Air Quality Modeling Guidelines

APDG 6232

Air Permits Division

Texas Commission on Environmental Quality

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Summary of Changes

April 2015:

- Minor updates to text in various sections in relation to comments provided on the Draft Guidelines during the comment period.
- Added in Appendix A – Justifying the Use of the Significant Impact Levels, guidance for justifying the $PM_{2.5}$ SILs for the Increment Analysis.
- Removed Appendix Q – Conducting an Ambient Ozone Impacts Analysis. This appendix is under further review.

September 2018:

- Minor updates to text in various sections.
- Updates to numerous sections based on the EPA finalizing revisions to the Guideline on Air Quality Models (January 2017).
- Updates to numerous sections based on EPA memoranda.
- Addition of Appendix Q - Conducting an Ambient Ozone Impacts Analysis.
- Updates to Appendix R - Secondary Formation of Particulate Matter ($PM_{2.5}$), updated based on draft EPA guidance.

November 2019:

- Updates to Appendices Q and R based on EPA finalizing guidance on Modeled Emission Rates for Precursors.

Glossary of Acronyms and Symbols

ActualBD	Actual emissions at the applicable minor source baseline date
ActualMD	Actual emissions as of the date of the modeling demonstration
ADMT	Air Dispersion Modeling Team
AOI	Area of Impact
APD	Air Permits Division
AQA	Air Quality Analysis
AQRV	Air Quality Related Value
AQS	Air Quality System
CAMS	Continuous Ambient Monitor Station
CAS	Chemical Abstract Service
CFR	Code of Federal Regulations
CTM	Chemical Transport Model
EPA	Environmental Protection Agency
EPN	Emission Point Number
ESL	Effects Screening Level
FCAA	Federal Clean Air Act
FLM	Federal Land Manager
GAQM	EPA's Guideline on Air Quality Models
GEP	Good Engineering Practice
GLC	Ground-Level Concentration
H	Structure Height
HGEP	GEP Stack Height
IRD	Information Resources Division
L	Lesser of the structure height or maximum projected width
LULC	Land-Use/Land-Cover
MERPs	Modeled Emission Rates for Precursors
MSDS	Material Safety Data Sheet
NAAQS	National Ambient Air Quality Standard(s)
NSR	New Source Review

Glossary of Acronyms and Symbols (*continued*)

PBR	Permit By Rule
PPB	Parts Per Billion
PSD	Prevention of Significant Deterioration
SER	Significant Emission Rate
SIL	Significant Impact Level
SIP	State Implementation Plan
SMC	Significant Monitoring Concentration
SPLD	Single Property Line Designation
TAC	Texas Administrative Code
TAD	Technical Assistance Document
TCAA	Texas Clean Air Act
TCEQ	Texas Commission on Environmental Quality
TD	Toxicology Division
THSC	Texas Health and Safety Code
TPY	Tons Per Year
USGS	United States Geological Survey
UTM	Universal Transverse Mercator

Definitions

The following explanations of terms are included solely for the reader's convenience; they do not take the place of any definition in state or federal laws, rules, or regulations. All section references are to Title 30 of the Texas Administrative Code (TAC) unless specified otherwise.

Air contaminant. Particulate matter, radioactive materials, dust, fumes, gas, mist, smoke, vapor, or odor, including any combination of those items, produced by processes other than natural (Texas Health and Safety Code [THSC] Section 382.003). May also be referred to by staff as a *constituent*, *chemical*, *compound*, or *pollutant*.

Air dispersion model. A simplification of the physical laws governing the dispersion and transport of contaminants in the atmosphere. The simplification is represented as a set of mathematical equations that require information describing a physical situation before the equations can be solved.

Air pollution. One or more air contaminants in such concentration and of such duration that they could cause injury; adversely affect human health or welfare, animal life, vegetation, or property; or interfere with the normal use and enjoyment of animal life, vegetation, or property (THSC 382.003).

Air Quality Related Value (AQRV). A term used by federal land managers that include visibility, odor, flora, fauna; geological resources; archeological, historical, and other cultural resources; and soil and water resources.

Ambient air. That portion of the atmosphere, external to buildings, to which the general public has access (30 TAC 101.1).

Area of Impact (AOI). All locations where the significant increase in the potential emissions of a pollutant from a new source, or significant net emissions increase from a modification, will cause a significant impact (i.e., equal or exceed the applicable de minimis impact level, as shown in 30 TAC 101.1). The highest modeled pollutant concentration for each averaging time is used to determine whether the source will have a significant impact for that pollutant.

Attainment area. Any area that meets the national primary or secondary ambient air quality standard for an applicable criteria pollutant.

Background. Air contaminant concentrations present in the ambient air that are not attributed to the source or site being evaluated.

Chemical Transport Model (CTM). Models that simulate atmospheric chemical and physical processes such as gas and particle chemistry, deposition, and transport. There are two types of chemical transport models that are differentiated based on a fixed frame of reference (Eulerian) or a frame of reference that moves with parcels of air between the source and receptor point (Lagrangian).

Class I area. An area defined by Congress that is afforded the greatest degree of air quality protection. Class I areas are deemed to have special natural, scenic, or historic value. The Prevention of Significant Deterioration (PSD) regulations provide special protection for Class I areas. Little deterioration of air quality is allowed.

Class II area. An area defined by Congress where a moderate degree of emissions growth is allowed.

Criteria pollutant. A pollutant for which a National Ambient Air Quality Standard (NAAQS) has been defined.

De minimis impact. A change in ground-level concentration of an air contaminant as a result of the operation of any new major stationary source or of the operation of any existing source that has undergone a major modification that does not exceed the significance levels as specified in 40 Code of Federal Regulations (CFR) §51.165(b)(2). [30 TAC 101.1].

Effects Screening Level (ESL). Guideline concentrations derived by the Texas Commission on Environmental Quality (TCEQ) and used to evaluate ambient air concentrations of constituents. Based on a constituent's potential to cause adverse health effects, odor nuisances, vegetation effects, or materials damage. Health-based screening levels are set at levels lower than those reported to produce adverse health effects and are set to protect the general public, including sensitive subgroups such as children, the elderly, or people with existing respiratory conditions. If an air concentration of a constituent is below the screening level, adverse effects are not expected. If an air concentration of a constituent is above the screening level, it is not indicative that an adverse effect will occur, but rather that further evaluation is warranted.

Emission point. Point of constituent emissions released into the air.

Facility. A discrete or identifiable structure, device, item, equipment, or enclosure that constitutes or contains a stationary source, including appurtenances other than emission control equipment. A mine, quarry, well test, or road is not considered to be a facility (30 TAC 116.10). For the purpose of emissions inventory, the term does not refer to the entire site but to individual process units at the site.

Fugitive emission. Any gaseous or particulate contaminant entering the atmosphere that could not reasonably pass through a stack, chimney, vent, or other functionally equivalent opening designed to direct or control its flow. (30 TAC 101.1).

Greenfield site. An area of agricultural or forest land, or some other undeveloped site earmarked for commercial development or industrial projects.

Ground-Level Concentration (GLC). The concentration, commonly provided in micrograms per cubic meter ($\mu g/m^3$), as predicted by modeling. May also be observed by ambient air monitoring.

Hazardous Air Pollutant (HAP). Any pollutant subject to a standard promulgated under the Federal Clean Air Act (FCAA) section 112 (relating to hazardous air pollutants).

Major. The term *major* may refer to the total emissions at a stationary source or to a specific facility. For PSD review, once a site or project is major for one pollutant, all other pollutant's emissions are compared to significance levels in 30 TAC 116.12(17) and (18).

- A named major stationary source is any source belonging to a list of 28 source categories in 40 CFR 52.21(b)(1) which emits or has the potential to emit 100 tons per year (tpy) or more of any pollutant regulated by the FCAA.
- An un-named major stationary source is any source not belonging to the 28 named source categories which emits or has the potential to emit such pollutants in amounts of 250 tpy or more.
- A major source is any source that emits 10 tpy or more of any single HAP or 25 tpy or more of any combination of HAPs under FCAA section 112(b).

Major modified stationary source or facility. Used in the context of a PSD or Nonattainment permit application, the phrase *major modified stationary source or facility* refers to a change in operation that results in a significant net increase of emissions for any regulated pollutant. New sources at an existing major stationary source are treated as modifications to the major stationary source. Also, see the definitions of *source* and *facility*.

Major New Source Review (NSR) Program. The major NSR program contained in parts C and D of title I of the FCCA is a preconstruction review and permitting program applicable to new major sources and major modifications at such sources. In areas meeting the NAAQS (*attainment areas*) or for which there is insufficient information to determine whether they meet the NAAQS (*unclassifiable areas*), the NSR requirements under part C of title I of the FCAA apply. The Environmental Protection Agency (EPA) calls this portion of the major NSR program the *Prevention of Significant Deterioration* or PSD program. In areas not meeting the NAAQS (*nonattainment areas*), the major NSR program is implemented under the requirements of part D of title I of the FCCA. The EPA calls this program the "nonattainment" major NSR program. The EPA has promulgated rules in 40 CFR 52.21 to implement PSD in portions of the country that do not have approved state or tribal PSD programs.

Major source baseline date. This is the date after which actual emissions associated with physical changes or changes in the method of operation at a major stationary source affect the available increment. Changes in actual emissions occurring at any stationary source after this date contribute to the baseline concentration until the minor source baseline date is established.

Minor. The term *minor* may refer to the total emissions at a stationary source or to a specific facility. To be minor for PSD review, the emissions must be less than 250 tpy for an un-named source and 100 tpy for a named source. To be minor for Nonattainment review, the emissions must be less than the major source emission thresholds in 30 TAC 116. To be minor for HAPs review, the emissions must be less than 10 tpy for a single HAP or 25 tpy for multiple HAPs (30 TAC 116).

Minor source baseline date. This is the earliest date after the PSD increment *trigger date* on which a PSD application for a new major source or a major modification to an existing source is considered complete. The minor source baseline date is pollutant and geographically-specific.

Modified stationary source or facility.

- When used in the context of modeling, the phrase *modified stationary source or facility* refers to a change in the location or stack parameters of an emission point, including emission rate.
- When used in the context of a permit application, the phrase *modified stationary source or facility* refers to a physical change in or change in method of operation, which results in an increase of emissions.

National Ambient Air Quality Standards (NAAQS). Levels of air quality to protect public health and welfare (40 CFR 50.2). Primary standards are set to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly from the effects of "criteria air pollutants" and certain non-criteria pollutants. Secondary standards are set to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings.

New facility. A facility for which construction started after August 30, 1971, and no contract for construction was executed on or before August 30, 1971, and that contract specified a beginning construction date on or before February 29, 1972 (30 TAC 116.10).

New source. Any stationary source, the construction or modification of which is started after March 5, 1972 (30 TAC 116.10).

- When used in the context of modeling, the phrase *new source* refers to a proposed emission point.
- When used in the context of a permit application, the term *new source* refers to a stationary source that was constructed or modified after March 5, 1972 (30 TAC 116.10).
- When used in the context of a PSD or Nonattainment permit application, the term *new source* refers to the total proposed emissions for a greenfield site when the increase in emissions will be major. Or, *new source* refers to emissions at a minor stationary source when the increase in emissions will be major.

Nonattainment area. Any area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the national primary or secondary ambient air quality standard for a criteria pollutant.

Project. An operational and/or physical change that may affect air emission rates at a site.

Property. All land under common control or ownership coupled with all improvements on such land, and all fixed or movable objects on such land, or any vessel on the waters of this state (30 TAC 101.1).

PSD Increment. The maximum allowable increase of an air pollutant that is allowed to occur above the applicable baseline concentration for that pollutant.

Receptor. A location where the public could be exposed to an air contaminant in the ambient air. For the health effects evaluation process, receptors are classified as industrial or non-industrial.

- Industrial. A receptor relating to the manufacturing of products or handling of raw materials or finished products without any associated retail product sales on the property.
- Non-industrial. A receptor type such as residential, recreational, commercial, business, agricultural, or a school, hospital, day-care center, or church. Other types include rights-of-way, waterways, or the like. In addition, receptors in unzoned or undeveloped areas may be treated as non-industrial.

Refined model. An analytical technique that provides a detailed treatment of physical and chemical atmospheric processes and requires detailed and precise input data. Specialized estimates are calculated that are useful for evaluating source impact relative to air quality standards and allowable increments. The estimates are more representative than those obtained from conservative screening techniques.

Screening technique. A relatively simple analysis technique to determine whether a given source is likely to pose a threat to air quality. Concentration estimates from screening techniques are conservative.

Significant Monitoring Concentration (SMC). A de minimis level of impact that the EPA has concluded does not justify collecting pre-construction monitoring data for purposes of an air quality analysis.

Single Property Line Designation (SPLD). A legal agreement that allows two or more property owners to claim a single property line for consideration of their off-property impact for purposes of minor NSR analyses.

Site. The area that encompasses all emission sources of constituents. Includes all facilities and other emission sources associated with the regulated entity number (30 TAC 122.10).

Site-wide modeling. Modeling (refined or screening) of *all* emission points on a contiguous property or associated with the regulated entity number. Emissions from all authorization types except de minimis are included: permit by rule, standard permit, and new source review permit.

Source.

- A point of origin of air contaminants, whether privately or publicly owned or operated (30 TAC 116.10). Upon request of a source owner, the executive director shall determine whether multiple processes emitting air contaminants from a single point of emission will be treated as a single source or as multiple sources (30 TAC 101.1).
- For PSD and Nonattainment permit applications, the term *source* may refer to all emission points on a site or to a facility.
- When used in the context of modeling, the term *source* refers to the release point, volume, or area of emissions.

Stationary source.

- When used in the context of modeling, the term *stationary source* refers to emission points that are fixed and not mobile. For example, exhaust from a stack or baghouse is from a fixed point, and exhaust from a car is from a mobile source because the exhaust moves as the car does.
- When used in the context of PSD and Nonattainment permit applications, the term *stationary source* refers to any building, structure, facility, or installation that emits or may emit any air pollutant subject to regulation under the FCAA (30 TAC 116.12).
- Also, see the terms *modified stationary source or facility* and *major modified stationary source or facility*.

Trigger date. This is the date after which the PSD increment minor source baseline date may be established.

Unclassifiable area. Any area that cannot be classified on the basis of available information as meeting or not meeting the national primary or secondary ambient air quality standard for the pollutant.

Universal Transverse Mercator projection (UTM). UTM is a widely used map projection that employs a series of identical projections around the world in the mid-latitude areas, each spanning six degrees of longitude and oriented to a meridian. This projection preserves angular relationships and scale plus it easily allows a rectangular grid to be superimposed on it. Many worldwide topographic and planimetric maps at scales ranging between 1:24,000 and 1:250,000 use this projection.

Section I – Introduction

The Texas Commission on Environmental Quality (TCEQ or commission) manages air quality in the state of Texas by regulating the release of air contaminants through the Texas Clean Air Act (TCAA), located in Chapter 382 of the Texas Health and Safety Code (THSC), develops rules, including those in Title 30 of the Texas Administrative Code (TAC), and implements provisions of the Federal Clean Air Act (FCAA) and Code of Federal Regulations (CFR).

Applications for projects subject to air quality impacts analyses are those with new and/or modified facilities or sources of emissions of air contaminants. The applicant must fully document the basis for air quality impact analysis determinations as it is the applicant's responsibility to demonstrate that the permit should be issued.

This document provides permit reviewers and air dispersion modeling staff with a process to evaluate and determine air quality impacts analysis requirements for case-by-case permit reviews for new and/or modified facilities. While the focus of the document is on the technical review process, it is available to the regulated community and the public to provide an understanding of air quality impacts analysis requirements and processes that affect air permit applications.

During the course of the technical review of an air permit application, the permit reviewer and air dispersion modeling staff evaluate air quality impacts analysis requirements and confirm that the applicant has conducted an appropriate air quality impacts analysis and properly determined off-property impacts for the project facilities and associated sources. The applicant's air quality impacts analysis, along with the permit reviewer and air dispersion modeling staff's evaluation and final recommendation, provide a record that demonstrates that the operation of a proposed facility will not cause or contribute to a condition of air pollution and will comply with all applicable federal and state rules and regulations, as well as with the intent of the TCAA.

While this document provides a general process and defines minimum criteria for agency staff's consideration of air quality impacts analysis requirements, this document is not regulatory and does not limit the permit reviewer's ability to require the applicant to provide additional information. This additional information could be related to comments received during the public notice or meeting process, coordination with Environmental Protection Agency (EPA) or TCEQ staff on known areas of interest, or issues related to off-property impacts (protection of public health). Permit reviewers and air dispersion modeling staff may deviate from this guidance with approval from their supervisors or from the Air Permits Division (APD) director.

Be aware that there are often differences in term usage and term definitions between the state and federal regulatory agencies. Please refer to "Glossary of Acronyms and Symbols" and "Definitions" for additional clarification.

Section II – Authority for Requesting Air Quality Impacts Analyses

The policy of the state of Texas and the purpose of the TCAA is “to safeguard the state's air resources from pollution by controlling or abating air pollution and emissions of air contaminants, consistent with the protection of public health, general welfare, and physical property, including the esthetic enjoyment of air resources by the public and the maintenance of adequate visibility” (THSC 382.002(A)).

The TCEQ receives its authority for an air quality impacts analysis review through the TCAA and the FCAA. The TCAA requires air permit authorizations for new and/or modified facilities, including a demonstration that the operation of a proposed facility will not cause or contribute to a condition of air pollution and comply with federal requirements under the FCAA.

Under 30 TAC 116.111, all construction permits and amendments for facilities require an air quality impacts analysis. In addition, each proposed new major source or major modification in an attainment or unclassifiable area shall comply with 30 TAC 116.160.

The EPA has approved the Texas State Implementation Plan (SIP), making the TCEQ the permitting authority for regulation of air emissions generated in the state of Texas. The Texas SIP, which is federally enforceable, includes Texas’ New Source Review (NSR) permitting programs for both major and minor sources, and these programs implement both the FCAA and the TCAA. The required permits are commonly referred to as “construction,” “case-by-case,” or “NSR” permits and must be issued prior to construction. Facilities must, at a minimum, comply with TCAA requirements. Additional requirements apply if a facility is subject to the permitting programs established in the FCAA.

Facilities must meet all applicable state rules and federal regulations to receive any state or federal air authorization. The applicant must address each of the air quality rules and regulations for applicability and explain the basis for expected compliance. If any particular rule or regulation is not applicable, the applicant must provide the basis for non-applicability.

Section III – Air Quality Analysis

An applicant must demonstrate that the proposed operation, as represented in the air permit application, would not cause or contribute to a National Ambient Air Quality Standard (NAAQS) or Prevention of Significant Deterioration (PSD) Increment violation and would be protective of public health, general welfare, and physical property. This demonstration is commonly referred to as a protectiveness or impacts review or evaluation. An air quality analysis (AQA) is the means for the applicant to make the demonstration. The AQA is an evaluation of the potential impact on the environment associated with increased emissions from a new and/or modified facility and can contain a combination of air dispersion modeling and ambient air monitoring data. Additional analyses required by federal rule would also be included in the AQA.

The AQA is a stand-alone report. Results from the report should be sufficient for staff to evaluate the impact of the proposed operation without input from other reports. Staff should not refer to other documents or reports for data required to be in the report. In addition, applicants should not exclude items normally required without coordination with the Air Dispersion Modeling Team (ADMT), unless the items are clearly not applicable to the project.

Air Dispersion Modeling

As stated above, an AQA may include air dispersion modeling (30 TAC 116.111(J)). Air dispersion models are tools to approximate concentrations from one or more facilities or sources of air contaminants. When an air contaminant is emitted into the atmosphere, it is transported and dispersed by various atmospheric processes. Algorithms and equations have been developed to approximate (model) these atmospheric processes and have been incorporated into various computer codes (computer models). Agency staff uses the results from these computer models in their review of air permit applications. A modeled prediction alone does not mean that there will be a condition of air pollution, but it is one of many indicators that agency staff considers in the air permit application review process. However, a modeled prediction exceeding a standard or guideline value may be used as the basis to modify proposed/existing allowable emission rates, stack parameters, or operating conditions in order to demonstrate that the predicted impact from the operation is acceptable.

Ambient Air Monitoring

Occasionally, modeled predictions may not clearly indicate whether emissions from a site or individual facility could cause or contribute to a condition of air pollution. In those cases, the use of ambient air monitoring data in the technical review process may be an option to supplement modeled predictions. With few exceptions, the monitoring demonstration must be conducted before a permit is issued to ensure that permit conditions and allowable emissions are protective.

An ambient air monitor captures a sample of air from the atmosphere. The sample is then analyzed to determine the amount (concentration) of air contaminants contained in the sample. The sample can be automatically analyzed at the monitor location (continuous ambient monitor station or CAMS) or taken to a laboratory to be analyzed (canister or filter sample).

The air contaminants contained in a sample from an ambient air monitor come from air contaminant sources that are upwind of the monitor location, both manmade and natural. Some air contaminant sources may be immediately upwind, such as a combustion engine exhaust stack, or thousands of miles away, such as the Sahara Desert. The farther the upwind distance from the monitor, the longer the transport time from the source to the monitor, and the more the contaminants are dispersed before reaching the monitor.

Ambient air monitoring is used to give an idea of what the air quality is at a specific location during a specific time period. Many samples over an extended period of time from many locations in proximity to each other can provide a reasonable estimate of the air quality over a region.

Air Quality Analysis Process

The AQA process may involve a number of agency staff, depending on the complexity of the application and the potential impact of the proposed facilities or sources on air quality. The permit reviewer determines the scope of the AQA to be performed by the applicant and the involvement of other agency staff. Therefore, the applicant should contact the permit reviewer for guidance before involving other agency staff in the AQA process.

For all minor NSR AQAs, management recommends that a modeling protocol be submitted or a guidance meeting be held detailing the proposed approach to demonstrate compliance with all applicable requirements. For all federal AQAs, a modeling protocol is required, and a copy of the modeling protocol must be sent to EPA Region 6. A modeling protocol or guidance meeting should include as many details, specifics, and support documents as applicable. Ideally, the AQA modeling protocol or guidance meeting minutes would be identical to the final AQA report without any modeling results. When setting up a guidance meeting, the applicant should provide as much detail to the agency staff before the meeting to allow sufficient time for staff to prepare for the meeting.

Next, the applicant prepares and submits an AQA to the agency as part of an air permit application. Frequently, the permit reviewer requests that the ADMT conduct a technical review, or audit, of an AQA. The purpose of the review is to evaluate the technical quality of the AQA to ensure the information and results can be used by agency staff in the technical review process. A key part of the review is ADMT's assessment that the predicted concentrations represent potential impacts and demonstrate compliance with federal and state regulations.

If the ADMT staff finds errors and/or discrepancies during the review, they evaluate the errors and/or discrepancies to determine whether they would cause a significant change in the magnitude or location of predicted concentrations. That is, whether the predicted concentrations would still be representative and usable by agency staff to determine whether the permit should be issued. The ADMT should work closely with the permit reviewer and the applicant's modeler to resolve omissions, unclear documentation, or other deficiencies.

If the ADMT cannot resolve a modeling-related deficiency, then the modeling submittal is not accepted, and the ADMT forwards recommended corrective actions to the permit reviewer. Then, the permit reviewer contacts the applicant to provide the deficiencies and schedule to resolve them.

Section IV – Conducting the Air Quality Analysis

The AQA is an evaluation of the impact on the environment associated with increased emissions from a new and/or modified facility and is usually based on the predicted concentrations obtained through modeling. There are two levels of modeling used in the AQA process: screening and refined. Modeling results from either level, as appropriate, may be used to demonstrate compliance with standards or guidelines.

Screening Modeling

The first level of modeling involves the use of screening procedures or models. Screening models use simple algorithms and conservative techniques to indicate whether more detailed modeling is necessary.

Screening models are usually designed to evaluate a single source. Multiple sources can be modeled individually. The maximum predicted concentration from each source is then summed for an overall estimate of the maximum predicted concentration. This technique is conservative since the predicted concentrations from each source are added without regard to time and space.

Refined Modeling

The second level of modeling, refined modeling, requires more detailed and precise input data and more complex models in order to provide refined concentration estimates.

The permit reviewer may determine that refined modeling is necessary if the screening analysis indicates that the predicted concentrations from the evaluated sources could exceed a standard, a guideline (such as an effects screening level), a de minimis level, or an agency staff-identified percentage of a standard or guideline.

Modeling Emissions Inventory

The modeling emissions inventory consists of the emissions from facilities to be permitted, as well as other applicable on- and off-property emissions. These emissions are identified by emission point numbers (EPNs) but are usually referred to as sources in air dispersion modeling guidance documents.

Preliminary Impact Determination

It is important to understand that individual facilities may be subject to different requirements depending on the contaminants and proposed emission rates of each facility. There are two general categories of permits: major NSR and minor NSR. The major NSR permit is often referred to as a federal or PSD permit. A PSD permit can be issued for criteria pollutants (those with NAAQS and PSD increments) and selected non-criteria pollutants (those with significant emission rates but no NAAQS). Technically, all TCEQ permits are federal in that the state must implement a minor NSR permitting program to ensure the NAAQS and increments are attained. The AQAs for major NSR and minor NSR permits begin with a preliminary impact determination. The purpose of a preliminary impact determination is to determine whether a new and/or modified facility or a combination of the two, could cause a significant off-property impact. Either screening or refined modeling can be used as appropriate. Below are general steps for identifying emissions to include in the preliminary impact determination.

Step 1: Identify All Sources of Emissions. Include emissions from all new and/or modified facilities associated with the project.

Step 2: Determine Whether There Is a Net Emissions Increase. Determination of the project emissions may vary depending on the type of permit (minor NSR or major NSR). The determination of the level of federal applicability is the first step in the technical review process and is performed by the permit reviewer. The federal applicability process determines whether a project is minor or major. While the steps of the modeling process are consistent, requirements vary based on the type of permit and contaminant.

Note that the discussion below in terms of actual emissions refers to emissions used in modeling (the two years before the modeling demonstration) and may not be the same as that used in the federal applicability process.

Minor NSR: The permit reviewer evaluates proposed allowable emissions from new facilities and allowable emissions increases and decreases from existing facilities directly associated with the permit application or project.

Major NSR: The permit reviewer evaluates proposed allowable emissions from new facilities and emissions increases and decreases at any facility site-wide over a contemporaneous period (minimum five-year period).

