

North Carolina  
Prevention of Significant Deterioration  
Modeling Guidance

July 1, 2020

North Carolina Department of Environmental Quality  
Division of Air Quality  
Permitting Section  
Air Quality Analysis Branch

# Table of Contents

1.0	Introduction.....	1
2.0	PSD Regulated Pollutants.....	3
3.0	Pre-Modeling Activities.....	4
3.1	Pre-Application Meeting.....	4
3.2	Modeling Protocol.....	4
4.0	Single-Source Impact Analysis.....	6
4.1	Meteorology .....	6
4.2	Receptor Grids.....	7
4.3	Pollutant Emissions and Worst-Case Operating Conditions.....	8
4.4	Characterization and Treatment of Intermittent Sources .....	10
4.5	Class II Area Single-Source Impact Analysis .....	10
4.6	Class I Area Increment Single-Source Impact Analysis .....	12
4.6.1	Class I Area Increment Screening Analysis .....	14
4.6.2	Class I Area Emissions and Worst-Case Operating Conditions.....	15
4.7	Class I Area AQRV Single-Source Impact Analysis .....	15
4.7.1	Air Quality Related Values (AQRVs) Screening Analysis .....	16
5.0	Additional Impacts Analysis.....	17
5.1	Growth.....	17
5.2	Soils and Vegetation.....	17
5.3	Visibility Impairment .....	17
6.0	Cumulative Impact Air Quality Analysis .....	18
6.1	Class II Areas .....	18
6.1.1	NAAQS Emissions Inventory and Source Parameters.....	18
6.1.2	Increment Emissions and Source Parameters .....	19
6.1.3	Class II Area NAAQS and Increments .....	19
6.2	Class I Areas.....	21
6.2.1	Increment Analysis .....	22
7.0	AQRV Analysis .....	23
7.1	Acid Deposition Analysis / Deposition Thresholds .....	23
7.2	Visibility Analysis.....	23

8.0 Air Quality Modeling Report..... 25

### List of Tables

Table 1. PSD Regulated Pollutants / Significant Emission Rates ..... 3  
Table 2. Class II Area Significant Impact Levels ( $\mu\text{g}/\text{m}^3$ )..... 11  
Table 3. Class I Areas for North Carolina ..... 13  
Table 4. Class I Area Significant Impact Levels ( $\mu\text{g}/\text{m}^3$ ) ..... 13  
Table 5. Class II Area NAAQS ( $\mu\text{g}/\text{m}^3$ ) ..... 20  
Table 6. Class II Area Increments ( $\mu\text{g}/\text{m}^3$ )..... 21  
Table 7. Class I Area Increments ( $\mu\text{g}/\text{m}^3$ )..... 22

### List of Appendices

Appendix A – Treatment of  $\text{NO}_2$  Chemistry with AERMOD ..... 26  
Appendix B – Secondary  $\text{PM}_{2.5}$  Formation from  $\text{SO}_2$  and  $\text{NO}_x$ ..... 28  
Appendix C – Secondary Ozone Formation from  $\text{NO}_x$  and VOCs ..... 30  
Appendix D – Nearby Source Inventory Instructions..... 32

## Definitions and Acronyms

<b>Term</b>	<b>Acronym</b>	<b>Definition</b>
Air Quality Related Value	AQRV	ambient visibility and deposition thresholds set by Federal Land Managers for Class I Areas
Allowable Emissions	--	emissions rate of a stationary source (or emission unit) calculated using the maximum rated capacity of the source (unless the source is subject to federally enforceable limits which restrict the operating rate, or hours of operation, or both) and the most stringent of the following: (i) The applicable standards as set forth in 40 CFR parts 60 and 61; (ii) The applicable State Implementation Plan emissions limitation, including those with a future compliance date; or (iii) The emissions rate specified as a federally enforceable permit condition.
Baseline Actual Emissions	BAE	average rate in tons per year of an emission unit for a representative 24-month operating period (see 40 CFR 51.166)
California Puff Model	CALPUFF	Non-steady state Lagrangian transport and diffusion model system for atmospheric dispersion
Community Multiscale Air Quality Model	CMAQ	EPA photochemical grid model
Comprehensive Air Quality Model with Extensions	CAMX	A multi-scale photochemical modeling system for gas and particulate air pollution
Increment	--	maximum allowable increase concentration, as defined in 40 CFR 51.166 (c)1, for a specific baseline area after the baseline date
Major Modification	--	means any physical change in or change in the method of operation of a major stationary source that would result in: a significant emissions increase of a regulated NSR pollutant; and a significant net emissions increase of that pollutant from the major stationary source.
Major Stationary Source	--	a facility listed in the group of 28 under 40 CFR 51.166(b)(1)(i)(a) and that has the potential to emit 100 tpy of any regulated NSR pollutant; or a facility not listed in the group of 28 and that has the potential to emit 250 tpy of any regulated NSR pollutant
Modeled Emission Rates for Precursors	MERPs	EPA Tier 1 screening approach for developing secondary impacts on ozone and PM <sub>2.5</sub> based on pre-existing photochemical modeling.
National Ambient Air Quality Standards	NAAQS	Federal ambient concentration ceilings for primary standards to protect public health, and for secondary standards to protect the environment, economy, and public well-being
New Major Source	--	A proposed new major stationary source
New Source Review	NSR	Federal program under the Clean Air Act for establishing best available controls and evaluating source impacts.

<b>Term</b>	<b>Acronym</b>	<b>Definition</b>
Potential Emissions	PTE	maximum capacity of a stationary source (or emission unit) to emit a pollutant under its physical and operational design
Prevention of Significant Deterioration	PSD	Federal program under the Clean Air Act for new projects to maintain compliance with the NAAQS and PSD Increments while allowing for some economic growth.
Projected Actual Emissions	PAE	maximum annual rate, in tons per year, at which an existing emissions unit is projected to emit a regulated NSR pollutant in any one of the 5 years (12-month period) following the date the unit resumes regular operation after the project, or in any one of the 10 years following that date, if the project involves increasing the emissions unit's design capacity or its potential to emit of that regulated NSR pollutant and full utilization of the unit would result in a significant emissions increase or a significant net emissions increase at the major stationary source.
Second-Order Closure Integrated Puff Model with Chemistry	SCICHEM	Non-steady state Lagrangian transport and diffusion model for atmospheric dispersion and chemistry
Significant Concentration Gradient	--	significant spatial change in concentrations per unit distance; significant being determined by qualitative or quantitative measures of spatial uncertainty for modeled ambient impacts
Significant Impact Area	SIA	circular area or receptor location areas that encompass modeled impacts equal to or above the SIL
Significant Impact Level	SIL	ambient impact concentration below which allowable emission increases from a PSD project would not be expected to exceed the NAAQS and Class I and Class I Area PSD Increments

## 1.0 Introduction

North Carolina's state rules, under 15A NCAC 02D Section .0530 Prevention of Significant Deterioration (PSD), apply to owners and/or operators of a proposed new major stationary source ("facility") or a project deemed a major modification at an existing major stationary source. They are required to conduct and submit to NC DAQ an ambient air quality analysis to demonstrate that emissions from the project will not cause or contribute to a violation of applicable NAAQS, Class I and II Area PSD increments, and Class I Area Air Quality Related Values (AQRVs). The emissions from the project must include those in conjunction with other applicable emissions from existing sources, including emissions from growth associated with the new project. In addition to PSD pollutants, project impacts from total suspended particulate (TSP) and North Carolina toxic air pollutants (TAPs) must also be evaluated under 15 NCAC 02D Sections .0430 and .0700, respectively. The analysis must be submitted prior to construction and operation of the proposed new or modified source.

The North Carolina PSD Modeling Guidance is based on the organizational formats and contents interpreted from the EPA [Draft New Source Review Workshop Manual \(NSRWM\)](#) and the Appendix W to 40 CFR Part 51 (Guideline on Air Quality Models) published January 17, 2017, referred to here as EPA Modeling Guidelines. Additionally, other EPA memoranda and permit modeling guidance documents are relevant to various aspects of PSD modeling in North Carolina. These documents may be found on the EPA Support Center for Regulatory Atmospheric Modeling (SCRAM) [website](#). Further, the NC PSD modeling guidance includes specific modeling requirements and recommendations as defined by the North Carolina PSD permitting program (i.e., 15 NCAC 02 .0530 and 40 CFR 51.166). This guidance document includes hyperlinks, footnotes, and text references to most if not all supporting EPA and NC memoranda and guidance documents.

The suitability and application of any mathematical modeling approach to demonstrate compliance with the ambient standards under the PSD program should be evaluated and determined by reasonably competent air quality science professionals (see 40 CFR Part 51, Appendix W, Sections 1.0(c) and 2.1(e)). The NC PSD modeling guidelines were written based on the presumption that any such air quality professional choosing to interpret and apply NC PSD modeling guidelines does so based on their understanding of the relevant PSD regulatory modeling applications and inherent limitations as well as any and all evaluated, selected and proposed ambient air impact analysis supporting assumptions, datasets, parametrizations, and methodologies.

The guidelines presented in this document may change at any time as new guidance or new air quality modeling techniques become available. For the latest changes in NC DAQ guidance, refer to the "Alert Page" located on the AQAB web site, which can be found at: <https://deq.nc.gov/about/divisions/air-quality/air-quality-permits/modeling-meteorology/alerts> .

This document is organized to present the analyses that may be required in a PSD impact air quality analysis. The body of the document contains the general steps, while the appendices presents in more detail guidance covering subjects that may occur in multiple steps of the analysis.

## 2.0 PSD Regulated Pollutants

Air pollutants subject to PSD review are those defined under 40 CFR 51.166(b)(23) where annual project net emissions increases as a result of the new major stationary source or major modification at a major stationary source (“facility”) located in an area designated as attainment or unclassifiable exceed the significant emission rates (SERs) shown in Table 1. Currently, NC requires an ambient air quality analysis for all PSD pollutants exceeding the SERs except for asbestos, fluorides, and sulfuric acid mist. Asbestos, fluorides, and sulfuric acid mist ambient impacts are evaluated under the NC Air Toxics Program, where any project net emissions increase of TAPs require facility-wide evaluation under 15 NCAC 02D Sections .0700 and .1104. Please refer to the Guidelines for Evaluating the Air Quality Impacts of Toxic Pollutants in North Carolina available [here](#) for further details on the air toxics analysis.

