New Mexico Air Quality Bureau
Air Dispersion Modeling Guidelines

Revised April 22, 2016

Applicability note:

For all sources with increases of NO_2 and/or SO_2 emission rates, 1-hour NO_2 and 1-hour SO_2 concentrations are required to be modeled for minor sources and minor modifications. Information about the implementation timeframe can be found here:
https://www.env.nm.gov/aqb/permit/documents/Guidance_on_Implementation_of_1hr_NO2_SO2_Stds_20Nov15.docx

Note of changes since 2014 version:

1-hour NO_2 and SO_2 modeling is now required for all sizes of facilities with NO_2 or SO_2 emissions.

ARM2 method of NO_2 modeling has been added to the approved options.

Concentration conversion has been simplified to use the same method for NAAQS and NMAAQS.

Emission rates for the very small emission rate modeling waivers have changed.

The modeling report form, Universal Application 4 (UA4), is available.

Bureau Modeling Staff:
David Heath (505) 476-4325
Gi-Dong Kim (505) 476-4326
Sufi Mustafa (505) 476-4318
Eric Peters (505) 476-4327

Table of Contents

TABLE OF CONTENTS **2**

LIST OF FIGURES **5**

LIST OF TABLES **5**

1.0 INTRODUCTION **7**
- **1.1 Introductory Comments** **7**
- **1.2 The Modeling Review Process** **7**
  - 1.2.1 Modeling Protocol Review 7
  - 1.2.2 Permit Modeling Evaluation 7

2.0 MODELING REQUIREMENTS AND STANDARDS **9**
- **2.1 Regulatory Requirement for Modeling** **9**
  - 2.1.1 Title V Operating Permits 9
  - 2.1.2 New Source Review (NSR) Permitting for Minor Sources 10
  - 2.1.3 NSR Permitting for Major Sources 11
- **2.2 Air pollutants** **12**
- **2.3 Modeling Exemptions and Reductions** **12**
  - 2.3.1 Modeling waivers 12
  - 2.3.2 General Construction Permits (GCPs) 13
  - 2.3.3 Streamlined Compressor Station Modeling Requirements 13
  - 2.3.4 Exempt Equipment 17
- **2.4 Levels of Protection** **17**
  - 2.4.1 Significance Levels 17
  - 2.4.2 Air Quality Standards 18
  - 2.4.3 Prevention of Significant Deterioration (PSD) Increments 18
- **2.5 Concentration Conversions** **18**
  - 2.5.1 Gaseous Conversion Factor for Elevation and Temperature Correction 19
  - 2.5.2 Gaseous Conversion Factor at Standard Temperature and Pressure (STP) Conditions 19
- **2.6 Modeling the Standards and Increments** **20**
  - 2.6.1 Carbon Monoxide (CO) Standards 20
  - 2.6.2 Hydrogen sulfide (H_2S) Standards 21
  - 2.6.3 Lead (Pb) Standards 21
  - 2.6.4 Nitrogen Dioxide (NO_2) Standards 22
  - 2.6.5 Ozone (O_3) Standards 25
  - 2.6.6 Particulate matter less than 2.5 micrometers in aerodynamic diameter ($PM_{2.5}$) Standards 26
  - 2.6.7 Particulate matter less than 10 micrometers in aerodynamic diameter (PM_{10}) Standards 28
  - 2.6.8 Total Suspended Particulates (TSP) Standards 29
  - 2.6.9 Sulfur Dioxide (SO_2) Standards 30
  - 2.6.10 Total Reduced Sulfur Except For Hydrogen Sulfide Standards 31
- **2.7 PSD Increment Modeling** **34**
  - 2.7.1 Air Quality Control Regions and PSD Baseline Dates 34
  - 2.7.2 PSD Class I Areas 35
  - 2.7.3 PSD Class I Area Proposed Significance Levels 36
- **2.8 New Mexico State Air Toxics Modeling** **36**

2.9 Hazardous Air Pollutants **39**
2.10 Non-Attainment and Maintenance Areas **39**
2.10.1 Ozone Maintenance Area in Sunland Park: 39
2.10.2 PM_{10} non-attainment area in Anthony: 39
2.10.3 SO_2 Maintenance area at the Phelps Dodge Smelter 39
2.10.4 Information on the New Mexico Natural Events Action Plans (NEAPs) for PM_{10} 39
2.10.5 Ozone Early Action Compact in San Juan County 39
2.10.6 PM_{10} non-attainment area in El Paso, Texas 40

3.0 MODEL SELECTION **40**
3.1 What dispersion models are available? **40**
3.2 EPA Modeling Conferences and Workshops **40**
3.3 Models Most Commonly Used in New Mexico **40**
3.3.1 AERMOD 41
3.3.2 CALPUFF 41
3.3.3 CTSCREEN 41
3.3.4 RTDM (Rough Terrain Dispersion Model) 41

4.0 MODEL INPUTS AND ASSUMPTIONS **42**
4.1 Operating Scenarios **42**
4.1.1 Emission Rates 42
4.1.2 Hours of Operation 42
4.1.3 Time Scenarios 42
4.1.4 Operating at Reduced Load 42
4.1.5 Alternate Operating Scenario 42
4.1.6 Startup, Shutdown, Maintenance (SSM), and Other Short-term Emissions 43
4.2 Plume Depletion and Deposition **43**
4.3 Meteorological Data. **43**
4.3.1 Selecting Meteorological Data. 43
4.4 Background Concentrations **46**
4.4.1 Uses of Background Concentrations 46
4.4.2 CO Background Concentration 49
4.4.3 H_2S Background Concentration 49
4.4.4 Lead Background Concentration 49
4.4.5 NO_2 Background Concentration 49
4.4.6 Total Reduced Sulfur Background Concentration 50
4.4.7 Ozone Background Concentration 51
4.4.8 $PM_{2.5}$ Background Concentration 52
4.4.9 PM_{10} Background Concentration 54
4.4.10 SO_2 Background Concentration 56
4.4.11 TSP Background Concentrations 56
4.5 Location and Elevation **56**
4.5.1 Terrain Use 56
4.5.2 Obtaining Elevation 57
4.6 Receptor Placement **57**
4.6.1 Elevated Receptors on Buildings 57
4.6.2 Ambient Air 57
4.6.3 Receptor Grids 57
4.6.4 PSD Class I Area Receptors 58
4.6.5 PSD Class II Area Receptors 58

4.7 Building Downwash and Cavity Concentrations **58**
4.8 Neighboring Sources/Emission Inventory Requirements **59**
4.8.1 Neighboring Sources Data 59
4.8.2 Source Groups 61
4.8.3 Co-location with GCP 2, 3, or 5 61

5.0 EMISSIONS SOURCE INPUTS **61**
5.1 Emission Sources **61**
5.2 Stack Emissions/Point Sources **61**
5.2.1 Vertical Stacks 61
5.2.2 Stacks with Rain Caps and Horizontal Stacks 62
5.2.3 Flares 62
5.3 Fugitive Sources **63**
5.3.1 Aggregate Handling 63
5.3.2 Fugitive Equipment Sources 63
5.3.3 Haul Roads 64
5.3.4 Area Sources 66
5.3.5 Open Pits 67
5.3.6 Landfill Offgas 67

6.0 MODELING PROTOCOLS **67**
6.1 Submittal of Modeling Protocol **67**
6.2 Protocol ingredients **68**
6.3 How to submit the protocol **68**

7.0 DISPERSION MODELING PROCEDURE **69**
7.1 Step 1: Determining the Radius of Impact **69**
7.1.1 Prepare the ROI analysis as follows: 70
7.1.2 Analyze modeling results to determine ROI 70
7.2 Step 2: Refined Analysis **70**
7.2.1 Prepare the Refined Analysis as Follows: 71
7.2.2 Analyze the Refined Modeling Results 71
7.2.3 NMAAQS and NAAQS 71
7.2.4 PSD Class II increment 71
7.2.5 PSD Class I increment 72
7.3 Step 3: Portable Source Fence Line Distance Requirements for Initial Location and Relocation **72**
7.4 Step 4: Non-Attainment Area Requirements **73**
7.5 Step 5: Modeling for Toxic Air Pollutants **73**
7.6 Step 6: PSD Permit Application Modeling **74**
7.6.1 Meteorological Data 74
7.6.2 Ambient Air Quality Analysis 74
7.6.3 Additional Impact Analysis (NMAC 20.2.74.304) 75
7.6.4 Increment Analysis 75
7.6.5 Emission trade-offs 75
7.6.6 Emission Inventories 76
7.6.7 BACT analysis 76
7.7 Step 7: Write Modeling Report **76**
7.8 Step 8: Submit Modeling Analysis **78**

8.0 LIST OF ABBREVIATIONS 79

9.0 REFERENCES 80

10.0 INDEX 81

List of Figures

Figure 1: Class I areas 35
Figure 2: Air quality control regions (each AQCR has a different color) 37
Figure 3: Meteorological Stations in New Mexico 46
Figure 4: One-Way Road Source 66
Figure 5: Two-Way Road Source 66
Figure 6. Plot of pollutant concentrations showing the 5 $\mu g/m^3$ significance level and the radius of impact (dashed line circle), determined from the greatest lineal extent of the significance level from the source. 69
Figure 7: Setback Distance Calculation 73

List of Tables

Table 1. Very small emission rate modeling waiver requirements 13
Table 2. Areas Where Streamlined Permits Are Restricted 14
Table 3. List of state parks, Class I areas, Class II wilderness areas, Class II national wildlife refuges, national historic parks, and state recreation areas 15
Table 4. Streamlined Permit Applicability Requirements for facilities with less than 200 tons/year PTE 17
Table 5A: Carbon Monoxide Air Quality Standards 20
Table 5B: Hydrogen Sulfide Air Quality Standards 21
Table 5C: Lead Air Quality Standards 21
Table 5D: NO_2 Air Quality Standards 22
Table 5E: O_3 Air Quality Standards 26
Table 5F: $PM_{2.5}$ Air Quality Standards 26
Table 5G: PM_{10} Air Quality Standards 28
Table 5H: TSP Air Quality Standards 29
Table 5I: SO_2 Air Quality Standards 30
Table 5J: Total Reduced Sulfur except for H_2S Air Quality Standards 31
Table 6A. Air Quality Standard Summary (Without Notes) 32
Table 6B. Standards for which Modeling is not Required. 33
Table 6C. Modeling the Design Value Summary (Default Modeling). 33
Table 7: PSD Increment Consumption and Expansion 34
Table 8: Minor Source Baseline Dates by Air Quality Control Region 35
Table 9: Major Source Baseline Dates and Trigger Dates 35
Table 10. Class I Prevention of Significant Deterioration Significance Levels 36
Table 11: Stack Height Release Correction Factor (adapted from 20.2.72.502 NMAC) 38
Table 12: A few common state air toxics and modeling thresholds (from 20.2.72.502 NMAC) 38
Table 13: CTSCREEN Correction factors for 1-hour concentration. 41
Table 14: Meteorological Data by Region 45
Table 15: Roswell $PM_{2.5}$ Monitoring Data (2007-2009) 48
Table 16: Carbon Monoxide Background Concentration 49
Table 17: NO_2 Background Concentration 50
Table 18: Ozone Background Concentration 51
Table 19A: $PM_{2.5}$ Background Concentration 52
Table 19B: $PM_{2.5}$ Background Concentration (Refined, by Month) 53

Table 20A: PM_{10} Background Concentration 54
Table 20B: PM_{10} Background Concentration (Refined, by Month) 55
Table 21: SO_2 Background Concentrations 56
Table 22: Surrounding Source Retention Example for a Source Near Bloomfield. 59
Table 23: Example Dimensions of Fugitive Sources 64
Table 24: Example Haul Road Vertical Dimensions 65
Table 25: Example Haul Road Horizontal Dimensions 66
Table 26: List of Abbreviations 79

1.0 INTRODUCTION

1.1 Introductory Comments

Air pollution has been proven to have serious adverse impacts on human health and the environment. In response, governments have developed air quality standards designed to protect health and secondary impacts. The only way to predict compliance with these standards by a facility or modification that does not yet exist is to use models to simulate the impacts of the project. Regulatory models strike a balance between cost-effectiveness and accuracy, though the field of air quality prediction is not necessarily an inexpensive or a highly accurate field. The regulatory model design is an attempt to apply requirements in a standard way such that all sources are treated equally and equitably.

It is the duty of the NMED/Air Quality Bureau (the Bureau) to review modeling protocols and the resulting modeling analyses to ensure that air quality standards are protected and to ensure that regulations are applied consistently. This document is an attempt to document clear and consistent modeling procedures in order to achieve these goals. Occasionally, a situation will arise when it makes sense to deviate from the guidelines because of special site-specific conditions. Suggested deviations from the guidelines should be documented in a modeling protocol and submitted to the Bureau for approval prior to submission of modeling.

In general, the procedures in the EPA document, Guideline On Air Quality Models[1] (EPA publication number EPA-450/2-78-027R (revised)) as modified by Supplements A, B, and C should be followed when conducting the modeling analysis. This EPA document provides fairly complete guidance on appropriate model applications. The purpose of this document is to provide clarification, additional guidance, and to highlight differences between the EPA document and New Mexico State modeling requirements.

Please do not hesitate to call the Bureau modeling staff with any questions you have before you begin the analysis. We are here to provide assistance; however, we will not conduct modeling courses. There are many courses offered which teach the principles of dispersion modeling. These courses provide a much better forum for learning about modeling than the Bureau modeling staff can provide.

1.2 The Modeling Review Process

1.2.1 Modeling Protocol Review

A modeling protocol should be submitted and approved before submitting a permit application. The Bureau will make every attempt to approve, conditionally approve, or reject the protocol within two weeks. Details regarding the protocol are described in section 6.0, Modeling Protocols. Protocols will be archived in the modeling archives in the protocol section until they can be stored with the files for the application.

1.2.2 Permit Modeling Evaluation

When a permit application involving air dispersion modeling is received, modeling staff has 30 days to determine whether the modeling analysis is administratively complete. The modeling section staff will make a quick determination to see if the modeling analysis appears complete. This involves checking to see if

[1] Environmental Protection Agency, 40 CFR Part 51, Revision to the Guideline on Air Quality Models http://www.epa.gov/ttn/scram/guidance/guide/appw_05.pdf

modeling files are attached and readable and verifying that application forms and modeling report are present. If the analysis is incomplete, the staff will inform the applicant of the deficiencies as quickly as possible. This will halt the permitting process until sufficient information is submitted. If deficiencies are not resolved within 30 days it may result in ruling the application incomplete.

After the application has been ruled complete, Bureau staff will perform a complete review of the modeling files. This analysis includes a review to make sure that information in the modeling files are consistent with the information in the permit application, and may involve the emission rate of each emission point, the elevation of sources, receptors, and buildings, evaluation and modification of DEM data, property fenceline, or other aspects of the modeling inputs. If the dispersion modeling analysis submitted with the permit application adequately demonstrates that ambient air concentrations will be below air quality standards and/or Prevention of Significant Deterioration (PSD) increments, the Bureau modeler will summarize the findings and provide the information to the permit writer. If dispersion modeling predicts that the construction or modification causes or significantly contributes to an exceedance of a New Mexico or National Ambient Air Quality Standard (NMAAQS or NAAQS) or PSD increment, the permit cannot be issued under the normal permit process. For non-attainment modeling, refer to 20.2.72.216 NMAC or contact the Bureau for further information.

The application (including modeling) is expected to be complete and in good order at the time it is received. However, the Bureau will accept general modifications or revisions to the modeling before the modeling is reviewed provided that the changes do not conflict with good modeling practices. Once the modeling review begins, only changes to correct problems or deficiencies uncovered during the review of the modeling will normally be accepted, and the Bureau will provide a deadline by which changes need to be submitted in order to allow for them to be reviewed and for the permit to be issued. No changes to modeling will be allowed after the review has been completed.

2.0 MODELING REQUIREMENTS AND STANDARDS

2.1 Regulatory Requirement for Modeling

The requirements to perform air dispersion modeling are detailed in New Mexico Administrative Code (NMAC) **20.2.70.300.D.10 NMAC** (Operating Permits), **20.2.72.203.A.4 NMAC** (Construction Permits), and **20.2.74.305 NMAC** (Permits - Prevention of Significant Deterioration). The language from these sections is listed below for easy reference.

Basically, with a construction permit application, an analysis of air quality standards is required, which normally requires air dispersion modeling. In some cases, previous modeling may satisfy this requirement. In these cases, the applicant may seek a modeling waiver from the Bureau. In any case, it is the responsibility of the applicant to provide the modeling, or the justification for the modeling waiver, or the air quality analysis for non-attainment areas. Operating permit applications for landfills that have not been modeled require modeling to demonstrate compliance with NAAQS and NMAAQS. Other Title V permits satisfy the modeling requirement through the NSR permit.

2.1.1 Title V Operating Permits

Federal air quality standards are applicable requirements for sources required to have an operating permit. Modeling is not required to issue a Title V operating permit, except for landfills that do not require an NSR permit.

Selected Title V regulatory language applying to modeling is copied below for easy reference.

> **20.2.70.7 NMAC** DEFINITIONS: In addition to the terms defined in 20.2.2 NMAC (definitions), as used in this part the following definitions shall apply.
>
> E. "Applicable requirement" means all of the following, as they apply to a Part 70 source or to an emissions unit at a Part 70 source (including requirements that have been promulgated or approved by the board or US EPA through rulemaking at the time of permit issuance but have future-effective compliance dates).
>
> (11) Any national ambient air quality standard.
>
> 20.2.70.201 NMAC REQUIREMENT FOR A PERMIT:
>
> D, Requirement for permit under 20.2.72 NMAC.
>
> (1) Part 70 sources that have an operating permit and do not have a permit issued under 20.2.72 NMAC or 20.2.74 NMAC shall submit a complete application for a permit under 20.2.72 NMAC within 180 days of September 6, 2006. The department shall consider and may grant reasonable requests for extension of this deadline on a case-by-case basis.
>
> (2) Part 70 sources that do not have an operating permit or a permit under 20.2.72 NMAC upon the effective date of this subsection shall submit an application for a permit under 20.2.72 NMAC within 60 days after submittal of an application for an operating permit.
>
> (3) Paragraphs 1 and 2 of this subsection shall not apply to sources that have demonstrated compliance with both the national and state ambient air quality standards through dispersion modeling or other method approved by the department and that have requested incorporation of conditions in their operating permit to ensure compliance with these standards.
>
> **20.2.70.300.D.10 NMAC**
>
> (10) Provide certification of compliance, including all of the following.

(a) A certification, by a responsible official consistent with Subsection E of 20.2.70.300 NMAC, of the source's compliance status for each applicable requirement. For national ambient air quality standards, certifications shall be based on the following.

(i) For first time applications, this certification shall be based on modeling submitted with the application for a permit under 20.2.72 NMAC.

(ii) For permit renewal applications, this certification shall be based on compliance with the relevant terms and conditions of the current operating permit.

2.1.2 New Source Review (NSR) Permitting for Minor Sources

For new permits, a demonstration of compliance with air quality standards, PSD increments, and toxic air pollutants subject to 20.2.72.403.A(2) is required for all pollutants emitted by the facility. For significant revisions, a demonstration of compliance with air quality standards, PSD increments, and toxic air pollutants subject to 20.2.72.403.A(2) is required for all pollutants affected by the modification or permit revision. For technical revisions involving like kind replacement, as specified in 20.2.72.219B(1)((d), a demonstration that the replacement unit has stack parameters which are at least as effective in the dispersion of air pollutants is required (provided previous modeling determined the area to be in compliance with air quality standards). Permits for sources not in attainment with standards should refer to 20.2.72.216 NMAC, NONATTAINMENT AREA REQUIREMENTS.

If previous modeling has demonstrated compliance for each averaging period of each pollutant with a state or federal ambient air quality standard or toxic air pollutant, and that modeling used current modeling practices and is up-to-date for that area, then a modeling waiver may be used as the discussion demonstrating compliance. Otherwise, new modeling is required. For other minor source permitting actions, modeling is not part of the permitting process. Modeling waivers do not apply to nonattainment areas.

Selected NSR regulatory language applying to modeling is copied below for easy reference.
Definition of modification:

20.2.72.7 DEFINITIONS: In addition to the terms defined in 20.2.2 NMAC (Definitions) as used in this Part:

P. "Modification" means any physical change in, or change in the method of operation of, a stationary source which results in an increase in the potential emission rate of any regulated air contaminant emitted by the source or which results in the emission of any regulated air contaminant not previously emitted, but does not include:

(1) a change in ownership of the source;

(2) routine maintenance, repair or replacement;

(3) installation of air pollution control equipment, and all related process equipment and materials necessary for its operation, undertaken for the purpose of complying with regulations adopted by the board or pursuant to the Federal Act; or

(4) unless previously limited by enforceable permit conditions:

(a) an increase in the production rate, if such increase does not exceed the operating design capacity of the source;

(b) an increase in the hours of operation; or

(c) use of an alternative fuel or raw material if, prior to January 6, l975, the source was capable of accommodating such fuel or raw material, or if use of an alternate fuel or raw material is caused by any natural gas curtailment or emergency allocation or any other lack of supply of natural gas.

Requirements for permit:

20.2.72.200 APPLICATION FOR CONSTRUCTION, MODIFICATION, NSPS, AND NESHAP - PERMITS AND REVISIONS:

A. Permits must be obtained from the Department by:

(1) Any person constructing a stationary source which has a potential emission rate greater than 10 pounds per hour or 25 tons per year of any regulated air contaminant for which there is a National or New Mexico Ambient Air Quality Standard. If the specified threshold in this subsection is exceeded for any one regulated air contaminant, all regulated air contaminants with National or New Mexico Ambient Air Quality Standards emitted are subject to permit review. Within this subsection, the potential emission rate for nitrogen dioxide shall be based on total oxides of nitrogen;

(2) Any person modifying a stationary source when all of the pollutant emitting activities at the entire facility, either prior to or following the modification, emit a regulated air contaminant for which there is a National or New Mexico Ambient Air Quality Standard with a potential emission rate greater than 10 pounds per hour or 25 tons per year and the regulated air contaminant is emitted as a result of the modification. If the specified threshold in this subsection is exceeded for any one regulated air contaminant, all regulated air contaminants with National or New Mexico Ambient Air Quality Standards emitted by the modification are subject to permit review. Within this subsection, the potential emission rate for nitrogen dioxide shall be based on total oxides of nitrogen;

Like-kind-replacement required modeling:

20.2.72.219 PERMIT REVISIONS:

B. Technical Permit Revisions:

(1) Technical permit revision procedures may be used only for:

(d) Modifications that replace an emissions unit for which the allowable emissions limits have been established in the permit, provided that the new emissions unit:

(i) Is equivalent to the replaced emissions unit, and serves the same function within the facility and process;

(ii) Has the same or lower capacity and potential emission rates;

(iii) Has the same or higher control efficiency, and stack parameters which are at least as effective in the dispersion of air pollutants;

(vi) Would not, when operated under applicable permit conditions, cause or contribute to a violation of any National or New Mexico Ambient Air Quality Standard; and

Modeling requirements for new permits or significant revisions:

20.2.72.203.A.4 NMAC

Contain a regulatory compliance discussion demonstrating compliance with each applicable air quality regulation, ambient air quality standard, prevention of significant deterioration increment, and provision of 20.2.72.400 NMAC - 20.2.72.499 NMAC. The discussion must include an analysis, which may require use of US EPA-approved air dispersion model(s), to (1) demonstrate that emissions from routine operations will not violate any New Mexico or National Ambient Air Quality Standard or prevention of significant deterioration increment, and (2) if required by 20.2.72.400 NMAC - 20.2.72.499 NMAC, estimate ambient concentrations of toxic air pollutants.

