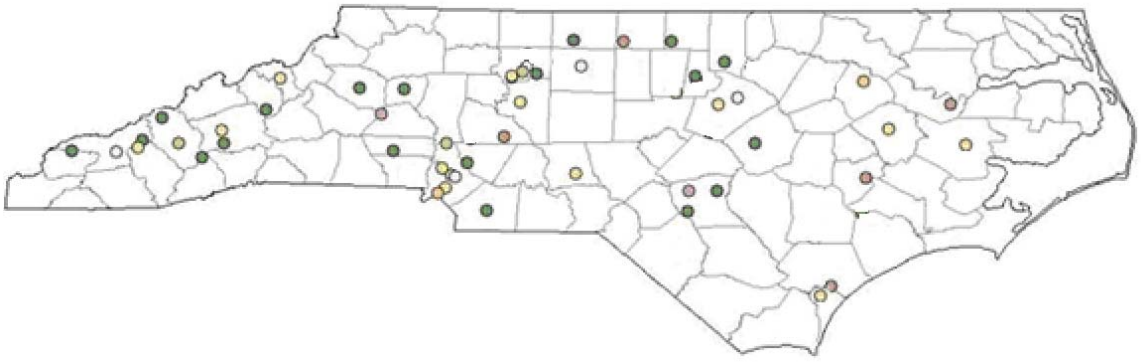
2016-2017 Annual Monitoring Network Plan for the North Carolina Division of Air Quality

Volume 1

Addendum



September 1, 2016

North Carolina Division of Air Quality
A Division of the North Carolina Department
of Environmental Quality
Mail Service Center 1641
Raleigh, North Carolina 27699-1641

CERTIFICATION

By the signatures below, the North Carolina Division of Air Quality, DAQ, certifies that the information contained in the 2016-2017 Annual Monitoring Network Plan Addendum is complete and accurate at the time of submittal to EPA Region 4. However, due to circumstances that may arise during the sampling year, some network information may change. A notification of change and a request for approval will be submitted to EPA Region 4 at that time.

Signature _____ Date 9-1-16

Lori Cherry
Acting Ambient Monitoring Section Chief, DAQ

Signature _____ for S.H. Date 9/1/16

Sheila C. Holman
Director, DAQ

Appendix L. CPI Southport Siting Analysis and Additional Site Information

CPI Southport SO_2 Modeling for Monitor Placement

Introduction

On June 22, 2010, the EPA revised the primary sulfur dioxide (SO_2) National Ambient Air Quality Standard (NAAQS) (75 FR 35520). The EPA promulgated a new 1-hour daily maximum primary SO_2 standard at a level of 75 parts per billion (ppb), based on the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations.

On May 13, 2014, the EPA proposed the Data Requirements Rule (DRR) for the 1-Hour SO_2 NAAQS (79 FR 27445). The final DRR was promulgated on August 21, 2015 (80 FR 51051) and requires states to gather and submit to the EPA additional information characterizing SO_2 air quality in areas with larger sources of SO_2 emissions. In the DRR, air agencies have the choice to use either monitoring or modeling to characterize SO_2 air quality in the vicinity of priority SO_2 sources, and submit the modeling and/or monitoring to the EPA on a schedule specified by the rule.

This analysis was conducted to identify a suitable 1-hour SO_2 source-oriented monitoring site location for the 2017-2019 monitoring period intended to satisfy the DRR for CPI Southport. Currently, the closest SO_2 monitor with a design value is about 40 kilometers north northeast of CPI Southport, located at 2400 US Highway 421 N, Wilmington, NC. The 1-hour monitored air concentration at this site based on 2012-2014 data is 32 ppb (83.84 $\mu g/m^3$). However, the latest 2014 1-hour concentration has dropped to 3 ppb (7.86 $\mu g/m^3$) due to the shutdown of several large sources of SO_2 in the area near the monitor.

CPI USA North Carolina - Southport Plant

CPI USA North Carolina - Southport Plant is located at 1281 Power House Drive Southeast in Southport, Brunswick County, North Carolina. CPI has two electricity generating units consisting of six watertube design boilers. CPI Southport is a cogeneration facility that primarily burns wood, coal and tire-derived fuel to produce steam. A portion of the steam is sold to Archer Daniels Midland for process use. The remainder of the steam is used to drive two identical turbine generator units to provide electricity that is sold to Duke Energy Progress.

The facility is a significant source of SO_2 emissions under the DRR since it emits more than the 2,000 tons per year threshold specified for determining which sources need to be evaluated in determining area NAAQS compliance designations. In addition, CPI Southport is one of the facilities included in the March 2, 2015, SO_2 Designation Consent Decree.

A part of the requirements for the DRR is the consideration of other sources of SO_2 emissions in the vicinity of the facility. Figure L-1 shows the locations and magnitude of SO_2 emissions in the vicinity. As shown in the figure, there are no large sources nearby. There are two facilities near CPI Southport that had been included in previous modeling. However, these very small emissions sources, less than two tons per year each, do not impact the receptor ranking and were not included in the modeling for monitor placement.

