New Mexico Air Quality Bureau

Dispersion Modeling Guidelines

revised July 2003

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Figures and Tables

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INTRODUCTION

An air dispersion modeling analysis must be submitted with each air quality permit application under New Mexico Air Quality Control Regulation 20NMAC2.72 (previously AQCR 702). Some sources may be exempted from the usual modeling requirement under 20NMAC2.72 Subpart III; if so, skip to *Streamlined Compressor Station Modeling Requirements.* These guidelines have been developed to aid the modeler in developing an acceptable analysis and to facilitate the Bureau staff in expediting the review process.

These guidelines define what the Bureau considers as acceptable for a dispersion modeling analysis. Please take the time to thoroughly read this document. Many frequently asked questions are answered in this document. We have attempted to develop some general procedures; however, we realize that each analysis will be somewhat unique. Following the guidelines will usually result in an acceptable analysis. In some cases the Bureau may require further analysis, beyond that which is outlined in this document. It is beneficial for the modeler and the Bureau to resolve these details before the analysis is submitted. 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. Modelers who have not submitted an analysis to the Bureau recently are encouraged to call the modeling staff to ensure that appropriate models, meteorological data, area emissions data and procedures will be applied.

The purpose of the modeling analysis is to demonstrate that all applicable air quality standards and, as appropriate, Prevention of Significant Deterioration (PSD) increments, will be met after a proposed construction or modification. If the analysis adequately demonstrates that standards and/or PSD increments will be met, the permit application will move swiftly through the permitting process. If the analysis is incomplete, the staff will inform the applicant as quickly as possible by letter or phone call. This will halt the permitting process until sufficient information is submitted. If dispersion modeling demonstrates that construction or modification causes or significantly contributes to a violation 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. Contact the Bureau for further information should this occur.

In general, the procedures in the EPA document, Guideline On Air Quality Models (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. There are some differences in procedures which are specific to the New Mexico program. These differences are outlined below. The level of analysis will depend on the complexity of the source, surrounding sources and terrain in the area. The modeler should check with the Bureau modeling staff for approval of methods and level of analysis.

Requirements for Determination of Completeness

The purpose of the following requirements is to expedite the processing of the permit. Each of the following items is part of any basic modeling analysis; there is no exemption from providing any item. Failure to address any one item will result in an incomplete ruling. The Bureau modeling staff must verify that the input is correct, that the model was run properly, that the meteorological data are correct, and that the model output can be verified. If a complete analysis is submitted, it becomes relatively simple for the Bureau staff to review.

A report must be submitted (this means actual text, not just a pile of model output) which presents the case as to why the permit should be issued. Please keep in mind that all modeling analyses are available for public review. The document should be written in such a manner that public review would not prove embarrassing to the modeler. Often, the Bureau receives analyses with little or no text explaining the modeling procedures followed. All assumptions should be identified and fully documented. The Bureau is not interested in a compendium of the history of dispersion modeling; however, the modeler should not make the Bureau guess why certain methods were used. If we have to guess, we will guess that the analysis is incomplete, and you will have to submit a supplemental report.

The following are **required** elements of the analysis:

A. 3.5” diskette(s) containing the following:

1. Input data for all model runs;
2. Met data, if not Bureau-supplied;
3. Output files for model runs;
4. Building downwash input (pip) and output (gep) files;
5. Fence line coordinates.

B. A typed, bound report addressing the following issues:

- A completed dispersion modeling checklist.

- A list of all the file names in the accompanying diskette(s) and description of these files.

- An appropriate discussion (text) of the modeling approach for screening and refined modeling. This should include which models and model options were used and why they were considered appropriate to the application.

- A discussion of the meteorological data, including identification of the source of the data. If the data were not provided by the Bureau, the discussion should include how missing data were handled, how stability class was determined and how the data were processed.

- A copy of an appropriate USGS topographic map showing the location of the proposed facility, on-site buildings, emission points and property boundaries.

- Description of the site, dimensions of buildings, and a plot plan.

- Description of the spacing of the receptor grids; this should include boundary (fence line) coordinates and receptors on the property boundary.

- A copy of surrounding sources emission inventory provided by the Bureau, and a listing of all sources used in the modeling, with cross-reference names/numbers to the sources in the model input.

- A cross-reference from the model input source numbers/names to the sources listed in the permit application for the proposed facility.

- 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.

- A discussion of the radius of impact determination.

- A cross-reference to file names on disk when discussing ambient impacts. Otherwise the Bureau staff will have to spend a lot of time figuring out which files contain the relevant receptors and your analysis may be deemed incomplete.

- A table showing concentrations or standards corrected for elevation.

- A summary of the modeling results including the maximum concentrations, location where the maximum concentration occurs, and comparison to the ambient standards.

- 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.

- A summary of flare calculations used to determine effective stack parameters.

- **Very Important: Bind Your Analysis!** Unbound documents are very difficult to keep together. Bureau modeling staff will not be responsible for loss of parts of your analysis and subsequent incomplete rulings. **Do not submit** analyses in paper bags, boxes, folders, briefcases, purses, or any other containers! Three-ring binders or plastic side bindings are preferred.

C. The following topics must be addressed within the report:

- a narrative summary of the proposed construction, modification, or revision;
- the models used and the justification for using each model;
- all criteria, Part IV, or hazardous air pollutants emitted by the proposed source;
- all appropriate state and federal averaging periods for each pollutant;
- significant impact and radius of impact;
- adjacent sources modeling and sources eliminated from the inventory;
- building downwash;
- fence line coordinates;
- flat and complex terrain;
- PSD, NSPS and NESHAP applicability;
- source, cumulative, and increment impacts;
- Class I increment impact (see fig. 3).

General Procedures

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 EPA Region 6 offices for review and comment. Consultation with Bureau modeling staff regarding appropriate model options, meteorological data, and neighboring sources is recommended for minor sources also, and can be accomplished in writing or by phone. The applicant should allow two to three 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.) Source inventory data
b.) Receptor grids
c.) Terrain classification (simple or complex)
d.) Choice of models
e.) Model input options
f.) Minor source baseline dates for modeling increment consumption
g.) Nearby Class I areas
h.) Any other possible sources of disagreement

The input data to the models will be unique to the source. Data will usually consist of 1) maximum load capacity emission rates and stack parameters for the proposed source; 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 of the proposed source must be the same as those in the permit application**. Failure to adhere to this rule will result in an incomplete analysis.