2.1.3 NSR Permitting for Major Sources

PSD major sources and major modifications have additional modeling requirements beyond those of minor sources. PSD major source modeling authority is contained here:

20.2.74.305 NMAC AMBIENT AIR QUALITY MODELING: All estimates of ambient concentrations required by this Part shall be based on applicable air quality models, data bases, and other requirements as specified in EPA's Guideline on Air Quality Models (EPA-450/2-78-027R, July, 1986), its revisions, or any superseding EPA document, and approved by the Department. Where an air quality impact model specified in the Guideline on Air Quality Models is inappropriate, the model may be modified or another model substituted. Any substitution or modification of a model must be approved by the Department. Notification shall be given by the Department of such a substitution or modification and the opportunity for public comment provided for in fulfilling the public notice requirements in subsection B of 20.2.74.400 NMAC. The Department will seek EPA approval of such substitutions or modifications.

2.2 Air pollutants

Emissions of Sulfur Dioxide (SO_2), Total Suspended Particulates (TSP), Particulate matter with an aerodynamic diameter of less than or equal to 10 micrometers (PM_{10}), Particulate matter with an aerodynamic diameter of less than or equal to 2.5 micrometers ($PM_{2.5}$), Carbon Monoxide (CO), Nitrogen Dioxide (NO_2), Lead (Pb), Hydrogen sulfide (H_2S), and air toxics as listed in 20.2.72 NMAC are pollutants that may require modeling. Ozone and Volatile Organic Compound (VOC) emissions do not currently require a modeling analysis for a PSD minor source. 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.

2.3 Modeling Exemptions and Reductions

2.3.1 Modeling waivers

In some cases, the demonstration that ambient air quality standards and PSD increments will not be violated can be satisfied with a discussion of previous modeling. If emissions have been modeled using current modeling procedures and air quality standards, then the modeling waiver form may be submitted to request approval of a modeling waiver. The Bureau will determine on a case-by-case basis if the modeling waiver can be granted. The waiver discussion and written waiver approval should be included in the modeling section of the application.

The Bureau has performed generic modeling to demonstrate that the following small sources do not need modeling. Permitting staff must approve the total emission rates during the permitting process for this waiver to be valid.

Table 1. Very small emission rate modeling waiver requirements

Pollutant	If all emissions come from stacks 20 feet or greater in height and there are no horizontal stacks or raincaps (lb/hr)	If not all emissions come from stacks 20 feet or greater in height, or there are horizontal stacks, raincaps, volume, or area sources (lb/hr)
CO	50	2
H_2S (Pecos-Permian Basin)	0.1	0.02
H_2S (Not in Pecos-Permian Basin)	0.01	0.002
Lead	No waiver	No waiver
NO_2	2	0.025
PM2.5	0.3	0.015
PM10	1.0	0.05
TSP	5	0.25
SO_2	2	0.025
Reduced sulfur (Pecos-Permian Basin)	0.033	No waiver
Reduced sulfur (Not in Pecos-Permian Basin)	No waiver	No waiver

2.3.2 General Construction Permits (GCPs)

General Construction Permits do not require modeling. General modeling was performed in the development of these permits.

2.3.3 Streamlined Compressor Station Modeling Requirements

Compressor stations may be eligible for streamlined permits under the authority of **20.2.72.300-399 NMAC**. Streamlined permits have reduced modeling analysis requirements.

Streamlined Compressor Station Location Requirements

Restrictions preventing use of streamlined permits in certain locations are listed in **20.2.72.301 NMAC**. Those restrictions dealing with location are described below.

According to **20.2.72.301.B.4 NMAC**, the facility cannot co-locate with petroleum refineries, chemical manufacturing plants, bulk gasoline terminals, natural gas processing plants, or at any facility containing sources in addition to IC engines and/or turbines for which an air quality permit is required through state or federal air quality regulations.

20.2.72.301.B.5 NMAC restricts the location of streamlined permit in areas predicted by air quality monitoring or modeling to have more than 80% of state or federal ambient air quality standards or PSD increments consumed. Table 2, below, is a list of these areas. This restriction means that any streamlined permit applicant wishing to locate in a non-attainment area or those areas listed in Table 2 must demonstrate, using air dispersion modeling, that the entire facility will not produce any concentrations above significance levels.

Table 2. Areas Where Streamlined Permits Are Restricted

County	Range	Township	Sections
Chaves	15E	4S	35
Chaves	24E	9S	29
Eddy	26E	18S	26
Eddy	27E	18S	1, 11-13, 17
Eddy	32E	20S	31
Grant	15W	19S	10, 14-16, 21-22, 27-28
Hidalgo	17W	29S	13
Hidalgo	17W	29S	24
Lea	32E	17S	20-21, 28-29
Lea	33E	17S	20, 29
Lea	33E	15S	4-5
Lea	33E	14S	32-33
Lea	34E	18S	1-2
Lea	34E	17S	25-26, 35-36
Lea	35E	21S	1
Lea	35E	21S	12-13
Lea	36E	21S	6-7, 18, 26-27, 34-35
Lea	36E	20S	1-2, 36
Lea	37E	25S	4-5
Lea	37E	24S	5-6, 28-29, 32-33
Lea	37E	23S	31-32
Lea	37E	22S	2-4, 13-14, 27-28, 33-34
Lea	37E	21S	28, 33-35
Lea	37E	19S	29
Lea	37E	15S	2-3, 10-11
Lea	38E	19S	5-6
Lea	38E	18S	31-32
Lincoln	12E	3S	3, 9-11, 15
Luna	11W	24S	3-4, 9
Luna	11W	23S	34
McKinley	17W	15N	9, 16
McKinley	13W	13N	4-5
McKinley	6W	20N	33
Roosevelt	36E	8S	15
San Juan	17W	19N	9-10, 15-16
San Juan	15W	28N	6
San Juan	15W	29N	1
San Juan	12W	26N	15-17
San Juan	11W	28N	13-14
San Juan	11W	29N	14-15

20.2.72.301.B.6 NMAC prohibits the location of streamline permit from use in areas if the nearest property boundary will be located less than:
(a) 1 kilometer (km) from a school, residence, office building, or occupied structure. Buildings and structures within the immediate industrial complex of the source are not included.
(b) 3 km from the property boundary of any state park, Class II wilderness area, Class II national wildlife refuge, national historic park, state recreation area, or community with a population of more than twenty thousand people.

Table 3. List of state parks, Class I areas, Class II wilderness areas, Class II national wildlife refuges, national historic parks, and state recreation areas

County	Name	Type	Min. Distance (km)
Bernalillo	Sandia Mountain Wilderness	State Wilderness	3
Catron	Gila Wilderness	Class I Area	30
Catron	Gila Cliff Dwelling	National Monuments	3
Catron	Datil Well	Recreation Sites	3
Chaves	Bottomless Lake	Class II State Parks	3
Chaves	Salt Creek Wilderness Area	Class I Area	30
Chaves	Bitter Lake National W.R.	Class II Wildlife Refuge	3
Cibola	Bluewater Lake	Class II State Parks	3
Cibola	El Malpais	National Monuments	3
Cibola	El Morro	National Monuments	3
Colfax	Cimarron Canyon	Class II State Parks	3
Colfax	Maxwell National W.R.	Class II Wildlife Refuge	3
Colfax	Capulin	National Monuments	3
DeBaca	Sumner Lake	Class II State Parks	3
DeBaca	Ft. Sumner	State Monuments	3
Dona Ana	Leesburg Dam	Class II State Parks	3
Dona Ana	Aguirre Springs	Recreation Sites	3
Dona Ana	Ft. Seldon	State Monuments	3
Eddy	Carlsbad Caverns National Park	Class I Area	30
Eddy	Living Desert	Class II State Parks	3
Grant	Gila Wilderness	Class I Area	30
Grant	City of Rocks	Class II State Parks	3
Guadalupe	Santa Rosa Lake	Class II State Parks	3
Harding	Chicosa Lakes	Class II State Parks	3
Harding	Kiowa National Grasslands	National Grasslands	3
Lea	Harry McAdams	Class II State Parks	3
Lincoln	White Mountain Wilderness	Class I Area	30
Lincoln	Valley of Fires	Class II State Parks	3
Lincoln	Lincoln	State Monuments	3
Luna	Pancho Villa	Class II State Parks	3
Luna	Rock Hound	Class II State Parks	3
McKinley	Red Rock	Class II State Parks	3
Mora	Coyote Creek	Class II State Parks	3
Mora	Ft. Union	National Monuments	3
Otero	Oliver Lee	Class II State Parks	3
Otero	White Sands	National Monuments	3
Otero	Three Rivers Petro	Recreation Sites	3
Quay	Ute Lake	Class II State Parks	3
Rio Arriba	San Pedro Parks Wilderness	Class I Area	30
Rio Arriba	El Vado Lake	Class II State Parks	3
Rio Arriba	Heron Lake	Class II State Parks	3
Rio Arriba	Navajo Lake (Sims)	Class II State Parks	3
Rio Arriba	Chama River Canyon Wilderness	State Wilderness	3
Roosevelt	Oasis	Class II State Parks	3

County	Name	Type	Min. Distance (km)
Roosevelt	Grulla National W.R	Class II Wildlife Refuge	3
San Juan	Navajo (Pine)	Class II State Parks	3
San Juan	Chaco Canyon	National Historic Park	3
San Juan	Aztec Ruins	National Monuments	3
San Juan	Angel Peak (National)	Recreation Area	3
San Miguel	Conchas Lake	Class II State Parks	3
San Miguel	Storey Lake	Class II State Parks	3
San Miguel	Villanueva	Class II State Parks	3
San Miguel	Las Vegas National W.R.	Class II Wildlife Refuge	3
San Miguel	Pecos	National Monuments	3
Sandoval	Bandelier Wilderness	Class I Area	30
Sandoval	Coronado	Class II State Parks	3
Sandoval	Rio Grande Gorge/Fenton Lake	Class II State Parks	3
Sandoval	Bandelier	National Monuments	3
Sandoval	Sandia Crest (State)	Recreation Area	3
Sandoval	Coronado	State Monuments	3
Sandoval	Jemez	State Monuments	3
Sandoval	Sandia Mountain Wilderness	State Wilderness	3
Santa Fe	Hyde Memorial	Class II State Parks	3
Sierra	Caballo Lake	Class II State Parks	3
Sierra	Elephant Butte Lake	Class II State Parks	3
Sierra	Percha Dam	Class II State Parks	3
Socorro	Bosque del Apache Wilderness	Class I Area	30
Socorro	Sevillita National W.R.	Class II Wildlife Refuge	3
Taos	Pecos Wilderness	Class I Area	30
Taos	Wheeler Park Wilderness	Class I Area	30
Taos	Kit Carson	Class II State Parks	3
Taos	Rio Grande Gorge	Recreation Sites	3
Taos	Latir Peak Wilderness	State Wilderness	3
Torrance	Manzano Mountain	Class II State Parks	3
Torrance	Grand Guivira	National Monuments	3
Torrance	Quarai at Salinas	National Monuments	3
Torrance	Abo at Salinas	State Monuments	3
Torrance	Manzano Mountain Wilderness	State Wilderness	3
Union	Clayton Lake	Class II State Parks	3
Valencia	Sen. Willie Chavez	Class II State Parks	3
Valencia	Manzano Mountain Wilderness	State Wilderness	3

(c) 10 km from the boundary of any community with a population of more than forty-thousand people, or
(d) 30 km from the boundary of any Class I area;

20.2.72.301.B.7 NMAC prohibits the location of streamline permit in Bernalillo County or within 15 km of the Bernalillo County line.

Streamlined Compressor Station Modeling and Public Notice Requirements

Modeling and public notice requirements for streamlined compressor station permits depend on the amount of emissions from the facility. Refer to the table below, using the maximum of the Potential to Emit (PTE) of each regulated contaminant from all sources at the facility to determine applicability. The potential to emit for nitrogen dioxide shall be based on total oxides of nitrogen. The effects of building downwash shall be included in modeling if there are buildings at the site.

Table 4. Streamlined Permit Applicability Requirements for facilities with less than 200 tons/year PTE

Applicable Regulation	PTE (tpy)	Modeling Requirements (from 20.2.72.301 D NMAC)
20.2.72.301 D (1)	<40	• None
20.2.72.301 D (2)	<100	• The impact on ambient air from all sources at the facility shall be less than the ambient significance levels.
20.2.72.301 D (3)	<200	• Air quality impacts must be less than 50% of all applicable NAAQS, NMAAQS and PSD increments. • There shall be no adjacent sources emitting the same air contaminant(s) as the source within 2.5 km of the modeled NO_2 impact area. • The sum of all potential emissions for NO_X from all adjacent sources within 15 km of the NO_X ROI must be less than 740 tons/year. • The sum of all potential emissions for NO_X from all adjacent sources within 25 km of the NO_X ROI must be less than 1540 tons/year.

There are other criteria that must be met for streamlined permits for compressor stations. Please refer to **20.2.72.300-399 NMAC** for more information.

2.3.4 Exempt Equipment

Exempt equipment under 20.7.72.202 NMAC do not need to be included in modeling for 20.2.72 NMAC permits. The exemption does not exclude them from modeling requirements under other types of permits, such as 20.2.70 NMAC or 20.2.74 NMAC.

2.4 Levels of Protection

2.4.1 Significance Levels

Modeling significance levels are thresholds below which the source is not considered to contribute to any predicted exceedance of air quality standards or PSD increments. The definition of ‘source’ can apply to the whole facility or to the modifications at the facility. In cases where a particular averaging period has not been modeled for a pollutant, or was modeled, but predicted concentrations were above 95% of air quality standards or PSD increments, then NMED considers the entire facility to be the ‘source’ for those pollutants and periods. For other cases, ‘source’ includes only the modification described in the current application plus all contemporaneous emissions increases in the past 5 years since the entire facility was last modeled.

Example of source to model for permitting:

The entire facility was modeled for annual NO_2 and 1-hour and 8-hour CO in 1999 but was never modeled for 1-hour NO_2. Each of the modeled pollutants was predicted to be below 95% of the standards and PSD increments. The facility submits an application to replace an engine. No changes were made to the facility before this application since the previous permit. The engine emits only NO_2 and CO, so modeling review is applicable for these pollutants. For CO and for annual NO_2, the applicant may model only the replacement engine. If the impacts from the engine alone are below significance levels, then modeling is done for that pollutant/averaging period. (This is assumed for the rest of the example). If the impacts from the engine alone are above significance levels, then the entire facility plus nearby sources must be modeled for comparison with air quality standards and PSD increments. Since 1-hour NO_2 had never been modeled, the entire facility is considered the source for comparison with significance levels. If a different engine is replaced the following year the single engine is the source for 1-hour NO_2, and the two engines from the two modifications are the source for the other averaging periods and pollutants.

Significance levels are listed in **20.2.72.500 NMAC** and are repeated in the sections below. Always use the maximum predicted concentration from the source for radius of impact/significance level determination. Even if the form of the standard allows it to be exceeded a number of times per period, that fraction is based on cumulative concentration and cannot be related to partial concentrations. If multiple years of meteorological data are used, then the average of those concentrations is compared with the significance level, except for $PM_{2.5}$ and 1-hour SO_2, for which the maximum across multiple years is compared with the significance level.

Use of the $PM_{2.5}$ significant ambient concentration level or significant monitoring concentration for PSD major modifications or new PSD major sources is not allowed. This significant ambient concentration level may still be used for minor source permitting.

2.4.2 Air Quality Standards

Air quality standards are maximum allowable concentrations that are designed to protect the most sensitive individuals from harm from airborne pollutants. National Ambient Air Quality Standards (NAAQS) and New Mexico Ambient Air Quality Standards (NMAAQS) are explained below. Unless otherwise noted, standards are not to be exceeded.

2.4.3 Prevention of Significant Deterioration (PSD) Increments

In order to prevent relatively clean areas from degrading to levels just barely in compliance with the air quality standards, limits on the change have been established in the form of PSD increments. Compliance demonstrations for PSD increments demonstrate that the deterioration is less than the allowable increment.

List of State air quality standards:
http://www.nmcpr.state.nm.us/nmac/parts/title20/20.002.0003.htm

2.5 Concentration Conversions

Many of the air quality standards are written in the form of parts per million (ppm) or parts per billion (ppb), but the models generally give output in units of micrograms per cubic meter ($\mu g/m^3$) at local temperature and pressure conditions. NMED approves the use of the following method to convert concentrations. NMAAQS are defined at actual value, and are dependent on the elevation of targeted receptors where the concentration is predicted. NAAQS are defined at standard reference values, but monitored or modeled concentrations are adjusted to standard conditions before comparing. In order to

simplify standard calculation in μg/m^3, the elevation of the highest receptor may be used. Conversion of background concentrations should use the same equation being used to evaluate the standard.

2.5.1 Gaseous Conversion Factor for Elevation and Temperature Correction

The following equation calculates the conversion from μg/m^3 to ppm, with appropriate corrections for temperature and pressure (elevation):

$$ppm = 4.553 \times 10^{-5} \times \frac{C \times T}{M_w} \times 10^{Z \times 1.598 \times 10^{-5}}$$

or, rearranged to calculate μg/m^3:

$$C = ppm \times M_W / (T \times (4.553\ E\ -5) \times (10^{Z \times 1.598\ E\ -5}))$$

where:

C = component concentration in μg/m^3.
T = average summer morning temperature in Rankin at site (typically 530 R).
M_w = molecular weight of component.
Z = site elevation, in feet.

2.5.2 Gaseous Conversion Factor at Standard Temperature and Pressure (STP) Conditions

Federal standards are expressed as mass per unit volume or ppm or ppb under standard temperature and pressure.

> "40 CFR 50.3 Reference conditions.
> All measurements of air quality that are expressed as mass per unit volume (e.g., micrograms per cubic meter) other than for particulate matter (PM2.5) standards contained in §§ 50.7 and 50.13 and lead standards contained in § 50.16 shall be corrected to a reference temperature of 25 (deg) C and a reference pressure of 760 millimeters of mercury (1,013.2 millibars)."

If a monitored or modeled concentration has been adjusted to STP, then the following equation calculates the conversion from ppm to μg/m^3 for NAAQS:

$$C = ppm \times M_w \times 40.8727$$

or, rearranged to calculate ppm:

$$ppm = C / (M_w \times 40.8727)$$

where:

C = component concentration in μg/m^3.
M_w = molecular weight of component.

$$p = p_0 \cdot \left(1 - \frac{L \cdot h}{T_0}\right)^{\frac{g \cdot M}{R \cdot L}} \approx p_0 \cdot \exp\left(-\frac{g \cdot M \cdot h}{R \cdot T_0}\right),$$

Parameter	Description	Value
p_0	sea level standard atmospheric pressure	101325 Pa
L	temperature lapse rate	0.0065 K/m
T_0	sea level standard temperature	288.15 K
g	Earth-surface gravitational acceleration	9.80665 m/s^2
M	molar mass of dry air	0.0289644 kg/mol
R	universal gas constant	8.31447 J/(mol•K)

$[PM10]_{STP} = [PM10]_{modeled} (P_{standard})(T_{measured})/((P_{calculated\ by\ elevation})(T_{standard}))$

Federal standards have been expressed below in units of μg/m^3.

2.6 Modeling the Standards and Increments

Unless otherwise specified, the discussion of the standards assumes one year of representative meteorological data is used. For multiple years of data, some pollutants use the average of the values predicted for each year as the design value. Others (including PM2.5, CO, Pb, and 24-hr TSP) use the maximum value from the multiple years of data. Verify the form of the standard in regulations and EPA memos if multiple years of meteorological data are being used. Background concentrations are averaged over three years unless otherwise specified.

In cases where all the emissions of the pollutant in question are emitted from permitted sources, the nearby sources may be modeled instead of adding the background concentration. CO, NO_2, and SO_2 may use this substitution if they are over 10 km from the center of Albuquerque and El Paso. To use this substitution, include all nearby sources.

2.6.1 Carbon Monoxide (CO) Standards

Table 5A: Carbon Monoxide Air Quality Standards

Averaging Period	Significance Level (μg/m^3)	NAAQS (ppm)	NMAAQS (ppm)
8-hour	500	9	8.7
1-hour	2,000	35	13.1

2.6.1.1 Design value of CO standard.

CO NAAQS are not to be exceeded more than once per year. NMAAQS are not to be exceeded. Demonstration of compliance with CO NMAAQS automatically demonstrates compliance with NAAQS.

2.6.1.2 Modeling for the CO design value.

Tier 1, 1-hour NMAAQS: Model the entire facility to determine the high 1-hour concentration. Add the high 1-hour background concentration to the high 1-hour predicted concentration to determine the total design concentration for comparison to the 1-hour NMAAQS.

Tier 1, 8-hour NMAAQS: Model the entire facility to determine the high 8-hour concentration. Add the high 8-hour background concentration to the high 8-hour predicted concentration to determine the total design concentration for comparison to the 8-hour NMAAQS.

Optionally, all nearby sources may be modeled instead of adding a background concentration, if the facility is over 10 km from the center of Albuquerque and El Paso.

Tier 2: Hourly background concentrations may be added instead of the maximum concentrations for each averaging period.

2.6.2 Hydrogen sulfide (H_2S) Standards

Table 5B: Hydrogen Sulfide Air Quality Standards

Averaging Period	Significance Level ($\mu g/m^3$)	NMAAQS	Notes
1-hour	1.0	0.010 ppm	For the state, except for the Pecos-Permian Basin Intrastate AQCR. Not to be exceeded more than once per year.
1/2-hour	5.0	0.10 ppm	For the Pecos-Permian Basin Intrastate AQCR
1/2-hour	5.0	0.030 ppm	for within 5-miles of the corporate limits of municipalities within the Pecos-Permian Basin AQCR

Design value of standard: For modeling ½-hour H_2S NMAAQS, use the 1-hour averaging time because the models cannot resolve less than one hour increments.

Model the entire facility and any nearby sources and compare the high 1-hour concentration to the standard for that region. No background concentration is added.

2.6.3 Lead (Pb) Standards

Table 5C: Lead Air Quality Standards

Averaging Period	Significance Level ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
Quarterly	0.03	0.15

Design value of standard: For modeling quarterly lead averages, use the monthly averaging period as a conservative approach, unless the model being used has a quarterly averaging period or post-processing is desired to calculate quarterly values. Model the entire facility without surrounding sources and compare the high month concentration to the standard. No background concentration is added.

2.6.4 Nitrogen Dioxide (NO_2) Standards

Table 5D: NO_2 Air Quality Standards

Averaging Period	Significance Level ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	NMAAQS (ppb)	Class II PSD Increment ($\mu g/m^3$)	Class I PSD Significance Level ($\mu g/m^3$)	Class I PSD Increment ($\mu g/m^3$)
annual	1.0	99.67[2]	50	25	0.1[8]	2.5
24-hour	5.0		100			
1-hour	7.52[1]	188.06[3]				

[1] EPA proposed significance level of 4 ppb corrected to a reference temperature of 25ºC and a reference pressure of 760 millimeters of mercury.
[2] NAAQS of 53 ppb corrected to a reference temperature of 25ºC and a reference pressure of 760 millimeters of mercury.
[3] NAAQS of 100 ppb corrected to a reference temperature of 25ºC and a reference pressure of 760 millimeters of mercury.