Step 3: Evaluate Modifications to Existing Sources at the Site. Carry out this step even if there is no net increase in emissions. For both minor and major NSR modeling, include these sources in the preliminary impact determination if there is a change in operating hours or stack parameters, and previous modeling demonstrations were limited to those operating hours or stack parameters. That is, the permit was based on those limits.

Step 4: Develop the Emission Inventory for the Site. In general, the statements below are valid; however, the applicant should consult with the permit reviewer to verify that the appropriate emission rates were developed.

New Facility:

> Minor NSR: The emission rate is the proposed allowable emission rate.
>
> Major NSR: The emission rate is the proposed allowable emission rate.

Modified Facility:

> Minor NSR: The emission rate is the difference between the proposed allowable emission rate and the current allowable emission rate.

For modified facilities that have not had a change in location or source parameters, this emission rate is the difference between the proposed allowable emission rate and the current allowable emission rate. For modified facilities that have a proposed change in location or source parameters, model the current allowable emission rates as a negative value with the current location and source parameters and the proposed allowable emission rates with the proposed location and source parameters. Include facilities that will be shut down permanently, not operating, or operating at a reduced rate as represented in the air permit application. These representations will be incorporated as enforceable permit limits.

Major NSR: The emission rate is the difference between the proposed allowable emission rate and the actual emission rate. For facilities identified in the contemporaneous period, the emission rate is the difference between the allowable emission rate and the actual emission rate.

For modified facilities that have not had a change in location or source parameters, this emission rate is the difference between the proposed allowable emission rate and the actual emission rate. For modified facilities that have a proposed change in location or source parameters, model the actual emission rates as a negative value with the current location and source parameters and the proposed allowable emission rates with the proposed location and source parameters. Include facilities that will be shut down permanently, not operating, or operating at a reduced rate as represented in the air permit application. These representations will be incorporated as enforceable permit limits.

If the applicant has data on actual short-term emission rates, then these data can be used to determine representative short-term emission rates over the appropriate averaging time period. If these data are not available, the short-term emission rates can be derived from the actual annual emission rates. Using the derived short-term emission rates may result in larger emission rates to model, which is a reasonable approach.

Step 5: Conduct Modeling. Carry out the preliminary impact determination modeling as indicated for the applicable modeling analysis discussed below.

Minor NSR

When a project does not trigger major NSR review or emits an air contaminant not subject to major NSR review, the minor NSR air quality analysis consists of the following elements and modeling as applicable:

- NAAQS analysis;
- State Property Line Standard analysis; and
- Health Effects analysis. Also known as effects screening level (ESL) analysis and includes consideration of welfare effects.

Minor NAAQS Analysis

The purpose of the Minor NAAQS analysis is to demonstrate that proposed emissions of criteria pollutants from a new facility or from a modification of an existing facility that does not trigger PSD review will not cause or contribute to an exceedance of the NAAQS. The demonstration may consist of both air dispersion modeling predictions and ambient air monitoring data. The person conducting the modeling should follow the basic procedure described in the following paragraphs.

Minor NAAQS Step 1: Conduct a preliminary impact determination to predict whether the proposed source(s) could make a significant impact on existing air quality. That is, the model predicts concentrations at one or more receptors in the modeling grid greater than or equal to a NAAQS de minimis level (note for this document, the term de minimis and the phrase significant impact level (SIL) are synonymous). It should be noted that the use of interim or recommended SILs will need to be justified. Refer to Appendix A for additional guidance on justifying the use of the SILs.

- Model all new and/or modified sources. Compare the predicted high concentration at or beyond the property line for each criteria pollutant and each averaging time to the appropriate NAAQS de minimis level in Appendix B. The predicted high concentration may be related to the form of the NAAQS (exceedance- or statistically-based) and the number of years of meteorological data used.
- If the sources do not make a significant impact for a pollutant of concern, the demonstration is complete. If there is a significant impact, then the significant receptors define an area of impact (AOI), and a full NAAQS analysis is required. Go to Step 2.

Minor NAAQS Step 2: Determine the AOI for each criteria pollutant and averaging period subject to the NAAQS analysis.

- The AOI is the set of receptors that have predicted concentrations at or greater than the de minimis level for each applicable averaging time and criteria pollutant.
- The full NAAQS analysis is carried out for each criteria pollutant and averaging time separately and need only include the AOI for the associated criteria pollutant and averaging time combination.

Minor NAAQS Step 3: Off-property sources will need to be evaluated. One method is to obtain a listing of applicable sources and associated parameters from the TCEQ to evaluate in the AQA. The Information Resources Division (IRD) should be contacted to request this listing. It is the responsibility of the person conducting the modeling to obtain these data and ensure their accuracy. Any changes made to the data must be documented and justified. In addition, if the person conducting the modeling is aware of source data not provided by the IRD, such as recently issued permitted facilities or applicable facilities in other states within the distance limits of the model, the data should be included as applicable. Refer to Appendix C for additional guidance for requesting data from the IRD.

Minor NAAQS Step 4: Determine predicted concentrations over the AOI from all obtained sources and sources to be permitted using the same meteorological data set used in the preliminary impact determination modeling. Model allowable emission rates for all sources that emit the criteria pollutant. Use a certified limit for permit-by-rule (PBR) authorizations. For PBRs without a certified limit, use an estimate of allowable emissions based on actual emissions. Use allowable emissions for standard permit authorizations.

Minor NAAQS Step 5: Determine a representative monitored background concentration. As defined by the EPA, background air quality includes pollutant concentrations due to natural sources, nearby sources other than the one(s) under consideration, and unidentified sources. Refer to Appendix D for additional guidance on determining a representative monitored background concentration.

Minor NAAQS Step 6: Compare the predicted concentration plus representative monitored background concentration for each criteria pollutant and averaging time to the appropriate NAAQS (Appendix B). If the maximum concentrations are at or below the NAAQS, the demonstration is complete. If not, review the demonstration for conservatism and determine if any refinements can be made, or demonstrate that the project's impact will not be significant.

Refer to Appendix E for additional guidance on conducting the Minor NAAQS analysis.

State Property Line Standard Analysis

The purpose of the state property line standard analysis is to demonstrate compliance with state standards for net ground-level concentrations. This analysis must demonstrate that resulting air concentrations from all on-property facilities and sources that emit the regulated pollutant will not exceed the applicable standard.

Although all on-property facilities should be evaluated, in many cases the proposed emissions or changes in emissions may not be substantial when compared to the total emissions from the site. The person conducting the modeling should follow the basic procedure described in the following paragraphs.

State Property Line Step 1: Conduct a preliminary impact determination by modeling the allowable emission rates for all new and/or modified facilities that emit the applicable contaminant.

- For new sources with no other sources on site. If the predicted high concentration is equal to or less than the standard, the demonstration is complete.
- For new and modified or only modified sources at the site. If the predicted high concentration is less than two percent of the standard, technical justification for demonstrating compliance may require additional information such as project emissions increases, total site emissions, results from previous site-wide modeling, or ambient air monitoring data. Refer to Appendix F for further discussion to determine if site-wide modeling is needed.

- If the predicted high concentration is equal to or greater than two percent of the standard, coordinate with the permit reviewer to determine if site-wide modeling is needed. Staff will consider factors such as project emissions increases, total site emissions, results from previous site-wide modeling, or ambient air monitoring data. Refer to Appendix F for further discussion to determine if site-wide modeling is needed. If site-wide modeling is required, go to Step 2.

State Property Line Step 2: Model the allowable emission rates for all sources on the property that emit the contaminant. Use a certified limit for PBR authorizations. For PBRs without a certified limit, use an estimate of allowable emissions based on actual emissions. Use allowable emissions for standard permit authorizations. Compare the predicted high concentration to the applicable state standard (see Appendix B).

- If the predicted high concentration is less than or equal to the standard, the demonstration is complete.
- If the predicted high concentration is greater than the standard, review the demonstration for conservatism and determine if any refinements can be made.

Refer to Appendix F for additional guidance on conducting the State Property Line Standard analysis.

Health Effects Analysis

The purpose of the Health Effects analysis is to demonstrate that emissions of non-criteria pollutants from a new facility or from a modification of an existing facility will be protective of the public's health and welfare.

Agency toxicologists use the results from the Health Effects analysis to evaluate the effects of emissions on a contaminant-by-contaminant basis. The objectives of the analysis are to:

- Establish off-property ground-level concentrations (GLCs) of contaminants resulting from proposed and/or existing emissions, and
- Evaluate these GLCs for their potential to cause adverse health or welfare effects.

Toxicology Division (TD) staff compare the GLC to an effects screening level (ESL). An ESL is a guideline and not a standard. This format provides the flexibility required to easily revise the value to incorporate the newest toxicity data. Consult with the TD to ensure that the most recent ESLs are used, to obtain additional information concerning the basis for ESLs, or to obtain ESLs for contaminants not in the Toxicity Factor database. For contaminants not in the Toxicity Factor database, provide the chemical abstract service (CAS) registry number and a material safety data sheet (MSDS) to the TD staff so that they can positively identify the contaminant and derive an ESL.

Refer to Appendix G for additional guidance on conducting the Health Effects analysis.

PSD Air Quality Analysis

The PSD program applies when a major source, that is located in an area that is designated as attainment or unclassifiable for any criteria pollutant, is constructed and/or undergoes a major modification. The PSD program also applies to select non-criteria pollutants. The air quality analysis consists of the following elements:

- PSD NAAQS analysis;
- PSD pre-application analysis;
- PSD increment analysis;
- Additional impacts analysis; and
- Class I area analysis.

PSD NAAQS Analysis

The purpose of the PSD NAAQS analysis is to demonstrate that emissions of criteria pollutants from a new major source or major modification of an existing source will not cause or contribute to an exceedance of the NAAQS. The demonstration may consist of both air dispersion modeling predictions and ambient air monitoring data. The person conducting the modeling should follow the basic procedure described in the following paragraphs.

PSD NAAQS Step 1: Conduct a preliminary impact determination to predict whether the proposed source(s) could make a significant impact on existing air quality. That is, the model predicts concentrations at one or more receptors in the modeling grid greater than or equal to a NAAQS de minimis level (note for this document, the term de minimis and the phrase SIL are synonymous). It should be noted that the use of interim or recommended SILs will need to be justified. Refer to Appendix A for additional guidance on justifying the use of the SILs.

- Model all new and/or modified sources. Compare the predicted high concentration at or beyond the fence line for each criteria pollutant and each averaging time to the appropriate NAAQS de minimis level in Appendix B. The predicted high concentration may be related to the form of the NAAQS (exceedance- or statistically-based) and the number of years of meteorological data used.
- If the sources do not make a significant impact for a criteria pollutant of concern, the demonstration is complete. If there is a significant impact, then an AOI is defined, and a full NAAQS analysis is required. Go to Step 2.

PSD NAAQS Step 2: Determine the AOI for each criteria pollutant and averaging period subject to the NAAQS analysis.

- The AOI is the set of receptors that have predicted concentrations at or greater than the de minimis level for each applicable averaging time and criteria pollutant.

- The full NAAQS analysis is carried out for each criteria pollutant and averaging time separately and need only include the AOI for the associated criteria pollutant and averaging time combination.

PSD NAAQS Step 3: Off-property sources will need to be evaluated. One method is to obtain a listing of applicable sources and associated parameters from the TCEQ to evaluate in the AQA. The IRD should be contacted to request this listing. It is the responsibility of the person conducting the modeling to obtain these data and ensure their accuracy. Any changes made to the data must be documented and justified. In addition, if the person conducting the modeling is aware of source data not provided by the IRD, such as recently issued permitted facilities or applicable facilities in other states within the distance limits of the model, the data should be included as applicable. Refer to Appendix C for additional guidance for requesting data from the IRD.

PSD NAAQS Step 4: Determine predicted concentrations over the AOI from all obtained sources and sources to be permitted using the same meteorological data set used in the preliminary impact determination modeling. Model allowable emission rates for all sources that emit the regulated criteria pollutant. Use a certified limit for PBR authorizations. For PBRs without a certified limit, use an estimate of allowable emissions based on actual emissions. Use allowable emissions for standard permit authorizations.

PSD NAAQS Step 5: Determine a representative monitored background concentration. As defined by the EPA, background air quality includes pollutant concentrations due to natural sources, nearby sources other than the one(s) under consideration, and unidentified sources. Refer to Appendix D for additional guidance on determining a representative monitored background concentration.

PSD NAAQS Step 6: Compare the predicted concentration plus representative monitored background concentration for each criteria pollutant and averaging time to the appropriate NAAQS (Appendix B). If the maximum concentrations are at or below the NAAQS, the demonstration is complete. If not, review the demonstration for conservatism and determine if any refinements can be made, or demonstrate that the project's impact will not be significant.

Refer to Appendix E for additional guidance on conducting the PSD NAAQS analysis.

PSD Pre-application Analysis

The purpose of the PSD pre-application analysis is to provide an analysis of the existing ambient air quality in the area that the major source or major modification would affect. The analysis must be based on continuous air quality monitoring data. The person conducting the analysis should follow the basic procedure described in the following paragraphs. Note that pre-construction and/or post-construction monitoring could be required by the TCEQ.

PSD Pre-application Step 1: Compare the predicted high concentration obtained from the applicable preliminary impact determination to the significant monitoring concentration (SMC) in Appendix B.

- For criteria pollutants, compare the predicted high concentrations obtained from the NAAQS preliminary impact determination modeling demonstration to the SMC for the pollutant of interest. If the maximum concentration is less than the SMC, the demonstration is complete. If the maximum concentration equals or exceeds the SMC, go to Step 2.
- For non-criteria pollutants, use the preliminary impact determination results from the appropriate minor NSR modeling demonstration. If the maximum concentration is less than the SMC, the demonstration is complete. If the maximum concentration equals or exceeds the SMC, go to Step 2.

PSD Pre-application Step 2: Provide an analysis of the ambient air quality in the area that the project emissions would affect for all applicable averaging periods.

- For criteria pollutants, collect representative monitoring background concentrations to establish the existing air quality for the area that the project emissions would affect. Refer to Appendix D for additional guidance on determining representative monitoring background concentrations.
- For non-criteria pollutants, site-wide modeling from the minor NSR modeling demonstration may be sufficient for the pre-application analysis.

If existing monitoring data are not available or are judged not to be representative or conservative, go to Step 3.

PSD Pre-application Step 3: Establish a site-specific monitoring network. The applicant should coordinate with the permit reviewer for determining the scope of monitoring and for assistance in the preparation of a monitoring quality assurance plan.

Refer to Appendix H for additional guidance on conducting the PSD pre-application analysis.

PSD Increment Analysis

The purpose of the PSD increment analysis is to demonstrate that emissions of applicable criteria pollutants from a new major source or major modification of an existing source will not cause or contribute to an exceedance of an increment. The PSD increment is the maximum allowable increase in concentration that is allowed to occur above a baseline concentration for a pollutant. The person conducting the modeling should follow the basic procedure described in the following paragraphs. The following discussion introduces and explains several terms that are specific to PSD increment analyses followed by the basic procedure for conducting the analysis.

Baseline and Trigger Dates. There are several dates that are used in the increment analysis:

- *Major source baseline date.* This is the date after which actual emissions associated with physical changes or changes in the method of operation at a major stationary source affect the available increment. Changes in actual emissions occurring at any stationary source after this date contribute to the baseline concentration until the minor source baseline date is established. After the minor source baseline date, new and modified major and minor stationary sources in the baseline area consume increment.

- *Trigger date.* This is the date after which the minor source baseline date may be established.
- *Minor source baseline date.* This is the earliest date after the trigger date on which a PSD application for a new major source or a major modification to an existing source is considered complete. The minor source baseline date is pollutant- and geographically-specific.

Baseline area. The baseline area is established for each applicable pollutant's minor source baseline date by the submission of a complete PSD application and subsequent source impact analysis. The extent of a baseline area is limited to intrastate areas and includes all portions of the attainment or unclassifiable area in which the PSD applicant would propose to locate, as well as any attainment or unclassifiable area in which the proposed emissions would have a significant ambient impact for the annual averaging period.

Baseline concentration. The ambient concentration level that existed in the baseline area at the time of the applicable minor source baseline date. The baseline concentration is the reference point for determining air quality deterioration in an area. The baseline concentration level is not based on ambient monitoring because ambient measurements reflect emissions from all sources, including those that should be excluded from the measurements.

Increment calculation. The baseline concentration does not need to be obtained to determine the amount of PSD increment consumed or the amount of increment available. Instead, the amount of PSD increment that has been consumed in an attainment or unclassified area is determined from the emissions increases and decreases that have occurred from stationary sources in operation since the applicable baseline date. Modeled increment consumption calculations reflect the change in ambient pollutant concentration attributable to increment-affecting emissions. Increment consumption (or expansion) calculations are determined by evaluating the difference between the actual emissions at the applicable baseline date ($Actual_{BD}$) and actual emissions as of the date of the modeling demonstration ($Actual_{MD}$).

- $Actual_{BD}$. This is the representative two-year average for long-term emission rates, or the maximum short-term emission rate in the same two-year period immediately before the applicable baseline date. If little or no operating data are available, as in the case of permitted sources not yet in operation at the time of the applicable baseline date, the permit allowable emission rate as of the applicable baseline date is used.
- $Actual_{MD}$. This is the most recent, representative two-year average for long-term emissions rates, or the maximum short-term emission rate in the same two-year period immediately before the modeling demonstration. If little or no operating

data are available, as in the case of permitted sources not yet in operation at the time of the increment analysis, the permit allowable emission rate is used.

A tiered approach is suggested for this analysis to limit the amount of research needed to determine actual emission rates. The person conducting the modeling should follow the basic procedure described in the following paragraphs.

PSD Increment Step 1: Determine whether the predicted high concentration (excluding background concentration) obtained in the PSD full NAAQS analysis is equal to or less than the applicable increment. If yes, the demonstration is complete because all sources were modeled at allowable emission rates. If not, go to Step 2. Note that Step 1 does not apply for criteria pollutants with NAAQS that are statistically-based (i.e., multi-year average).

PSD Increment Step 2: Determine the AOI for each criteria pollutant and averaging period subject to the PSD increment analysis. The AOI will be the same one used in the PSD NAAQS analysis, except for those criteria pollutants with NAAQS that are statistically-based. For criteria pollutants with NAAQS that are statistically-based, determine the AOI following the convention of exceedance-based NAAQS (i.e., maximum predicted concentration). It should be noted that the use of interim or recommended SILs to determine the AOI will need to be justified. Refer to Appendix A for additional guidance on justifying the use of the SILs.

PSD Increment Step 3: Obtain a listing of applicable increment-affecting sources and associated parameters from the TCEQ to evaluate in the AQA. The IRD should be contacted to request this listing. It is the responsibility of the person conducting the modeling to obtain these data and ensure their accuracy. Any changes made to the data must be documented and justified. In addition, if the person conducting the modeling is aware of source data not provided by the IRD, such as recently issued permitted facilities or applicable facilities in other states within the distance limits of the model, the data should be included as applicable. Refer to Appendix C for additional guidance for requesting data from the IRD.

PSD Increment Step 4: Adjust the emission inventory.

- Omit any source from the inventory that has a negative emission rate unless the source existed and was in operation at the applicable baseline date. A source must have existed and been in operation on or before the applicable baseline date to be considered for increment expansion.
- Omit any source permitted after the applicable baseline date that has shut down or that will be shut down as part of the current project. A source that did not exist or was not operating on or before the applicable baseline date would not have contributed to the air quality at that time, and there would be no need to model the source with an emission rate of zero.

PSD Increment Step 5: Conduct the modeling demonstration using the same meteorological data set used in the determination of the AOI using the following tiered approach, as applicable.

Increment Modeling Tier I. Model all sources using their allowable emission rates. This approach is conservative since the increment consumed is based on the entire allowable emission rate. Compare the predicted high concentration to the appropriate increment (Appendix B). If the increment is not exceeded, the demonstration is complete. Otherwise, go to Tier II.

Increment Modeling Tier II. Model selected sources with $Actual_{MD}$ emission rates and all other sources at allowable emission rates. The selected sources are usually the applicant's, since actual emission rates may be difficult to obtain for off-property sources. This process assumes that the increment consumed for the selected sources is based on the entire actual emission rate and the entire allowable emission rate for all other sources. If the increment is not exceeded, the demonstration is complete. Otherwise, go to Tier III.

Increment Modeling Tier III. Model selected sources that existed and were in operation at the applicable baseline date with the *difference* between $Actual_{MD}$ and $Actual_{BD}$.

- For major sources permitted at or before the applicable major source baseline date but not in operation as of the applicable minor source baseline date or for minor sources permitted at or before the applicable minor source baseline date but not in operation as of the applicable minor source baseline date, use the difference between $Actual_{MD}$ and the allowable emission rate.
- For sources that existed at the applicable baseline date, where a change in actual emission rates involved a change in stack parameters, use the emission rates associated with both the applicable baseline date and the current and/or proposed source configuration. That is, enter the $Actual_{BD}$ as negative numbers along with the applicable baseline source parameters, and enter $Actual_{MD}$ for the same source as positive numbers along with the current and/or proposed source parameters.
- Use emission rates found in Tiers I or II for other sources, as applicable.

If the increment is not exceeded, the demonstration is complete. Otherwise, continue to refine increment emission rates or demonstrate that the project's impact will not be significant.

Refer to Appendix I for additional guidance on conducting the PSD increment analysis.

Additional Impacts Analysis

The purpose of the Additional Impacts Analysis is to show that additional impacts from a new major source or major modification of an existing source will not impair visibility, soils, and vegetation as a result of the emissions associated with the source or modification. Also, an analysis of the air quality impact projected for the area due to growth associated with the new major source or major modification of the existing source is required. The person conducting the modeling should follow the basic procedure described in the following paragraphs.

The Additional Impacts Analysis consists of the following elements:

- Growth Analysis;
- Visibility Impairment Analysis; and
- Soils and Vegetation Analysis.

Each of these analyses is described in detail below.

- **Growth Analysis**

  The analysis consists of estimating how much new growth (residential, industrial, commercial, and/or other growth) is likely to occur in the area (i.e. within the modeling domain) to support the major source or major modification under review, and then estimate the emissions which will result from that associated growth. The growth analysis shall also include an analysis of the air quality impact projected for the area as a result of general residential, industrial, commercial, and/or other growth associated with the major source or major modification under review. An in-depth growth analysis is only required if the project would result in a significant shift in population and associated activity into the area (i.e. a population increase on the order of thousands of people).

- **Visibility Impairment Analysis**

  The analysis consists of evaluating visual impairment from the project emissions within the area (i.e. within the modeling domain). This analysis is distinct and separate from the Class I area visibility analysis. The applicant can meet the requirement for the Class II visibility impairment analysis by acknowledging compliance with the visibility and opacity requirements in 30 TAC Chapter 111.

- **Soils and Vegetation Analysis**

  The analysis consists of evaluating the impact of the project emissions on soils and vegetation within the area (i.e. within the modeling domain). A good faith effort must be made to understand the area surrounding the project site and verify with other agencies (National Park Service, U.S. Forest Service, Texas Parks and Wildlife, etc.) the existence of sensitive soils and vegetation. For most types of soils and vegetation, ambient concentrations of criteria pollutants below the secondary NAAQS will not result in harmful effects. The impact on vegetation having no significant commercial or recreational value need not be addressed.

Class I Area Analysis

A Class I area is an area defined by Congress that is afforded the greatest degree of air quality protection. Class I areas are deemed to have special natural, scenic, or historic value. The PSD regulations provide special protection for Class I areas. Little deterioration of air quality is allowed. Maps of all Class I areas, as well as other location information, are located at the following link: www.nps.gov/subjects/air/class1.htm

The purpose of the Class I area analysis is to demonstrate that the project emissions will not have an adverse impact on any Class I area and not exceed Class I increments. The FCAA specifically addresses the prevention of visibility impairment and protection of air quality-related values (AQRVs) regarding Federal Class I areas. The AQRVs are all those values possessed by an area that may be affected by changes in air quality and include all those assets of an area whose visibility, significance or integrity are dependent upon the environment. Examples of AQRVs include:

- visibility, odor, flora, fauna, and other geological resources;
- archeological, historical, and other cultural resources; and
- soils and water quality resources.

A Class I area analysis is required for all applicable criteria and non-criteria pollutants from any new major source or major modification located within 10 kilometers (km) of a Class I area and would have a 24-hour average impact greater than 1 $\mu g/m^3$. In addition, any new major source or major modification located within 100 km of a Class I area is required to perform an impacts analysis for the affected Class I areas. A Class I area analysis could be required for sources located more than 100 km from a Class I area if there is a concern that the project emissions could cause an adverse impact on a Class I area. The person conducting the modeling should follow the basic procedure described in the following paragraphs.

The Class I area analysis consists of the following elements:

- Class I area increment analysis; and
- Visibility and AQRV analysis.

Each of these analyses is described in detail below.

- **Class I Area Increment Analysis**

  An approach to address long-range transport (distances beyond 50 km) for purposes of assessing PSD increments can be used to determine if a significant ambient impact will occur on a Class I area. The person conducting the analysis should follow the basic procedure described in the following paragraphs.

  Class I Area Increment Step 1: Use predicted concentrations from the near-field application of the appropriate screening and/or preferred model to determine the significance of ambient impacts at or about 50 km from the new or modified source. If the new or modified source does not make a significant ambient impact, the demonstration is complete. If the analysis indicates there may be significant ambient impacts at this distance, further analysis is necessary. Go to Step 2.

Class I Area Increment Step 2: For further analysis of assessing significance of ambient impacts for PSD increments on a Class I area, there is not a preferred model for distances beyond 50 km. Therefore, consultation with the ADMT and EPA is needed to develop an approach for assessing ambient impacts. Chemical transport models (CTMs) can be used at this step and the model setup will need to be based on conservative techniques (e.g., do not include plume depleting processes). If the new or modified source does not make a significant ambient impact, the demonstration is complete. If the analysis indicates there may be significant ambient impacts, go to Step 3.

Class I Area Increment Step 3: Conduct a cumulative PSD increment analysis. For this analysis, the selection and use of an alternative model shall occur in agreement with the ADMT and approval from EPA following the requirements of paragraph 3.2.2(e) of the Guideline on Air Quality Models (GAQM).

