STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF AIR RESOURCE MANAGEMENT

PREVENTION OF SIGNIFICANT DETERIORATION (PSD)
AIR QUALITY MODELING BEST PRACTICES

Revised February 2024

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1. Introduction

The Florida Department of Environmental Protection (Department) Division of Air Resource Management (Division) Office of Permitting and Compliance manages the Department's Prevention of Significant Deterioration (PSD) air permitting program. When a major stationary source of emissions is constructed or modified and is projected to emit more than a certain amount of air pollutants, the facility must perform an air quality impact analysis to ensure that the project's future emissions will not cause or contribute to an exceedance of an established air quality standard. Air modeling is used as a part of this analysis to predict the ambient concentrations of air pollutants for comparison to the National Ambient Air Quality Standards (NAAQS) and PSD increments and to evaluate certain Air Quality Related Values (AQRVs) such as deposition and visibility degradation in protected areas known as Federal Class I areas. The Division's Air Planning Team reviews these analyses to determine if the applicant has provided reasonable assurances that the facility will not cause or contribute to an exceedance of an established air quality standard.

This document provides modeling best practices that applicants should follow to prepare a PSD air quality impact analysis as part of a PSD permit application in Florida. Applicants should also consult the latest U.S. Environmental Protection Agency (EPA) modeling guidance when preparing a PSD air quality impact analysis (EPA's Guideline on Air Quality Models, 40 CFR Part 51, Appendix W – herein referred to as "Appendix W"). EPA has also produced a number of memoranda further clarifying this guidance. Please see **Appendix A** of this document for links to these guidance documents. Please see **Appendix B** for links to online resources that will assist applicants in the development of a PSD Air Quality Analysis.

Please contact the Air Planning Team below if you have any questions about this document or about how to develop a PSD air quality analysis for projects in Florida:

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2. PSD Pollutants and Applicability Analysis

Applications for air construction permits subject to PSD preconstruction review (Rule 62-212.400, F.A.C.) are required for:

- New "major stationary sources" with potential emissions of a PSD pollutant (listed in **Table 1**) of 100 tons per year (tpy) or greater (including fugitive emissions) if the source is one of the 28 PSD "listed" facility categories defined in paragraph 62-210.200(153)(b), F.A.C.;

- New "major stationary sources" with potential emissions of a PSD pollutant of 250 tpy or greater (excluding fugitive emissions) if the source is not one of the 28 PSD "listed" facility categories defined in paragraph 62-210.200(153)(b), F.A.C.; or

- "Major modifications" to existing PSD "major stationary sources" that equal or exceed the PSD significant emissions rate (SER) defined in Rule 62-210.200(234), F.A.C. (**Table 1**).

Table 1: List of Significant Emissions Rates for PSD Pollutants.

Pollutant	Significant Emissions Rate (tons per year)
CO	100
NO_X	40
PM	25
PM_{10}	15
$PM_{2.5}$	10
SO_2	40
VOC*	40
Pb*	0.6
Sulfuric Acid Mist (SAM)*	7
GHG** (CO_2e)*	75,000
*These pollutants are not modeled. However, VOC emissions must be included in the secondary ozone analysis and SAM emissions must be included in the Class I Area Air Quality Related Values (AQRV) analysis. ** GHG is only triggered if one of the other PSD pollutants exceeds the SER.	

Certain pollutants subject to PSD review must be modeled to determine compliance with the applicable NAAQS and PSD increment. Pollutants with annual emission rates less than the SERs are not subject to PSD.

3. Pre-application Meeting and Modeling Protocol

Pre-application meetings are essential to the permitting process. The Department highly recommends that an applicant schedule a pre-application meeting with the Division well in advance of submitting an application, in order to discuss the project and expectations. Good communication is essential to satisfying the regulatory requirements and getting authorization to construct quickly. This pre-application meeting is not intended to be simply an overview of an already finalized application; it should be held early enough to potentially shape the content of the application. As part of the pre-application meeting, the applicant should discuss the planned air quality impact analysis and modeling portion of the project.

The applicant should also provide the Department with a modeling protocol prior to beginning any modeling work. This ensures that any potential problems or unintended oversights in the technical analysis are resolved early in the process and ensures that all requirements are met in the initial application.

The modeling protocol should provide sufficient detail to ensure the PSD modeling requirements described in this document will be met. The modeling protocol should include descriptions of the following (as applicable):

- Project info, facility name, project description, site location
- Map of the site showing emission release locations, nearby buildings, property lines, fence lines, roads, UTM coordinates and a true north arrow
- Topographic or aerial map showing source location, facility boundaries, terrain features, nearby buildings, roads, adjacent facilities, the NWS ASOS station proposed to be for the meteorological data, monitors proposed to be used to estimate background concentrations, as applicable, and Class I areas within 300 km of the project.
- The proposed model(s) and modeling options to be used
- Modeling methodology
- Meteorology
- Receptor network, ambient air boundary, fenceline-property line
- Terrain
- Pollutants / Averaging Periods / Emissions Rates / Stack Parameters
- Preliminary / Full Impact Analysis – Class I and Class II
- NAAQS / PSD Increment Analysis
- Building Downwash
- Background Concentrations
- Preconstruction monitoring
- Significant impact area
- Background source inventory
- Secondary ozone and secondary $PM_{2.5}$ impact analysis
- Additional Impact Analysis (growth, soils and vegetation, visibility impairment)
- Visibility Modeling / AQRV Analysis

The protocol should also identify any site-specific issues that may involve any non-typical sources or dispersion modeling techniques to be used by the applicant. Any modeling of non-default options should be discussed with the Department and EPA's Region 4 New Source Review modeling expert. A non-regulatory model requires an alternative modeling demonstration to be reviewed and approved by EPA and the Department. The Department can assist the applicant with setting up a meeting with EPA if necessary.

Applicants are encouraged to consult early and often with the Division's Air Planning Team as they develop the air quality analysis.