2.6.4.1 Design value of NO_2 standard

Demonstration of compliance with 1-hour standard is automatically a demonstration of compliance with the 24-hour NMAAQS. Otherwise, the 24-hour NO_2 standard is compared with the highest 24-hour average calculated by the model.

The annual NMAAQS design value is determined by modeling the entire facility and adding the annual background concentration. The total is compared to the standard. Optionally, to determine the total design value, the facility and all nearby sources may be modeled instead of adding a background concentration if the facility is over 10 km from the center of Albuquerque and El Paso..

The annual NO_2 PSD increment is compared with the annual average calculated by the model.

The 1-hour NO_2 standard is compared with the 3-year average of the 98th-percentile of the annual distribution of daily maximum 1-hour concentrations. If one year of on-site meteorological data is used, the 98th-percentile value associated with the 1-year period of meteorological data modeled is the design value. Each day of modeling, the maximum 1-hour concentration is determined for each receptor. The high-eighth-high value at each receptor is calculated, and the maximum of these is compared with the standard. If multiple years are modeled, the maximum value is averaged over the span of years before comparing with standards.

2.6.4.2 NO_2 Reactivity

Combustion processes emit nitrogen oxides in the forms of nitrogen oxide (NO) and nitrogen dioxide (NO_2). Only the concentration of NO_2 is regulated by air quality standards; however, emissions of nitrogen oxides ($NO_X = NO + NO_2$) must be modeled in order to estimate total NO_2 concentrations because nitrogen oxides change form in the atmosphere.

Two key reactions are most important in determining the equilibrium (or quasi-equilibrium) ratio of NO_2 to NO.

$NO + O_3 \rightarrow NO_2 + O_2$

$NO_2 + h\nu$ (energy) $\rightarrow NO + O$

Many other reactions participate in the determination of the atmospheric concentration of NO_2. As the plume travels away from the stack, more and more ozone diffuses into the plume, enabling the relatively quick reaction to form NO_2.

2.6.4.3 Estimating NO_2 concentrations

The Bureau has approved techniques, described below, for estimating NO_2 concentrations from NO_X point sources. Note that NO_2 emissions reported by the emissions inventory are actually NO_X emissions.

Tier 1, Total Conversion Technique: 100% conversion

This technique assumes all of the NO_X is converted to NO_2. This simple technique is suitable for small facilities where compliance with standards is not a problem.

Tier 2, Fixed Rate Conversion Technique

A fixed rate of conversion may be applied to estimate NO_2 concentrations. The fixed rate of conversion of 75%, which is the Ambient Ratio Method (ARM) default adopted in the Guideline on Air Quality Models, is approved in most cases. Site-specific ozone monitoring data may be used to derive an ARM different from the default. EPA may require extra justification for the use of 75% conversion for new PSD major sources or major modifications for 1-hour NO_2 standard, but has approved 80% conversion without additional justification. 40% conversion from NO_X to NO_2 may be used for demonstrating compliance with the 24-hour NO_2 NMAAQS, provided that an in-stack NO_2/NO_X ratio of 0.4 or below can be justified with data.

ARM2 method is included as an option in AERMOD. This method is approved for minor source permitting actions without EPA approval. The default minimum ambient ratio is 0.2 and the default maximum ratio is 0.9. The minimum ratio used should not be below the maximum in-stack NO_2/NO_X ratio at the facility being modeled.

Tier 3, Ozone Reaction Techniques

Two methods take into account the ozone that mixes into the plumes and encourages NO_2 formation: Ozone Limiting Method (OLM) and Plume Volume Molar Ratio Method (PVMRM). Both these techniques are accepted and are built into AERMOD.

OLM assumes an NO_2 plume and an NO plume are each dispersing. The in-stack ratio of NO_2/NO_X is used to determine the amount of nitrogen in each plume. The concentration of NO at each receptor is assumed to react stoichiometrically with the background ozone concentration at that time to form NO_2. Contributions from both plumes are added to get the NO_2 concentration at that time.

PVMRM works similarly to OLM, but uses the total volume of the plume by the time it reaches the receptor to calculate how much ozone is available for reaction. Both methods result in greater conversion with greater distance from the source, but use different approximations for determining how much ozone has dispersed into the plume.

Both methods require additional information.

For equilibrium NO_2/NO_X ratio, the value of 0.9 is approved.

For in-stack NO_2/NO_X ratio, values must be justified with data. Combustion involving excess oxygen results in higher NO_2/NO_X ratios than do stoichiometric reactions. The facility may use a ratio of 0.5 without justification. Surrounding sources, if required, may be modeled with a default of 0.3 without justification.

Recent ozone data representative of the area should be used. See the section on background concentrations for more information.

Special techniques are required to model PSD increment with OLM or PVMRM if increment-expanding sources are being modeled. No negative emission rates can be used. See *ADDENDUM, USER'S GUIDE FOR THE AMS/EPA REGULATORY MODEL – AERMOD (EPA-454/B-03-001, September 2004)*, Pg. 25, for more details on the PSDCREDIT option**.** **(http://www.rflee.com/RFL_Pages/AERMOD_USERGUIDE_ADDENDUM_06341.pdf)**

Combined-Plume Option vs. Indivudual-Plume Option
AERMOD provides two options for calculating ozone-limited NO_2 concentrations, the "plume-by-plume" (INDVDL) calculation, and the combined plume (SRCGRP) calculation. The Bureau has accepted a general demonstration that if two plumes are impacting the same receptor at the same time, then the two plumes have merged. If the plumes do not impact the same receptor at the same time, then the plumes have not merged, but both options will calculate the same concentration for that hour. Therefore, the Bureau will accept either INDVL or SRCGP option without additional demonstrations.

2.6.4.4 Modeling for the 1-hour NO_2 design value

Model the entire facility and add the maximum 1-hour background concentration to compare to the design value. Optionally, all nearby sources may be modeled instead of adding a background concentration if the facility is over 10 km from the center of Albuquerque and El Paso, Texas. Refined hourly background concentrations may be used instead of the maximum 1-hour concentration as described in the section on background concentrations.

Before attempting to calculate the design value, first locate the areas with highest overall concentrations. Place a few receptors in these areas and re-run the model in these areas. The maximums will occur in nearly the same places.

Maximum modeled concentration may also be used as a conservative approximation of the design value.

Only calculate the design value for a small number of receptors that represent the maximum concentrations.

Step 1: ROI
To determine the modeling domain for 1-hour NO_2, run AERMOD, selecting the high-first-high concentration with no daily tables or POSTFILE options. 75% NO_X to NO_2 conversion may be assumed, but do not use OLM or PVMRM for ROI or significance determination.

Step 2: Identify areas with maximum concentrations:
Discard receptors beyond the radius of impact and add surrounding sources, if appropriate. Run AERMOD with PVMRM, OLM, or 75% conversion, selecting the high-eighth-high concentration with no daily tables or POSTFILE options. Place fine grids in areas of maximum concentration and re-run the model with the same options.
Step 3:
If all receptors demonstrate compliance, then the results may be reported and the modeling exercise ended. Optionally, the receptors with maximum concentrations may be modeled as described below to determine the design value.

If great numbers of receptors are predicting exceedances of standards at a time and place where the facility produces concentrations above significance levels, isolate the highest few dozen receptors and perform further analysis on those in order to see what sort of control devices or equipment removal will be required to come into compliance with standards. Removing the top 2% of concentrations will probably not reduce the maximum by much more than 20%. Once you have demonstrated compliance with these receptors, go back to step 1 with the new configuration.If there are less than a few hundred receptors with predicted exceedances, isolate those receptors and continue analysis with step 4.

Step 4:
1. "Run AERMOD for the selected meteorological data period, retaining hourly concentrations at each receptor for each hour within the modeled period using the hourly POSTFILE option (Note: PLOTFILEs will not provide the required data)"[2].
2. "From hourly AERMOD POSTFILE output (every hour of the modeled period), for each receptor, determine the maximum 1-hour concentration for each day of the data period."
3. "At each receptor, for each year modeled, determine the 8th-highest daily 1-hour maximum concentration from the distribution of 365 or 366 daily 1-hour maximum concentrations. The 8th-highest concentration is representative of the 98th-percentile concentration from the distribution of daily 1-hour maximum values."
If multiple years are modeled, continue with steps 4 and 5.
4. "At each receptor, average the 8th-highest daily 1-hour maximum concentrations across the modeled years."
5. "The highest of the average 8th-highest (98th-percentile) concentrations across all receptors, based on the length of the meteorological data period, represents the modeled 1-hour NO_2 design value based on the form of the standard."

2.6.4.5 Modeling for the annual NO_2 NMAAQS design value

Model the entire facility and add the annual background concentration to compare to the design value. Optionally, all nearby sources may be modeled instead of adding a background concentration if the facility is over 10 km from the center of Albuquerque and El Paso, Texas. (Use of hourly background concentrations does not affect the result for an annual average).

2.6.4.6 Modeling for the annual NO_2 PSD increment design value

Model all increment-consuming parts of the facility and increment-consuming nearby sources of the facility (or nearby sources of the Class I area for Class I analysis). Compare the result to the design value. All sources (not just increment affecting sources) will need to be modeled in order to take credit for increment expanding sources using OLM or PVMRM. See the AERMOD User's Guide Addendum for more details.

2.6.5 Ozone (O_3) Standards

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.

---

[1] All quoted sections in Step 4 are from EPA's Air Quality Modeling Group communication, "Notice Regarding Modeling for New Hourly NO2 NAAQS, Updated - 02/25/2010"

Table 5E: O_3 Air Quality Standards

Averaging Period	NAAQS
1-hour	(0.12 ppm) [2]
8-hour	0.07 ppm [1]

[1] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.07 ppm.
[2] The 1-hour standard has been vacated.
(a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is <= 1, as determined by appendix H.
(b) The 1-hour NAAQS will no longer apply to an area one year after the effective date of the designation of that area for the 8-hour ozone NAAQS. The effective designation date for most areas is June 15, 2004. (40 CFR 50.9; see Federal Register of April 30, 2004 (69 FR 23996).)

> "Simulation of ozone formation and transport is a highly complex and resource intensive exercise. Control agencies with jurisdiction over areas with ozone problems are encouraged to use photochemical grid models, such as the Models-3/Community Multi-scale Air Quality (CMAQ) modeling system, to evaluate the relationship between precursor species and ozone." --68234 Federal Register / Vol. 70, No. 216 / Wednesday, November 9, 2005 / Rules and Regulations

In accordance with this guidance, NMED performs ozone modeling on a regional scale as need arises, rather than requiring permit applicants to quantify their contribution to a regional ozone concentration. Comprehensive ozone modeling is too resource intensive to attach this expense to a typical permit application, and screening modeling on an affordable scale currently cannot quantify a source's impacts to ambient ozone concentrations.

Regional ozone modeling for the Four Corners area was done in 2009 (see http://www.nmenv.state.nm.us/aqb/4C/Modeling.html) and the Air Quality Bureau is continuing to analyze ozone in the region.

2.6.6 Particulate matter less than 2.5 micrometers in aerodynamic diameter ($PM_{2.5}$) Standards

Table 5F: $PM_{2.5}$ Air Quality Standards[3]

Averaging Period	Significance Level [4] ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	Class II PSD Increment[3] ($\mu g/m^3$)	Class I PSD Significance Level ($\mu g/m^3$)	Class I PSD Increment[3] ($\mu g/m^3$)
annual	0.3	15 [1]	4	0.06	1
24-hour	1.2	35 [2]	9	0.07	2

[3] Prevention of Significant Deterioration (PSD) for Particulate Matter Less Than 2.5 Micrometers (PM2.5) – Increments, Significant Impact Levels (SILs) and Significant Monitoring Concentration (SMC), ENVIRONMENTAL PROTECTION AGENCY
40 CFR Parts 51 and 52, RIN 2060-AO24 http://www.epa.gov/nsr/documents/20100929finalrule.pdf

[1] To attain this standard, the 3-year average of the annual arithmetic mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 ug/m^3.
[2] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 ug/m^3.
[3] For any period other than an annual period, the applicable maximum allowable increase may be exceeded during one such period per year at any one location.
[4] Use of the $PM_{2.5}$ significant ambient concentration level or significant monitoring concentration for PSD major modifications or new PSD major sources is not allowed. This significant ambient concentration level may still be used for minor source permitting.

2.6.6.1 $PM_{2.5}$ design value

The 24-hour design value is the 98th percentile of the combined concentrations from all sources. The annual design value is the annual average.

2.6.6.2 Modeling for the 24-hour $PM_{2.5}$ design value

AERMOD and current emissions inventories currently do not account for secondary formation of $PM_{2.5}$ in the atmosphere. Sources that emit at least 40 tons per year of NO_X or at least 40 tons per year of SO_2 are considered to emit significant amounts of precursors. PSD major sources that emit significant amounts of precursors must qualitatively and/or quantitatively account for secondary formation of $PM_{2.5}$.[4] Minor sources that emit at these rates may qualitatively and/or quantitatively account for secondary PM2.5 formation, or they may add the maximum modeled PM2.5 concentration to the 98th percentile background concentration.

Two tiers of modeling are available for $PM_{2.5}$ modeling. Both tiers include modeling the facility and nearby sources and adding a background concentration to that. Particulate sources typically have impacts in the immediate vicinity of the source that are not represented in background monitors, so double-counting of background concentrations is expected to be limited.

For sources that have accounted for secondary $PM_{2.5}$, add the design value of the modeled direct $PM_{2.5}$ to the design value of the secondary $PM_{2.5}$ and the design value of the background $PM_{2.5}$. For sources that have not accounted for secondary $PM_{2.5}$, add the maximum modeled direct $PM_{2.5}$ to the design value of the background $PM_{2.5}$. [5]

Tier 1: To the modeled concentration(s), add the 98th percentile 24-hour monitored background concentration.
Tier 2: Add monthly or quarterly maximum background concentrations to daily modeled concentrations. Compare the maximum total to the standard. If the facility does not emit significant amounts of secondary $PM_{2.5}$ precursors or the secondary formation is accounted for, then the high-eighth-high combined concentration may be compared with the 24-hour standard. If multiple years of meteorological data are used, then the highest resulting 24-hour concentration from those years is compared with the

---

[4] Guidance for PM2.5 Permit Modeling, Stephen D. Page, May 20, 2014.
http://www.epa.gov/ttn/scram/guidance/guide/Guidance_for_PM25_Permit_Modeling.pdf
[5] Modeling Procedures for Demonstrating Compliance with $PM_{2.5}$ NAAQS, Stephen D. Page, March 23, 2010.
http://www.epa.gov/ttn/scram/guidance/clarification/Official%20Signed%20Modeling%20Proc%20for%20Demo%20Compli%20w%20PM2.5.pdf

standard, or the high-eighth-high combined concentration if the facility does not emit secondary $PM_{2.5}$ precursors or the secondary formation is accounted for.

2.6.6.3 Modeling for the 24-hour $PM_{2.5}$ PSD increment design value

Model all increment-consuming sources at the facility and at nearby sources. Compare the high predicted concentration with the allowable increment. If the facility does not emit secondary $PM_{2.5}$ precursors or the secondary formation is accounted for, then the high-second-high concentration may be compared with the 24-hour PSD increment.

2.6.6.4 Modeling for the annual $PM_{2.5}$ PSD increment design value

Model all increment-consuming sources at the facility and at nearby sources. Compare the predicted annual average concentration with the allowable increment.

2.6.7 Particulate matter less than 10 micrometers in aerodynamic diameter (PM_{10}) Standards

Table 5G: PM_{10} Air Quality Standards

Averaging Period	Significance Level (μg/m³)	NAAQS (μg/m³)	PSD Increment[2] Class II	PSD Class I Significance Level (μg/m³)	PSD Class I Increment[2] (μg/m³)
annual	1.0		17 μg/m³	0.2[1]	4
24-hour	5.0	150	30 μg/m³	0.3[1]	8

[1] EPA proposed significance level
[2] For any period other than an annual period, the applicable maximum allowable increase may be exceeded during one such period per year at any one location.

2.6.7.1 Modeling for the 24-hour PM_{10} NAAQS design value

If PM2.5 emission rates are modeled as equal to PM10 emission rates, then the PM2.5 NAAQS demonstration will satisfy the requirement for demonstration of compliance with PM10 NAAQS. However, PM10 PSD increment demonstration is not necessarily satisfied by any PM2.5 modeling.

The 24-hour NAAQS is not to be exceeded more than once per year.
Use high second high and a single year of representative meteorological data. This is approximately equivalent to the high fourth high specified in the multi-year analysis.
"…[W]hen n years are modeled, the (n+1)th highest concentration over the n-year period is the design value, since this represents an average or expected exceedance rate of one per year."
http://www.epa.gov/ttn/scram/guidance/guide/appw_05.pdf

Two tiers of modeling are available for PM_{10} NAAQS modeling. Both tiers include modeling the facility and nearby sources and adding a background concentration to that. Particulate sources typically have impacts in the immediate vicinity of the source that are not represented in background monitors, so double-counting of background concentrations is expected to be limited.

Tier 1, option 1: Use highest predicted concentration (instead of the high second high) and a single year of representative meteorological data. To the modeled concentration, add the high second high 24-hour monitored background concentration.

Tier 1, option 2: Use high second high predicted concentration and a single year of representative meteorological data. To the modeled concentration, add the highest 24-hour monitored background concentration.

Tier 2: Add monthly maximum background concentrations to daily modeled concentrations. The high-second-high combined concentration may be compared with the 24-hour standard.

2.6.7.2 Modeling for the 24-hour PM_{10} PSD increment design value

Model all increment-consuming sources at the facility and at nearby sources. Compare the high-second-high predicted concentration with the allowable increment.

2.6.7.3 Modeling for the annual PM_{10} PSD increment design value

Model all increment-consuming sources at the facility and at nearby sources. Compare the predicted annual average concentration with the allowable increment.

2.6.8 Total Suspended Particulates (TSP) Standards

Table 5H: TSP Air Quality Standards

Pollutant	Averaging Period	Significance Level ($\mu g/m^3$)	NMAAQS
Total Suspended Particulates (TSP)	7-day		110 $\mu g/m^3$
	30-day		90 $\mu g/m^3$
	annual	1.0	60$\mu g/m^3$ [1]
	24-hour	5.0	150$\mu g/m^3$

[1] annual geometric mean

2.6.8.1 TSP NMAAQS design value

If PM2.5 emission rates are modeled as equal to TSP emission rates, then the PM2.5 NAAQS demonstration will satisfy the requirement for demonstration of compliance with TSP NMAAQS.

TSP is interpreted by the modeling section as PM_{30}. If the applicant wants to use a larger diameter (i.e., PM_{50}) for TSP for sections of their facility, that is acceptable as long as any particle size distributions for plume depletion match the size used for that equipment and as long as the emission rate applied for matches the one used in the model.

There are no significance levels for the 30-day or 7-day averages. Assume that if a receptor is not significant for annual and 24-hour periods, then it is not significant for the other periods.

Design value of standard: The form of the annual TSP standard is the geometric mean. The models calculate annual arithmetic mean, so this approximation is normally used for all annual averaging periods.

For applications using post-processing files for TSP for other reasons, calculate the 7-day and 30-day average using hourly output in the POST file. Otherwise, use monthly period as an approximation of the 30-day period and assume the 7-day period is in compliance if the 24-hour averaging period is in compliance.

2.6.8.2 Modeling for the 24-hour TSP NMAAQS design value

Two tiers of modeling are available for TSP 24-hour NMAAQS modeling. Both tiers include modeling the facility and nearby sources and adding a background concentration to that. Particulate sources typically have impacts in the immediate vicinity of the source that are not represented in background monitors, so double-counting of background concentrations is expected to be limited.

Tier 1: Use highest predicted concentration and a single year of representative meteorological data. To the modeled concentration, add the high 24-hour monitored background concentration and compare to the 24-hour NMAAQS.

Tier 2: Add monthly maximum background concentrations to daily modeled concentrations. The high combined concentration may be compared with the 24-hour NMAAQS.

2.6.8.2 Modeling for the annual TSP NMAAQS design value

Add the annual background concentration to the annual modeling results from the facility and nearby sources to compare to the annual NMAAQS.

2.6.9 Sulfur Dioxide (SO_2) Standards

Table 5I: SO_2 Air Quality Standards

Averaging Period	Significance Level ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	NMAAQS (ppb)	PSD Class II Increment[3] ($\mu g/m^3$)	PSD Class I Significance Level ($\mu g/m^3$)	PSD Class I Increment[3] ($\mu g/m^3$)
annual	1.0		20	20 $\mu g/m^3$	0.1[2]	2
24-hour	5.0		100	91 $\mu g/m^3$	0.2[2]	5
3-hour	25.0	1309 [4]		512 $\mu g/m^3$	1.0[2]	25
1-hour	7.8[1]	196.4 [5]				

[1] EPA proposed 1-hour significance level of 3 ppb corrected to a reference temperature of 25°C and a reference pressure of 760 millimeters of mercury.
[2] EPA proposed significance level.
[3] For any period other than an annual period, the applicable maximum allowable increase may be exceeded during one such period per year at any one location.
[4] NAAQS of 500 ppb corrected to a reference temperature of 25°C and a reference pressure of 760 millimeters of mercury.
[5] NAAQS of 75 ppb corrected to a reference temperature of 25°C and a reference pressure of 760 millimeters of mercury.

2.6.9.1 SO_2 design value

In NMAC, the SO_2 standards for the area within 3.5 miles of the Chino Mines Company smelter furnace stack at Hurley are set equal to the federal standards. However, since this stack no longer exists, the distance is irrelevant. The NMAAQS listed in table 5I apply for the entire state.
Demonstration of compliance with 1-hour standard will also demonstrate compliance with the other standards, but not necessarily the PSD increments.

The form is the 3-year average of the 99th percentile of the annual distribution of daily maximum 1-hour average concentrations.

2.6.9.2 Modeling for the 1-hour SO_2 NAAQS

The standard is calculated similarly to the NO_2 1-hour standard instructions in section 2.6.4.4, but the fourth highest is used in place of the eighth highest (and 99th percentile is substituted for 98th percentile). All sulfur oxides are assumed to be in the form of SO_2. If multiple years are modeled, the resulting high-fourth-high values at each receptor are averaged over the years modeled and the maximum average value is compared with the standard.

Tier 1: Add the high 1-hour background concentration to 99th percentile modeling for the entire facility (without neighboring sources) and compare the total with the 1-hour NAAQS. Optionally, to determine the total design value, the facility and all nearby sources may be modeled instead of adding a background concentration if the facility is over 10 km from the center of Albuquerque and El Paso.

Tier 2: Add the hourly 1-hour background concentrations (as described in the background concentration section) to each hour of the modeling results and compare the 99th percentile of the totals with the 1-hour NAAQS. Optionally, to determine the total design value, the facility and all nearby sources may be modeled instead of adding a background concentration if the facility is over 10 km from the center of Albuquerque and El Paso.

2.6.9.3 Modeling for the 3-hour SO_2 PSD increment

Model the increment consuming emissions at the facility and at nearby sources and compare the high-second-high 3-hour average with the allowable PSD increment.