Note that the demonstration of compliance with Class I area increment values is similar in procedure to the Class II area increment compliance demonstration; however, there are several differences:

- The Class I increment analysis considers only the impact on Class I areas.
- The preliminary impact determination is performed with respect to the Class I area SILs.
- The Class I area is the center point for the development of the emissions inventory for the cumulative Class I area increment analysis.
- The modeled results are compared to the Class I area increment values.
- **Visibility and AQRV Analysis**

Be sure to coordinate with the appropriate Federal Land Manager (FLM) to determine the scope of the analysis. The FLM is the federal agency or the federal official charged with direct responsibility for management of an area designated as a Class I area. Pre-application meetings between the applicant, TCEQ, and the affected FLM to discuss air quality concerns for a specific Class I area are encouraged. Given preliminary information, such as the source’s location and the types and quantity of projected air emissions, the FLM can discuss specific AQRVs, including visibility, for an area and advise the applicant of the analyses needed to assess potential impacts on these resources.

Section V – Preferred Air Dispersion Models and Associated Inputs

An air dispersion model is a simplification of the physical laws governing the dispersion and transport of contaminants in the atmosphere. The simplification is represented as a set of mathematical equations that require information describing a physical situation before the equations can be solved. The required information describing the physical situation is the source data, downwash applicability, receptor design, surface characteristics of the modeling domain, and meteorological data. When the model is run, the required information is read into the set of mathematical equations and then the calculations are performed. The result would be the types of values the user desired to see, such as ambient air ground-level concentrations.

The person conducting the modeling should select the model that is appropriate for the evaluation being conducted, as well as develop/acquire the input data associated with the selected model. The basic procedure is described in the following paragraphs.

Preferred Air Dispersion Models

In general, use the models and follow the modeling procedures identified in the GAQM. Although the GAQM was developed to address PSD and SIP modeling issues, the ADMT applies the general guidance contained in the GAQM to other modeling demonstrations in order to maintain a consistent approach for all projects.

Refer to Appendix J for additional guidance on preferred air dispersion models.

Source Data

Begin by clearly identifying and documenting all sources of emissions associated with the modeling analysis. For each identified source, evaluate and discuss how emissions are generated and emitted. This discussion will be the supporting basis for the source characterization used in the modeling analysis. Then determine and document the appropriate source parameters associated with the source characterization.

Refer to Appendix K for additional guidance on characterizing sources.

Downwash Applicability

Downwash is a term used to represent the potential effects of a building on the dispersion of emissions from a source. Downwash is considered for sources characterized as point sources. The stack height and proximity of a point source to a structure can be used to determine the applicability of downwash. Downwash does not apply to sources characterized as areas. Downwash is indirectly considered for volume sources by adjusting the initial dispersion factors.

Point sources with stack heights less than good engineering practice (GEP) stack height should consider dispersion impacts associated with building wake effects (downwash). GEP stack height is the greater of (40 CFR § 51.100(ii)):

(1) 65 meters, measured from the ground-level elevation at the base of the stack;

(2)(i) For stacks in existence on January 12, 1979, and for which the owner or operator had obtained all applicable permits or approvals required under 40 CFR parts 51 and 52,

$$H_g = 2.5H$$

provided the owner or operator produces evidence that this equation was actually relied on in establishing an emission limitation;

(ii) For all other stacks,

$$H_g = H + 1.5L$$

where H_g is the GEP stack height, measured from the ground-level elevation at the base of the stack; H is the structure height, measured from the ground-level elevation at the base of the stack; and L is the lesser dimension of the structure height or maximum projected width (the width as seen from the source looking towards either the wind direction or the direction of interest) of the structure.

These formulas define the stack height above which building wake effects on the stack gas exhaust may be considered insignificant.

A structure is considered sufficiently close to a stack to cause downwash when the minimum distance between the stack and the building is less than or equal to five times the lesser of the structure height or maximum projected width of the structure (5L). This distance is commonly referred to as the structure's region of influence. If the source is located near more than one structure, assess each structure and stack configuration separately.

Once downwash applicability is determined, provide documentation to support that determination. If downwash is applicable for the modeling analysis, refer to Appendix L for additional guidance on developing downwash parameters.

Receptor Design

For modeling, receptors are locations where the model calculates a predicted concentration. Design a receptor grid with sufficient spatial coverage and density to determine the maximum predicted ground-level concentration in an off-property area or an area not controlled by the applicant. For NAAQS and PSD increment modeling, receptors should cover the entire area of de minimis impact. For example, if the model predictions at the edge of the receptor grid are greater than de minimis, extend the receptor grid until the model predictions are less than de minimis.

When designing a receptor grid, consider such factors as:

- Results of screening analyses;
- A source's release height;
- Proximity of sources to the property line;
- Location of non-industrial receptors and ambient air monitors; and
- Topography, climatology, and other relevant factors.

In addition, the location of ambient air receptors should guide the design of the receptor grid. Ambient air for minor NSR modeling starts at the applicant's property line. If a single property line designation (SPLD) exists, then ambient air for minor NSR modeling starts at the single property line boundary. Note that the SPLD does not apply to federal reviews.

For PSD modeling, ambient air starts at the applicant's fence line or other physical barrier to public access. Also, no receptors are required on the applicant's property because the air over an applicant's property is not ambient; therefore, in a regulatory sense, applicants cannot cause a condition of air pollution on their property from their own sources.

Generally, the spacing of receptors increases with distance from the facilities being evaluated. Consider the following types of receptor spacing:

- *Tight receptors.* Spaced 25 meters apart. Tight receptors could extend up to 200-300 meters from the facilities being evaluated. Consider the distance between the facility and the property or fence line.
- *Fine receptors.* Spaced 100 meters apart. Fine receptors could extend one km from each facility being modeled.
- *Medium receptors.* Spaced 500 meters apart. Medium receptors could cover the area that lies between one and five km from each facility.
- *Coarse receptors.* Spaced one km apart. This spacing could cover the area that lies beyond the medium receptors out to 50 km.

Enter receptor locations into air dispersion models in Universal Transverse Mercator (UTM) coordinates, in order to be consistent with on- and off-property source locations represented in the air permit application, and other reference material, such as United States Geological Survey (USGS) topographic maps. Provide the datum used for UTM coordinates. Applicable UTM zones in Texas are either 13 (from the west border to 102 degrees longitude), 14 (between 102 and 96 degrees longitude), or 15 (east of 96 degrees longitude to the east border). Do not use coordinate systems based on plant coordinates or other applicant-developed coordinate systems.

Refer to Appendix M for additional guidance on developing receptor grids.

Surface Characteristics of the Modeling Domain

The modeling domain is the region that will influence the dispersion of the emissions from the facilities under review. Surface characteristics for the modeling domain should be evaluated when determining representative dispersion coefficients. Air dispersion models utilize dispersion coefficients to determine the rate of dispersion for a plume. Dispersion coefficients are influenced by factors such as land-use / land-cover (LULC), terrain, averaging period, and meteorological conditions.

Evaluating the LULC within the modeling domain is an integral component to air dispersion modeling. The data obtained from a LULC analysis can be used to determine representative dispersion coefficients. The selection of representative dispersion coefficients may be as simple as selecting between rural or urban land-use types. For more complex analyses, representative dispersion coefficients can be determined by parameters that are directly related to the LULC within the modeling domain.

Dispersion coefficients are also influenced by terrain. Evaluate the geography within the modeling domain to determine how terrain elevations should be addressed.

Refer to Appendix N for additional guidance on conducting a LULC analysis and terrain.

Meteorological Data

The ADMT has prepared meteorological data sets for modeling demonstrations in order to establish consistency among modeling demonstrations across the state. These data sets are available by county for download from the ADMT Internet page.

For minor NSR permit applications, the use of one year of meteorological data may be sufficient. However, if five years of meteorological data are used, then use the same five-year meteorological data for all applicable averaging periods for consistency. For PSD demonstrations, use the most recent, readily available five years of meteorological data. Provide an ASCII version of the data with the AQA submittal.

Applicants may request to use other available meteorological data not available from the ADMT. If the request is approved, the applicant is responsible for obtaining, preparing, and processing the data. Before these data sets are used in any modeling demonstration, the applicant should submit them to the ADMT. The ADMT should review and approve the data sets and all the data used to develop the specific meteorological parameters required.

Refer to Appendix O for additional guidance on meteorological data.

Section VI Reporting Requirements

Include in the AQA a written discussion covering the project, the modeling performed, and the results. This analysis should contain at least the items in Appendix P.

The AQA is a stand-alone report. Results from the report should be sufficient to make a decision without input from other reports. Do not refer to other documents or reports for data required to be in the report. In addition, do not exclude items without coordination with the ADMT, unless the items are clearly not applicable to the project. Follow the reporting requirements to expedite the technical review of the AQA and to eliminate unnecessary modeling.

Send the AQA to the permit reviewer that requested the analysis. In addition, for PSD applications send a copy of the AQA to EPA Region 6.

Appendix A – Justifying the Use of the Significant Impact Levels

The purpose of this appendix is to provide guidance for conducting an air quality analysis (AQA) when relying on interim or recommended Significant Impact Levels (SILs). The SILs are screening tools that can be used to determine whether proposed emissions cause or contribute to a violation of a National Ambient Air Quality Standard (NAAQS) or a Prevention of Significant Deterioration (PSD) increment.

Historic Use of SILs

The Environmental Protection Agency (EPA) has historically used pollutant-specific concentration levels, known as SILs, to identify the degree of air quality impact that causes or contributes to a violation of a NAAQS or PSD increment. A proposed source can demonstrate that they do not cause or contribute to a violation by showing that the ambient air quality impacts resulting from the proposed source's emissions would be less than the SIL concentration levels. These SIL values have served as a compliance demonstration tool to make the required demonstration in the PSD program.

Conducting the Air Quality Analysis

The AQAs for PSD and minor New Source Review (NSR) permits begin with a preliminary impact determination. The preliminary impact determination is an evaluation of the project emissions and the results are used to determine whether the project emissions could cause a significant ambient air impact. If the project emissions do not make a significant impact for a pollutant of concern, the demonstration is complete.

The EPA has codified several SILs into regulations at 40 Code of Federal Regulation (CFR) 51.165(b). However, there are criteria pollutants/averaging times that do not have a SIL codified. The EPA has developed interim and recommended SILs, and has provided guidance on their use until formal rulemaking can be pursued.

Interim SILs for 1-hour Nitrogen Dioxide and 1-hour Sulfur Dioxide

The EPA promulgated a 1-hour NAAQS for nitrogen dioxide (NO_2) that became effective on April 12, 2010. The EPA also promulgated a 1-hour NAAQS for sulfur dioxide (SO_2) that became effective on August 23, 2010. The EPA provided guidance for the implementation of these two standards for the PSD program (see memoranda titled, "Guidance Concerning the Implementation of the 1-hour NO_2 NAAQS for the Prevention of Significant Deterioration Program," dated June 29, 2010 and "Guidance Concerning the Implementation of the 1-hour SO_2 NAAQS for the Prevention of Significant Deterioration Program," dated August 23, 2010). The guidance set forth interim SILs that could be used when conducting the required air quality analyses.

The interim SILs were derived using an impact equal to four percent of the respective 1- hour NAAQS. The EPA used a threshold of four percent in order to be consistent with how significant emission rates (SERs) were defined for pollutants subject to PSD (45 Federal Register 52676, August 7, 1980). The EPA defined SERs for particulate matter (PM) and SO_2 as the emission rate that resulted in an ambient impact equal to four percent of the applicable short-term NAAQS. The interim 1-hour SIL values are:

- NO_2: 4 ppb (7.5 µg/m^3)
- SO_2: 3 ppb (7.8 µg/m^3)

To support the use of the interim SILs, the documentation associated with the AQA should include a discussion on why it is reasonable to use the interim SILs in the analysis, along with copies of the EPA guidance memoranda that set forth the interim SILs.

Recommended SILs for Particulate Matter-2.5 and Ozone

The EPA promulgated SILs for $PM_{2.5}$ in 2010 (75 Federal Register 64864, October 20, 2010). However, the U.S. Court of Appeals vacated and remanded 40 CFR 51.166(k)(2) and 52.21(K)(2) based on EPA's lack of authority to exempt sources from the requirements of the Federal Clean Air Act (FCCA) when it established SILs for $PM_{2.5}$ (Sierra Club v. U.S. EPA, Docket No. 10-1413, D.C. Circuit, January 22, 2013). Following litigation, the EPA conducted further evaluations for not only $PM_{2.5}$ but for ozone (O_3) as well given a need, expressed by multiple stakeholders, for the EPA to develop SIL values for O_3. As a result of these evaluations, the EPA developed a new analytical approach to identify a SIL for each O_3 and $PM_{2.5}$ NAAQS and the $PM_{2.5}$ PSD increments (see the guidance memorandum from EPA titled, "Guidance on Significant Impact Levels for Ozone and Fine Particles in the Prevention of Significant Deterioration Permitting Program," dated April 17, 2018).

The new analytical approach is referred to as the air quality variability approach and is based on identifying and quantifying an insignificant impact on air pollutant concentrations based on an assessment of the variability of air quality using data from the ambient $PM_{2.5}$ and O_3 monitoring network. Due to fluctuating meteorological conditions and changes in day-to-day source operations, there is an inherent variability in the air quality in the area of a monitoring site. Using a statistical framework, the EPA quantified the variability and determined a value for a concentration difference that is meaningful in the context of inherent variability. Changes of less than the value may be considered to be in the noise of the observed design values. The analysis provides a basis to conclude that concentration increases below the value (or SIL) do not cause or contribute to violations of the relevant NAAQS or PSD increments. The recommended SIL values are:

- $PM_{2.5}$: 24-hour – 1.2 µg/m^3;

  Annual – 0.2 µg/m^3
- O_3: 1 ppb (1.96 µg/m^3)

As noted above, the recommended SIL value for 24-hour $PM_{2.5}$ is 1.2 µg/m^3. The derived value from the ambient air quality variability approach is 1.5 µg/m^3. However, 40 CFR 51.165(b)(2) lists 1.2 µg/m^3 as the SIL value for the 24-hour $PM_{2.5}$ NAAQS. Pending further evaluation by EPA, the value of 1.2 µg/m^3 is recommended in order to be consistent with the rule.

The recommended SIL value for annual $PM_{2.5}$ is less than the SIL value of 0.3 $\mu g/m^3$ listed in 40 CFR 51.165(b)(2). As noted in the EPA guidance memorandum, an impact less than 0.2 $\mu g/m^3$, based on the ambient air quality variability approach, is insignificant and should be considered to not cause or contribute to a violation of the annual $PM_{2.5}$ NAAQS. The memorandum also notes that permitting authorities have the discretion to determine on a case-by-case basis whether an impact between 0.2 $\mu g/m^3$ and 0.3 $\mu g/m^3$ will cause or contribute to a violation of the annual $PM_{2.5}$ NAAQS. Be sure to discuss with the ADMT, prior to submitting an AQA, if an impact between 0.2 $\mu g/m^3$ and 0.3 $\mu g/m^3$ will be proposed to be used to determine the significance of the project emissions.

To support the use of the recommended SILs, the documentation associated with the AQA should include a discussion on why it is reasonable to use the recommended SILs in the analysis, along with a copy of the EPA guidance memorandum that set forth the recommended SILs.

Appendix B - Federal and State Air Quality Standards

The tables below list contaminants that are specifically regulated by federal or state rules by a limit on the concentration in ambient air. The table lists the pollutant name, applicable averaging time, the type of standard, and the threshold concentration. When performing an air quality analysis (AQA), all applicable standards are to be addressed.

The source of the information for the tables is as follows: Texas Commission on Environmental Quality (TCEQ) de minimis levels (note for this document, the term de minimis and the phrase significant impact level (SIL) are synonymous) are listed in 40 Code of Federal Regulation (CFR) 51.165(b)(2); Significant Monitoring Concentrations (SMCs) are listed in 40 CFR 52.21(i)(5)(i); Primary and Secondary National Ambient Air Quality Standards (NAAQS) and form of the standard are listed in 40 CFR 50; Prevention of Significant Deterioration (PSD) Increments for Class I and Class II areas are listed in 40 CFR 52.21(c); and State Property Line Standards are listed in 30 Texas Administrative Code (TAC) Chapter 112. Interim and recommended SILs are included in table B-1 (see footnotes b and c) and the source of information for these values is from Environmental Protection Agency (EPA) memoranda. The references to the EPA memoranda are noted beneath table B-1.

Table B-1. Criteria Pollutants

Pollutant	Averaging Time	SIL ($\mu g/m^3$)	SMC ($\mu g/m^3$)	Primary NAAQS ($\mu g/m^3$)	Secondary NAAQS ($\mu g/m^3$)	Class II Increment ($\mu g/m^3$)	Class I Increment ($\mu g/m^3$)
Carbon Monoxide	1-Hour	2,000	-	40,000	-	-	-
Carbon Monoxide	8-Hour	500	575	10,000	-	-	-
Lead	Rolling 3-month average	-	0.1[a]	0.15	-	-	-
Nitrogen Dioxide	1-Hour	7.5[b]	-	188	-	-	-
Nitrogen Dioxide	Annual	1	14	100	100	25	2.5
Ozone	8-Hour	1.96 (1 ppb)[c]	-	137 (70 ppb)	137 (70 ppb)	-	-
Particulate Matter (PM_{10})	24-Hour	5	10	150	150	30	8
Particulate Matter (PM_{10})	Annual	1	-	-	-	17	4
Particulate Matter ($PM_{2.5}$)	24-Hour	1.2[c]	-	35	35	9	2
Particulate Matter ($PM_{2.5}$)	Annual	0.2[c]	-	12	15	4	1
Sulfur Dioxide	1-Hour	7.8[b]	-	196	-	-	-
Sulfur Dioxide	3-Hour	25	-	-	1,300	512	25
Sulfur Dioxide	24-Hour	5	13	365[d]	-	91	5
Sulfur Dioxide	Annual	1	-	80[d]	-	20	2

a - The SMC for lead is based on a 3-month average and not a rolling 3-month average
b - Interim SIL (www.tceq.texas.gov/assets/public/permitting/air/memos/guidance_1hr_no2naaqs.pdf for 1-hour NO_2 and www.tceq.texas.gov/assets/public/permitting/air/memos/appwso2.pdf for 1-hour SO_2)
c - Recommended SIL
d - EPA revoked both the existing 24-hour and annual standards; however, they will remain in effect until one year after the effective date of the 1-hour SO_2 designations. Refer to 40 CFR 81.344 for 1-hour SO_2 designations.

Table B-2. Non-Criteria Pollutants with a Significant Monitoring Concentration

Pollutant	Averaging Time	SMC ($\mu g/m^3$)
Fluorides[a]	24-Hour	0.25
Hydrogen Sulfide	1-Hour	0.2
Reduced Sulfur Compounds	1-Hour	10
Total Reduced Sulfur	1-Hour	10

a - Fluorides does not include hydrogen fluoride

Table B-3. State Property Line Standards

Pollutant	Averaging Time	County	Land Use	Value ($\mu g/m^3$)
Hydrogen Sulfide	30-Minute[a]	All Counties	Residential, business, or commercial purposes (in general, non-industrial areas)	108
Hydrogen Sulfide	30-Minute[a]	All Counties	All other land uses	162
Sulfur Dioxide	30-Minute[a]	Galveston and Harris	All land uses	715
Sulfur Dioxide	30-Minute[a]	Jefferson and Orange	All land uses	817
Sulfur Dioxide	30-Minute[a]	Remaining Counties	All land uses	1,021
Sulfuric Acid	1-Hour	All Counties	All land uses	50
Sulfuric Acid	24-Hour	All Counties	All land uses	15

a - The 1-hour averaging time is used given that the shortest averaging time for the preferred models typically used for regulatory demonstrations is the 1-hour averaging time.

Appendix C - Requesting Information from the Air Permits Allowable Database

If staff or applicants need emissions data for an air quality analysis (AQA), they should request this information from the Information Resources Division (IRD) by filling out and submitting an Air Permits Allowable Database (APAD) Modeling Retrieval Request Form. This form may be obtained at the following link: www.tceq.texas.gov/permitting/air/guidance/newsourcereview/nsr_mod_guidance.html

Allow ten business days for the IRD to provide the retrieval information. Provide the following information with the request:

For National Ambient Air Quality Standard (NAAQS) and Prevention of Significant Deterioration (PSD) increment retrievals, provide the center point, in Universal Transverse Mercator (UTM) coordinates in North American Datum of 1983 (NAD83), of the radius of impact (ROI);

- UTM easting
- UTM northing
- UTM zone

The coordinates include the UTM easting (meters), UTM northing (meters), and UTM zone. The retrieval program will automatically take care of any overlap from one zone to another. For the UTM zone, use either 13 (from the west border to 102 degrees longitude), 14 (between 102 and 96 degrees longitude), or 15 (east of 96 degrees longitude to the east border).

For the requested pollutant, this information is used by the retrieval program to locate all sources that are within 50 kilometers (km) of the specified center point. A radius of 50 km is based on transport distances over which steady-state assumptions are appropriate. Steady-state assumptions are fundamental to Gaussian air dispersion models used for regulatory purposes.

Check the type of reports desired;

- By pollutant
- By averaging time
- By review type (NAAQS or PSD increment)
- For Particulate Matter ($PM_{2.5}$) or less, also request a retrieval for Particulate Matter (PM_{10}) or less

The selection of pollutants depends on the review type. For NAAQS or PSD increment, as applicable, identify the pollutant using carbon monoxide (CO), nitrogen oxides (NO_x), sulfur dioxide (SO_2), PM_{10}, $PM_{2.5}$, or lead (Pb).

Indicate the averaging time of interest. The averaging times to select from depend on the review type and pollutant combination. For example, for NO_x, the relevant averaging times for NAAQS are 1-hour and annual and for PSD increment, annual only. If you do not specify an averaging time, the retrieval will include all relevant averaging times.

Indicate the type of request: NAAQS and/or PSD increment.

The term NAAQS pertains to criteria pollutants and indicators, e.g. CO, SO_2, NO_x, PM_{10}, $PM_{2.5}$, and Pb. PSD increment retrievals are available for NO_x, SO_2, PM_{10}, and $PM_{2.5}$.

For each pollutant, averaging time, and review type combination, the retrieval program generates an electronic file with data for all sources, including area sources, meeting the search criteria with the modeling parameters placed in the proper format for use with certain Environmental Protection Agency (EPA) models including AERMOD, ISC-PRIME, and ISCST3.

Submit the APAD Modeling Retrieval Request Form:

- Mail the form to:

  Information Resources Division, MC 197
  Attn: Open Records & Reporting Services
  TCEQ
  PO Box 13087
  Austin TX 78711-3087

- Submit request and form through online Open Records Request Form
- Call 512/239-DATA (3282)

What the requestor will receive:

- **Model-ready text file** for each pollutant, averaging time, and review type combination requested.
  - All sources (POINT and AREA) listed in APAD within 50 km of a UTM coordinate provided in the request are included.
  - Source identifiers are the unique source identifier listed in APAD.
- **Summary Report** listing all sources included in the retrievals with their associated regulated entity number (RN), emission point number (EPN), permit number, source location, source emission rate by pollutant, and source parameters.

What data are in APAD:

Data were migrated into APAD in three phases:

- Source IDs (EPNs), source parameters (including locations), permit allowable emission rates (by pollutant), and permit number for effective permits from the point source database (PSDB);

- Source IDs and source parameters for active sources from the State of Texas Air Reporting System (STARS); and
- For active sources that reported emissions of criteria pollutants, if there was no record of an allowable emission rate, those sources were assigned an allowable emission rate of 0 pounds per hour (lb/hr) and 0 tons per year (tpy) for the reported pollutants.

Now that the data migration is complete, data in APAD are currently being supplemented through data entry of permit information listed in Maximum Allowable Emission Rate Tables (MAERTs), with priority given to permits for major sources of criteria pollutants.

What data gaps exist in APAD:

As it was not initially possible to populate APAD with all allowable emission rates for all sources, some cases of missing or inconsistent data have been encountered in the database. The issues related to the data gaps are:

- EPNs on MAERTs not matching the source identifiers listed in PSDB or STARS;
- Pollutant names on MAERTs not matching pollutant names listed in PSDB or STARS;
- EPNs with no associated permit number;
- EPNs with missing or invalid source parameters; and
- EPNs with missing or invalid coordinates.

The supplemental data entry continues to eliminate many of the data gaps, but some data are still missing. Indicators of missing data are:

- Permit numbers beginning with "D-." These indicate that a dummy permit number was assigned to the EPN.
- Allowable emission rate being 0 lb/hr or 0 tpy. These indicate that actual emissions of this pollutant were reported for the EPN, but there is no record of an allowable emission rate. It is the applicant's responsibility to research and determine the appropriate emission rate values for these sources. (See What to do about data gaps in APAD below).

Missing or invalid source parameters have been filled in the following way.

- For missing or invalid parameters for type "STACK":
  - Height = 1.0 meter
  - Temperature = 0 Kelvin
  - Velocity = 0.001 meters/second
  - Diameter = 0.001 meters

- For missing or invalid parameters for type “FLARE”:
    - Height = 1.0 meter
    - Diameter = 0 meters
- For missing or invalid parameters for type “FUGITIVE”:
    - Height = 1.0 meter
    - Length = 1.0 meter
    - Width = 1.0 meter
    - Degree = 0
- Missing or invalid source coordinates. These sources have been assigned the coordinate of the site centroid or coordinate provided on the agency Core Data Form for the site.

What to do about data gaps in APAD:

As was the case with data retrievals from PSDB, it is the applicant’s responsibility to correct any data in error and provide any supplementary data that may be necessary for performing their AQA. Any corrections to the data must be accompanied with documentation that the Air Permits Division (APD) staff can validate. Much of the data necessary to fill in data gaps are contained in the paper files located in Central Records at the Texas Commission on Environmental Quality (TCEQ). However, there are on-line data sources applicants are encouraged to use:

- Site emission inventory data access by Regulated Entity reference number at www15.tceq.texas.gov/crpub/index.cfm?fuseaction=regent.RNSearch
- Central Records search to access permit documents, like the MAERTs, at records.tceq.texas.gov/cs/idcplg?IdcService=TCEQ_SEARCH

Validated data corrections will be loaded in APAD as appropriate. As corrections are made, the data quality will improve.

Staff and applicants are not limited to using only APAD as a data source. If the applicant is aware of data not contained in APAD, such as recently issued permitted facilities, shut down facilities, or facilities in other states, the data should be included as applicable. All changes to data must be documented.

Contact the Air Dispersion Modeling Team (ADMT) at (512) 239-1250 if you have questions about how to use the retrievals for the AQA.