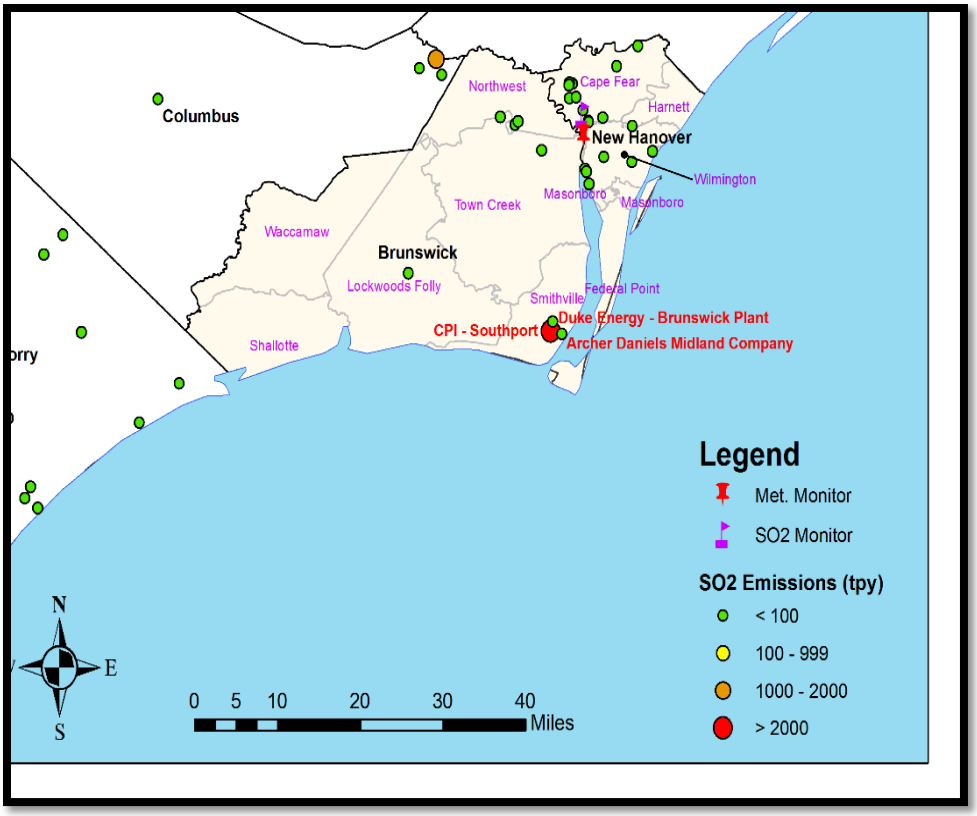


Figure L-1. Sources of SO_2 Emissions in the Vicinity of CPI Southport

AERMOD Modeling

As described in the EPA SO_2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document (Monitoring TAD),[1] NCDAQ's modeling followed the recommendations of the SO_2 NAAQS Designations Modeling Technical Assistance Document (Modeling TAD).[2] According to the Modeling TAD, given the source-oriented nature of SO_2, dispersion models are appropriate air quality modeling tools to predict the near-field concentrations. The AMS/EPA Regulatory Model (AERMOD) was used, as suggested in the Monitoring TAD. AERMOD is the preferred air dispersion model because it is capable of handling rural and urban areas, flat and complex terrain, surface and elevated releases, and multiple sources (including, point, area, and volume sources) to address ambient impacts for the designations process.

Three years (2013-2015) of hourly SO_2 Continuous Emissions Monitor (CEM) data for each of the two stacks at the CPI facility was used in the modeling. Following the example in Appendix A of the Monitoring TAD, normalized emission rates were used as input to the model. Because of the linear scalability of emissions to modeled concentrations, the relative model results using normalized emissions can be used to predict the location of maximum concentration gradients. The CEM emissions rates were normalized by dividing each hour's rate by the highest overall rate over all stacks throughout the period. The location, size and orientation of the buildings

[1] http://www3.epa.gov/airquality/sulfurdioxide/pdfs/SO2MonitoringTAD.pdf
[2] http://www3.epa.gov/airquality/sulfurdioxide/pdfs/SO2ModelingTAD.pdf

relative to the stacks were input into BPIP-PRIME to calculate building parameters for AERMOD. Table L-1 provides the stack parameters used in the modeling analysis.

Table L-1. Parameters for CPI Southport SO_2 Modeling for Monitor Placement

Source ID	Easting (X)	Northing (Y)	Base Elevation	Stack Height	Temperature	Exit Velocity	Stack Diameter
	(m)	(m)	(m)	(m)	(K)	(m/s)	(m)
UNIT1	221,576.9	3,760,059.2	7.62	60.35	449.82	22.49	2.64
UNIT2	221,579.2	3,760,099.0	7.62	60.35	449.82	22.49	2.64

As shown in Figure L-2, receptors were spaced 100 meters apart along the fence line. A set of nested Cartesian grid receptors were generated extending outward from the fence line. The receptors were spaced 100 meters apart out to 3 km from the facility center, 500 meters apart from 3 to 5 km out, and 1000 meters apart from 5 to 10 km out. Receptors were removed from the model if they were within the fence line of the facility or in areas not suitable for the placement of a permanent monitor such as open water. The following figures are included to show the facility and modeling inputs.