Table 1. PSD Regulated Pollutants / Significant Emission Rates

<b>Pollutant</b>	<b>Significant Emissions Rate (tons/year)<sup>a</sup></b>
Carbon Monoxide (CO)	100
Nitrogen Oxide (NO <sub>2</sub> )	40
Sulfur Dioxide (SO <sub>2</sub> )	40
PM/PM <sub>10</sub>	25/15
PM <sub>2.5</sub>	10
Ozone (VOC)	40 (VOCs or NO <sub>x</sub> )
Lead	0.6
Asbestos	0.007
Fluorides	3
Sulfuric Acid Mist	7

<sup>a</sup> if the major source is located within 10 kilometers of any Class I Area, any emission or net emissions increase of a criteria or non-criteria pollutant that results in an increase of 1 µg/m<sup>3</sup> (24-hour average) in the Class I Area must also be evaluated under PSD.

Note that project net emissions increases for determining PSD review applicability can be calculated from the differences between baseline actual emissions and projected actual emissions, differences between baseline actual emissions and potential emissions, differences between baseline actual emissions and permitted allowable emissions, or differences between baseline actual emissions and a combination of future actual, potential, and allowable emissions estimates depending on the emission units and fugitive emissions involved in the proposed project. These project net emissions increases are only used for PSD applicability are not used in further analyses.

### 3.0 Pre-Modeling Activities

The most successful and least delayed PSD modeling demonstrations rely strongly upon preparatory efforts made before finalizing the applicability, scope, timeline, and execution of any applicable proposed PSD modeling methodologies. These preparatory efforts mainly take the form of clear communications between the applicant and DAQ during the pre-application meeting and review and approval of the PSD modeling protocol.

#### 3.1 Pre-Application Meeting

A PSD pre-application meeting is required prior to submitting the modeling protocol and completed PSD application with any required ambient modeling analyses. The pre-application meeting is held to discuss project specifics with the appropriate DAQ Air Permits engineering and modeling staff to identify the permitting and modeling requirements on a case-by-case basis. The PSD pre-application meeting requirements are listed in a preapplication form available at: <https://deq.nc.gov/about/divisions/air-quality/air-quality-permits/nsr-permitting/psd-preapplication-checklist>. The pre-application form should be filled out and provided to the Section Chief of the Air Permits Section, or appropriate designee, prior to the meeting. DAQ will forward the preapplication form to the applicable Federal Land Manager (FLM) contacts so they can determine what analyses they will require for determining Class I Area impacts.

#### 3.2 Modeling Protocol

Prior to submitting the PSD application and modeling analysis, the applicant is required to submit a modeling protocol to the DAQ AQAB. The modeling protocol should provide adequate detail to demonstrate compliance with the PSD modeling regulatory requirements and demonstrate adherence to the applicable NC DAQ and EPA Modeling Guidelines. The following is a list of suggested topics to include in the modeling protocol:

- a. Project description;
- b. Source characterization: operating loads/scenarios, production schedules, release parameters, fuels, startup/shutdowns, fugitives, baseline actual emissions, allowable emission increases, source types, PSD pollutants and averaging periods;
- c. Selected model(s) and non-default regulatory modeling options (if any);
- d. Screening and refined cumulative modeling methodologies;
- e. Building downwash analysis;
- f. Meteorological input data: site dataset selection and representativeness, non-default regulatory options, and surface characteristics;
- g. Class II Area modeling domain: terrain elevations, receptor networks, hotspots, and ambient air boundary;
- h. Preconstruction monitoring PSD pollutant background concentrations;
- i. NO<sub>x</sub> Tier 1, 2, or 3 analysis inputs and methodologies;
- j. PM<sub>2.5</sub> Tier 1 or 2 analysis data inputs and methodologies;

- k. Ozone Tier 1 or 2 analysis data inputs and methodologies;
- l. Class II Area Preliminary impact analysis, a.k.a Class II significance analysis or SILs analysis;
- m. Significant impact area (SIA), screening nearby source inventories (NAAQS, PSD increment);
- n. Class II Area NAAQS cumulative impact analysis and nearby source inventory;
- o. Class II Area PSD increment cumulative impact analysis and nearby source inventory;
- p. Class I Area PSD Increment preliminary impact screening analysis, a.k.a Class I significance analysis or SILs analysis;
- q. Class I Area Air Quality Related Values (AQRVs)), e.g., visibility and deposition impacts.
- r. Additional impact analysis (growth, soils and vegetation, visibility impairment);

In response to advancements made in the science of air quality dispersion modeling, dispersion models and modeling methodology are revised and updated on a continual basis. To ensure these changes are reflected in the PSD modeling demonstration, the modeling plan is only valid for a period of 90 days from the date of approval. If the modeling analysis is expected to be submitted after the modeling plan expiration date, a protocol “approval extension request” or a revised protocol should be submitted to AQAB.

## 4.0 Single-Source Impact Analysis

The single-source impact analysis (see Appendix W, Section 9.2.3(c)) is conducted to determine if a cumulative impact air quality analysis is needed. The cumulative impact analysis for Class II Areas would typically evaluate the NAAQS and Class II Area PSD Increments. The cumulative impact analysis for Class I Areas would typically evaluate the Class I Area PSD Increments.

The objective of the single-source impact analysis is to determine whether there is any “potential” causes or contributions to a violation of the NAAQS or PSD increments for a given project location and nearby impact area. Thus, the analysis includes assessment of all potential, worst-case emissions and operating scenarios for a proposed project to adequately demonstrate whether the new source or modification could contribute or cause an exceedance of the NAAQS or PSD increments. The single-source impact analysis is the first step in satisfying the regulatory requirements of the “Source impact analysis” under 40 CFR 51.166(k).

## 4.1 Meteorology

Refined models, such as AERMOD use actual meteorological data, hourly or averaged, collected from a pre-determined, representative, National Weather Service (NWS) station, or as part of an on-site data collection program, and can use up to five (5) years of data. In some cases, with AQAB approval, data collected at local universities, FAA sites, military bases, industries, or pollution control agencies may be used. Meteorological data should be selected based on climatological representativeness and the ability of the data to accurately characterize atmospheric transport and dispersion in the location of the facility. The AQAB maintains a list of recommended NWS airport Automated Surface Observing Systems (ASOS) meteorological data sets to be used for refined modeling for each county in NC. The county list, meteorological datasets, and meteorological station profile base elevations are available on the AQAB Meteorological Data web page here: <https://deq.nc.gov/about/divisions/air-quality/air-quality-permits/modeling-meteorology/meteorological-data>

AQAB provides AERMOD-ready five-year meteorological surface and upper-air profile data sets pre-processed by AERMET. The parameters of albedo, Bowen ratio, and surface roughness for each AERMET dataset have been determined by the AQAB via pre-processing of digital landcover data with AERSURFACE and are available upon request.

Any use of on-site (at least 1-year of hourly data) or other alternative meteorological data that has not been processed by the AQAB will require prior review and approval to verify the meteorological data meets the data quality objectives and siting and exposure requirements as discussed and recommended in Appendix W and subsequent references linked [here](#). The AQAB will assist in the selection of surface characteristics to be used in the AERMET meteorological data processing. If solar radiation data and delta-T data are collected on-site, the bulk Richardson method (i.e., ‘BLKRN’) should be specified in AERMET stage 3 processing. The BLKRN method uses solar radiation and delta-T measurements to calculate daytime and nighttime meteorological turbulence parameters, respectively. The data input requirements for AERMET are described in detail in the User’s Guide for the AERMOD Meteorological

Preprocessor (AERMET), EPA-454/B-03-002. This document can be downloaded from the EPA SCRAM web site.

The latest version of AERMET provides added capabilities and options for refining meteorological parameters derived under low-wind, stable conditions. The option for refining horizontal friction velocity under low-wind, stable conditions, or “ADJ\_U\*”, has recently been recommended by EPA as a regulatory option for modeling applications. As such, AQAB has processed AERMET data sets using the ADJ\_U\* option for all NWS stations in the state, and will share these data sets with applicants upon request. Note: use of these alternative, ADJ\_U\* data sets for toxics modeling will require justification. Justifications should demonstrate that model design concentrations are dominated and controlled by stable, low-wind conditions such that application of the ADJ\_U\* option is valid. Contact the AQAB for more information if you wish to utilize the ADJ\_U\* option.

Under certain circumstances (e.g., complex terrain, land-sea breezes, etc.) applicants may choose to develop and apply 3-5 years of prognostic gridded meteorological data (e.g., Weather Research and Forecast (WRF) Model) at a particular site. Using a gridded meteorological dataset will require running the Mesoscale Model Interface Program (MMIF) to generate surface and upper air input files for processing by AERMET. Subsequent processing with AERMET would then provide meteorological inputs to AERMOD. For more guidance on processing prognostic gridded meteorological data with MMIF, please refer to the EPA support page linked [here](#). Performance evaluations of prognostic meteorology and dispersion modeling applications of AERMOD using meteorological datasets processed with MMIF should follow recommendations from EPA guidance documents linked [here](#). Please contact the AQAB before using this method to determine representativeness and validity of gridded meteorological data.

Meteorological datasets developed for long-range transport (LRT) modeling applications (e.g., Lagrangian models such as CALPUFF, SCICHEM, etc., modeling receptors greater than 50 km from the source) should follow recommendations covered in the MMIF guidance documents and Appendix W, as appropriate. Development, performance evaluation, and consultation with EPA Region 4 on such meteorological datasets are beyond the scope of this guidance document. Note that LRT screening techniques for Class I PSD Increment demonstrations do not require alternative model demonstrations as per Appendix W Section 4.2.1. Please contact AQAB to discuss further options for any LRT modeling proposals.