2.6.9.4 Modeling for the 24-hour SO_2 PSD increment

Model the increment consuming emissions at the facility and at nearby sources and compare the high-second-high 24-hour average with the allowable PSD increment.

2.6.9.5 Modeling for the annual SO_2 PSD increment

Model the increment consuming emissions at the facility and at nearby sources and compare the predicted annual average with the allowable PSD increment.

2.6.10 Total Reduced Sulfur Except For Hydrogen Sulfide Standards

Table 5J: Total Reduced Sulfur except for H_2S Air Quality Standards

Averaging Period	NMAAQS	Significance Level ($\mu g/m^3$)
1/2-hour	0.003 ppm	for the state, except for the Pecos-Permian Basin Intrastate AQCR
1/2-hour	0.010 ppm	for the Pecos-Permian Basin Intrastate AQCR
1/2-hour	0.003 ppm	For within corporate limits of municipalities within the Pecos-Permian Basin Intrastate Air Quality Control Region.
1/2-hour	0.003 ppm	For within five miles of the corporate limits of municipalities having a population of greater than twenty thousand and within the Pecos-Permian Basin Intrastate Air Quality Control Region

2.6.10.1 Total Reduced Sulfur design value

EPA test methods suggest that reduced sulfur compounds in some cases consist primarily of carbon disulfide (CS_2), carbonyl sulfide (COS), and hydrogen sulfide (H_2S). To calculate the parts per million of reduced sulfur, use the average molecular weight in the sample. For example, 1-heptanethiol ($CH_3[CH_2]6SH$) has a molecular weight of 132.3.

For modeling ½-hour total reduced sulfur NMAAQS, use the 1-hour averaging time because the models cannot resolve less than one hour increments.

2.6.10.2 Modeling the Total Reduced Sulfur ½-hour NMAAQS

Model the entire facility and compare the 1-hour predicted concentration with the ½-hour NMAAQS. Surrounding sources and background concentrations are not added.

Table 6A. Air Quality Standard Summary (Without Notes).

Pollutant	Avg. Period	Sig. Lev. ($\mu g/m^3$)	Class I Sig. Lev. ($\mu g/m^3$)	NAAQS	NMAAQS	PSD Increment Class I	PSD Increment Class II
CO	8-hour	500		9,000 ppb	8,700 ppb		
	1-hour	2,000		35,000 ppb	13,100 ppb		
H_2S	1-hour	1.0			10 ppb		
	1/2-hour	5.0			100 ppb		
	1/2-hour	5.0			30 ppb		
Pb	Quarterly	0.03		0.15 $\mu g/m^3$			
NO_2	annual	1.0	0.1	99.67 $\mu g/m^3$	50 ppb	2.5 $\mu g/m^3$	25 $\mu g/m^3$
	24-hour	5.0			100 ppb		
	1-hour	7.54		188.06 $\mu g/m^3$			
O_3	8-hour			70 ppb			
$PM_{2.5}$	annual	0.3	0.06	12 $\mu g/m^3$		1 $\mu g/m^3$	4 $\mu g/m^3$
	24-hour	1.2	0.07	35 $\mu g/m^3$		2 $\mu g/m^3$	9 $\mu g/m^3$
PM_{10}	annual	1.0	0.2			4 $\mu g/m^3$	17 $\mu g/m^3$
	24-hour	5.0	0.3	150 $\mu g/m^3$		8 $\mu g/m^3$	30 $\mu g/m^3$
TSP	7-day				110 $\mu g/m^3$		
	30-day				90 $\mu g/m^3$		
	annual	1.0			60$\mu g/m^3$		
	24-hour	5.0			150$\mu g/m^3$		
SO_2	annual	1.0	0.1		20 ppb	2 $\mu g/m^3$	20 $\mu g/m^3$
	24-hour	5.0	0.2		100 ppb	5 $\mu g/m^3$	91 $\mu g/m^3$
	3-hour	25.0	1.0	1309 $\mu g/m^3$		25 $\mu g/m^3$	512 $\mu g/m^3$
	1-hour	7.8		196.4 $\mu g/m^3$			
Reduced S	1/2-hour				3 ppb		
	1/2-hour				10 ppb		

Table 6B. Standards for which Modeling is not Required.

Standard not Modeled	Surrogate that Demonstrates Compliance
CO 8-hour NAAQS	CO 8-hour NMAAQS
CO 1-hour NAAQS	CO 1-hour NMAAQS
NO_2 annual NAAQS	NO_2 annual NMAAQS
NO_2 24-hour NMAAQS	NO_2 1-hour NAAQS
O_3 8-hour	Regional modeling
TSP 7-day NMAAQS	TSP 24-hour NMAAQS
SO_2 annual NMAAQS	SO_2 1-hour NAAQS
SO_2 24-hour NMAAQS	SO_2 1-hour NAAQS
SO_2 3-hour NAAQS	SO_2 1-hour NAAQS

Table 6C. Modeling the Design Value Summary (Default Modeling).

Averaging Period	Add Nearby Sources?	Add Background Concentration?	Modeled Concentration
CO 8-hour NMAAQS	No* (Yes)	Yes* (high 8 hour) (No)	high 8 hour
CO 1-hour NMAAQS	No* (Yes)	Yes* (high 1 hour) (No)	high 1 hour
H_2S 1-hour or ½-hour NMAAQS	No	No	high 1 hour
Pb Quarterly NMAAQS	No	No	high month
NO_2 annual NMAAQS	No* (Yes)	Yes* (annual average) (No)	annual average
NO_2 annual PSD increment	Yes	No	annual average
NO_2 1-hour NAAQS	No* (Yes)	Yes* (high 1 hour) (No)	98th-percentile 1 hour
$PM_{2.5}$ annual NAAQS	Yes	Yes (annual average)	annual average
$PM_{2.5}$ annual PSD increment	Yes	No	annual average
$PM_{2.5}$ 24-hour NAAQS	Yes	Yes (24-hr 98th percentile)	high 24 hour
$PM_{2.5}$ 24-hour PSD increment	Yes	No	high 24 hour
PM_{10} annual PSD increment	Yes	No	annual average
PM_{10} 24-hour NAAQS	Yes	Yes (high 24 hour)	high second high 24 hour
PM_{10} 24-hour PSD increment	Yes	No	high second high 24 hour
TSP 30-day NMAAQS	Yes	Yes (annual PM_{10} average)	high month
TSP annual NMAAQS	Yes	Yes (annual PM_{10} average)	annual average
TSP 24-hour NMAAQS	Yes	Yes (high 24 hour PM_{10})	high 24 hour
SO_2 annual PSD increment	Yes	No	annual average
SO_2 24-hour PSD increment	Yes	No	high second high 24 hour
SO_2 3-hour PSD increment	Yes	No	high second high 3 hour
SO_2 1-hour NAAQS	No* (Yes)	Yes* (high 1 hour) (No)	99th-percentile 1 hour
Reduced S ½-hour NMAAQS	No	No	high 1 hour

* Standards marked with an asterisk normally offer the choice to either model nearby sources or add a representative background concentration.

2.7 PSD Increment Modeling

2.7.1 Air Quality Control Regions and PSD Baseline Dates

Any facility that is required to provide an air dispersion modeling analysis with its construction permit application is required to submit a PSD increment consumption analysis unless none of its sources consume PSD increment. Table 7 serves as a tool to determine which sources to include in PSD increment modeling.

Table 7: PSD Increment Consumption and Expansion

Sources that do not consume PSD increment	• Temporary emissions (sources involved in a project that will be completed in a year or less). • Any facility or modification to a facility constructed before the PSD major source baseline date. • Any minor source constructed before the PSD minor source baseline date.
Sources that consume PSD increment	• Any new emissions or increase in emissions after the PSD Minor Source Baseline date (for that AQCR and pollutant). • Any new emissions or increase in emissions at a PSD Major source that occurs after the Major Source Baseline Date.
Sources that expand PSD increment	• A permanent reduction in actual emissions from a baseline source.

Notes:

- EPA memos written before the publication of the Draft NSR Workshop Manual indicate that PSD regulations were not intended to apply to temporary pilot projects. The memo clearly indicated that the pilot project did not need a PSD permit.
- If a minor source facility once existed but shut down before the minor source baseline date, then it would not be considered to be part of the baseline.
- Haul road emissions are treated the same way other sources of emissions are treated.
- An increase in emissions due to increased utilization of a facility, such as de-bottlenecking, are treated as any other increase in emissions.
- The Bureau interprets temporary emissions to mean emissions at the location that will occur for less than one year or emissions of standby or emergency equipment that operates less than 500 hours per year. For example, if a series of three gravel crushers operate at a mine for more than one year, PSD increment modeling should be performed because the mining operations at the location are not temporary in nature, even though none of the of individual crushers remained on-site for an entire year.

Table 8: Minor Source Baseline Dates by Air Quality Control Region

AQCR	NO_2 Date	SO_2 Date	PM_{10} Date	$PM_{2.5}$ Date
12	8/10/1995	8/10/1995	8/10/1995	Not established
14	6/6/1989	8/7/1978	8/7/1978	Not established
152	3/26/1997	5/14/1981	3/26/1997	2/11/2013
153	8/2/1995	Not established	6/16/2000	Not established
154	Not established	Not established	Not established	Not established
155	3/16/1988	7/28/1978	2/20/1979	11/13/2013
156	Not established	8/4/1978	8/4/1978	Not established
157	Not established	Not established	Not established	Not established

Table 9: Major Source Baseline Dates and Trigger Dates

Pollutant	Major Source Baseline Date	Trigger Date
PM	January 6, 1975	August 7, 1977
SO_2	January 6, 1975	August 7, 1977
NO_2	February 8, 1988	February 8, 1988
$PM_{2.5}$	October 20, 2010	October 20, 2011

2.7.2 PSD Class I Areas

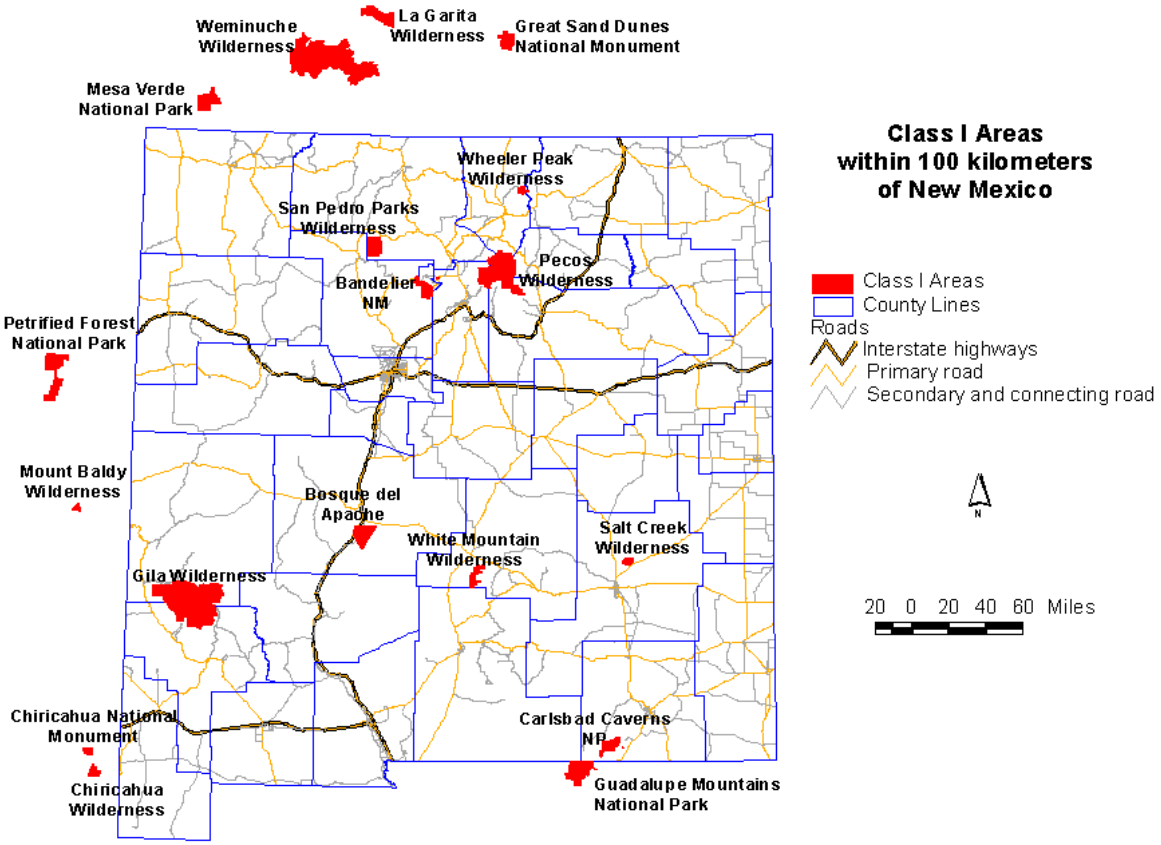


Figure 1: Class I areas

2.7.3 PSD Class I Area Proposed Significance Levels

The Environmental Protection Agency (EPA) has proposed significance levels for PSD Class I areas. No significance levels have been promulgated, but the Federal land managers (FLMs) are currently accepting the use of this value.

Table 10. Class I Prevention of Significant Deterioration Significance Levels

Pollutant	Averaging Period	Significance Level ($\mu g/m^3$)	PSD Class I Increment ($\mu g/m^3$)
Sulfur Dioxide (SO_2)	annual [a] 24-hour 3-hour	0.1 [b] 0.2 [b] 1.0 [b]	2 5 25
PM_{10}	annual [a] 24-hour	0.2 [b] 0.3 [b]	4 8
Nitrogen Dioxide (NO_2)	annual [a]	0.1 [b]	2.5
$PM_{2.5}$	annual 24-hour	0.06 0.07	1 2

[a] annual arithmetic mean
[b] EPA proposed significance level

2.8 New Mexico State Air Toxics Modeling

Modeling must be provided for any toxic air pollutant sources that may emit any toxic pollutant in excess of the emission levels specified in **20.2.72.502 NMAC** - Permits for Toxic Air Pollutants. Sources may use a correction factor based on release height for the purpose of determining whether modeling is required. Divide the emission rate for each release point by the correction factor for that release height on Table 11 and add the total values together to determine the total adjusted emission rate. If the total adjusted emission rate is higher than the emission rate in pounds per hour listed in **20.2.72.502 NMAC**, then modeling is required. The controlled emission rate (not the adjusted emission rate) of the toxic pollutant should be used for the dispersion modeling analysis.

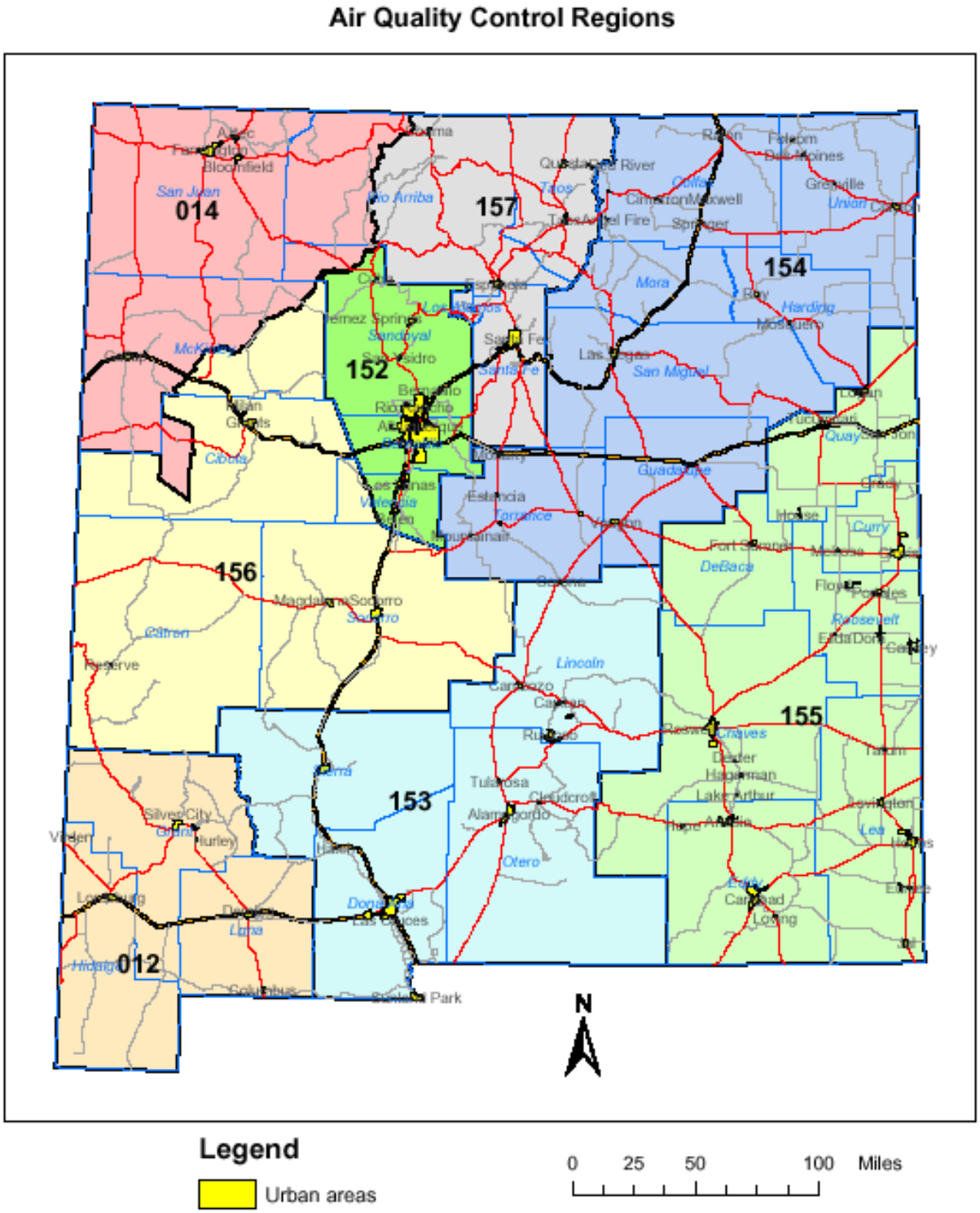


Figure 2: Air quality control regions (each AQCR has a different color)

Table 11: Stack Height Release Correction Factor (adapted from 20.2.72.502 NMAC)

Release Height in Meters	Correction Factor
0 to 9.9	1
10 to 19.9	5
20 to 29.9	19
30 to 39.9	41
40 to 49.9	71
50 to 59.9	108
60 to 69.9	152
70 to 79.9	202
80 to 89.9	255
90 to 99.9	317
100 to 109.9	378
110 to 119.9	451
120 to 129.9	533
130 to 139.9	617
140 to 149.9	690
150 to 159.9	781
160 to 169.9	837
170 to 179.9	902
180 to 189.9	1002
190 to 199.9	1066
200 or greater	1161

The table below lists a few of the commonly encountered State Air Toxics in New Mexico. This is not the complete list, which is too expansive to reprint here.

Table 12: A few common state air toxics and modeling thresholds (from 20.2.72.502 NMAC)

Pollutant	OEL (mg/m^3)	1% OEL ($\mu g/m^3$)	Emission Rate Screening Level (pounds/hour)
Ammonia	18	180	1.20
Asphalt (petroleum) fumes	5.00	50	0.333
Carbon black	3.50	35	0.233
Chromium metal	0.500	5.00	0.0333
Glutaraldehyde	0.700	7.0	0.0467
Nickel Metal	1.00	10.0	0.0667
Wood dust (certain hard woods as beech & oak)	1.00	10.0	0.0667
Wood dust (soft wood)	5.00	50.0	0.333

If modeling shows that the maximum eight-hour average concentration of each toxic pollutant is less than one one hundredth of its Occupational Exposure Level (OEL) listed in **20.2.72.502 NMAC**, then the analysis is finished. For a source of any known or suspected human carcinogens (per **20.2.72.502 NMAC**) which will cause an impact greater than one-one hundredth of the OEL, the source must demonstrate that best available control technology will be used to control the carcinogen. If modeling

shows that the impact of a toxic which is not a known or suspected human carcinogen (per **20.2.72.502 NMAC**) is greater than one-one hundredth of the OEL, the application must contain a health assessment for the toxic pollutant that includes: source to potential receptor data and modeling, relevant environmental pathway and effects data, available health effects data, and an integrated assessment of the human health effects for projected exposures from the facility.

2.9 Hazardous Air Pollutants

Hazardous Air Pollutants (HAPs) do not require modeling, as they are regulated by means other than air quality standards. Sources should be aware of the Title V major source thresholds of 10 tons/year for any Hazardous Air Pollutants (HAP) and 25 tons/year for total HAPs, which will require an operating permit to be obtained from the department under **20.2.70 NMAC**- Operating Permits.

2.10 Non-Attainment and Maintenance Areas

In non-attainment areas and for those sources outside of the non-attainment area that significantly contribute to concentrations in a non-attainment area, the modeling analysis required is a demonstration of an air quality benefit. Regular modeling is required in maintenance areas, however. Further information on non-attainment area modeling is located in the section 7.4, Non-Attainment Area Requirements.

2.10.1 Ozone Maintenance Area in Sunland Park:

The Sunland Park ozone maintenance area is bounded by the New Mexico-Texas State line on the east, the New Mexico-Mexico international line on the south, the Range 3E-Range 2E line on the west, and the N3200 latitude line on the north. EPA designated this area as non-attainment for ozone in July 1995. Due to changes in ozone air quality standards, this area is now classified as a maintenance area.

2.10.2 PM_{10} non-attainment area in Anthony:

The Anthony PM_{10} non-attainment area is bounded by Anthony Quadrangle, Anthony, New Mexico - Texas. SE/4 La Mesa 15' Quadrangle, N32 00 - W106 30/7.5, Township 26S, Range 3E, Sections 35 and 36 as limited by the New Mexico/Texas State line on the south. The State of NM submitted a SIP to the regional EPA headquarters in November 8, 1991.

2.10.3 SO_2 Maintenance area at the Phelps Dodge Smelter

This SO_2 maintenance area is located near the Phelps Dodge Chino Hurley Copper Smelter in Grant County. The maintenance area is defined as a 3.5-mile radius region around the smelter. The maintenance area also includes high elevation areas within an 8-mile radius.

2.10.4 Information on the New Mexico Natural Events Action Plans (NEAPs) for PM_{10}

The Bureau has submitted NEAPs for the counties of Doña Ana, Lea, Luna, and Chaves. EPA will excuse monitored PM_{10} concentrations above air quality standards if the episode is caused by uncontrollable natural events, provided adequate dust control plans are in place. The NEAP keeps each County from being designated non-attainment. More NEAP information is available at http://www.nmenv.state.nm.us/aqb/NEAP/index.html.

2.10.5 Ozone Early Action Compact in San Juan County

In December 2003, the Bureau, EPA, and local organizations signed an agreement that details strategies for keeping ozone concentrations in San Juan County below air quality standards. The primary goal of

this plan is to prevent areas in San Juan County from becoming non-attainment. A Clean Air Action Plan for San Juan County was adopted and submitted to EPA in December 2004.

2.10.6 PM_{10} non-attainment area in El Paso, Texas

The area within the city limits of El Paso, Texas has been declared non-attainment for PM_{10}.