Models Most Commonly Used in New Mexico

NMED accepts the use of EPA-approved models for dispersion analyses. For dispersion modeling within 50 km of the source, gaussian plume models such as SCREEN3, ISCST3, and CTSCREEN should be used with the technical options recommended in the Guideline on Air Quality Models.

SCREEN3

Screening models are used to simulate an absolute worst case condition. These models take less computer time and are more conservative than refined models. The SCREEN3 model (or other EPA-approved models) may be used to determine 1-hour concentrations. Grid spacing can be relatively coarse; 250 to 1000 meter grid spacing is acceptable, but good judgment should be used as to what is appropriate for the source. Table 1 can be used to convert 1-hour concentrations to 3-hour, 8-hour, 24-hour and annual concentrations by multiplying by the appropriate conversion factor for averaging period and stability class of the 1-hour concentration.

Table 1. Correction factors for 1-hour concentration

	Averaging Period			
Stability	3-hour	8-hour	24-hour	Annual
A	1.00	0.45	0.15	0.08
B	1.00	0.60	0.20	0.08
C	1.00	0.67	0.26	0.08
D	1.00	0.67	0.53	0.08
E	1.00	0.67	0.34	0.08
F	1.00	0.67	0.30	0.08

ISCST3

This model is most commonly used in modeling simple, intermediate and complex terrain for both short term and long term (annual). The following are suggestions for using ISCST3:

1) Some of the Bureau's meteorological data sets have missing data. To avoid "model crash", use the MSGPRO option and eliminate the DFAULT option in MODELOPT on the CO pathway.

2) Make sure that the source location and parameters are the same as those applied for in the permit!! This is the most common mistake we see.

3) Make sure that your receptor grid is near your source.

4) Receptor grids for cumulative impact analysis must extend up to the radius of impact of the facility.

5) It is a good idea to get 1st and 2nd highest tables and maximum 50 tables. Remember that you must look at all exceedances of the standard to see if the source is culpable; you may need to get 3rd, 4th, 5th highest, additionally, if there are exceedances.

6) Source grouping is a good option to employ in ISCST3. In some cases, one run can be made instead of three.

CTSCREEN

1) Again, **make sure that the receptor grid is appropriate for the source!**

2) Bureau staff will verify that the terrain elevations/contours represent the terrain in the area of the source. The modeler should make an effort to correctly enter terrain data.

3) In general, the best approach to complex terrain modeling is a coarse grid run on all complex terrain within the radius of impact to identify the area of maximum concentration, followed by a refined grid run (100 meter spacing or less) in the area of maximum concentration. A combination of the receptors generated by RECGEN and discrete receptors is recommended with 50 - 100 meter spacing. The following list can be used to correct 1-hour concentrations to 3-hour, 24-hour and annual concentrations by multiplying by the appropriate conversion factor for the averaging period.

CTSCREEN Correction factors for 1-hour concentration.

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

Other Models Commonly Used

1) RTDM (Rough Terrain Dispersion Model) may be used in cases where a more refined complex terrain model is required.
2) RPM IV (Reactive Plume Model) may be used for some larger sources and sources near urban areas. This model would be appropriate for ozone precursors.

Selecting Meteorological Data.

For SCREEN3, worst case meteorological data is provided with the model. When using other models, the meteorological data used in the modeling analysis should be representative of the meteorological conditions at the specific site of proposed construction or modification. 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 met data before the analysis is submitted. PSD permits contain more rigorous requirements relating to meteorological data. Either 1 year of 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 conduct on-site monitoring for a PSD permit.

Obtaining Elevation

The ISCST3 model performs calculations for simple and complex terrain. The model accepts elevation data for receptors. This data should be obtained from USGS topographic maps. Elevations should be included for all receptors within the radius of impact (ROI), or within 10 km if the ROI is greater than 10 km. Elevations should also be included for all sources within the ROI or within 10 km if the ROI is greater than 10 km. Use your source's elevation for all sources beyond this. For fine grid analysis with receptor spacing less than 100 meters, 7.5 minute series quadrangles should be used. The 1°x1° maps may be used for coarse-grid analyses.

Simple and Complex Terrain

Simple terrain is defined as terrain with elevations below stack height. Complex terrain is defined as terrain with elevations above plume height. Intermediate terrain is defined as terrain with elevations between stack and plume height. ISCST3 is the guideline model which handles both simple and complex terrain. CTSCREEN is a refined model for determining complex terrain impacts.

Building Downwash and Cavity Concentrations

Building downwash should be included in the analysis when stack height is less than good engineering practice (GEP). All buildings on property should be identified and analyzed for potential downwash effects. NMED requires the use of BPIP 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.

DISPERSION MODELING DETAILS

Determining the Radius of Impact

When an air pollutant discharged by a facility results in an ambient impact greater than significance levels (see Table 3), an ROI should be determined. The ROI analysis is usually performed using SCREEN3 or ISCST3. To save time, receptor elevations need not be entered for the ROI analysis. The ROI is the maximum extent of the source's significant impact. This may be determined with a Cartesian grid (see fig. 1) or a polar grid. A radius of impact for each pollutant averaging period is determined, then the largest ROI is designated as the ROI for that pollutant. The area within the ROI must be included in the analyses for all averaging periods for each pollutant. The ROI may be determined using Ozone Limiting Method (OLM) or Ambient Ratio Method (ARM). Inclusion of building downwash is optional for the ROI analysis.

If the screening analysis shows that impacts from the proposed facility are less than applicable significance levels (see Table 3), there is no need to continue with a full refined analysis. DO NOT PANIC if screening analyses show the facility is exceeding NAAQS or NMAAQS!! In most cases screening analyses are inadequate because of the complexity of the proposed source and the level of emissions. The screening models or refined models run in a screening mode; however, can be useful in identifying areas of concern for the full analysis and receptor placement. It is acceptable to scale impacts from one pollutant to determine impacts from another pollutant if several pollutants vent from the same stack.

Obtaining Neighboring Sources Data

Once the ROI is determined for a specific source, neighboring sources need to be included and a cumulative impact analysis needs to be performed. Neighboring sources information can be obtained from Bureau modeling staff in the form of a retrieval from the US EPA's Aerometric Information Retrieval System (AIRS) data base. In some cases, neighboring source data from other states may be required. The Bureau can provide some data for neighboring states, but the applicant is responsible for verifying any missing data with the other states. The modeler should be prepared with site UTM coordinates, source radius of impact information, and pollutants to be modeled. Any suspicious data within the retrieval should be brought to the attention of the modeling staff. Further information on neighboring sources modeling can be found in the *Emission Inventory Requirements* section of this document. Depending upon the geographic location, emission inventories can change rapidly; please consult with the Bureau if there is a significant time lag (more than 2 months) between the time the retrieval is prepared and the submittal of the analysis.