Appendix D – Representative Background Monitoring Concentrations

The purpose of representative background monitoring concentrations is to account for sources not explicitly modeled in an air dispersion modeling analysis. Most air dispersion modeling analyses only account for industrial stationary emission sources; therefore, additional information needs to be used to account for other emission sources such as natural sources, nearby sources other than the one(s) under consideration, and unidentified sources. Ambient air quality monitors are used to provide representative background concentrations for a project site.

Ideally, a network of monitors would be available to provide concentrations near the site of the permit application. The term “near” means within about one kilometer (km) of the area of maximum concentrations from existing sources or the area of the combined maximum impact from existing and proposed sources. However, existing monitors within 10 km of the proposed sources can also be used. Unfortunately, data from nearby monitors are rarely available; furthermore, time and cost constraints usually prohibit the establishment of site-specific networks. Applicants and staff should use the following guidance to determine an appropriate monitor to represent air quality at the project site. This procedure can be used for National Ambient Air Quality Standards (NAAQS) and pre-application analyses.

Existing Ambient Monitoring Data for the County

If site-specific ambient air monitoring data are not available and an ambient air monitor is located in the same county as the project site, use the most recent data from the nearest ambient air monitor. Justify why the monitoring data are representative for the air quality in the area of the project site.

If there are multiple monitors in the same county, justify why the monitor selected is conservative or representative of the area the project would affect. For example, if the nearest monitor is located in an urban area surrounded by many industrial sources but the project sources are located in a rural area with no surrounding sources, the argument could be made that the air quality by the nearest monitor is indicative of a pollutant “hot spot” and not of the regional air quality around the project sources. The use of this monitor may be considered conservative and the type of documentation to support this claim could be aerial photography of the two locations.

However, if the use of the nearest monitor in the example above is too conservative, a more representative monitor from the same county may be used. The type of documentation to support the use of the selected monitor could be aerial photography of the two locations.

The documentation to support the selected monitors in the above examples was based on a qualitative assessment. Some cases may require a more quantitative assessment that could include an analysis of the source of emissions surrounding the two locations (project sources and monitor). For example, the types of sources in the vicinity of each location, the magnitude of reported emissions, allowable emissions, etc. An assessment out to 10 km from each location should be sufficient. Detailed actual emissions data from the Point Source Emissions Inventory may be obtained at the following link: www.tceq.texas.gov/airquality/point-source-ei/psei.html

No Existing Ambient Monitoring Data for the County

If there are no existing monitoring data for the county where the project is located, monitoring data from an adjacent county may be used. Justify why the reported concentrations are conservative or representative of the area the project would affect.

If there are no existing monitoring data for an adjacent county, then monitoring data from another county may be used. Justify why the reported concentrations are representative of the area the project would affect. For example, the nearest ambient air monitor is located over 80 km and two counties over from the project. The project is the only major source in its county. The monitor over 80 km away is in close proximity to several major sources. The monitoring data from this monitor may be used provided the justification would be the air quality in the area near several major sources would be no higher in an area that only has one major source. The type of documentation to support this claim includes comparing county emissions, county population, categories of source emissions for each county, and a quantitative assessment of emissions surrounding the location of monitor compared to the project site, etc.

Emissions data can be obtained at the following url:
www.epa.gov/air-emissions-inventories/national-emissions-inventory-nei and
www.epa.gov/air-emissions-inventories

Population data can be obtained at the following url:
www.census.gov/programs-surveys/popest.html

Once an appropriate monitor has been selected to represent the air quality of the project site, the representative background concentration is determined. Begin by obtaining ambient monitoring data and corresponding documentation from the Environmental Protection Agency (EPA) AirData website at the following url:
www.epa.gov/outdoor-air-quality-data

The EPA AirData is a good source to obtain representative background concentrations since it contains current monitoring data and reports both the exceedance and statistically-based values.

Monitoring data may also be obtained from the Texas Commission on Environmental Quality’s (TCEQ’s) Texas Air Monitoring Information System (TAMIS) Web Interface located at the following url:
www17.tceq.texas.gov/tamis/

The monitoring data from TAMIS are the same monitoring data that are in the EPA AirData; however, the statistically-based values are not readily available.

A third option is to obtain monitoring data from the TCEQ's yearly summary reports at the following url:
www.tceq.texas.gov/cgi-bin/compliance/monops/select_year.pl

Depending on the pollutant and averaging time being evaluated, the representative background concentration may be in the form of the standard (exceedance- or statistically-based). Note that any higher monitor rank may be used as a background concentration. That is, the high, first high (H1H) monitored concentration could be used instead of the high, second high (H2H) monitored concentration, since the H1H monitored concentration would be higher and thus more conservative:

- Carbon Monoxide (CO) - Select the H2H monitored concentration from the most recent complete year for the 1-hour and 8-hour averaging times.
  - A year meets data completeness criteria if at least 75 percent of the hours in a year are reported.
- Lead (Pb) - Select the highest rolling 3-month average value that encompasses the most recent 38-month period of complete data for a monitoring site (i.e., the most recent three-year calendar period plus two previous months).
  - The rolling 3-month average is considered complete if the 3-month data capture rate is greater than or equal to 75 percent.
- Nitrogen Dioxide (NO_2)
  - 1-hour averaging time - Select the most recent three-year average of the annual 98th percentile daily maximum 1-hour values that encompass three consecutive calendar years of complete data for a monitoring site.
    - A year meets data completeness criteria when all four quarters are complete. A quarter is complete when at least 75 percent of the sampling days for each quarter have complete data. A sampling day has complete data if 75 percent of the hourly concentration values, including State-flagged data affected by exceptional events that have been approved for exclusion by the Administrator, are reported.
  - Annual averaging time - Select the annual monitored concentration from the most recent complete year for the annual averaging time.
    - A year meets data completeness criteria when 75 percent of the hours in a year are reported.
- Ozone (O_3) - Select the most recent three-year average of the annual fourth-highest daily maximum 8-hour average that encompasses three consecutive calendar years of complete data for a monitoring site.
  - The completeness criteria is met for the three-year period at a monitoring site if daily maximum 8-hour average concentrations are available for at least 90% of the days within the O_3 monitoring season, on average, for the three-

year period, with a minimum data completeness criteria in any one year of at least 75% of the days within the O_3 monitoring season.

   - Years with concentrations greater than the level of the standard shall be included even if they have less than complete data. Thus, in computing the three-year average fourth-highest daily maximum 8-hour average concentration, calendar years with less than 75% data completeness shall be included in the computation if the three-year average fourth-highest daily maximum 8-hour concentration is greater than the level of the standard.

- Particulate Matter (PM_{10}) - Select the H2H monitored concentration for the 24-hour averaging time that encompasses the most recent three consecutive calendar years of complete data for a monitoring site.
   - A year meets data completeness criteria if at least 75 percent of the scheduled PM_{10} samples per quarter are reported.
- Particulate Matter ($PM_{2.5}$)
   - 24-hour averaging time - Select the most recent three-year average of the annual 98th percentile of the 24-hour values that encompasses three consecutive calendar years of complete data for a monitoring site.
      - A year meets data completeness criteria when at least 75 percent of the scheduled sampling days for each quarter have valid data.
   - Annual averaging time - Select the most recent three-year average of the annual monitored concentrations that encompasses three consecutive calendar years of complete data for a monitoring site.
      - A year meets data completeness criteria when at least 75 percent of the scheduled sampling days for each quarter have valid data.
- Sulfur Dioxide (SO_2)
   - 1-hour averaging time - Select the most recent three-year average of the annual 99th percentile daily maximum 1-hour values that encompass three consecutive calendar years of complete data for a monitoring site.
      - A year meets data completeness criteria when all four quarters are complete. A quarter is complete when at least 75 percent of the sampling days for each quarter have complete data. A sampling day has complete data if 75 percent of the hourly concentration values, including State-flagged data affected by exceptional events which have been approved for exclusion by the Administrator, are reported.
   - 3-hour averaging time - Select the H2H monitored concentration for the 3-hour averaging time from the most recent complete year.
      - A year meets data completeness criteria provided that at least 75 percent of the hourly data are complete in each calendar quarter.
   - 24-hour averaging time - Select the H2H monitored concentration for the 24-hour averaging time from the most recent complete year.

        - A year meets data completeness criteria provided that at least 75 percent of the hourly data are complete in each calendar quarter.
    - Annual averaging time - Select the annual monitored concentration from the most recent complete year for the annual averaging time.
        - A year meets data completeness criteria provided that at least 75 percent of the hourly data are complete in each calendar quarter.

If the monitoring data do not meet the completeness criteria described above, there are procedures in the Appendices to 40 CFR Part 50 that provide methods for validating incomplete data for several pollutants and averaging times. For those pollutants and averaging times where procedures are not provided, the applicant can propose methods for using monitoring data with incomplete data.

Monitoring Background Refinement

If the monitored background concentration used in an analysis is too conservative, then it may be necessary to refine the monitored background concentration in order to remove or limit contributions from the modeled point sources. Several methods are provided below. The goal is to obtain a representative background concentration using an appropriate amount of time and effort. Therefore, the options do not need to be followed in sequence and may be combined as appropriate.

- For isolated sources located in the general area of the monitors. Isolated means there are no other point sources within the 90-degree sector, or whose emissions would interact within the 90-degree sector with the same meteorological conditions. A source could impact a monitor within a 90-degree sector downwind of the source. Determine the average background concentration at each applicable monitor for the year under review by excluding values when the source(s) in question impacts the monitor. Obtain hourly or daily concentrations and corresponding meteorological data from the TCEQ. Exclude concentrations caused by transport from the source toward the monitor within the 90-degree sector. Average the remaining concentrations for each separate averaging time to determine the average background value.
- Identify the location of the receptors with significant predicted concentrations from the project. Determine the meteorological conditions associated with these predicted concentrations. Obtain hourly or daily monitored concentrations and corresponding meteorological data from the TCEQ. Find meteorological conditions that are similar to those that caused the predicted concentrations and identify applicable monitoring data with the same meteorological conditions. Use this monitored concentration as the background concentration.
- Find a monitor that is not affected by the background point sources included in the modeling demonstration. This could be done by modeling the background point sources to identify those that contribute to the monitored concentrations or by analyzing wind flow patterns.

- For particulates, determine if the concentration was caused by a non-prescribed fire, wind speed in excess of the monthly average, etc. If so, use the next highest concentration that would not be affected by these events.

For any method of refinement of monitoring background concentrations, all documentation and technical justification must be provided. For example, when excluding hourly data, be sure to clearly identify all excluded hourly data and discuss the rationale for excluding the data.

Appendix E - Minor and Prevention of Significant Deterioration National Ambient Air Quality Standards

The purpose of the National Ambient Air Quality Standards (NAAQS) analysis is to demonstrate that proposed emissions of criteria pollutants from a new facility or from a modification of an existing facility will not cause or contribute to an exceedance of the NAAQS. The demonstration may consist of both air dispersion modeling predictions and ambient air monitoring data. The person conducting the modeling should follow the basic procedure described in the following paragraphs.

Preliminary Impact Determination

The procedure begins with a preliminary impact determination to predict whether the proposed emissions could make a significant impact on existing air quality. That is, the model predicts concentrations at one or more receptors in the modeling grid greater than or equal to a NAAQS de minimis level (note for this document, the term de minimis and the phrase significant impact level (SIL) are synonymous). It should be noted that the use of interim or recommended SILs will need to be justified. Refer to Appendix A for additional guidance on justifying the use of the SILs.

Model all new and/or modified sources using the appropriate length of meteorological data. For Minor NAAQS, one year of National Weather Service (NWS) meteorological data is sufficient. However, if five years of meteorological data are used, then use the same five-year meteorological data for all applicable averaging periods for consistency. For Prevention of Significant Deterioration (PSD) NAAQS, five years of NWS meteorological data, three years of prognostic meteorological data, or at least one year of site-specific meteorological data are required.

The predicted high concentration for each criteria pollutant and each averaging time are then compared to the appropriate NAAQS de minimis level. For Minor NAAQS, the predicted high concentration is located at or beyond the property line. For PSD NAAQS, the predicted high concentration is located at or beyond the fence line. The predicted high concentration may be related to the form of the NAAQS (exceedance- or statistically-based) and the number of years of meteorological data used:

- Carbon Monoxide (CO) - Report the maximum high, first high (H1H) predicted concentration from all receptors across the applicable meteorological data set for the 1-hour and 8-hour averaging times.
- Lead (Pb) - A de minimis level has not been established. Proceed to the full NAAQS analysis.
- Nitrogen Dioxide (NO_2)
    - 1-hour averaging time - When using one year of meteorological data, report the maximum H1H predicted concentration from all receptors. When using five years of meteorological data, report the highest five-year average of the H1H predicted concentrations from all receptors. When using three years of prognostic meteorological data, report the highest three-year average of the

H1H predicted concentrations from all receptors. For additional guidance regarding the evaluation of 1-hour NO_2, see Appendix S.

  - Annual averaging time - Report the maximum predicted concentration from all receptors across the applicable meteorological data set.

- Ozone (O_3) - Any net emissions increase of 100 tons per year (tpy) or more of volatile organic compounds (VOCs) or nitrogen oxides (NO_x) subject to PSD would require an ambient impact analysis. See Appendix Q for guidance on conducting an ozone ambient impact analysis.
- Particulate Matter (PM_{10}) - Report the maximum H1H predicted concentration from all receptors across the applicable meteorological data set for the 24-hour averaging time.
- Particulate Matter ($PM_{2.5}$)
  - 24-hour averaging time - When using one year of meteorological data, report the maximum H1H predicted concentration from all receptors. When using five years of meteorological data, report the highest five-year average of the H1H predicted concentrations from all receptors. When using three years of prognostic meteorological data, report the highest three-year average of the H1H predicted concentrations from all receptors.
  - Annual averaging time - When using one year of meteorological data, report the maximum predicted concentration from all receptors. When using five years of meteorological data, report the highest five-year average of the predicted concentrations from all receptors. When using three years of prognostic meteorological data, report the highest three-year average of the predicted concentrations from all receptors.
- Sulfur Dioxide (SO_2) – The Environmental Protection Agency (EPA) revoked both the existing 24-hour and annual average standards with the promulgation of the 1-hour standard; however, these averaging times will remain in effect until one year after the effective date of the 1-hour SO_2 designations.
  - 1-hour averaging time - When using one year of meteorological data, report the maximum H1H predicted concentration from all receptors. When using five years of meteorological data, report the highest five-year average of the H1H predicted concentrations from all receptors. When using three years of prognostic meteorological data, report the highest three-year average of the H1H predicted concentrations from all receptors. For additional guidance regarding the evaluation of 1-hour SO_2, see Appendix S.
  - 3-hour and 24-hour averaging times - Report the maximum H1H predicted concentration from all receptors across the applicable meteorological data set.
  - Annual averaging time - Report the maximum predicted concentration from all receptors across the applicable meteorological data set.

Be aware of model limitations when using a concatenated meteorological data set with multiple averaging times in the same model run. For example, when modeling NO_2 with a concatenated five-year meteorological data set and both the 1-hour and annual averaging times are selected, the model may compute five-year average concentrations for both averaging times. This is not appropriate for the annual averaging time.

If the sources do not make a significant impact for a pollutant of concern, the demonstration is complete. If there is a significant impact, then an area of impact (AOI) is defined, and a full NAAQS analysis is required. The AOI is the set of receptors that have predicted concentrations at and above the de minimis level for each applicable averaging time and pollutant. Please note that when evaluating emissions of $PM_{2.5}$, secondary formation must be addressed. Refer to Appendix R for additional information regarding secondary formation of $PM_{2.5}$.

Full NAAQS Analysis

The full NAAQS analysis is carried out for each pollutant using the AOI results from the preliminary impact determination and applicable averaging time. For multiple AOIs for the same pollutant, the person conducting the modeling can use one receptor grid that combines all significant receptors from each averaging time.

The full NAAQS analysis considers all emissions at the site under review, as well as emissions from nearby sources and background concentrations. The person conducting the modeling can receive a listing of all sources and associated parameters from the Texas Commission on Environmental Quality (TCEQ) to include in the air quality analysis (AQA). The person conducting the modeling should contact the Information Resources Division (IRD) to request this listing. Refer to Appendix C for additional guidance on source retrievals. It is the responsibility of the person conducting the modeling to obtain these data and ensure their accuracy. Any changes made to the data must be documented and justified. In addition, if the person conducting the modeling is aware of source data not provided by the IRD, such as recently issued permitted facilities or applicable facilities in other states within the distance limits of the model, the data should be included as applicable.

Model allowable emission rates for all sources that emit the pollutant. Use a certified limit for permit-by-rule (PBR) authorizations. For PBRs without a certified limit, use an estimate of allowable emissions based on actual emissions. Use allowable emissions for standard permit authorizations. Use the same meteorological data set used in the preliminary impact determination modeling. The predicted concentrations may be related to the form of the NAAQS (exceedance- or statistically-based) and the number of years of meteorological data used:

- CO - When using one year of meteorological data, report the maximum H1H predicted concentration from all receptors for the 1-hour and 8-hour averaging times. When using five years of meteorological data, three years of prognostic meteorological data, or one year of site-specific meteorological data, report the maximum high, second high (H2H) predicted concentration from all receptors for the 1-hour and 8-hour averaging times.

- Pb - The NAAQS for Pb is based on a rolling 3-month average. For a conservative representation, the Air Dispersion Modeling Team (ADMT) recommends reporting the maximum H1H monthly predicted concentration from all receptors across the applicable meteorological data set. Or a post-processing tool is available from EPA (LEADPOST) that will compute the maximum predicted concentration in the form of the standard from all receptors across the applicable meteorological data set. To download LEADPOST and the corresponding documentation, refer to: https://www.epa.gov/scram/air-quality-dispersion-modeling-preferred-and-recommended-models#aermod
- NO_2
  - 1-hour averaging time - When using one year of meteorological data, report the maximum H1H predicted concentration from all receptors. When using five years of meteorological data, report the maximum five-year average of the 98th percentile of the annual distribution of the maximum daily 1-hour predicted concentrations (or high, eighth high (H8H) predicted concentration) determined for each receptor. When using three years of prognostic meteorological data, report the maximum three-year average of the 98th percentile of the annual distribution of the maximum daily 1-hour predicted concentrations (or H8H predicted concentration) determined for each receptor. When using one year of site-specific meteorological data, report the maximum 98th percentile of the annual distribution of the maximum daily predicted concentrations (or H8H predicted concentration) determined for each receptor.
  - Annual averaging time - Report the maximum predicted concentration from all receptors across the applicable meteorological data set.
- O_3 - Any net emissions increase of 100 tpy or more of VOCs or NO_x subject to PSD would be required to perform an ambient impact analysis. Refer to Appendix Q for additional guidance on conducting an ozone ambient impact analysis.
- PM_{10} - When using one year of meteorological data, report the maximum H1H predicted concentration from all receptors for the 24-hour averaging time. When using five years of meteorological data, report the maximum high, sixth high (H6H) predicted concentration for the concatenated five-year period. When using three years of prognostic meteorological data, report the maximum high, fourth high (H4H) predicted concentration for the concatenated three-year period. When using one year of site-specific meteorological data, report the maximum H2H predicted concentration for the 24-hour averaging time.
- $PM_{2.5}$
  - 24-hour averaging time - When using one year of meteorological data, report the maximum H1H predicted concentration from all receptors. When using five years of meteorological data, report the maximum five-year average of the 98th percentile of the annual distribution of the maximum 24-hour

predicted concentrations (or H8H predicted concentration) determined for each receptor. When using three years of prognostic meteorological data, report the maximum three-year average of the 98th percentile of the annual distribution of the maximum 24-hour predicted concentrations (or H8H predicted concentration) determined for each receptor. When using one year of site-specific meteorological data, report the maximum 98th percentile of the annual distribution of the maximum 24-hour predicted concentrations (or H8H predicted concentration) determined for each receptor. This is consistent with EPA guidance provided the secondary formation of $PM_{2.5}$ is sufficiently addressed. Refer to Appendix R for additional information concerning secondary formation of $PM_{2.5}$.

  - Annual averaging time - When using one year of meteorological data, report the maximum predicted concentration from all receptors. When using five years of meteorological data, report the highest five-year average of the predicted concentrations from all receptors. When using three years of prognostic meteorological data, report the highest three-year average of the predicted concentrations from all receptors.

- SO_2
  - 1-hour averaging time - When using one year of meteorological data, report the maximum H1H predicted concentration from all receptors. When using five years of meteorological data, report the maximum five-year average of the 99th percentile of the annual distribution of the maximum daily 1-hour predicted concentrations (or H4H predicted concentration) determined for each receptor. When using three years of prognostic meteorological data, report the maximum three-year average of the 99th percentile of the annual distribution of the maximum daily 1-hour predicted concentrations (or H4H predicted concentration) determined for each receptor. When using one year of site-specific meteorological data, report the maximum 99th percentile of the annual distribution of the maximum daily 1-hour predicted concentrations (or H4H predicted concentration) determined for each receptor.
  - 3-hour and 24-hour averaging times - When using one year of meteorological data, report the maximum H1H predicted concentration from all receptors for the 3-hour and 24-hour averaging times. When using five years of meteorological data, three years of prognostic meteorological data, or one year of site-specific meteorological data, report the maximum H2H predicted concentration from all receptors.
  - Annual averaging time - Report the maximum predicted concentration from all receptors across the applicable meteorological data set.

Note that for any demonstration a higher concentration rank may be used to compare with a standard. That is, the maximum H1H predicted concentration could be used instead of the maximum H2H predicted concentration, since the maximum H1H would be higher and thus more conservative.

Determine a representative monitored background concentration to add with the predicted concentrations. Refer to Appendix D for additional guidance on determining representative monitoring concentrations. Compare the predicted concentration plus representative monitored background concentration for each pollutant and averaging time to the appropriate NAAQS. If the maximum concentration is at or below the NAAQS, the demonstration is complete. If not, review the demonstration for conservatism and determine if any refinements can be made (operating limitations, conservative emissions estimates, etc.), or demonstrate that the project's impact will not be significant.

One refinement could be the use of the most recent two years of actual emissions data for select off-property sources. However, actual emissions data available for short-term averaging periods may be limited or not available. The EPA developed technical assistance documents (TADs) for implementing the 2010 SO_2 standard. See the following webpage:
www.epa.gov/so2-pollution/technical-assistance-documents-implementing-2010-sulfur-dioxide-standard

The SO_2 modeling TAD provides recommendations on how an air agency could model ambient air in proximity to or impacted by an SO_2 emission source to assess compliance with the SO_2 NAAQS for designation purposes only. There are recommendations in the TAD that differ from guidance contained in the Guideline on Air Quality Models (GAQM) and these recommendations should not be used in permit modeling. With that said, the SO_2 modeling TAD does provide a discussion on developing actual emissions data for modeling based on available operational data and could be used to help estimate actual emissions data. Keep in mind that dividing the annual emissions by the number of hours in the year is not an accurate representation of actual emissions for sources that experience emission rate variability throughout the year and should not be used. Be sure to coordinate with the ADMT on developing actual emissions data for modeling prior to submitting the AQA.

A possible demonstration to determine if the project's impact will not be significant may consist of comparing the project's impact to the applicable NAAQS de minimis level. If the project's impact is less than the applicable NAAQS de minimis level, then the project's impact is not significant. This demonstration should be completed once all refinements have been considered.

Appendix F - State Property Line Standard Analysis

The purpose of the state property line standard analysis is to demonstrate compliance with state standards for net ground-level concentrations for sulfur dioxide (SO_2), hydrogen sulfide (H_2S), and sulfuric acid (H_2SO_4). This analysis must demonstrate that resulting air concentrations from all on-property facilities and sources that emit the regulated pollutant will not exceed the applicable state standard.

Although all on-property facilities should be evaluated, in many cases the proposed emissions or changes in emissions may not be substantial when compared to the total emissions from the site. The basic procedure is described in the following paragraphs.

Preliminary Impact Determination

The procedure begins by conducting a preliminary impact determination by modeling the proposed allowable emission rates for all new and/or modified facilities that emit the regulated pollutant. Modeling with one year of National Weather Service (NWS) meteorological data is sufficient. If conducting an analysis for both the SO_2 state property line standard and 1-hour SO_2 National Ambient Air Quality Standards (NAAQS), and the 1-hour SO_2 NAAQS analysis is based on five years of meteorological data, be aware of model limitations when using a concatenated meteorological data set. For example, when modeling SO_2 with a concatenated five-year meteorological data set in AERMOD, AERMOD will compute five-year average concentrations. This is not appropriate for the state property line standard.

In addition, the Environmental Protection Agency (EPA) has provided modeling guidance related to the treatment of emissions from facilities that operate intermittently. The techniques described in EPA's modeling guidance are based on the form of the 1-hour SO_2 NAAQS, and they do not apply to the state property line standard analysis for SO_2.

For new sources with no other sources on-site, the predicted high concentrations for each pollutant and averaging time at or beyond the property line are then compared against the applicable state standard. If the predicted high concentrations are equal to or less than the standard, the demonstration is complete. Note that the SO_2 state standard depends on the county. Galveston, Harris, Jefferson, and Orange counties have a more stringent state standard. In addition, the H_2S state standard depends on the land usage of the downwind property affected. If the downwind property is used for residential, business, or commercial purposes (in general, non-industrial areas), the state standard is more stringent:

- SO_2 - The state standard for SO_2 is based on a 30-minute averaging time. Report the maximum high, first high (H1H) predicted concentration from all receptors for the 1-hour averaging time. The 1-hour averaging time is used given that the shortest averaging time for the preferred models typically used for regulatory demonstrations is the 1-hour averaging time.

- H_2S - The state standard for H_2S is based on a 30-minute averaging time. Report the maximum H1H predicted concentration from all receptors for the 1-hour averaging time. The 1-hour averaging time is used given that the shortest averaging time for the preferred models typically used for regulatory demonstrations is the 1-hour averaging time.
- H_2SO_4 - Report the maximum H1H predicted concentration from all receptors for the 1-hour and 24-hour averaging times.

For new and modified or only modified sources at the site, the predicted high concentrations for each pollutant and averaging time at or beyond the property line are then compared against two percent of the applicable state standard. If the predicted high concentration is less than two percent of the state standard, technical justification for demonstrating compliance may require additional information such as project emissions increases, total site emissions, results from previous site-wide modeling, or ambient air monitoring data.

