Air Dispersion Modeling Guidelines
For
Air Quality Permitting

City of Albuquerque
Environmental Health Department
Air Quality Program

Revised May 2024

Table of Contents

Introduction

Albuquerque-Bernalillo County Air Quality Control Board Regulations **20.11.41.13(E)(4) NMAC (Construction Permits)**, **20.11.42.12(A)(4)(j)(ii) NMAC (Operating Permits), and 20.11.61.15 through 20.11.61.17 NMAC (Prevention of Significant Deterioration)** require an applicant to demonstrate the effects that a proposed facility or modification will have upon any New Mexico or National Ambient Air Quality Standard (NMAAQS or NAAQS) or PSD increment. This demonstration must relate the expected emissions from the facility to the maximum off-site ambient air impact. The required analysis must be developed using an Environmental Protection Agency (EPA) approved air dispersion model.

Those planning to submit air dispersion models to the Air Quality Program (AQP) should also carefully study both the federal and state modeling guidelines in addition to those of the AQP. This guideline is a supplement to the federal and state guidelines. The federal Guideline on Air Quality Models, better known as Appendix W of 40 CFR 51, can be found on EPA's Support Center for Regulatory Atmospheric Modeling (SCRAM) website (https://www.epa.gov/scram/air-quality-dispersion-modeling). The New Mexico Environment Department's (NMED) Air Dispersion Modeling Guidelines can be found at https://www.env.nm.gov/air-quality/modeling-publications/. If discrepancies are found between the various guidance documents, please contact the AQP for guidance.

Modeling Review Process

Modeling Protocol Review

For all permitting applications that require modeling, a modeling protocol shall be submitted and go through the review process before complete modeling and an application are submitted to the AQP. The modeling protocol must describe the proposed action in detail and explain the choice of input parameters to be used.

The AQP will review each modeling protocol submitted and will: (1) approve the protocol as submitted; (2) approve the protocol and provide comments and/or recommendations; or (3) not accept the protocol and provide questions and comments. When the modeling protocol is not accepted, the modeling protocol will have to be resubmitted to the AQP for review. As of May 7, 2020, the AQP will only review two versions of a modeling protocol submitted for a given project. After the second review of a protocol for the same permit application, the company and/or consultant will be asked to submit the full application and modeling/modeling report.

The intent of the protocol is to minimize the odds of a model being rejected during the full modeling/application review. However, the AQP's approval of a protocol does not guarantee that every potential problem has been identified or that the modeling will be accepted. It is still the responsibility of the company to submit a model with sound modeling methodologies and proper inputs, regardless of the AQP approval decision at the end of the modeling protocol review. **The AQP reserves the right to revoke or amend approval of a protocol during the modeling review if facts and circumstances warrant such action.**

The AQP will make every effort to review the protocol and approve, approve with comments, or deny the protocol within 6 weeks. Do not submit the full modeling or permit application until the protocol has been reviewed and the AQP has instructed that the full modeling and application can be submitted.

The items the AQP looks for in its review of modeling protocols are provided in Attachment B to this document. As noted in Attachment B, the AQP requests tables of emission rates for all emission units to be modeled, especially lb/hr emissions. The maximum short-term emission rate should generally be used for all averaging periods and hours of operation, as noted in the NMED Modeling Guidelines. If appropriate, hourly emission factors, rather than different emission rates, can be used to limit the facility's emissions based on operational hours. If different emission rates are proposed to be modeled for an annual standard those values should also be in the table(s) and an explanation should be provided for how the different emission rates were calculated. Tables with stack and other model parameters for each modeled source, including point, volume or area sources, should also be provided so that any questions about the proposed parameters can be raised and addressed during the protocol stage. These tables are requested in order to minimize the chance of there being an issue with new emission rates or source parameters used in the modeling upon application submittal. If changes to stack/modeling parameters are proposed for existing units, please clearly explain that the parameters are proposed and do not exist that way currently. This is especially important and helpful in the full modeling report but is also useful at the protocol stage if changes are known. Additional details on modeling protocol components are provided throughout this document. Information from the modeling protocol should also be present in the modeling report submitted with the application package.

If there are sources with unusual or uncommon parameters, such as a source that would typically be modeled as a fugitive volume source but is contained and exhausted through a stack at a specific facility, please provide photo documentation and an explanation of the source setup to reduce the number of questions that the AQP may have about unexpected source parameters. Photos of all sources are helpful if available.

Surrounding sources for use in cumulative modeling may be requested from the AQP as part of the modeling protocol or proposed surrounding sources should be included in the protocol. The AQP typically provides comments on proposed surrounding sources or provides details on the surrounding sources to be included when the modeling protocol review is returned to the consultant and not before the protocol is submitted. This is due to the fact that there is sometimes a significant delay between the pre-application meeting and submittal of the modeling protocol. The AQP wants to provide an accurate and up to date list of surrounding sources. If there is a specific need for surrounding sources earlier than the end of the protocol review stage, please contact the AQP and explain the need.

Surrounding source data provided by the AQP will also include modeled fence lines for surrounding sources as appropriate. If a fence is provided by AQP, it can be assumed that the area inside the fence is restricted access and can be excluded from ambient air. If fences are included in the modeling submittal that were not provided by AQP, be sure that these surrounding sources have restricted access so that they can reasonably be excluded from ambient air. It may still be prudent to leave any receptors inside these fence lines, depending on their distance from the modeled facility, in order to demonstrate that the modeled facility does not cause or contribute to any exceedances inside any surrounding source's fence.

Permit Modeling Review

After a modeling protocol is approved, or after two protocols have been reviewed, a permit application and modeling report with modeling files can be submitted. The Completeness Requirements section near the end of this document provides guidance on the information that the AQP looks for when models and modeling reports are submitted to support a permit application. Modeling source identifications (IDs) or source descriptions must include which emission unit(s) in the application correspond to each modeled source. If the model source ID does not clearly identify the emission unit then this information should be included in the source description, both in the model files and modeling report. This will help to eliminate confusion when comparing modeled emissions to calculated emissions in the event that individual emission points are modeled but are combined into one unit in the application/calculations. The modeling report in the application package should explain any proposed changes in stack/modeling parameters or source locations so that the AQP knows they have not occurred yet. Additional details are provided throughout this document.