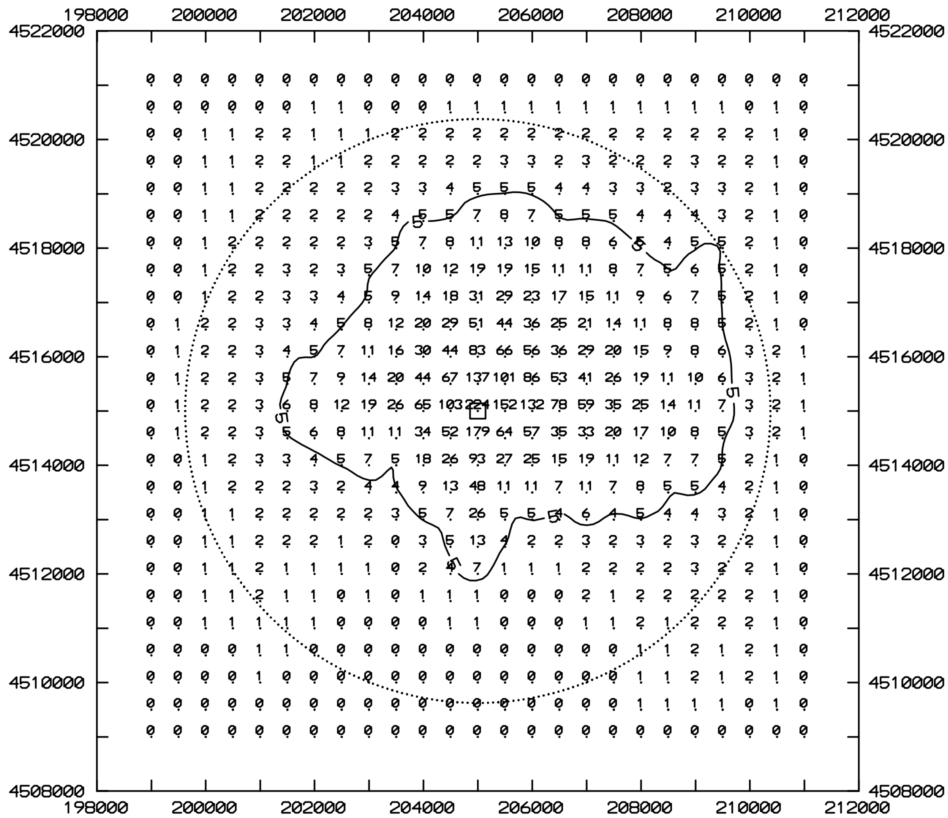


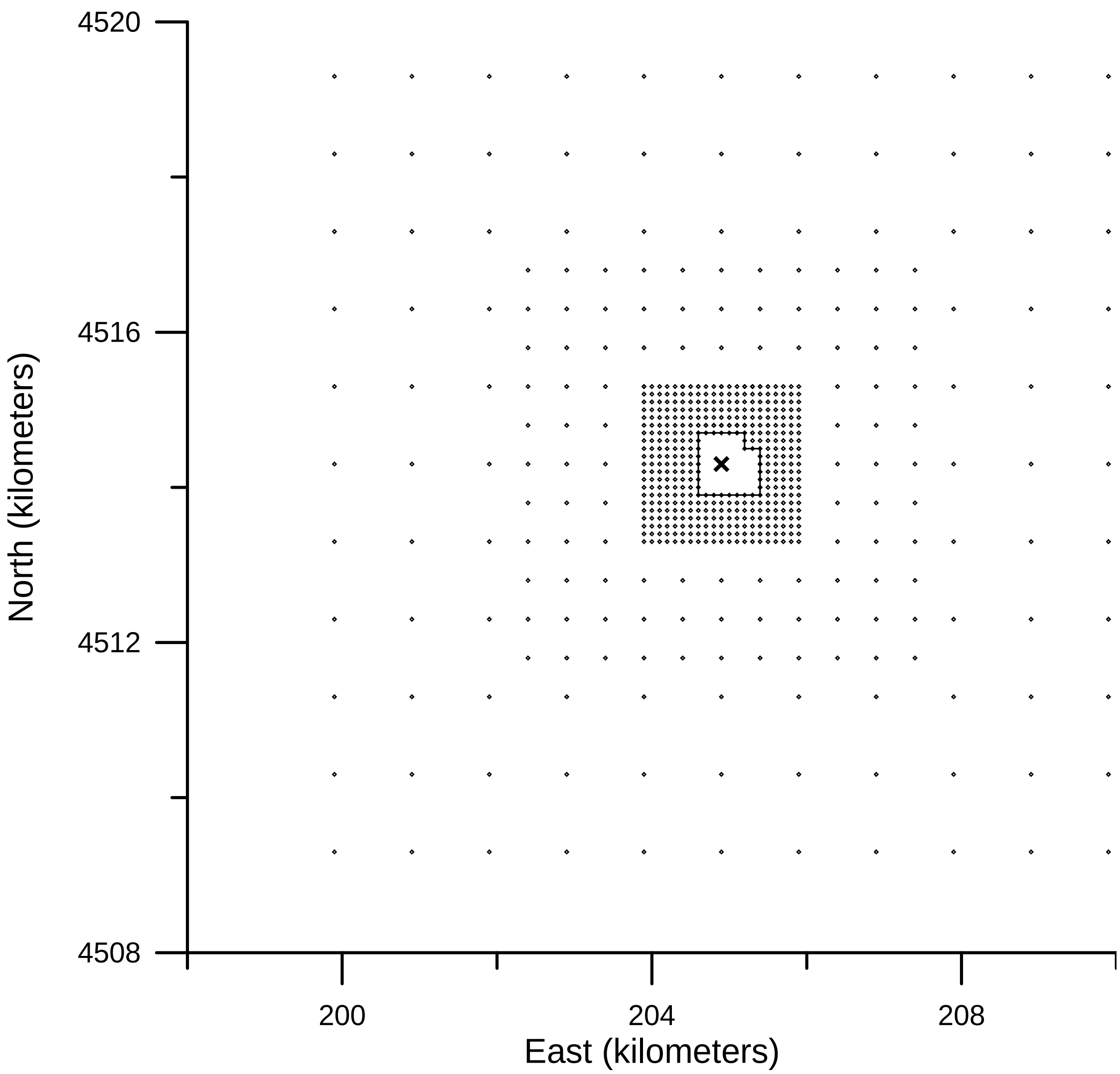
Figure 1. Plot of pollutant concentrations showing the 5 μg/m^3 significance level and the radius of impact (dashed line circle), determined from the greatest lineal extent of the significance level from the source.