For example, a nearby H_2S ambient monitor (within 8-10 kilometers (km) of the site property line) has recorded a concentration just below the state standard. The site seeking an authorization has never conducted site-wide modeling for H_2S. The project emissions increase is a small percentage of the overall site emissions. Even though the project emissions increase has a model prediction of less than two percent of the state standard, modeling only the project emissions increase may not be sufficient to demonstrate compliance with the standard.

However, if the predicted high concentration is equal to or greater than two percent of the state standard, coordinate with the permit reviewer to determine if site-wide modeling is needed. Staff will consider factors such as project emissions increases, total site emissions, results from previous site-wide modeling, or ambient air monitoring data.

For example, an applicant models the project emissions increase of H_2S, which results in a predicted concentration equal to or greater than two percent of the state standard. Site-wide modeling for H_2S has been previously conducted using the same model and the site-wide modeling results were only a small fraction of the state standard. Even though model predictions associated with the project emissions increase is greater than two percent of the state standard, adding the predicted concentration from the project to the previous site-wide predicted concentration may be sufficient to demonstrate compliance with the state standard. Site-wide modeling including the project emissions increase may not be necessary.

Site-wide Modeling

If site-wide modeling is required, model the allowable emission rates for all sources on the property that emit the regulated pollutant using the same meteorological data set used in the preliminary impact determination modeling. Use a certified limit for permit-by-rule (PBR) authorizations. For PBRs without a certified limit, use an estimate of allowable emissions based on actual emissions. Use allowable emissions for standard permit authorizations. Compare the predicted high concentration to the applicable state standard. If the predicted high concentration is equal to or less than the state standard, the demonstration is complete. If the predicted high concentration is greater than the state standard, review the demonstration for conservatism and determine if any refinements can be made.

Appendix G - Health Effects Analysis

The purpose of the health effects analysis is to demonstrate that emissions of non-criteria pollutants from a new facility or from a modification of an existing facility will be protective of the public's health and welfare.

Agency toxicologists use the results from the health effects analysis to evaluate the effects of emissions on a contaminant-by-contaminant basis. The objectives of the analysis are to:

- Establish off-property ground-level concentrations (GLCs) of contaminants resulting from proposed and/or existing emissions, and
- Evaluate these GLCs for their potential to cause adverse health or welfare effects.

The Air Permits Division (APD) has developed a guidance document to assist with conducting a health effects analysis. This guidance document is titled, *Modeling and Effects Review Applicability: How to Determine the Scope of Modeling and Effects Review for Air Permits* (MERA), and can be found at the following url: www.tceq.texas.gov/assets/public/permitting/air/Guidance/NewSourceReview/mera.pdf

The MERA document establishes a process to determine the scope of the modeling and health effects review. The MERA document also provides information on the toxicology health effects evaluation procedure typically performed by the Toxicology Division (TD).

The site-wide health effects evaluation procedure is based on a three-tiered approach. Tiers I, II, and III represent progressively more complex levels of review:

- Tier I - The maximum off-property short- and long-term GLCs are compared to the effects screening levels (ESLs) for the contaminants under review. An ESL is a guideline—not a standard. This format provides the flexibility required to easily revise the value to incorporate the newest toxicity data. Consult with the TD to ensure that the most recent ESLs are used, to obtain additional information concerning the basis for ESLs, or to obtain ESLs for contaminants not in the Toxicity Factor database. For contaminants not on the published list, provide the chemical abstract service (CAS) registry number and a material safety data sheet (MSDS) to the TD staff so that they can positively identify the contaminant and derive an ESL. If the maximum off-property short- and long-term GLCs are equal to or less than the ESLs for the contaminants under review, adverse health or welfare effects would not be expected. Information on the Toxicity Factor database can be found at the following url: www.tceq.texas.gov/toxicology/esl/ESLMain.html
- Tier II - For contaminants with GLCs predicted to exceed their applicable ESL, determine whether the locations are industrial or non-industrial (residences, recreational areas (land or water), daycare centers, hospitals, schools, unzoned and/or undeveloped areas, etc.). For industrial receptors, if the maximum off-property short- and long-term GLCs are equal to or less than two times the ESLs for the contaminants under review, adverse health or welfare effects would

not be expected. For non-industrial receptors, if the maximum off-property short- and long-term GLCs are equal to or less than the ESLs for the contaminants under review, adverse health or welfare effects would not be expected.

- Tier III - While Tiers I and II are reviews based solely on predicted concentrations, Tier III incorporates additional case-specific factors that have a bearing on exposure. The factors the TD considers in a Tier III case-by-case review may include surrounding land use, magnitude of predicted concentrations, frequency of predicted exceedance, toxic effect caused by the contaminant, etc. Consideration of all these factors together provides additional information about the potential for exposure and occurrence of adverse health and welfare effects.

  For additional information on the frequency of predicted exceedance, refer to the guidance memo at the following url:

  www.tceq.texas.gov/assets/public/permitting/air/memos/effeval.pdf

Appendix H – Prevention of Significant Deterioration Pre-application Analysis

The purpose of the Prevention of Significant Deterioration (PSD) pre-application analysis is to provide an analysis of the existing ambient air quality in the area that the major source or major modification would affect. The analysis must be based on continuous air quality monitoring data. The basic procedure is described in the following paragraphs. Note that pre-construction and/or post-construction monitoring could be required by the Texas Commission on Environmental Quality (TCEQ).

Compare the predicted high concentration obtained from the applicable preliminary impact determination to the significant monitoring concentration (SMC):

- Carbon Monoxide (CO) - Report the maximum high, first high (H1H) predicted concentration from all receptors for the 8-hour averaging time.
- Lead (Pb) - The SMC for Pb is based on a three-month average. For a conservative representation, the Air Dispersion Modeling Team (ADMT) recommends reporting the maximum H1H monthly predicted concentration from all receptors.
- Nitrogen Dioxide (NO_2) - Report the maximum predicted concentration from all receptors for the annual averaging time.
- Ozone (O_3) - A SMC has not been established for O_3. However, any net emissions increase of 100 tons per year (tpy) or more of volatile organic compounds (VOCs) or nitrogen oxides (NO_x) subject to PSD would be required to perform an ambient impact analysis, including the gathering of ambient air quality data.
- Particulate Matter (PM_{10}) - Report the maximum H1H predicted concentration from all receptors for the 24-hour averaging time.
- Particulate Matter ($PM_{2.5}$) - The SMC for $PM_{2.5}$ was vacated on January 22, 2013.
- Sulfur Dioxide (SO_2) - Report the maximum H1H predicted concentration from all receptors for the 24-hour averaging time.
- Fluorides - Report the maximum H1H predicted concentration from all receptors for the 24-hour averaging time.
- Hydrogen Sulfide (H_2S) - Report the maximum H1H predicted concentration from all receptors for the 1-hour averaging time.
- Reduced Sulfur Compounds - Report the maximum H1H predicted concentration from all receptors for the 1-hour averaging time.
- Sulfuric Acid Mist (H_2SO_4) - A SMC has not been established for H_2SO_4. However, site-wide modeling from the minor New Source Review (NSR) modeling demonstration may be sufficient for the pre-application analysis.

- Total Reduced Sulfur Compounds - Report the maximum H1H predicted concentration from all receptors for the 1-hour averaging time.

If the maximum concentration is less than the SMC, the demonstration is complete. If the maximum concentration equals or exceeds the SMC, provide an analysis of the ambient air quality in the area that the project emissions would affect for applicable averaging periods.

When conducting an analysis of the ambient air quality in the area that the project emissions would affect, collect representative monitoring background concentrations to establish the existing air quality in that area. Refer to Appendix D for additional guidance on determining representative monitoring background concentrations. Please note that when conducting an analysis of the ambient air quality in the area that the project emissions would affect, the pre-application analysis is required for all averaging periods for which there is a National Ambient Air Quality Standards (NAAQS); not just the averaging period associated with the SMC.

If existing monitoring data are not available, or are judged not to be representative, then the applicant should establish a site-specific monitoring network. The applicant should coordinate with the permit reviewer for determining the scope of monitoring and for assistance in the preparation of a monitoring quality assurance plan.

Appendix I - Prevention of Significant Deterioration Increment

The purpose of the Prevention of Significant Deterioration (PSD) increment analysis is to demonstrate that emissions of applicable criteria pollutants from a new major source or major modification of an existing source will not cause or contribute to an exceedance of an increment. The PSD increment is the maximum allowable increase in concentration that is allowed to occur above a baseline concentration for a pollutant. The following discussion introduces and explains several terms that are specific to PSD increment analyses followed by the basic procedure for conducting the analysis.

Terms

Baseline and Trigger Dates. There are several dates that are used in the increment analysis:

- *Major source baseline date*. This is the date after which actual emissions associated with physical changes or changes in the method of operation at a major stationary source affect the available increment. Changes in actual emissions occurring at any stationary source after this date contribute to the baseline concentration until the minor source baseline date is established. After the minor source baseline date, new and modified major and minor stationary sources in the baseline area consume increment. Applicable major source baseline dates are listed below:
    - Nitrogen Dioxide (NO_2) - February 8, 1988
    - Particulate Matter (PM_{10}) - January 6, 1975
    - Particulate Matter ($PM_{2.5}$) - October 20, 2010
    - Sulfur Dioxide (SO_2) - January 6, 1975
- *Trigger date*. This is the date after which the minor source baseline date may be established. Applicable trigger dates are listed below:
    - NO_2 - February 8, 1988
    - PM_{10} - August 7, 1977
    - $PM_{2.5}$ - October 20, 2011
    - SO_2 - August 7, 1977
- *Minor source baseline date*. This is the earliest date after the trigger date on which a PSD application for a new major source or a major modification to an existing source is considered complete. The minor source baseline date is pollutant- and geographically-specific.

    The minor source baseline dates have been established for NO_2, PM_{10}, and SO_2 for all areas of the state. For NO_2, the minor source baseline date was established as a single date for the entire state. For PM_{10} and SO_2, the minor source baseline dates were established by air quality control regions (AQCRs).

The minor source baseline dates have not been established for $PM_{2.5}$ for all areas of the state. The minor source baseline dates for $PM_{2.5}$ are established by county.

Please contact the Air Dispersion Modeling Team (ADMT) for information on minor source baseline dates.

Baseline area. The baseline area is established for each applicable pollutant's minor source baseline date by the submission of a complete PSD application and subsequent source impact analysis. The extent of a baseline area is limited to intrastate areas and includes all portions of the attainment or unclassifiable area in which the PSD applicant would propose to locate, as well as any attainment or unclassifiable area in which the proposed emissions would have a significant ambient impact for the annual averaging period.

The following are three examples for determining the extent of the baseline area:

1. If the annual predicted concentrations associated with proposed emissions of $PM_{2.5}$ are less than 0.3 µg/m^3 for all receptors, then the extent of the baseline area is limited to the county in which the PSD applicant would propose to locate.
2. If the receptors with annual predicted concentrations associated with proposed emissions of $PM_{2.5}$ equal to 0.3 µg/m^3 or greater are limited to the county in which the PSD applicant would propose to locate, then the extent of the baseline area is limited to that county.
3. If the receptors with annual predicted concentrations associated with proposed emissions of $PM_{2.5}$ equal to 0.3 µg/m^3 or greater extend into one or more adjacent counties, then the extent of the baseline area encompasses all of those counties.

Baseline concentration. The ambient concentration level that existed in the baseline area at the time of the applicable minor source baseline date. The baseline concentration is the reference point for determining air quality deterioration in an area. The baseline concentration level is not based on ambient monitoring because ambient measurements reflect emissions from all sources, including those that should be excluded from the measurements.

Increment calculation. An applicant does not need to obtain the baseline ambient concentration to determine the amount of PSD increment consumed or the amount of increment available. Instead, the amount of PSD increment that has been consumed in an attainment or unclassified area is determined from the emissions increases and decreases that have occurred from stationary sources in operation since the applicable baseline date. Modeled increment consumption calculations reflect the change in ambient pollutant concentration attributable to increment-affecting emissions. Increment consumption (or expansion) calculations are determined by evaluating the difference between the actual emissions at the applicable baseline date ($Actual_{BD}$) and actual emissions as of the date of the modeling demonstration ($Actual_{MD}$).

- *$Actual_{BD}$*. This is the representative two-year average for long-term emission rates, or the maximum short-term emission rate in the same two-year period immediately before the applicable baseline date. If little or no operating data are available, as in the case of permitted sources not yet in operation at the time of the applicable baseline date, the permit allowable emission rate as of the applicable baseline date is used.

- $Actual_{MD}$. This is the most recent, representative two-year average for long-term emissions rates, or the maximum short-term emission rate in the same two-year period immediately before the modeling demonstration. If little or no operating data are available, as in the case of permitted sources not yet in operation at the time of the increment analysis, the permit allowable emission rate is used.

Conducting the Analysis

The ADMT suggests a tiered approach to this analysis to limit the amount of research needed to determine actual emission rates. The person conducting the modeling should follow the basic procedure described in the following paragraphs.

Determine whether the predicted high concentration (excluding background concentration) obtained in the PSD full National Ambient Air Quality Standards (NAAQS) analysis is at or below the applicable increment. This procedure does not apply for criteria pollutants with NAAQS that are statistically-based (i.e., multi-year average).

- NO_2 - Report the maximum annual average concentration at any receptor for each year modeled.
- PM_{10}
    - 24-hour averaging time - Report the maximum high, second high (H2H) concentration at any receptor from each year modeled.
    - Annual averaging time - Report the maximum annual average concentration at any receptor for each year modeled.

  If the 24-hour PM_{10} NAAQS results are based on the maximum high, sixth high (H6H) predicted concentration, then do not compare the results with the increment.

  Although there is no annual NAAQS for PM_{10}, follow the procedure to determine the area of impact (AOI) for the annual NAAQS. The AOI is the set of receptors that have predicted concentrations equal to or greater than the de minimis level. Use this AOI to conduct the annual PM_{10} increment analysis. Also, be aware of model limitations when using a concatenated meteorological data set. For example, when modeling PM_{10} with a concatenated five-year meteorological data set for the annual averaging period, the model may compute concentrations that have been averaged over the five-year period. This is not appropriate for the annual averaging time. Compare the highest average concentrations from each year modeled to the increment to determine compliance.

- $PM_{2.5}$

- 24-hour averaging time - Report the maximum H2H concentration at any receptor from each year modeled.
- Annual averaging time - Report the maximum annual average concentration at any receptor for each year modeled.

If the 24-hour and annual $PM_{2.5}$ NAAQS results are based on a five-year average of the maximum predicted concentrations, then do not compare the results with the increments. Please note that when evaluating emissions of $PM_{2.5}$, secondary formation must be addressed. Refer to Appendix R for additional information regarding secondary formation of $PM_{2.5}$.

- SO_2
  - 3-hour and 24-hour averaging times - Report the maximum H2H concentration at any receptor from each year modeled.
  - Annual averaging time - Report the maximum annual average concentration at any receptor for each year modeled.

If the predicted concentration (excluding background concentration) obtained in the PSD full NAAQS analysis for the pollutants listed above is at or below the applicable increment, then the demonstration is complete because all sources were modeled at allowable emission rates. If not, then an AOI is defined, and further analyses are required.

The increment analysis is carried out for each criteria pollutant and averaging time separately and need only include the AOI for the associated criteria pollutant and averaging time combination. The AOI will be the same one used in the PSD NAAQS analysis, except for those criteria pollutants with NAAQS that are statistically-based. While the significant impact levels (SILs) for both NAAQS and increment are identical, the procedures to determine significance (that is, predicted concentrations to compare to the SIL) are different. This difference occurs because, for those NAAQS that are statistically-based, the corresponding increments are exceedance-based. For criteria pollutants with NAAQS that are statistically-based, determine the AOI following the convention of exceedance-based NAAQS (i.e., maximum predicted concentration).

- For example, when modeling $PM_{2.5}$, use the maximum predicted concentrations from all receptors to determine the AOI for the 24-hour and annual averaging times instead of the five-year average of the maximum predicted concentrations from the NAAQS analysis.

It should be noted that the use of interim or recommended SILs to determine the AOI will need to be justified. Refer to Appendix A for additional guidance on justifying the use of the SILs.

The increment analysis considers all increment-affecting emissions at the site under review, as well as increment-affecting emissions from nearby sources. The person conducting the modeling can receive a listing of all increment-affecting sources and associated parameters from the Texas Commission on Environmental Quality (TCEQ) to include in the air dispersion modeling. The person conducting the modeling should contact the Information Resources Division (IRD) on how to receive this listing. Refer to

Appendix C for additional guidance on source retrievals. It is the responsibility of the person conducting the modeling to obtain these data and ensure their accuracy. Any changes made to the data must be documented and justified. In addition, if the person conducting the modeling is aware of source data not provided by the IRD, such as recently issued permitted facilities or applicable facilities in other states, the data should be included as applicable.

Adjust the emission inventory.

- Omit any source from the inventory that has a negative emission rate unless the source existed and was in operation at the applicable baseline date. A source must have existed and been in operation on or before the applicable baseline date to be considered for increment expansion.
- Omit any source permitted after the applicable baseline date that has shut down or that will be shut down as part of the current project. A source that did not exist or was not operating on or before the applicable baseline date would not have contributed to the air quality at that time, and there would be no need to model the source with an emission rate of zero.

Conduct the modeling demonstration using the same meteorological data set used in the determination of the AOI using the following tiered approach, as applicable.

Increment Modeling Tier I. Model all sources using their allowable emission rates. This approach is conservative since the difference in increment is based on the entire allowable emission rate.

- NO_2 - Report the maximum annual average concentration at any receptor for each year modeled.
- PM_{10}
    - 24-hour averaging time - Report the maximum H2H concentration at any receptor from each year modeled.
    - Annual averaging time - Report the maximum annual average concentration at any receptor for each year modeled.
- $PM_{2.5}$
    - 24-hour averaging time - Report the maximum H2H concentration at any receptor from each year modeled.
    - Annual averaging time - Report the maximum annual average concentration at any receptor for each year modeled.
- SO_2
    - 3-hour and 24-hour averaging times - Report the maximum H2H concentration at any receptor from each year modeled.
    - Annual averaging time - Report the maximum annual average concentration at any receptor for each year modeled.

Be aware of model limitations when using a concatenated meteorological data set. For example, when modeling NO_2 with a concatenated five-year meteorological data set for the annual averaging period, the model may compute five-year average annual concentrations. This is not appropriate for the annual averaging time. Please note that when evaluating emissions of $PM_{2.5}$, secondary formation must be addressed. Refer to Appendix R for additional information regarding secondary formation of $PM_{2.5}$.

Compare the predicted concentration to the appropriate increment. If the increment is not exceeded, the demonstration is complete. Otherwise, go to Tier II.

Increment Modeling Tier II. Model selected sources with $Actual_{MD}$ emission rates and all other sources at allowable emission rates. The selected sources are usually the applicant's, since actual emission rates may be difficult to obtain for off-property sources. This process assumes that the *difference* in increment for the selected sources is based on the entire actual emission rate.

Report the model predictions following the same conventions listed in Tier I. Compare the predicted high concentration to the appropriate increment. If the increment is not exceeded, the demonstration is complete. Otherwise, go to Tier III.

Increment Modeling Tier III. Model selected sources that existed and were in operation at the applicable baseline date with the *difference* between $Actual_{MD}$ and $Actual_{BD}$.

- For major sources permitted at or before the applicable major source baseline date but not in operation as of the applicable minor source baseline date or for minor sources permitted at or before the applicable minor source baseline date but not in operation as of the applicable minor source baseline date, use the difference between $Actual_{MD}$ and the allowable emission rate ($Actual_{BD}$).
- For sources that existed at the applicable baseline date, where a change in actual emission rates involved a change in stack parameters, use the emission rates associated with both the applicable baseline date and the current and/or proposed source configuration. That is, enter the $Actual_{BD}$ as negative numbers along with the applicable baseline source parameters, and enter $Actual_{MD}$ for the same source as positive numbers along with the current and/or proposed source parameters.
- Use emission rates found in Tiers I or II for other sources, as applicable.

Report the model predictions following the same conventions listed in Tier I. Compare the predicted high concentration to the appropriate increment. If the increment is not exceeded, the demonstration is complete. Otherwise, continue to refine increment emission rates or demonstrate that the project's impact will not be significant. This demonstration should be completed once all refinements have been considered.

Appendix J - Preferred Air Dispersion Models

The Environmental Protection Agency (EPA) has adopted the American Meteorological Society/EPA Regulatory Model (AERMOD) as the preferred air dispersion model for major New Source Review (NSR) permits. The model is used for refined modeling of criteria pollutants within approximately 50 kilometers (km) of a site.

Beyond 50 km, the EPA does not have a preferred model for long-range transport. The EPA codified a screening approach to address long-range transport for purposes of assessing NAAQS and/or PSD increments. The first step of the screening approach relies upon the near-field application of the appropriate screening and/or preferred model to determine the significance of ambient impacts at or about 50 km from the new or modified source. If the analysis indicates there may be significant ambient impacts at this distance, further analysis is necessary. For further assessment of the significance of ambient impacts for NAAQS and/or PSD increments, approaches (models and modeling parameters) must be established on a case-by-case basis in consultation with the Air Dispersion Modeling Team (ADMT) and EPA Region 6.

Refined Models

An applicant can use either AERMOD or the most recent version of the Industrial Source Complex (ISC) with Plume Rise Model Enhancements (ISC-PRIME) model until a federal NSR review is required. The most recent version of the ISC model can also be used if the dispersion of air contaminants could not be affected by building downwash at a site.

Once an applicant has used AERMOD for a major NSR permit, AERMOD should be used for minor NSR permits as well. In addition, if AERMOD has been relied upon for a minor NSR permit, AERMOD should continue to be used at that site (this includes single property line designations [SPLDs]). This guidance will ensure consistency in the technical review process as modeled concentrations will be calculated under the requirements of the same modeling system. If the ISC-PRIME model or the ISC model has been used previously, engineering judgment must be used to reconcile emissions limits and controls based on predicted differences in contaminant concentrations between modeling systems until all authorizations at the site are evaluated under the same modeling system.

Screening Models

An applicant can use either AERSCREEN or the SCREEN3 model until a federal NSR review is required. AERSCREEN is a screening version of AERMOD, and SCREEN3 is a screening version of the ISC model.

Once an applicant has used AERSCREEN for a major NSR permit, AERSCREEN should be used for minor NSR permits as well. In addition, if AERSCREEN has been relied upon for a site-wide analysis for a minor NSR permit, AERSCREEN should continue to be used at that site (this includes SPLDs). This guidance will ensure consistency in the technical review process as modeled concentrations will be calculated under the requirements of the same modeling system. If the SCREEN3 model has been used previously, engineering judgment must be used to reconcile emissions limits and controls based on predicted differences in contaminant concentrations between modeling systems until all authorizations at the site are evaluated under the same modeling system.

Appendix K - Source Characterizations

It is important that the applicant, or staff developing scenarios for agency-directed modeling, completely and accurately describes the operating factors and conditions of the facilities undergoing permit review. The following is a list of the type of factors that should be considered before emissions can be characterized and model parameters developed.

Operation or Process Limitations

The applicant, or Texas Commission on Environmental Quality (TCEQ) staff as applicable, should address the following factors in the permit application and modeling protocol or checklist if the facilities do not operate continuously:

- Operational scenarios. Provide worst-case and reasonable worst-case operational scenarios, and discuss how likely it would be for the worst-case scenario to occur. In addition, describe the operational processes in enough detail to justify all source type characterizations. For example, for a blasting operation, provide the minimum and maximum size of a blasting area and the details of how the blasting operation will be conducted. That is, describe such operational factors as whether the operation will be done manually or by machine; on a single side at a time or multiple sides; or on one level at a set height or multiple levels with varying height.
- Hours of operation. For each facility under permit review, identify the hours of operation. If the hours of operation are less than 8760 hours per year, provide any time-of-day or seasonal restrictions, and whether the emissions are the same for each hour or if they are reduced for some hours.
- Type of emissions. Identify all facilities that could be operated simultaneously. For example, for a site with coating and blasting facilities, indoor coating and outdoor blasting could occur at the same time. If the emissions are not continuous, the applicant should identify any batch process or a process that must occur before another process can occur. In addition, the applicant should include the frequency and duration of the emissions, for example, one hour out of every three hours or one hour per day.
- Emission rates. Short-term emissions for a single specific facility often vary significantly with time because of such factors as fluctuations in process operating conditions; control device operating conditions; type of raw materials being handled or processed; and ambient conditions. Provide the basis used to determine the maximum allowable emission rate. For example, is the emission rate based on the potential for a single spike during an hour, or are the emissions uniform throughout an hour? Alternatively, are the emissions linked to wind speed, such as wind-generated emissions originating from a standing stockpile?

- Controls. Describe any best management practice that will be used in addition to controls that must be used to meet best available control technology requirements, such as shrouds, bunkers, or fixed enclosures. The use of partial or full obstructions to airflow will affect the way a fugitive emission is characterized for input into the air dispersion model. The characterization will depend on factors such as the height of release; height of the enclosure; particle size; and the duration of the operation. For example, if shrouds will be used to contain emissions from the outdoor blasting or painting of small equipment, the characterization will be different if two-sided shrouds are used compared to the use of four-sided shrouds. The height of release that will be used in the model for the two-sided shroud will be lower than the height of release for a four-sided shroud. In addition, if particle size was not considered in the development of the emission rate, the modeled emission rate might be reduced to account for lower expected emissions due to impact with all sides of the shroud and release of emissions at the top of the shroud.

Source Types

The source characterizations used in a modeling analysis will depend on the model being used. The guidance discussed in this section addresses some, but not all, possible ways to characterize certain types of point and non-point sources. Ensure that applicants are aware of any new procedures before final modeling is conducted. In addition, applicants, or staff if applicable, should include a complete description of how a source is characterized and how the applicable modeling parameters were developed in the air quality analysis (AQA). The description is important because several characterizations for the same source could be appropriate depending upon the potential impact of building and other structures and meteorological conditions. The following is a brief discussion of different source characterizations:

- Point. Use the point source characterization to simulate emissions that are emitted from a stack. For the point source characterization, such as a vent pipe, use the actual stack diameter, exit gas velocity, and exit gas temperature in the modeling demonstration. Use the actual height of release unless the height of release varies due to the operational process. In those cases, use the average height of release. For example, if a vent pipe is located on the deck of a marine vessel, the height of the top of the pipe will vary during the loading or unloading process, as the vessel rises or falls in the water. Therefore, determine an average height of release and use that height in the model.
    - Pseudo-point. This source type is a point source characterization using default stack parameters, and the emissions are treated as if they are released from a stack. Default parameters for stack diameter, exit gas velocity, and exit gas temperature are used to prevent the stack plume from having any buoyancy or momentum flux. Examples of sources that might be treated as pseudo-points are individual pipe connections; flanges; small vents and ducts (a few feet in diameter); small stockpiles; and covered, obstructed, or horizontal stacks.

