<sub>2</sub> are shown in Figure 2-2.

Statistics for the sixth monitoring year are broken down by months and summarized in Table 2-4. Annual summaries are graphed in Figures 2-3 and 2-4 showing the monthly averages for all constituents and the daily maximum 1-hr averages for NO<sub>2</sub> and SO<sub>2</sub> averaged across the respective month.

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

| Date   | 24-hour Averages                       |          |                       |                       |                       | Daily Max 1-hr Avg.   |                       | Daily Max 3-hr Avg.   |
|--------|--|----------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
|        | PM <sub>2.5</sub> (µg/m <sup>3</sup> ) | NO (ppb) | NO <sub>2</sub> (ppb) | NO <sub>x</sub> (ppb) | SO <sub>2</sub> (ppb) | NO <sub>2</sub> (ppb) | SO <sub>2</sub> (ppb) | SO <sub>2</sub> (ppb) |
| 1/1/21 | 11.45                                  | 0.19     | 2.55                  | 2.72                  | 0.28                  | 13.32                 | 0.39                  | 0.31                  |
| 1/2/21 | 8.79                                   | 0.94     | 1.61                  | 2.36                  | 0.24                  | 3.02                  | 0.35                  | 0.28                  |
| 1/3/21 | 7.71                                   | 0.20     | 1.34                  | 1.49                  | 0.26                  | 2.52                  | 0.37                  | 0.34                  |
| 1/4/21 | 8.21                                   | 3.06     | 5.84                  | 8.86                  | 0.38                  | 11.29                 | 0.94                  | 0.73                  |
| 1/5/21 | 11.70                                  | 1.21     | 8.18                  | 9.33                  | 0.45                  | 22.02                 | 0.70                  | 0.63                  |
| 1/6/21 | 9.04                                   | 1.31     | 7.18                  | 8.47                  | 0.64                  | 14.95                 | 1.22                  | 1.13                  |
| 1/7/21 | 8.52                                   | 2.58     | 6.51                  | 9.07                  | 0.49                  | 15.21                 | 0.73                  | 0.68                  |
| 1/8/21 | 7.02                                   | 1.33     | 4.59                  | 5.88                  | 0.37                  | 10.59                 | 0.48                  | 0.45                  |
| 1/9/21 | 11.31                                  | 0.71     | 2.51                  | 3.20                  | 0.41                  | 5.82                  | 0.50                  | 0.46                  |