Figure L-2. Receptor Locations Near the CPI Southport Boundary Used in Modeling

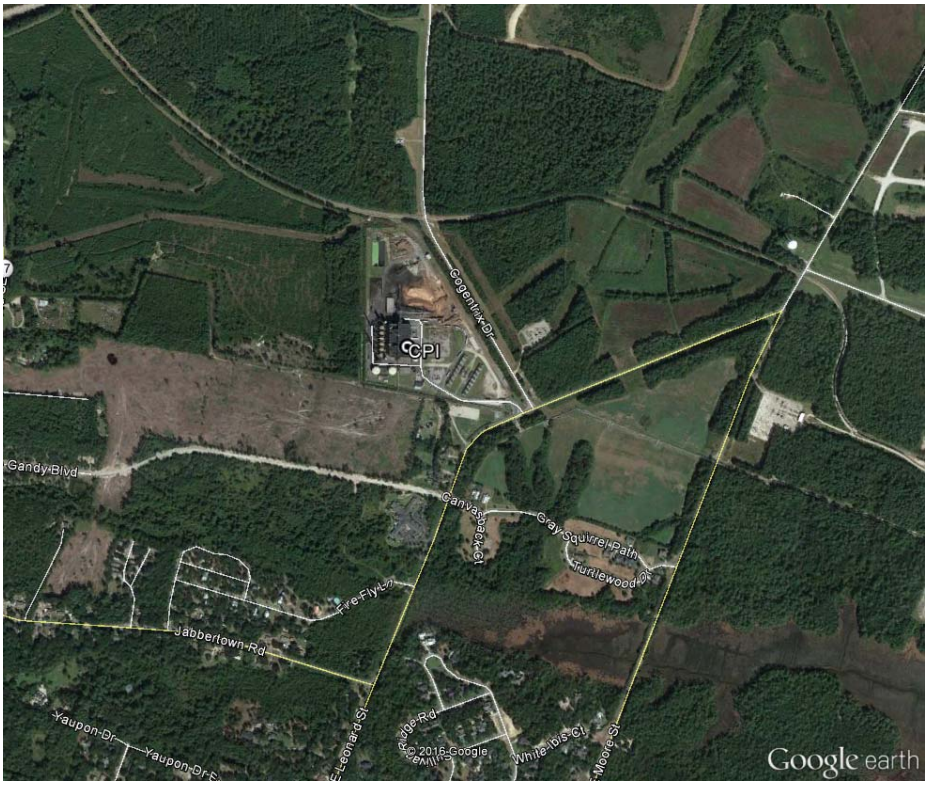


Figure L-3. Aerial View of CPI Southport and Surrounding Areas

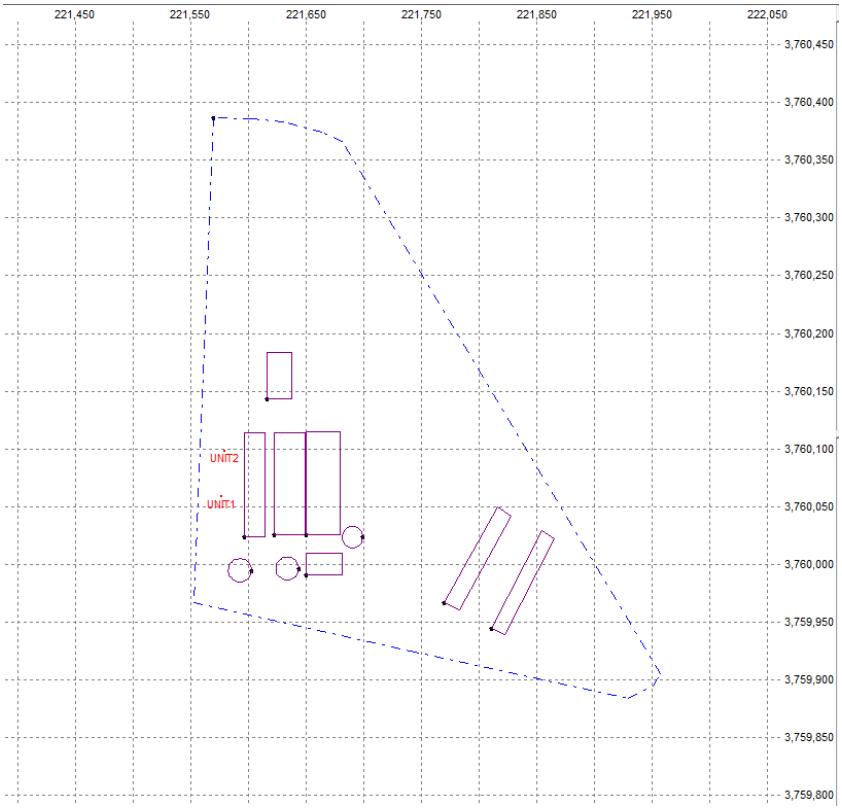


Figure L-4. Locations in CPI Southport SO_2 Modeling for Monitor Placement (UTM NAD 83 Coordinates in Meters, Zone 18)

Terrain data used in the analysis was obtained from the USGS Seamless Data Server at http://viewer.nationalmap.gov/viewer/. The 1 arc-second NED data was obtained in the GeoTIFF format and used in determining receptor elevations and hill heights using AERMAP. National Weather Service (NWS) Automated Surface Observation Station (ASOS) data for 2013 to 2015 (concurrent with the modeled emissions data) for the station located at Wilmington, NC, paired with upper air sounding data collected at Newport, NC, were used in the analysis. AERMinute was also used in processing the data to incorporate additional 1-minute wind data available for the Wilmington surface station.

Modeling Results and Ranking Methodology

Following the guidance outlined in Appendix A of the Monitoring TAD, normalized modeled impacts were used to determine suitable locations for installing an SO_2 monitor near CPI Southport. The three-year average of each year's 4th daily highest 1-hour maximum concentration (99th percentile of daily 1-hour maximum concentrations) was calculated for each receptor. This value is commonly referred to as the design value (DV). Because normalized emissions were used to calculate these values, the results are referred to as normalized design values (NDVs) in this analysis. Figure L-5 shows a contour plot of the NDVs for the receptors near CPI Southport.