4. Preconstruction Monitoring

Monitoring data from monitors in Florida's ambient air monitoring network that are located in an area representative of the project site can be used to satisfy the preconstruction monitoring requirements for PSD review contained in Rule 62-212.400(7), F.A.C.

To determine whether the monitor is representative of the project site, the applicant should consider proximity to the project site, proximity to the coast, proximity to urban areas, etc.

5. General Modeling Requirements

This section provides general modeling requirements for PSD air quality analyses.

5.1. Model Selection and Version

There are two air quality models that are generally used to assess source impacts: AERMOD and CALPUFF.

The AERMOD (AMS [American Meteorological Society]/EPA Regulatory Model) modeling system is a near-field, Gaussian, steady-state plume dispersion model that simulates pollutant dispersion methods based on planetary boundary layer turbulence structure and scaling concepts, including the treatment of both surface and elevated sources, and both simple and complex terrain. The system is comprised of the AERMET meteorological processor, the AERMAP terrain processor, and the actual AERMOD model. AERMOD was commissioned by EPA for regulatory use and was developed by AERMIC (AMS/EPA Regulatory Model Improvement Committee) from 1991 to 2005 when EPA officially promulgated it as the preferred regulatory model. Since 2005, the program has undergone 13 major updates. AERMOD is listed in Appendix W as a preferred model, and it is the recommended model for assessing air quality impacts up to 50 km from the source.

CALPUFF is a multi-layer, multi-species, non-steady-state, puff dispersion model that simulates the effects of time- and space-varying meteorological conditions on pollution transport, transformation and removal. It is capable of evaluating sub-grid scale effects as well as longer range effects such as pollutant removal, chemical transformation, and visibility. It is generally utilized for long-range transport between 50 and 300 km from the source. In Florida, this model is typically only used for Class I area analyses as most sources are more than 50 km from any Class I area. CALPUFF is no longer included on the list of preferred models in Appendix W; therefore, it is only approved for use at the screening level (e.g. for a Class I SIL analysis). It is also still approved by FLMs for use in Class I Area AQRV analyses. If the applicant must use CALPUFF for a refined analysis, the applicant must first submit an alternative model demonstration for review and approval by EPA and the Department.

Applicants must only use EPA-approved models and must use the most recently approved regulatory version of the model.

5.2. Modeling Options

The applicant should use only regulatory default options. Use of non-regulatory options requires an alternative modeling demonstration approved by EPA and the Department.

5.3. Land Use Analysis – Urban vs. Rural Determination

The applicant should perform a land use analysis following one of two recommended procedures (See EPA's Appendix W section 7.2.1.1). The Department recommends the Land Use Procedure, which is more precise.

Land use should be classified within a 3 km radius around the project. If 50 percent or more of the area is comprised of urban land use types, the applicant should use the urban dispersion setting in AERMOD. Otherwise, the rural setting should be used.

5.4. Building Downwash

All modeling must take building downwash effects into account. The applicant should include building location and dimension information for all buildings input into the model. The applicant should use the latest EPA-approved version of the BPIP model to calculate downwash.

5.5. Meteorological Data

PSD modeling requires using the most recent five years of representative meteorological data. This data is generally derived from National Weather Service Automated Surface Observing System (ASOS) stations.

The Department has compiled 32 meteorological datasets using AERMET v. 21112 that are ready to use in AERMOD. These datasets each include the most recent five consecutive years of surface and upper air data from one National Weather Service ASOS station and can be used for PSD permit modeling.

Applicants should use professional judgment when determining which meteorological dataset is the most representative for their project location, keeping in mind that in general, the most important influence on mesoscale meteorology in Florida is proximity to the coastline. The applicant should also consider the distance of the ASOS station from the project site, and compare land surface parameters (surface roughness, albedo and Bowen ratio parameters) estimated with AERSURFACE between the two sites. Average land surface parameters for the relevant ASOS station can be provided by the Department upon request.

One year of site-specific data may be used instead of five years of ASOS station meteorological data. EPA provides guidance on collecting and processing site-specific meteorological data here: https://www3.epa.gov/scram001/guidance/met/mmgrma.pdf.

For rare occasions where meteorological data from ASOS stations are not representative of the project site, and it is not feasible to collect on-site data, three years of prognostic meteorological data can be used (https://www.epa.gov/scram/air-modeling-meteorological-grid-models).

5.6. Ambient Air and Receptor Grids

Receptors must be placed in all areas of ambient air. Ambient air is that portion of the atmosphere, external to buildings, to which the general public has access. Receptors may only be excluded in areas that are both (1) owned or controlled by the stationary source, and (2) where the owner or operator of the source employs measures, which may include physical barriers, that are effective in deterring or precluding access to the land by the general public. The ambient air boundary is typically the facility fenceline. However, the Department may approve other types of barriers to be used as the ambient air boundary on a case-by-case basis.

Receptor grids begin at the ambient air boundary and extend sufficiently outward to capture the maximum impacts from both onsite and offsite (when applicable) sources for each pollutant and pollutant averaging period evaluated.

Receptor resolution may vary. However, receptors near the facility must be no greater than 100m apart. Receptors along the fenceline/ambient air boundary should be no more than 50m apart. In general, receptors should be spaced closely enough to capture the maximum modeled impact. If initial modeling shows that the maximum impact occurs in an area with coarser grid resolution, the receptor density should be increased and re-modeled until the maximum impact is sufficiently captured.

5.7. Terrain Analysis

Terrain elevations must be used for all receptors, buildings, and sources. In most cases the elevation data will be assigned using the USGS elevation data from the National Elevation Database (NED), using AERMAP. Applicants should use the USGS NED data with 1/3 arcsecond resolution (~10 meter). In

setting site elevations for sources, buildings, and fenceline receptors, the applicant should make adjustments as needed to ensure that known site grading is represented.