Q1 2021 Report and Annual Summary

| 24-hour Averages |  |          |                       |                       |                       | Daily Max 1-hr Avg.   |                       | Daily Max 3-hr Avg.   |
|------------------|--|----------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Date             | PM <sub>2.5</sub> (µg/m <sup>3</sup> ) | NO (ppb) | NO <sub>2</sub> (ppb) | NO <sub>x</sub> (ppb) | SO <sub>2</sub> (ppb) | NO <sub>2</sub> (ppb) | SO <sub>2</sub> (ppb) | SO <sub>2</sub> (ppb) |
| 1/10/21          | 7.34                                   | 1.00     | 3.36                  | 4.34                  | 0.60                  | 9.06                  | 1.23                  | 0.96                  |
| 1/11/21          | 6.85                                   | 1.44     | 8.00                  | 9.42                  | 0.47                  | 15.84                 | 0.59                  | 0.52                  |
| 1/12/21          | 8.77                                   | 1.78     | 8.49                  | 10.24                 | 0.47                  | 17.29                 | 0.65                  | 0.52                  |
| 1/13/21          | 11.52                                  | 1.10     | 4.14                  | 5.23                  | 0.41                  | 6.10                  | 0.47                  | 0.40                  |
| 1/14/21          | 10.03                                  | 1.75     | 5.09                  | 6.83                  | 0.47                  | 8.89                  | 0.75                  | 0.62                  |
| 1/15/21          | 9.13                                   | 0.52     | 4.33                  | 4.80                  | 0.32                  | 8.38                  | 0.56                  | 0.39                  |
| 1/16/21          | 6.05                                   | 0.75     | 3.23                  | 3.96                  | 0.32                  | 7.09                  | 0.53                  | 0.44                  |
| 1/17/21          | 7.34                                   | 0.85     | 4.15                  | 5.00                  | 0.38                  | 6.83                  | 0.49                  | 0.47                  |
| 1/18/21          | 9.68                                   | 0.85     | 5.71                  | 6.55                  | 0.43                  | 16.32                 | 0.66                  | 0.61                  |
| 1/19/21          | 10.25                                  | 3.97     | 8.71                  | 12.69                 | 0.58                  | 25.56                 | 2.23                  | 1.43                  |
| 1/20/21          | 11.49                                  | 0.75     | 5.38                  | 6.04                  | 0.50                  | 11.56                 | 0.77                  | 0.66                  |
| 1/21/21          | 17.67                                  | 2.07     | 6.52                  | 8.50                  | 0.47                  | 12.22                 | 0.64                  | 0.57                  |
| 1/22/21          | 8.95                                   | 1.22     | 5.82                  | 7.02                  | 0.27                  | 12.27                 | 0.35                  | 0.32                  |
| 1/23/21          | 8.25                                   | 2.92     | 5.86                  | 8.77                  | 0.06                  | 12.38                 | 0.26                  | 0.10                  |
| 1/24/21          | *                                      | 0.64     | 2.04                  | 2.65                  | 0.01                  | 13.81                 | 0.03                  | 0.02                  |
| 1/25/21          | *                                      | 0.69     | 3.14                  | 3.71                  | 0.00                  | 12.14                 | 0.01                  | 0.00                  |
| 1/26/21          | *                                      | 0.63     | 0.83                  | 1.42                  | 0.00                  | 2.91                  | 0.00                  | 0.00                  |
| 1/27/21          | *                                      | 0.75     | 4.07                  | 4.76                  | 0.00                  | 15.11                 | 0.00                  | 0.00                  |
| 1/28/21          | *                                      | 1.44     | 3.32                  | 4.72                  | 0.01                  | 14.32                 | 0.07                  | 0.04                  |
| 1/29/21          | *                                      | 1.26     | 5.48                  | 6.70                  | 0.11                  | 26.39                 | 0.72                  | 0.48                  |
| 1/30/21          | *                                      | 0.53     | 1.18                  | 1.65                  | 0.01                  | 6.03                  | 0.03                  | 0.02                  |
| 1/31/21          | *                                      | 0.08     | 1.11                  | 1.15                  | 0.00                  | 3.27                  | 0.01                  | 0.01                  |
| 2/1/21           | *                                      | 2.17     | 4.95                  | 7.04                  | 0.00                  | 10.39                 | 0.02                  | 0.01                  |
| 2/2/21           | *                                      | 1.64     | 4.11                  | 5.59                  | 0.00                  | 8.41                  | 0.01                  | 0.01                  |
| 2/3/21           | *                                      | 1.63     | 6.71                  | 8.19                  | 0.00                  | 19.23                 | 0.01                  | 0.01                  |
| 2/4/21           | *                                      | 1.38     | 7.92                  | 9.26                  | 0.05                  | 25.26                 | 0.80                  | 0.29                  |
| 2/5/21           | *                                      | 0.80     | 4.59                  | 5.33                  | 0.00                  | 7.88                  | 0.01                  | 0.01                  |
| 2/6/21           | *                                      | 0.45     | 2.90                  | 3.31                  | 0.00                  | 8.66                  | 0.01                  | 0.00                  |
| 2/7/21           | *                                      | 0.90     | 4.89                  | 5.72                  | 0.00                  | 22.38                 | 0.01                  | 0.01                  |
| 2/8/21           | *                                      | 1.28     | 1.75                  | 2.91                  | 0.00                  | 9.17                  | 0.00                  | 0.00                  |
| 2/9/21           | *                                      | 7.01     | 9.24                  | 16.20                 | 0.07                  | 20.57                 | 0.17                  | 0.14                  |
| 2/10/21          | *                                      | 3.30     | 4.08                  | 7.35                  | 0.04                  | 8.89                  | 0.14                  | 0.08                  |
| 2/11/21          | *                                      | 3.99     | 7.72                  | 11.70                 | 0.04                  | 20.43                 | 0.09                  | 0.08                  |
| 2/12/21          | *                                      | 0.95     | 2.17                  | 3.10                  | 0.04                  | 9.52                  | 0.19                  | 0.08                  |
| 2/13/21          | *                                      | 0.40     | 1.49                  | 1.84                  | 0.05                  | 4.15                  | 0.08                  | 0.05                  |