Use the following default stack parameters when using SCREEN3 or ISC:

- Stack diameter: 0.001 meter
- Exit gas velocity: 0.001 meters per second
- Exit gas temperature: 0 Kelvin (the ISC model will use the ambient temperature as the exit gas temperature)
- Height of release: use the actual release height

When using AERSCREEN or AERMOD, follow the appropriate guidance contained in the AERMOD Implementation Guide for determining the default parameters:
www.epa.gov/scram/air-quality-dispersion-modeling-preferred-and-recommended-models#aermod

Note that AERSCREEN and AERMOD also have options for covered/capped and/or horizontal stacks. Use POINTCAP for covered/capped stacks and POINTHOR for horizontal stacks. For each of these options, the user specifies the actual stack parameters (height of release, stack diameter, exit gas velocity, and exit gas temperature) as if the release were from a non-capped vertical point source.

- Volume. Use the volume source characterization to simulate emissions that initially disperse in three dimensions with little or no plume rise, such as emissions from vents on a building roof; multiple vents from a building; and fugitive emissions from pipes, stockpiles, and conveyor belts. Parameters used to characterize volume sources are location, height of release, and initial horizontal and vertical dimensions. The height of release is the center of the volume source above the ground. The initial horizontal and vertical dimensions are used to determine the applicable dispersion parameters. The length of the side of the volume source, the vertical height of the source, and whether the source is on or adjacent to a structure or building must be identified in order to determine the applicable dispersion parameters (see section 1.2.2 of the ISC Model User's Guide - Volume II for suggested procedures to be used for estimating the initial horizontal and vertical dimensions for various types of volume sources).

  For example, if the length and width of a piping structure is 10 meters and the piping extends from the surface to 20 meters, and the emissions could come from multiple locations throughout the entire piping structure, then the initial horizontal dimension would be 10 meters divided by 4.3, the initial vertical dimension would be 20 meters divided by 2.15, and the height of release would be 10 meters. However, if emissions could only come from the upper portions of the piping structure (from 10 to 20 meters), then the initial horizontal dimension would be 10 meters divided by 4.3, the initial vertical dimension would be 10 meters divided by 4.3, and the height of release would be 15 meters.

  The base of the volume source must be square. If the base is not square, model the source as a series of adjacent volume sources, each with a square base. For relatively uniform sources, determine an equivalent square by taking the square root of the area of the length and width of the volume base.

- Area. Use the area source characterization to simulate emissions that initially disperse in two dimensions with little or no plume rise, such as ground-level or low-level emissions from a storage pile, slag dump, landfill, or holding pond. Parameters used to characterize area sources are location, geometry, and release height. The geometry of an area source may be characterized as a rectangle, irregularly shaped polygon, or circle. If the source is not at ground level, then a height of release must be entered into the model.

  The emission "rate" is unique for an area source in that emissions are entered in units of mass per unit time per unit area; an emission flux rather than a rate. Use an emission rate per unit area instead of total emissions; that is, divide the total emissions in grams per second by the total area in square meters. Also, the model integrates over the portion of the area that is upwind of a receptor so receptors may be placed within the area and at the edge of the area. The model does not integrate for portions of the area that are closer than one meter upwind of a receptor.

- Open Pit. Use the open pit source characterization to simulate emissions from facilities that originate from a below-grade open pit. Parameters used are the open pit emission rate, the average release height, the initial lengths of the X and Y sides of the open pit, the volume of the open pit, and the orientation angle in degrees from 360 degrees (north). While detailed guidance is contained in section 1.2.4 of the ISC Model User's Guide - Volume II, some factors to consider follow.
  - As with the area source characterization, an emission rate per unit area is used; that is, the total emissions in grams per second divided by the total area in square meters.
  - The average release height above the base of the open pit cannot exceed the pit's effective depth, which is calculated by the model based on the pit's length, width, and volume. An average release height of zero indicates emissions that are released from the base of the pit.
  - The length-to-width aspect ratio for open pit sources should be less than 10 to 1. Unlike the area source characterization, the open pit cannot be subdivided because the assumption used to develop the algorithm is that the emissions are mixed throughout the pit before being dispersed. Characterize irregularly shaped pit areas by a rectangular shape of equal area.
  - Unlike the area source characterization, receptors cannot be placed within the boundaries of the pit.

- Flare. Flares are a special type of elevated source that may be modeled using a point source characterization or a flare source characterization. It may be difficult to obtain the necessary input parameters for air dispersion modeling based on the design and operation of a flare. A large open flame radiates a significant portion of the heat of combustion associated with a flaring gas stream. The buoyancy of the combustion gases will be related to the remaining sensible heat of the flare gas. There are two methods for modeling emissions from a flare. One method uses a traditional point source characterization with user-provided exit gas velocity, exit gas temperature, height of release, and effective stack diameter to determine the amount of buoyancy flux. In this method, the heat release of the flared gas is used to derive an equivalent stack diameter while the exit gas temperature and exit gas velocity are fixed.

Use the following default parameters:

- Exit gas velocity: 20 meters per second
- Exit gas temperature: 1273 Kelvin
- Height of release: use the actual height of the flare tip

The effective stack diameter (D) in meters is calculated using the following equations:

$$D = \sqrt{10^{-6} q_n}$$

and

$$q_n = q(1 - 0.048\sqrt{MW})$$

where:

q = gross heat release in calories per second

q_n = net heat release in calories per second

MW = weighted (by volume) average molecular weight of the compound being flared

Note that enclosed vapor combustion units should not be modeled with the preceding parameters but instead with stack parameters that reflect the physical characteristics of the unit.

The second method for modeling emissions from a flare was developed for the flare source characterization. In this method, the user provides the height of release and the gross heat release from the flare. The height of release is the actual height of the flare tip. The model uses the gross heat release from the flare together with a fixed exit gas temperature and exit gas velocity to internally calculate the effective diameter.

Equivalency of Source Types

There is no direct equivalency or relationship between the types of source characterizations. Many factors must be considered to determine if a source characterization is conservative or representative. A conservative characterization is one that will result in a higher concentration than a representative characterization would in a specific area of concern. In addition, a conservative concentration would not be expected to occur based on actual operation of the permitted facility. In general, use a screening model to determine whether a characterization would be conservative and under what meteorological conditions. This information will make the processes of model result clarification or post-processing of modeled predictions easier. Factors to consider when choosing a source characterization include:

- Type of compliance demonstration. National Ambient Air Quality Standards (NAAQS), Prevention of Significant Deterioration (PSD) Increment, and state property line standard compliance demonstrations are directly related to the highest concentrations predicted in ambient air. For these demonstrations, a characterization does not have to be representative if it results in a conservative prediction. However, for a health effects review, the type of receptor and magnitude and frequency of exposure must be considered. Therefore, a source should be characterized in the most representative way to ensure that the health effects review is based on realistic data and to prevent costly or unnecessary process changes.
- Distance from the source to the property line or area of concern. At great distance (on the order of thousands of feet), and other factors such as height of release being equal, source type is not as important as when the distance to a property line or area of concern is short. At great distance, predicted concentrations will begin to converge as horizontal and vertical dispersion parameters increase and differences between them for a given source type decrease. However, for short distances there can be significant differences between horizontal and vertical dispersion parameters and thus between predicted concentrations of different source types.
- Height of release. While the height of release from a stack is obvious, the height of release from a fugitive source may not be obvious and is important because the height of release for a fugitive source is the plume centerline and the height of maximum concentration. With no plume rise, the maximum concentration in the plume will stay at the same height and concentrations can only reach the ground through vertical dispersion. For a pseudo-point and usually any point within an area, there is no initial vertical dispersion; however, a volume source has initial dispersion. Therefore, a volume source with the same level of emissions as a pseudo-point source can have a greater impact than a pseudo-point source within short distances because the plume reaches the ground more quickly.
- Shape of a non-point source. The shape of a non-point source will directly affect the model's prediction of the magnitude and location of maximum concentrations. In addition, the predicted frequency of occurrence will also be affected. Therefore, it would not be appropriate to represent the base of a long and narrow source of emissions as a single equivalent square, unless there were other mitigating factors such as great distance from the source to the property line or receptors of concern. Either multiple volumes, single area, or several areas may be an appropriate choice. Keep in mind that a justification for any choice of source type based on the specific factors for the project is required.

Appendix L - Downwash Applicability

Downwash is a term used to represent the potential effects of a building on the dispersion of emissions from a source. Downwash is considered for sources characterized as point sources. The stack height and proximity of a point source to a structure can be used to determine the applicability of downwash. Downwash does not apply to sources characterized as areas. Downwash is indirectly considered for volume sources by adjusting the initial dispersion factors.

Point sources with stack heights less than good engineering practice (GEP) stack height should consider dispersion impacts associated with building wake effects (downwash). GEP stack height is the greater of (40 Code of Federal Regulation (CFR) 51.100(ii)):

(1) 65 meters, measured from the ground-level elevation at the base of the stack;

(2)(i) For stacks in existence on January 12, 1979, and for which the owner or operator had obtained all applicable permits or approvals required under 40 CFR parts 51 and 52,

$$H_g = 2.5H$$

provided the owner or operator produces evidence that this equation was actually relied on in establishing an emission limitation;

(ii) For all other stacks,

$$H_g = H + 1.5L$$

where H_g is the GEP stack height, measured from the ground-level elevation at the base of the stack; H is the structure height, measured from the ground-level elevation at the base of the stack; and L is the lesser dimension of the structure height or maximum projected width (the width as seen from the source looking towards either the wind direction or the direction of interest) of the structure.

These formulas define the stack height above which building wake effects on the stack gas exhaust may be considered insignificant.

A structure is considered sufficiently close to a stack to cause downwash when the minimum distance between the stack and the building is less than or equal to five times the lesser of the structure height or maximum projected width of the structure (5L). This distance is commonly referred to as the structure's region of influence.

If the source is located near more than one structure, assess each structure and stack configuration separately. For SCREEN3, include the building with dimensions that result in the highest GEP stack height for that source, to evaluate the greatest downwash effects. Be aware that when screening tanks, the tank diameter should not be used. The SCREEN3 model uses the square root of the sum of the individual squares of both the width and length for a structure in order to calculate the projected width. Because most tanks are round, the projected width is constant for all flow vectors. However, using the actual tank diameter for both width and length will result in a projected width that is too large. Therefore, when screening tanks, the diameter of the tank should be divided by the square root of 2.

For refined models, there are tools available for assessing each structure and stack configuration if a source is located near more than one structure. The Building Profile Input Program - Plume Rise Model Enhancements (BPIP-PRIME) is a multi-building dimensions program incorporating the GEP technical procedures for PRIME applications, which calculates direction-specific downwash parameters for use with air dispersion models. For more information on the user's guide and the program documentation, see the following url: www.epa.gov/scram/air-quality-dispersion-modeling-related-model-support-programs#bpipprm

Once downwash applicability is determined, provide documentation to support that determination. The documentation may include, but is not limited to, a plot plan with all sources and structures clearly labeled, a table of structure heights used in the downwash analysis, recent aerial photography, etc.

Note that for solid structures surrounded by porous structures, only include the dimensions for the solid structure. For example, if a building is surrounded by condensed piping, include the dimensions of the enclosed building in the downwash analysis and do not base the dimensions on the total size of the enclosed building and condensed piping.

Appendix M – Receptor Design

For modeling, receptors are locations where the model calculates a predicted concentration. Design a receptor grid with sufficient spatial coverage and density to determine the maximum predicted ground-level concentration in an off-property area or an area not controlled by the applicant. For NAAQS and PSD increment modeling, receptors should cover the entire area of de minimis impact. For example, if the model predictions at the edge of the receptor grid are greater than de minimis, extend the receptor grid until the model predictions are less than de minimis.

When designing a receptor grid, consider such factors as:

- Results of screening analyses;
- A source's release height;
- Proximity of sources to the property line;
- Location of non-industrial receptors and ambient air monitors; and
- Topography, climatology, and other relevant factors.

In addition, the location of *ambient air* receptors should guide the design of the receptor grid. Ambient air for minor New Source Review (NSR) modeling starts at the applicant's property line. If a single property line designation (SPLD) exists, then ambient air for minor NSR modeling starts at the single property line boundary. Note that the SPLD does not apply to federal reviews.

For Prevention of Significant Deterioration (PSD) modeling, ambient air starts at the applicant's fence line or other physical barrier to public access. Also, no receptors are required on the applicant's property because the air over an applicant's property is not ambient; therefore, in a regulatory sense, applicants cannot cause a condition of air pollution on their property from their own sources.

Generally, the spacing of receptors increases with distance from the sources being evaluated. Consider the following types of receptor spacing:

- *Tight receptors*. Spaced 25 meters apart. Tight receptors could extend up to 200-300 meters from the sources being evaluated. Consider the distance between the source and the property or fence line.
- *Fine receptors.* Spaced 100 meters apart. Fine receptors could extend one kilometer (km) from each source being modeled.
- *Medium receptors*. Spaced 500 meters apart. Medium receptors could cover the area that lies between one and five km from each source.
- *Coarse receptors*. Spaced one km apart. This spacing could cover the area that lies beyond the medium receptors out to 50 km.

Enter receptor locations into air dispersion models in Universal Transverse Mercator (UTM) coordinates, in order to be consistent with on- and off-property source locations represented in the air permit application, and other reference material, such as United States Geological Survey (USGS) topographic maps. Provide the datum used for UTM coordinates. Applicable UTM zones in Texas are either 13 (from the west border to 102 degrees longitude), 14 (between 102 and 96 degrees longitude), or 15 (east of 96 degrees longitude to the east border). Do not use coordinate systems based on plant coordinates or other applicant-developed coordinate systems.

Special cases to consider when developing a receptor grid

In most cases, the property line is well defined and all sources of emissions are on the property. However, for some activities, such as marine loading, sources may be located off-property and emitting directly into ambient air. For these cases, the following guidance for determining the points of evaluation is appropriate for the technical review process and applies whether the analysis is for a standard or effects screening level (ESL), with one exception. The Texas legislature enacted Section 382.066 in the Texas Health and Safety Code (THSC) [House Bill (HB) 3040] for shipyard facilities. This section exempts shipbuilding or ship repair operations from modeling and effects review for non-criteria pollutants over coastal waters. Therefore, for these facilities, the following guidance only applies to reviews concerning criteria pollutants. For non-criteria pollutants, no receptors are required over water.

Off-property receptors over water

There are three basic approaches that could be used to determine where receptors should be placed when a source is located off-property in ambient air. These could be used individually or in combination. These distances would apply for technical review purposes only. The applicant must still comply with all the Agency's rules and regulations.

- *Set distance*: A fixed distance for modeled receptor grid points of 25 meters is normally used for low-level fugitive-type emissions and for emissions from stacks that could be affected by downwash. The points start at the property line and extend from about 100-200 meters before the suggested grid spacing changes. If the activity is located off-property in the water, the source of emissions is considered to be part of the property during actual operations. Since the general public would not be present at the source, receptors should be placed starting at a distance 25 meters from the edge of the source instead of on the actual property line.
- *Controlled or restricted distance*: There are two general distance limit scenarios.
    - Controlled: If the applicant can limit access to an area near the source of emissions for the duration of the operation such that the general public and off-site workers would not be exposed, the modeled receptor grid points could begin at the edge of the control area, as well as, on the property line in the

uncontrolled areas. Use of buoys would be an example of a way to limit access.

    - Restricted: If the applicant can show that access is restricted, the modeled receptor grid points could begin at the edge of the restricted area, as well as, on the property line in the unrestricted areas. For the purposes of modeling and effects review, a restricted area is accessible only to the applicant's employees, including personnel associated with marine vessel operations. If other individuals have access to the area, then the area is not restricted, and receptors would be placed in the area. Examples of restricted areas could be a coastal easement agreement with the General Land Office that allows the applicant to restrict access, or any other authority that allows the applicant to post signs that prohibit access to anyone other than the applicant's personnel. The applicant should provide documentation for restricted areas, including specific coordinates and any applicable specified conditions for the area, to the permit reviewer. Note that a restricted area could be a water area, shore area, or both.

- *Model limitation distance*: There is another consideration, in addition to the set or controlled distance consideration. The model may not be able to calculate a concentration immediately adjacent to the source. In that case, the modeled receptor grid points should begin at the closest point that the model can calculate a concentration from the source at or beyond 25 meters from the edge of the source. The distance of the grid points from the edge of the source would be linked to the limiting algorithm in the model. This distance could be a minimum of one meter for a point, pseudo-point, or an area source to about 47 meters from the center of a volume source with about a 91-meter base.

Note that a model's limitation is not related to a "property line" but to an algorithm in the model. Therefore, there may be sources that are located on a property at a distance that would prevent the model from calculating a concentration on a property line or on a grid receptor placed on a land location off the property.

Following are some receptor placement examples

Receptor Placement Example 1: Consider a site that has emissions from a stack on a ship that is moored at a dock in the water off the actual property of the applicant. Receptors should be placed starting at a distance of 25 meters from the edge of the ship in the water and out a sufficient distance to record the highest predicted concentrations and to demonstrate that concentrations are declining with distance.

Receptor Placement Example 2: Consider a site that conducts blasting operations in two locations at a site: a dock, located in the water off the applicant's actual property; and, outside a building located in the center of the property. Operations are such that the permit reviewer determines that PM_{10} (a criteria pollutant) should be evaluated per HB3040. During blasting at the dock, the applicant can control access out to a distance of 40 meters over water from all sides of the ship. For the controlled area, receptors should be placed at the start of the area. Normal receptor placement procedures would be used for the property-line receptors over land, and away from the controlled area over the water. Receptors over both land and water should extend out a sufficient distance to record the highest predicted concentrations and to demonstrate that concentrations are declining with distance.

If the dock and building operations can occur at the same time, then the controlled area for the dock operation will drive the creation of the receptor grid over water. However, if the operations can occur independently, and the area near the dock will not be controlled during operations at the building, then a separate model run may be required for this scenario depending on factors such as the amount of emissions and distance from the water. In this case, the receptors should start at the property line and extend directly over water.

Receptor Placement Example 3: Consider a site where the applicant unloads container ships at a dock. Assume that the width of the ship is 20 meters. In addition, assume that the operation can be represented by a volume created by the movement of a multiple scoop conveyor lifting material out of a compartment and onto another conveyor. The length and width of the volume are 16 meters based on the size of the compartment. With no other adjustments to the initial dimensions, receptors over water could be placed starting at a distance of about 9 meters from the center of the volume. However, since this distance is less than 25 meters from the edge of the ship, the greater distance should be used.

In this case, the receptors over water would begin at a distance of 45 meters from the dock (25 meters from the edge of the ship) and should continue out a sufficient distance over the water to record the highest predicted concentrations and to demonstrate that concentrations are declining. Normal receptor placement would be used for the property-line receptors away from the water. If the distance from the center of the volume to a non-water property line is less than 9 meters, the receptors over land would start at 9 meters from the center of the volume.

Appendix N - Surface Characteristics of the Modeling Domain

The modeling domain is the region that will influence the dispersion of the emissions from the facilities under review. Surface characteristics for the modeling domain should be evaluated when determining representative dispersion coefficients. Air dispersion models utilize dispersion coefficients to determine the rate of dispersion for a plume. Dispersion coefficients are influenced by factors such as land-use / land-cover (LULC), terrain, averaging period, and meteorological conditions.

Evaluating the LULC within the modeling domain is an integral component to air dispersion modeling. The data obtained from a LULC analysis can be used to determine representative dispersion coefficients. The selection of representative dispersion coefficients may be as simple as selecting between rural or urban land-use types. For more complex analyses, representative dispersion coefficients can be determined by parameters that are directly related to the LULC within the modeling domain.

LULC Analysis for ISC, ISC-PRIME, and SCREEN3

For the ISC, ISC-PRIME, and SCREEN3 models, the dispersion coefficients are based on whether the area is predominately rural or urban. The classification of the land use in the vicinity of sources of air pollution is needed because dispersion rates differ between rural and urban areas. In general, urban areas cause greater rates of dispersion because of increased turbulent mixing and buoyancy-induced mixing. This mixing is due to the combination of greater surface roughness caused by more buildings and structures and greater amounts of heat released from concrete and similar surfaces.

The Environmental Protection Agency (EPA) guidance provides two procedures to determine whether the character of an area is predominantly rural or urban. One procedure is based on land-use typing and the other is based on population density. Both procedures require an evaluation of characteristics within a three-kilometer radius from a source. The land-use typing method is based on the work of August Auer (Auer, 1978) and is preferred because it is more directly related to the surface characteristics of the evaluated area that affects dispersion rates.

While the Auer land-use typing method is more direct, it can be labor-intensive to apply. A simplified technique can be used as a screening tool. If the land-use designation is clear; that is, about 70 percent or more of the total land use is either rural or urban, then further refinement is not necessary.

Simplified Auer Land-Use Analysis

The Auer land-use approach considers four primary land-use types: Industrial (I), Commercial (C), Residential (R), and Agricultural (A). Within these primary types, subtypes are identified in Table N-1.

Table N-1. Land Use Types and Corresponding Dispersion Classification

Type	Description	Class
I1	Heavy Industrial	Urban
I2	Light/Moderate Industrial	Urban
C1	Commercial	Urban
R1	Common Residential (Normal Easements)	Rural
R2	Compact Residential (Single-Family)	Urban
R3	Compact Residential (Multi-Family)	Urban
R4	Estate Residential (Multi-Acre)	Rural
A1	Metropolitan Natural	Rural
A2	Agricultural	Rural
A3	Undeveloped (Grass/Weeds)	Rural
A4	Undeveloped (Heavily Wooded)	Rural
A5	Water Surfaces	Rural

The goal in a simplified Auer land-use analysis is to estimate the percentage of the area within a three-kilometer radius of the source to be evaluated that is either rural or urban. Both land-use types do not need to be evaluated since the land use type that has the greatest percentage will be the representative type.

The primary assumption for the simplified procedure is based on the premise that many facilities should have clear-cut rural or urban designations; that is, the percentage of the primary designation should be greater than about 70 percent. If the land-use designation represents less than 70 percent of the total, supplement the analysis with current aerial photography of the area surrounding the sources or with a detailed drive-through summary to support the land-use designation to be used in the modeling demonstration.

LULC Analysis for AERMOD and AERSCREEN

For AERMOD and AERSCREEN, dispersion coefficients are determined by parameters that are directly related to the LULC within the modeling domain. For example, albedo, Bowen ratio, and surface roughness length all vary for different land-use types and all three parameters affect processes that take place in the surface boundary layer.

- **Albedo** - defined as the ratio of reflected flux density to incident flux density, referenced to some surface. A high albedo value is associated with a greater amount of reflection of incoming solar radiation. An increase in the reflection of incoming solar radiation will result in less energy available for sensible or latent heat loss and thus a decrease in convective turbulence.
- **Bowen Ratio** - defined as the ratio of sensible heat flux to latent heat flux from the earth's surface up into the air. A low Bowen ratio is associated with a surface that has a larger latent heat flux than sensible heat flux. A large latent heat flux means less energy is available for sensible heat loss, and will result in a decrease in convective turbulence.
- **Surface Roughness Length** - defined as the height above the displacement plane at which the mean wind becomes zero when extrapolating the logarithmic wind speed profile downward through the surface layer. A high surface roughness length will result in greater mechanical turbulence and increased vertical mixing.

There are numerous field studies and references that document different values for these surface characteristic parameters based on LULC, as well as for different seasons of the year. In addition, a tool has been developed by the EPA (AERSURFACE) that can be used to process land cover data to determine the surface characteristic values of the modeling domain. To download AERSURFACE and the corresponding documentation, refer to: www.epa.gov/scram/air-quality-dispersion-modeling-related-model-support-programs#aersurface

Provide the technical justification for model options selected, including any references for parameter values in the air quality analysis (AQA).

AERMOD and AERSCREEN also include an urban option so that the model can be run using urban algorithms. The urban option used in AERMOD and AERSCREEN is not the same as urban dispersion coefficients used with ISC, ISC-PRIME, and SCREEN3. The urban option in AERMOD and AERSCREEN is used to account for the dispersive nature of the "convective-like" boundary layer that forms during nighttime conditions due to the urban heat island effect. The urban heat island effect is due to industrial and urban development. In rural areas, a large part of the incoming solar energy is used to evaporate water from vegetation and soil. In cities, where less vegetation and exposed soil exists, the majority of the sun's energy is absorbed by urban structures and asphalt. At night, the solar energy (stored as vast quantities of heat in city buildings and roads) is slowly released into the city air. Additional city heat is given off at night by vehicles and factories, as well as by industrial and domestic heating and cooling units. The slow release of heat tends to keep nighttime city temperatures higher than those of the faster cooling rural areas. The magnitude of the urban heat island effect is driven by the urban-rural temperature difference that develops at night.

The urban option is used to enhance the turbulence for urban nighttime conditions over that which is expected in the adjacent rural, stable boundary layer. For most applications, the Land Use Procedure described in Section 7.2.1.1 of the Guideline on Air Quality Models (GAQM) is sufficient for determining the urban/rural status. However, there may be sources located within an urban area but located close enough to a body of water or to other non-urban land-use categories to result in a predominately rural land use classification within three kilometers of the source following that procedure. Users are therefore cautioned against applying the Land Use Procedure on a source-by-source basis, but should also consider the potential for urban heat island influences across the full modeling domain. This is consistent with the fact that the urban heat island is not a localized effect, but is more regional in character.

For additional information about the urban option and the corresponding required input parameters for the urban option, see the guidance contained in the *AERMOD Implementation Guide*:
www.epa.gov/scram/air-quality-dispersion-modeling-preferred-and-recommended-models#aermod

Terrain

Much of Texas can be characterized as having relatively flat terrain; however, some areas of the state have simple-to-complex terrain. The Air Dispersion Modeling Team (ADMT) defines flat terrain as terrain equal to the elevation of the stack base; simple terrain as terrain lower than the height of the stack top; and, complex terrain as terrain above the height of the plume centerline (for screening modeling, complex terrain is terrain above the height of the stack top). Terrain above the height of the stack top but below the height of the plume centerline is known as intermediate terrain.