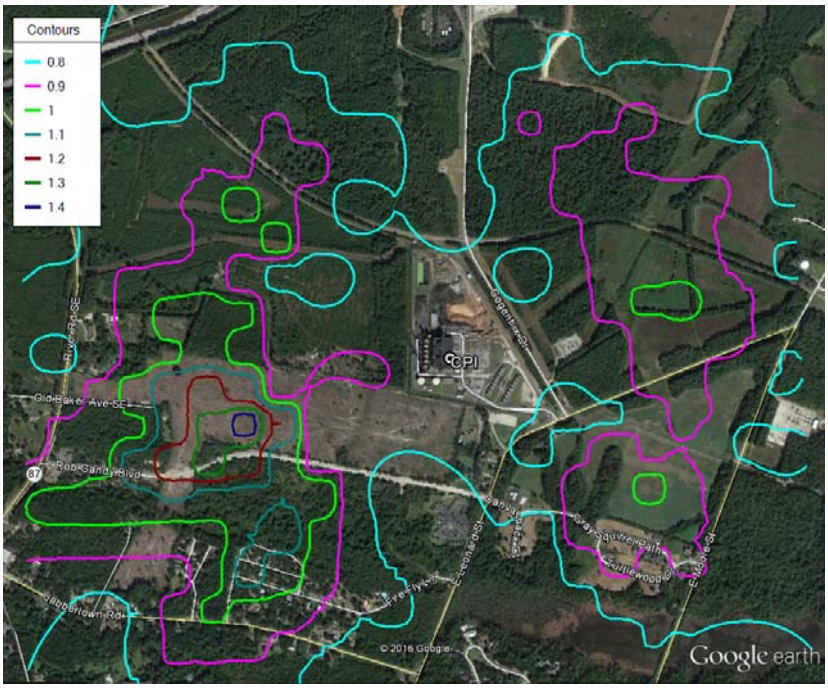


Figure L-5. Modeled NDVs for CPI Southport

According to Appendix A of the Monitoring TAD, the site selection process also needs to account for the frequency in which a receptor has the daily maximum concentrations. The

frequency is the number of times each receptor was estimated to have the maximum daily 1-hour concentration. Figure L-6 shows the results of the frequency analysis.

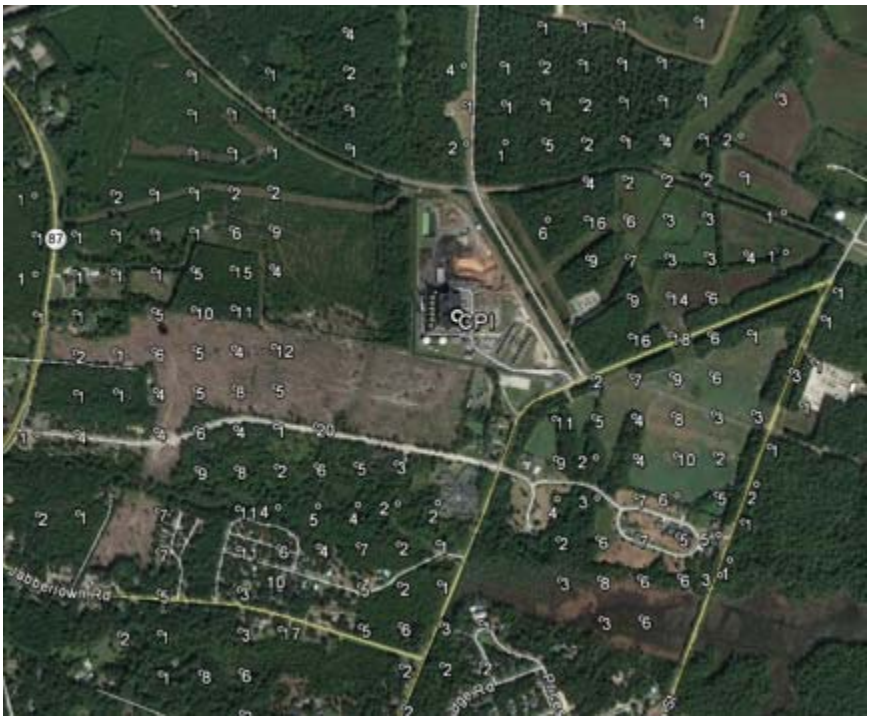


Figure L-6. Frequency of Daily Maximum Concentrations for CPI Southport

Each receptor's frequency value was used with its NDV to create a relative prioritized list of receptor locations. This process is referred to in Appendix A of the Monitoring TAD as a scoring strategy. The list of receptors was developed through the following steps:

1. The NDVs were ranked from highest to lowest. Rank 1 means the highest NDV.
2. The frequencies for the 200 receptors were ranked from the highest to lowest. Rank 1 means the highest number of days having the daily maximum value.
3. The NDV rank and the frequency rank were added together to obtain a score.
4. The scores were ranked from lowest to highest. The receptors with the lowest scores were identified as the most favorable locations for the monitor.

Ranking Results and Discussion of Proposed Monitor Site

Figure L-7 shows the top ranked receptors. The proposed monitor location (marked with yellow pin), ranked 13th, resulted from a site visit conducted using information from the scoring strategy. This is the highest rated location that was in a clear area and for which we were able to receive written permission from the property owner to site a monitor. The top 30 ranked locations are provided in Table L-2 with reasons why the other 29 locations were not selected. As shown in Figure L-8, this site also provides a clear view of the facility.