Q1 2021 Report and Annual Summary

| 24-hour Averages |  |          |                       |                       |                       | Daily Max 1-hr Avg.   |                       | Daily Max 3-hr Avg.   |
|------------------|--|----------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Date             | PM <sub>2.5</sub> (µg/m <sup>3</sup> ) | NO (ppb) | NO <sub>2</sub> (ppb) | NO <sub>x</sub> (ppb) | SO <sub>2</sub> (ppb) | NO <sub>2</sub> (ppb) | SO <sub>2</sub> (ppb) | SO <sub>2</sub> (ppb) |
| 2/14/21          | *                                      | 0.58     | 2.33                  | 2.87                  | 0.06                  | 5.01                  | 0.15                  | 0.08                  |
| 2/15/21          | *                                      | 1.31     | 1.75                  | 2.99                  | 0.05                  | 7.43                  | 0.09                  | 0.07                  |
| 2/16/21          | 2.56                                   | 1.07     | 2.57                  | 3.56                  | 0.04                  | 6.06                  | 0.07                  | 0.05                  |
| 2/17/21          | 7.72                                   | 3.96     | 6.89                  | 10.84                 | 0.07                  | 18.13                 | 0.18                  | 0.17                  |
| 2/18/21          | 6.11                                   | 1.80     | 5.31                  | 7.09                  | 0.03                  | 10.90                 | 0.05                  | 0.04                  |
| 2/19/21          | 6.10                                   | 2.72     | 10.22                 | 12.93                 | 0.06                  | 23.03                 | 0.14                  | 0.10                  |
| 2/20/21          | 12.53                                  | 3.12     | 8.18                  | 11.05                 | 0.54                  | 19.97                 | 5.14                  | 1.77                  |
| 2/21/21          | 10.73                                  | 1.49     | 5.40                  | 6.75                  | 0.01                  | 19.08                 | 0.08                  | 0.00                  |
| 2/22/21          | 6.77                                   | 1.86     | 5.62                  | 7.30                  | 0.07                  | 23.96                 | 0.19                  | 0.15                  |
| 2/23/21          | 6.98                                   | 2.04     | 3.02                  | 4.91                  | 0.24                  | 7.79                  | 0.49                  | 0.45                  |
| 2/24/21          | 11.84                                  | 3.22     | 5.61                  | 8.71                  | 0.35                  | 15.48                 | 0.92                  | 0.82                  |
| 2/25/21          | 16.07                                  | 2.12     | 4.84                  | 6.84                  | 0.38                  | 12.63                 | 0.86                  | 0.79                  |
| 2/26/21          | 11.00                                  | 0.88     | 5.53                  | 6.40                  | 0.17                  | 14.15                 | 0.24                  | 0.22                  |
| 2/27/21          | 12.51                                  | 0.34     | 2.98                  | 3.19                  | 0.10                  | 12.67                 | 0.39                  | 0.29                  |
| 2/28/21          | 5.12                                   | 0.07     | 0.20                  | 0.21                  | 0.03                  | 2.71                  | 0.08                  | 0.04                  |
| 3/1/21           | 7.07                                   | 1.63     | 0.47                  | 1.60                  | 0.03                  | 1.72                  | 0.08                  | 0.07                  |
| 3/2/21           | 5.39                                   | 0.56     | 2.54                  | 2.97                  | 0.05                  | 7.21                  | 0.08                  | 0.06                  |
| 3/3/21           | 5.17                                   | 0.51     | 3.52                  | 3.87                  | 0.05                  | 13.61                 | 0.08                  | 0.07                  |
| 3/4/21           | 8.62                                   | 2.07     | 3.76                  | 5.55                  | 0.18                  | 19.56                 | 0.98                  | 0.56                  |
| 3/5/21           | 8.84                                   | 1.55     | 3.74                  | 5.18                  | 0.11                  | 14.75                 | 0.18                  | 0.17                  |
| 3/6/21           | 9.79                                   | 0.86     | 3.69                  | 4.44                  | 0.19                  | 13.15                 | 1.44                  | 0.77                  |
| 3/7/21           | 11.44                                  | 1.35     | 9.29                  | 10.53                 | 0.33                  | 21.91                 | 0.89                  | 0.81                  |
| 3/8/21           | 9.61                                   | 1.62     | 7.30                  | 8.75                  | 0.25                  | 28.74                 | 0.76                  | 0.54                  |
| 3/9/21           | 11.62                                  | 5.09     | 8.81                  | 13.71                 | 0.22                  | 27.14                 | 0.62                  | 0.56                  |
| 3/10/21          | 7.81                                   | 2.18     | 3.96                  | 5.94                  | 0.15                  | 21.19                 | 0.34                  | 0.28                  |
| 3/11/21          | 4.66                                   | 0.29     | 0.18                  | 0.38                  | 0.07                  | 0.65                  | 0.13                  | 0.08                  |
| 3/12/21          | 9.27                                   | 2.29     | 1.08                  | 2.87                  | 0.08                  | 6.57                  | 0.23                  | 0.18                  |
| 3/13/21          | ^                                      | 2.28     | 4.51                  | 6.71                  | 0.13                  | 17.09                 | 0.84                  | 0.55                  |
| 3/14/21          | ^                                      | 1.84     | 7.85                  | 9.64                  | 0.02                  | 12.30                 | 0.05                  | 0.04                  |
| 3/15/21          | ^                                      | 0.84     | 3.08                  | 3.88                  | 0.04                  | 15.58                 | 0.09                  | 0.07                  |
| 3/16/21          | ^                                      | 5.58     | 9.74                  | 15.27                 | 0.07                  | 18.99                 | 0.34                  | 0.21                  |
| 3/17/21          | ^                                      | 4.44     | 4.19                  | 8.59                  | 0.10                  | 16.25                 | 1.11                  | 0.54                  |
| 3/18/21          | ^                                      | 0.48     | 0.55                  | 0.88                  | 0.01                  | 2.23                  | 0.03                  | 0.02                  |
| 3/19/21          | ^                                      | 3.22     | 2.10                  | 5.16                  | 0.02                  | 7.18                  | 0.12                  | 0.07                  |
| 3/20/21          | ^                                      | 0.54     | 1.95                  | 2.46                  | 0.05                  | 5.80                  | 0.11                  | 0.10                  |