3.0 MODEL SELECTION

3.1 What dispersion models are available?

The Bureau accepts the use of EPA approved models for dispersion analysis. Commercial or parallel versions of these models are fine as long as they produce the same results. This section of the modeling guidelines is designed to describe the models that are available and provide some guidance on which situations are the most appropriate for which regulatory modeling situations.

Two types of models are currently in use for air dispersion modeling: probability density function (PDF) models, and puff models. Probability density function models apply a probability function from each emission release point to calculate the concentration at a receptor based on the location of the receptor, wind speed and direction, stability of the atmosphere, and other factors. The plume is assumed to extend all the way out to the most distant receptor, no matter how far that receptor is from the emission source. Because of this characteristic, PDF models suffer in accuracy when modeling distant concentrations or unstable conditions. SCREEN3, ISCST3, ISC_OLM, CTSCREEN, ISC-PRIME, and AERMOD are all PDF models. All but AERMOD use a Gaussian, or normal, distribution for their probability density function. AERMOD uses a PDF that varies depending on nearby terrain and other factors. Currently, AERMOD and CTSCREEN are EPA-approved models for near-field modeling. As of November 9, 2006, SCREEN3, ISCST3, and ISC_OLM are no longer considered EPA-approved models. The Federal Register notice detailing the promulgation of AERMOD is located at: http://www.epa.gov/scram001/guidance/guide/appw_05.pdf

CALPUFF is a puff model, meaning that it tracks puffs, or finite elements of pollution, after they are released from their source. This strategy makes the model ideal for tracking pollution over long distances or in conditions that are not stable, and also allows chemical reactions within the plume to be modeled. Unfortunately, puff models require large amounts of computing time. CALPUFF is an EPA-approved model for modeling long range transport and/or complex non-steady-state meteorological conditions.

3.2 EPA Modeling Conferences and Workshops

EPA Modeling Conference presented a wealth of information about recent regulatory modeling developments. The EPA web page with the details is http://www3.epa.gov/ttn/scram/conferenceindex.htm.

3.3 Models Most Commonly Used in New Mexico

Most analyses reviewed by the Bureau will begin with an AERMOD analysis, and possibly CALPUFF for Class I analyses. For dispersion modeling within 50 kilometers of the source, AERMOD should be used. CALPUFF should be used only for PSD Class I area analyses, per the Interagency Workgroup Air Quality Modeling (IWAQM) Phase II report, but may be approved for use on a case-by-case basis for other analyses.

3.3.1 AERMOD

- AERMOD is intended to be the standard regulatory model. The PRIME building downwash algorithm is used by the model. Both the Ozone Limiting Method (OLM) and the Plume Volume Molar Ratio Method (PVMRM) algorithms for nitrogen conversion are built into the model.
- AERMOD has greater accuracy in complex terrain than CTSCREEN.
- AERMOD is suggested for extremely complex terrain.

See the section on nitrogen oxides for more information and options.

3.3.2 CALPUFF

- CALPUFF is a puff model designed to calculate concentrations at distances up to and beyond 50 kilometers. The model is significantly more difficult to run than the other models discussed in these guidelines. Use of CALPUFF for NAAQS, NMAAQS, or PSD increment modeling must be approved by the Bureau before submitting the modeling.
- CALPUFF is required for additional impact analyses when Federal Land Managers require additional impact analyses for Class I areas near PSD major sources. Typically, CALPUFF light is used for this modeling.

3.3.3 CTSCREEN

- CTSCREEN is applicable only for modeling receptors above stack height.
- CTSCREEN is a difficult model to run because of the difficulty in obtaining hill contour profiles.
- CTSCREEN uses screening meteorology.
- AERMOD produced greater accuracy than CTDMPLUS (the full implementation of CTSCREEN) when modeling the data that was used to develop CTSCREEN/CTDMPLUS.
- CTSCREEN is typically used to model the terrain on top of a hill that did not pass when using AERMOD.

The following list can be used to correct 1-hour CTSCREEN concentrations to 3-hour, 24-hour and annual concentrations by multiplying by the appropriate conversion factor for the averaging period.

Table 13: CTSCREEN Correction factors for 1-hour concentration.

Averaging Period	Correction factor
3-hour	0.7
24-hour	0.15
Annual	0.03

3.3.4 RTDM (Rough Terrain Dispersion Model)

- RTDM is a Gaussian dispersion model specifically designed to predict impacts in complex terrain.
- It is rarely used in New Mexico.
- RTDM (Rough Terrain Dispersion Model) may be used in cases where a more refined complex terrain model is required.

4.0 MODEL INPUTS AND ASSUMPTIONS

Models should be used with the technical options recommended in the Guideline on Air Quality Models (http://www.epa.gov/ttn/scram/guidance/guide/appw_05.pdf) except as noted in this document or approved by the Bureau.

Unless otherwise noted, information and procedures in this section refer to all of the models listed above.

4.1 Operating Scenarios

4.1.1 Emission Rates

All averaging periods shall be modeled using the maximum short-term emission rate allowed in the permit. The preferred method of modeling all averaging periods is to use maximum short-term emission rates and to use the hours of operation model input option to limit the facility's emissions.

4.1.2 Hours of Operation

If the facility is limited to operating certain hours of the day or has other operating restrictions, limiting the operating hours in the model can normally reduce the concentration produced by the model. Hours of operation can only be modeled by models that use actual meteorology, but not by screening models. Use screening models only to model facilities as if the maximum operating rate were emitting continuously.

4.1.3 Time Scenarios

Sometimes a facility has unusual operating times, for example, if the facility is allowed to operate 12 hours per day, but the hours are not specified. The facility may model as if it operates continuously, but as an option, the facility can model different time periods at the amount of time allowed per day as different operating scenarios, making sure that the maximums are modeled. In the 12 hour example, the facility might model three scenarios: 7AM to 7PM. 7PM to 7AM. And 5PM to 5AM. This way, all the hours of the day were modeled, and the modeler can be fairly certain that the maximum was modeled because the worst-case scenarios would occur when the calm blocks of time were modeled together. All scenarios should be modeled at maximum hourly emission rates.

4.1.4 Operating at Reduced Load

Some sources (like engines and boilers) can produce higher concentrations of pollution in ambient air when they are operating below maximum load than when they are at maximum load. The applicant shall analyze various feasible operating scenarios (100%, 75%, and 50% are typical) to determine the worst-case impacts, and then use that worst-case scenario for the entire modeling analysis. This requirement is in section 8.1 of Appendix W of EPA's Guideline.

4.1.5 Alternate Operating Scenario

If the permit application contains multiple operating scenarios (such as use of different fuels or different engines) then the applicant shall model each of the scenarios for the radius of impact analysis. Whichever scenario produces the greatest impacts on ambient air shall be used for the cumulative analysis, if required. If it is unclear which operating scenario produces the greatest impacts, each scenario shall be modeled for cumulative impact analysis.

4.1.6 Startup, Shutdown, Maintenance (SSM), and Other Short-term Emissions

If startup, shutdown, maintenance, or other temporary events have the potential for producing short-term impacts greater than the normal operating scenarios, then the applicant shall model each of the scenarios to demonstrate compliance with the ambient air quality standard.

If it is probable that an adjacent facility will have emissions higher than normal operation during the time the applicant's facility has increased emissions, then those emissions should also be taken into account in the modeling. Otherwise, model surrounding sources at their normal operating rate. Because of the short nature of the SSM emissions, modeling does not have to demonstrate compliance with annual standards or annual increment consumption. Highest hourly SSM emission rate should be modeled for NAAQS, NMAAQS and for increment consumption modeling.

Whichever scenario produces the greatest impacts on ambient air shall be used for the cumulative analysis, if required. If it is unclear which operating scenario produces the greatest impacts, each scenario shall be modeled for cumulative impact analysis.

4.2 Plume Depletion and Deposition

Dry plume depletion may be used to reduce concentrations of particulate matter. Appropriate particle characteristics for the specific type of source being modeled should be used. Check the web page for sample particle size distributions. Because of the length of time required to run a model with plume depletion, the Bureau recommends only applying plume depletion to receptors that are modeled to be above standards when the model is run without plume depletion.

The wet deposition option should not be used for the modeling analysis unless data are available and the use of wet deposition has been previously approved.

4.3 Meteorological Data.

4.3.1 Selecting Meteorological Data.

The meteorological data used in the modeling analysis should be representative of the meteorological conditions at the specific site of proposed construction or modification, or else use screening meteorological data, which contains worst-case data.

Representative, on-site data is obviously the best data to use; however, for many sources on-site data is not available. Bureau modeling staff can supply preferred meteorological data sets for various locations around the state. The National Weather Service also collects data throughout the country. These data sets are available through the National Climatic Data Center. It is mandatory that Bureau modeling staff approve the chosen meteorological data before the analysis is submitted. PSD permits contain more rigorous requirements relating to the collection of representative, on-site meteorological data. Either 1 year of representative data which serves as on-site data or 5 years of appropriate off-site data must be used. Please contact the Bureau as soon as possible if you anticipate the need to collect on-site meteorological or ambient monitoring data for a PSD permit.

Setback distance modeling for portable sources may require separate meteorological data than that used in the rest of the modeling for that facility. Preliminary analysis indicates that the Bloomfield meteorological data set is appropriate for locations throughout the State. Contact the Bureau for guidance on relocation meteorological data selection.

The goal of modeling is to use site-specific meteorological data. In cases where the form of the standard allows the standard to be exceeded a number of times per year, this is based on site-specific data. If the equivalent of site-specific data is not available, then the highest concentration estimate should be considered the design value unless multiple years of data are used. (68238 Federal Register / Vol. 70, No. 216 / Wednesday, November 9, 2005 / Rules and Regulations)

For example, no meteorological monitoring stations are available near Raton, New Mexico, and there are terrain features that may make Raton meteorology different from other places. The Bureau will still recommend meteorological data to use for modeling in Raton, but the PM_{10} standard is not allowed to be exceeded at all because the meteorological data is not completely representative of the area.

For concentration monitoring data, proximity to the monitor is normally the driving factor for selection of a representative monitor. For meteorological data, the similarity of the terrain (including canyon and valley directions) is more important than finding the closest monitor. Unless otherwise noted, AQB staff will need the exact location of the facility in order to select or approve a set of meteorological data representative of the location. Staff will compare wind roses with prominent terrain features that influence drainage patterns or otherwise influence wind directions.

The following table lists sets of data have been processed at the time of this writing. Notes indicate areas where the data are considered to be site-specific.

Table 14: Meteorological Data by Region

Region	Location	Year	Elevation (m)	Notes
Albuquerque area	Albuquerque International Airport	1993	1620	Use for area east of Rio Grande and west of Sandia Mountains.
Albuquerque area	Bernalillo	1997	1540	Use for in the Rio Grande Valley area.
Albuquerque area	Intel Corporation, Rio Rancho	1993	1595	Use for on top of the mesa west of the Rio Grande.
North Central	Los Alamos	1995	2262	Use for Jemez mountains.
North Central	Santa Fe - State Police Academy	1999	1978	Use for areas around Santa Fe and Espanola between the mountain ranges.
Northeast NM	Amarillo	1991	1098	Use for northeast plains of NM.
Eastern NM	Empire Abo	1993-1994	1080	Use for eastern NM, east of the mountains.
4-Corners	Bloomfield	1997	1713	Good for east-west valley flow with northern drainage.
4-Corners	Farmington - San Juan Gen Stn	1993-1994	1625	Good for northwest-southeast valley flows. This meteorological data includes SODAR data.
4-Corners	Val Verde	1993	1705	Good for east-west valley flow with northern drainage.
Western	Gallup	1991	1970	Good for western NM.
South Central	El Paso International Airport	1985	1195	Good general data set without much terrain interference.
South Central	Holman Road - East Mesa of Las Cruces	1997	1362	Good general data set without much terrain interference.
South Central	Sunland Park City Yard	1996	1146	Good for east-west valley flows.
South Central	Sunland Pk - El Paso Elec Rio Grande	2005	1135	Good for northwest-southeast valley flows.

Source locations for meteorological data that the Bureau has processed are shown on the map below. Some pictured may not be available for AIRMOD, but were processed for ISCST3.

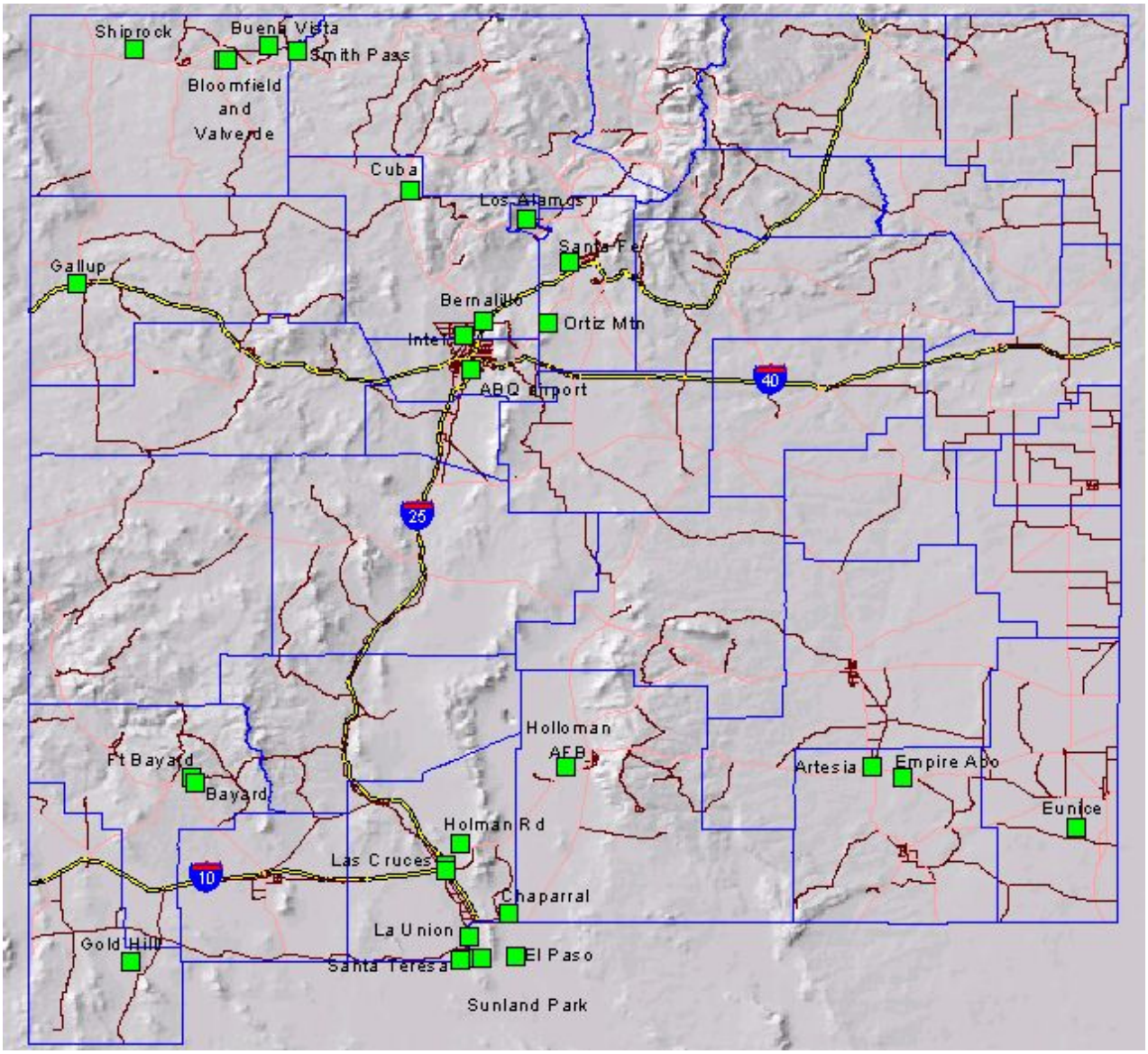


Figure 3: Meteorological Stations in New Mexico

4.4 Background Concentrations

> "Background concentrations should be determined for each critical (concentration) averaging time." (68242 Federal Register / Vol. 70, No. 216 / Wednesday, November 9, 2005 / Rules and Regulations)

The background concentrations listed below were derived from information downloaded from http://aqsdr1.epa.gov/aqsweb/aqstmp/airdata/download_files.html.

4.4.1 Uses of Background Concentrations

Background concentrations are added to the modeled concentrations or are used for stoichiometric modeling applications such as OLM or PVMRM. Normally, a background concentration associated with

the averaging period being modeled is added after the model (with all facility and nearby sources) is completed. Sometimes this approach proves too conservative to demonstrate compliance with standards. If so, monthly, daily, or hourly concentration profiles can be developed using representative sets of monitoring data appropriate for the modeling domain. Adding refined background concentrations normally requires post-processing of hourly output files.

It is very important to use recent monitoring data, because concentration trends are likely to change over time (much more so than weather patterns). If hourly meteorological data does not match hourly monitoring data, then the following methods can be used to produce a concentration profile for the refined modeling exercise.

Choose the highest background for each period for the region that best describes the modeling domain, unless adequate justification can be made that a specific monitor is most representative. For rural areas that do not match the regional descriptions above, use a monitor from Eastern NM or Southwestern NM.

4.4.1.1 Refined background concentrations

Background concentrations may be refined to take into account patterns in daily and monthly fluctuations in concentration. Since background concentrations are added to the model after dispersion is complete, there is no point mathematically in determining refined background concentrations shorter than the averaging period of the air quality standard. 24-hour concentrations do not need 1-hour background concentrations (except for ozone limiting of NO_2 concentrations, which happens during dispersion).

4.4.1.2 Developing 24-hour refined background concentrations

Each of the 12 months is represented by the maximum 24-hour concentration occurring during that month. If three years of data are available, average the three values for each month and use the average for the background. If a given month has a low maximum concentration due to the small number of samples collected that month, then the concentration from that month is not used and the average of the maximums of the two other years will be used as the 24-hour background for that month.

Example: Roswell $PM_{2.5}$ (This example uses actual data and may be used for modeling areas where Roswell $PM_{2.5}$ monitoring data is representative).

$PM_{2.5}$ has a 24-hour averaging period and an annual averaging period. The annual average uses the annual value in the standard background tables, but it is appropriate to use refined background concentrations for the 24-hour period. The Partisol sampler in Roswell is a Federal Reference Method sampler for $PM_{2.5}$. The filters are collected about every three days, so there is not data available for every day. Over three years of data are available, and 2007 through 2009 are presented in the following table.

January, 2007 had a maximum reported concentration of 10.0 $\mu g/m^3$. January 2008 and 2009 had maximum concentrations of 18.0 and 11.7, respectively. The average of these three values is 13.2. After the model has run, every day in January adds a background concentration of 13.2 $\mu g/m^3$. Care must be taken to identify the greatest sum of modeled concentration plus background, since background concentration varies each month – the highest modeled concentration may no longer be the highest when the background values are added.

Table 15: Roswell $PM_{2.5}$ Monitoring Data (2007-2009)

Year	Month	$PM_{2.5}$ concentration. ($\mu g/m^3$)											Max	3-year avg.
2007	1	2.33	3.67	9.50	6.25	10.00	6.25	4.67	5.58	7.25			10.00	**13.2**
2007	2	5.92	5.50	25.5	9.00	13.75	2.67	2.42	5.67	2.25			25.50	**14.7**
2007	3	1.67	2.92	4.42	4.17	3.42	12.25	8.00	9.29	2.67	5.58	2.67	12.25	**12.8**
2007	4	4.75	9.58	4.83	5.86	3.67	5.75	8.00	2.75	5.83	6.00		9.58	**9.2**
2007	5	4.58	3.42	4.00	8.33	6.08	4.00	3.75	4.33				8.33	**10.0**
2007	6	7.00	6.92	8.25	4.00	5.19	5.67	9.29	13.7	6.58			13.67	**11.5**
2007	7	8.58	8.28	8.17	5.75	7.92	8.67	7.33	7.28				8.67	**9.2**
2007	8	11.92	3.08	7.50	11.83	18.50	8.67	7.92	6.33	6.00	7.83		18.50	**13.2**
2007	9	11.75	4.00	4.75	6.75	9.17	4.08	4.08	3.17	4.42	4.08		11.75	**11.1**
2007	10	5.25	6.00	6.08	6.92	4.33	5.08						6.92	**7.0**
2007	11	7.75	7.58	8.75	7.25	5.42	8.33	7.83	7.25	18.58	8.33		18.58	**10.4**
2007	12	3.17	4.08	4.25	3.17	5.83	10.50	5.58	4.33	2.25			10.50	**10.8**
2008	1	5.3	8.2	3.6	4.4	3.0	4.9	18.0	13.4	4.2	2.6		18.0	
2008	2	2.2	3.8	3.3	3.3	7.4	3.5	9.3	4.6				9.3	
2008	3	6.8	3.7	14.8	4.9	5.8	5.8						14.8	
2008	4	3.7	5.5	10.7	2.9	6.7	6.2	5.2	9.5				10.7	
2008	5	6.8	7.4	4.3	5.2	11.6	6.2	6	5.3				11.6	
2008	6	6.3	7.1	4.8	5.2	6.3	14	4.9	4.9				14.0	
2008	7	6.7	6.4	4.8	4.0	7.0	6.1	9.2	9.2	9.8			9.8	
2008	8	6.5	6.7	9.2	3.6	5.6	4.3	5.2	7.8				9.2	
2008	9	7.6	7.6	2.3	4.8	5.0	8.8	8.8	11.1	8.9			11.1	
2008	10	7.2	2.8	4.6	4.8	3.2	4.3	7.9	3.5	4.0			7.9	
2008	11	5.5	6.2	4.1									6.2	
2008	12	3.8	4.6	7.8	5.2								7.8	
2009	1	5.2	3.7	1.8	11.7	10.0	5.6	4.1	7.3				11.7	
2009	2	5.8	5.6	9.3	3.4	8.1	9.0	4.2	5.4	4.7			9.3	
2009	3	4.1	6.0	11.4	2.8	4.1	3.8	11.3	6.2	9.7	4.0	4.2	11.4	
2009	4	7.2	4.4	6.2	1.8	4.8	1.8	3.1	6.6				7.2	
2009	5	6.4	3.2	10.0	6.7	3.9							10.0	
2009	6	6.4	3.9	4.7	5.0	6.7	5.3						6.7	
2009	7	4.8	8.9	4.5	5.7	6.0	8.6	9.2	5.8	8.5	8.1	8.4	9.2	
2009	8	8.4	10.5	7.6	5.0	6.1	11.8	7.0	4.3				11.8	
2009	9	7.9	3.9	4.9	5.3	10.3	1.7	6.5					10.3	
2009	10	2.2	6.2	1.9	1.9	3.0	3.6						6.2	
2009	11	6.2	5.3	6.1	2.8	5.5	5.0	6.3	2.6				6.3	
2009	12	14.2	5.5	4.3	7.7	4.9	5.3						14.2	

4.4.1.3 Developing 1-hour refined background concentrations

From the geographically nearest full set of monitoring data to the facility to be modeled, determine the maximum one-hour concentration that occurs during each hour of the day for each month. The result will be twelve different 24-hour profiles that will be repeated for the entire month that each represents. This profile can be used for all averaging periods. If three years of data are available, average the three values for each month and use the average for the background. POST files may be used to add hourly background concentrations to receptors.