## 4.2 Receptor Grids

Receptor grids may be polar, cartesian, discrete, or any combination thereof with receptors beginning at the facility ambient boundary (e.g., fenceline or other measure that adequately precludes public access) and extending sufficiently outward to identify the maximum impacts from both the onsite and offsite emission sources for each pollutant and pollutant averaging period evaluated. In many cases, the receptor grid is limited to less than 25 kilometers from the facility under review based on short stack heights and the presence of simple or complex terrain. Receptor resolution may vary; however, receptors near the facility fenceline and in the area of maximum impact must be resolved by a spatial resolution of at least 100 meters. If a coarse grid

is used to locate an area of maximum impact, then subsequent “hotspot” grid modeling must be done with 100-meter spacing centered on the locale of the coarse grid maximum impact. The hotspot should cover the area of maximum impact with a buffer distance of at least 1000 meters.

Terrain elevations must be used for all receptors. In most cases the elevation data will be assigned using the USGS elevation data from the National Elevation Database (NED). The old DEMs for NC have a number of documented problems that are corrected in the NED data. The 7.5 minute USGS data with a 30 meter resolution is required unless the AQAB approves an alternative. A USGS terrain database with a denser resolution may be used. In setting site elevations for sources, buildings, and fence-line receptors, adjustments should be made to ensure that known site grading is represented. Absolute values of elevation will differ from different data sources, so they should not be mixed without close scrutiny and manual adjustment; e.g., receptors elevations derived from NED data and on-site source elevations derived from survey map data may require adjustments to ensure consistency and representativeness.

### 4.3 Pollutant Emissions and Worst-Case Operating Conditions

Worst case operating conditions for each source should be used in both Class I and Class II single-source impact analyses for all PSD pollutants and averaging periods under evaluation. A load and operating scenario screening analysis is required to identify the worst-case impacts for emission units that can operate under a variety of fuels and operating loads. All representative loads (e.g., 50%, 75%, and 100%) paired with all fuel combinations are evaluated in the screening analysis to determine the maximum impact emissions scenario selected for each pollutant and averaging period.

Start up and shut down operating scenarios and the operation of auxiliary boilers/equipment must be accounted for when evaluating potential, worst-case operating scenarios. The annual and daily frequency of startup and shut down scenarios should be evaluated to characterize intermittency and whether these scenarios occur frequently enough to contribute to the overall model design value for any given PSD pollutant and averaging period. Emission scenarios from malfunctions should be appropriately identified and discussed, but do not require modeling.

**\*\*\*Evaluation and characterization of startup and shutdown scenarios should be discussed in the pre-application meeting and modeling protocol to avoid delays in DAQ application processing and the modeling review.**

For a new facility, the SIL analysis must evaluate all PSD pollutant worst-case emission rates from all emissions units including the quantifiable fugitive emissions. For major modifications at existing facilities, the SIL analysis must evaluate the worst-case emission rates from all emission units associated with the proposed modification. All modeled emissions and operating scenarios should be discussed during the pre-application meeting and documented in a modeling protocol for approval.

The following two formulas represent the required methodology for calculating hourly allowable emissions increases for short-term and annual SIL modeling demonstrations.

For both a new facility's or a modification project's short-term averaging periods (1-hour, 3-hour, 8-hour and 24-hour), the hourly allowable or potential modeled emission rate is calculated as follows:

$$Q_m = (Q_{wc} - Q_{2yr} * 0.228) - (Q_{5yr} * 0.228)$$

Where:

- Q<sub>m</sub> = modeling emission rate (lb/hr)
- Q<sub>wc</sub> = short-term, worst case allowable or potential emission rate over all scenarios (lb/hr)
- Q<sub>2yr</sub> = 2-year average baseline actual emissions or BAE (tpy)
- 0.228 = conversion factor = 2000lb/ton \* 1year/8760hrs
- Q<sub>5yr</sub> = enforceable actual emissions reductions over the past 5 years (tpy)

For both a new facility's or a modification project's annual averaging periods, the hourly allowable emission rate increase is calculated as follows:

$$Q_m = \left\{ \frac{\sum(Q_{wci} * N_i)}{\sum N_i} - Q_{2yr} * 0.228 \right\} - Q_{5yr} * 0.228$$

Where:

- Q<sub>m</sub> = modeling emission rate (lb/hr)
- Q<sub>wci</sub> = short-term, worst case allowable or potential emission rate for each scenario (lb/hr)
- N<sub>i</sub> = hours of operation for each scenario (Note:  $\sum N_i = 8760$  hours of operation)
- Q<sub>2yr</sub> = 2-year average baseline actual emissions or BAE (tpy)
- 0.228 = conversion factor = 2000lb/ton \* 1year/8760hrs
- Q<sub>5yr</sub> = enforceable actual emissions reductions over the past 5 years (tpy)

Note the lb/hr rates calculated from the formula above should be used for all secondary ozone and PM<sub>2.5</sub> impact screening and cumulative modeling demonstrations. As such, the annualized lb/hr rates calculated for NO<sub>x</sub>, VOCs, and SO<sub>2</sub> (with net emission increases greater than the SERs) may be converted to the tpy rates assuming 2000 lb/ton and 8760 hours/year.

## 4.4 Characterization and Treatment of Intermittent Sources

In general, procedures for characterizing, evaluating, and in some cases, modeling intermittent sources/scenarios are:

- Given operational data supporting < 100 hr/yr, and source/scenario operation will be < 100hr/yr in the future, no modeling is required for short-term or annual models
- 100-500 hr/yr source/scenario operation, modeling refinements are case-by-case
  - If source is truly intermittent (e.g., unplanned scenario, random time of day/year, infrequent year-to-year, nature of source, etc.) based on last ~2 years operational data, use annualized hourly emissions (e.g., lb/hr x 500/8760 op factor) for short-term and annual models
  - Otherwise, use max hourly rate and worst-case stack parameters;
    - in case of emergency engines, model readiness testing emissions using sub-hourly operating factor (e.g., 20min/60min, or 30min/60min) for short-term models; annual models use annualized hourly rate (e.g., lb/hr x 500/8760 op factor)
    - turbines or power boilers model whatever comes out of load analysis for short-term and annual models
- > 500 hr/yr, model using max hourly rate and worst case stack parameters (e.g., for turbines, whatever comes out of load analysis, including startup and shutdown scenarios, oil/gas combustion, etc.)

The procedures listed above are not meant as an exhaustive set of options, but do address AQAB past and current interpretations of EPA guidance on intermittent sources within the context of PSD modeling. In general, sources should be considered intermittent if they do not contribute significantly to the determination that a specific project will exceed a SIL, or if the source would not be expected to cause or contribute to a modeled exceedance of the NAAQS and/or Class I or Class II Area PSD Increments. For further information please see documents available at the EPA webpage on Air Quality Models – Clarification Memos for Dispersion Models linked [here](#), and the EPA March 2011 memo Additional Clarification Regarding Applicability of Appendix W Modeling Guidance for the 1-hour NO<sub>2</sub> NAAQS linked [here](#).

## 4.5 Class II Area Single-Source Impact Analysis

The Class II Area single-source impact analysis evaluates the significant project emissions increase in potential or permitted allowable emissions of a PSD pollutant from a proposed new source, or the significant project net emissions increase in permitted allowable emissions of a PSD pollutant from a proposed modification. The maximum modeled results, High-First-High (H1H), of the single-source impact analysis are compared to the PSD Significant Impact Levels (SILs) as shown in Table 2 to determine whether the applicant must perform a cumulative impact air quality analysis for any PSD pollutant as described in section 6.0.

Table 2. Class II Area Significant Impact Levels ( $\mu\text{g}/\text{m}^3$ )

Pollutant	Averaging Period	SIL ( $\mu\text{g}/\text{m}^3$ )	Model Design Value <sup>a</sup>
SO <sub>2</sub>	1-hour	10 <sup>a</sup>	multi-year average of H1Hs
	3-hour	25	H1H
	24-hour	5	H1H
	Annual	1	H1H
PM <sub>10</sub>	24-hour	5	H1H
	Annual	1	H1H
PM <sub>2.5</sub>	24-hour	1.2 <sup>b</sup>	multi-year average of H1Hs
	Annual	0.3 <sup>b</sup>	multi-year average of H1Hs
NO <sub>2</sub>	1-hour	10 <sup>a</sup>	multi-year average of H1Hs
	Annual	1	H1H
Ozone (O <sub>3</sub> )	8-hour	1 ppb	H1H
CO	1-hour	2,000	H1H
	8-hour	500	H1H
Pb	Rolling 3-month	-- <sup>c</sup>	-- <sup>c</sup>
TSP <sup>d</sup>	24-hour	5	H1H
	Annual	1	H1H

<sup>a</sup> Interim 1-hr SO<sub>2</sub> and NO<sub>2</sub> SILs Established by DAQ memorandum. See NC DAQ web page for memos: <https://deq.nc.gov/about/divisions/air-quality/air-quality-permits/permitting-procedures-memos-guidance>

<sup>b</sup> Taken from 40 CFR 51.165(b)(2). Note that model design values for PM<sub>2.5</sub> must include impacts from primary PM<sub>2.5</sub> plus secondary PM<sub>2.5</sub> formed from SO<sub>2</sub> and NO<sub>2</sub> project allowable emissions increases.

<sup>c</sup> Lead (Pb) impacts for project emissions > 0.6 tpy require a full impact analysis. Monthly mean model design values from facility-wide emission impacts are typically compared with the Pb NAAQS.

<sup>d</sup> TSP is no longer a PSD criteria pollutant and therefore not subject to PSD review; however, TSP is a regulated North Carolina criteria pollutant with a state air quality standard (SAAQS) equal to the pre-1987 TSP NAAQS.

If the highest modeled concentrations are equal to or greater than the SIL, a cumulative impact analysis for the NAAQS and/or increments will be required for the significant impact area (SIA) defined for each pollutant and averaging period. The SIA is typically defined by a circular area with a radius extending out to the most distant point where the modeled concentrations are greater than or equal to the SIL. Given the steady-state assumptions and spatial limits of application of EPA's preferred model, AERMOD, and the extreme unlikelihood that project and nearby source plumes will overlap and impact the same receptor location for any given modeling hour, the SIA for 1-hour PSD pollutants may be limited to the lesser of 25 km or the SIA. Spatial refinements to SIAs for other pollutants and averaging periods may be applied on a case-by-case basis. Refinements to the SIA should be properly discussed and presented in a modeling protocol.