Evaluate the geography within the modeling domain to determine how terrain elevations should be addressed. There are many sources of terrain elevation data that can be used in air dispersion modeling demonstrations. However, the sources of terrain elevation data may differ in sampling interval, geographic reference system, areas covered, and accuracy of data. For example, Universal Transverse Mercator (UTM) is just one of many map projections used to represent locations on a flat surface. Also, be aware that there are several horizontal data coordinate systems or datum (North American Datum (NAD) 27, World Geodetic System (WGS) 72, NAD83, and WGS84) that are used to represent locations on the earth’s surface in geographic coordinates (latitude and longitude). When representing receptor, building, and source locations in UTM coordinates, make certain that all of the coordinates originated in, or are converted to, the same horizontal datum.

For modeling with the ISC and ISC-PRIME models, use both the simple and complex terrain calculation options if other than flat terrain applies. That is, if terrain elevations for receptors are used, activate both simple and complex options. In cases where multiple sources with varying heights of emissions must be evaluated, use the ISC or ISC-PRIME models rather than the SCREEN3 model. Since the SCREEN3 model can only evaluate one source at a time, combined results for sources in intermediate-to-complex terrain might not be representative.

If other than flat terrain is modeled, use appropriate receptor elevations. Ensure that the higher terrain is always included in any direction from the source, not just the highest terrain. For example, if the highest terrain is to the north of the property, but the second-highest terrain is to the south, include receptors at and in the general vicinity of each location. Conservative options may be used to reduce the effort of determining specific receptor heights for dense grid networks. For example:

- Omit terrain if only ground-level fugitive sources are modeled. Terrain is generally not a consideration when modeling releases from fugitive sources. Releases from these sources are typically neutrally buoyant and are essentially at ground level. Maximum concentrations from fugitive releases are thus expected to occur at the nearest downwind receptor location. However, include terrain near a property or fence line for elevated fugitive releases, or if non-fugitive point sources are included in the modeling demonstration.
- Set receptors to the stack base elevation, if some elevations are below stack base.
- If the terrain is all below the stack base, choose the FLAT terrain height option keyword in the Control pathway of the ISC and ISC-PRIME models, which will cause the model to ignore terrain heights. Note: do not select the elevated terrain height option without including receptor elevations in the Source pathway.

For modeling with AERMOD and AERSCREEN, the model treats the plume as a combination of two limiting cases: a horizontal plume (terrain impacting) and a terrain-following plume. In flat terrain the two states are equivalent. In complex terrain, AERMOD incorporates the concept of the dividing streamline for stably-stratified conditions. Generally, in stable flows, a two-layer structure develops in which the lower layer remains horizontal while the upper layer tends to rise over the terrain. Since the plume is modeled as a combination of two limiting cases (horizontal plume and terrain-following plume), the model handles the computation of pollutant impacts in both flat and complex terrain within the same modeling framework thereby obviating the need to differentiate between the formulations for simple and complex terrain. The model's total concentration is calculated as a weighted sum of the concentrations associated with these two limiting cases or plume states.

A pre-processor program, AERMAP, has been developed to process terrain data in conjunction with a layout of receptors and sources to be used in AERMOD. Using gridded terrain data, AERMAP first determines the base elevation at each receptor and source. AERMAP then calculates a representative terrain-influence height for each receptor (hill height scale) with which AERMOD computes receptor-specific dividing streamline values. For more information on AERMAP and the corresponding documentation, refer to:
www.epa.gov/scram/air-quality-dispersion-modeling-related-model-support-programs#aermap

If there are significant problems with the resolution of the terrain data, that is, a mix of scales that could result in the omission of terrain features or significant changes in elevation, additional discrete receptors with appropriate elevations should be included in the receptor grid.

Appendix O - Meteorological Data

The Air Dispersion Modeling Team (ADMT) has prepared meteorological data sets for modeling demonstrations in order to establish consistency among modeling demonstrations across the state. These data sets are available by county for download from the ADMT Internet page as follows:

For ISC/ISC-PRIME
www.tceq.texas.gov/permitting/air/modeling/admtmet.html

For AERMOD
www.tceq.texas.gov/permitting/air/modeling/aermod-datasets.html

In addition to the meteorological data sets, the Internet pages above include information on how the meteorological data sets were developed, as well as the file naming conventions of the meteorological data sets.

For AERMOD, meteorological data sets have been developed using three surface roughness categories (low, medium, and high). Refer to Appendix N for additional guidance on determining the appropriate surface roughness category.

For minor New Source Review (NSR) permit applications, the use of one year of National Weather Service (NWS) meteorological data may be sufficient. However, if five years of NWS meteorological data are used, then use the same five-year meteorological data for all applicable averaging periods for consistency. For Prevention of Significant Deterioration (PSD) demonstrations, use the most recent, readily available five years of NWS meteorological data. The Guideline on Air Quality Models (GAQM) also provides an option to use prognostic meteorological data for a regulatory modeling application where there is no representative NWS station, and it is prohibitive or not feasible to collect adequately representative site-specific data. The Environmental Protection Agency (EPA) released the Mesoscale Model Interface Program (MMIF) that converts the prognostic meteorological data (Mesoscale Model 5 or Weather Research and Forecasting) into a format suitable for dispersion modeling applications. When processing prognostic meteorological data for AERMOD, the MMIF should be used to process data to generate AERMET inputs and the data subsequently processed through AERMET for input into AERMOD. The GAQM also notes that at least three years of prognostic meteorological data are required, and an operational evaluation of the meteorological modeling data for all model years (i.e., statistical or graphical) should be completed. The use of these data will need to be coordinated with the ADMT.

Provide an ASCII version of the model-ready data with the air quality analysis (AQA) submittal.

Applicants may request to use other available meteorological data not available from the ADMT. If the request is approved, the applicant is responsible for obtaining, preparing, and processing the data. Before these data sets are used in any modeling demonstration, the applicant should submit them to the ADMT. The ADMT should review and approve the data sets and all the data used to develop the specific meteorological parameters required. Provide the following information:

- Surface and upper-air data. Provide how these data were obtained (e.g., National Climatic Data Center [NCDC], Support Center for Regulatory Atmospheric Modeling [SCRAM], or other source).
- Procedures for replacing missing data. Replacement of missing data must follow standard procedures. Follow the guidance in *Procedures for Substituting Values for Missing NWS Meteorological Data for Use in Regulatory Air Quality Models* (Atkinson, 1992) to replace missing values before processing them. Document and submit all occurrences of missing data and proposed replacement values.
- Technical justification and supporting documentation for all model selections (e.g., albedo, Bowen ratio, surface roughness length, etc.).
- Documentation for how these data will be processed, including quality assurance/quality control procedures.

Appendix P - Reporting Requirements

The air quality analysis (AQA) submitted to the Texas Commission on Environmental Quality (TCEQ) in support of an air permit application becomes an addendum to the air permit application. The analysis should include the items below, as appropriate.

Project Identification Information

- Provide the following information to clearly identify the analysis:
  - Applicant
  - Facility
  - Permit Application Number
  - Regulated Entity Number
  - Nearest City and County
  - Applicant's Modeler

Project Overview

- Include a brief discussion of the plant process(es), and types and locations of emissions under consideration.

Type of Permit Review

- Indicate the type of permit review required by the permit reviewer.

Constituents Evaluated

- List all constituents that were evaluated. Be sure to provide all relevant information for each constituent evaluated (standard/effects screening level (ESL), chemical abstract service (CAS) number, etc.).

Plot Plan

- Depending on the scope of the project, several plot plans may be needed to present all the requested information.
- Include a plot plan that includes:
  - A clearly marked scale.
  - All property lines. For Prevention of Significant Deterioration (PSD) Analyses, include fence lines.
  - A true-north arrow.

- Universal Transverse Mercator (UTM) coordinates along the vertical and horizontal borders. Please do not use plant or other coordinates.
- Include the datum of your coordinates.
- Reference UTM coordinates and locations of all emission points including fugitive sources modeled.
- Labels/IDs and coordinates for emission points on the plot plan should correlate with the information contained in the AQA.
- Buildings and structures on-property or off-property which could cause downwash. Include length, width, and height.

Area Map

- For minor New Source Review (NSR) Analyses,
    - Include a copy of the area map submitted with the air permit application. The map should cover the area within a 1.9 mile (three-kilometer) radius of the facility if used for the Auer land-use analysis.
    - The area map should include all property lines. For sites with a single property line designation (SPLD), include all property lines associated with the SPLD. Also include a copy of the SPLD agreement and order with the AQA.
    - Add UTMs to the horizontal and vertical dimensions of the map section, as well as the date and title of the map. Include the datum of your coordinates.
    - Annotate schools within 3,000 feet of the sources nearest to the property line.
    - For the Health Effects Review, annotate the nearest non-industrial receptor of any type. Include any additional non-industrial receptors requested by the Toxicology Division.
- For PSD Analyses,
    - Include a copy of the area map submitted with the air permit application. The map should cover the area within a 1.9 mile (three-kilometer) radius of the facility if used for the Auer land-use analysis.
    - The area map should include all fence lines.
    - Add UTMs to the horizontal and vertical dimensions of the map section, as well as the date and title of the map. Include the datum of your coordinates.
    - Include maps that show the location of:
        - PSD Class I areas within 10 kilometers (6.2 miles) or 100 kilometers (62 miles).
        - Urban areas, non-attainment areas, and topographic features within 50 kilometers (31 miles) or the distance to which the source has a significant impact, whichever is less.

    - Any on-site or local meteorological stations, both surface and upper air.
    - State/local/on-site ambient air monitoring sites used for background concentrations.

Air Quality Monitoring Data

- For minor NSR and PSD National Ambient Air Quality Standards (NAAQS) Analyses,
    - Provide the monitor ID, county, and address for each monitor.
    - Discuss how ambient background concentrations were obtained.
    - Include a summary of observations for each constituent and averaging time, if available.
    - Provide all calculations, including electronic spreadsheets and substitution data.
- For the Health Effects Review, identify monitored data that was used to supplement or substitute for modeling. Demonstrate that the data represent near worst-case operational and meteorological conditions.

Modeling Emissions Inventory

- On-Property Sources to be Permitted,
    - Include a copy of the Table 1(a) that was submitted with the air permit application and subsequently approved by the permit reviewer. Ensure additional entries are provided on the Table 1(a) if stack parameters for any averaging period or load level could be different.
    - Identify special source types or characterizations such as covered stacks, horizontal exhausts, fugitive sources, area sources, open-pit sources, volume sources, stockpiles, and flares.
    - Include all assumptions and calculations used to determine as appropriate the size, sides, rotation angles, heights of release, initial dispersion coefficients, effective stack diameter, gross heat release and weighted (by volume) average molecular weight of the mixture being burned.
    - Specify particulate emissions as a function of particle size; mass fraction for each particle size category; and particle density for each particle size category, as applicable.
- Other On-Property and Off-Property Sources,
    - Include the Air Permits Allowable Database (APAD) retrieval for each constituent.
    - Include an additional list for each constituent for any sources modeled but were not included in the APAD retrieval. This list should contain all the information required by the Table 1(a).

- For PSD Analyses, include a list of secondary emissions, if applicable. Secondary emissions occur from any facility that is not a part of the facility being reviewed, that would only be constructed or would have an increase of emissions as a result of the permitted project.

Table Correlating the Emission Inventory Source Name and Emission Point Number (EPN) with the Source Number in the Modeling Output

- Include a table that cross-references the source identification numbers used in the modeling if they are different from the EPNs in the Table 1(a) or from any additional list of sources.

Stack Parameter Justification

- Include the basis for using the listed stack parameters (flow rates, temperatures, stack heights, velocities). This should include the calculations used to determine the parameters.
- If the production or load levels could be less than 100 percent, demonstrate how the modeled emission rates and stack parameters were obtained to produce the worst-case impacts (in certain cases lower production levels may result in higher predicted impacts).
- Include at least 25 percent, 50 percent, 75 percent, and 100 percent production or load levels analyses, if the source could be operated at these reduced levels.

Scaling Factors

- Discuss how emission scalars were developed and used in the modeling demonstration. In addition, identify those scalars that should be included in an enforceable permit provision, such as restricted hours of operation.

Models Proposed and Modeling Techniques

- Include a detailed discussion of the models that were used, model version numbers, and the model entry data options such as the regulatory default option and the period option.
- Discuss any specialized modeling techniques such as screening, collocating sources, and ratioing.
- Include assumptions and sample calculations.

Selection of Dispersion Option

- Base the selection of urban or rural dispersion coefficients on the Auer land-use analysis.

- Include a detailed discussion and sufficient technical justification to support the selection of the dispersion option.

Building Wake Effects (Downwash)

- Discuss how downwash structures were determined and include applicable information required to use the EPA's BPIP-PRIME. Submit all input files and files generated by the BPIP-PRIME program, and any computer-assisted drawing files.
- Provide a table of structure heights and associated building IDs used in the downwash analysis.

Receptor Grid

- Discuss how the receptor grids were determined for each type of analysis.
- Include the datum of your coordinates.
- Discuss if terrain was applicable. If so, discuss how terrain for individual receptors was determined.

Meteorological Data

- Indicate the surface station, surface station anemometer height, surface station profile base elevation, upper-air station, and period of record, as applicable.
- Include the meteorological data files used for all demonstrations.
- Discuss how meteorological data were determined or replaced. Include Air Dispersion Modeling Team (ADMT) approval of replacement data.
- In addition, submit all the supplementary data used to develop the specific input meteorological parameters required by the meteorological pre-processor programs.

Modeling Results

- Summarize and compare the modeling results relative to all applicable de minimis values, standards, guidelines, or reference air concentrations. Tabulated results are preferred.
- For the Health Effects Review, present the maximum concentrations predicted for non-industrial receptors separately and include the location of the receptor. Provide the predicted frequency of exceedance if applicable.
- For the Additional Impacts Analysis (for PSD Analyses), include the results of the additional impacts analysis for growth, visibility, and soils and vegetation.
- For the Class I Area Impacts Analysis (for PSD Analyses), include the results of the Class I area impacts analysis, as applicable.

Electronic Information (Model Input/Output and Associated Computer or Electronic Files)

- Include:
  - All input and output files for each air dispersion model run, including data, grid and plot files.
  - All files produced by a software entry program.
  - All automated downwash program input and output files and any computer-assisted drawing files.
  - All meteorological data files in ASCII format.
  - All boundary files, including computer-assisted drawing files, specifying coordinates for property lines.
  - For PSD Analyses, all boundary files, including computer-assisted drawing files, specifying coordinates for fence lines.
  - Include all spreadsheet files used for comparison of predicted concentrations with standards or guidelines. This includes, but is not limited to, spreadsheet files used for ratio techniques.

Appendix Q - Conducting an Ambient Ozone Impacts Analysis

For a Prevention of Significant Deterioration (PSD) application, if a project will emit 100 tons per year (tpy) or more of volatile organic compounds (VOCs) or nitrogen oxides (NO_x) emissions, an ozone impact analysis to demonstrate predicted compliance with the 8-hour ozone standard is required, including the gathering of ambient air quality data. The person conducting the analysis should follow the basic procedure described in the following paragraphs:

Step 1. Determine whether site-specific monitoring data or representative monitoring data will be used to obtain an ozone background concentration.

- A site-specific monitoring program must last a minimum of at least four to six months up to twelve months during the ozone season (an ozone season can vary based on the location being evaluated). Use the fourth-highest daily maximum 8-hour average ozone concentration monitored during a single ozone season or up to a three-year average of the annual fourth-highest daily maximum 8-hour ozone concentrations if data are available.
- Representative monitoring data may be available from the ozone network in Texas. Refer to Appendix D for additional guidance on determining a representative ozone background concentration.

If the background concentration equals or exceeds 70 parts per billion (ppb), Step 2 cannot be used and approaches such as the applicant providing emissions offsets or reducing proposed VOC or NO_x emissions for the project below 100 tpy would be considered.

Step 2. Determine the potential impacts on ozone levels associated with the proposed project emissions.

As part of the revisions made to the Guideline on Air Quality Models (January 17, 2017), the Environmental Protection Agency (EPA) promulgated a two-tiered demonstration approach for addressing single-source impacts on ozone. The first tier involves the use of technically credible relationships between precursor emissions and a source's impact (that may be published in literature; developed from modeling that was previously conducted for an area by a source, a governmental agency, or some other entity that is deemed sufficient; or generated by a reduced form model) in combination with other supportive information and analysis for the purpose of estimating secondary impacts from a particular source. The second tier involves application of more sophisticated case-specific chemical transport models (e.g., photochemical grid models). The appropriate tier for a given application should be selected in consultation with the Air Dispersion Modeling Team (ADMT) and be consistent with applicable EPA guidance.

Tier 1

The EPA developed a tier 1 demonstration tool for ozone precursor emissions called Modeled Emission Rates for Precursors (MERPs). The development of the tool and related guidance is summarized in a memorandum from EPA dated April 30, 2019, with a subject, "Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and $PM_{2.5}$ under the PSD Permitting Program." The basic idea behind the MERPs is to use technically credible air quality modeling to relate precursor emissions and peak secondary pollutant impacts from specific or hypothetical sources. To derive a MERP value, the model predicted relationship between precursor emissions from hypothetical sources and their downwind maximum impacts can be combined with a significant impact level (SIL) using the following equation:

$$MERP = SIL * \frac{Modeled\ emission\ rate\ from\ hypothetical\ source}{Modeled\ air\ quality\ impact from\ hypothetical\ source}$$

The ADMT used the air quality modeling results for hypothetical sources summarized in Appendix A of the EPA MERPs memorandum to derive MERPs for the hypothetical sources located in Texas using the EPA recommended SIL for ozone (1 ppb). The EPA is maintaining an Excel spreadsheet of the maximum impacts for daily maximum 8-hour average ozone for the hypothetical sources on their Support Center for Regulatory Atmospheric Modeling website. It is expected that the information in the Excel spreadsheet will be updated over time as newer modeling is done. The worst-case derived MERPs for the hypothetical Texas sources are presented below in Table Q-1:

Table Q-1. Worst-case MERP Values (in tons per year)

Precursor	8-hour Ozone
NO_x	250
VOC	2604

To use the MERP values in Table Q-1 as a tier 1 demonstration, an analysis will need to be provided that shows that the emissions characteristics of the project source and the chemical and physical environment in the vicinity of the project source are adequately represented by the various hypothetical Texas sources modeled by the EPA (and documented in the EPA MERPs memorandum).

For the ozone impacts, VOC and NO_x are both precursors to ozone formation, and the contributions to ozone formation are considered together. The proposed ozone precursor emissions increase can be expressed as a percent of the lowest MERP for each precursor and then summed. A value less than 100% indicates that the SIL will not be exceeded:

$$\left[\frac{NO_x\ project\ emissions}{NO_x\ MERP} + \frac{VOC\ project\ emissions}{VOC\ MERP}\right] * 100 < 100\%$$

For example, a project with proposed emissions of 200 tpy of NO_x and 120 tpy of VOC. Since NO_x and VOC are both precursors to ozone formation, the contributions to 8-hour daily maximum ozone are considered together. The proposed emissions increase can be expressed as a percent of the lowest MERP for each precursor and then summed:

$$\left[\frac{200\ tpy}{250\ tpy} + \frac{120\ tpy}{2604\ tpy}\right] * 100$$

$$= \ [0.8 + 0.046] * 100$$

$$= 84.6\%$$

Since the value is less than 100%, this example shows the source impact is less than the SIL and a cumulative analysis would not be needed.

If the worst-case MERP values listed in Table Q-1 are too conservative, then MERP values for a specific hypothetical source may be used provided a demonstration is shown that the identified hypothetical source is representative for the project source. Tables Q-2 and Q-3 show the derived MERPs for all of the hypothetical Texas sources for precursors NO_x and VOC, respectively. The ADMT used the air quality modeling results for hypothetical sources summarized in Appendix A of the EPA MERPs memorandum (also provided in Tables Q-2 and Q-3 as the Max Impact) to derive MERPs for the hypothetical sources located in Texas using the EPA recommended SIL for ozone:

Table Q-2. NO_x MERP Values for Hypothetical Texas Sources

Source	Emissions (tpy)	Height	Max Impact (ppb)	MERP (tpy)
5 (Terry)	500	H	1.168	428
5 (Terry)	500	L	1.199	417
5 (Terry)	1000	H	2.043	489
5 (Terry)	3000	H	4.292	698
19 (Henderson)	500	H	1.93	259
19 (Henderson)	500	L	1.998	250
19 (Henderson)	1000	H	3.462	288
19 (Henderson)	3000	H	8.424	356
20 (Harris)	500	H	0.782	639
20 (Harris)	500	L	0.788	634
20 (Harris)	1000	H	1.352	739
20 (Harris)	3000	H	2.81	1067
24 (Parker)	500	H	1.295	386
24 (Parker)	500	L	0.959	521
24 (Parker)	1000	H	2.311	432
24 (Parker)	3000	H	5.137	583
25 (Guadalupe)	500	H	0.723	691
25 (Guadalupe)	500	L	0.721	693
25 (Guadalupe)	1000	H	1.34	746
25 (Guadalupe)	3000	H	3.059	980

Table Q-3. VOC MERP Values for Hypothetical Texas Sources

Source	Emissions (tpy)	Height	Max Impact (ppb)	MERP (tpy)
5 (Terry)	500	H	0.03	16666
5 (Terry)	500	L	0.032	15625
5 (Terry)	1000	H	0.061	16393
5 (Terry)	3000	H	0.313	9584
19 (Henderson)	500	L	0.044	11363
19 (Henderson)	1000	H	0.077	12987
19 (Henderson)	1000	L	0.097	10309
19 (Henderson)	3000	H	0.463	6479
20 (Harris)	500	L	0.124	4032
20 (Harris)	1000	H	0.262	3816
20 (Harris)	1000	L	0.247	4048
20 (Harris)	3000	H	0.943	3181
24 (Parker)	500	L	0.155	3225
24 (Parker)	1000	H	0.304	3289
24 (Parker)	1000	L	0.305	3278
24 (Parker)	3000	H	1.035	2898
25 (Guadalupe)	500	L	0.149	3355
25 (Guadalupe)	1000	H	0.313	3194
25 (Guadalupe)	1000	L	0.334	2994
25 (Guadalupe)	3000	H	1.152	2604

The sources are identified by number and county. The numbers are the same numbers used to identify sources in the EPA MERP memorandum. For source height, a value of H represents an elevated release (90 meters) and a value of L represents a lower release (10 meters).

As an example, a project with proposed emissions of 800 tpy of NO_x and 310 tpy of VOC is proposed to be located in Caldwell County. Caldwell County is adjacent to Guadalupe County and the MERP values from source 25 (Guadalupe) will be used. An analysis is first conducted to compare the chemical and physical environment in the vicinity of the project source (Caldwell County) relative to the hypothetical source modeled in Guadalupe County. Information used in the analysis may include average and peak temperatures, humidity, terrain, rural/urban nature of the area, regional sources of pollutants (biogenic, industrial, etc.), and ambient concentrations of relevant pollutants.

Based on this analysis, and the proposed emissions associated with the project, the NO_x MERP value associated with the 1000 tpy source and the VOC MERP value associated with the 500 tpy source will be used. As with the previous example, the proposed emissions increase can be expressed as a percent of the MERP for each precursor and then summed:

$$\left[\frac{800\ tpy}{746\ tpy} + \frac{310\ tpy}{3355\ tpy}\right] * 100$$

$$= [1.072 + 0.092] * 100$$

$$= 116.4\%$$

Given that the value is greater than 100 percent, a cumulative analysis is needed since the source impact is greater than the SIL.

The cumulative analysis for a NAAQS demonstration includes contributions from background concentrations and impacts associated with ozone precursor emissions. The following equation is used:

$$Cumulative\ concentration = Background\ concentration +$$

$$\left[\frac{NO_x\ project\ emissions}{NO_x\ MERP} + \frac{VOC\ project\ emissions}{VOC\ MERP}\right] * SIL$$

Continuing with the Caldwell County project example, the 8-hour background concentration for the project area is determined to be 60 ppb. The cumulative concentration would be:

$$= 60\ ppb + \left[\frac{800\ tpy}{746\ tpy} + \frac{310\ tpy}{3125\ tpy}\right] * 1\ ppb$$

$$= 60\ ppb + 1.164\ ppb$$

$$= 61.164\ ppb$$

The cumulative concentration is less than the 8-hour NAAQS (70 ppb) and the demonstration is complete. The contributions to the formation of ozone from off-site sources are generally accounted for through the use of background concentrations. For nearby off-site sources that may have been recently permitted and are not yet operating, their contribution towards ozone formation may need to be determined since background concentrations will not include their contribution.

Tier 2

Tier 2 assessments are intended for impact assessments that are not able to be satisfied with a tier 1 demonstration in that pre-existing information is not available or representative of the situation such that more refined modeling is necessary. For these situations, application of more sophisticated case-specific chemical transport models (e.g., photochemical grid models) should be performed to address single-source impacts.

Appendix R - Secondary Formation of Particulate Matter ($PM_{2.5}$)

The purpose of this appendix is to provide guidance for addressing the secondary formation of $PM_{2.5}$. Please note that secondary formation of $PM_{2.5}$ must be addressed even if the predicted concentration for direct $PM_{2.5}$ is less than the significant impact levels (SILs). Furthermore, secondary formation of $PM_{2.5}$ must be addressed for projects that trigger minor or federal New Source Review (NSR) for $PM_{2.5}$, including cases where the project emissions of precursor emissions (sulfur dioxide (SO_2) and nitrogen oxides (NO_x)) are less than the significant emission rates (SERs).

Terms

Direct PM emissions. Solid particles emitted directly from an air emissions source or activity, or gaseous emissions or liquid droplets from an air emissions source or activity which condense to form particulate matter at ambient temperatures. Direct $PM_{2.5}$ emissions include elemental carbon, directly emitted organic carbon, directly emitted sulfate, directly emitted nitrate, and other inorganic particles (including but not limited to crustal materials, metals, and sea salt).

Secondary PM Emissions. Those air pollutants other than $PM_{2.5}$ direct emissions that contribute to the formation of $PM_{2.5}$. For NSR permitting purposes, $PM_{2.5}$ precursors include SO_2 and NO_x.