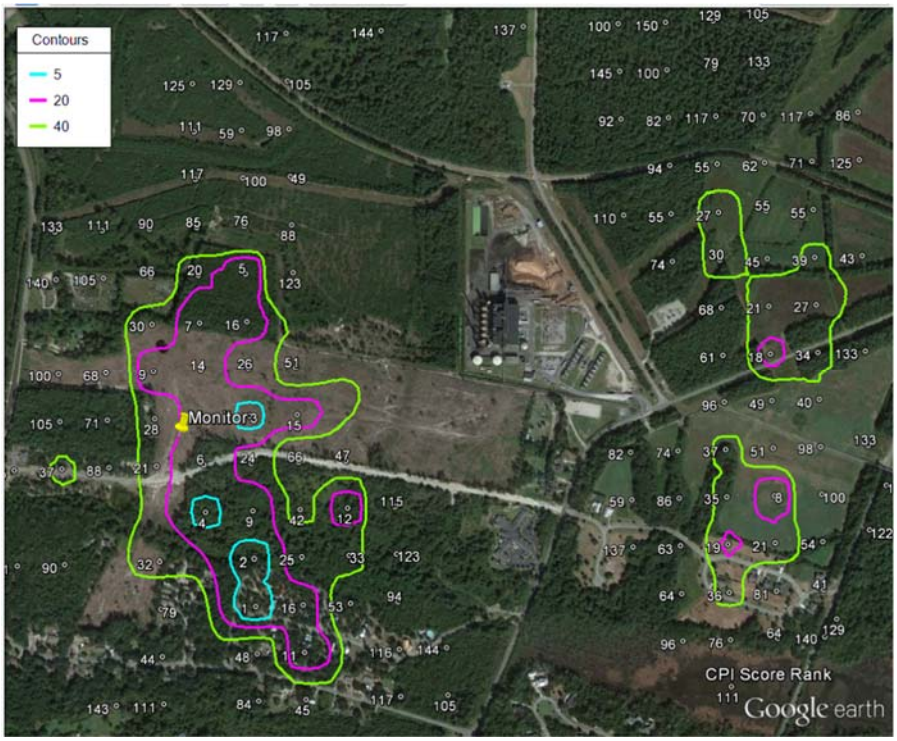


Figure L-7. Locations of Top Ranked Receptors from Score Ranking for CPI Southport

Table L-2 Selected Ranking Results from the CPI Southport SO_2 Modeling for Monitor Placement

Easting (m)	Northing (m)	Normalized Design Value (NDV)	NDV Rank	Freq. Count	Freq. Rank	Score	Score Rank	Comments on Location
221,100	3,759,500	1.14	10	11	9	19	1	Ownership
221,100	3,759,600	1.10	14	11	9	23	2	Trees
221,100	3,759,900	1.43	1	8	22	23	3	Ownership
221,000	3,759,700	1.08	18	9	16	34	4	Trees
221,100	3,760,200	1.02	29	15	6	35	5	Trees
221,000	3,759,800	1.34	2	6	34	36	6	Ownership
221,000	3,760,100	1.04	25	10	13	38	7	Trees
222,200	3,759,700	1.03	28	10	13	41	8	Trees
221,100	3,759,700	1.07	20	8	22	42	9	Trees
220,900	3,760,000	1.19	8	6	34	42	9	Ownership
221,200	3,759,400	0.98	36	10	13	49	11	Ownership
221,300	3,759,700	1.09	16	6	34	50	12	Trees
221,000	3,759,900	1.32	3	5	51	54	13	Selected location
221,000	3,760,000	1.24	6	5	51	57	14	Ownership
221,200	3,759,900	1.20	7	5	51	58	15	Ownership
221,100	3,760,100	0.96	50	11	9	59	16	Trees

Table L-2 Selected Ranking Results from the CPI Southport SO_2 Modeling for Monitor Placement

Easting (m)	Northing (m)	Normalized Design Value (NDV)	NDV Rank	Freq. Count	Freq. Rank	Score	Score Rank	Comments on Location
221,200	3,759,500	1.04	25	6	34	59	16	Ownership
222,200	3,760,000	0.94	59	18	2	61	18	Ownership
222,100	3,759,600	0.98	36	7	27	63	19	Ownership
221,000	3,760,200	1.08	18	5	51	69	20	Trees
222,200	3,760,100	0.93	63	14	7	70	21	Ownership
222,200	3,759,600	0.98	36	6	34	70	21	Trees
220,900	3,759,800	1.28	4	4	66	70	21	Ownership
221,100	3,759,800	1.26	5	4	66	71	24	Ownership
221,200	3,759,600	1.18	9	4	66	75	25	Trees
221,100	3,760,000	1.14	10	4	66	76	26	Ownership
222,100	3,760,300	0.97	43	6	34	77	27	Trees
222,300	3,760,100	0.97	43	6	34	77	27	Ownership
220,900	3,759,900	1.13	13	4	66	79	28	Ownership
222,100	3,760,200	0.95	56	7	27	83	30	Trees
220,900	3,760,100	0.99	32	5	51	83	30	Ownership

Note to Table L-2: Comments show reasons higher ranked locations were not selected. Ownership means that the landowners were identified as private individuals, who would not respond to our inquiries and where it was less likely a three-year dataset could be obtained.

Figure L-8. View of CPI Southport from the Monitor Location

NCDAQ staff, in conjunction with CPI Southport staff and a representative from EPA Region 4, conducted an in-situ survey in the vicinity of the area around CPI Southport to select a suitable location for SO_2 monitor placement. When selecting adequate locations for the proposed monitor, considerations were made regarding the availability of electrical power, security of the monitor, accessibility, proper instrument exposure, and assurance of long-term use of the site. This last point was especially important, given the tight timelines in the rule. Most of the nearby clear area is privately-owned and there was no guarantee that we could keep the monitor there for at least three years to get a design value. We believe that this is the best location since it is highly ranked, has available electric power, will be secure, is readily accessible, and provides the correct exposure.

Region 4 Requested Information for Proposed Sites

In 2016, the North Carolina Division of Air Quality, DAQ, began working with CPI USA North Carolina Southport to establish a sulfur dioxide monitoring station in Southport, North Carolina, to characterize the ambient sulfur dioxide concentrations near the CPI facility as required by the data requirements rule for sulfur dioxide.[3] The area chosen for placement of the monitor was selected using the results of modeling done as described in the technical assistance document[4] and is reported in earlier in this appendix. An aerial view of the proposed monitoring location identified based on the earlier reported considerations is shown in Figure L9.

Figure L-9. Aerial view showing the location of the proposed monitoring station

The Air Quality System identification number for this monitor will be 37-019-0005-42401-1. DAQ will operate this monitor in collaboration with CPI Southport to ensure the air in the

[3] Data Requirements Rule for the 2010 1-Hour Sulfur Dioxide Primary National Ambient Air Quality Standard, Federal Register of August 21, 2015, (80 FR 51052) (FRL-9928-18-OAR), 2015-20367.
[4] SO_2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document, U.S. EPA, Office of Air and Radiation, Office of Air Quality Planning and Standards, Air Quality Assessment Division, December 2013, Draft.