The treatment of NO<sub>2</sub> chemistry may be warranted depending on the Class II Areas and project emission units and operating scenarios being modeled. Please refer to Appendix A for further guidance.

Assessment and evaluation of both primary and secondary PM<sub>2.5</sub> impacts from a proposed project precursor (NO<sub>x</sub> and SO<sub>2</sub>) allowable emission increases must be included in any Class II Area single-source impact analysis, as well as any subsequent cumulative NAAQS and PSD Increment analysis. EPA has developed a Tiered approach for evaluating secondary PM<sub>2.5</sub> impacts from NO<sub>x</sub> and SO<sub>2</sub> project allowable emissions. Tier 1 involves a screening analysis that relies on pre-existing photochemical grid modeling to make science-based extrapolations between precursor emissions at hypothetical sources and secondarily formed PM<sub>2.5</sub> at the PSD project source. This Tier 1 screening analysis is described in greater detail within the EPA April 2019 [Guidance on the Development of Modeled Emission Rates for Precursors \(MERPs\) as a Tier 1 Demonstration Tool for Ozone and PM2.5 under the PSD Permitting Program](#). Please refer to Appendix B for further guidance.

Similar to the Tier 1 MERPs secondary PM<sub>2.5</sub> screening methodologies, secondary ozone impacts from VOCs and NO<sub>x</sub> project allowable emissions greater than the SERs must be evaluated. Please refer to Appendix C for further guidance.

#### 4.6 Class I Area Increment Single-Source Impact Analysis

The Class I Area Increment single-source impact analysis evaluates the significant project emissions increase in potential or permitted allowable emissions of a PSD pollutant from a proposed new source, or the significant project net increase in permitted allowable emissions of a PSD pollutant from a proposed modification. The objective of the analysis is to determine whether a project would cause or contribute to an exceedance of the Class I Increments at Class I Areas located within 300 km of the project. Class I Areas located within 300 km of North Carolina are shown in Table 3.

Table 3. Class I Areas for North Carolina

<b>Class I Area</b>	<b>State</b>	<b>FLM</b>
Linville Gorge National Wilderness Area	NC	USFS
Great Smoky Mountains National Park	NC	NPS
Joyce Kilmer Slickrock National Wilderness Area	NC	USFS
Shining Rock National Wilderness Area	NC	USFS
Swanquarter National Wildlife Refuge	NC	USFWS
Cape Romain National Wildlife Refuge	SC	USFWS
James River Face Wilderness Area	VA	USFS
Cohutta Wilderness Area	GA	USFS

The Class I area SIL levels are shown in Table 4 and represent the de minimis thresholds used to determine if a cumulative Class I Increment analysis is warranted.

Table 4. Class I Area Significant Impact Levels ( $\mu\text{g}/\text{m}^3$ )

<b>Pollutant<sup>a</sup></b>	<b>Averaging Period</b>	<b>SIL (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Model Design Value</b>
SO <sub>2</sub> <sup>b</sup>	3-hour	1	H1H
	24-hour	0.2	H1H
	Annual	0.08	H1H
PM <sub>10</sub> <sup>b</sup>	24-hour	0.32	H1H
	Annual	0.2	H1H
PM <sub>2.5</sub> <sup>c</sup>	24-hour	0.27	H1H
	Annual	0.05	H1H
NO <sub>2</sub> <sup>b</sup>	Annual	0.1	H1H

<sup>a</sup> An air quality analysis is required for projects located within 10 km of a Class I Area where project 24-hour impacts from any criteria or non-criteria pollutant would be greater than 1  $\mu\text{g}/\text{m}^3$ .

<sup>b</sup> Values taken from 1996 proposed rule 61 FR 38249.

<sup>c</sup> Values taken from EPA's Guidance on Significant Impact Levels for Ozone and Fine Particles in the Prevention of Significant Deterioration Permitting Program (April 17, 2018).

### 4.6.1 Class I Area Increment Screening Analysis

EPA has developed a Class I increment screening modeling approach using AERMOD to assess Class I Area impacts: Technical Support Document (TSD) for AERMOD-Based Assessments of Long-Range Transport Impacts for Primary Pollutants - [EPA-454/B-16-007]. The TSD is available at the following EPA webpage linked [here](#). The approach involves a full ring (i.e., 360 degrees) of polar gridded receptors centered and located 50 km from the project location. The polar receptors use 1-degree spacing, and ground elevations and hill height scales as calculated by AERMAP. The maximum modeled results at these receptors (i.e., High-First-High (H1H)) are compared to Class I SILs as shown in Table 4 to determine whether the applicant must perform a cumulative impact air quality analysis for Class I Increment. As such, any impacts greater than or equal to the Class I SILs require a cumulative impact analysis for Class I Increments as discussed in Section 6.2.

Where the screening approach with AERMOD shows project impacts equal or exceed Class I SILs, a screening approach with a non-steady-state Lagrangian model (e.g., SCICHEM or CALPUFF) may be applied on a case-by-case basis in consultation with DAQ and EPA Region 4. A separate long-range transport modeling protocol (beyond the scope of this PSD modeling guidance document) will be required to address methodologies and development of the terrain, meteorology, chemistry, secondary PM<sub>2.5</sub> formation precursor emissions, emissions speciation profiles, and post-processing refinements, etc., needed for any Lagrangian modeling effort. This screening approach with a Lagrangian model does not require an alternative modeling demonstration (i.e., Appendix W Section 4.2); however, should the modeled impacts equal or exceed any Class I SILs at any nearby Class I Area, a cumulative Class I Area Increments modeling demonstration will be required. Only the cumulative Class I Area Increments modeling demonstration is required to provide an alternative modeling demonstration (e.g., model performance evaluation, peer review articles, etc.) in addition to the modeling analysis itself. The Class I Area screening modeling with a Lagrangian modeling system requires only consultation with DAQ and EPA Region 4.

Similar to the Class II area single-source impact analysis, NO<sub>x</sub> chemistry treatments available in AERMOD may be applied to the Class I area single-source impact analysis. The same requirements for application of AERMOD NO<sub>x</sub> chemistry options and parameters still apply. Please refer to the discussion in Appendix A for further guidance.

Assessment and evaluation of both primary and secondary PM<sub>2.5</sub> impacts from a proposed project precursor (NO<sub>x</sub> and SO<sub>2</sub>) allowable emission increases must be included in any Class I Area single-source impact analysis, as well as any subsequent cumulative NAAQS and PSD Increment analysis. Please refer to Appendix B for further guidance. Secondary PM<sub>2.5</sub> impacts from the project must be represented in the total PM<sub>2.5</sub> impacts compared to the Class I SILs. In some cases, it may be necessary to refine the secondary PM<sub>2.5</sub> impacts to represent the decrease in secondary PM<sub>2.5</sub> formation with downwind distance from a project source location. EPA provides data access to secondary PM<sub>2.5</sub> impacts for MERPs hypothetical sources (representative of a project source) as a function of distance and SO<sub>2</sub> or NO<sub>x</sub> emissions via a web application called MERPs VIEW Qlik applications and linked [here](#). The secondary PM<sub>2.5</sub> impacts at 50-km

in most cases are refined to eliminate overly conservative bias, and when added to the primary PM<sub>2.5</sub> impacts predicted by AERMOD at 50-km the total PM<sub>2.5</sub> impacts are more spatially representative, albeit still conservative, of the chemico-physical and temporal (i.e., 24-hour and annual) characterization of the single-source impact on Class I areas under evaluation.

Note that any project located within 10 km of a Class I Area where 24-hour impacts from any criteria or non-criteria pollutant would be greater than 1 µg/m<sup>3</sup> will require a separate refined analysis (40 CFR 51.166 (b)(23)(iii)). Please consult with DAQ on the details of this analysis which is beyond the scope of this guidance.

#### 4.6.2 Class I Area Emissions and Worst-Case Operating Conditions

The methodology and selection of the worst-case allowable emission increases and worst-case operating conditions used in the Class I Area single-source impact analysis are the same as those applicable to the Class II Area single-source impact analysis. Please refer to the discussion in Section 4.3. In general, most projects rely on maximum allowable emission increases under a normal operating scenario to demonstrate project impacts are below Class I SILs. All modeled emissions and scenarios should be discussed during the pre-application meeting and documented in a modeling protocol as well as the final modeling report of the PSD application.

Note the lb/hr rates calculated for annual averaging periods discussed in Section 4.3 should be used for all secondary ozone and PM<sub>2.5</sub> impact screening and cumulative modeling demonstrations. As such, the annualized lb/hr rates calculated for NO<sub>x</sub>, VOCs, and SO<sub>2</sub> (with net emission increases greater than the SERs) may be converted to the tpy rates assuming 2000 lb/ton and 8760 hours/year.

#### 4.7 Class I Area AQRV Single-Source Impact Analysis

All facilities undergoing PSD review in North Carolina must consider their potential impacts on one or more of the eight Federal Class I areas identified in Table 3. The appropriate Federal Land Manager (FLM) is contacted during or shortly after the initial PSD pre-application meeting to evaluate the need for a Class I Air Quality Related Value (AQRV) air quality analysis (visibility and deposition). The FLMs will typically request evaluation of visibility and deposition AQRV impacts if they believe the project emissions and distance from the respective Class I area warrant an AQRV impact assessment. As such, it is the responsibility of the PSD applicant to provide the FLMs (and DAQ) with accurate estimates of project allowable emission increases during the pre-application meeting to ensure that there is adequate information available to determine if a refined AQRV analysis is warranted. If the FLM does not request an AQRV analysis, DAQ will not request any further Class I evaluation of AQRVs. However, DAQ requires a separate single-source impact analysis of the Class I Increments (40 CFR 51.166(c)), as discussed in Section 4.7.

The Class I AQRV analysis requirements will be discussed during the PSD pre-application meeting and finalized after consultation with the applicable FLM(s). Note: DAQ requests applicants coordinate all FLM related discussions through DAQ and not directly with the FLM.