Refined Analysis

a.) If a screening analysis was used to determine ROI, the modeler may wish to use a refined model to reduce the area of significant impact. This is advisable for most sources, as you will be required to model the ENTIRE area of significant impact in the cumulative analysis. Grid spacing for the source only run will usually range from 100 to 1000 meters. The refined analysis should include receptor elevations for all receptors within the ROI or within 10 km of the source if the ROI is greater than 10 km. All other receptors can be input using the source elevation. When using one year of meteorological data, always compare the highest short term estimates and the highest annual estimate to the NAAQS and NMAAQS.

At this time, the modeler should note whether the facility alone will violate any NAAQS, NMAAQS, or PSD increment. If there are violations of the NMAAQS or NAAQS, the permit cannot be issued through the normal process. Please contact the Bureau for further information.

Grid Spacing: Ambient air is defined as any receptor 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, receptors should be located on-property. In general, polar grids are not acceptable for refined analyses. Please use Cartesian grids with actual UTM coordinates at 100 meter resolution or less, as appropriate for your source. We suggest creating your grid on even 100 meter UTM intervals. Thus, if your source is at UTM 367.584 km E, your grid should have x-coordinates of 367.600, 367.500, 367.400, etc. Some software generates 90 meter spacing for terrain elevations, and this is also acceptable. Fence line receptors should be analyzed at exact UTM coordinates with 50 meter spacing. Figure 2 shows an example of receptor grid spacing. Some air toxic analyses require very close receptor spacing due to the close proximity of buildings and/or points of public access.



Error! Switch argument not specified. Figure 2. Example of a simple terrain receptor grid consisting of a coarse (1 km increments), medium (500 m increments), and a fine mesh (100 m increments) with the facility source at the center.

b.) Determine if there is a violation of the NMAAQS or the NAAQS within the area defined by the radius of impact by including the source and all neighboring sources in the cumulative impact model run. To determine which neighboring sources should be included, see Emission Inventory Requirements. Neighboring sources within 10 km of the source should be input with actual plant elevations. All other neighboring sources can be input with the same elevation as the source being evaluated. Two runs are ideal at this time; a coarse grid (250 to 500 m grid spacing) to identify the area of maximum impact, and a fine grid (100 m grid spacing) encompassing the area of maximum impact. The fine grid must be at least 1 km by 1 km with 100 m spacing to identify the maximum concentration; however, it must definitively demonstrate that the maximum impact has been identified. Concentrations should "fall off" from the center of the fine grid. **Include fine grids near adjacent sources and in "hot spots" to determine if your facility significantly contributes to violations of the NMAAQS or NAAQS near other sources.** If there are violations 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 3) to the violation at those receptors during the same time period(s) that the violation occurs. If so, the permit cannot be issued through the normal process. Contact the Bureau for further information.

NOTE: Some sources will have an ROI greater than 50 kilometers. In these cases, the grid should extend out beyond 50 km despite the fact that EPA's *Guideline on Air Quality Models* indicates that the useful distance for guideline models is 50 kilometers. Due to the resource-intensive nature of long-range transport models and the need to estimate ambient concentrations at distances greater than 50 km, the Bureau policy is to use ISCST3 or other guideline models for estimating concentrations at distances greater than 50 km from the source. This will result in conservative estimates of impacts at distances greater than 50 km from the source. Receptor grids need not extend beyond 100 km from the source, however, even if the ROI is greater than 100 km.

c.) Determine if the PSD Class II increment is exceeded by including the source and all increment consumers in the model run. Again, use the highest predicted short-term and annual impacts for comparison with the NAAQS and NMAAQS. **Important: If the minor source baseline date has been triggered in the Air Quality Control Region (AQCR), PSD increment consumption modeling must be performed**. **This is a New Mexico requirement.** Increment consuming sources are identified on the inventory by a code of "1" in the far right-hand column of the AIRS retrieval. Baseline sources are identified by a "0" or blank. The Bureau will furnish a separate inventory of retired baseline sources upon request. Retired baseline or increment expansion can be included in model runs by using a negative emission rate. The receptor grid for the increment analysis should be the same as the one for the cumulative run. Also, if the proposed construction of a minor source is within 50 km of a Class I area (see figure 3), increment consumption at the Class I area(s) must be determined and compared with the Class I PSD increment. Discrete receptors should be placed at the property boundary of the Class I area in the increment run. This requirement is specific to New Mexico's approach to ensure that increment is protected. The PSD permit process requires a more thorough Class I analysis which is outlined in the section "Dispersion Modeling for PSD Applications".

d.) If no violations are found, the facility can be permitted per the modeling analysis.

Non-Attainment Area Requirements

If the modeling analysis of a source shows that the impact from any regulated air contaminant will exceed the significant ambient concentrations listed in Table 3 at any receptor which does not meet the NAAQS or NMAAQS, the source will be required to obtain emissions offsets of at least 120% for the proposed emissions and demonstrate a net air quality benefit of at least 20% reduction in impacts. The offsets and net air quality benefit must be from **actual** emissions, not from allowable emissions, and be quantifiable, enforceable, and permanent. For more information regarding offsets, see 20 NMAC2.79 - *Nonattainment Areas*. The net air quality benefit may be demonstrated by modeling actual emissions before and after construction and showing a reduction in modeled concentrations of at least 20%.

Stacks with Raincaps and Horizontal Stacks

Stacks which vent emissions horizontally and/or have raincaps should be modeled as point sources with stack parameters which will simulate the manner in which emissions are released to the atmosphere: V_s = 0.001 m/s; d_s = 1m; T_s = 0 K; H_s = release height.