Screening Analysis

Initial evaluations of the facility emissions can be made using the model AERSCREEN. The User's Guide and command prompt version of AERSCREEN are available through EPA's SCRAM website: https://www.epa.gov/scram/air-quality-dispersion-modeling-screening-models. Several environmental engineering firms have developed graphical user interfaces to assist with using AERSCREEN.

If the predicted ambient impacts modeled with AERSCREEN are less than all applicable ambient air quality standards, then no further modeling analysis is needed.

If the AERSCREEN modeled impacts are higher than applicable ambient air quality standards or use of AERSCREEN is not appropriate for the facility, then additional refined modeling analyses will be required.

Refined Analysis

Refined analysis is where most air dispersion modeling analyses start. The model of choice for refined analysis is AERMOD, which is available from the sources mentioned above. The use of any model other than AERMOD must be approved by the AQP on a case-by-case basis. Model inputs must reflect the estimated emission parameters of the source. Every effort should be made to ensure that the emission estimates for the project accurately reflect the desired operations, use sound engineering judgements, and that the calculations are performed correctly. As noted above and in the NMED Modeling Guidelines, the maximum short-term emission rate should generally be used for all averaging periods and hours of operation. If appropriate, hourly emission factors, rather than different emission rates, can be used to limit the facility's emissions based on operational hours. If different emission rates are proposed to be modeled for an annual standard those values should also be in the table(s) and an explanation should be provided for how the different emission rates were reached. Smooth model and permit application reviews depend upon accurate emissions estimates that are consistent between the public notice, the modeling, and the application. Inconsistencies among the documents and modeling files will delay the review process and may require re-modeling.

There are typically two stages to modeling with AERMOD. The first is the significant impact level (SIL) modeling and the second is the cumulative impact analysis (CIA) modeling.

SIL Modeling

Significant impact level (SIL) modeling is performed to determine whether facility impacts are high enough to potentially contribute to a modeled exceedance, if one exists, and therefore whether cumulative modeling is required. For SIL modeling, if a facility has not previously modeled a standard, such as 1-hour NO_2, then the AQP considers all sources of that pollutant at the facility to be new as far as that standard is concerned, not just the new or modifying emission sources. This means that all facility sources of that pollutant should be included in the SIL model.

If a standard was previously modeled for that facility then just the project (new) sources can be included for SIL modeling and all sources included if cumulative modeling is required. One exception could be a case in which a facility is reducing its emissions of a pollutant and the applicable standard has never been modeled. For example, replacing old equipment with new equipment which emits less of the particular pollutant. In this case, the facility is allowed to include in the SIL model only the sources that will remain and will emit the pollutant once the modification is complete.

When comparing model results to the SILs for each pollutant and averaging period, the highest 1st high (H1H) value should be compared to a given SIL when possible. AERMOD gives no choice for annual standards and these results are the annual high averaged over the number of years of meteorological (MET) data used, but the 1st high result should be selected for the short-term standards. Special processing should be disabled for NO_2, SO_2 and $PM_{2.5}$ so that the results are actually the H1H, rather than the H1H averaged over the number of years of MET data used.

If the impacts for a given pollutant and averaging period are below the SIL value, then the modeling demonstration for that pollutant and averaging period is complete. If the impacts for a given pollutant and averaging period are equal to or above the SIL value[1], then cumulative modeling is required.

The SIL value for each pollutant and averaging period have been established by EPA and can be found in the NMED Modeling Guidelines (Table 18, 2024 version). See the NMED Modeling Guidelines (Table 19, 2024 version) for information on which standards are surrogates that demonstrate compliance for other standards, which do not need to be modeled.

Buildings and other structures should be included in both SIL and CIA models. Building downwash analysis using BPIP-Prime must be run for each model and downwash should be included when the models are run.

Cumulative Modeling

Cumulative impact analysis (CIA) modeling is performed to determine whether a proposed new or modified facility will cause or contribute to a modeled exceedance of the NAAQS/NMAAQS.

Cumulative modeled impacts for comparison to the NAAQS/NMAAQS should follow the level and form of each standard and should consist of the total facility emissions plus surrounding source emissions, plus monitored background values as appropriate. Any comparisons to a given SIL for culpability analysis should also follow the level and form of the standard. Be aware that the level and form of the NMAAQS are different than the NAAQS for select pollutants and averaging periods.

If a culpability analysis is required for modeled exceedances in a cumulative model, each modeled exceedance should be examined. For any modeled exceedances, a table or similar demonstration

[1] U.S. EPA Memorandum "Guidance on Significant Impact Levels for Ozone and Fine Particles in the Prevention of Significant Deterioration Permitting Program", Apr. 17, 2018, Section IV and multiple footnotes and U.S. EPA Memorandum "Supplement to the Guidance on Significant Impact Levels for Ozone and Fine Particles in the Prevention of Significant Deterioration Permitting Program", Apr. 30, 2024

technique showing the cumulative modeled impact and the contribution of the source seeking a permit should be provided along with an explanation. Source contributions paired in time and space can be obtained by using the MAXDCONT output option in AERMOD for 24-hour $PM_{2.5}$, 1-hour NO_2 and 1-hour SO_2. Other techniques can also be used to demonstrate the contributions of the source seeking a permit. Other techniques, such as excluding certain sources, should be explained.

Background values should be requested from the AQP if the modeler does not have the current values. Consultants and others submitting applications with modeling should be aware of the potential for increasing backgrounds. The AQP has a duty to protect the NAAQS/NMAAQS so the background values used by AQP will be the current backgrounds at the time a modeling review is completed. Submitted models must pass with the existing backgrounds at the time of AQP modeling review completion. Modeled background values are typically updated near the end of the calendar year. If an application is ruled incomplete one or more times or delayed for issues related to the submittal, it is possible that the background values could change between submittal and the time the modeling review is completed.