#### 4.7.1 Air Quality Related Values (AQRVs) Screening Analysis

The AQRV screening analysis methodology is taken from the revised 2010 FLM AQRV Work Group Phase I Report listed on the NPS webpage linked [here](#). The screening analysis involves calculating the ratio of total AQRV project allowable emissions,  $Q$  (tpy), to the distance,  $D$  (km), from a particular Class I Area, and comparison to a significance value of 10 to determine whether project impacts are significant. In general, project impacts screened in terms of  $Q/D$  that are less than or equal to 10 do not require a refined AQRV analysis and would not be considered to cause or contribute to AQRV impairments. AQRV project allowable emissions,  $Q$ , include the sum of annualized max daily totals from the following pollutants:  $SO_2$ ,  $NO_x$ ,  $PM_{10}$ , and  $H_2SO_4$ . The AQRV screening analysis does not apply to project impacts that would occur at a Class I Area located less than 50 km from the project; those project impacts would require a refined AQRV analysis. A refined AQRV analysis requires development of a non-steady state, chemico-physical, long-range transport modeling analysis using a Lagrangian (e.g., CALPUFF, SCICHEM) or photochemical model (e.g., CMAQ, CAMX) to predict project impacts on AQRVs at each Class I Area located within 300 km from the project location. Further details on the refined AQRV analysis are discussed in Section 7.0.

## 5.0 Additional Impacts Analysis

All PSD permit applicants are required to conduct an additional impacts analyses for each pollutant subject to PSD that will be emitted by the proposed new or modified sources. The additional impact analysis assesses the impacts of air, ground and water pollution on soils, vegetation, and visibility caused by any increase in emissions of any regulated pollutant from the source or modification under review, and from associated growth.

The additional impacts analysis generally has three parts, as follows:

- (1) growth;
- (2) soils and vegetation;
- (3) visibility impairment.

Each are briefly described below. Specific guidance, references, and examples can be found in the EPA New Source Review Manual, (DRAFT, October 1990).

### 5.1 Growth

A projection of the associated industrial, commercial, and residential source growth that will occur in the area due to the source and an estimate of the air emissions generated by this growth. Significant increases in human population and associated activities (e.g. road traffic, other industrial growth, etc.) may contribute to airshed pollution. The net growth in population and ancillary support activities should be quantified and discussed.

### 5.2 Soils and Vegetation

The analysis of soil and vegetation air pollution impacts should be based on an inventory of the soil and vegetation types found in the impact area. This inventory should include all vegetation with any commercial or recreational value, and may be available from conservation groups, State agencies, and universities. EPA document 450/2-81-078, "A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals" provides more specific guidance, screening procedures, pollutant sensitivities, etc., and is available on the EPA National Service Center for Environmental Publications (NSCEP) website linked [here](#).

### 5.3 Visibility Impairment

The visibility impairment analysis evaluates the impacts that occur within the SIA and is **distinct from the Class I area visibility analysis requirement**. The visibility impairment analysis consists of a Level I, Level II, or Level III screening procedure using the VISCREEN or PLUVUE II model. If the Level I analysis indicates a potential visibility impairment, a Level II analysis is then conducted and, if necessary, a Level III analysis. The EPA document, Workbook for Plume Visual Impact Screening and Analysis will provide more specific guidance and examples and is available on the EPA National Service Center for Environmental Publications (NSCEP) website linked [here](#).

## 6.0 Cumulative Impact Air Quality Analysis

A cumulative impact air quality analysis consists of modeling demonstrations for the NAAQS and PSD increments and includes emissions from the proposed PSD source(s) or source modifications, all existing on-site sources, nearby sources, and for the NAAQS analysis, representative background concentrations. A cumulative impact air quality analysis is required for each pollutant and averaging period where the Class II or Class I Area single source impact analysis demonstration shows that impacts from project allowable emission increases are equal to or greater than the Class II and/or Class I SILs. On a case-by-case basis, DAQ may in certain permitting situations require a cumulative impact analysis in the case of, for example, historically modeled NAAQS exceedances at a major source, or in the case that there is reasonable doubt that a major source can demonstrate compliance with the NAAQS or PSD Increments.

### 6.1 Class II Areas

Developing and refining the PSD facility's modeling analysis for the Class II Area cumulative impact analysis for NAAQS and increment analyses generally requires the development of the facility's permitted allowable emissions inventory, spatial and temporal assumptions for addressing chemistry (e.g., urban SO<sub>2</sub> half-life, NO<sub>x</sub> conversion to NO<sub>2</sub>, etc.) and secondary formation (e.g., PM<sub>2.5</sub> and ozone). In addition to the PSD facility's impact, the cumulative impact analysis requires the development of a nearby source emissions inventory for modeling and the establishment of procedures for combining model and monitor design values to compare with NAAQS and PSD increments. The following sections discuss these topics in more detail as they pertain to Class II Areas.

#### 6.1.1 NAAQS Emissions Inventory and Source Parameters

All existing and proposed PSD facility permitted emission units and fugitive sources of the applicable PSD criteria pollutant must be modeled. The emission rates must reflect the maximum allowable emissions and potential worst-case operating conditions as expressed by the federally enforceable permitted emissions limit, operating level, and operating factor for each applicable pollutant and averaging time. Note that operating levels less than 100 percent of capacity may also need to be modeled where differences in stack parameters associated with various operating levels could result in higher ground level concentrations. Additionally, NC requires modeling of facility-wide TSP emissions (i.e. less than 100 micron size particles; TSP project allowable emissions increases greater than 25 tpy) as a part of the state SAAQS demonstration. The SAAQS demonstration is not necessary if all particulate emissions fall into the more conservative PM<sub>10</sub> size category.

In general, all nearby sources within the SIA and their associated maximum potential or allowable emissions must be included in the modeling. Please see Appendix D for further guidance and instructions on developing and refining the NAAQS nearby source inventory.

Given the steady-state assumptions and spatial limits of application of EPA's preferred model, AERMOD, and the extreme unlikelihood that project and nearby source plumes will overlap and impact the same receptor location for any given modeling hour, the nearby source inventories for 1-hour PSD pollutants may be limited to those permitted sources located within a maximum distance of 25 km or less from the project.

### 6.1.2 Increment Emissions and Source Parameters

All project facility emissions of the PSD criteria pollutants subject to PSD and for which PSD increments have been established (PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, and NO<sub>2</sub>) must be evaluated to determine the individual source emissions that consume increment and to include these sources in the PSD increment modeling analysis for any affected baseline area. Baseline areas in NC are typically tracked on a county-wide basis, but for any given project may include adjacent counties where project impacts are equal to or greater than the annual PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, or NO<sub>2</sub> SIL. All actual emission increases and/or decreases associated with modifications associated at major stationary sources occurring after the major source baseline date (MSBD) consume and/or expand increment in the baseline area. The MSBDs were established by EPA rule on Jan 6, 1975 for PM<sub>10</sub> and SO<sub>2</sub>, and Feb 8, 1988 for NO<sub>2</sub>, and October 20, 2010 for PM<sub>2.5</sub>. Additionally, actual emission increases from all major and minor sources associated with modifications that have occurred since the Minor Source Baseline Date (MiSBD) was established for the county in which the PSD application is being submitted must be modeled. A list of the MiSBDs by county is provided on the DAQ website at <https://deq.nc.gov/about/divisions/air-quality/air-quality-permits/nsr-permitting>. The modeled emission rates for each source must reflect the actual operating conditions actual operating level, and actual operating factor for each applicable pollutant and averaging period, as applicable. Note: operating levels less than 100 percent of capacity may also need to be modeled where differences in stack parameters associated with the lower operating levels could result in higher ground level concentrations. Note if actual emissions increase estimates are unavailable, potential and/or allowable emissions increases shall be modeled.

Contact AQAB to obtain an initial draft of increment inventory sources. Please see Appendix D for specific guidance and instructions on developing PSD increment nearby source inventories for the affected baseline areas and applicable pollutants.

### 6.1.3 Class II Area NAAQS and Increments

Each criteria pollutant and evaluation period requires a specific modeled impact (e.g., H1H, H2H, etc.) for comparison to the appropriate NAAQS and increment. Tables 5 and 6 display the appropriate NAAQS and increment, respectively, as well as the specific model design value for each PSD pollutant and averaging period.

Table 5. Class II Area NAAQS ( $\mu\text{g}/\text{m}^3$ )

Pollutant	Averaging Period	NAAQS (ppb)	NAAQS ( $\mu\text{g}/\text{m}^3$ )	Model Design Value <sup>a</sup>	Background Concentration Monitor Design Value <sup>b</sup>
SO <sub>2</sub>	1-hour	75	196	multi-year H4H	3-year 99%-tile daily max, or 3-year mean of H2H season-hourly varying
	3-hour	500	1,300	H2H	H2H
	24-hour	--	--	--	--
	Annual	--	--	--	--
PM <sub>10</sub>	24-hour	--	150	5-year H6H or 1-year H2H	3-year H2H
	Annual	--	--	--	--
PM <sub>2.5</sub>	24-hour	--	35	multi-year H8H	3-year mean of annual 98%-tile, or 3-year mean of H2H seasonally varying
	Annual	--	12	multi-year H1H	3-year mean
NO <sub>2</sub>	1-hour	100	188	multi-year H8H	3-year mean of annual 98%-tile daily max, or 3-year mean of H3H season-hourly varying
	Annual	53	100	H1H	1-year mean
Ozone (O <sub>3</sub> )	8-hour	75	137.3	multi-year H4H	3-year mean H4H daily max
CO	1-hour		40,000	H2H	H2H
	8-hour		10,000	H2H	H2H
Pb	Rolling 3-month		0.15	1-month H1H or 3-month rolling H1H	3-year H1H 3-month rolling mean
TSP <sup>b</sup>	24-hour		5	H1H	3-year H2H
	Annual		1	H1H	1-year mean

<sup>a</sup> Design values based on maximum model concentrations for the highest-nth-highest value predicted at any model receptor location for any given or specified range of 1-year to 5-year meteorological database periods.