Southport area complies with the national ambient air quality standards for sulfur dioxide. The DAQ will operate the monitor following the DAQ quality assurance project plan and the monitor will be part of the DAQ primary quality assurance organization. Figure L-10 through Figure L-13 show views from the proposed site looking north, east, south and west.

Figure L-10. Looking north from proposed location

Figure L-11. Looking west from the proposed location

Figure L-12. Looking east from the proposed location

Figure L-13. Looking south from the proposed location

The proposed monitoring site is located 30 meters from the trees to the east. The tallest trees are estimated to be 15 meters in height. The nearest road is Rob Gandy Boulevard located approximately 70 meters to the south. This road does not have traffic count data; however, as shown in Figure L-14, secondary road number 1526, Jabbertown Road, further south than Rob Gandy Boulevard, had an average annual daily traffic count of 4,600 in 2014. The traffic on Rob Gandy Boulevard would be expected to be less than that on Jabbertown Road. The probe height will be approximately 3.6 meters.

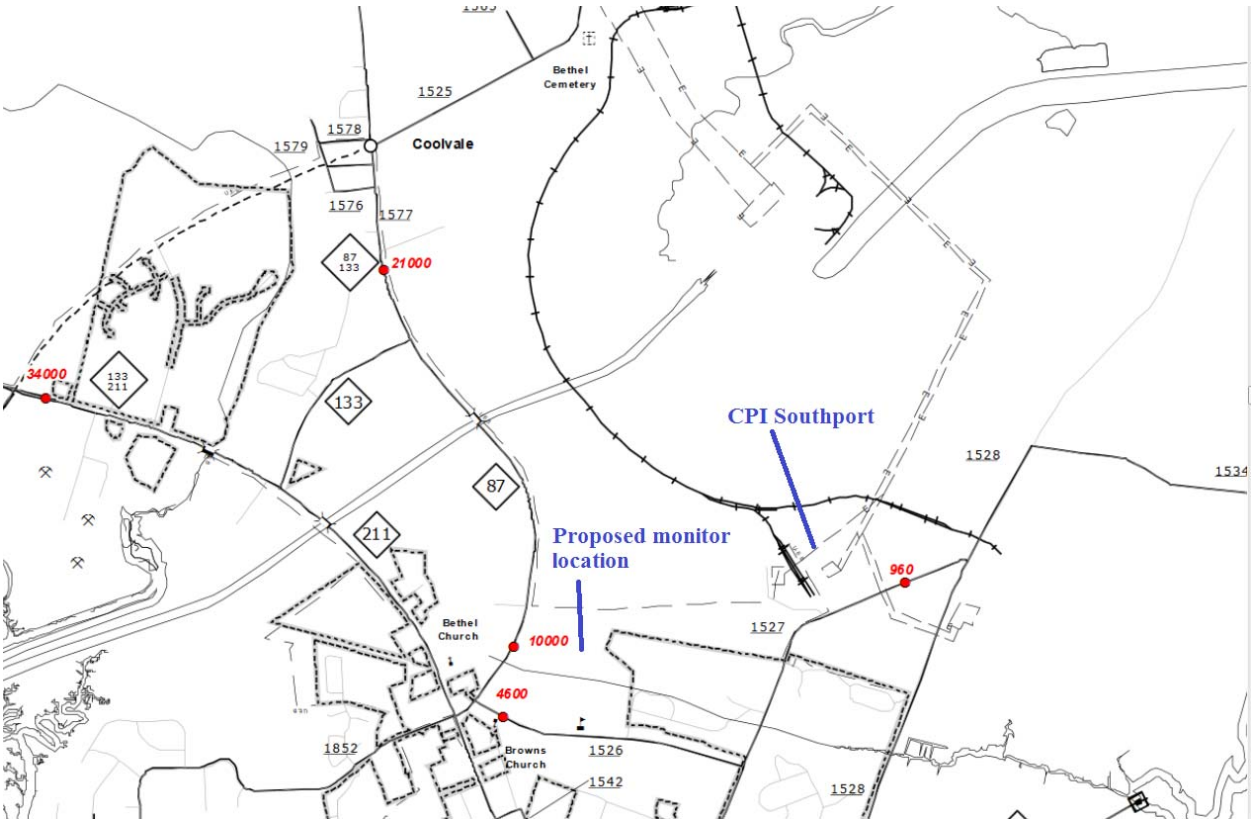


Figure L-14. 2014 Traffic count map (from NC DOT)

The Air Quality System, AQS, identification number and street address for the site will be: 37-019-0005 and 5538 Rob Gandy Blvd SE, Southport, NC 28461. The latitude and longitude will be 33.942222 and -78.019167. The sampling and analysis method will be AQS code 560, Thermo Electron 43i-TLE pulsed fluorescent instrument, EQSA-0486-060, and the operating schedule will be hourly. The monitoring objective will be source oriented. Figure L-15 shows the location of the monitoring station relative to the population center of Brunswick County in the Southport area.