6. Class II SIL Analysis

For certain pollutants above the SER, the applicant must perform initial modeling to determine if the maximum predicted concentrations due to the new project alone is likely to cause a significant impact on ambient air quality. In this analysis, only the project emissions are modeled, and the maximum modeled concentration is compared to the appropriate Significant Impact Level (SIL, **Table 2**). A SIL is the level at which an air quality impact is considered significant.

The maximum modeled concentration per pollutant averaging time is compared to the SIL. If the highest modeled concentration is at or above the SIL for that pollutant, further refined analysis is required as described in Section 7 and Section 8 to demonstrate that the project will not contribute to a violation of the applicable NAAQS or PSD increments. If the highest modeled concentration is below the SIL, a refined analysis is not required. However, even if below the SIL, pollutants still need to undergo an additional impact analysis as described in Section 9, a secondary impacts analysis as described in Sections 12 and 13, and an AQRV analysis as described in Section 14, as necessary to fulfill the PSD requirements.

A special note on $PM_{2.5}$: For projects with NO_X and/or SO_2 and primary $PM_{2.5}$ above the SER, secondary $PM_{2.5}$ project impacts must be estimated and added to the modeled primary $PM_{2.5}$ impact prior to comparison with the SIL. For projects with NO_X and/or SO_2 above the SIL and primary $PM_{2.5}$ below the SIL, the secondary impact alone should be compared to the SIL. Please see Section 12 for instructions on how to estimate the secondary $PM_{2.5}$ impact for Class II areas.

Table 2: Class II SILs

Pollutant	Averaging Time	SIL ($\mu g/m^3$)
CO	8-Hour	500
	1-Hour	2000
NO_2	Annual	1
	1-Hour	7.55 (4 ppb)
PM_{10}	Annual	1
	24-Hour	5
$PM_{2.5}$	Annual	0.2
	24-Hour	1.2
SO_2	Annual	1
	24-Hour	5
	3-Hour	25
	1-Hour	7.86 (3 ppb)

6.1. <u>On-Site Modeled Sources</u>

The applicant must identify all on-site emission units and source parameters included in the modeling analysis.

Point source parameters include stack coordinates, stack height, stack diameter, exit temperature, exit velocity, and the emission rate. Area source parameters should also include the southwest coordinates, height, and width. Volume source parameters should also include the center coordinates, height, and horizontal and vertical dimensions.

If the actual stack height of a source is higher than the Good Engineering Practices (GEP) stack height, the unit should be modeled with the GEP stack height.

The maximum potential short-term and long-term emission rates should be provided for all modeled pollutants. The application should show how all emission rates were calculated. New sources will model the maximum potential emissions. Existing sources will model the net emissions change.

If modeling $PM_{2.5}$, all fugitive emission sources must be accounted for and included in the modeling. Fugitive emissions are emissions that could not reasonably pass through a stack, chimney, vent, or other functionally equivalent opening, e.g. paved and unpaved roads, storage piles, etc. Guidance on developing emission rates for $PM_{2.5}$ emissions from various fugitive emission sources is available in EPA's AP-42 Compilation of Air Pollutant Emission Factors (https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors).

Intermittent sources may be excluded from the modeling. Generally, if a source is used ~400 hours or less per year, it may be considered an intermittent source. For example, emergency generators are typically excluded from modeling. For 1-hour NAAQS, any sources with emissions that are continuous enough or frequent enough to contribute significantly to the annual distribution of daily maximum 1-hour concentrations should be included in the modeling. EPA provides further guidance on intermittent sources here: https://www.epa.gov/sites/production/files/2015-07/documents/appwno2_2.pdf.

See Appendix W Table 8-2 for further guidance on estimating emissions rates.

<u>Load Analysis</u>

Emission rates should be based on the maximum potential rate under worst case operating conditions, which are the operating conditions that result in maximum ambient impacts. The project should include a load analysis analyzing ambient impacts at multiple loads, such as 50%, 75%, 100% load (or other loads and operating conditions that may make sense for the specific project), different fuel types, and ambient temperatures, as applicable to the project. The worst-case operating conditions may be different for different pollutants and averaging periods.

In addition, any operational limitations assumed for an emission unit should be specified.

7. NAAQS Analysis

Cumulative source modeling is performed for each pollutant and averaging time that resulted in impacts at or above the Class II SIL. In addition to modeled emissions from the project, the NAAQS analysis includes modeled emissions from all nearby sources that the applicant determines will have a significant impact and a non-modeled background concentration intended to represent all other sources of pollutants

not explicitly modeled. The resulting concentrations are evaluated on a receptor-by-receptor basis for comparison to each NAAQS using the following metrics:

- CO 1-Hour Average: Highest of yearly second-high 1-hour average concentrations;
- CO 8-Hour Average: Highest of yearly second-high 8-hour average concentrations;
- NO_2 1-Hour Average: 5-year average of the yearly 8th-high daily maximum 1-hour average concentration;
- NO_2 Annual Average: Highest annual mean over five years;
- $PM_{2.5}$ 24-Hour Average: 5-year average of the yearly 8th-high 24-hour average concentration;
- $PM_{2.5}$ Annual Average: 5-year average of the annual mean;
- PM_{10} 24-Hour Average: 6th-high 24-hour concentration over five years;
- SO_2 1-Hour Average: 5-year average of the yearly 4th-high daily maximum 1-hour average concentration;
- SO_2 24-Hour Average: Highest of yearly second-high 24-hour average concentrations;
- SO_2 Annual Average: Highest annual mean over five years.

Significant Impact Area

The significant impact area (SIA) is a circular area with a radius extending out to the most distant point where the SIL modeling predicts a significant ambient impact at or above the SIL (not to exceed 50 kilometers). A separate SIA must be defined for each pollutant and averaging period. The SIA is the area in which the NAAQS and PSD increment analysis is conducted. The refined modeling must analyze receptors within the entire SIA.