NO_2 Modeling Methodology

The Bureau has approved two screening techniques for estimating NO_2 concentrations from NO_x point sources. The first is a partial conversion rate of 40% which is only applicable to 24-hour concentrations. For example, if the NO_x concentration is 200 $\mu g/m^3$, the NO_2 concentration can be assumed to be 80 $\mu g/m^3$. This technique can be used to reduce the radius of impact. The Ambient Ratio Method (ARM) adopted in Supplement C to the Guideline on Air Quality Models allows a partial conversion rate of 75% for annual averages. The Bureau does not currently have data to support using any other percentage of conversion for the ARM.

Some sources will need to examine the atmospheric chemistry in a more rigorous manner. The Bureau continues to accept Ozone Limiting Method (OLM) to more accurately determine NO_2 concentrations. The use of ISC3-OLM or equivalent is recommended. EPA guideline requires OLM be performed on a "plume-by-plume" basis, unless a demonstration of plume merging can be made. The Bureau can provide maximum 24-hour profiles of ozone concentrations, maximum 24-hour seasonal profiles of ozone concentrations, and in some cases, an hour-by-hour ozone profile for the entire year. OLM should be used to resolve, if possible, any NO_2 standard exceedances at each receptor which shows a violation. For 24-hour NMAAQS violations, there may be several days of exceedance at a given receptor; therefore, it may be helpful to look at second, third, fourth, fifth -highest concentrations (and sixth, seventh-highest, etc. if applicable) to find all of the violations. In the past, the Bureau has received analyses which have "double-ozone-limited", meaning that the partial conversion was applied and the Ozone Limiting Method was then applied to the resulting concentrations. This is incorrect and will result in an incomplete ruling of the application.

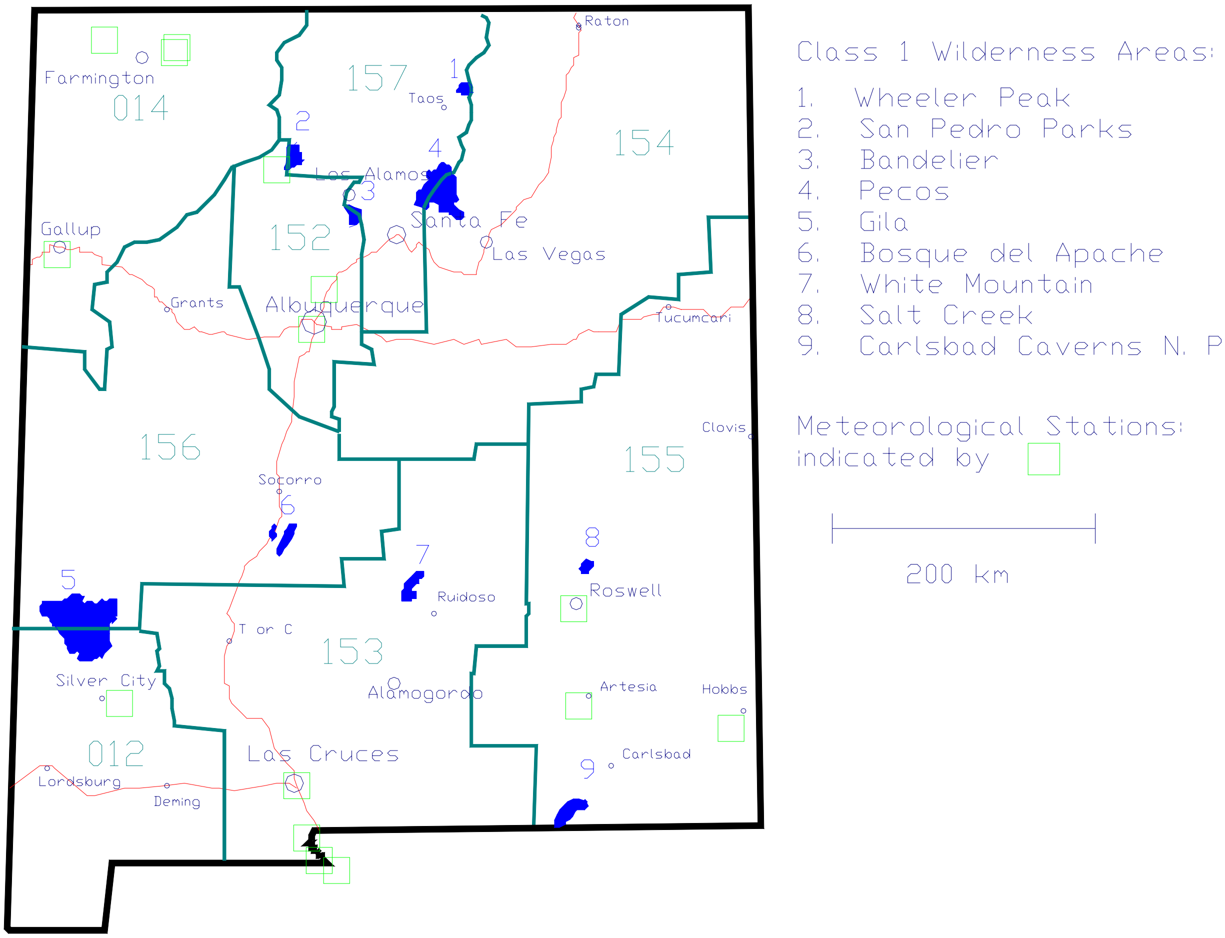


Figure 3. Class I areas and sites of available meteorological data sets

Flare Modeling

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

stack velocity = 20 m/s
stack temperature = 1000°C
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.

Flares in the emission inventory should already have an effective diameter calculated; so the parameters in the inventory can be typed 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 (in most cases, 3-hour and 24-hour standards) under upset conditions.

Fugitive Particulate Emissions from Mining Operations

ISCST3 should be used for modeling fugitive emissions. The wet deposition option should not be used for regulatory modeling analysis and the stack-tip downwash option should be turned off. Fugitive emission rates for sources of particulate emissions can be obtained from AP-42. Crushers, transfer points and screens should be modeled as volume sources with emissions calculated by the method of Ensor and Pilat (JAPCA, 1972). These emission rates are: crushers: 0.05 g/s; screens and transfers 0.03 g/s. Area sources or volume sources may be used to account for storage piles and should include areas between piles and areas of truck traffic within the storage pile area. Haul roads should be modeled as a series of volume sources. It is not necessary to incorporate terrain data when modeling fugitives, because there is no plume rise.