Example: Determine the maximum concentration for hour 1 (midnight to 1AM) in January. Use this for hour 1 for each day in January. Determine the maximum concentration for hour 2 (1AM to 2AM) in January. Use this for hour 2 for each day in January. … Determine the maximum concentration for hour 24 (11PM to midnight) in December. Use this for hour 24 for each day in December. Complete the entire year in this manner, with hour and month-specific data.

4.4.1.4 Eliminating double-counting of emissions in background

In some cases the addition of a background concentration may result in double-counting of some of the emissions, if the reference monitor is very close to the modeling domain. This effect may be reduced by placing a receptor at the monitor location and modeling the sources in the model that existed at the time of the monitoring. The modeled concentration at the monitor may be subtracted from the background (with a minimum background of zero). The averaging period should be the same as the one used for the background calculation, and must be temporally correlated if the maximum monitored concentration is not being used.

4.4.2 CO Background Concentration

Ambient CO monitors to represent New Mexico are very limited. Concentrations near Sunland Park are best represented by monitors in El Paso. NMED operated a monitor in Rio Rancho until 9/30/2006, which should be conservative for the rest of New Mexico.

Table 16: Carbon Monoxide Background Concentration

Location	Period	Background (ppm)	Notes
Sunland Park	1-hour	4.96	10/20/06 to 10/19/09 CAMS12, El Paso UTEP C12/A125/X151 1-hour max. The location of the CO monitor is 31.768056, -106.501111
Sunland Park	8-hour	3.01	2005-9 El Paso UTEP C12/A125/X151 8-hour max.
The rest of New Mexico	1-hour	2.1	2003-2006 2ZR Rio Rancho Senior Center.
The rest of New Mexico	8-hour	1.5	2003-2006 2ZR Rio Rancho Senior Center.

4.4.3 H_2S Background Concentration

NMED has no H_2S monitors. The standards are generally designed to protect against noticeable changes in concentration above the background concentration for the region, and no background concentration is added.

4.4.4 Lead Background Concentration

Reformulation of gasoline and other control measures have virtually eliminated ambient lead concentrations. NMED has no lead monitors. Treat as zero background.

4.4.5 NO_2 Background Concentration

Note: No 24-hour averages were calculated. Complaince with 1-hour NAAQS automatically demonstrates compliance with 24-hour NMAAQS.

Table 17: NO_2 Background Concentration

Region	ID	Location	1-hour Background (ppm)	Annual Background (ppm)	Notes
4-Corners	1H	Shiprock Substation	0.047	0.008	2007-2009
4-Corners	1ZB	Bloomfield	0.047	0.018	2007-2009
4-Corners	1NL	Navajo Lake	0.050	0.010	2007-2009
Albuquerque area	2ZR	Rio Rancho	0.055	0.009	7/25/06 to 7/24/09
Eastern NM	5ZP	Artesia	0.037	0.005	6/3/06 to 6/2/09
Eastern NM	5ZR	Carlsbad	0.030	0.003	2007-2009
Eastern NM	5ZS	Hobbs	0.053	0.007	2007-2009
South Central	6ZM	Desert View (Sunland Park)	0.075	0.010	2007-2009
South Central	6ZN	Santa Teresa	0.064	0.005	2007-2009
Southwestern NM	7E	Deming Airport	0.038	0.005	2007-2009

Annual background is the average of three annual averages of monitoring data from 2007 to 2009, or the closest available data set to that time period.

The maximum 1-hour NO_2 concentrations from each of three years were averaged to determine the 1-hour background concentration, using monitoring data from 2007 to 2009, or the closest available data set to that time period.

Refined 1-hour background profiles may be developed using the guidance described in “Refined Background Concentrations”, above.

4.4.6 Total Reduced Sulfur Background Concentration

NMED has no total reduced sulfur monitors. The standards are generally designed to protect against noticeable changes in concentration above the background concentration for the region, and no background concentration is added.

4.4.7 Ozone Background Concentration

Ozone background concentrations are required for NO_2 modeling using PVMRM or OLM.

Table 18: Ozone Background Concentration

Region	ID	Location	1-hour Background (ppm)	Notes
4-Corners	1H	Shiprock Substation	0.079	2007-2009
4-Corners	1NL	Navajo Lake	0.084	2007-2009
4-Corners	1ZB	Bloomfield	0.073	2007-2009
Albuquerque area	2LL	Los Lunas	0.072	6/11/09 to 6/10/10 (1 yr)
Albuquerque area	2ZJ	Bernalillo	0.072	2007-2009
Albuquerque area	2ZR	Rio Rancho	0.085	7/25/06 to 7/24/09
North Central	3SFA	Santa Fe Airport	0.075	7/2/07 to 7/1/10
Eastern NM	5ZR	Carlsbad	0.076	2007-2009
Eastern NM	5ZS	Hobbs	0.076	2007-2009
South Central	6O	La Union	0.097	2007-2009
South Central	6ZG	Sunland Park City Yard	0.089	2007-2009
South Central	6ZK	Chaparral	0.091	2007-2009
South Central	6ZM	Desert View (Sunland Park)	0.096	2007-2009
South Central	6ZN	Santa Teresa	0.094	2007-2009
South Central	6ZQ	Las Cruces	0.074	2007-2009
Southwestern NM	7E	Deming Airport	0.069	2007-2009
Southwestern NM	7T	Hurley Smelter	0.070	2007-2009

The hourly maximum ozone concentration from the nearest ozone monitor may be used for ozone limiting.

Refined 1-hour background profiles may be developed using the guidance described in “Refined Background Concentrations”, above.

Ozone files typically use the format, “(4I2,5X,F8.3)”. Hourly concentrations use $\mu g/m^3$ to avoid elevation errors.

4.4.8 $PM_{2.5}$ Background Concentration

Table 19A: $PM_{2.5}$ Background Concentration

Region	ID	Location	24-hour Background 100th%ile (μg/m^3)	24-hour Background 98th%ile (μg/m^3)	Annual Background (μg/m^3)	Notes
4-Corners	1Z	Farmington	18.2	13.6	6.0	9/22/05 to 9/21/08
4-Corners	1FO	Farmington	13.5	10.4	4.4	2009 (1 year)
Albuquerque area	2ZR	Rio Rancho	14.6	9.6	4.3	7/27/06 to 7/26/09
North Central	3HM	Santa Fe (Runnels)	9.4	8.5	4.4	2007-2009
Eastern NM	5ZG	Roswell	16.9	13.2	6.2	2007-2009
Eastern NM	5ZS	Hobbs	16.9	12.4	6.2	2007-2009
South Central	6Q	Las Cruces	16.5	13.0	5.8	2007-2009
South Central	6ZG	Sunland Park City Yard	35.9	28.8	10.7	2007-2009
Southwestern NM	7S	Silver City	12.2	10.1	5.1	2007-2009

Concentrations are the average of three years of maximum data from Partisol samplers, unless otherwise noted. Collection frequencies are assumed to represent 24-hour average concentrations.

Use the highest 98th percentile background concentration from the region in which the facility is located, unless another monitor is more representative of the local area.

Refined 24-hour background profiles may be developed using the guidance described in "Refined Background Concentrations", above. Results of the refined background concentration data by month are listed in the table below. Monitor IDs are decoded in the table above.

Exceptional events were eliminated before calculating aggregate concentrations. In this case, exceptional events were identified as concentrations above 25 μg/m^3 if the concentrations before and after the sample in question were much lower than the concentration and if such high concentrations were unusual for that time of year.

Table 19B: $PM_{2.5}$ Background Concentration (Refined, by Month)

ID	January (µg/m^3)	February (µg/m^3)	March (µg/m^3)	April (µg/m^3)	May (µg/m^3)	June (µg/m^3)	July (µg/m^3)	August (µg/m^3)	September (µg/m^3)	October (µg/m^3)	November (µg/m^3)	December (µg/m^3)
1FO	13.5	5.2	8.2	11.8	6.4	5.5	5.5	8.0	7.0	5.5	10.4	10.0
1Z	14.9	9.4	6.9	11.3	8.1	7.9	9.1	7.8	7.4	7.0	11.2	15.3
2ZR	12.6	5.7	8.3	7.9	10.0	7.3	6.4	9.2	6.3	10.1	10.4	8.9
3HM	8.9	5.2	5.8	6.5	6.8	5.8	6.5	7.7	6.2	6.0	6.9	7.4
5ZG	13.2	10.8	12.8	9.2	10.0	11.5	9.2	13.2	11.1	7.0	10.4	10.8
5ZS	10.6	8.8	10.3	9.7	11.3	10.4	11.4	14.5	13.5	8.2	8.9	7.2
6Q	15.5	7.3	9.5	9.2	8.7	8.3	10.9	10.0	9.8	7.5	12.3	11.6
6ZG	30.5	27.3	20.6	22.6	26.2	25.4	14.8	14.0	14.7	21.4	30.6	31.4
7S	9.2	6.9	8.1	6.0	7.3	8.8	9.5	9.1	7.1	7.5	9.8	10.2

Partisol samplers are the Federal Reference Method (FRM) for $PM_{2.5}$, TEOM are not. Use of FRM to develop background concentrations is preferred, but in some cases TEOM monitor results may be scaled to determine a background if appropriate data for scaling is available.

For example, Sunland Park has both kinds of monitors, but Santa Teresa has only a TEOM. The 2006-2008 average annual TEOM concentration ratio of Santa Teresa/Sunland Park is 0.647, which could be multiplied by the Sunland Park Partisol background to get a background specific to Santa Teresa.

4.4.9 PM_{10} Background Concentration

Table 20A: PM_{10} Background Concentration

Region	ID	Location	24-hour Background Maximum (µg/m^3)	24-hour Background Second High (µg/m^3)	Annual Background (µg/m^3)	Notes
4-Corners	1Z	Farmington	40.4	29.5	15.5	9/22/05 to 9/21/08
4-Corners	1FO	Farmington	73.2	44.9	12.0	10/2/08 to 10/1/09 (1 year)
Albuquerque area	2U	Bernalillo	35.4	27.5	13.4	2007-2009
North Central	3HM	Santa Fe (Runnels)	36.6	30.5	12.9	2007-2009
North Central	3ZD	Taos	56.4	52.1	19.3	2007-2009
Eastern NM	5ZG	Roswell	66.9	52.5	20.0	2007-2009
Eastern NM	5ZS	Hobbs	51.9	46.2	21.1	2007-2009
South Central	6CM	Anthony	89.0	80.4	30.5	2007-2009
South Central	6ZG	Sunland Park City Yard	92.3	89.1	34.0	2007-2009
Southwestern NM	7D	Deming	55.6	45.4	17.9	2007-2009
Southwestern NM	7R	Hurley	44.0	31.5	13.7	12/12/2005 to 12/11/2008
Southwestern NM	7T	Hurley Smelter	28.3	22.3	12.5	3/26/09 to 3/25/10 (1 year)
Southwestern NM	7S	Silver City	45.6	31.3	15.1	2007-2009

Taos PM_{10} Partisol is considered FRM. Other monitors listed are Wedding monitors, which are considered FRM. TEOM monitors are available in some locations, but are not listed in the table above. TEOM monitors operate continuously, and are considered Federal Equivalent Method (FEM). In some cases TEOM monitor results may be scaled to determine a background if appropriate data for scaling is available.

The annual PM_{10} NAAQS has been vacated, and background concentrations are not added to PSD increment, but PM_{10} annual background concentrations are required to determine TSP annual background concentrations.

Refined 24-hour background profiles may be developed using the guidance described in "Refined Background Concentrations", above.

Exceptional events were eliminated before calculating aggregate concentrations. In this case, exceptional events were identified as concentrations above 100 µg/m^3 if the concentrations before and after the sample in question were much lower than the concentration and if such high concentrations were unusual for that time of year.

Table 20B: PM_{10} Background Concentration (Refined, by Month)

Site	January (µg/m^3)	February (µg/m^3)	March (µg/m^3)	April (µg/m^3)	May (µg/m^3)	June (µg/m^3)	July (µg/m^3)	August (µg/m^3)	September (µg/m^3)	October (µg/m^3)	November (µg/m^3)	December (µg/m^3)
1Z	22.0	19.6	18.4	27.0	23.9	22.7	20.7	21.5	19.5	20.1	31.5	28.4
1FO	13.0	8.7	15.7	73.2	20.8	11.0	13.1	17.1	44.9	16.0	22.5	8.0
2U	27.0	21.2	18.2	25.4	22.1	20.6	16.4	19.2	16.2	20.3	26.5	17.5
3HM	24.4	26.4	20.8	18.4	16.7	21.7	15.9	18.1	18.6	16.9	20.1	14.5
3ZD	39.1	32.5	51.2	30.6	41.5	31.2	19.0	22.0	15.8	21.2	42.5	30.5
5ZG	18.9	17.7	18.7	39.0	23.2	47.3	36.8	40.0	31.1	33.4	33.1	28.8
5ZS	21.0	24.2	22.1	42.4	21.8	32.0	33.5	36.5	29.4	38.2	37.5	33.3
6CM	40.9	38.1	61.4	62.7	50.7	57.5	25.2	33.9	28.6	39.8	56.7	42.1
6ZG	45.7	53.9	66.2	56.9	57.2	45.2	41.1	32.4	26.5	48.3	90.4	47.8
7D	18.9	34.3	28.2	31.9	41.6	38.5	21.7	21.2	21.5	27.3	33.0	12.2
7R	11.0	14.7	15.2	30.5	16.2	26.8	20.0	19.9	18.7	32.6	27.0	17.9
7T	15.0	13.0	16.0	14.7	22.3	19.0	19.7	14.3	12.3	13.0	28.3	16.1
7S	25.7	45.5	20.3	21.5	17.0	18.4	15.6	18.3	21.9	29.9	27.5	18.2

4.4.10 SO_2 Background Concentration

Table 21: SO_2 Background Concentrations

Location	ID	1-hour Background (ppb)	3-hour Background Maximum (ppb)	24-hour Background Second High (ppb)	Annual Background (ppb)	Location	Notes
Eastern New Mexico	5ZP	20.35	8.65	1.86	0.29	Artesia	6/3/2006-6/2/2009
Southwest New Mexico	7T	8.06	2.85	1.17	0.29	Hurley Smelter	2007-2009
Between Farmington and Shiprock	1H	61.71	42.38	7.98	0.94	Shiprock Substation	2007-2009
The rest of New Mexico	1ZB	7.25	5.50	3.08	1.12	Bloomfield	2007-2009

Refined 1-hour background profiles may be developed using the guidance described in "Refined Background Concentrations", above.

4.4.11 TSP Background Concentrations

There are no TSP monitors in New Mexico. TSP background concentrations are equal to PM_{10} concentrations for the same averaging period because the larger particles have settled out under background conditions. Selection and refinement of data is discussed in the section on PM_{10}.

4.5 Location and Elevation

Important: Use the same UTM zone and datum for the entire facility. Facilities on the border between two UTM zones must convert all information into one zone or the other.

Make sure that the source location and parameters are the same as those listed in the application form!! This is the most common mistake we see.

4.5.1 Terrain Use

Terrain classifications are defined as follows:

- **Flat terrain** – Terrain with all elevations equal to the base of the source
- **Simple terrain** – Terrain with elevations below stack height
- **Complex terrain** – Terrain with elevations above stack height
- **Intermediate (Complex) terrain** – Terrain with elevations between stack height and plume height (a subset of complex terrain).

Flat terrain should be used if the source base is higher than all the surrounding terrain or if the facility consists primarily of non-buoyant fugitive sources. Simple and complex terrain should be used for all other scenarios.

4.5.2 Obtaining Elevation

Elevation data for receptors, sources, and buildings should be obtained from Digital Elevation Model (DEM) files or National Elevation Dataset (NED) files with a resolution of 30 meters or better. USGS DEMs are available for New Mexico in either 7.5-minute or 1-degree formats. It is strongly suggested that the 7.5-minute data be used in dispersion modeling rather than the coarse resolution 1-degree data. Keep in mind that the USGS DEMs can be in one of two horizontal datums. Older DEMs were commonly in NAD27 (North American Datum of 1927) while many of the latest versions in NAD83 (North American Datum of 1983). It is important to use the same source of data for all elevations. Even USGS 7.5-minute maps and USGS 7.5-minute DEM data may differ. Surrounding sources' elevations provided by the Bureau have been determined using 7.5-minute DEM data (NAD83), where available, and 1-degree DEM data elsewhere.

Elevations should be included for at least all receptors within 10 km of your facility or within your facility's ROI (whichever is smaller). Your source's elevation may be used for receptors beyond 10 km, but it may be wiser to use actual DEM elevations for the entire ROI because surrounding sources are provided with actual elevations.

4.6 Receptor Placement

4.6.1 Elevated Receptors on Buildings

Elevated receptors should be placed on nearby buildings at points of public access where elevated concentrations may be predicted. Use flagpole receptors in areas with multi-story buildings to model state and federal standards. In cases where nearby buildings have publicly accessible balconies, rooftops, or similar areas, the applicant should consult with the Bureau modeling staff to ensure proper receptor placement. PSD increment receptors are limited to locations at ground level.[6]

4.6.2 Ambient Air

Ambient air is defined as any location at or beyond the fence line of the facility. The fence line must restrict public access by a continuous physical barrier, such as a fence or a wall. If plant property is accessible to the public or if any residence is located within the restricted area, receptors should be located on-property.[7] Public access is interpreted to include housing, schools, hospitals, and similar areas that are frequented by family members of employees, but the remainder of the restricted area is excluded from public access if such family members do not have access to excluded areas. For example, receptors would not be placed in dormitories on military bases, but would be placed in family housing areas.

4.6.3 Receptor Grids

"Receptor sites for refined modeling should be utilized in sufficient detail to estimate the highest concentrations and possible violations of a NAAQS or a PSD increment. In designing a receptor network, the emphasis should be placed on receptor resolution and location, not total number of receptors." (68238 Federal Register / Vol. 70, No. 216 / Wednesday, November 9, 2005 / Rules and Regulations)

The modeling domain can be defined using a Cartesian grid with 1000 meter spacing. Fine grids or fence line receptors with 50 to 100 meter spacing should fill any areas of the domain with potential to contain

---

[6] NSR Workshop Manual, page C.42

[7] NSR Workshop Manual, Page C.42

the highest concentration and/or any possible exceedances of NMAAQS, NAAQS, or PSD increment for the refined modeling. 50 meter spacing is recommended for fence line receptors for most sources, but 100 meters is recommended for expansive sources like coal mines, copper mines, or large military bases. (Grids with 50 meter spacing and 2 km side width are recommended for medium or large neighboring point sources. 50 meter spacing and 1 km width grids are recommended for hilltops or small neighboring sources.) Once these areas of potential high concentrations have been refined, the remaining receptors may be discarded.

For sources with an ROI greater than 50 kilometers, the grid should not extend beyond 50 km, as is noted in the NSR Workshop Manual.

4.6.4 PSD Class I Area Receptors

A modeling analysis of the PSD increment consumed at the nearest Class I areas must be performed by increment-consuming sources in AQCRs where the PSD minor source baseline date has been established, or in any AQCR where a new PSD-major source is to be installed. One receptor at the near boundary of the Class I area is normally sufficient for modeling to compare with Class I significance levels. 1000 meter spacing is recommended within the Class I areas for facilities with significant concentrations. If concentrations are above 75% of the PSD increment, then 50 to 100 meter spacing should be used near the hot spots. See Figure 1 for locations of Class I areas.

4.6.5 PSD Class II Area Receptors

Other than areas that are designated as PSD Class I areas, the entire state of New Mexico is a Class II area. The receptor grid for the PSD Class II increment analysis should be the same as the one for the cumulative run.

4.7 Building Downwash and Cavity Concentrations

Building downwash should be included in the analysis when stack height is less than good engineering practice (GEP) stack height and there are buildings, tanks, fans or other obstacles near the facility. All buildings and structures should be identified and analyzed for potential downwash effects. NMED requires the use of BPIP-Prime or equivalent for this analysis. GEP stack height should be determined as per 40 CFR 51.100. For receptors very near buildings, a cavity region analysis may be required. Modelers should consult with the Bureau modeling staff.

As summarized from 40 CFR 51.100:
GEP stack height is the greater of:

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

or

2) H + 1.5L

Where

H = Height of nearby structure(s) measured from the ground-level elevation at the base of the stack.

L = The lesser of the height or the projected width (width seen by the stack) of nearby structures.

Nearby structures can be as far as 5 times the lesser of the width or height dimension of the structure, but not greater than 0.8 km.
Stacks taller than GEP stack height should be modeled as if they were GEP stack height.

4.8 Neighboring Sources/Emission Inventory Requirements

"All sources expected to cause a significant concentration gradient in the vicinity of the source or sources under consideration for emission limit(s) should be explicitly modeled. The number of such sources is expected to be small except in unusual situations. Owing to both the uniqueness of each modeling situation and the large number of variables involved in identifying nearby sources, no attempt is made here to comprehensively define this term. Rather, identification of nearby sources calls for the exercise of professional judgement by the appropriate reviewing authority (paragraph 3.0(b)). This guidance is not intended to alter the exercise of that judgement or to comprehensively define which sources are nearby sources." (Federal Register / Vol. 70, No. 216 / Wednesday, November 9, 2005 / Rules and Regulations 68243)

4.8.1 Neighboring Sources Data

The Emissions Inventory of neighboring sources is used as input data in air quality models. This data will be provided by the Bureau within a few days of request. E-mail the UTM coordinates of the location(s) to be modeled to the Bureau to request source data.

4.8.1.1 Determining which sources to include

This section functions as a definition for "nearby sources" as used in this document. The definition varies based on context, as illustrated below.

The contributions of distant sources are included in the background concentration. If the background concentration is added and includes all neighboring sources or a conservative approximation of them, then surrounding source modeling is not required for modeling of NAAQS or NMAAQS. For particulate matter or cases where the background concentration does not include all neighboring sources, then include all sources within 10 km of the facility in the model, and discard sources beyond 10 km from the facility. PSD increment is modeled, not monitored. For cases where background concentrations are not added, retain all sources within 25 km of the facility, plus sources emitting over 1000 pounds per hour within 50 km of the facility. For PSD Class I increment analysis, retain all sources within 25 km of the Class I area, plus sources emitting over 1000 pounds per hour within 50 km of the Class I area.

Table 22: Surrounding Source Retention Example for a Source Near Bloomfield.

Pollutant and averaging period	Neighboring source notes:
NO_2 1-hour NAAQS	Do not include surrounding sources. (Optionally, instead of adding background concentrations, include all sources within 25 km of the facility, plus sources emitting over 1000 pounds per hour within 50 km of the facility.)
$PM_{2.5}$ 24-hour NAAQS	Retain sources within 10 km of facility.
NO_2 annual Class II PSD increment	Retain sources within 25 km of the facility, plus sources emitting over 1000 pounds per hour within 50 km of the facility..
NO_2 annual Class I PSD increment	Retain sources within 25 km of Mesa Verde National Park, plus sources emitting over 1000 pounds per hour within 50 km of Mesa Verde.

4.8.1.2 Surrounding source format

Unless otherwise noted, units of measure used in the surrounding sources files are the metric units associated with model input format. Multiple values of emission rates are included in the files. Use the short term (g/s) emission rate for modeling. The other emission rates are provided for reference and for error checking. Emissions designated as NO_2 are actually total oxides of nitrogen (NO_X).

4.8.1.3 Handling errors in surrounding source files

Please contact the Bureau if you see suspicious data in the inventory. We know that there are errors in our database and we would like to correct them.