Modeled Sources

In order to assess cumulative impacts, the potential emissions from the most significant nearby sources are added to the modeling platform developed for the SIL analysis.

EPA recommends that the list of explicitly modeled sources should remain small and that professional judgment should be used in the decision process. Generally, all sources within about 10 km should be modeled unless they are screened out. The applicant should use best judgment to determine which background sources should be included in the analysis.

The 20D method is an example of a screening method that can be used to determine which sources to include in the cumulative modeling. Offsite sources within the screening area can be excluded from the modeling if their facility-wide emission rate in tons per year is less than 20D, where D is defined as the distance from the offsite source to the PSD facility being modeled for short-term emissions and as the distance from the offsite source to the nearest boundary of the SIA for long-term emissions.

In the cumulative modeling, the on-site modeled sources will be the same as used in the SIL analysis, and project source parameters should continue to use the maximum allowable emissions limit, maximum permitted operating level, and assume continuous operation. Background sources should use the maximum allowable emission limit, but may use actual operating level and actual operating factor data (see Appendix W Table 8-2).

The Department will provide a background source emissions inventory upon request, if provided the project location coordinates and pollutants the project will evaluate. Applicants are responsible for confirming that data in the inventory is up to date and should cross-reference the information with

permits. The inventory will include all background sources within a 50 km radius of the project. The applicant must review these sources and determine which should be explicitly modeled.

Background Monitor Concentration

A background monitor concentration is used to account for impacts from all anthropogenic and natural pollutant sources that are not explicitly modeled. The most recent design value from a representative background monitor should be added to the maximum modeled concentration before comparing to the NAAQS.

To determine whether a background monitor is representative of the project site, the applicant should consider at least the following: location of the monitor, proximity to the project site, land use around the monitor and project site, proximity to urban areas, and proximity to coastline.

Results

If the maximum modeled impact (with the added background monitor concentration) is greater than the NAAQS, the applicant should reconsider any stack heights, emissions assumptions, control technologies, fuel usage, and other relevant factors and remodel. If results are still above the NAAQS, the applicant must perform a culpability analysis to determine the project's contribution to the potential violation of the NAAQS (using the MAXDCONT setting in AERMOD).

A special note on $PM_{2.5}$: For projects with NO_X and/or SO_2 above the SER, secondary $PM_{2.5}$ project impacts must be estimated and added to the modeled primary $PM_{2.5}$ impact (and the added background monitor concentration) prior to comparison with the NAAQS. Please see Section 12 for instructions on how to estimate the secondary $PM_{2.5}$ impact for Class II areas.

8. Class II Increment Analysis

The PSD increment represents the limit above an established baseline concentration that a new source may increase the local ambient ground level concentrations of a pollutant. PSD increment modeling is similar to NAAQS modeling in that it is a cumulative analysis that takes into account the impact from nearby PSD increment consuming or expanding sources, only a background monitor concentration is not added. For annual averaging periods, the highest five-year annual average is compared to the increment. For all other short-term averaging periods, the 2nd-highest concentration from each of five years is compared to the increment. PSD increments have been established for the pollutants listed in **Table 3** below.

Table 3: Class II Increments

Pollutant	Averaging Time	Class II PSD Increment ($\mu g/m^3$)
NO$_2$	Annual	25
	1-Hour	--
PM$_{10}$	Annual	17
	24-Hour	30
PM$_{2.5}$	Annual	4
	24-Hour	9
SO$_2$	Annual	20
	24-Hour	91
	3-Hour	512
	1-Hour	--

The background source emissions inventory provided by the Department has columns indicating whether each source is increment-consuming or increment-expanding for a given pollutant. However, the applicant is responsible for verifying which sources are increment-consuming or increment-expanding and for determining which sources should be explicitly modeled in the PSD increment modeling. Generally, any emissions increases that have occurred since the baseline date are increment-consuming. Any emissions decreases that have occurred since the baseline date are increment-expanding. **Table 4** below lists Florida's baseline dates by pollutant:

Table 4: Florida Major and Minor Source Baseline Dates

Pollutant	Major Source Baseline Date	Minor Source Baseline Date	Baseline Area
NO$_2$	February 8, 1988	March 28, 1988	Entire State
SO$_2$	January 6, 1975	December 27, 1977	Entire State
PM	January 6, 1975	December 27, 1977	Entire State

A special note on PM$_{2.5}$: For any project with SO$_2$ and/or NO$_X$ over the SER, secondary PM$_{2.5}$ project impacts must be estimated and added to the modeled primary PM$_{2.5}$ impact prior to comparison with the increment. Please see Section 12 for instructions on how to estimate the secondary PM$_{2.5}$ impact for Class II areas.

9. Additional Impacts Analysis

The applicant is required by Rule 62-212.400(8), F.A.C. to provide an analysis of the project's potential impacts on visibility, soils, vegetation and wildlife due to the proposed project or any general commercial, residential or industrial growth associated with the project.

9.1. Growth

The applicant should discuss associated industrial, commercial, and residential source growth that will occur in the area due to the source and any related construction, 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 applicant should quantify and discuss net growth in population and ancillary support activities.

9.2. Soil, Vegetation and Wildlife

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. Comparison of project air quality impacts to the secondary NAAQS is also appropriate as the secondary NAAQS have been set to protect against visibility impairment and damage to animals, crops, vegetation, and buildings.

10. Class I SIL Analysis

A Class I SIL analysis is required if a source is within 300 km of a Federal Class I area. This analysis is identical to the Class II SIL analysis except that the SILs are smaller (**Table 5**) and only evaluated within the boundaries of the Class I area. Every area of Florida is within 300 km of at least one Class I area. Therefore, all PSD permit applications are required to include a Class I area air quality impact analysis. The Department provides a Class I area locator on the Department website to help project applicants determine which Class I areas require a Class I SIL analysis for the project. Some Class I areas may be located in other states.