Modeling Waivers

In some cases, a discussion of previous modeling can be used to demonstrate that ambient air quality standards will not be violated and a modeling waiver can be granted. If emissions were modeled using current procedures and air quality standards, and the modeling is still valid for those standards, a modeling waiver may be requested. Modeling done in ISC (Industrial Source Complex model) cannot be used to make such an argument. You may submit a request for a modeling waiver if you believe previous modeling of your facility or source can demonstrate that ambient air quality standards will not be violated. The modeling waiver request form must be used and the form can be requested from the AQP. The modeling waiver request should include a thorough discussion of the previous modeling and explain why it should satisfy the modeling requirement. The AQP will determine if a modeling waiver request can be granted on a case-by-case basis. The AQP does not have set de minimis levels like NMED under which modeling is not required based on source type(s) and/or stack heights due to the smaller property sizes in Albuquerque/Bernalillo County. An explanation of the emission rate(s), release parameters and why modeling should be waived must be provided for each pollutant for which a waiver is requested. If a modeling waiver is granted, the waiver request/form and written waiver approval must be included in the modeling section of the application.

The AQP has exempted some source categories from air dispersion modeling because they have minimal or intermittent emissions or another justification for exemption exists. The following are examples of sources that do not need to request a waiver:

- Emergency Generators (backup PNM power and less than 500 hours of annual operations)
- Gasoline Stations
- Dry Cleaners
- Automotive Paint and Body
- Groundwater Stripping Systems

Other sources can request a waiver and the AQP will determine on a case-by-case basis whether modeling is required. The following are examples of such cases:

- Boilers intended solely for comfort heat
- Certain Soil Vapor Extraction Systems

Pollutant-Specific Information

This section provides some specific information on modeling select pollutants.

NO_2

Demonstration of compliance with the 1-hour NO_2 NAAQS is automatically a demonstration of compliance with the 24-hour NMAAQS for NO_2. Demonstration of compliance with the annual NMAAQS is automatically a demonstration of compliance with the annual NAAQS. See the NMED Modeling Guidelines for detailed guidance on modeling for these standards.

If cumulative modeled impacts for annual NO_2 for a facility exceed 90% of the NMAAQS, the AQP will require that the facility provide individual year results rather than the typical annual high averaged over 5 years based on the MET data in order conform to the form of the standard and ensure there are no modeled exceedances.

NO_2 Tier Modeling Options (Estimating NO_2 Concentrations)

Tier 1: Total conversion (100% conversion of NO_x to NO_2)
This is the most conservative option and is always accepted.

Tier 2: Ambient Ratio Method 2 (ARM2)
This method is approved and built into AERMOD. If the ARM2 option is used for NO_2 modeling, the default minimum (0.5) and maximum (0.9) NO_2/NO_x ratios should be used.

Tier 3: OLM and PVMRM
There are two Tier 3 methods built into AERMOD and accepted as regulatory options. They are the Ozone Limiting Method (OLM) and the Plume Volume Molar Ratio Method (PVMRM). Tier 3 methods require additional input information in the form of in-stack ratios for sources and ozone data that is temporally paired with the MET data. Ozone background data paired with the MET data is available on the AQP website. The default equilibrium ratio (0.9) should be used if OLM or PVMRM are used. Select in-stack ratio information is provided in the table below.

Multiple source groups that model emissions occurring at the same time cannot be used with OLM or PVMRM to determine modeled impacts, such as if only 3 of 4 sources can operate at a time, because AERMOD does not portion available ozone correctly when source groups are used. AERMOD applies these methods to all sources, ignoring source grouping, which will cause it to underestimate the ozone available for conversion and therefore underestimate the modeled impact. When using OLM, the OLMGROUP ALL option in AERMOD should be selected[4].

In-Stack Ratios

The in-stack ratio (ISR) values for Tier 3 NO_2 modeling that are generally accepted by the AQP are listed below.

Sources	In-stack ratio value accepted by the AQP
Diesel-fired RICE engines	0.15[2]
Natural gas-fired boilers	0.2[3]
Default source ISR/Other sources at facility seeking permit	0.5[4]
Other sources 1-3 km from fence of facility seeking permit	0.2[4,5]
Other sources < 1 km from fence of facility seeking permit	0.3[6*]

*The closer one of these sources is to the fence of the facility seeking an air quality permit, the less likely the AQP will accept the 0.3 ISR value. Make your suggestion in the modeling protocol and the AQP will comment if the ISR suggested is unacceptable.
Other ISR values may be suggested. Justify your suggestion with values from the EPA ISR databases, peer-reviewed journal articles, EPA clarification memos and technical documents, etc.

Ozone

Ozone is normally only modeled for regional compliance demonstrations and does not need to be modeled for air quality permits. However, permit applicants for PSD applications that apply to NO_x or VOC should contact the Air Quality Program to determine current ozone modeling requirements on a case-by-case basis.

Secondary $PM_{2.5}$ and Ozone

Analysis of secondary $PM_{2.5}$ and ozone may be required, depending on the emission levels of the source. Secondary $PM_{2.5}$ concentrations should be calculated if the project (new) emissions of NO_x or SO_2 are ≥40 tons/year or the primary $PM_{2.5}$ emissions are ≥10 tons/year. These are the significant emission rates (SERs) for these pollutants and the requirement to analyze secondary $PM_{2.5}$ if any of them equal or exceed the SERs is explained in recent EPA guidance[7]. The secondary $PM_{2.5}$ concentrations should be calculated as described in the NMED Modeling Guidelines (Section 2.6.6, 2024 version) and added to the modeled concentrations. The most conservative, i.e. lowest, MERP values for New Mexico for each precursor pollutant and averaging period in the $PM_{2.5}$ MERPS table should be used for the calculation in most cases. If a source wants to use different, more representative, MERPs values then this should be explained and justified in the modeling protocol and discussed with the Air Quality Program.