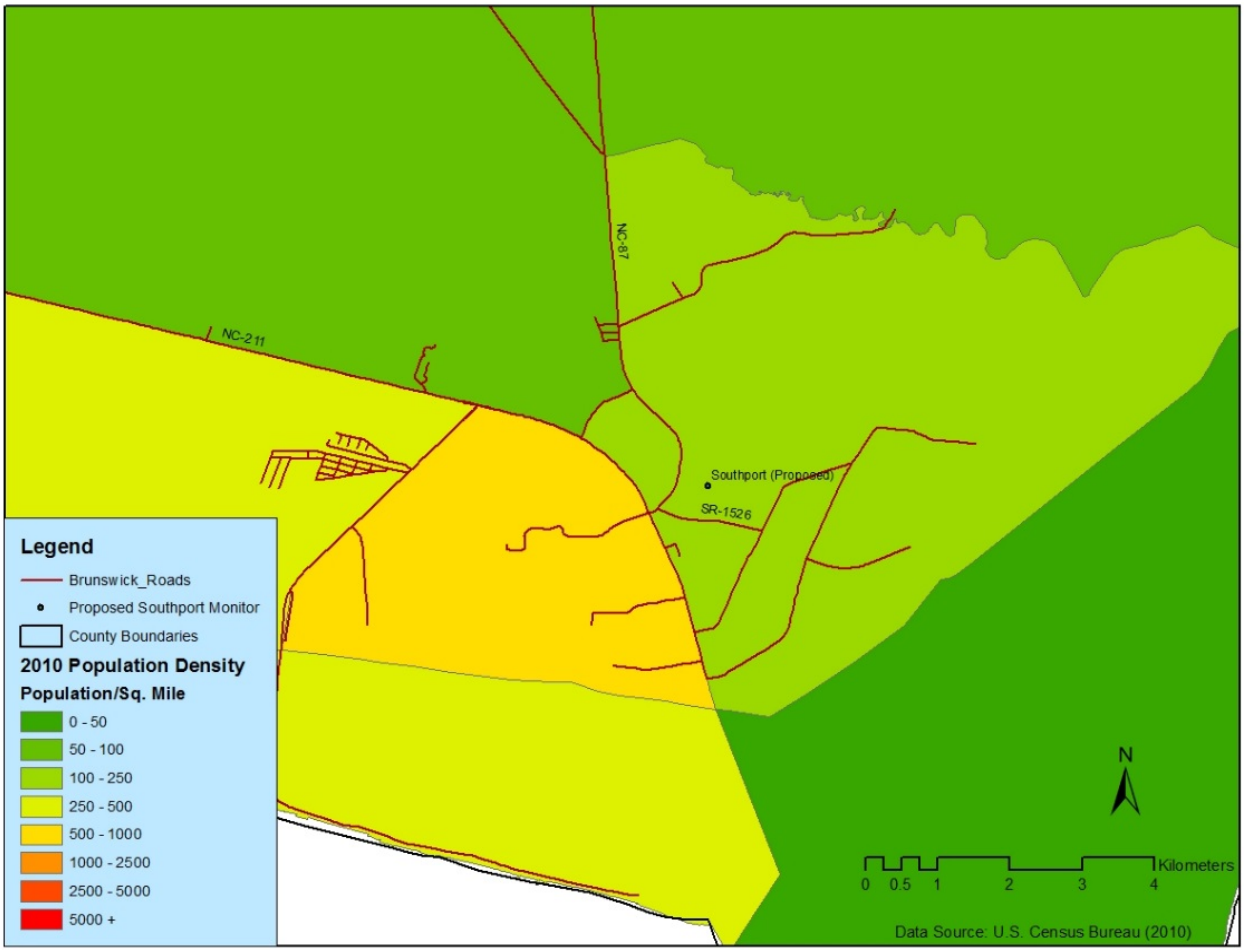


Figure L-15. Location of the proposed monitoring station relative to the population of the Southport area in Brunswick County

Based on the wind rose in Figure L-16, the proposed monitoring station is located downwind of the CPI Southport plant. Figure L-16 is a wind rose representing the 3-year period (2013 to 2015) for Wilmington, NC, surface meteorological data. As expected, the greatest frequency of occurrence or tendency of wind speed and direction occurred within the northeast quadrant. There is also a high frequency of wind speed and direction from the southwest, which is consistent with the direction of prevailing wind flow patterns for much of North Carolina. The high frequency of winds from the northeast direction likely coincides with colder ridge air masses to the north/northeast and coastal low pressure systems off the coast during winter and early spring.

