Richard J. Berry, Mayor

Mary Lou Leonard, Director

AIR DISPERSION MODELING GUIDELINES For AIR QUALITY PERMITTING

City of Albuquerque
Environmental Health Department
Air Quality Program
Permitting Division

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 information must be developed using an Environmental Protection Agency (EPA) approved 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, better known as Appendix W of 40 CFR 51, can be found at http://www.epa.gov/ttn/scram/guidance/guide/appw_05.pdf. The New Mexico Environment Department's modeling guidelines can be found at https://www.env.nm.gov/aqb/modeling/modelingpubs.html. If discrepancies are found between the various guidance documents, please contact the AQP for guidance.

SCREENING ANALYSIS

Initial evaluations of the facilities 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: http://www.epa.gov/ttn/scram/dispersion_screening.htm. Several environmental engineering firms have developed graphical user interfaces to assist 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's 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

The model of choice for refined analyses is AERMOD, which is available from the sources mentioned above. 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. Smooth model and permit application reviews depend upon accurate emissions estimates that are consistent between the public notice, the modeling, and the application. Inconsistencies between these documents delay the review process and may require re-modeling.

AERMOD should be run using a rectangular grid receptor array. Fenceline receptor spacing must be 50 meters or less. Beyond the fenceline, receptor spacing may be increased to 100 meters out to 1 kilometer. If the radius of impact exceeds 1 kilometer, the receptor array spacing may be increased to 500 meters for those areas beyond 1 kilometer. The emission points, buildings and fence lines should be located using exact UTM coordinates.

In addition, AERMOD should be run using the regulatory default options with one exception. The AERMOD beta options POINTCAP and POINTHOR may also be used. 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; use of urban must be explained. Use of gravitational settling for particles and hourly emissions factors must be documented and explained.

MODELING PROTOCOLS

For minor stationary source permitting actions, a modeling protocol should be submitted and approved before modeling begins. For PSD or major stationary source permit applications, a modeling protocol shall be submitted and approved before modeling begins. The modeling protocol must describe the proposed action in detail and explain the choice of input parameters to be used.

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

POLLUTANTS AND MODELS

1. 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 sources emitting over 100 tons per year of NO_X or VOC should contact NMED and the EPA Regional Office to determine current ozone modeling requirements on a case by case basis.
2. NO_2 and SO_2

   All sources and all modifications, major and minor, are now required to demonstrate compliance with the 1-hour SO_2 and 1-hour NO_2 standards. Demonstration of compliance with the 1-hour NO2 standard is automatically a demonstration of compliance with the 24-hour NMAAQS for NO_2. See the New Mexico Air Quality Bureau's Air Dispersion Modeling Guidelines for detailed guidance on modeling for these standards. Contact the Air Quality Program for ozone background data.
3. All pollutants and averaging times shall be modeled using AERMOD or AERSCREEN. Exceptions must be approved by the AQP on a case-by-case basis.

MODELING WAIVERS

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

- Emergency Generators (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 for comfort heat
- Certain Soil Vapor Extraction Systems

In some cases, a discussion of previous modeling can be used to demonstrate that ambient air quality standards will not be violated. Modeling done in ISC 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 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.

METEOROLOGICAL DATA

Meteorological 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 surface characteristics appropriate for the area from which the data were collected. Either one year of representative data which serves as on-site data or five years of appropriate off-site data must be used. Whether a dataset is representative enough to serve as on-site 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 appropriate, then site specific data may need to be gathered and processed for use in PSD applications. Before using site specific meteorological data, submit a report detailing what data were collected and the parameters used in processing the data. Representativeness and quality of site-specific data must be demonstrated with documentation.

PLUME DEPLETION

Particle size distributions used to simulate gravitational settling of particles must be documented and justified. 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 is acceptable for modeling of both Total Suspended Particulate and PM_{10}.

The following particle size distribution is acceptable for crushing of rock and stone:

Table I: Particle Size Distribution

Size Range (μm)	Mass Mean Diameter (μm)	Mass Fraction
2.5-5.0	3.88	0.06
5-10	7.77	0.205
10-15	12.66	0.16
15-20	17.62	0.175
20-30	25.33	0.225
30-45	38.0	0.175

The particle size distribution in Table I was derived from a journal article. The distribution in Table I can also be used for aggregate handling if the applicant shows that calculated TSP emissions include particles larger than 30 microns.