An analysis of secondary ozone formation is also required if project (new) emissions of NO_x or VOC equal or exceed the SERs (≥40 tons/year). This is based on the same recent EPA guidance[7]. The ozone

[2] Based on an analysis of diesel RICE tests in the EPA ISR Database
[3] U.S. EPA Memorandum "Model Clearinghouse Review of the Use of the Ambient Ratio Method 2 (ARM2) Default AERMOD Option for Hankook Tires Facility NO_2 Ambient Impact Analysis", Dec. 22, 2015, p. 2
[4] U.S. EPA Memorandum "Clarification on the Use of AERMOD Dispersion Modeling for Demonstrating Compliance with the NO_2 National Ambient Air Quality Standard", Sep. 30, 2014, Section 5 & 4
[5] Technical support document (TSD) for NO_2-related AERMOD modifications, EPA- 454/B-15-004, July 2015, Section 4.2
[6] Air Dispersion Modeling Guidelines, New Mexico Environment Department Air Quality Bureau, March 2024, Section 2.6.4
[7] Guidance for Ozone and Fine Particulate Matter Permit Modeling, EPA-454/R-22-005, July 2022, Sections II.2, II.5, Table III-1 and Table III-2

analysis should be done using the formula in the NMED Modeling Guidelines (Section 2.6.5, 2024 version) and the most conservative New Mexico MERP values in the O_3 MERPS table. If a source wants to use different, more representative, MERPs values then this should be explained and justified in the modeling protocol and discussed with the Air Quality Program.

TSP

20.11.8.13 NMAC includes ambient air standards for Total Suspended Particulate (TSP). The TSP standards were repealed by the State of New Mexico's Environmental Improvement Board and no longer exist. Until the local regulation for Ambient Air Quality Standards can be updated, modelers should be aware that the AQP does not require modeling for TSP emissions.

AERMOD Model Input Options

AERMOD should be run using the regulatory default options. In AERMOD, a decision concerning rural vs. urban dispersion coefficients must be made. Use Attachment A to make this determination. Rural is the default since it is more conservative, *i.e.* less dispersion, and is appropriate for most of Albuquerque and Bernalillo County; use of urban must be explained and justified.

Modeled Fence Line and Receptors

Modeled fence lines should, in almost all cases, match the physical restricted access boundary, i.e. fence, not just the property boundary. If the coordinates of the modeled fence line cannot be viewed in the modeling program files that are submitted (e.g. BEEST .BST or Breeze .ami files) then the fence line coordinates should be provided in a spreadsheet along with the electronic modeling files.

The receptor grid in AERMOD should be either a fence line-following grid or a Cartesian grid receptor array. Fence line receptor spacing must be 25 meters or less. Exceptions may be made for facilities with very large fence lines to use 50 meter receptor spacing on the fence but that should be discussed with AQP in the modeling protocol. If access to a facility's property is unrestricted, then receptors must be placed inside the property. If a building is the barrier that restricts access, then ambient air (and thus the receptor field) begins at the edge of the building. Receptor spacing on property with unrestricted access should be less than 25 meters to the edge of the property. Beyond the fence line or edge of the property, receptor spacing may be increased to 50 meters out to at least 250 meters from the fence/property edge and then 100 meters out to at least 1 kilometer from the fence/property edge. For areas beyond 1 kilometer, the receptor array spacing may be increased in steps gradually to 250 meters, then 500 meters, then greater if needed for those areas beyond 1 kilometer from the fence/property edge. The emission points, buildings and fence lines should be located using exact UTM coordinates. The receptor grid may be decreased for cumulative modeling of a given pollutant and averaging period by removing the receptors with modeled impacts less than the applicable significance level in SIL modeling.

Flagpole receptors elevated above ground level may be required if there are elevated locations where the public may be present at or near the facility. These areas may include parking structures, elevated walkways, balconies or elevated roadways/overpasses, etc. Flagpole receptor spacing should be 25 meters or less. See the Buildings section for additional details on flagpole receptors on parking structures.

Terrain

Elevations for receptors, emission sources and buildings should be determined using the AERMAP terrain preprocessor for AERMOD. The elevations should be determined using National Elevation Dataset (NED) files, as recommended in the AERMOD Implementation Guide[8] and the AERMAP User's Guide[9], both of which can be found on EPA's SCRAM website: https://www.epa.gov/scram/air-quality-dispersion-modeling-preferred-and-recommended-models and https://www.epa.gov/scram/air-quality-dispersion-modeling-related-model-support-programs#aermap. The required NED files should be downloaded from the Dispersion Modeling page of the Air Quality Program website (https://www.cabq.gov/airquality/air-quality-permits/dispersion-modeling-guidelines). The 1 arc-second resolution NED files were downloaded directly from USGS, have already been processed by AQP and are ready for use in AERMOD.

Buildings

Buildings and other structures at the facility being modeled must be included in both SIL and CIA models, and should be proposed in the modeling protocol. Building downwash analysis using BPIP-Prime must be run for each model and downwash should be included when the models are run.

Please note somewhere in the modeling protocol and modeling report the source and date of aerial imagery, e.g. Oct. 4, 2020 Google Earth imagery, or other method that was used when locating the buildings in the models. This will help the AQP when checking if buildings are in appropriate locations. Google Earth is typically the easiest to access. To find the year of the imagery, look first at the bottom of the Google Earth window. The date is typically shown here, however, the default image is not always the most recent. Click the clock with a green arrow near the top of the window to 'view historical imagery'. A slider will appear that allows the user to click backward or forward through different images. The date should still be shown at the bottom of the Google Earth image. The newest imagery is not always the best or clearest. The AQP recommends that the 3D Buildings feature be turned off when locating buildings using Google Earth. 3D building imagery is generally not a good idea to use because the base image is usually several years out of date and will not show more recent changes to a site. It is the responsibility of the company/consultant to ensure that the modeled fence/buildings/stacks/piles reflect what is actually happening on the ground. Changes in buildings, fence lines or other site features should be accounted for in the model even if they are not shown in the latest satellite imagery. If this is the case, please include a description of the change(s) that will not be visible on satellite imagery, whether because they are proposed changes or because the imagery is not recent enough.