If you find a piece of equipment that has unusual stack parameters, document the error and corrected values in your modeling report. Please also report the error to Joe Kimbrell (Joseph.Kimbrell@state.nm.us) as well for database correction. Include MASTER_AI_ID, SUBJECT_ITEM_CATEGORY_CODE, and SUBJECT_ITEM_ID in the documentation. Please document the reason the error is suspected. The following parameters may be substituted for missing or invalid data.

For compressor stations, the following default values may be used to replace missing data:

Stack height = 7.6 m
Temperature = 697 K
Exit Velocity = 32.6 m/s
Diameter = 0.3 m

For diesel generators at asphalt and crushing plants, the following default values may be used to replace missing data:

Stack height = 1.82 m = 6 ft
Temperature = 650 K = 710.3 ^{o}F
Exit Velocity = 18.1 m/s = 59.4 ft/s
Diameter = 0.3 m = 1 ft

For GCP 2, 3, and 5 permits with 95 tons/year of $PM_{2.5}$ emissions, use the following values:

TSP emission rate = 95 TPY
PM_{10} emission rate = 71.25 TPY (TSP X 0.75)
$PM_{2.5}$ emission rate = 17.875 TPY (PM_{10} X 0.25) = (TSP X 0.1875)

4.8.1.4 Merged sources

Models will run more quickly with fewer sources. However, merging sources takes time and can increase predicted concentrations. Combining stacks at a single facility is allowed only if the stack with the worst dispersion characteristics is used as the merging stack. Model the facility as if all the emissions come out of the stack with the lowest value of M.

For each stack, compute a value for M, as follows:[8]

$M = HVT/Q$

where: H = stack height (m).
V = stack gas volume flow rate (m^3/s).
T = stack gas exit temperature (K).
Q = pollutant emission rate (g/s).

---

[8] Reference: *Screening Procedures for Estimating the Air Quality Impact of Stationary Sources*, Revised, EPA-450/R-92-019, October, 1992. U.S. Environmental Protection Agency, Office of Air and Radiation, Office of Air Quality Planning and Standards, Research Triangle Park, NC. http://www.epa.gov/scram001/guidance/guide/scrng.wpd

4.8.2 Source Groups

It often saves considerable analysis time to set the model up to run with multiple source groups. The following groups are recommended.

- **Source alone group** – contains the sources at the facility that are used to compare with significance levels for the pollutant and averaging period being modeled. This group determines if the facility is above significance levels at the location and time.
- **Cumulative sources group** – contains all allowable emissions of the source and surrounding sources. This group is used to determine compliance with NAAQS and NMAAQS.
- **PSD sources group** – contains all sources that consume or expand PSD increment. This group is used to determine compliance with PSD increment regulations.

Impacts from different groups can be compared to determine if a source contributes significant concentrations if there is a problem complying with air quality standards.

4.8.3 Co-location with GCP 2, 3, or 5

GCP 2, 3, and 5 currently have the requirement that no visible emissions shall cross the fenceline, which has been demonstrated to show compliance with all particulate matter air quality standards and PSD increments. NMED has allowed co-located facilities to rely upon the GCP modeling demonstration for when the facilities operate at the same time, since all facilities at the location are required to have the same visible emissions requirement at the fenceline at that time. However, the regular permit must still show compliance with all particulate matter air quality standards in case the GCP is ever not operating. The modeling for this situation shall include all sources other than the co-located GCP sources. Gaseous pollutant modeling shall include the co-located GCP(s).

5.0 EMISSIONS SOURCE INPUTS

This section describes appropriate modeling for many types of sources. Additional guidance can be found in the User's Guide for the AMS/EPA Regulatory Model - AERMOD (EPA, 2004, http://www.epa.gov/scram001/dispersion_prefrec.htm).

5.1 Emission Sources

There are two general types of sources:

Sources that come from a stack or vent – stack sources, or point sources;
And sources that don't – fugitive sources.

5.2 Stack Emissions/Point Sources

All stacks should be modeled as point sources, as detailed below.

5.2.1 Vertical Stacks

Stacks that vent emissions vertically should be modeled as point sources with stack parameters that will simulate the manner in which emissions are released to the atmosphere:

Stack exit velocity, V_s = average upward velocity of emissions at the top of the stack;
Stack diameter, d_s = stack exit diameter;
Stack exit temperature, T_s = average temperature of emissions at the top of the stack;
Stack height, H_s = stack release height.

5.2.2 Stacks with Rain Caps and Horizontal Stacks

Stacks that vent emissions horizontally and/or have rain caps should be modeled as point sources with stack parameters that will simulate the manner in which emissions are released to the atmosphere:

Stack exit velocity, $V_s = 0.001$ m/s;
Stack diameter, $d_s = 1$m;
Stack exit temperature, $T_s = 0$ K, or optionally actual temperature for stacks with high temperature;
Stack height, H_s = release height.

AERMOD will set the temperature to ambient temperature if the stack exit temperature is set to 0 K. If the model being used does not do this, then set the temperature to ambient temperature or to a close approximation thereof.

If modeling only horizontal stacks that are not capped, turn stack tip downwash off, whether there are buildings or not. Stack tip downwash calculations are inappropriate for horizontal stacks. If only some stacks have rain caps or are horizontal and others release upward without caps, use stack tip downwash.

Optionally, for modeling only vertical stacks that are capped, turn stack tip downwash off and reduce the stack height by three times the actual stack diameter. The cap will probably force stack tip downwash most of the time. The maximum amount of the stack tip downwash (as calculated in ISC2) is three times the stack diameter. Reducing the stack height by this amount, while turning off the stack tip downwash option, causes the maximum stack tip downwash effect. (Joseph A. Tikvart, 1993)

AERMOD beta options using the POINTCAP and POINTHOR may also be used.

5.2.3 Flares

Both process and emergency flares should be modeled for comparisons with NAAQS and NMAAQS. If parts of the facility will be shut down when the flare operates then those emission units may be omitted from the flare modeling.

Flares should be treated as point sources with the following parameters:

Stack velocity = 20 m/s = 65.617 ft/s
Stack temperature = 1000°C = 1832°F
Stack height = height of the flare in meters
Effective stack diameter in meters= $D = \sqrt{10^{-6} q_n}$

where $q_n = q(1 - 0.048\sqrt{MW})$
and q is the gross heat release in cal/sec
MW is the weighted by volume average molecular weight of the mixture being burned.
(SCREEN3 Model User's Guide, 1995)

Flares in the surrounding sources inventory from the Bureau should already have an effective diameter calculated; so the parameters in the inventory can be entered directly into your model input "as is". There are other methods for analyzing impacts of flares; if you wish to use another method, check with the Bureau modeling staff first.

NOTE: The NAAQS cannot be violated, even during upset conditions. All emergency flares should be modeled to show compliance with the NAAQS short-term standards under upset conditions. Emergency flares should be modeled with surrounding sources, but not including neighboring emergency flares and other sources that operate less than 500 hours per year.

5.3 Fugitive Sources

5.3.1 Aggregate Handling

Aggregate handling emissions consist of three separate activities, namely: loading material to and from piles, transportation of material between work areas, and wind erosion of storage piles.

Loading material to and from piles should be modeled as volume sources representative of the loading or unloading operation. Emissions for loading and unloading are calculated using AP-42 Section 13.2.4. The loading and unloading each involve dropping the material onto a receiving surface, whether being dropped by a dump truck, a front-end loader, or a conveyor. Each drop should be modeled as described in Fugitive Equipment Sources, below.

Transportation of material between work areas should be modeled according to haul road methodology if vehicles are used to transport the material, or using transfer point methodology if conveyors are used to transport the material, as described in Fugitive Equipment Sources, below.

Modeling of wind erosion of storage piles is optional, as it says in AP42 not to use the equations for wind erosion in a steady state model.

For the following example facility, aggregate is handled 6 times:

1- a pile in front of the mine face is created,
2- a pile in front of the mine face is loaded into trucks or conveyors,
3- a pile in front of the processing equipment (crusher or HMA) is created,
4- loading the equipment (crusher or HMA),
5- a pile after the equipment, and
6- loading the truck

1 and 2 would not apply if on-site mining does not occur.
5 may be considered a transfer point (conveyor) instead of aggregate handling if controls are applied.
5 and 6 may not apply for HMA plant, as material is bound in asphalt.
6 would not apply if the waste pile is left on site.

5.3.2 Fugitive Equipment Sources

Emissions coming from equipment such as crushers, screens, or material transfer points should be modeled as volume sources. Emission rates are normally calculated using AP42 factors.

The release height (H) is the distance from the center of the volume to the surface of the ground. The base of each volume source must be square. For elongated sources, use a series of volume sources with square bases. Determine the apparent size of a volume source by estimating how large the plume would look to an observer. Consider the movement of the plume source during the course of an hour when determining the apparent size. For example, if the source of emissions is from disturbances on a pile, and the entire pile is disturbed at some point in the hour, then use the size of the pile as the apparent size instead of the area of the pile that would be disturbed at any one instant. The reason for this is that the model operates in one-hour blocks of time, so using instantaneous sizes could inaccurately target nearby receptors with elevated emission concentrations.

For a single volume source, divide the apparent length by 4.3 to determine the initial lateral dimension (σ_{Yo}) to input into the model. For a line source represented by a series of volume sources, divide the distance between the centers of adjacent sources by 2.15 to determine σ_{Yo}.

For a source on the ground, divide the vertical dimension of the source by 2.15 to determine the initial vertical dimension (σ_{Zo}) to input into the model. For a source on or connected to a building, divide the height of the building by 2.15 to determine the σ_{Zo}. For an isolated elevated source, divide the vertical dimension of the source by 4.3 to determine the σ_{Zo}.

Example sources are described in the table below. Some sources will vary from the characteristics listed in the table.

Table 23: Example Dimensions of Fugitive Sources

Source Type	Height of Volume (m)	σ_{Zo} (m)	Release Height (m)	Width of Volume (m)	σ_{Yo} (m)
Crusher	5	2.33	6	5	1.16
Screen	5	2.33	4	5	1.16
Transfer point	2	0.93	2	2	0.47
Elevated transfer point	4	0.93	4	2	0.47
High Elevated transfer point	4	0.93	8	2	0.47
Concrete truck loading	5	2.33	4	5	1.16

5.3.3 Haul Roads

Traffic carrying materials mined or processed at the facility must be modeled as part of the facility. Haul roads to be modeled include the portion of roads that are not publicly accessible. The Bureau recommends haul road modeling to be consistent with Regional/State/Local Haul Road Workgroup Recommendations, as described below. Haul road emissions should be modeled as a series of adjacent volume sources, except that area sources should be used for modeling haul roads where receptors located within source dimensions are important. A procedure to develop model input parameters follows. The applicant can use other procedures on a case-by-case basis but must demonstrate that those procedures would be appropriate.

Road Source Characterization: Follow the instructions described below.

Plume height:

The height of the volume (H) or plume height will be equal to 1.7 times the height of the vehicle generating the emissions. Use the same for top of plume height for area sources.
The initial vertical sigma (σ_{Zo}) is determined by dividing the height of the plume by 2.15.
The release height is determined by dividing the height of the volume by two. This point is in the center of the volume.

Table 24: Example Haul Road Vertical Dimensions

Vehicle size	Truck Height	Height of Volume	σ_{Zo}	Release Height
Large trucks	4 m (13.1 ft)	6.8 m (22.3 ft)	3.16 m (10.4 ft)	3.4 m (11.1 ft)
Small trucks	2 m (6.6 ft)	3.4 m (11.2 ft)	1.58 m (5.2 ft)	1.7 m (5.6 ft)

RH = H/2 = Release Height above the ground (m). It's the center of the volume source. Also use this for the source height of the area source, if using the area source alternative.
σ_{Zo} = H/2.15 = initial vertical dimension of the volume (m)

Road width:

The adjusted width of the road (W) is the actual width of the road plus 6 meters. The additional width represents turbulence caused by the vehicle as it moves along the road. This width will represent a side of the base of the volume. Use W for the width of the area source, if using the area source alternative.

The initial horizontal sigma (σ_{Yo}) for each volume is determined as follows:

- If the road is represented by a single volume, divide W by 4.3.
- If the road is represented by adjacent volumes, divide W by 2.15.
- If the road is represented by alternating volumes, divide the distance between the center point of one volume to the center point of the next volume by 2.15. $\sigma_{Yo} = 2W/2.15$ This representation is only recommended for very long roads.
- If using area sources, the aspect ratio (i.e., length/width) should be less than 100 to 1. Subdivide the sources if they are too long.
- If using area sources, model each road segment as a straight line. Do not create a road segment with a bend in the road – divide the road into different segments when bends occur.

Road length:

The sum of the length of all volume sources should be about equal to the actual road length, unless the road is very long and half the segments are skipped to save time. The volume sources should be evenly spaced along the road and should be of equal size for a given road. It is acceptable to artificially end the haul road up to 50 meters before the intersection with a public road. The reduced length of the road is due to the observation that vehicles normally slow down or stop before exiting the property. All emissions from haul roads must be modeled, however. Emissions from the reduced road length are added to other road segments.

The two lateral dimensions (length and width) of a volume source should be equal. The number of volume sources, N, is determined by dividing the length of the road (optionally minus 50 meters) by W. The result is the maximum number of volume sources that could be used to represent the road. If N is very large, modeling time can be reduced by using alternating volume sources to reduce the number of sources.

Table 25: Example Haul Road Horizontal Dimensions

Vehicle size	Width of Volume	Length of Volume	σ_{Yo}
Large trucks	13 m (42.65 ft)	13 m (42.65 ft)	W/2.15 = 6.05 m (19.85 ft)
Small trucks	10 m (32.8 ft)	10 m (32.8 ft)	W/2.15 = 4.65 m (15.26 ft)

Road location:

The UTM coordinates for the volume source are in the center of the base of the volume. This location must be at least one meter from the nearest receptor.

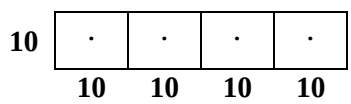
Emission Rate:

Divide the total emission rate equally among the individual volumes used to represent the road, unless there is a known spatial variation in emissions. Use the emissions calculated from the entire road length, even if you artificially end the road volume sources early before exiting the facility.

Example sources:

Use of the following modeling parameters should result in acceptable haul road modeling. Different facilities have different sized trucks, roads, and other variables. It is acceptable to use facility-specific parameters

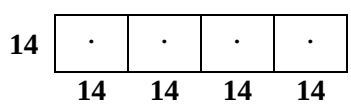
Example One-Way Road Source



(looking from above)
Width = W = 10 m (32.8 ft)
σ_{Yo} = W/2.15 = 4.65 m (15.26 ft)

Figure 4: One-Way Road Source

Two-Way Road Source



(looking from above)
Width = W = 14 m (45.9 ft)
σ_{Yo} = W/2.15 = 6.51 m (21.4 ft)

Figure 5: Two-Way Road Source

Additional guidance can be found in Volume II of the User's Guide for ISC3 model (EPA, 1995).

5.3.4 Area Sources

Sources that have little plume rise may be modeled as area sources. Examples are: storage pile emissions, waste lagoon emissions, or gaseous emissions from landfills. Area source types include rectangle, circle, and irregularly shaped polygon. The model uses only the portion of the area source that is upwind of the receptor for calculating emissions for the hour, so it is safe to put receptors inside the area source without overly magnifying concentrations. The ISC input file uses emissions per area, but

front-end programs for developing input files may calculate this for you based on total emissions from the source. For additional information, see the ISC User's Guide (EPA, 1995d).

Extremely long or odd-shaped (like a giant "L") area sources should be broken up into smaller area sources or modeled as a series of volume sources, because they may misrepresent emissions. Area sources, such as AREACIRC sources, may require many times as long to run the model as do volume or point sources in AERMOD.

5.3.5 Open Pits

The open pit source type should only be used to model open pits (not elevated trash dumpsters or anything else that somewhat resembles an open pit). The elevation of the pit entered into the model is the elevation of the top of the pit, which should be ground level.

The model calculates the effective depth of the pit by dividing the pit volume by the length and width of the pit. Release height above the base of the pit must be smaller than this value. Emissions from the bottom of the pit are expressed with a release height of zero.

Pit length should be less than 10 times the pit width. However, a pit cannot be sub-divided because the model needs to calculate mixing done throughout the pit. If the pit is irregular in shape, use the actual area of the top of the pit to calculate a rectangular shape with the same area.

Do not place receptors inside a pit.

The model input file requires pit emission rates to be expressed in mass per time per area [i.e., $g/(s \cdot m^2)$]. Model input front-end programs may convert actual emission rate into area-based emission rates automatically, however.

5.3.6 Landfill Offgas

Decomposition of landfill material can result in the release of gasses such as H_2S. If these gases are not collected using a negative pressure system and flared, then the area of the landfill that is releasing gas can be modeled as an area or a circular area source. If gas is collected by a negative pressure collection system and flared, then model the flare the same way other flares are modeled. Place large area sources in areas that have little effect from the negative pressure collection system. In either case, elevation of the source should be equal to that of the surface, and release height should be zero because they are released from the ground and are not significantly affected by turbulence caused by vehicles traveling over the off-gasses.

6.0 MODELING PROTOCOLS

6.1 Submittal of Modeling Protocol

A modeling protocol should be submitted prior to the performance of a dispersion modeling analysis. For PSD applications, a modeling protocol is mandatory, and must be sent to NMED/AQB for review and comment. Consultation with Bureau modeling staff regarding appropriate model options, meteorological data, background concentrations, and neighboring sources is recommended for minor sources also, and can be accomplished in writing or by phone. The applicant should allow two weeks for the Bureau to review and respond to the written protocol. To avoid delays caused by misinterpretation or misunderstanding, we strongly recommend consultation with our staff on the following topics:

a.) Choice of models;

b.) Model input options;
c.) Terrain classification (flat or simple and complex);
d.) Receptor grids;
e.) Source inventory data;
f.) Minor source baseline dates for modeling increment consumption;
g.) Nearby Class I areas;
h.) Appropriate meteorological data;
i.) Background concentrations;
j.) Setback distance calculation if a proposed facility is a portable fugitive source;
k.) Any possible sources of disagreement;

Important: Modeling that substantially deviates from guidelines may be rejected if it is not accompanied by a written approved modeling protocol.

The input data to the models will be unique to the source. Data will usually consist of 1) emission rates and stack parameters for the proposed source at maximum load capacity and at reduced load capacity; 2) emission parameters of sources in the area; 3) model options; 4) suitable meteorological data; 5) definition of source operation which creates the greatest air quality impacts if other than maximum load conditions; and 6) terrain information, if applicable. Very important: **The emission parameters used in the modeling analysis of the proposed source are normally the same as those in the permit application. Any difference between the two should be clearly documented and explained.** Failure to adhere to this rule may result in an incomplete analysis.

6.2 Protocol ingredients

The shortest acceptable modeling protocol would be a statement that the modeling guidelines will be followed and a statement of what meteorological data will be used. Ask the modeling section or check the web page for the latest sample protocols.

6.3 How to submit the protocol

E-mail the modeling protocol to the modeling manager: Sufi.Mustafa@state.nm.us

7.0 DISPERSION MODELING PROCEDURE

Note: The basic steps for performing the modeling are presented in sequential format. Sometimes, it will make sense to perform some of the steps out of order. The sequential modeling steps are designed as an aid to modeling, not a mandatory requirement.

It is important to have an approved modeling protocol before proceeding. Modeling that substantially deviates from guidelines may be rejected if it is not accompanied by a written approved modeling protocol.

7.1 Step 1: Determining the Radius of Impact

A facility's significance area is defined as all locations outside of its fence line where the source produces concentrations that are above the significance levels listed in Table 6. The source is deemed culpable for concentrations that exceed air quality standards or PSD increments that occur at a receptor if the source's contribution is above the significance level at the same time that the exceedance of air quality standards or PSD increments occurs.

The Bureau uses the Radius of Impact (ROI) to make sure the entire significance area is analyzed. The ROI is defined as the greatest distance from the center of the facility to the most distant receptor where concentrations are greater than significance levels.

An illustration of determining an ROI from modeling output is shown in Figure 6, below. Note that the entire ROI is completely contained within the receptor grid, as required.

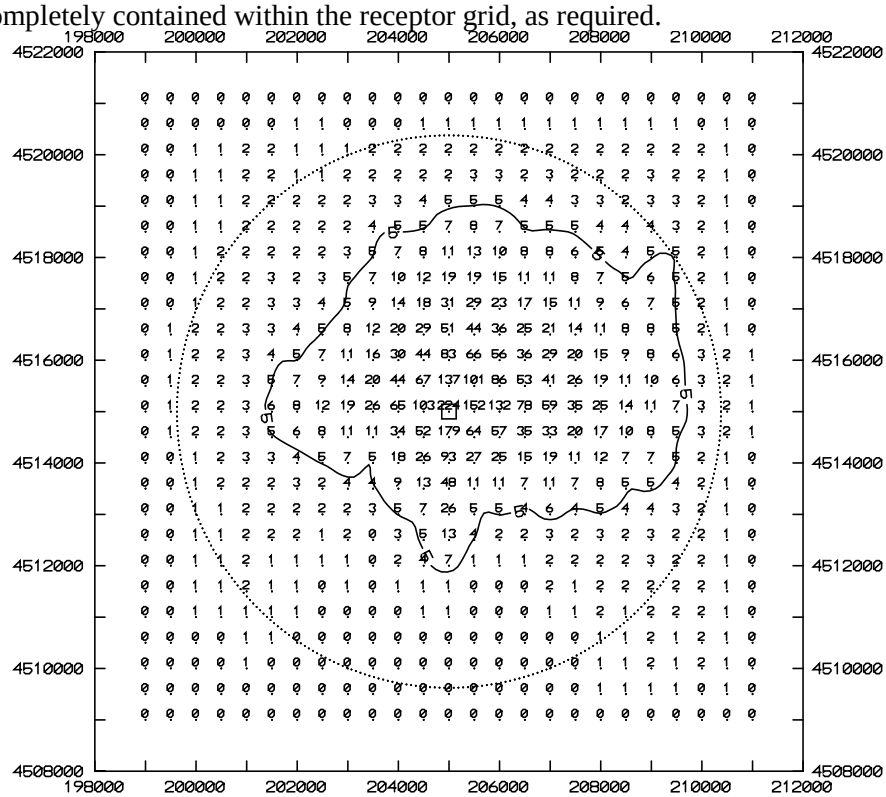


Figure 6. Plot of pollutant concentrations showing the 5 μg/m^3 significance level and the radius of impact (dashed line circle), determined from the greatest lineal extent of the significance level from the source.

7.1.1 Prepare the ROI analysis as follows:

I. Select the model that will be used for the analysis. It is usually quicker in the long run to use the same model for the radius of impact analysis as will be used for the refined analysis.
II. Model the entire source, as defined in section 2.4.1. Suggestion: Plot your sources to verify locations and identify typographical errors.
III. Set up the receptors as described above. Make sure the receptor grid extends far enough in every direction to capture the entire ROI, subject to the maximum radius of 50km.
IV. Optional step: Calculate the elevations of all sources, receptors, and buildings. This complex terrain analysis is optional for the ROI run, but it may save time to do it now.
V. Optional step: Add buildings and analyze them with BPIP or equivalent programs. This building downwash analysis is optional for the ROI run, but it may save time to do it now.
VI. Choose modeling options, as appropriate.
VII. Make sure that all sources and operating scenarios are modeled according to the guidelines in sections 4 and 5, above.
VIII. Run the model.