<sup>b</sup> See 40 CFR 50 and 40 CFR 58 for NAAQS monitoring design values. For 1-hour SO<sub>2</sub> and NO<sub>2</sub>, and 24-hour and annual PM<sub>2.5</sub>, please see applicable guidance and clarification memos provided by EPA: <https://www.epa.gov/scram/clean-air-act-permit-modeling-guidance>

Table 6. Class II Area Increments ( $\mu\text{g}/\text{m}^3$ )

<b>Pollutant</b>	<b>Averaging Period</b>	<b>Increment<sup>a</sup> (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Model Design Value<sup>b</sup></b>
SO <sub>2</sub>	3-hour	512	H2H
	24-hour	91	H2H
	Annual	20	H1H
PM <sub>10</sub>	24-hour	30	H2H
	Annual	17	H1H
PM <sub>2.5</sub>	24-hour	9	H2H
	Annual	4	H1H
NO <sub>2</sub>	Annual	25	H1H

<sup>a</sup> See 40 CFR 51.166 for Class II Area maximum allowable increase (aka, increment).

<sup>b</sup> Design values based on maximum model concentrations from each year for the highest-nth-highest value predicted at any model receptor location for any given or specified range of 1-year to 5-year meteorological database periods.

## 6.2 Class I Areas

PSD regulations require a single-source impact analysis be conducted for all new major sources or major modification project sources with the potential for air quality impacts on a Class I area. As such, any single-source impact demonstration showing that project allowable emission increases would result in modeled impacts equal to or greater than the Class I SILs requires a Class I Area cumulative impact modeling analysis. Execution of the project PSD facility's modeling analysis for the Class I Area cumulative impact analysis generally requires the development of the facility's actual and allowable emissions inventory, long-range transport dispersion assumptions, spatial and temporal assumptions for addressing chemistry (e.g., urban SO<sub>2</sub> half-life, NO<sub>x</sub> conversion to NO<sub>2</sub>, etc.) and secondary formation (e.g., PM<sub>2.5</sub>). In addition to the PSD facility's impact, the cumulative impact analysis requires the development of a Class I Area increment near-by source emissions inventory for modeling and comparison of cumulative impacts at each affected Class I Area to the PSD increments. EPA defines all proposed major sources or major modifications within 50 km to 300 km of a Class I area as those with the potential for air quality impacts on a Class I area. There are five Class I areas (see Table 3) within North Carolina and one each in South Carolina, Virginia, and Georgia that may be impacted by PSD sources in North Carolina.

The Class I areas are managed by the U.S. Forest Service (USFS), the National Park Service (NPS), or the U.S. Fish and Wildlife Service (USFWS). All Class I area AQRV air quality analyses are coordinated with the appropriate FLM. However, Class I increment analyses are regulated under the NC DAQ State Implementation Plan for NSR, and therefore, all Class I increment analyses are approved by NC DAQ in consultation with EPA Region 4.

## 6.2.1 Increment Analysis

Class I increments have been established for PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, and NO<sub>2</sub> and are listed in Table 7. These represent the maximum increases in ambient pollutant concentrations allowed over baseline concentrations.

Table 7. Class I Area Increments (µg/m<sup>3</sup>)

<b>Pollutant</b>	<b>Averaging Period</b>	<b>Increment<sup>a</sup> (µg/m<sup>3</sup>)</b>	<b>Model Design Value<sup>b</sup></b>
SO <sub>2</sub>	3-hour	25	H2H
	24-hour	5	H2H
	Annual	2	H1H
PM <sub>10</sub>	24-hour	8	H2H
	Annual	4	H1H
PM <sub>2.5</sub>	24-hour	2	H2H
	Annual	1	H1H
NO <sub>2</sub>	Annual	2.5	H1H

<sup>a</sup> See 40 CFR 51.166 for Class I Area maximum allowable increase (aka, increment).

<sup>b</sup> Design values based on maximum model concentrations for the highest-nth-highest value predicted at any model receptor location for any given year from the range of 1-year to 5-year meteorological database periods modeled.

The PM<sub>2.5</sub> Class I increment analysis may rely on the MERPs or the same long-range transport (LRT) modeling (e.g., CALPUFF or SCICHEM) used for the AQRV analysis. Both the MERPs and LRT solutions to demonstrating protection of the PM<sub>2.5</sub> Class I increments are considered appropriate and equivalent modeling methods under Appendix W. LRT modeling requires consultation with EPA Region 4 to determine the scope of regulatory application, modeling options, and any model performance evaluation demonstration criteria. LRT modeling using no chemistry with CALPUFF or SCICHEM will require minimal Region 4 consultation, whereas LRT modeling with chemistry options enabled (e.g., CALPUF MESO-PUFF II or SCICHEM Carbon-Bond 6 chemistry) will require an alternative modeling demonstration as per Appendix W Section 3.2 Alternative Models.

For assessing secondary PM<sub>2.5</sub> impacts (e.g., SO<sub>2</sub> converted to sulfate particles, and NO<sub>x</sub> converted nitrate particles), the MERPs impacts as derived from a representative hypothetical source may be used and added to the primary PM<sub>2.5</sub> impacts as predicted with AERMOD at 50 km. Secondary PM<sub>2.5</sub> impacts may be spatially refined based on distance versus secondary PM<sub>2.5</sub> maximum concentrations as derived from the representative MERPs hypothetical source. Please see Appendix B for related guidance on secondary PM<sub>2.5</sub>.

## 7.0 AQRV Analysis

Air Quality Related Values (AQRVs) include air quality impact indicators such as acid deposition and visibility degradation. The FLM for each Class I area of concern is responsible for specifying which AQRV(s) must be evaluated. These are determined during initial conversations with the appropriate FLMs following the pre-application meeting as well as following any revisions to project emissions estimates after the application is submitted.

### 7.1 Acid Deposition Analysis / Deposition Thresholds

Estimates of atmospheric deposition are obtained by selecting the options in CALPUFF to calculate and output the wet and dry fluxes of the pollutants modeled. The units of the fluxes are in  $\text{g/m}^2/\text{s}$  of the pollutant modeled (e.g.,  $\text{g/m}^2/\text{s}$  of  $\text{HNO}_x$ ). Generally, AQRV analyses require values of total deposition (background plus modeled impact) to be given in units of  $\text{kg/ha/yr}$  of an element, such as nitrogen (N) or sulfur (S). Therefore, the modeled deposition flux of each of the oxides of sulfur or nitrogen from CALPUFF must be adjusted for the difference of the molecular weight of their oxides and the element and the various forms must be summed to yield a total deposition of sulfur or nitrogen. This is accomplished using multipliers in a post-processor, POSTUTIL, to do all of the conversions, as follows: The CALPOST program will produce an average flux (i.e., annual average), therefore, the average value must be multiplied by the number of seconds in an hour and the total number of hours used in the averaging period for the total deposition. The wet and dry fluxes of  $\text{SO}_2$ ,  $\text{SO}_4$ ,  $\text{NO}_x$ ,  $\text{HNO}_x$ , and  $\text{NO}_3$  need to be calculated and saved in a CALPUFF run. POSTUTIL is then used to process the CALPUFF-generated wet and dry fluxes. POSTUTIL repartitions nitric acid/nitrate based on total available sulfate and ammonia. Each species is normalized by the molecular weight of a common compound or element (usually S or N), output units are converted, and adjustments are made for the total number of averaging periods used in the CALPOST run (i.e., 8760 for 1 year). Finally, CALPOST, in addition to providing output concentrations and visibility calculations, is used to provide summarize both wet and dry total calculation fluxes.

Both the National Parks Service and the U.S. Forest Service have established deposition thresholds at Class I Areas under their respective control. The approach used by each agency to establish the thresholds differs remarkably; however, both agencies have established a deposition threshold value of  $0.01 \text{ kg/ha/yr}$  for both sulfur and nitrogen.

Deposition values obtained from CALPUFF model output should be compared to the established threshold for each Class 1 area of concern. If either the sulfur or nitrogen deposition values exceed the  $0.01 \text{ kg/ha/yr}$  threshold, the FLM may require further evaluation of deposition impacts at the affected Class 1 area.

### 7.2 Visibility Analysis

Applicants may be required to demonstrate that visibility at nearby Class 1 areas is not degraded beyond an acceptable level by emissions from a proposed project. Nearby implies any Class I area within which the FLM expresses a concern with possible visibility degradation.

For Class 1 areas located more than 50 kilometers from the subject facility, the latest EPA-approved version of the CALPUFF modeling system (CALPUFF, CALMET, and CALPOST) should be used to compute the maximum 24-hour light extinction that is expected due to proposed emissions from the source facility. If the project-related change in extinction (commonly referred to as “delta-dv”) is less than 5% ( $\text{delta-dv} < 0.5$ ), then the project’s regional haze impact is usually judged to be insignificant and no further analysis is required. If the delta-dv is greater than 0.5, but less than 1.0, the FLMs may take into account the number of days the 0.5 delta-dv threshold is exceeded.

The FLAG guidance document (FLAG 2010 Phase 1 Report) should be followed when conducting the regional haze analysis. A 3-year MM5 CALPUFF-ready meteorological dataset with 4-km resolution is available from DAQ upon request and is preferred by the FLMs for regional haze analyses. The MM5 dataset (sub-domain 5) has already been processed with CALMET and is prepared for direct input to CALPUFF. CALPUFF should be run for each of the 3 years of MM5 data and then CALPOST should be used to calculate changes in deciview for each year. DAQ should be contacted on the appropriate method for determining which values (i.e. coefficients) to use for background light extinction. Coefficients based on “natural conditions” are currently preferred by the FLMs and can be found in the document “Guidance for Estimating Natural Visibility Conditions under the Regional Haze Rule” (EPA-454/B-03-005, Rev. September 2003). Coefficients can also be determined using data from the 20% cleanest days collected at IMPROVE monitoring sites; however, this method is discouraged by the FLMs and will likely generate an FLM regional haze analysis “deficiency” comment.