| 24-hour Averages |  |          |                       |                       |                       | Daily Max 1-hr Avg.   |                       | Daily Max 3-hr Avg.   |
|------------------|--|----------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Date             | PM <sub>2.5</sub> (µg/m <sup>3</sup> ) | NO (ppb) | NO <sub>2</sub> (ppb) | NO <sub>x</sub> (ppb) | SO <sub>2</sub> (ppb) | NO <sub>2</sub> (ppb) | SO <sub>2</sub> (ppb) | SO <sub>2</sub> (ppb) |
| 3/21/21          | ^                                      | 0.45     | 1.38                  | 1.80                  | 0.03                  | 6.92                  | 0.05                  | 0.04                  |
| 3/22/21          | ^                                      | 0.29     | 2.11                  | 2.40                  | 0.03                  | 8.13                  | 0.08                  | 0.05                  |
| 3/23/21          | ^                                      | 0.53     | 3.57                  | 4.09                  | 0.03                  | 7.85                  | 0.09                  | 0.08                  |
| 3/24/21          | ^                                      | 2.70     | 5.56                  | 8.25                  | 0.02                  | 15.62                 | 0.06                  | 0.04                  |
| 3/25/21          | ^                                      | 2.31     | 6.24                  | 8.49                  | 0.02                  | 22.52                 | 0.05                  | 0.03                  |
| 3/26/21          | 0.00                                   | 0.64     | 1.68                  | 2.12                  | 0.01                  | 3.23                  | 0.06                  | 0.03                  |
| 3/27/21          | 8.77                                   | 0.42     | 1.70                  | 2.08                  | 0.02                  | 4.06                  | 0.08                  | 0.07                  |
| 3/28/21          | 6.69                                   | 0.13     | 0.86                  | 0.94                  | 0.01                  | 1.98                  | 0.04                  | 0.03                  |
| 3/29/21          | 7.53                                   | 1.03     | 3.91                  | 4.85                  | 0.02                  | 21.20                 | 0.06                  | 0.04                  |
| 3/30/21          | 5.60                                   | 0.97     | 3.87                  | 4.76                  | 0.02                  | 10.21                 | 0.06                  | 0.04                  |
| 3/31/21          | 5.69                                   | 1.16     | 4.06                  | 4.98                  | 0.01                  | 14.44                 | 0.02                  | 0.02                  |

^ 5014i monitor offline, faulty pump motor starting capacitor.

\* 5014i monitor offline, depleted filter roll.

Table 2-2. Quarterly Statistics

| 24-hour Averages |  |          |                       |                       |                       | Daily Max 1-hr Avg.   |                       | Daily Max 3-hr Avg.   |
|------------------|--|----------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Date             | PM <sub>2.5</sub> (µg/m <sup>3</sup> ) | NO (ppb) | NO <sub>2</sub> (ppb) | NO <sub>x</sub> (ppb) | SO <sub>2</sub> (ppb) | NO <sub>2</sub> (ppb) | SO <sub>2</sub> (ppb) | SO <sub>2</sub> (ppb) |
| Average          | 8.64                                   | 1.57     | 4.34                  | 5.82                  | 0.16                  | 12.49                 | 0.41                  | 0.28                  |
| Minimum          | 0.00                                   | 0.07     | 0.18                  | 0.21                  | 0.00                  | 0.65                  | 0.00                  | 0.00                  |
| Maximum          | 17.67                                  | 7.01     | 10.22                 | 16.20                 | 0.64                  | 28.74                 | 5.14                  | 1.77                  |



Table 2-3. National Ambient Air Quality Standards

| Pollutant         | Primary/Secondary     | Averaging Time | Level                 | Form  |
|-------------------|-----------------------|----------------|-----------------------|---|
| NO <sub>2</sub>   | Primary               | 1-hour         | 100 ppb               | 98th Percentile, averaged over 3 years  |
|                   | Primary and Secondary | Annual         | 53 ppb <sup>(1)</sup> | Annual Mean   |
| SO <sub>2</sub>   | Primary               | 1-hour         | 75 ppb <sup>(2)</sup> | 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 <sub>2.5</sub> | Primary               | Annual         | 12 µg/m <sup>3</sup>  | Annual mean, averaged over 3 years  |
|                   | Secondary             | Annual         | 15 µg/m <sup>3</sup>  | Annual mean, averaged over 3 years  |
|                   | Primary and Secondary | 24-hour        | 35 µg/m <sup>3</sup>  | 98th Percentile, averaged over 3 years  |

- (1) The level of the annual NO<sub>2</sub> standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison to the 1-hour standard level.
- (2) The previous SO<sub>2</sub> standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: (1) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standards, and (2) any area for which an implementation plan providing for attainment of the current (2010) standard has not been submitted and approved and which is designated nonattainment under the previous SO<sub>2</sub> standards or is not meeting the requirements of a SIP call under the previous SO<sub>2</sub> standards (40 CFR 50.4(3)). A SIP call is an EPA action requiring a state to resubmit all or part of its State Implementation Plan to demonstrate attainment of the required NAAQS.