For both significance and cumulative models, surrounding buildings outside of the facility being modeled should be included if they are within the 5L distance of a stack[10]. A building must be within a distance to a stack, at the facility being modeled, equal to or less than five times the height or projected width of the structure (L), whichever is less. These surrounding buildings to be included should be proposed in the modeling protocol, as well as being listed/described in the modeling report.

Buildings or structures not proposed to be included, especially on facility property, should be explained. This is especially important if the excluded buildings/structures are similar to and located very close to other structures that are proposed to be included.

[8] AERMOD Implementation Guide, EPA-454/B-23-009, October 2023
[9] User's Guide for the AERMOD Terrain Preprocessor (AERMAP), EPA-454/B-18-004, April 2018
[10] Guideline for Determination of Good Engineering Practice Stack Height (Technical Support Document For the Stack Height Regulations) (Revised), EPA-450/4-80-023R, June 1985, Section 1.2(2)

Parking structures that are open on all sides at each level should not be included as buildings in models for downwash purposes because wind is likely to pass through the structure rather than be affected by downwash like a solid building. Instead, flagpole receptors should be placed around the edge of the structure on each level and on the full top level, if it is open, at a spacing of 25 meters or less to ensure that impacts are modeled at each level where the public may be present.

Background Concentrations & Nearby Sources

Background concentrations are added to modeled impacts of emissions to ensure that ambient air standards will not be violated. Backgrounds include pollution from vehicular emissions, wildfires, dust, open burning, industrial pollution, and any other source of pollution. The AQP maintains a network of monitors for particulate matter, nitrogen dioxide, sulfur dioxide, and carbon monoxide. The data from this network is used to calculate the background concentration for each pollutant and averaging period.

The AQP can provide background concentrations for modeling, including NO_2 backgrounds that vary by season and hour of day per EPA guidance.

Sometimes nearby industrial sources are too large to be accounted for with background concentrations. Nearby sources can be suggested or requested in the modeling protocol. The AQP may direct those who submit models to include nearby sources. Nearby source information is typically provided at the end of the modeling protocol review(s). Such decisions will be made on a case-by-case basis using the professional judgement of AQP staff.

The facility desiring a permit, modification, or revision must demonstrate that it is:

1) not causing or contributing to an exceedance of NAAQS or NMAAQS on the property of nearby sources included in the model;

2) not causing or contributing to an exceedance of NAAQS or NMAAQS in the ambient air.

Modelers should use the significance levels outlined in Table 18 of the NMED Modeling Guidelines (2024 version) to determine whether a facility is contributing to an exceedance.

Companies and consultants should be wary of the potential for increasing backgrounds. The background values used by the AQP will be the current backgrounds at the time the modeling review is completed. Submitted models must pass with the existing backgrounds at the time of AQP modeling review completion. Modeled backgrounds are typically updated near the end of the calendar year. It is the responsibility of the company and consultant to leave a cushion in the modeling result that allows for the possibility of an increase in the background value.

Meteorological Data

Meteorological (MET) data files are available from the AQP for use with AERMOD. These data sets have been gathered at the Albuquerque Airport by the National Weather Service.

The data has been processed using AERMET with appropriate surface characteristics. Either one year of representative data which serves as on-site data or five years of adequately representative off-site data must be used. Whether a dataset is representative enough to serve as site-specific is a professional judgement that will be made by the AQP.

In areas where the five-year meteorological dataset (typically National Weather Service data from the airport) is not adequately representative, then on-site data may need to be gathered and processed for use in modeling major sources. Before using on-site meteorological data, submit a report detailing what data

were collected and the parameters used in processing the data. Representativeness and quality of on-site data must be demonstrated with documentation.

For some areas, the Albuquerque Airport data may not be the most representative data set. For some parts of Albuquerque's North Valley, the Bernalillo meteorological data, found on the NMED website, may be more representative. For some areas of northwest Albuquerque, the Rio Rancho/Intel data, also found on the NMED website, may be better than the Albuquerque Airport meteorological data. These data sets can also be requested from AQP. If you are not sure, ask AQP staff which meteorological data set is most appropriate for your project.

Emission Factors

The maximum hourly emissions being requested must also be the hourly emissions used in the model. Hourly emission factors can be used to limit modeled emissions to permitted hours. Table 8-1 of Appendix W lists some other appropriate uses of hourly emission factors. The use of hourly emission factors must be documented and explained.

It is inappropriate to use hourly emission factors to spread total daily emissions out over potential operating hours. For example, say a concrete batch plant can produce its maximum daily throughput in 8 hours, yet the plant wants the flexibility to operate during any time of day between 5 AM and 9 PM (16 hours). Because dispersion conditions change throughout the day, it is inappropriate to spread 8 hours of emissions out over 16 hours when it is unlikely that the plant will actually operate 16 hours in a day.

Modeling Blocks of Time

Sometimes a facility needs the flexibility to operate during any 8 hours, 10 hours, 12 hours, etc. out of the day, but a model with full-bore operations for 24 hours shows an exceedance. Using blocks of time is an acceptable modeling methodology provided that the facility is limited (federally enforceable limitation) to a daily throughput that can be concentrated temporally within a model.

For example, suppose that XYZ Materials needs the flexibility to operate anytime. XYZ accepts a daily limit of 2400 tons per day in their permit. Their equipment is only rated for 300 tons per hour. So the shortest day they could reach their maximum daily throughput is an 8 hour day. Modeling 8 hour blocks of time, e.g. Midnight – 8 AM, 2 AM – 10 AM, etc., will cover the worst case scenario. If XYZ decides to actually operate 10 hours or 12 hours, it's fine as long as they don't exceed their daily throughput limit.

Maximum impacts will usually occur with nighttime operations. Nearby sources, location of the sources within a property, and building downwash are some factors that can complicate modeling blocks of time. Document the different scenarios studied in the air dispersion modeling report and describe any assumptions made regarding the complicating factors mentioned above.