Table 5: Class I SILs

Pollutant	Averaging Time	SIL ($\mu g/m^3$)
NO$_2$	Annual	0.1
PM$_{10}$	Annual	0.2
	24-Hour	0.3
PM$_{2.5}$	Annual	0.05
	24-Hour	0.27
SO$_2$	Annual	0.1
	24-Hour	0.2
	3-Hour	1.0

The Class I SIL analysis has two screening steps.

> Step 1. Screening in AERMOD. The applicant should use the latest regulatory version of AERMOD to assess air quality impacts of the project along a ring of receptors located at 50 km from the project site and spaced 1 km apart. If any portion of a Class I area is within 50 km of the

project site, receptors should also be placed within the Class I area. If the maximum predicted concentration at any receptor on the ring in any direction from the project site is above the SIL, the applicant must move on to the next step.

<u>Step 2. Screening in CALPUFF[1]</u>. The applicant should use CALPUFF to assess air quality impacts of the project at receptors placed within the Class I area(s). The applicant can obtain Class I area receptors here: https://irma.nps.gov/Datastore/Reference/Profile/2249830.

If the maximum modeled impact is at or above the Class I SIL for any pollutant, a Class I PSD increment analysis is required for that pollutant.

A special note on $PM_{2.5}$: For projects with NO_X and/or SO_2 above the SER, secondary $PM_{2.5}$ project impacts must be estimated and added to the modeled primary $PM_{2.5}$ impact prior to comparison with the SIL. Please see Section 13 for instructions on how to estimate the secondary $PM_{2.5}$ impact for Class I areas.

11. Class I Increment Analysis

For any pollutant where the maximum modeled impact from the project is at or above the Class I SIL, a Class I increment analysis is required. This analysis is similar to the Class II increment analysis, except that the PSD increments (**Table 6**) are smaller and are only evaluated within the Class I area.

Table 6: Class I Increments

Pollutant	Averaging Time	Class I PSD Increment ($\mu g/m^3$)
NO_2	Annual	2.5
	1-Hour	--
PM_{10}	Annual	4
	24-Hour	8
$PM_{2.5}$	Annual	1
	24-Hour	2
SO_2	Annual	2
	24-Hour	5
	3-Hour	25
	1-Hour	--

AERMOD may be used to evaluate Class I area receptors that are within 50 km of the project site. For any Class I areas beyond 50 km from the project site, CALPUFF must be used. The use of CALPUFF for this analysis requires an alternative modeling demonstration approved by EPA and the Department. If an applicant thinks a Class I increment analysis in CALPUFF may be required for a project, the applicant should contact the Department for further guidance before continuing work on the project.

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[1] Although CALPUFF is no longer an approved Appendix W model, it is still approved for use in screening-level analysis such as the Class I SIL analysis. It may be used here without an alternative modeling demonstration.

A special note on PM$_{2.5}$: For projects with NO$_X$ and/or SO$_2$ above the SER, secondary PM$_{2.5}$ project impacts must be estimated and added to the modeled primary PM$_{2.5}$ impact prior to comparison with the increment. Please see Section 13 for instructions on how to estimate the secondary PM$_{2.5}$ impact for Class I areas.

12. Class II Area Secondary Pollutant Analysis

Ozone is a secondarily formed pollutant that is known to be caused by the regional emissions of VOC and NO$_X$ in combination with certain meteorological conditions (temperature, humidity, solar insolation, etc.). Secondary PM$_{2.5}$ is formed in the atmosphere by chemical reactions mainly involving the precursor pollutants NO$_X$ and SO$_2$. Only the precursor pollutants emitted at or above the SER need to be included in the secondary analysis.

EPA's Appendix W recommends a two-tiered demonstration approach for addressing single-source impacts on the formation of ozone and secondary PM$_{2.5}$. The first tier involves use of relationships between precursor emissions and ambient concentrations of ozone and PM$_{2.5}$ that have been developed from EPA modeling of hypothetical sources known as Modeled Emission Rates for Precursors (MERPs, **Table 7**). A MERP is the level of emissions (tons per year) of a precursor that would result in the formation of a secondary pollutant at a concentration equal to the Class II SIL (**Table 2**). The ozone SIL is in **Table 8** below. The second tier involves application of a photochemical grid model to evaluate secondary impacts.

Table 7: Most conservative MERP values (tons per year) for hypothetical sources by precursor and pollutant for the Southeast Climate Zone.

Precursor	Climate Zone	8-hr O$_3$	24-hr PM$_{2.5}$	Annual PM$_{2.5}$
NO$_X$	Southeast	170	1,943	5,679
SO$_2$	Southeast	-	367	859
VOC	Southeast	1,936	-	-

Table 8: SIL Value for Ozone

Pollutant	Averaging Time	SIL (μg/m^3)
Ozone	8-hour	1.0 ppb

12.1.   Ozone Analysis

Tier 1 Demonstration –

> The project's secondary ozone impacts should be assessed using project emissions of the precursors that are at or above the SER (NO$_X$ and/or VOC) and the most conservative MERPs for the Southeast Climate Zone, in the equation below:

$$\left(\frac{NOx\_Em}{NOx\_MERP}\right) + \left(\frac{VOC\_Em}{VOC\_MERP}\right) < 1$$

Where:

NOx_Em = Project related NOx Emissions (tons per year – tpy)
NOx MERP = From Table 7 (tpy)
VOC_Em = Project related VOC Emissions (tpy)
VOC_MERP = From Table 7 (tpy)

If the sum of the ratios in the equation is less than 1, then the secondary ozone impacts are below the SIL and no additional analysis is necessary.

If the value is 1 or higher, the applicant may use less conservative MERPs from a different hypothetical source, if the hypothetical source is representative of the project source, and reassess.