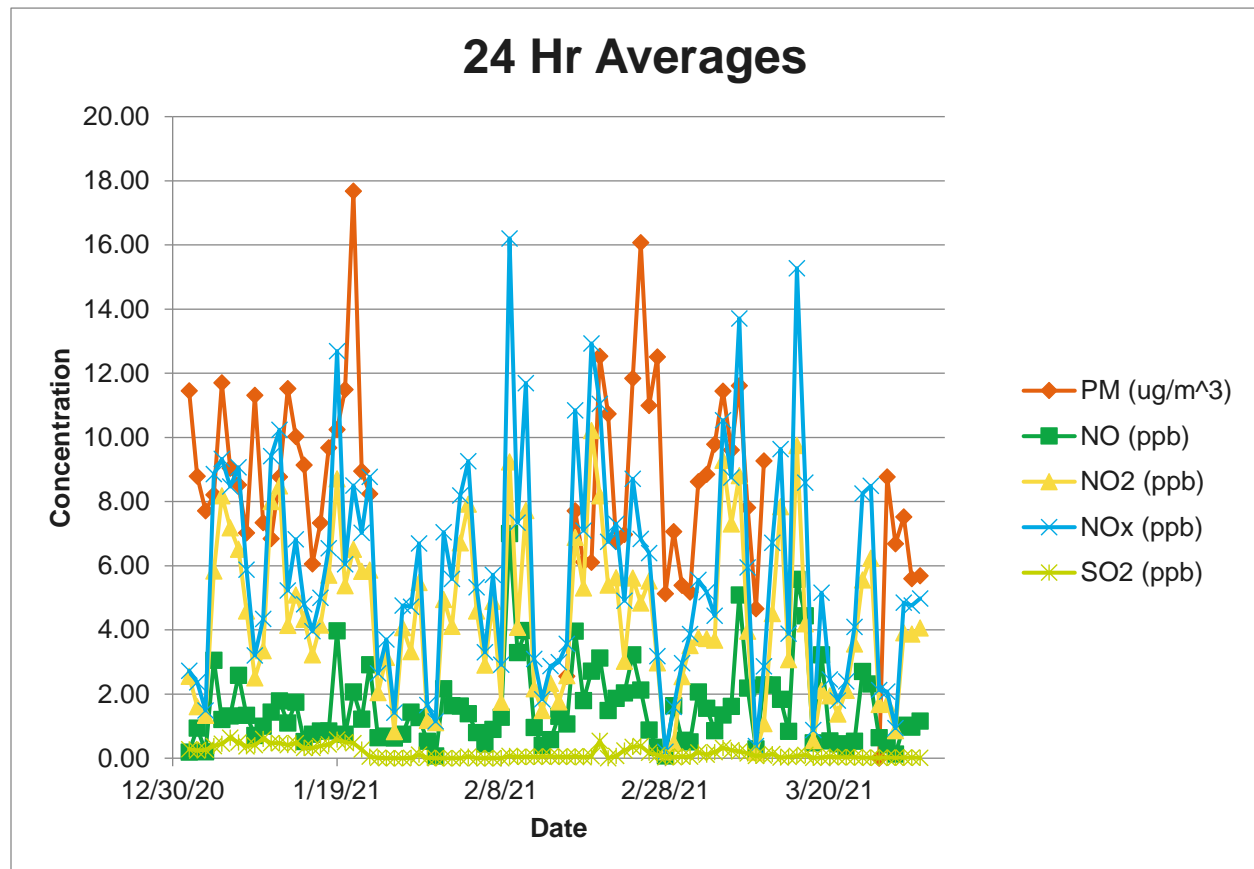


Figure 2-1. 24-hour Averages

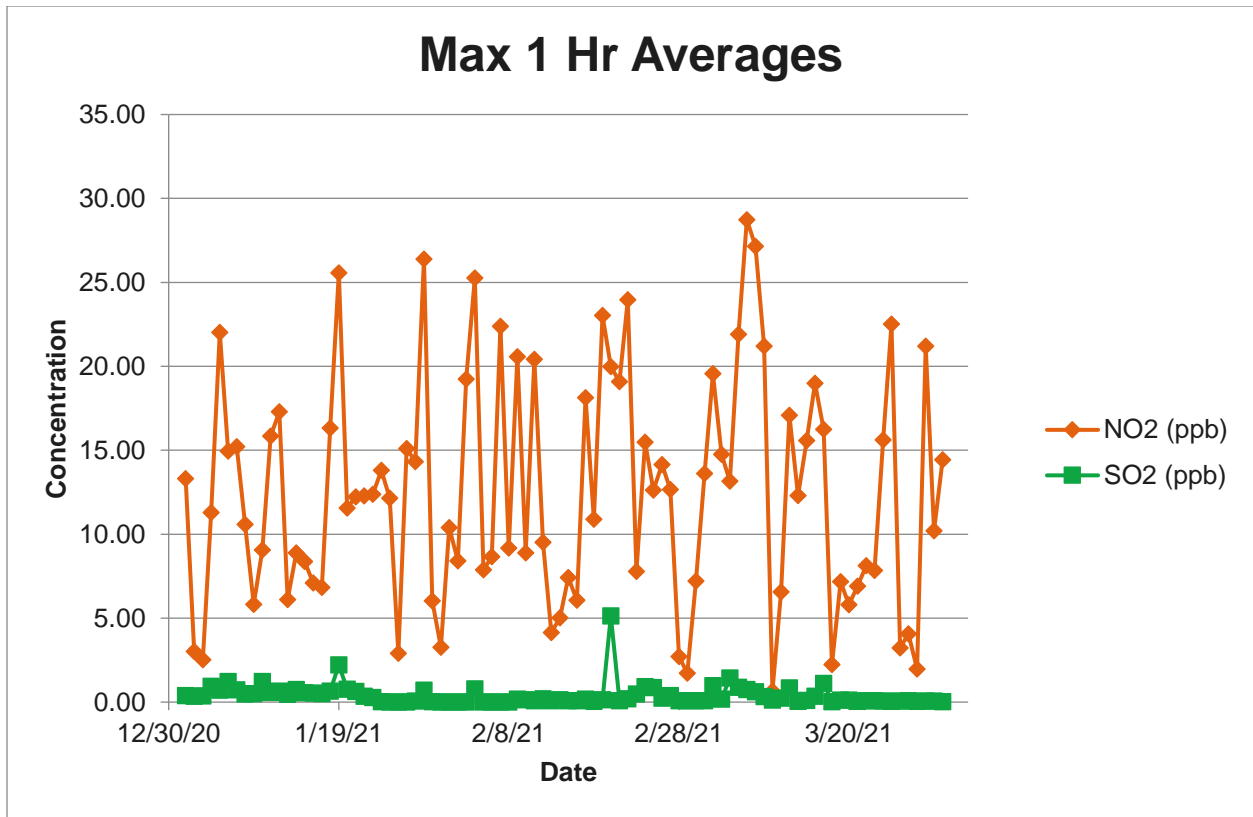


Figure 2-2. Max 1-hour Averages

Table 2-4. Monthly Statistics for the Sixth Monitoring Year

| Month | Monthly Averages                       |          |                       |                       |                       | Monthly Daily Max 1-hr Avg. |                       | Daily Max 3-hr Avg.   |
|-------|--|----------|-----------------------|-----------------------|-----------------------|-----------------------------|-----------------------|-----------------------|
|       | PM <sub>2.5</sub> (µg/m <sup>3</sup> ) | NO (ppb) | NO <sub>2</sub> (ppb) | NO <sub>x</sub> (ppb) | SO <sub>2</sub> (ppb) | NO <sub>2</sub> (ppb)       | SO <sub>2</sub> (ppb) | SO <sub>2</sub> (ppb) |
| 4/20  | 11.06                                  | 0.87     | 3.03                  | 3.79                  | 0.37                  | 10.07                       | 0.65                  | 0.51                  |
| 5/20  | 9.19                                   | 0.79     | 2.53                  | 3.23                  | 0.21                  | 7.38                        | 0.39                  | 0.32                  |
| 6/20  | 10.82                                  | 0.85     | 2.39                  | 3.12                  | 0.16                  | 6.03                        | 0.28                  | 0.23                  |
| 7/20  | 16.31                                  | 0.90     | 2.14                  | 2.95                  | 0.13                  | 6.25                        | 0.42                  | 0.29                  |