Plume Depletion

The use of gravitational settling for particles, also called dry plume depletion, must be documented and explained. Particle size distributions used to simulate gravitational settling of particles must be documented and justified if not received from the AQP. The modeling analysis submitted must explain the derivation of particle sizes, percentages/mass fractions, and densities for all particle size distributions used within the model. Use of plume depletion may be acceptable for modeling of PM_{10}. The AQP can provide acceptable particle size distributions upon request.

Emission Source Inputs

Stack Parameters

Many stacks, which are modeled as point sources, are vertical with unobstructed releases, i.e. no rain cap blocking flow. Stacks that are not simple vertical releases must be modeled using the appropriate options. Rain capped stacks should be modeled with the POINTCAP option and horizontally emitting stacks with the POINTHOR option. Both of these options should use the actual stack parameters. Rain caps that do not impede flow may be modeled as simple vertical releases but the type of rain cap must be documented.

If stacks are not cylindrical, then an explanation should be provided of how the modeled stack diameter was calculated. Stack diameters for rectangular stacks can be calculated using the equivalent diameter method.

$$D_{eq} = 2\sqrt{\frac{L\ x\ W}{\pi}}$$

Where:

D_{eq} = equivalent diameter

L = length

W = width

Equation sourced from: https://www.weblakes.com/Newsletter/2007/Nov2007.html

Haul Roads

When haul roads are modeled, the methodology described in the NMED Modeling Guidelines is acceptable. Other methodologies may be accepted on a case-by-case basis and must be explained in detail. Companies/consultants need to document how they develop the emission factors and emission rates used in haul road modeling. They must justify (scientific studies, AP-42, etc.) values used to develop emission factors, such as percentage of silt on haul road surfaces. Unpaved haul road control efficiencies described in the NMED guidance document "Department Accepted Values for Aggregate Handling, Storage Pile, and Haul Road Emissions" are generally accepted by the AQP for the given control measures. One difference from this NMED guidance document is the default number of days in a year with at least 0.01 inches of precipitation (P) accepted by the AQP if used in the tons/year haul road emission calculations. The default P value for most of Albuquerque/Bernalillo County is 60 days, not 70. Haul road dimensions should be provided and how those dimensions were converted to modeled dimensions should be explained if NMED default values are not used. It should also clearly be explained and/or shown whether haul road segments are one-way or two-way travel.

The WRAP Fugitive Dust Handbook, revised in September 2006, shows paving of haul roads and keeping those roads clean results in nearly 100 percent control of PM_{10} emissions. Paved haul roads can be conditionally excluded from modeling. The conditions shall be enforceable permit conditions. Specifically, the applicant shall use any of the following control measures to **prevent** visible emissions of fugitive dust from being generated as specified by 20.11.20.23 NMAC with regards to paved haul roads:

1. Cleaning up spillage and trackout as necessary to prevent pulverized particulates from being entrained into the atmosphere;
2. Using on-site wheel washes; or
3. Performing regularly scheduled vacuum street cleaning or wet sweeping with a sweeper certified by the manufacturer to be efficient at removing particulate matter having an aerodynamic diameter of less than 10 microns (i.e. PM_{10}).

Not complying with the above minimum conditions shall be a violation of the applicant's permit.

Other Fugitive Sources

Emissions from material stockpiles are typically modeled as fugitive volume sources, however, they can be modeled as either volume or area sources as noted in the NMED Modeling Guidelines. The source type and proposed parameters, as well as the dimensions or assumptions those parameters are based on, should be discussed with the AQP in the modeling protocol and modeling report.

The Air Quality Program also generally accepts the NMED default modeled dimension values for other fugitive sources. However, these default values are not appropriate for all sources of a given type. If different values are used then provide an explanation of how the modeled dimensions were calculated based on the actual dimensions of the source.

Completeness Requirements

A narrative report describing the modeling performed for the facility is required to be submitted with the modeling files. This report should be written so as to provide the public and the AQP with sufficient information to determine that the proposed construction will not cause or contribute to violations of air quality standards. The report needs to contain enough information to allow a reviewer to determine that modeling was done in a defensible manner, consistent with available modeling guidance. Do not include raw modeling output in the report, only summaries and descriptions of the output.

It is suggested that reports be laid out according to the following outline. The outline may also be used as a checklist to determine if the analysis is complete. Note that this outline is a modified version of the outline provided in the NMED Modeling Guidelines.

I. Applicant and consultant information
   a. Name of facility and company.
   b. Permit numbers currently registered for the facility.
   c. Contact name, phone number, and e-mail address for the AQP in case of modeling questions.

II. Facility and operations description
   a. A narrative summary of the purpose of the proposed construction, modification, or revision.
   b. Brief physical description of the location.
   c. Duration of time that the facility will be located at this location.
   d. A map showing the location of the proposed facility, on-site buildings, emission points, fence line, and property boundary, along with UTM coordinates in meters.

III. Modeling requirements description
   a. List of pollutants at this facility requiring NAAQS and/or NMAAQS modeling.
   b. If PSD, NSPS and NESHAP are applicable, then state any additional modeling requirements that result.

IV. Modeling inputs
   a. General modeling approach
      i. The models used and the justification for using each model (AERMOD requires no justification).
      ii. A discussion of the operational flexibility that the company seeks (hours of operation, location of equipment, multiple processes, etc.) and how the modeling grants that flexibility.
      iii. If source groups were used to demonstrate compliance, explain how.
      iv. Hourly emission factors.
      v. Gravitational settling/plume depletion.
      vi. Reduction of NO_x to NO_2 including in-stack ratios if used.
      vii. Background concentrations.
      viii. Method for demonstrating compliance inside the properties of nearby facilities.
   b. Meteorological and ozone data
      i. A discussion of the meteorological and ozone data, including identification of the source of the data.
      ii. The data itself and a discussion of the procedures used to quality-assure the data (if the AQP did not provide the data).
   c. Receptor and terrain discussion
      i. Description of the spacing of the receptor grids, including the fence line. Provide fence line coordinates in a spreadsheet if not accessible in submitted models.
      ii. Flat and complex terrain discussion, including source of elevation data. NED files should come from the AQP website. If these are not used, then resolution of NED data (1/3 or 1 arc-second) and date of the NED file at time of download (which is provided on the USGS website) must also be provided.