If the value is still 1 or higher, then the applicant must add the project's estimated ozone impacts to the ozone design value from a representative background ozone monitor and compare to the ozone NAAQS using the equation below:

$$Background\ Ozone + \left[\left(\left(\frac{NOx\_Em}{NOx\_MERP}\right) + \left(\frac{VOC\_Em}{VOC\_MERP}\right)\right) * SIL\right] \le NAAQS$$

Where:

Background Ozone = Most recent 8-hour ozone design value (ppb) for representative monitor
NOx_Em = Project related NOx Emissions (tons per year – tpy)
NOx MERP = From Table 7 (tpy)
VOC_Em = Project related VOC Emissions (tpy)
VOC_MERP = From Table 7 (tpy)
SIL = 1 ppb ozone
NAAQS = 8-hour ozone NAAQS (70 ppb)

If this value is at or below the ozone NAAQS, the demonstration is complete and the project is unlikely to cause or contribute to a violation of the ozone NAAQS.

If the value is above the NAAQS, the applicant may use less conservative MERPs from a different hypothetical source, if the hypothetical source is representative of the project source, and reassess.

If the value is still above the NAAQS, the applicant must proceed to a Tier 2 demonstration.

Tier 2 Demonstration –

The applicant must use a photochemical grid model to evaluate the project's secondary ozone impacts and ensure that the project will not cause or contribute to a violation of the ozone NAAQS.

The Department expects the need for a Tier 2 demonstration to be rare. The applicant should consult with the Department if they believe that a Tier 2 demonstration may be necessary for the project.

12.2.   Secondary PM$_{2.5}$ Analysis

Tier 1 Demonstration –

The project's combined primary and secondary PM$_{2.5}$ impacts should be assessed using the maximum modeled primary PM$_{2.5}$ concentration (if direct PM$_{2.5}$ emissions are at or above the SER), the Class II SIL, project emissions of the precursors that are at or above the SER (NO$_X$ and/or SO$_2$), and the most conservative MERPs for the Southeast Climate Zone, in the equation below:

$$\frac{HMC}{SIL} + \left(\frac{NOx\_Em}{NOx\_MERP}\right) + \left(\frac{SO2\_Em}{SO2\_MERP}\right) < 1$$

Where:
HMC = Highest modeled primary PM2.5 impact using AERMOD and project related PM2.5 emissions (μg/m3)
SIL = Significant Impact Level (μg/m3)
NOx_Em = Project related NOx Emissions (tons per year – tpy)
NOx MERP = From Table 7 (tpy)
SO2_Em = Project related SO2 Emissions (tpy)
SO2_MERP = From Table 7 (tpy)

If the sum of the ratios in the equation is less than 1, then the combined primary and secondary PM$_{2.5}$ impacts are below the SIL and no additional analysis is necessary.

If the value is 1 or higher, the applicant may use less conservative MERPs from a different hypothetical source, if the hypothetical source is representative of the project source.

If project impacts are still at or above the SIL, then for those projects that require a primary PM$_{2.5}$ modeling analysis, a refined modeling analysis (NAAQS and increment analysis) is required, as described in Sections 7 and 8 above. The secondary PM$_{2.5}$ impacts as calculated with the equation below will be added to the primary modeled impacts in the refined analyses:

$$\left(\left(\frac{NOx\_Em}{NOx\_MERP}\right) + \left(\frac{SO2\_Em}{SO2\_MERP}\right)\right) * SIL$$

Where:
NOx_Em = Project related NOx Emissions (tons per year – tpy)
NOx MERP = From Table 7 (tpy)
SO2_Em = Project related SO2 Emissions (tpy)
SO2_MERP = From Table 7 (tpy)
SIL = Significant Impact Level (μg/m3)

For those projects that do not require a primary PM$_{2.5}$ modeling analysis, where secondary PM$_{2.5}$ impacts are at or above the SIL, a refined modeling analysis (NAAQS and increment analysis) is required, as described in Sections 7 and 8 above, including primary and secondary impacts from background sources. This differs from the method above in that primary PM$_{2.5}$ from the project may not need to be modeled. If the cumulative analysis results in concentrations greater than the NAAQS or Increment, a Tier 2 demonstration is required to assess secondary PM$_{2.5}$ impacts.

Tier 2 Demonstration –

> The applicant must use a photochemical grid model to evaluate the project's secondary $PM_{2.5}$ impacts and ensure that the project will not cause or contribute to a violation of the $PM_{2.5}$ NAAQS.

> The Department expects the need for a Tier 2 demonstration to be rare. The applicant should consult with the Department if they believe that a Tier 2 demonstration may be necessary for the project.

13. Class I Area Secondary Pollutant Analysis

EPA's MERPs, which are used to estimate secondary impacts at Class II areas, are based on a modeled hypothetical source's maximum modeled secondary impact, which is typically located very near the hypothetical source. Therefore, using the MERPs to estimate secondary impacts at Class I areas, which are typically far away from a source, is too conservative for estimating secondary impacts in Class I areas. Instead, the project can use the hypothetical source's modeled secondary impacts at a distance equal to the project's distance from the nearest Class I area.

EPA provides tables of the hypothetical modeling results that lists each hypothetical source's impacts on secondary ozone and secondary $PM_{2.5}$ at various distances downwind from the hypothetical source. For example, if the project is 100 km away from the nearest Class I area, then the project should use the hypothetical source's maximum modeled secondary ozone and secondary $PM_{2.5}$ impacts at 100 km and all distances greater than 100 km to estimate the project's secondary ozone and secondary $PM_{2.5}$ impacts in the Class I area. The hypothetical source chosen should be representative of the project.

EPA's modeled hypothetical source impacts at various distances can be found here: https://www.epa.gov/scram/merps-view-qlik.

The secondary impact analysis for Class I areas should otherwise follow a procedure similar to the Class II area secondary impact analysis, except that for various values (e.g. the SIL) the appropriate Class I area value should be used.