7.1.2 Analyze modeling results to determine ROI

I. Determine a radius of impact for each pollutant for each applicable averaging period. The largest ROI may be designated as the ROI for that pollutant, or each averaging period determined independently.
II. The ROI for NO_2 may be determined using Ambient Ratio Method (ARM).
III. Concentrations inside the facility's fence line can be ignored when determining the ROI.
IV. If no concentrations of a pollutant are above the significance levels for that pollutant, then the ROI for that pollutant is 0. Skip to Step 3 for that pollutant.
V. It is acceptable to scale impacts from one pollutant to determine impacts from another pollutant if several pollutants vent from the same stack and the ratios of emission rates and the averaging periods are the same.

Proceed to Step 2 for each pollutant with an ROI greater than zero.

7.2 Step 2: Refined Analysis

The entire area of significance must be included in the analyses for all averaging periods for each pollutant. If the ROI was determined using coarse grids, then add fine grid spacing to the potential areas of maximum concentration or concentrations above standards. If the ROI was determined using appropriate grid spacing, elevations, and building downwash (if applicable), then only the significant receptors need to be modeled for the refined analysis.

Once the ROI is determined for a specific source, neighboring sources need to be included and a cumulative impact analysis needs to be performed. As the ROI analysis is concerned with significance levels, the refined analysis is concerned with NAAQS, NMAAQS, and PSD Class I and Class II increments. The concentrations produced by the facility plus surrounding sources must be demonstrated to be below these levels in order to issue a permit under the regular permitting process.

Operating permit Note: For Title V sources modeling under 20.2.70.300.D.10 NMAC (10) that are not obtaining an NSR permit (i.e., new landfills), PSD increment does not need to be modeled. Other steps remain the same.

7.2.1 Prepare the Refined Analysis as Follows:

I. If a screening model was used to determine ROI, the modeler may wish to use a refined model to reduce the area of significant impact. If so, return to *Step 1* and repeat the step with the new model.
II. Prepare a new modeling input file from the ROI file.
III. Fill the ROI with receptors with appropriate spacing (or discard receptors below significance levels if appropriate spacing was used for the ROI analysis).
IV. Add receptors near areas of high concentration if these areas are not contained within a fine grid. The modeling run must definitively demonstrate that the maximum impact has been identified. Concentrations should "fall off" from the center of the fine grid.
V. Add surrounding sources to the input file, if appropriate, as described in *Neighboring Sources/Emission Inventory Requirements*, above. Include $PM_{2.5}$ surrounding sources if particulate modeling is required. Suggestion: set up source groups so that impacts from the source alone, from the PSD increment consuming sources, and from all sources can be analyzed in a single run and compared with each other for determination of culpability.
VI. Building downwash analysis must be included in the refined analysis, if applicable.
VII. Terrain elevations must be included in the refined analysis, if applicable.

7.2.2 Analyze the Refined Modeling Results

I. Make sure the maximum impacts for each averaging period fall within a fine enough receptor grid to identify true maximums. Include fine grids near adjacent sources and in "hot spots".
II. Compare the highest short-term and annual impacts from all sources with NAAQS and NMAAQS.
III. Determine if there is an exceedance of PSD Class II increment within the area defined by the radius of impact by the group containing all PSD increment consuming sources.
IV. Determine if there is an exceedance of PSD Class I increment within any Class I area.
V. If the facility alone will violate any NAAQS, NMAAQS, or PSD increment, then the permit cannot be issued through the normal process. Please contact the Bureau for further information.
VI. If there are exceedances of the NMAAQS or NAAQS at any receptors within the ROI, the next step is to determine if the facility being modeled significantly contributes (see significance levels in Table 6) to the exceedance at those receptors during the same time period(s) that the exceedance occurs. If so, the permit cannot be issued through the normal process. See non-attainment area requirements, below.
VII. If no exceedances are found, or if the facility does not contribute amounts above significance levels to the exceedances, then the facility can be permitted per the modeling analysis.

7.2.3 NMAAQS and NAAQS

All sources are required to submit NMAAQS and NAAQS modeling. The total concentrations of all facilities and background sources are required to be below the NAAQS. The steps required for this analysis are outlined above.

7.2.4 PSD Class II increment

PSD Increment modeling applies to both minor and major sources. If the minor source baseline date has been established in the Air Quality Control Region (AQCR) in which the facility will be located, then PSD increment consumption modeling must be performed. If the minor source baseline date has not been established in that region, then only PSD major sources must perform this analysis.

Portable sources that are not located at a single location continuously for more than one year are not required to model PSD increment consumption.

The steps required for this analysis are outlined above.

The same significance levels that apply to NAAQS and NMAAQS standards are assumed to apply to PSD Class II increment as well.

7.2.5 PSD Class I increment

If a PSD Class II increment analysis is required and the proposed construction of a minor source is within 50 km of a Class I area (see Figure 1), then PSD increment consumption at the Class I area(s) must be determined and compared with the Class I PSD increment. If the proposed construction of a PSD major source is within 100 km of a Class I area, then PSD increment consumption at the Class I area(s) must be determined and compared with the Class I PSD increment. The PSD permit process requires a more thorough Class I analysis, which is described in *Step 6*.

See *Receptor Placement*, above, for receptor instructions.

Proceed with the Class I area analysis similarly to the other analyses described above. Class I significance levels apply for determining whether or not a facility contributes significantly to an exceedance in a PSD Class I area and for determining the Class I ROI.

7.3 Step 3: Portable Source Fence Line Distance Requirements for Initial Location and Relocation

Skip this step if the facility is not a portable source.

Portable sources should model fence line distance requirements for relocation purposes and for setback distances within the initial property. If the facility wants to be able to move equipment around within the property, or move to a new location, permit conditions will be required to ensure the facility continues to demonstrate compliance with air quality standards as it moves. For this modeling, use meteorological data that the Bureau has approved for relocation modeling, which may be different from that used for the rest of the modeling for the facility. Model the facility with a haul road length at least as long as the setback distance and a number of truck trips equal in number to the count at the original location. Surrounding sources may be ignored, but include co-located facilities if the desire is to be able to co-locate with other facilities at the new locations. To determine setback distance, draw a line connecting the concentrations where they drop off to the point that are just under the ambient air standard or PSD increment. Make sure to add background concentration before determining the isopleths for ambient air standards. From each point on the isopleth line, determine the distance to the nearest source (excluding haul road sources). The setback distance is the largest of these distances. Setback distance is typically rounded up to the nearest meter that is above the calculated value. An example setback distance determination is pictured in Figure 7, below.

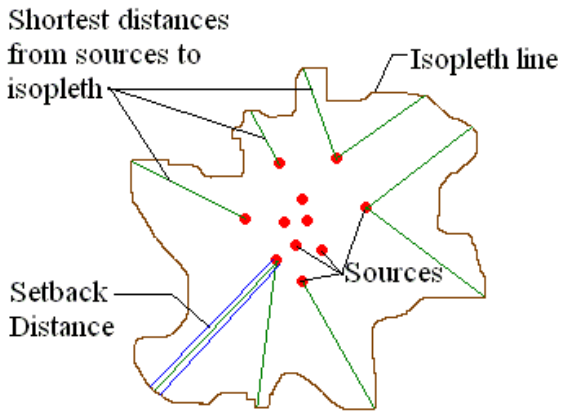


Figure 7: Setback Distance Calculation

Fine spacing is suggested within the property boundary for relocation requirement modeling.

If the applicant does not perform fence line distance modeling, relocation distance will be assumed to be the distance from the edge of a facility operations to the most distant point on the initial fence line. An irregular or elongated fence line shape can result in relocation requirements that require very large properties to be fenced off in order to relocate there without submitting modeling for each new location of the facility.

7.4 Step 4: Non-Attainment Area Requirements

Skip this step if all modeled concentrations are below NAAQS, NMAAQS, and PSD Increments.

If the modeling analysis of a source predicts that the impact from any regulated air contaminant will exceed the significance level concentrations at any receptor which does not meet the NMAAQS or NAAQS, the source will be required to obtain emissions offsets of at least 120% of the proposed emissions and demonstrate a net air quality benefit. The net air quality benefit is a reduction of at least 20% of the maximum modeled concentration from the emission sources being modified. The 20 percent reduction shall be calculated as the projected impact subtracted from the existing impact divided by the existing impact. The offsets and net air quality benefit must be from actual emissions, not from allowable emissions, and the offsets must be quantifiable, enforceable, and permanent. For more information regarding offsets, see **20.2.72.216 NMAC** and **20.2.79 NMAC** – Non-attainment Areas.

7.5 Step 5: Modeling for Toxic Air Pollutants

Skip this step if there are no toxics to model at this facility. See section 2, "New Mexico State Air Toxics Modeling", to determine if modeling of toxics is required and for other details about toxics regulatory requirements.

I. Model the toxic air pollutants similar to the way the other pollutants were modeled, as described above in steps 1 and 2. Use an 8-hour averaging period, complex terrain, and building downwash.
II. No surrounding source inventory exists for the toxics, so model only your source.
III. Make sure a fine grid is used in the area of maximum concentration.
IV. If more than one toxic pollutant is being modeled and they use the same stacks at the same ratio of emission rates, it is allowable to scale the results of the first pollutants by the emission rate ratio to determine the concentration of the other toxics.

If modeling shows that the maximum eight-hour average concentration of all toxics is less than one percent of the Occupational Exposure Level (OEL) for that toxic, then the analysis of that toxic pollutant is finished. Report details about the maximum concentrations in the modeling report. Otherwise, perform BACT analysis or health assessments, as required. Contact the Bureau on how to proceed if the 1/100th of the OEL is exceeded.

7.6 Step 6: PSD Permit Application Modeling

Skip this step if the facility is not a PSD major source.

PSD sources and requirements are defined in NMAC 20.2.74.303 to 305. New PSD major sources and major modifications to PSD major sources must submit the following modeling requirements in addition to the regular NSR modeling requirements listed above. Minor modifications to PSD major sources are only subject to regular NSR modeling requirements listed above, as required under NMAC 20.2.72.

Due to a court ruling, the use of the $PM_{2.5}$ significant ambient concentration level or significant monitoring concentration for PSD major modifications or new PSD major sources is not allowed. This significant ambient concentration level may still be used for minor source permitting.

Sources subject to PSD requirements should consult with the Bureau to determine how to proceed in the application process. For PSD applications, a modeling protocol is required for review. Please refer to EPA's *New Source Review Workshop Manual.* The following items are required for PSD permit applications and supersede other modeling requirements in this document.

7.6.1 Meteorological Data

Applicants may need to collect one year of on-site meteorological and ambient data to satisfy PSD requirements. In some cases, it may be advantageous to begin collecting on-site meteorological and ambient data to ensure that it is available at a site that may become PSD in the future. A company considering a monitoring program is advised to consult with the Bureau as early as possible so that an acceptable data collection process, including instrument parameters, can be started. Generally, the following meteorological parameters will be measured: wind direction, wind speed, ambient air temperature, solar insolation, ΔT, and σ_θ. For further information on meteorological monitoring Refer to EPA's *Guideline on Air Quality Models* and *On-Site Meteorological Program Guidance for Regulatory Modeling Applications*. Refer to *Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD)* for ambient monitoring guidance. In addition, a monitoring protocol and QA plan **must** be submitted and approved prior to beginning collection of data for a PSD application if these data are to be used for the analysis.

In the absence of actual on-site data, the Bureau may approve the use of off-site data that the Bureau believes mimics on-site data for that location or the Bureau may approve the use of data produced by the model MM5.

7.6.2 Ambient Air Quality Analysis

The ambient air quality analysis is the same as described above, with the exception of the following points.

- If the maximum ambient impact is less than EPA's significant concentration levels (see Table 6), then a full analysis is not required.
- Nearby sources must be considered. Discarding sources is discussed in the section on "neighboring sources data".
- A total air quality analysis must also be performed for each appropriate Class I area if the facility produces concentrations greater than the Class I significance levels in Table 6. All sources near

the Class I area must be considered. The inventories for the analysis near the facility and the inventory for the analysis near Class I areas may be quite different because they are centered on different locations.

- An analysis of Air Quality Related Values must be included in the PSD application. If the facility will have no impact on the AQRV, then that must be stated in the application (NSR Workshop Manual, Chapter D).
- There may be additional analyses required by the Federal Land Managers (FLM) for Air Quality Related Values (AQRVs). See **F**ederal **L**and **M**anagers' **A**ir Quality Related Values Work **G**roup (FLAG) for more information at: http://www2.nature.nps.gov/air/Permits/flag/index.cfm

7.6.3 Additional Impact Analysis (NMAC 20.2.74.304)

The owner or operator of the proposed major stationary source or major modification shall provide an analysis of the impact that would occur as a result of the source or modification and general commercial, residential, industrial, and other growth associated with the source or modification. This analysis is in addition to the Class I analysis, but may use some of the same techniques that were used in the Class I analysis.

- Visibility Analysis: A Class II Visibility Analysis is required to determine impact the facility will have upon Class II areas. Analyze the change in visibility of a nearby peak or mountain for this analysis. In the absence of nearby mountains, analyze the visibility of clear sky from nearby state or local parks.
- Soils analysis: What changes will occur to soil pH, toxicity, susceptibility to erosion, or other soil characteristics as a result of the project and indirect growth related to the project?
- Vegetation analysis: What changes will occur to type, abundance, vulnerability to parasites, or other vegetation characteristics as a result of the project and indirect growth related to the project? The owner or operator need not provide an analysis of the impact on vegetation having no significant commercial or recreational value.
- Growth analysis: The owner or operator shall also provide an analysis of the air quality impact projected for the area as a result of general commercial, residential, industrial, and other growth associated with the source or modification.

7.6.4 Increment Analysis

- If the facility produces ambient concentrations greater than the significance levels in Table 6, then the Class II PSD increment analysis for the facility must use the inventory of all increment consuming sources near the facility. Sources in other states should be obtained from the agency in the surrounding state.
- If there is a Class I area within 100 km of the facility (or any distance, if requested by the FLM), then receptors must be located at the Class I area.
- If the facility produces ambient concentrations greater than the Class I significance levels in Table 6 in a Class I area, then the increment analysis for the Class I areas should use the inventory of all increment consuming sources near the Class I area, including those sources in other states. Sources in other states should be obtained from the agency in the surrounding state.

7.6.5 Emission trade-offs

- If a facility is trading off emissions from another source that is not owned by the applicant, the applicant must produce a federally enforceable legal document that the state can use to force the emission reductions.

7.6.6 Emission Inventories

- The most current inventory of sources must be used. It should contain all sources currently under review by the Bureau that would be located within the appropriate inventory area. The applicant should check with the modeling staff to ensure that the inventory is up to date.

7.6.7 BACT analysis

- The analysis must follow current EPA procedures and guidelines.

7.7 Step 7: Write Modeling Report

A narrative report describing the modeling performed for the facility is required to be submitted with the permit application using Universal Application form 4 (UA4). This report should be written so as to provide the public and the Bureau with sufficient information to determine that the proposed construction does not cause or contribute to exceedances of air quality standards. The report needs to contain enough information to allow a reviewer to determine that modeling was done in a manner consistent and defensible with respect to available modeling guidance. Do not include raw modeling output in the report, only summaries and descriptions of the output or input.

This outline may be used as a checklist to determine if the analysis is complete.

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 Bureau 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, and property boundaries. Include UTM zone and datum.
III. Modeling requirements description
   a. List of pollutants at this facility requiring NAAQS and/or NMAAQS modeling.
   b. AQCR facility is located in and resulting list of pollutants requiring PSD increment (Class I and II) modeling. Include distances to Class I areas in discussion.
   c. List of State Air Toxic pollutants requiring modeling.
   d. PSD, NSPS, and NESHAP applicability and any additional modeling requirements that result if those regulations are applicable to the facility.
   e. State whether or not the facility is in a federal Non-attainment area, and any special modeling requirements or exemptions due to this status.
   f. Any special modeling requirements, such as streamline permit requirements.
IV. Modeling inputs
   a. General modeling approach
      i. The models used and the justification for using each model.
      ii. Model options used and why they were considered appropriate to the application.
      iii. Ozone limiting model options discussion, if used for NO_2 impacts.
      iv. Background concentrations.

b. Meteorological data
   i. A discussion of the meteorological data, including identification of the source of the data.
   ii. Discussion of how missing data were handled, how stability class was determined, and how the data were processed, if the Bureau did not provide the data.
c. Receptor and terrain discussion
   i. Description of the spacing of the receptor grids.
   ii. List fence line coordinates and describe receptor spacing along fence.
   iii. PSD Class I area receptor description.
   iv. Flat and complex terrain discussion, including source of elevation data.
d. Emission sources
   i. Description of sources at the facility, including:
      1. A cross-reference from the model input source numbers/names to the sources listed in the permit application for the proposed facility.
      2. Determination of sigma-Y and sigma-Z for fugitive sources.
      3. Description and list of PSD increment consuming sources, baseline sources, and retired baseline sources.
      4. Describe treatment of operating hours
      5. Particle size characteristics, if plume depletion is used.
      6. If the modeled stack parameters are different from the stack parameters in the application, an explanation must be provided as to what special cases are being analyzed and why.
      7. Partial operating loads analysis description.
      8. Flare calculations used to determine effective stack parameters.
      9. In-stack NO_2/NO_X ratio determination, if using OLM or PVMRM.
   ii. Surrounding sources:
      1. The date of the surrounding source retrieval.
      2. Details of any changes or corrections that were made to the surrounding sources.
      3. Description of adjacent sources eliminated from the inventory.
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 discussion of the radius of impact determination.
   b. A summary of the modeling results including the maximum concentrations, location where the maximum concentration occurs, and comparison to the ambient standards.
   c. Source, cumulative, and increment impacts.
   d. Class I increment impact.
   e. A table showing concentrations and standards corrected for elevation.
   f. If ambient standards are exceeded because of surrounding sources, please 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.
   g. Toxics modeling results, if needed.

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

Ask the modeling section or check the web page for a sample modeling reports. The modeling report documents details the standard format for the modeling report.

7.8 Step 8: Submit Modeling Analysis

Submit the following materials to the Bureau:

A CD containing the following:

I. An electronic copy (in MS Word format) of the modeling report.
II. Input and output files for all model runs. Include BEEST, ISC-View, or BREEZE files, if available.
III. Building downwash input and output files.
IV. Fence line coordinates.
V. Meteorological data, if not Bureau-supplied.
VI. A list of the surrounding sources at the time the facility was modeled.
VII. An electronic copy of the approved modeling protocol.

Do not include paper copies of modeling input and output files.

8.0 List of Abbreviations

Table 26: List of Abbreviations

ACRONYM	DESCRIPTION
AQB	Air Quality Bureau
AQCR	Air Quality Control Region
AQCR	Air Quality Control Regulation (CURRENTLY NOT USED)
AQRV	Air Quality Related Values
ARM	Ambient Ratio Method
BACT	Best Available Control Technology
CO	Carbon monoxide
DEM	Digitized Elevation Model
EPA	Environmental Protection Agency
FLAG	**F**ederal **L**and **M**anagers' **A**ir Quality Related Values Work **G**roup
FEM	Federal Equivalent Method
FRM	Federal Reference Method
GEP	Good Engineering Practice
H_2S	Hydrogen sulfide
ISCST3	Industrial Source Complex Short Term Model version 3
NAAQS	National Ambient Air Quality Standards
NED	National Elevation Dataset
NO_2	Nitrogen dioxide
NO_X	Nitrogen oxides
NMAAQS	New Mexico Ambient Air Quality Standards
NMAC	New Mexico Administrative Code
O_3	Ozone
OEL	Occupational Exposure Level
OLM	Ozone limiting method
Pb	Lead
PDF	Probability density function
$PM_{2.5}$	Particulate matter equal to or under 2.5 μm in aerodynamic diameter
PM_{10}	Particulate matter equal to or under 10 μm in aerodynamic diameter
PPM	Parts per million (volume ratio)
PSD	Prevention of Significant Deterioration
PVMRM	Plume Volume Molar Ratio Method
ROI	Radius of Impact
SO_2	Sulfur dioxide
TSP	Total suspended particulates
UTM	Universal Trans Mercator
VOC	Volatile organic compounds

9.0 References

Ensor, D.S. and M.J., Pilat (1971). Calculation of smoke plume opacity from particulate air pollutant properties. J.Air Poll.Cont.Assoc. 21(8): 496-501.

EPA (1995). User's Guide for the Industrial Source Complex (ISC3) Dispersion Model, Volume I - User Instructions. EPA-454/B-95-003a. September 1995.

Joseph A. Tikvart (1993). "MEMORANDUM: Proposal for Calculating Plume Rise for Stacks with Horizontal Releases or Rain Caps for Cookson Pigment, Newark, New Jersey", Joseph A. Tikvart (Model Clearinghouse), July 9, 1993.

SCREEN3 Model User's Guide (1995). SCREEN3 Model User's Guide, EPA-454/B-95-004, September, 1995. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Emissions, Monitoring, and Analysis Division, Research Triangle Park, NC.

NSR Workshop Manual, Chapter D – Air Quality Related Values

Federal **L**and **M**anagers' **A**ir Quality Related Values Work **G**roup (FLAG) Phase I Report: http://www2.nature.nps.gov/air/Permits/flag/index.cfm–
New Mexico Administrative Code (NMAC)

EPA, 1995d*: User's Guide for the Industrial Source Complex (ISC3) Dispersion Models*, EPA-454/B-95-003a, September, 1995. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Emissions, Monitoring, and Analysis Division, Research Triangle Park, NC.

Texas 1999: ***Air Quality Modeling Guidelines***, TNRCC-New Source Review Permits Division, RG-25 (Revised), February 1999

"The Plume Volume Molar Ratio Method [(PVMRM)] for Determining NO_2/NOx Ratios in Modeling", by Pat Hanrahan of the Oregon DEQ. The paper appeared in the November 1999 issue of the AWMA journal.

Links:

Environmental Protection Agency, 40 CFR Part 51, Revision to the Guideline on Air Quality Models Appendix W: http://www.epa.gov/ttn/scram/guidance/guide/appw_05.pdf

NSR Workshop Manual 1990 Draft: http://www.epa.gov/ttn/nsr/gen/wkshpman.pdf

Modeling Procedures for Demonstrating Compliance with PM2.5 NAAQS memo from Stephen Page, March 23, 2010:
http://www.epa.gov/ttn/scram/Official%20Signed%20Modeling%20Proc%20for%20Demo%20Compli%20w%20PM2.5.pdf

10.0 INDEX

AERMOD, 41, 42
Background, 47
Building downwash, 17, 59, 72, 79
CALPUFF, 42
crushing, 61
CTSCREEN, 41, 42
Flare, 63
GEP, 59, 80
haul road, 35
ISCST3, 41, 42, 80
meteorological, 44, 46, 68, 69, 75, 78
nearby sources, 18, 20, 21, 22, 24, 25, 28, 29, 30, 31, 32, 34, 48, 60
neighboring sources, 60, 68, 71
NO_2, 12, 17, 22, 23, 24, 33, 36, 37, 71, 80, 81
PSD increment, 8, 35, 58, 72, 73
PVMRM, 42
receptor, 40, 41, 59, 70, 71, 72, 73, 74, 78
ROI, 17, 59, 70, 71, 72, 73, 80
RTDM, 42
SCREEN3, 41, 63, 81
temporary, 35