iii. How the size of the receptor field was reduced for cumulative modeling, e.g. significance levels, radius of impact, examining impacts without plume depletion, etc.

d. Emission sources
   i. Description of sources at the facility, including:
      1. A discussion of the choice of source types, including whether point sources are vertical, horizontal or rain capped. Provide photos of sources, especially atypical sources, such as point sources that would normally be volume sources.
      2. A table or tables of source emission rates and stack parameters.
      3. A summary of actual and modeled dimensions of all volume sources, whether the sources are elevated or surface based, and whether they are attached to a building or not. A summary of actual and modeled dimensions of all area or other source types.
      4. For modifications to a facility, include a table that lists changes in emissions for existing sources and provide a description of any changes to stack heights or orientations that will be made as part of the modification, or any other source changes.
      5. Describe treatment of operating hours.
      6. Particle size characteristics, if plume depletion is used.
      7. If the modeled stack parameters are different from those in the application, an explanation must be provided as to what special cases are being analyzed and why.
      8. Flare calculations used to determine effective stack parameters.
      9. A cross-reference from the model input source numbers/names and/or descriptions to the sources listed in the permit application for the proposed facility.

e. Building downwash
   i. Dimensions of buildings.
   ii. Discussion of why some buildings were included and some were not.

V. Modeling files description
   a. A list of all the file names in the accompanying CD/thumb drive and description of these files.
   b. Description of the scenarios represented by each file.

VI. Modeling results
   a. A brief summary discussion of the modeling results including the maximum concentrations, location where the maximum concentration occurs, and comparison of the cumulative (modeled + background) concentration to the ambient standards.
   b. A table showing cumulative concentrations versus ambient air quality standards.
   c. Figures showing the locations of high modeled results that are close to the standards.
   d. If ambient standards are exceeded because of surrounding sources, include a culpability analysis for the source and show that the contribution from your source is less than the significance levels for the specific pollutant.

VII. Summary/conclusions
   a. A statement that modeling requirements have been satisfied and that the permit can be issued.
   b. A discussion of the expected permit conditions that will be derived from modeling assumptions.

Submit your report:

I. An electronic copy of the modeling report in addition to the hardcopy as part of the application.
II. Input files for all model runs. Include text input files in case the AQP doesn't have the same software that you're using. AQP needs the AERMOD input and BPIP input files at a minimum. Complete modeling files should be submitted if possible. This could include BEEST .BST or Breeze .ami/.amz files, as well as output/results/plot files so that submitted results can be confirmed or any issues can be investigated.
III. Building downwash input and output files.
IV. MET data files and a windrose, if data not supplied by AQP.

Attachment A:
Urban / Rural Dispersion Coefficients Classification

The following land use procedure should be used when determining whether urban or rural dispersion coefficients should be used when performing an ambient impact analysis using dispersion modeling. Should urban dispersion coefficients be required, the 'single urban area' option should be selected and the roughness length should be left as the default value of 1.0 meter (AERMOD User's Guide[11] v23132 Section 3.2.8 & AERMOD Implementation Guide[12] v23132 Section 5.3). The area population should be based on the procedure in Section 5.2 of the AERMOD Implementation Guide v23132 and the source of the data clearly identified. The sources that will be treated as urban must be identified on the Urban tab of the Source Options pathway.

1. Classify the land use within the total area, A_o, circumscribed by a 3 kilometer (km) radius circle about the source using the meteorological, land use, typing scheme proposed by Auer*.
2. If land use types I1, I2, C1, R2, and R3 (defined below) account for 50 percent or more of A_o, use urban dispersion coefficients; otherwise use appropriate rural dispersion coefficients.

DEFINITION OF LAND USE TYPES

TYPE	USE AND STRUCTURES	VEGETATION
I 1	Heavy industrial - Major chemical, steel and fabrication industries; generally 3 - 5 story buildings with flat roofs	Grass and tree growth extremely rare; < 5% vegetation
I 2	Light-moderate Industrial - Rail yards, Truck depots, Warehouses, Industrial parks, Minor fabrications; generally 1 - 3 story buildings with flat roofs	Very limited grass, trees almost totally absent; < 5% vegetation
C 1	Commercial - Office and apartment buildings, hotels > 10 stories; with flat roofs	Limited grass and trees; < 15% vegetation
R 2	Compact residential - Single, some multiple family dwellings with close spacing; generally < 2 story, pitched roof structures; garages (via alley); no driveways	Limited lawn sizes and shade trees; <30% vegetation
R 3	Compact Residential - Old multi-family dwellings with close (< 2 meter) lateral separation; generally 2 story, flat roof structures; garages (via alley); no driveways	Limited lawn sizes, old established shade trees; < 35% vegetation

*Auer, Jr., A.H., 1978. Correlation of Land Use and Cover with Meteorological Anomalies. Journal of Applied Meteorology, 17:636-643

[11] User's Guide for the AMS/EPA Regulatory Model (AERMOD), EPA-454/B-23-008, October 2023
[12] AERMOD Implementation Guide, EPA-454/B-23-009, October 2023

Attachment B: Protocol Review Checklist

The following outline is the checklist used by the Air Quality Program to review modeling protocols as of the revision date of this guideline. It has been included in this modeling guideline to assist companies and consultants in crafting a protocol.