BACKGROUND CONCENTRATIONS & NEARBY SOURCES

Background concentrations are added to modeled impacts of emissions to ensure that ambient air standards won't 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. **AQP staff will provide background concentrations upon request.**

Sometimes nearby industrial sources are too large to be accounted for with background concentrations. The AQP may direct those who submit models to include nearby sources. 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 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 6A of the New Mexico Environment Department's Air Dispersion Modeling Guidelines to determine whether a facility is contributing to an exceedance.

As a result of the US EPA revoking the Total Suspended Particulate Matter (TSP) standard and requirements for monitoring, the AQP discontinued ambient air monitoring for TSP in May 1989. Therefore, established TSP background concentration values are identical as those of PM_{10} background values.

If a nearby property has a source of large particles, then cumulative modeling will be required for the TSP standards. Assuming a PM_{10} background is available, PM_{10} emissions can usually be subtracted from TSP emissions for the nearby source. To get the TSP total air quality concentration, the maximum impact found in the cumulative model must then be added to PM_{10} background value.

EMISSIONS FACTORS

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

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's 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 providing 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.

HAUL ROADS

When haul roads are modeled, the methodology described in the New Mexico Air Quality Bureau's Air Dispersion 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.

The WRAP Fugitive Dust Handbook published in November 2004 shows paving of haul roads and keeping those roads clean results in nearly 100 percent control of PM10 emissions. Paved haul roads can be conditionally excluded from modeling. The conditions shall be enforceable permit conditions and at a minimum, these conditions include:

1. The applicant shall use any of the control measures to **prevent** visible emissions of fugitive dust from being generated as specified by 20.11.20.23.A and B NMAC:
    a. Cleaning up spillage and trackout as necessary to prevent pulverized particulates from being entrained into the atmosphere
    b. Using paved or gravel entry/exit aprons with devices, such as steel grates, capable of knocking mud and bulk material off vehicle tires;
    c. Using on-site wheel washes; or
    d. 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})
    e. Using dust suppressants applied in amounts and rates recommended by the manufacturer and maintained as recommended by the manufacturer
    f. Using wet suppression
    g. Using traffic controls, including decreased speed limits with appropriate enforcement; other traffic calming methods, vehicle access restrictions and controls; road closures or barricades; and off-road vehicle access controls and closures
2. Visible accumulation of particulate matter that is deposited on all paved haul roads shall be cleaned and/or mitigated as soon as possible. If visible fugitive emissions are observed from paved haul roads with accumulated particulate matter, all traffic activities shall be shut down until one or a combination of the above control measures is implemented and completed to prevent any visible emissions of fugitive dust from being generated.

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

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 New Mexico Air Quality Bureau's 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 to call 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 UTM coordinates and the location of the proposed facility, on-site buildings, emission points, fence line, and property boundary.

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. Model options used and why they were considered appropriate to the application.
      iii. Reduction of NO_X to NO_2.
      iv. Background concentrations.
   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 fenceline.
      ii. Flat and complex terrain discussion, including source of elevation data.

iii. How the size of the receptor field was reduced, 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 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.
        2. Describe treatment of operating hours
        3. Particle size characteristics, if plume depletion is used
        4. 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.
        5. Flare calculations used to determine effective stack parameters.
        6. A cross-reference from the model input source numbers/names to the sources listed in the permit application for the proposed facility.

e. Building downwash
    i. Dimensions of buildings

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

VI. Modeling results
    a. A summary 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.

VII. Summary/conclusions
    a. A statement that modeling requirements have been satisfied and that the permit can be issued.

Bind Your Report! Division modeling staff will not be responsible for loss of parts of your analysis and subsequent incomplete rulings. Three-ring binders or plastic side bindings are preferred.

Submit your report:

I. An electronic copy of the modeling report.
II. Input files for all model runs. Include .INP files in case the AQP doesn't have the same software that you're using.
III. Building downwash input and output files.
IV. Met data and a windrose, if data not supplied by AQP.
V. A paper copy of the modeling report.
VI. A map showing all sources along with UTM coordinates in meters.

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 and your particular model gives you the option of URBAN-1, URBAN-2, or URBAN-3, the URBAN-3 dispersion coefficients should be selected.

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[1].

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

(Meteorological Anomalies. Journal of Applied Meteorology, 17:636643.)

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