14. Class I AQRV Visibility and Deposition Analysis

The Federal Land Manager (FLM) and the Federal official charged with direct responsibility for management of Class I lands have an affirmative responsibility to protect the air quality related values (AQRV), including visibility and deposition, of any such lands. The FLM's AQRV Workgroup (FLAG) has developed a guidance document for completing an AQRV analysis, available here: https://irma.nps.gov/Datastore/DownloadFile/420352 (herein referred to as FLAG 2010).

The applicant is required to evaluate the potential impact of the proposed project on all applicable AQRV for any portion of a Class I area located within 50 km of the project, and any area beyond 50 km that does not meet the FLAG 2010 screening criteria.

14.1. Class I Areas Within 50 km

For distances within 50 km, visibility impairment may take the form of a distinct plume from the source. The FLAG 2010 guidance requires the use of VISCREEN to assess plume impacts on visibility against a sky background and a terrain background, both looking into and out from the Class I area. The

VISCREEN model code and user guide are available here: https://www.epa.gov/scram/air-quality-dispersion-modeling-screening-models.

Because Florida has no protected integral vistas, VISCREEN results looking out from the Class I area can be excluded from the analysis. For any Class I area where there is no possibility of viewing distant terrain, the VISCREEN results against a terrain background can be excluded. For example, the Chassahowitzka National Wilderness Area is a coastal area with no terrain features and elevation ranging from zero to five feet. Therefore, VISCREEN results in Chassahowitzka against a terrain background would be excluded from the analysis.

VISCREEN requires inputs of emissions of particulates, NO_X, primary NO_2, soot, and primary SO_4. Other inputs include distance to the observer in the Class I area, distance to the nearest and farthest points in the Class I area, background visual range, wind speed, stability index, ozone background, and plume offset angle. The VISCREEN model calculates the project's plume visual impacts and compares them to the thresholds in **Table 9** below.

Table 9: VISCREEN Visibility Thresholds

Total color contrast (ΔE) threshold	2.0
Green contrast threshold	0.05

A VISCREEN analysis consists of three levels of analysis:

Level 1 Screening – This screening level assumes the worst possible dispersion condition (combination of wind speed and stability class) regardless of actual meteorology at the site. A conservative background visual range is assumed based on pristine conditions and the scattering angle and line of sight that would maximize plume impacts. If visibility criteria in the model are not exceeded, the analysis is complete and the project is not likely to have a significant impact on visibility for any portions of a Class I area within 50 km. If visibility thresholds are exceeded, a Level 2 Screening is required.

Level 2 Screening – This screening level also assumes the scattering angle and line of sight that would maximize plume impacts, but uses a more realistic background visual range based on actual annual average natural conditions at the Class I area, as provided in the FLAG 2010 guidance, and uses worst case dispersion conditions based on actual meteorological data. The VISCREEN user guide provides instructions for how to process the meteorological data and identify the worst-case dispersion condition. If visibility criteria in the model are not exceeded, the analysis is complete and the project is not likely to have a significant impact on visibility for any portions of a Class I area within 50 km. If visibility thresholds are exceeded, a Level 3 Analysis is required.

Level 3 Analysis – This involves a more realistic, in-depth analysis of the magnitude and frequency of occurrence of plume visual impacts. Typically, the higher the magnitude and frequency of plume visual impacts at the Class I area, the more likely a project is to have a significant impact on visibility in the Class I area. The VISCREEN user guide provides detailed instructions for how to develop frequency distributions of dispersion conditions and plume visual impacts. Although the recommended model for Level 3 Analysis is a plume visibility model (PLUVUE II), in certain cases, the FLM may allow the applicant to use VISCREEN in place of

the plume visibility model for assessing whether visibility thresholds are exceeded. If the applicant determines that a Level 3 Analysis is required, the applicant should discuss with the Department before proceeding. The Department can assist the applicant in setting up a meeting with the appropriate FLM, if necessary.

Applicants should consult the VISCREEN users guide for how to develop VISCREEN model inputs and perform the VISCREEN analysis.

14.2.   Class I Areas Beyond 50 km

For distances greater than 50 km, visibility impairment is considered to take the form of regional haze rather than a distinct plume. For any portion of a Class I area more than 50 km away from the project, there are two steps to the process:

Step 1. Q/d screening analysis. The screening analysis calculates the project's Q/d ratio, where Q is potential project emissions in tons per year of the visibility-impairing pollutants SO_2, NO_2, PM_{10}, and SAM based on maximum allowable 24-hour emissions limits, and d is the distance in kilometers to the Class I area. Emissions of all four visibility-impairing pollutants must be included in the calculation, regardless of which pollutants actually triggered NSR. For sources with a Q/d ratio of 10 or less, no further AQRV analysis is required.

Step 2. Refined analysis. If the Q/d ratio is greater than 10, the applicant must use CALPUFF[2] to complete a visibility and deposition analysis.

Refined AQRV Analysis in CALPUFF

CALPUFF should be used to assess visibility impairment and total nitrogen and sulfur deposition in Class I areas. Instructions on performing a refined AQRV analysis in CALPUFF are found in the FLAG 2010 guidance document and are summarized below. Please refer to the FLAG 2010 guidance for additional details.

The Department will provide ready-to-use CALMET meteorological files to be used in the modeling upon request. Class I area receptor grids that should be used in the modeling are available here: https://irma.nps.gov/Datastore/Reference/Profile/2249830.

Visibility

The emissions input to CALPUFF should be the maximum allowable 24-hour mass emission rate of SO_2, NO_2, PM, and SAM. All four of these visibility-impairing pollutants should be modeled from all modified or affected emission units, regardless of which pollutants actually triggered NSR. PM should be speciated into filterable PM (coarse, fine, elemental carbon) and condensable PM (organic carbon and sulfates) based on the best available information. Applicants should calculate the 24-hour average net emission increase for each pollutant from modified facilities as the maximum allowable 24-hour average minus the actual hourly rate averaged over the past two years (annual emissions over past two years/hours of operation over last two years).