Specific model options should be set as follows:

- MVISBK = 2 in CALPOST (Note Method 6 using speciated PM measurements can also be used as a refinement to Method 2 if the speciated data is available)
- RHMAX = 95% in CALPOST
- MNITRATE = 1 in POSTUTIL

A more detailed discussion and description of these and other model options can be found in the “CALPUFF User’s Guide” available at [www.src.com](http://www.src.com).

Maximum delta-dv values at each Class I area are obtained from the CALPOST .lst files and should be listed in a table that shows the maximum delta-dv and the number of days, if any, that the 0.5 or 1.0 threshold is exceeded.

## 8.0 Air Quality Modeling Report

The PSD modeling report is generally included as a part of the PSD permit application that is submitted to the DAQ permits section; however, since the modeling is reviewed by the AQAB, the modeling report should be a stand-alone report and should contain all the necessary documentation (e.g., site maps, survey, etc.) to allow for an independent review of the compliance demonstration. Although the length and detail of the modeling report is dictated by the complexity and scope of the modeling effort, each report should include a discussion (models, modeling methodology and assumptions, emissions, results, etc.) of the topics listed in the modeling protocol (see Section 3.2) and which were identified as a modeling requirement during the PSD pre-application meeting.

## Appendix A – Treatment of NO<sub>2</sub> Chemistry with AERMOD

The treatment of NO<sub>2</sub> chemistry may be warranted depending on the Class I and Class II Areas and project emission units and operating scenarios being modeled. According to various EPA guidance documents and supporting studies, and due to NO<sub>x</sub> combustion chemistry, hourly NO<sub>2</sub> emissions from combustion sources contribute to 50% or less of the total NO<sub>x</sub> emissions for any given fuel or combustion source type. Additionally, once NO<sub>x</sub> emissions are far enough downwind from the combustion source and have had enough time to mix and interact with the atmosphere, daytime photochemistry and oxidation reactions convert 90% or more of available NO in the NO<sub>x</sub> plume to NO<sub>2</sub>. The conversion of NO<sub>x</sub> emissions to NO<sub>2</sub> via these combustion and atmospheric chemical reactions occurs relatively quickly on the order of 10 minutes, and therefore, can be approximated using hourly meteorology and a steady-state dispersion model such as AERMOD. As such, EPA has developed guidance and modeling procedures (AERMOD) for refining hourly NO<sub>2</sub> modeled impacts that more accurately represent NO<sub>x</sub> converted to NO<sub>2</sub> based on NO<sub>2</sub>/NO<sub>x</sub> in-stack ratios (i.e., 50% default) and NO<sub>2</sub>/NO<sub>x</sub> atmospheric equilibrium ratios (i.e., 90% default). All details of these EPA modeling methodologies and procedures are beyond the scope of this PSD modeling guidance, but will be briefly discussed here in general terms to list what will be required by DAQ for any NO<sub>2</sub> single-source impact modeling analysis.

EPA has established a 3-step Tier system for addressing chemistry in NO<sub>2</sub> regulatory modeling applications. Tier 1 assumes 100% of all NO<sub>x</sub> emissions are converted to NO<sub>2</sub> impacts as modeled with AERMOD. Tier 2 assumes NO<sub>x</sub> emissions converted to NO<sub>2</sub> impacts are based on a polynomial equation developed by EPA from ambient data and implemented in AERMOD by specifying the “ARM” or ambient ratio method keyword under the control block section of the AERMOD runstream input file. Both Tier 1 and 2 approaches require no justifications given that EPA has recommended these as regulatory default options in AERMOD and under section 4.2.3.4 of Appendix W. The Tier 3 approach requires the applicant to make several case-by-case assumptions pertaining to characterization of the emission source(s) and oxidation of NO<sub>x</sub> emissions by ozone. Thus, the applicant would evaluate all available in-stack NO<sub>2</sub>/NO<sub>x</sub> ratio data available from EPA or stack testing to determine a representative value for a given emission unit and operating scenario. Then the applicant would compile hourly, seasonal, or annual ozone design values from an available PSD-quality, representative (or conservative) ozone collection station to be paired with the hourly meteorology in AERMOD. Further, the applicant would select, propose and justify the AERMOD NO<sub>2</sub> chemistry option using either Plume Volume Molar Ratio Method (PVMRM) or Ozone Limiting Method (OLM). The applicant is required to submit via email, or under separate hard copy, the entire Tier 3 modeling approach, in-stack NO<sub>2</sub>/NO<sub>x</sub> data and selections, and all ozone data and any wintertime and summertime data substitution routines. DAQ will review the Tier 3 modeling package and consult with EPA Region 4 to evaluate and approve the modeling methodology and selected data assumptions.

More information on the details of the Tier 1, 2, and 3 NO<sub>2</sub> modeling options are available in Appendix W and on EPA's SCRAM webpages here:

[https://www3.epa.gov/ttn/scram/appendix\\_w-2016.htm](https://www3.epa.gov/ttn/scram/appendix_w-2016.htm)

[https://www3.epa.gov/scram001/no2\\_isr\\_database.htm](https://www3.epa.gov/scram001/no2_isr_database.htm)

<https://www.epa.gov/scram/air-quality-models-clarification-memos-dispersion-models>

[https://www3.epa.gov/ttn/scram/guidance/clarification/NO2\\_Clarification\\_Memo-20140930.pdf](https://www3.epa.gov/ttn/scram/guidance/clarification/NO2_Clarification_Memo-20140930.pdf)

Selection of the Tier 1, 2, or 3 option is left to the applicant when developing methodologies for both the single-source impact analysis as well as any subsequent NAAQS and PSD Increment cumulative impact analysis. The more conservative Tiers 1 and 2 are recommended for the Class I and Class II single-source impact analysis and establishing the 1-hour and annual NO<sub>2</sub> SIA, whereas Tier 3 using AERMOD NO<sub>2</sub> chemistry options should be reserved for the more refined cumulative impact analysis. Based on EPA guidance and Tier 3 model evaluations, the PVMRM Tier 3 option is typically applied to single isolated sources and the OLM Tier 3 option is typically applied for multi-source modeling demonstrations.

## Appendix B – Secondary PM<sub>2.5</sub> Formation from SO<sub>2</sub> and NO<sub>x</sub>

Assessment and evaluation of both primary and secondary PM<sub>2.5</sub> impacts from a proposed project must be included in any Class I and Class II Area single-source impact analysis, as well as any subsequent cumulative NAAQS and PSD Increment analysis. Primary and secondary PM<sub>2.5</sub> impacts should be assessed only for those PSD pollutants (i.e., PM<sub>2.5</sub> primary, NO<sub>x</sub>, and SO<sub>2</sub>) where project emissions increases are greater than the SERs. As such, where only primary PM<sub>2.5</sub> project emissions are greater than the 10 tpy SER, only primary PM<sub>2.5</sub> impacts should be evaluated. Where primary PM<sub>2.5</sub> project emissions are above 10 tpy and the project emissions are greater than the 40 tpy SERs for NO<sub>x</sub> and/or SO<sub>2</sub>, both primary and secondary PM<sub>2.5</sub> impacts from allowable emission increases in PM<sub>2.5</sub> and NO<sub>x</sub> and/or SO<sub>2</sub> should be assessed as part of the single-source impact analysis. Note the project emissions increases used in the PSD applicability determinations may differ from the allowable emissions increases required for evaluation under the single-source impact analysis and cumulative impact analysis demonstrations for the NAAQS and PSD Increments. For further details please refer to the EPA DRAFT Guidance for Ozone and Fine Particulate Matter Permit Modeling (February 2020, EPA EPA-457/P-20-002). The draft guidance can be found on the EPA webpage linked [here](#).

EPA has developed a Tiered approach for evaluating secondary PM<sub>2.5</sub> impacts from NO<sub>x</sub> and SO<sub>2</sub> project allowable emissions. A Tier 1 demonstration is a screening analysis that requires less effort and is based on extrapolation of defensible, existing photochemical grid modeling, and is discussed here. A Tier 2 demonstration is a more demanding and refined modeling analysis that requires development of a photochemical grid modeling application including meteorological gridded fields, speciated and temporalized emissions for project and nearby sources, chemistry and physics options, and performance evaluations of both the meteorological and photochemical modeling results. The Tier 2 option would require consultation from EPA Region 4 and a photochemical modeling protocol separate from the PSD modeling protocol typically submitted to DAQ for other PSD pollutants analyzed with the AERMOD modeling system. Further details on required elements (e.g., model performance evaluations, etc.) of Tier 2 photochemical modeling for PM<sub>2.5</sub> can be found on the EPA SCRAM website and Appendix W.

Tier 1 screening analysis for secondary PM<sub>2.5</sub> is described in greater detail within the EPA April 2019 [Guidance on the Development of Modeled Emission Rates for Precursors \(MERPs\) as a Tier 1 Demonstration Tool for Ozone and PM<sub>2.5</sub> under the PSD Permitting Program](#). Based on this EPA guidance, project impacts on secondary PM<sub>2.5</sub> can be screened for significant impacts (using PM<sub>2.5</sub> SILs) in terms of annual allowable emission increases (tpy) of any combination of the total impacts from NO<sub>x</sub>, SO<sub>2</sub>, and primary PM<sub>2.5</sub>. Project annual allowable emission increases can be compared to MERPs values based on conservatism and representativeness for a particular project site location, regional emissions profiles, and the regional photochemical environment. Where project impacts are less than a MERP value or less than one for a summation of MERP ratio values (e.g., NO<sub>x</sub>/MERP + SO<sub>2</sub>/MERP + PM<sub>2.5</sub>/SIL < 1), the project

has demonstrated that impacts would not cause or contribute to an exceedance of the NAAQS and PSD Increments.