| 8/20  | ^                                      | 0.77     | 2.57                  | 3.30                  | 0.11                  | 7.53                        | 0.23                  | 0.16                  |
| 9/20  | ^                                      | 1.00     | 2.73                  | 3.68                  | 0.08                  | 7.67                        | 0.17                  | 0.13                  |
| 10/20 | 9.36                                   | 1.41     | 3.55                  | 4.86                  | 0.27                  | 10.05                       | 0.43                  | 0.35                  |
| 11/20 | 8.84                                   | 1.25     | 4.47                  | 5.70                  | 0.32                  | 12.91                       | 0.79                  | 0.48                  |
| 12/20 | 10.57                                  | 4.48     | 7.82                  | 12.24                 | 0.13                  | 17.51                       | 0.44                  | 0.33                  |
| 1/21  | 9.44                                   | 1.24     | 4.52                  | 5.73                  | 0.30                  | 11.69                       | 0.54                  | 0.44                  |
| 2/21  | 8.93                                   | 1.87     | 4.75                  | 6.54                  | 0.09                  | 13.36                       | 0.38                  | 0.21                  |
| 3/21  | 7.42                                   | 1.61     | 3.78                  | 5.26                  | 0.08                  | 12.51                       | 0.30                  | 0.20                  |

^ 5014i monitor offline, beta detector failure.