After CALPUFF is run, the applicant should use CALPOST to evaluate visibility impairment. The CALPOST parameter MVISBK should be set to 8, sub-mode five (M8_MODE = 5), and the background hygroscopic and non-hygroscopic aerosol levels are typically derived from the annual average natural

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[2] No alternative modeling demonstration is required when using CALPUFF for an AQRV analysis.

conditions provided in the FLAG 2010 document (Table 6 in FLAG 2010). However, the FLM may require, on a case-by-case basis, that applicants use the 20% best natural background values (Table 5 in FLAG 2010) in lieu of annual average natural conditions. The monthly relative humidity adjustment factors for the Class I area are input to the RHFAC array in CALPOST (See Tables 7-9 in FLAG 2010 for these values). The visibility threshold (Table 10) is not exceeded if the 98th percentile change in light extinction is less than 5% for each year modeled, when compared to the annual average natural condition value for that Class I area.

Deposition

FLMs propose that the Interagency Workgroup on Air Quality Modeling (IWAQM) procedures be used to estimate S and N deposition (see https://www3.epa.gov/scram001/7thconf/calpuff/phase2.pdf). The applicant should select the options in CALPUFF to calculate and output the wet and dry fluxes of the pollutants modeled in units of $g/m^2/s$, and then use CALPOST to calculate total deposition of N and S in units of kg/ha/yr. Specifically, for S deposition, the wet and dry fluxes of sulfur dioxide and sulfate should be calculated, normalized by the molecular weight of S, and expressed as total S. For N deposition, the wet and dry fluxes of nitric acid (HNO_3) and nitrate (NO_3^-) and the dry flux of nitrogen oxides (NO_X) should be calculated, normalized by the molecular weight of N, and expressed as total N. Wet and dry fluxes of ammonium sulfate (($NH_4)_2SO_4$) and ammonium nitrate (NH_4NO_3) should also be calculated, normalized by the molecular weight of N, and added to the estimate of total N. Therefore, total N deposition is the sum of N contributed by dry and wet fluxes of HNO_3, NO_3^-, ($NH_4)_2SO_4$, and NH_4NO_3 and the dry flux of NO_X. The applicant should compare the total N deposition and total S deposition to the thresholds in **Table 10**.

The following background values of NH_3 can be used in the modeling, unless better data on NH_3 background levels are available: 10 parts per billion (ppb) for grasslands, 0.5 ppb for forest, and 1 ppb for arid lands at 20°C.

Table 10: AQRV Visibility and Deposition Analysis Thresholds

Visibility impairment threshold	5.0%
N deposition threshold	0.01 kg/ha/yr
S deposition threshold	0.01 kg/ha/yr

If the project impacts exceed the visibility or deposition thresholds, the applicant will need to propose emission reductions for the project to mitigate visibility and deposition impacts.

Upon receipt of a PSD permit application, the Department will provide the FLM with the results of the applicant's Class I AQRV air quality analysis. The Department will review to ensure the analysis was performed correctly. The FLM will review and determine whether any additional analysis is necessary.

15. Air Quality Modeling Report

The applicant should include an Air Quality Modeling Report as part of the PSD permit application that summarizes the air quality impact analysis and associated modeling. The Report should include sufficient detail for the Department to replicate any modeling and ensure that all requirements have been met. This includes providing all modeling input and output files, meteorological data files, and any other post-processing programs or files.

Appendix A – Modeling Guidance Documents

The list below includes the latest EPA modeling guidance. The Department intends to update this Appendix as new guidance is released; however, applicants should verify whether more recent guidance has become available since this document was revised. Due to the large amount of guidance available on a variety of topics, the list below is not comprehensive. Applicants who need additional guidance on any topic should contact the Air Planning Team.

EPA Support Center

- EPA Support Center for Regulatory Atmospheric Modeling (SCRAM)

Appendix W

- Guideline on Air Quality Models, 40 CFR Part 51, Appendix W (FR 5182, January 17, 2017)

AP-42 Emissions Factors

- Compilation of Air Emissions Factors (EPA AP-42)

Ambient Air

- Revised Ambient Air Policy (EPA Memo, December 2, 2019)

GEP Stack Height

- Guideline for Determination of Good Engineering Practice (GEP) Stack Height (EPA Report, June 1985)

Site-Specific Meteorological Data

- Meteorological Monitoring Guidance for Regulatory Modeling (EPA Report, February 2000)

NO$_2$ Modeling

- 1-Hour NO$_2$ Modeling Guidance (EPA Memo, June 28, 2010)
- Additional Clarification on 1-Hour NO$_2$ Modeling Guidance (EPA Memo, March 1, 2011)
- Clarification on the Use of AERMOD for the NO$_2$ NAAQS (EPA Memo, September 30, 2014)

SO$_2$ Modeling

- 1-Hour SO$_2$ Modeling Guidance (EPA Memo, August 23, 2010)

Ozone and Secondary PM$_{2.5}$

- Use of Photochemical Grid Models for Single-Source Ozone and Secondary PM$_{2.5}$ Impacts (EPA Memo, August 4, 2017)
- Guidance on Significant Impact Levels for Ozone and PM$_{2.5}$ (EPA Memo, April 17, 2018)
- MERPs Guidance (EPA Memo, April 30, 2019)
- DRAFT Guidance for Ozone and PM$_{2.5}$ Permit Modeling (EPA Memo, February 10, 2020)

AQRV Analysis

- Federal Land Managers' AQRV Analysis Guidance (FLAG 2010)
- VISCREEN Guidance (EPA Report, October 1992)
- IWAQM CALPUFF Long Range Transport Guidance (EPA Report, December 1998)

Appendix B – Online Resources

The Department has collected a list of resources available on the Department's website and external websites to assist with PSD air quality analysis development.

- Ready-to-use AERMET Datasets for 32 Florida Locations

- PSD Analysis Modeling Guide

- Class I Area Locator Tool

- Class I Area Receptors