Overview

The complex chemistry of secondarily formed $PM_{2.5}$ is well documented and has historically presented significant challenges with the identification and establishment of particular models for assessing the impacts of individual stationary sources on the formation of this air pollutant. For example, the current preferred air dispersion model (i.e. AERMOD) can be used to simulate the dispersion of direct $PM_{2.5}$ emissions but does not explicitly account for secondary formation of $PM_{2.5}$. As part of the revisions made to the Guideline on Air Quality Models (January 17, 2017), the EPA promulgated a two-tiered demonstration approach for addressing single-source impacts on secondary $PM_{2.5}$.

A detailed discussion on the tiered approach, including examples, is provided below. Keep in mind that the appropriate methods for assessing $PM_{2.5}$ impacts are determined as part of the normal consultation process with the Texas Commission on Environmental Quality (TCEQ).

Two-tiered Approach

As noted above, the EPA promulgated a two-tiered demonstration approach for addressing single-source impacts on secondary $PM_{2.5}$. The first tier involves the use of technically credible relationships between precursor emissions and a source's impact (that may be published in literature; developed from modeling that was previously conducted for an area by a source, a governmental agency, or some other entity that is deemed sufficient; or generated by a reduced form model) in combination with other supportive information and analysis for the purpose of estimating secondary impacts from a particular source. The second tier involves application of more sophisticated case-specific chemical transport models (e.g., photochemical grid models). The appropriate tier for a given application should be selected in consultation with the Air Dispersion Modeling Team (ADMT) and be consistent with applicable EPA guidance.

Tier 1

The EPA developed a tier 1 demonstration tool for secondary $PM_{2.5}$ precursor emissions called Modeled Emission Rates for Precursors (MERPs). The development of the tool and related guidance is summarized in a memorandum from EPA dated April 30, 2019, with a subject, "Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and $PM_{2.5}$ under the PSD Permitting Program." The basic idea behind the MERPs is to use technically credible air quality modeling to relate precursor emissions and peak secondary pollutant impacts from specific or hypothetical sources. To derive a MERP value, the model predicted relationship between precursor emissions from hypothetical sources and their downwind maximum impacts can be combined with a significant impact level using the following equation:

$$MERP = SIL * \frac{Modeled\ emission\ rate\ from\ hypothetical\ source}{Modeled\ air\ quality\ impact from\ hypothetical\ source}$$

The ADMT used the air quality modeling results for hypothetical sources summarized in Appendix A of the EPA MERPs memorandum to derive MERPs for the hypothetical sources located in Texas using the EPA recommended SILs for $PM_{2.5}$ (1.2 µg/m^3 for the 24-hour averaging time and 0.2 µg/m^3 for the annual averaging time). The EPA is maintaining an Excel spreadsheet of the maximum impacts for daily $PM_{2.5}$ and annual $PM_{2.5}$ for the hypothetical sources on their Support Center for Regulatory Atmospheric Modeling website. It is expected that the information in the Excel spreadsheet will be updated over time as newer modeling is done. The worst-case derived MERPs for the hypothetical Texas sources are presented below in Table R-1:

Table R-1. Worst-case MERP Values (in tons per year)

Precursor	24-hour $PM_{2.5}$	Annual $PM_{2.5}$
NO_x	2649	10397
SO_2	359	1820

To use the MERP values in Table R-1 as a tier 1 demonstration, an analysis will need to be provided that shows that the emissions characteristics of the project source and the chemical and physical environment in the vicinity of the project source are adequately represented by the various hypothetical Texas sources modeled by the EPA (and documented in the EPA MERPs memorandum).

An evaluation of $PM_{2.5}$ includes both direct $PM_{2.5}$ emissions and secondary $PM_{2.5}$ precursor emissions. For the direct $PM_{2.5}$ emissions, modeling is conducted following applicable guidance to determine impacts associated with the direct $PM_{2.5}$ emissions. The impacts can be expressed as a percent of the SIL and summed with the secondary $PM_{2.5}$ impacts. For the secondary $PM_{2.5}$ impacts, NO_x and SO_2 are both precursors to secondary $PM_{2.5}$ formation, and the contributions to secondarily formed $PM_{2.5}$ are considered together. The proposed secondary $PM_{2.5}$ precursor emissions increase can be expressed as a percent of the lowest MERP for each precursor and then summed. A value less than 100% indicates that the SIL will not be exceeded when considering the combined impacts of the direct and secondary precursor emissions on 24-hour and annual $PM_{2.5}$:

$$\left[\frac{Modeled\ value}{SIL} + \frac{NO_x\ project\ emissions}{NO_x\ MERP} + \frac{SO_2\ project\ emissions}{SO_2\ MERP}\right] * 100 < 100\%$$

For example, a project has proposed emissions of 200 tons per year (tpy) of NO_x and 80 tpy of SO_2. The project also has emissions of $PM_{2.5}$ and modeling of those emissions gives a 24-hour prediction of 0.4 $\mu g/m^3$ and an annual prediction of 0.03 $\mu g/m^3$. Using this information, along with the worst-case MERPs listed in Table R-1 gives:

$$24\ hour: \left[\frac{0.4\ \mu g/m^3}{1.2\ \mu g/m^3} + \frac{200\ tpy}{2649\ tpy} + \frac{80\ tpy}{359\ tpy}\right] * 100$$

$$= [0.33 + 0.076 + 0.223] * 100$$

$$= 62.9\%$$

$$Annual: \left[\frac{0.03\ \mu g/m^3}{0.2\ \mu g/m^3} + \frac{200\ tpy}{10397\ tpy} + \frac{80\ tpy}{1820\ tpy}\right] * 100$$

$$= [0.15 + 0.0192 + 0.044] * 100$$

$$= 21.3\%$$

Since the values for both the 24-hour and annual averaging times are less than 100%, this example shows the source impact is less than the SILs and a cumulative analysis would not be needed. Keep in mind that this exercise may need to be performed separately for the NAAQS and increment analyses based on the output metric used with the modeling of the direct $PM_{2.5}$ emissions. When modeling $PM_{2.5}$, the maximum predicted concentrations from all receptors are used in the increment analysis for the 24-hour and annual averaging times instead of the five-year averages of the maximum predicted concentrations used in a NAAQS analysis.

The example above follows the same procedure described in the EPA MERPs memorandum. The example is taken a step further in order to quantify the secondary $PM_{2.5}$ impacts using the same MERP concept. Quantifying the secondary $PM_{2.5}$ impacts in the air quality analysis is necessary in order to determine the total predicted concentration for the increment analysis since public notice requires the degree of increment consumption that is expected from the new source or modification. The estimated concentration from the secondary impacts can be determined from the following equation:

$$Concentration = \left[\frac{NO_x\ project\ emissions}{NO_x\ MERP} + \frac{SO_2\ project\ emissions}{SO_2\ MERP}\right] * SIL$$

Using the project information provided in the example, the worst-case MERPs from Table R-1, and the SILs, the total predicted concentrations can be determined based on the following:

$$Total\ concentration = \ Modeled\ direct\ concentrations + Secondary\ concentrations$$

$$24\ hour{:}\ 0.4\ \mu g/m^3 + \left[\frac{200\ tpy}{2649\ tpy} + \frac{80\ tpy}{359\ tpy}\right] * 1.2\ \mu g/m^3$$

$$= \ 0.4\ \mu g/m^3 + 0.358\ \mu g/m^3$$

$$= 0.758\ \mu g/m^3$$

$$Annual{:}\ 0.03\ \mu g/m^3 + \left[\frac{200\ tpy}{10397\ tpy} + \frac{80\ tpy}{1820\ tpy}\right] * 0.2\ \mu g/m^3$$

$$= \ 0.03\ \mu g/m^3 + 0.0126\ \mu g/m^3$$

$$= 0.0426\ \mu g/m^3$$

If the worst-case MERP values listed in Table R-1 are too conservative, then MERP values for a specific hypothetical source may be used provided a demonstration is shown that the identified hypothetical source is representative for the project source. Tables R-2 and R-3 show the derived 24-hour and annual MERPs, respectively, for the hypothetical Texas sources for precursor NO_x. Tables R-4 and R-5 show the derived 24-hour and annual MERPs, respectively, for the hypothetical Texas sources for precursor SO_2. The ADMT used the air quality modeling results for hypothetical sources summarized in Appendix A of the EPA MERPs memorandum (also provided in Tables R-2 thru R-5 as the Max Impact) to derive MERPs for the hypothetical sources located in Texas using the EPA recommended SILs for $PM_{2.5}$:

Table R-2. NO_x 24-hour MERP Values for Hypothetical Texas Sources

Source	Emissions (tpy)	Height	Max Impact ($\mu g/m^3$)	MERP (tpy)
5 (Terry)	500	H	0.038	15789
5 (Terry)	500	L	0.082	7317
5 (Terry)	1000	H	0.072	16666
5 (Terry)	3000	H	0.205	17560
19 (Henderson)	500	H	0.033	18181
19 (Henderson)	500	L	0.109	5504
19 (Henderson)	1000	H	0.07	17142
19 (Henderson)	1000	L	0.212	5660
19 (Henderson)	3000	H	0.236	15254
20 (Harris)	500	H	0.039	15384
20 (Harris)	500	L	0.114	5263
20 (Harris)	1000	H	0.083	14457
20 (Harris)	1000	L	0.215	5581
20 (Harris)	3000	H	0.31	11612
24 (Parker)	500	H	0.078	7692
24 (Parker)	500	L	0.198	3030
24 (Parker)	1000	H	0.164	7317
24 (Parker)	1000	L	0.453	2649
24 (Parker)	3000	H	0.586	6143
25 (Guadalupe)	500	H	0.05	12000
25 (Guadalupe)	500	L	0.103	5825
25 (Guadalupe)	1000	H	0.111	10810
25 (Guadalupe)	1000	L	0.224	5357
25 (Guadalupe)	3000	H	0.383	9399

Table R-3. NO_x Annual MERP Values for Hypothetical Texas Sources

Source	Emissions (tpy)	Height	Max Impact (µg/m^3)	MERP (tpy)
5 (Terry)	500	H	0.0011429	87496
5 (Terry)	500	L	0.00373408	26780
5 (Terry)	1000	H	0.00214904	93064
5 (Terry)	3000	H	0.00561334	106888
19 (Henderson)	500	H	0.00116918	85530
19 (Henderson)	500	L	0.00514512	19435
19 (Henderson)	1000	H	0.00284077	70403
19 (Henderson)	1000	L	0.01168501	17115
19 (Henderson)	3000	H	0.0121492	49385
20 (Harris)	500	H	0.00209254	47788
20 (Harris)	500	L	0.00930842	10742
20 (Harris)	1000	H	0.00441016	45349
20 (Harris)	1000	L	0.01923452	10397
20 (Harris)	3000	H	0.01515664	39586
24 (Parker)	500	H	0.00139691	71586
24 (Parker)	500	L	0.00424063	23581
24 (Parker)	1000	H	0.00329347	60726
24 (Parker)	1000	L	0.0093796	21322
24 (Parker)	3000	H	0.01297507	46242
25 (Guadalupe)	500	H	0.00146152	68421
25 (Guadalupe)	500	L	0.00512243	19521
25 (Guadalupe)	1000	H	0.0034135	58590
25 (Guadalupe)	1000	L	0.0116476	17170
25 (Guadalupe)	3000	H	0.01355757	44255

Table R-4. SO_2 24-hour MERP Values for Hypothetical Texas Sources

Source	Emissions (tpy)	Height	Max Impact ($\mu g/m^3$)	MERP (tpy)
5 (Terry)	500	H	0.068	8823
5 (Terry)	500	L	0.277	2166
5 (Terry)	1000	H	0.122	9836
5 (Terry)	3000	H	0.356	10112
19 (Henderson)	500	H	0.163	3680
19 (Henderson)	500	L	0.383	1566
19 (Henderson)	1000	H	0.55	2181
19 (Henderson)	1000	L	1.087	1103
19 (Henderson)	3000	H	2.116	1701
20 (Harris)	500	H	0.402	1492
20 (Harris)	500	L	1.562	384
20 (Harris)	1000	H	0.833	1440
20 (Harris)	1000	L	3.341	359
20 (Harris)	3000	H	2.643	1362
24 (Parker)	500	H	0.309	1941
24 (Parker)	500	L	0.526	1140
24 (Parker)	1000	H	0.821	1461
24 (Parker)	1000	L	1.999	600
24 (Parker)	3000	H	3.459	1040
25 (Guadalupe)	500	H	0.209	2870
25 (Guadalupe)	500	L	0.512	1171
25 (Guadalupe)	1000	H	0.64	1875
25 (Guadalupe)	1000	L	1.282	936
25 (Guadalupe)	3000	H	2.416	1490

Table R-5. SO_2 Annual MERP Values for Hypothetical Texas Sources

Source	Emissions (tpy)	Height	Max Impact ($\mu g/m^3$)	MERP (tpy)
5 (Terry)	500	H	0.00188606	53020
5 (Terry)	500	L	0.00385673	25928
5 (Terry)	1000	H	0.00365867	54664
5 (Terry)	3000	H	0.0102369	58611
19 (Henderson)	500	H	0.00270821	36924
19 (Henderson)	500	L	0.00637221	15693
19 (Henderson)	1000	H	0.00748003	26737
19 (Henderson)	1000	L	0.01979857	10101
19 (Henderson)	3000	H	0.0429117	13982
20 (Harris)	500	H	0.00962696	10387
20 (Harris)	500	L	0.03860893	2590
20 (Harris)	1000	H	0.02180936	9170
20 (Harris)	1000	L	0.10987971	1820
20 (Harris)	3000	H	0.10310254	5819
24 (Parker)	500	H	0.00300141	33317
24 (Parker)	500	L	0.00796769	12550
24 (Parker)	1000	H	0.00906999	22050
24 (Parker)	1000	L	0.026133	7653
24 (Parker)	3000	H	0.04585198	13085
25 (Guadalupe)	500	H	0.00617332	16198
25 (Guadalupe)	500	L	0.01313179	7615
25 (Guadalupe)	1000	H	0.01392273	14364
25 (Guadalupe)	1000	L	0.04064511	4920
25 (Guadalupe)	3000	H	0.07068093	8488

The sources are identified by number and county. The numbers are the same numbers used to identify sources in the EPA MERP memorandum. For source height, a value of H represents an elevated release (90 meters) and a value of L represents a lower release (10 meters).

As an example, a project with emissions of 800 tpy of NO_x and 150 tpy of SO_2 is proposed to be located in Hood County. The project also has emissions of $PM_{2.5}$ and modeling of those emissions gives a 24-hour prediction of 1.1 $\mu g/m^3$ and an annual prediction of 0.1 μg/m^3. Hood County is adjacent to Parker County and the MERP values from source 24 (Parker) will be used. An analysis is first conducted to compare the chemical and physical environment in the vicinity of the project source (Hood County) relative to the hypothetical source modeled in Parker County. Information used in the analysis may include average and peak temperatures, humidity, terrain, rural/urban nature of the area, regional sources of pollutants (biogenic, industrial, etc.), and ambient concentrations of relevant pollutants. Based on this analysis, and the proposed emissions associated with the project, the 1000 tpy NO_x MERP values (low height) and the 500 tpy SO_2 MERP values (low height) from source 24 (Parker) will be used. As with the previous example, the impacts associated with the direct $PM_{2.5}$ emissions can be expressed as a percent of the SIL and summed with the secondary $PM_{2.5}$ impacts, which are based on expressing the proposed emissions increase as a percent of the MERP for each precursor and then summed. A value less than 100% indicates that the SIL will not be exceeded when considering the combined impacts of the direct and secondary precursor emissions on 24-hour and annual $PM_{2.5}$:

$$24\ hour\!: \left[\frac{1.1\ \mu g/m^3}{1.2\ \mu g/m^3} + \frac{800\ tpy}{2649\ tpy} + \frac{150\ tpy}{1140\ tpy}\right] * 100$$

$$= [0.92 + 0.302 + 0.132] * 100$$

$$= 135.4\%$$

$$Annual\!: \left[\frac{0.1\ \mu g/m^3}{0.2\ \mu g/m^3} + \frac{800\ tpy}{21322\ tpy} + \frac{150\ tpy}{12550\ tpy}\right] * 100$$

$$= [0.5 + 0.038 + 0.012] * 100$$

$$= 55\%$$

Since the value for the annual averaging time is less than 100%, this shows the source impact is less than the SIL and a cumulative analysis would not be needed. For reporting purposes in the air quality analysis, the total annual predicted concentration would be determined following the steps in the previous example (total annual predicted concentration of 0.11 μg/m^3). Given that the value for the 24-hour averaging time is greater than 100 percent, a cumulative analysis is needed since the source impact is greater than the SIL.

When determining significant receptors to include in the cumulative analysis, add the contributions associated with the secondary $PM_{2.5}$ impacts to the modeling results associated with the direct $PM_{2.5}$ emissions on a receptor-by-receptor basis. Then identify receptors with total predictions greater than or equal to the SIL and use these receptors in the cumulative modeling analyses.

The cumulative analysis for a NAAQS demonstration includes contributions from background concentrations, modeling of direct $PM_{2.5}$ emissions (from the project source and nearby off-site sources), and impacts associated with secondary $PM_{2.5}$ precursor emissions. The following equation is used:

$$Cumulative\ concentration = Background\ concentration + Modeled\ value + \left[\frac{NO_x\ project\ emissions}{NO_x\ MERP} + \frac{SO_2\ project\ emissions}{SO_2\ MERP}\right] * SIL$$

Continuing with the Hood County project example, the 24-hour background concentration for the project area is determined to be 24 µg/m^3 and the 24-hour modeled value, which includes the project source and nearby off-site sources, is 4.6 µg/m^3. The 24-hour cumulative concentration would be:

$$= 24\ \mu g/m^3 + 4.6\ \mu g/m^3 + \left[\frac{800\ tpy}{2649\ tpy} + \frac{150\ tpy}{1140\ tpy}\right] * 1.2\ \mu g/m^3$$

$$= 24\ \mu g/m^3 + 4.6\ \mu g/m^3 + 0.52\ \mu g/m^3$$

$$= 29.12\ \mu g/m^3$$

The cumulative concentration is less than the 24-hour NAAQS (35 µg/m^3) and the demonstration is complete. The contributions to secondarily formed $PM_{2.5}$ from off-site sources are generally accounted for through the use of background concentrations. For nearby off-site sources that may have been recently permitted and are not yet operating, their contribution towards secondarily formed $PM_{2.5}$ may need to be determined since background concentrations will not include their contribution.

A similar type of demonstration can be performed for the 24-hour $PM_{2.5}$ increment analysis. However, background concentrations would not be included, as they are with a NAAQS analysis, and the 24-hour modeled value of the direct emissions would be different as well. The differences in the modeled value are related to using an inventory of increment affecting sources and the form of the model output. For the 24-hour $PM_{2.5}$ increment analysis, the model output would be the highest, high-second high 24-hour prediction over a five-year period. For the 24-hour $PM_{2.5}$ NAAQS analysis, the model output would be a five-year average of the 98th percentile of the annual distribution of the maximum 24-hour predicted concentrations.

Tier 2

Tier 2 assessments are intended for impact assessments that are not able to be satisfied with a tier 1 demonstration in that pre-existing information is not available or representative of the situation such that more refined modeling is necessary. For these situations, application of more sophisticated case-specific chemical transport models (e.g., photochemical grid models) should be performed to address single-source impacts.

Appendix S – Additional Guidance for evaluating Nitrogen Dioxide and 1-hour Sulfur Dioxide

The purpose of this appendix is to provide additional guidance for addressing the nitrogen dioxide (NO_2) and 1-hour sulfur dioxide (SO_2) National Ambient Air Quality Standards (NAAQS). The Environmental Protection Agency (EPA) issued a memorandum on March 1, 2011, with a subject, "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard." This memorandum is meant to supplement the memorandum issued by the EPA on June 29, 2010, with a subject, "Guidance Concerning the Implementation of the 1-hour NO_2 NAAQS for the Prevention of Significant Deterioration Program." The March 1 memorandum provides further clarification and guidance on the application of Appendix W guidance for the 1-hour NO_2 standard.

While the discussion of nitrogen oxides (NO_x) chemistry options in the March 1 memorandum is exclusive to the 1-hour NO_2 standard, the discussion of other topics in the memorandum should apply equally to the 1-hour SO_2 standard, accounting for the differences in the form of the two standards. The memorandum does not apply to the other averaging periods of NO_2 and SO_2, nor does it apply to other pollutants with a standard based on a multiyear average.

The EPA also issued a memorandum on September 30, 2014, with a subject, "Clarification on the Use of AERMOD Dispersion Modeling for Demonstrating Compliance with the NO_2 National Ambient Air Quality Standard." This memorandum is meant to supplement the memoranda issued by the EPA on June 29, 2010, and March 1, 2011. The September 30 memorandum discusses the Ambient Ratio Method 2 (ARM2) as a tier 2 screening approach. ARM2 is based on hourly measurements of the NO_2 to NO_x ratios and provides more detailed estimates of this ratio based on the total NO_x present. The memorandum also discusses the Ozone Limiting Method (OLM) and Plume Volume Molar Ratio Method (PVMRM) tier 3 screening approaches and the associated in-stack NO_2/NO_x ratios used in the tier 3 applications.

Approval and Application of a Tiering Approach for NO_2

There are different approaches to demonstrate compliance with the NO_2 NAAQS:

1. Tier 1 – 100 percent conversion of NO_x to NO_2.
2. Tier 2 – multiply the tier 1 results by the ARM2, which provides estimates of representative equilibrium ratios of NO_2/NO_x values based on ambient levels of NO_2 and NO_x derived from national data from the EPA's Air Quality System. The national default for ARM2 will include a minimum NO_2/NO_x ratio of 0.5 and a maximum ratio of 0.9. Alternative default minimum NO_2/NO_x values may be established based on the source's in-stack emissions ratio, with alternative minimum values reflecting the source's in-stack NO_2/NO_x ratios. These should be based on source-specific data, which satisfies all quality assurance procedures that ensure data accuracy for both NO_2 and NO_x within the typical range of measured values. However, manufacturer test data, state or local agency guidance, peer-reviewed literature, or the EPA's

NO_2/NO_x ratio database may be used as sources of data. If another minimum value is used, sufficient justification and documentation will need to be provided prior to submitting the Air Quality Analysis.

Note that the source code for AERMOD has been edited to include the ARM2 method; therefore, AERMOD will internally compute the ambient ratios using the ARM2 equation when modeling with applicable NO_x emission rates and using the ARM2 model option keyword. For model platforms that do not have the ARM2 method coded or when conducting modeling using generic emission rates (e.g., 1 pound per hour or 1 gram per second), use an ambient ratio of 0.9 for simplicity since 0.9 is the maximum ambient ratio used with ARM2.

3. Tier 3 – use of the regulatory OLM and PVMRM options within AERMOD to determine the amount of conversion of NO_x to NO_2. The key input variables for these model options are in-stack NO_2/NO_x ratios and background ozone concentrations.
    - In-stack NO_2/NO_x ratios:
        - The EPA established a general acceptance of 0.50 as a default in-stack ratio of NO_2/NO_x for input to the OLM and PVMRM model options within AERMOD. When conducting a cumulative modeling analysis, a default in-stack NO_2/NO_x ratio of 0.2 can be used for more distant sources (sources located greater than three kilometers from the primary source).
        - If proposing an in-stack NO_2/NO_x ratio other than the default, sufficient justification and documentation will need to be provided to support the source-specific data on the in-stack NO_2/NO_x ratio.
    - Background ozone concentrations:
        - There are many options for utilizing the background ozone data in the OLM and PVMRM model options. Be sure to provide sufficient justification and documentation to support the use of the ozone data (representativeness of the monitor, filling in missing data, etc.).

Even though the OLM and PVMRM tier 3 screening techniques are considered part of the regulatory version of AERMOD, prior approval (submitting modeling protocols to Air Permits Division (APD) and the EPA) is required for any applicant proposing to use a tier 3 approach given the additional input data requirements and complexities associated with the tier 3 screening options. Sufficient documentation and justification must be provided when developing the modeling protocol.

Treatment of Intermittent Emissions for 1-hour NO_2 and 1-hour SO_2 NAAQS

An assumption of continuous operation for intermittent emissions using the maximum allowable emissions may be an overly conservative assumption and could result in them becoming the controlling emission scenario for determining compliance with the 1-hour NO_2 and 1-hour SO_2 standards. To account for this, the March 1 memorandum discusses different approaches for evaluating intermittent emissions:

- Excluding certain types of intermittent emissions from the compliance demonstrations for the 1-hour NO_2 and 1-hour SO_2 standards. The most appropriate data to use for compliance demonstrations for the 1-hour NO_2 and 1-hour SO_2 NAAQS are those based on emissions scenarios that are continuous enough or frequent enough to contribute significantly to the annual distribution of daily maximum 1-hour concentrations.
- Using model scalars to limit the hours modeled to account for meteorological conditions that are more representative of actual operations. A permit condition can be used to restrict operation to certain hours of the day.
- Modeling the impacts from intermittent emissions based on an average hourly rate, rather than the maximum hourly emission rate.

The March 1 memorandum is limited to what intermittent emissions are related to. An emergency generator is provided as an example of an intermittent emissions unit, and startup/shutdown operations are provided as examples of intermittent emissions scenarios. The memorandum does not have a discussion regarding a specific duration on the number of hours of operation per year that constitutes intermittent or infrequent. Furthermore, there is no discussion on the frequency of intermittent emissions needed to be considered to contribute significantly to the annual distribution of daily maximum 1-hour concentrations. Also important for determining and evaluating intermittent emissions is the distinction between intermittent emissions that can be scheduled with some degree of flexibility and intermittent emissions that cannot be scheduled.

The recommendation is that compliance demonstrations for the 1-hour NO_2 and 1-hour SO_2 NAAQS be based on emission scenarios that can logically be assumed to be relatively continuous or which occur frequently enough to contribute significantly to the annual distribution of daily maximum 1-hour concentrations. There are unique case-by-case factors, as it relates to determining whether or not emissions are intermittent, which can affect the application of the guidance in the March 1 memorandum. The proposed operation of the unit or operating scenarios will need to be fully explained and documented in order to determine the appropriateness of following the guidance in the memorandum. The ADMT recommends providing sufficient justification and documentation for intermittent use prior to submitting the Air Quality Analysis. For example:

- How many units are there;
- How often will the unit operate per year;

- What is the duration of operation once the unit is operating;
- Will the unit be operated on a known schedule or will it operate randomly;
- What is the magnitude of the emissions for the source(s);
- Does the unit operate simultaneously with other sources?