Appropriate background concentrations for 24-hour and annual impacts can be determined from the PM-10 background map (fig. 4). TSP background can be computed by multiplying the PM-10 background by 1.33. **Background concentrations should be added to the impact of the source plus neighboring sources.**

Point Sources Emitting VOCs and NO_x

There are several photochemical models which are appropriate for determining ozone impacts from sources emitting VOCs and NO_x (UAM, RPM, EKMA). These models require an extensive amount of input data and can be quite resource-intensive. The Bureau recommends the screening procedure documented in *Point Source Screening for Ozone Precursor Emissions*, by Richard D. Scheffe, OAQPS, USEPA. The ozone concentration determined from the screening tables can be added to an ozone background for comparison with the NAAQS. Please contact the Bureau to obtain an ozone background which is appropriate for the source you are modeling.

Modeling for Toxic Air Pollutants

Modeling must be provided for any toxic air pollutant sources which emit any toxic in excess of the screening level emission rates in 20NMAC2.72 Subpart Four - *Permits for Toxic Air Pollutants*. The uncontrolled source emission rate should be compared with the screening level emission rates in Subpart Four Appendix A in pounds per hour and modeling should be performed for any toxic which exceeds the screening level. The controlled emission rate of the toxic should be used for the dispersion analysis. If modeling shows that the maximum eight-hour average concentration of all toxics is less than one-one hundredth of the OEL listed in Appendix A, the analysis is finished. For a source of any known or suspected human carcinogens (per Appendix A) which will cause an impact greater than one-one hundredth of the OEL, the source must demonstrate that best available control technology will control the carcinogen. If modeling shows that the impact of a toxic which is not a known or suspected human carcinogen (per AQCR 2.72 Appendix A) is greater than one-one hundredth of the OEL, the application must contain a health assessment for the toxic pollutant including 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. Sources should be aware of the Title V major source thresholds of 10 tpy for any Hazardous Air Pollutants (HAP) and 25 tpy for total HAPs which will require an operating permit to be obtained from the department under 20NMAC2.70- *Operating Permits.*

Streamlined Compressor Station Modeling Requirements

Some compressor stations may not be required to do a full modeling analysis under 20NMAC2.72 Subpart III (previously, AQCR 702 Part IV). Streamlined permits for compressor stations apply to any compressor station falling into one of the following three categories provided that the facility is not located in an exclusion area (see Table 2 for restricted areas):

a.) emissions after control are less than or equal to 40 tpy of a regulated air contaminant;

b.) emissions are less than 100 tpy of a regulated contaminant and impacts are less than significance;

c.) emissions are less than 200 tpy, impacts are less than 50% of all applicable NAAQS and NMAAQS and PSD increments, there are no adjacent sources emitting the same air contaminant(s) within 2.5 km of the modeled NO_2 impact area and adjacent sources have emissions less than thresholds in 20NMAC2.72 Subpart III. D.3.c.

Category (a) does not require any modeling analysis.

Category (b) requires a demonstration that emissions from the compressor station will not result in impacts greater than significance levels in Table 2. ISCST3 or SCREEN3 may be used, and building downwash should be considered if there are buildings at the site.

Category (c) requires a demonstration that facility impacts will be less than 50% of any applicable NAAQS, NMAAQS and PSD increments (see Table 3). PSD increment must be determined only in those Air Quality Control Regions (AQCR) where PSD has been triggered. The ROI will need to be determined (see the previous explanation) so that it can be demonstrated that there are no sources within 2.5 km of the ROI and that the following thresholds are met:

- 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 tpy;
- 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 tpy.

There are other criteria that must be met for streamlined permits for compressor stations. Please refer to *New Mexico Guidance for Streamlined Compressor Stations - Categories 1,2* and 20NMAC2.72 Subpart III for more information.

TABLE 2. Restricted Areas for Streamlined Permits

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

PSD Permit Application Modeling

Sources subject to PSD requirements should consult with the Bureau to determine how to proceed in the application process. Applicants may need to collect a 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, delta T, and sigma theta. Refer to EPA's *Guideline on Air Quality Models* and *On-Site Meteorological Program Guidance for Regulatory Modeling Applications* for further information on meteorological monitoring. 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.

For PSD applications, the EPA requires a modeling protocol for their 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.

1. Ambient Air Quality Analysis
    - The impact area is determined by including all emissions resulting from the proposed source, including all quantifiable fugitive emissions.
    - The impact area is a circular area with radius, the lesser of the distance from the source to the most distant point where significant impact will occur or 50 kilometers from the source. Each pollutant's impact area is the largest impact area for all applicable averaging periods. If the maximum impact is less than EPA's significance levels (see Table 3), then a full analysis is not required.
    - All sources within 100 km of the facility must be considered. Methods of eliminating non-significant impact sources from the inventory can be proposed.
    - Once a permit applies, then an analysis of total air quality for all applicable state and federal standards must be performed. The requirement of this analysis applies regardless of whether the pollutant is significant. This is a New Mexico requirement.
    - A total air quality analysis must also be performed for each appropriate Class I area using an inventory of all sources within 100 km of the Class I area. Non-significant sources can be eliminated from the inventory; however, the inventories for the analysis near the facility and the inventory for the analysis near Class I areas may be quite different. There may be additional analyses required by the Federal land managers for Air Quality Related Values (AQRVs).
2. Additional Impact Analysis
    - This analysis is required to assess the impacts of air, ground and water pollution on soils, vegetation, and visibility. 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.
3. Increment Analysis

- The increment analysis for the facility must use the inventory of all increment consuming sources within 50 km impact area of the facility. No sources should be eliminated.
- When the impact area plus 50 km extends into another state, the applicant must obtain the appropriate inventory from the other state agency.
- The increment analysis for the Class I areas should use the inventory of all increment consuming sources within 100 km of the Class I area. No sources should be eliminated.
- If there is a Class I area in another state within 100 km of the facility, then receptors must be located at the Class I area. Increment consuming sources near the Class I area in the other state must be included in the analysis.

4. Emission trade-offs
   - If a facility is trading off emissions from another source which is not owned by the applicant, the applicant must produce a federally enforceable legal document which the state can use to force the emission reductions legally.
5. Emission Inventories
   - The most current inventory of sources must be used. It should contain all sources currently under review by the Bureau which 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.
6. BACT analysis
   - The analysis must follow current EPA procedures and guidelines.