For project impacts that are greater than or equal to the MERPs emission thresholds (tpy), a refinement to the Tier 1 screening analysis may be made using primary PM<sub>2.5</sub> impacts from AERMOD modeling, representative background PM<sub>2.5</sub> design values, and secondary impacts as extrapolated from a representative MERPs hypothetical source. Selection of background PM<sub>2.5</sub> and a MERPs hypothetical source should be based on conservatism first and refined according to representativeness second. The applicant should discuss the basis for selection of the background PM<sub>2.5</sub> design values and MERPs hypothetical source in the modeling protocol and PSD application. See EPA's final May 2019 [PM<sub>2.5</sub> Precursor Demonstration Guidance](#) and December 2016 [Guidance on the Use of Models for Assessing the Impacts of Emissions from Single Sources on the Secondarily Formed Pollutants: Ozone and PM<sub>2.5</sub>](#) for further details on demonstrating representativeness of a selected MERPs hypothetical source as well as determining secondary PM<sub>2.5</sub> impacts from pre-existing photochemical modeling databases.

## Appendix C – Secondary Ozone Formation from NO<sub>x</sub> and VOCs

Assessment and evaluation of NO<sub>x</sub> and/or VOCs impacts on secondary ozone formation from a proposed project must be included in the Class II Area single-source impact analysis, as well as any subsequent cumulative NAAQS analysis. Ozone impacts should be assessed only for those PSD pollutants (i.e., NO<sub>x</sub>, and VOCs) where project emissions increases are greater than the SERs (i.e., 40 tpy NO<sub>x</sub> or 40 tpy VOCs). Note the project emissions increases used in the PSD applicability determinations may differ from the allowable emissions increases required for evaluation under the single-source impact analysis and cumulative impact analysis demonstrations for the 8-hour ozone NAAQS.

EPA has developed a Tiered approach for evaluating secondary ozone impacts from NO<sub>x</sub> and VOCs project allowable emissions. Tier 1 is a screening analysis that requires less effort and is based on extrapolation of defensible, existing photochemical grid modeling, and is discussed here. Tier 2 is a more demanding and refined modeling demonstration that requires development of a photochemical grid modeling application including meteorological gridded fields, speciated and temporalized emissions for project and nearby sources, chemistry and physics options, and performance evaluations of both the meteorological and photochemical modeling results. The Tier 2 option would require consultation from EPA Region 4 and a photochemical modeling protocol separate from the PSD modeling protocol typically submitted to DAQ for other PSD pollutants analyzed with the AERMOD modeling system. Further details on required elements (e.g., model performance evaluations, etc.) of Tier 2 photochemical modeling for ozone can be found on the EPA SCRAM website and Appendix W.

Tier 1 screening analysis for secondary ozone is described in greater detail within the EPA April 2019 [Guidance on the Development of Modeled Emission Rates for Precursors \(MERPs\) as a Tier 1 Demonstration Tool for Ozone and PM<sub>2.5</sub> under the PSD Permitting Program](#). Based on this EPA guidance, project impacts on secondary ozone can be screened for significant impacts (using ozone SIL) in terms of annual allowable emission increases (tpy) of any combination of the total impacts from NO<sub>x</sub> and VOCs. Project annual allowable emission increases can be compared to MERPs values based on conservatism and representativeness for a particular project site location, regional emissions profiles, and the regional photochemical environment. Where project impacts are less than a MERP value or less than one for a summation of MERP ratio values (e.g., NO<sub>x</sub>/MERP + VOCs/MERP < 1), the project has demonstrated that impacts would not cause or contribute to an exceedance of the 8-hour ozone NAAQS.

For project impacts that are greater than or equal to the MERPs emission thresholds (tpy), a refinement to the Tier 1 screening analysis may be made using representative background monitor ozone design values and NO<sub>x</sub> and/or VOCs secondary impacts as extrapolated from a representative MERPs hypothetical source. Selection of background ozone design value and a MERPs hypothetical source should be based on conservatism first and refined according to

representativeness second. The applicant should discuss the basis for selection of the background ozone design values and MERPs hypothetical source in the modeling protocol and PSD application. See EPA's December 2016 [Guidance on the Use of Models for Assessing the Impacts of Emissions from Single Sources on the Secondarily Formed Pollutants: Ozone and PM<sub>2.5</sub>](#) for further details on demonstrating representativeness of a selected MERPs hypothetical source as well as determining secondary ozone impacts from pre-existing photochemical modeling databases.

## Appendix D – Nearby Source Inventory Instructions

The following instructions and recommendations apply to development of nearby source inventories provided in an electronic workbook by DAQ to applicants for NAAQS and Class II Area PSD Increment cumulative modeling demonstrations for a specific project location. A preliminary nearby source inventory may be requested by emailing project coordinates (decimal lat/long coordinates accurate to the 1/10,000's decimal place) and a list of relevant PSD pollutants Connie Horne or another AQAB staff member as listed on the following DAQ webpage:

<https://deq.nc.gov/about/divisions/air-quality/air-quality-permits/modeling-meteorology/staff>

General Requirements and Recommendations for Refining NAAQS Nearby Source Inventories in NC:

- All NAAQS demonstrations require modeling or 20D screening of permit allowable emissions from nearby sources based on the most likely and representative normal and appropriate alternative operating scenarios. Nearby source maximum allowable emissions may be adjusted with an appropriate operating factor (e.g., 75% load), as per Appendix W Table 8-2. Please include and document all operating factor adjustments, e.g., based on worst-case fuel, load, batch or continuous operation, etc.
- All nearby sources located within the significant impact area (SIA) shall be modeled for NAAQS.
- Note these attached inventories do not include sources from other state (e.g., South Carolina, Virginia) and local agencies (e.g., Mecklenburg County, Forsythe County, Buncombe County) that may require inclusion depending on distance, emissions, and significant concentration gradients.
- The separate workbook tabs for each pollutant include only actual emissions and will require refinements to ensure all NAAQS modeling is based on representative allowable emissions for each emission unit.
- Impacts from nearby sources located farther than 15 km from the project location may be modeled as a single representative stack and a facility-wide allowable or potential emission rate.
- Assume 100 tpy for all non-Title V sources (e.g., small and synthetic minor) for 20D screening and modeling; apportion and scale 100 tpy amongst facility emission units based on actual emissions provided in the attached emission inventory workbook tabs.
- Do not evaluate or model emergency generators, fire pumps, or other emergency engines, that are greater than 1 kilometer distance from the project ambient boundary.
- For complex Title V facilities (e.g., paper mills, steel mills, etc.) with many sources in the inventory, contact the appropriate DAQ Regional Office Permit Coordinator and request

PTE or permit allowable emissions from the most recent permit application (if available) and/or engineering review. Regional staff may also be able to help with specific pollutant emissions rates for each emission unit at a particular facility of interest.

- If representative of short-term emissions impacts, and applicable, look for PSD avoidance conditions (i.e. 250 tpy cap) in the permit for a particular pollutant. If found, assume 250 tpy for screening and initial modeling, and apportion 250 tpy across individual emission units based on actual emissions from the attached emission inventory workbook. Using 250 tpy as a short-term emission rate for some sources may not be representative for short-term NAAQS modeling demonstration, and therefore, would necessitate modeling max short-term permit allowable hourly emission rates.
- We recommend contacting the DAQ Regional Office Permit Coordinator to discuss inclusion of any new permitted facilities, significant modifications that may be of concern, or if any existing facilities have ceased operation. Facilities that have been permitted but not yet built or not yet operating can be found in the list of all permits on the permitting main page [here](#). New and existing facilities with active permit applications can be found on the same page as well.
- Please include any sources of interest (e.g., large quarries, asphalt plants, etc., for PM modeling or screening), as preferred by the applicant.
- DAQ in most cases does not excluded any TV sources based on permit review of HAPS/VOCs or PSD avoidance facilities in the provided inventory.

#### 1-hour NO<sub>2</sub> or SO<sub>2</sub> NAAQS Inventory Refinements:

- a. Model all permitted sources located within the lesser of 25 km or the significant impact area (SIA); evaluate (model or 20D screening) only Title V sources located outside the SIA but less than 25 km from the project
- b. 25 km is based on  $Q > 20D$ , where  $Q = 2 * 250\text{tpy}$  based on a safety and model bias factor of 2, and 250 tpy is an estimator for a significant source.
- c. Within the screening area (SIA to 25 km), model or screen out using 20D the TV sources
- d. Include additional sources of interest and emission scenarios as indicated by AQAB

#### Annual NO<sub>2</sub> Increment:

- a. Include all increment consuming and expanding sources located within the county-wide baseline area and any of the adjoining counties where project modeled impacts are greater than or equal to the annual SIL, and as provided by DAQ in the nearby source inventory workbook (see PSD tab)
- b. Model all increment consuming emissions since the Major Source Baseline Date (MaSBD) for PSD Major Sources (i.e., construction, increased operations, projects, etc.) and since the Minor Source Baseline Dates (MiSBDs) for all major and minor sources.
- c. Include sources of interest and emission scenarios as indicated by AQAB

### 24-hour and Annual PM2.5 and 24-hour PM10 NAAQS

- a. Assume 100% PM2.5 = PM10
- b. Include all permitted sources located within the lesser of 50 km or the significant impact area (SIA)
- c. Include additional sources of interest and emission scenarios as indicated by AQAB

### 24-hour and Annual PM2.5 and PM10 Increment

- a. Assume 100% PM2.5 = PM10
- b. Include all increment consuming and expanding sources located within the county-wide baseline area and any of the adjoining counties where project modeled impacts are greater than or equal to the annual SIL, and as provided by DAQ in the nearby source inventory workbook (see PSD tab)
- c. Model all increment consuming emissions since the Major Source Baseline Date (MaSBD) for PSD Major Sources (i.e., construction, increased operations, projects, etc.) and since the Minor Source Baseline Dates (MiSBDs) for all major and minor sources.
- d. Include additional sources of interest and emission scenarios as indicated by AQAB

### 3-hour, 24-hour and Annual SO<sub>2</sub> Increment

- a. Include all increment consuming and expanding sources located within the county-wide baseline area and any of the adjoining counties where project modeled impacts are greater than or equal to the annual SIL, and as provided by DAQ in the nearby source inventory workbook (see PSD tab)
- b. Model all increment consuming emissions since the Major Source Baseline Date (MaSBD) for PSD Major Sources (i.e., construction, increased operations, projects, etc.) and since the Minor Source Baseline Dates (MiSBDs) for all major and minor sources.
- c. Include additional sources of interest and emission scenarios as indicated by AQAB