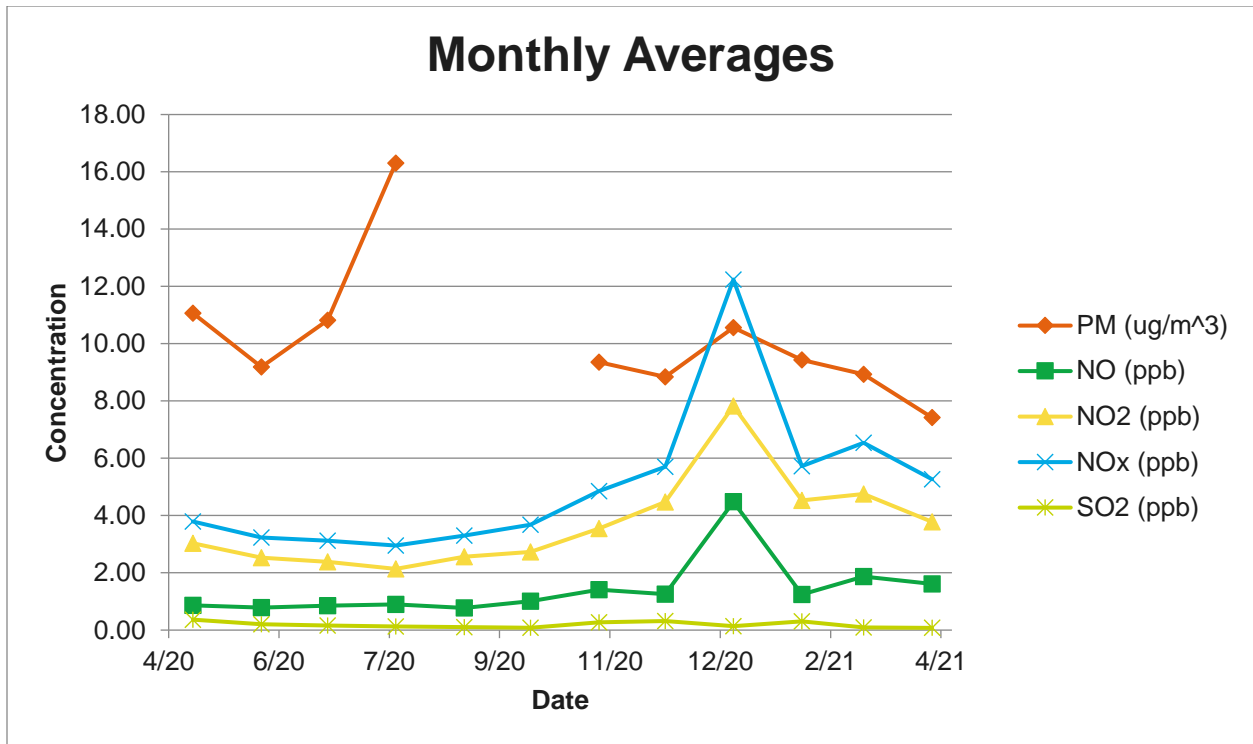


Figure 2-3. Monthly Averages

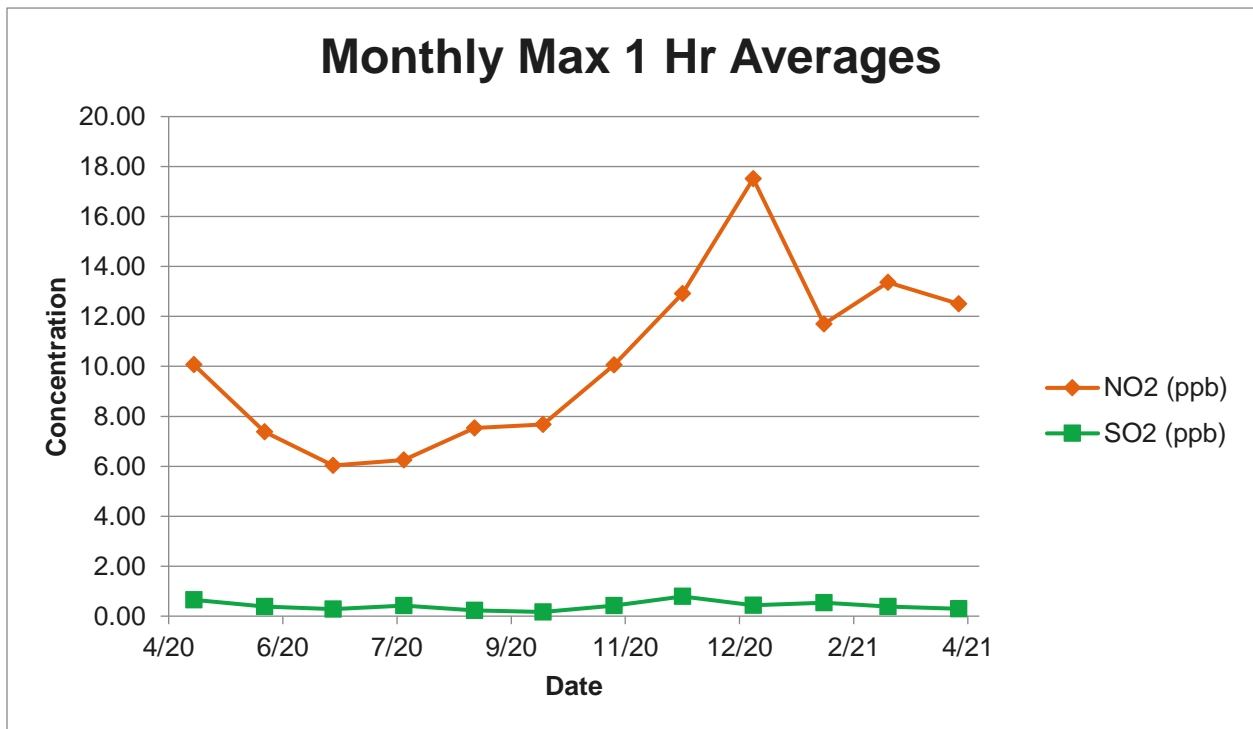


Figure 2-4. Monthly Max 1-hour Averages

### 3 COMPARISON TO NAAQS

Pollutant levels for all measured components at the Union Pier ambient air monitoring station are below the National Ambient Air Quality Standards (NAAQS). This report marks the start of the sixth year of the Union Pier monitoring station. Many of the NAAQS levels are based on three-year averages. These values have been calculated from the Union Pier data for comparison to the standard.

#### 3.1 NO<sub>2</sub>

The primary standard for NO<sub>2</sub> is 53 ppb (annual arithmetic average) or 100 ppb (3-year average of the 98th percentile of the daily maximum 1-hour average must not exceed 100 ppb). Table 2-4 and Figures 2-3 and 2-4 show that the monthly averages and monthly daily maximum 1-hr averages were below 53 ppb for this sixth year of monitoring (as they were for all previous years of monitoring). Table 2-5 presents the NO<sub>2</sub> NAAQS calculations for each standard.