Emission Inventory Requirements

Background Concentrations

Background concentrations, if applicable, can be obtained from the Bureau. There are no background concentrations, in general, for NO_x, CO, and SO_2, unless the source will be very near to Bernalillo County or El Paso. Figure 4 shows background concentrations for PM-10 annual and 24-hour impacts. The map was developed from recent PM-10 monitor data around the state. TSP background concentration can be calculated by multiplying PM-10 concentration by 1.33. The PM-10 and TSP background must be added to the impact of the source and any appropriate nearby sources for the NAAQS and the NMAAQS analysis. Ozone background data is also available from the Bureau.

Criteria for Inclusion of Surrounding Sources

To determine cumulative ambient impacts from a facility and surrounding sources, it is necessary to include emission rates from surrounding sources from the Bureau data base inventory. The method below outlines how to select surrounding sources that contribute significantly to ambient impact. This method for generating the area emission inventory is intended for minor source permitting, but may be used for PSD permitting against the NAAQS with some modification. Keep in mind that the method is only valid for analyzing compliance with the NAAQS and NMAAQS; it does not apply to increment consuming sources. All increment consuming sources within 65 km of the source must be included in the increment analysis! There is no criterion for dropping increment consuming sources!

Figure 5 is an example of a facility with adjacent sources with various emission rates within the radius of impact plus 10 km, plus 20 km, plus 30 km, plus 40 km, and plus 50 km, respectively. Also, a 100 km ring is shown as the outer limit to which adjacent sources shall be considered for inclusion, depending upon the emission rate of sources. The modeler can discriminate which sources are to be included in the cumulative modeling based on the size of the source and its distance from the facility. The criteria for selecting adjacent sources for inclusion in the cumulative modeling is as follows:

Once the radius of impact is determined, include the following sources from the retrieval:

- All sources from the facility to within **10 km** past the radius of impact; plus
- All sources between **10 km and 20 km** of the impact radius with total plant emissions of **24 lb/hr** or more; plus
- All sources between **20 km and 30 km** of the impact radius with total plant emissions of **53 lb/hr** or more; plus
- All sources between **30 km and 40 km** of the impact radius with total plant emissions of **86 lb/hr** or more; plus
- All sources between **40 km and 50 km** of the impact radius with total plant emissions of **119 lb/hr** or more.
- No sources past an absolute distance of **50 km + the ROI** need to be included in the modeling inventory.
- No sources past an absolute distance of **100 km** from the facility need to be included in the model inventory.

IMPORTANT: When facilities are located within 2.5 km of each other, the facilities should be considered as one source and their total emissions should be used in the procedure to determine if they should be dropped.

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.

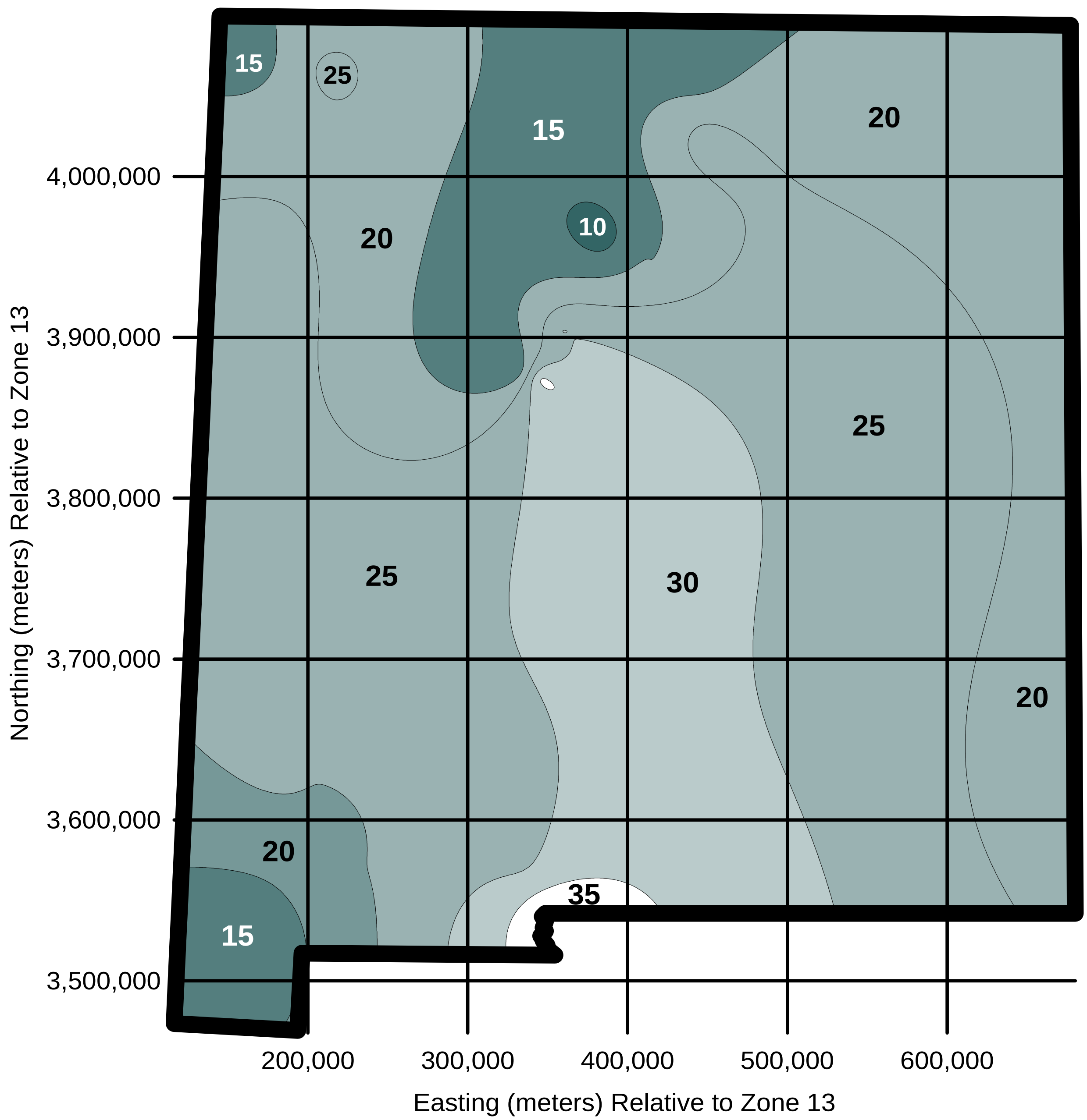


Figure 4. Background PM-10 values for 24-hour and annual PM-10 cumulative impacts