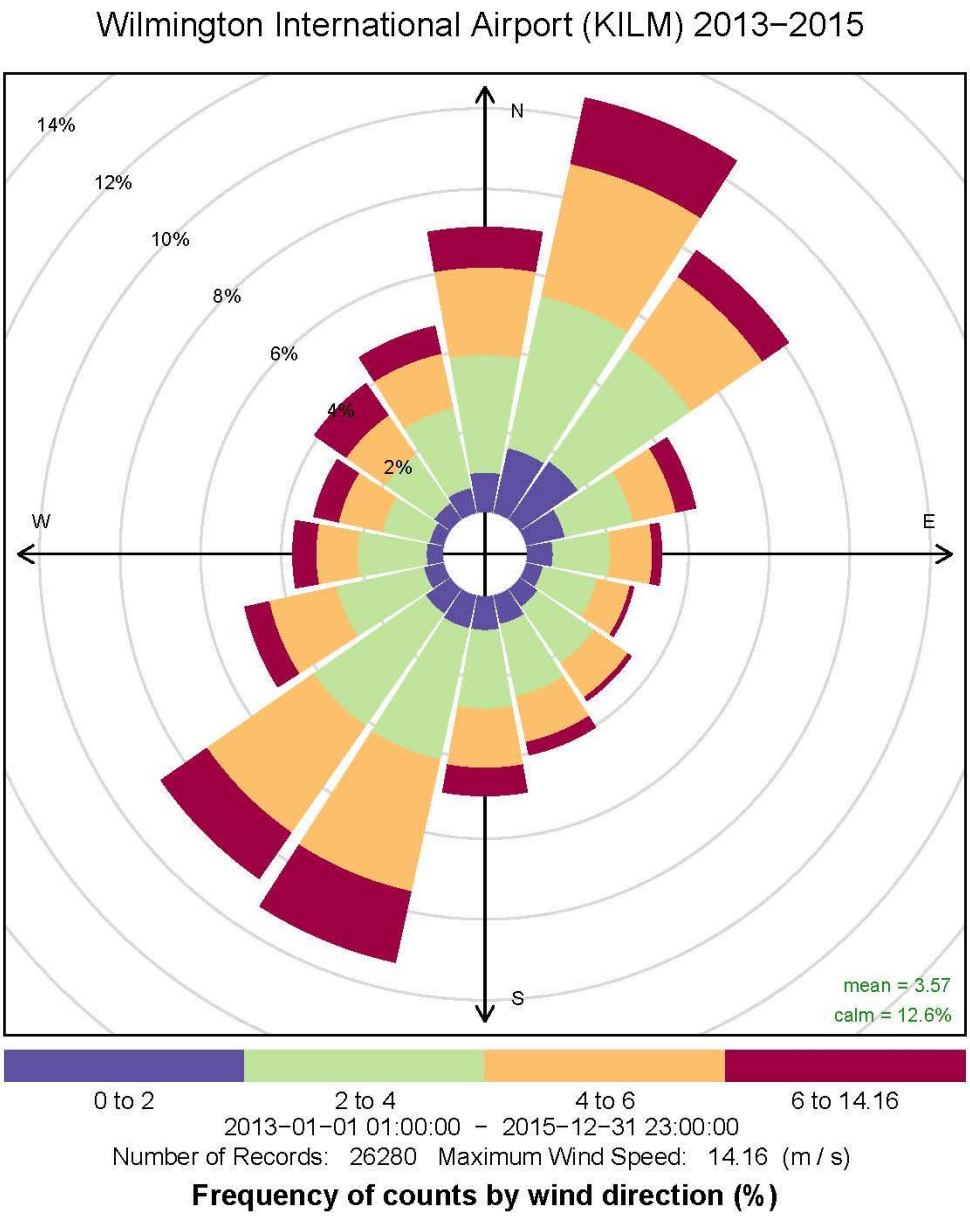


Figure L-16. Wind rose from the Wilmington International Airport for 2013 to 2015

The spatial scale of representativeness for the monitor will be neighborhood based on the distance of the monitor from the source. The monitor will be located approximately 600 meters southwest from the property line of the CPI Southport facility. This monitor is located in the Myrtle Beach-Conway-North Myrtle Beach metropolitan statistical area and is representative of the air quality downwind from the fence line of the CPI Southport facility. The proposed monitoring site was provided to the public for comment during 30 days in August 2016 as an addendum to the 2016-2017 network monitoring plan. Table L-3 summarizes other factors DAQ evaluated when choosing the proposed location for the monitoring station. Table L-4 summarizes the EPA-required information for the proposed Southport DRR site.

Table L-3. Other considerations in site selection

Factor	Evaluation
Long-term Site Commitment	The property owner is willing to provide DAQ with a long-term lease agreement and does not plan to develop the current area any time in the next three years
Sufficient Operating Space	10 meter by 10 meter area free of brush and 70 meter by 150 meter area free of trees and buildings
Access and Security	The building will be located by a driveway onto the property either off a lumber road or the nearby Rob Gandy Boulevard so it has easy access.
Safety	Appropriate electrical permits will be obtained.
Power	Overhead powerlines are located 130 meters northwest of the site.
Environmental Control	The monitoring shelter will be placed with the door to the north so that sunlight will not shine in through the window and warm up the building.
Exposure	The monitoring station will be at least 30 meters from the driplines of trees and will not be near any trees or buildings that could be an obstacle to air flow.
Distance from Nearby Emitters	The only permitted facility within 0.5 miles of the proposed location is CPI Southport. There are two other facilities that are within one mile: **S & W Ready Mix Concrete**, located at 1619 N Howe Street, 960 meters west southwest of the proposed monitoring station, emitted 0.4 tons of PM10 and 0.4 tons of TSP in 2014. **Duke Energy Progress – Brunswick Plant**, located at 8470 River Road, 1500 meters north northeast of the proposed monitoring station, emitted 1.9 tons of SO2, 12.6 tons of NOx, 0.3 tons of VOC, 3.3 tons of CO and 0.4 tons of TSP in 2014.
Proximity to Other Measurements	The proposed monitoring station is located about 4.5 kilometers east of the Brunswick County Airport and 40 kilometers south southwest of the New Hanover sulfur dioxide monitoring station.

Table 1 The 2016-2017 Sulfur Dioxide Monitoring Network for the Myrtle Beach-Concord-North Myrtle Beach MSA [a]

AQS Site Id Number:	37-019-0005
Site Name:	Southport DRR
Street Address:	5538 Rob Gandy Blvd SE
City:	Southport
Latitude:	33.942222
Longitude:	-78.019167
MSA, CSA or CBSA represented:	Myrtle Beach-Concord-North Myrtle Beach
Monitor Type:	SLAMS
Operating Schedule:	Hourly – every year
Statement of Purpose:	Maximum concentration site in the vicinity of the CPI-Southport Plant. Compliance w/NAAQS.
Monitoring Objective:	Source-oriented
Scale:	Neighborhood
Suitable for Comparison to NAAQS:	Yes
Meets Requirements of Part 58 Appendix A:	Yes
Meets Requirements of Part 58 Appendix C:	Yes: EQSA-0486-060
Meets Requirements of Part 58 Appendix D:	Yes – Data Requirements Rule
Meets Requirements of Part 58 Appendix E:	Yes
Proposal to Move or Change:	Monitoring will begin by Jan. 1, 2017

[a] The monitor uses an instrumental pulsed fluorescence method using a Thermo Electron 43i-TLE, Air Quality System, AQS, method code 560.