1) General Information
   a) Applicant Company
   b) Facility Name
2) Facility Information
   a) Purpose of permit and description/plan: Current permit:
      i) New source – modification – relocation – revision – Title V renewal
   b) Physical Address/Location of facility provided? Does the stated facility address match up with online Bernalillo County Assessor information?
   c) Map of facility or planned facility?
      i) Does the map show the layout of sources and buildings?
      ii) What does the latest Google Earth imagery show?
      iii) What do the City's Advanced Map Viewer and Google Maps show?
      iv) Is there actually a fence or some other barrier that restricts access to the site?
   d) Anticipated operating days and hours
   e) Hours to be modeled
3) Standards to be modeled
   a) PM_{10}
      i) 24-hr
   b) $PM_{2.5}$
      i) 24-hr
      ii) Annual
   c) CO
      i) 1-hr
      ii) 8-hr
   d) NO_2
      i) 1-hr
      ii) Annual
   e) SO_2
      i) 1-hr
   f) Lead
   g) H_2S
4) For which pollutants will emissions increase?
5) Modeling details
   a) Model utilized: AERSCREEN, AERMOD
   b) Version of model to be used:
   c) For modifications and revisions, are source changes summarized?
   d) Are tables with proposed emission rates and modeling parameters provided for all sources to be modeled?
   e) What source types will be used for which sources?
   f) Do the volume source dimensions come from the NMED guidelines?
   g) How will horizontal stacks and rain caps be modeled?
   h) Non-regulatory default options? If so, which?

i) How will haul roads be modeled?
j) Can any sources be moved around within the property and how will that be modeled?
k) Rural dispersion coefficients? _____ If urban, is there justification?
l) Does the company seek some operational flexibility, e.g. hours of operation, location of equipment, etc.? How will the modeling cover that flexibility?
m) Any buildings on the site or nearby that might warrant investigation of building downwash?
n) Will NED terrain data be used? 1 arc-second from AQP website?

6) Meteorological data
   a) Source of meteorological data: City _____ NMED _____ On Site_____
   b) Location and year(s) _____
   c) Adequately representative for this facility? _____
7) Nearby permits
   a) Are there other permits at the same facility?
   b) What are the hours of operations for nearby facilities? Will this be appropriately modeled?
   c) Are NO_x, CO, SO_2, PM_{10}, & $PM_{2.5}$ emissions of nearby permits worthy of inclusion?
   d) Will there be any receptors inside the nearby source properties?
   e) How will they analyze impacts inside the property of nearby facilities?
   f) Is access restricted at nearby facilities so that those properties can reasonably be excluded from ambient air?
8) Hourly emissions factors
   a) Other than limiting hours of operation in the model? Is that defensible, per Table 8-1 of App W?
   b) Averaging of emissions over non-operational hours?
9) Are the background concentrations appropriate for the location?
10) Receptors
   a) 25 meters or less along the fence line?
   b) 50 meters or less out to at least 250 meters and then 100 meters or less out to at least 1000 meters?
   c) Receptors beyond 1000 meters? If so, what resolution? Does receptor spacing increase in gradual steps?
11) Impacts/Results
   a) What are they planning on using as a design concentration? What results will be compared to the SILs? H1H for all short-term standards?
   b) If NO_x or SO_2 emissions are greater than or equal to 40 TPY, or direct $PM_{2.5}$ emissions are greater than or equal to 10 TPY, will the applicant account for secondary particulate formation?
   c) If NO_x or VOC emissions are greater than or equal to 40 TPY, will the applicant account for secondary ozone formation?
12) In-stack ratios to be used for each NO_x-emitting stack and justification for doing so
13) Haul roads
   a) Does truck traffic service each aggregate process?
   b) Will any roads be exempt from modeling?
14) Can the company accept setback conditions on piles, bins, and equipment that aren't modeled next to the fence?

Attachment C: Background Values Memo

City of Albuquerque

Environmental Health Department

Timothy M. Keller, Mayor

Interoffice Memorandum

April 24, 2024

To: Michael W. McKinstry, Environmental Health Supervisor

From: Jeff Stonesifer, Senior Environmental Health Scientist
Kyle Tumpane, Senior Environmental Health Scientist

Subject: **Background values for air dispersion modeling**

The background values calculated from monitor data for use in air dispersion modeling are reconsidered periodically to determine if the values are representative and appropriate to use. The explanations below focus on $PM_{2.5}$ data from the South Valley monitor as an illustrative example but the reasoning is true for other pollutants and monitors as well.

Using data from the $PM_{2.5}$ monitor in the South Valley (2ZV) for a background value in air dispersion models results in double counting of fine particulate emissions from industry. The monitor measures emissions from all sources because it indiscriminately counts all the fine particulates in the air. In other words, vehicle emissions, residential wood burning, wildfire smoke, agricultural burning, industrial emissions, cooking food, a small percentage of dust particles, etc. are all measured by the monitor.

The background values in air dispersion models are designed to account for pollutant levels present in an area, but not explicitly included in the model and are combined with the modeled pollutant impacts to ensure that ambient air quality standards are not violated. To include nearby industrial emissions in an air dispersion model when those emissions are already sampled in the monitored data is called "double counting" of industrial emissions. As the ambient air quality standards become tighter, double counting of emissions and other conservative features of modeling that result in overprediction of impacts become points of contention.

When a stationary source within a couple of kilometers of 2ZV wants to modify, its emissions have already been sampled by the monitor and are included in the background value. In other words, it is not just nearby sources that are double counted in air dispersion models, but the source that is seeking to modify its own permit will be double counting its own emissions in the cumulative modeling.

The Del Norte monitor, on the other hand, samples residential wood burning, the smallest dust particles, vehicle emissions, and wildfire smoke. In comparison to the South Valley monitor, the Del Norte monitor samples relatively little in the way of industrial emissions. This is due to the distance of the Del Norte monitor from industry. The closest industry is about 2.5 kilometers from the Del Norte monitor at the Singer-Chappell industrial park, which as of this writing hosts a hot mix asphalt plant, two concrete batch plants, and a crushing/screening/recycling plant.

Using $PM_{2.5}$ background values calculated from Del Norte monitor data nearly eliminates double counting of industrial emissions. This is also true for other pollutants, such as PM_{10} and NO_2, measured by the South Valley monitor. The Del Norte monitor is already used as the data source for modeled NO_2 and SO_2 background values. Like the South Valley monitor, the Jefferson, North Valley, and Foothills monitors are also not ideally located for calculating background values from monitored data. Background values for all pollutants should normally come from the Del Norte monitor and be used across the Albuquerque metro area within the jurisdiction of the Air Quality Program.