Table 2-5. NO<sub>2</sub> NAAQS Calculations for Union Pier Terminal

| Pollutant       | Primary/<br>Secondary    | Averaging<br>Time | Level   | Form                                      | Union Pier  |
|-----------------|--------------------------|-------------------|---------|---|---|
| NO <sub>2</sub> | Primary                  | 1-hour            | 100 ppb | 98th Percentile, averaged<br>over 3 years | 28.0 ppb  |
| NO <sub>2</sub> | Primary and<br>Secondary | Annual            | 53 ppb  | Annual Mean                               | Year 4: 3.8 ppb<br>Year 5: 3.7 ppb<br>Year 6: 3.7 ppb |

#### 3.2 SO<sub>2</sub>

The primary standard for SO<sub>2</sub> is 75 ppb (3-year average of the 99th percentile of the daily maximum 1-hour average must not exceed 75 ppb). The secondary standard for SO<sub>2</sub> is 0.5 ppm (500 ppb; 3-hour average not to be exceeded more than once per year). Table 2-4 and Figures 2-3 and 2-4 show that the monthly averages and monthly daily maximum 1-hr averages were below 75 ppb for this sixth year of monitoring (as they were for all previous years of monitoring), and that the secondary standard was never exceeded. Table 2-6 presents the SO<sub>2</sub> NAAQS calculations for each standard.

Table 2-6. SO<sub>2</sub> NAAQS Calculations for Union Pier Terminal

| Pollutant       | Primary/<br>Secondary | Averaging<br>Time | Level                | Form  | Union Pier |
|-----------------|-----------------------|-------------------|----------------------|---|------------|
| SO <sub>2</sub> | Primary               | 1-hour            | 75 ppb               | 99th Percentile of 1-hour daily<br>maximum concentrations, averaged<br>over 3 years | 3.4 ppb    |
| SO <sub>2</sub> | Secondary             | 3-hour            | 0.5 ppm<br>(500 ppb) | Not to be exceeded more than once<br>per year                                       | 3.6 ppb*   |

\* Maximum from 4/1/2010 to 3/31/2021.

### 3.3 PM<sub>2.5</sub>

The primary standard for PM<sub>2.5</sub> is 12.0 µg/m<sup>3</sup> (annual arithmetic average; 3-year average of the weighted annual mean PM<sub>2.5</sub> concentration must not exceed 12.0 µg/m<sup>3</sup>) or 35.0 µg/m<sup>3</sup> (24-hour average; 3-year average of the 98<sup>th</sup> percentile of the 24-hour concentrations must not exceed 35.0 µg/m<sup>3</sup>). The secondary standard for PM<sub>2.5</sub> is 15.0 µg/m<sup>3</sup> (annual arithmetic average; 3-year average of the weighted annual mean PM<sub>2.5</sub> concentration must not exceed 15.0 µg/m<sup>3</sup>). Table 2-7 presents the PM<sub>2.5</sub> NAAQS calculations for each standard and shows that the Union Pier Terminal had no exceedances.

**Table 2-7. PM<sub>2.5</sub> NAAQS Calculations for Union Pier Terminal**

| Pollutant         | Primary/<br>Secondary    | Averaging<br>Time | Level                | Form                                   | Union Pier             |
|-------------------|--------------------------|-------------------|----------------------|--|------------------------|
| PM <sub>2.5</sub> | Primary                  | Annual            | 12 µg/m <sup>3</sup> | Annual mean, averaged over 3 years     | 9.3 µg/m <sup>3</sup>  |
| PM <sub>2.5</sub> | Secondary                | Annual            | 15 µg/m <sup>3</sup> | Annual mean, averaged over 3 years     | 9.3 µg/m <sup>3</sup>  |
| PM <sub>2.5</sub> | Primary and<br>Secondary | 24-hour           | 35 µg/m <sup>3</sup> | 98th Percentile, averaged over 3 years | 19.8 µg/m <sup>3</sup> |

## 4 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 Union Pier Terminal (February 2015, Revision 0).

### 4.1 Daily and Quarterly QC/Validation

According to the QAP prepared for this work, results are reviewed for anomalies and validated daily. These validations are recorded on QA/QC Daily Comment Sheets. The occurrence and duration of normal calibration and maintenance activities are also recorded.

Daily QC checks were performed in accordance with section 5.1 of the QAPP. The PAC Display data logging software is remotely accessed from the ARCADIS office in Durham, NC where the instrumentation is monitored for alarms and the data trends are reviewed for irregularities. NO<sub>x</sub> and SO<sub>2</sub> zero and calibration values displayed on the PAC Display screen from the previous calibration event are recorded in the QC Log Book. After checking the PAC Display system for any anomalies, the H05 raw data file from the previous day is downloaded to Arcadis' Durham, NC server. The data file is saved to the project folder on the server and then processed by a Microsoft Excel macro. The resulting Excel file provides values for daily averages and maxima as well as alarm and calibration information. This information is recorded on the daily QC log sheet. Comments and observations regarding data quality are noted on the QC log sheet and are also entered on the SCPA QA/QC Daily Comment Sheet. The Project Manager is notified of any issues immediately.

Percent completeness for Quarter 1 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. One daily Excel file per week was validated by verifying the formulas and inputs used in the Microsoft Excel macro calculations are correct. The ranges used to calculate the PM<sub>2.5</sub> 24-hour average, NO<sub>2</sub> Daily Max 1-hour average, SO<sub>2</sub> Daily Max 1-hour average, and the 24-hour averages for PM, NO, NO<sub>2</sub>, NO<sub>x</sub>, and SO<sub>2</sub> were checked during each validation. Four random hourly average ranges for PM, NO, NO<sub>2</sub>, NO<sub>x</sub>, and SO<sub>2</sub> were also checked during each validation.

The quarterly data was assessed as follows:

- Percent completeness for Quarter 1 was 84.24%.
- 100% of the validated Quarter 1 data was flagged as "good"

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