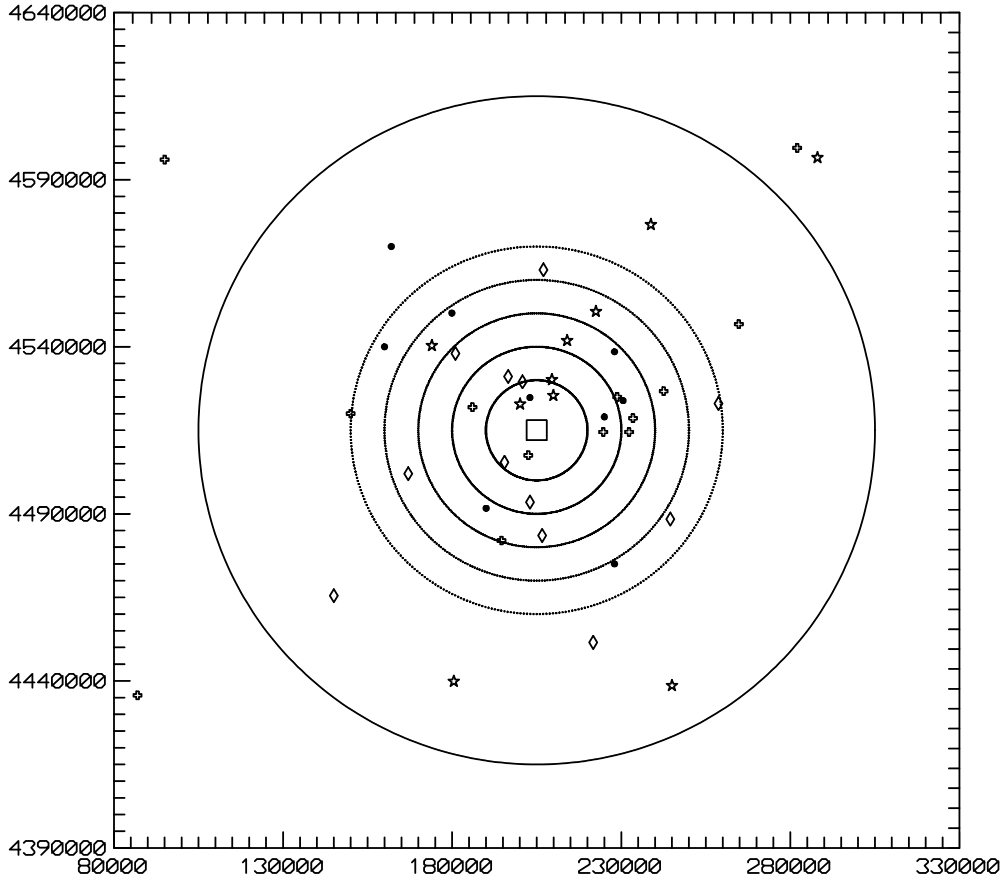


Figure 5. Facility ( ) and adjacent sources. Rings radiating from source at center are the radius of impact plus 10 km; radius of impact plus 20 km; radius of impact plus 30 km; radius of impact plus 40 km; radius of impact plus 50 km; the outer ring is 100 km from the facility. Symbols indicate adjacent source emission rates: star (★) = 24 lb/hr; plus sign (+) = 53 lb/hr; diamond (◊) = 86 lb/hr; dot (•) = 119 lb/hr.

Merging Stacks within a Facility

Sources emitting the same pollutant from multiple stacks within 100 meters of each other may be merged into one stack if stack height, flow rates, and stack gas exit temperatures differ by no more than 20% each. For each stack, compute a value for M (see equation below), then use the parameters of the stack with the lowest value of M as the "merging" stack. Sum the emissions from all stacks to obtain an emission rate from the "merging" stack using the following equation:

$$M = \frac{HVT}{Q}$$

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).

For sources located more than 10 km past the radius of impact, all stacks at the facility may be considered as one stack with the parameters of the stack with the lowest value of M as the “merging” stack, regardless of the differences in parameters and distance between stacks at the facility.

Gaseous Conversion Factor for Elevation and Temperature Correction

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

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

where:

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

Table 3. National and New Mexico Ambient Air Quality Standards and Prevention of Significant Deterioration Increments.

Pollutant	Averaging Period	Significance Levels (μg/m^3)	NAAQS	NMAAQS	PSD Increments Class I	PSD Increments Class II
Sulfur Dioxide	**annual**[+]	**1.0**	**0.03**[a]	**0.02**[a]	**2**[b]	**20**[b]
	24-hour	**5.0**	**0.14**[a]	**0.10**[a]	**5**[b]	**91**[b]
	3-hour	**25.0**	**0.50**[a]		**25**[b]	**512**[b]
Particulates (TSP)	**annual**[*]	**1.0**		**60**[b]		
	24-hour	**5.0**		**150**[b]		
PM-10	**annual**[+]	**1.0**	**50**[b]		**4**[b+]	**17**[b+]
	24-hour	**5.0**	**150**[b]		**8**[b]	**30**[b]
Carbon Monoxide	**8-hour**	**500**	**9.0**[a]	**8.7**[a]		
	1-hour	**2,000**	**35.0**[a]	**13.1**[a]		
Nitrogen Dioxide	**annual**[+]	**1.0**	**0.053**[a]	**0.050**[a]	**2.5**[b]	**25**[b]
	24-hour	**5.0**		**0.10**[a]		
Lead	**Quarterly**	**0.03**	**1.5**[b]			
H_2S	**1-hour**	**1.0**		**0.010**[a1]		
	1/2-hour	**5.0**		**0.10**[a2]		
	1/2-hour	**5.0**		**0.030**[a3]		
Ozone	**1-hour**		**0.12**[a]			

[a] parts per million (ppm)
[b] micrograms per cubic meter (μg/m^3)
[*] annual geometric mean
[+] annual arithmetic mean
[1] for the state, except for the Pecos-Permian Basin Intrastate AQCR (not to be exceeded more than once per year
[2] for the Pecos-Permian Basin Intrastate AQCR
[3] for within 5-miles of the corporate limits of municipalities within the Pecos-Permian Basin AQCR

List of Abbreviations

ACRONYM	DESCRIPTION
AQB	Air Quality Bureau
AQCR	Air Quality Control Region
AQCR	Air Quality Control Regulation (CURRENTLY NOT USED)
ARM	Ambient Ratio Method
BACT	Best Available Control Technology
CO	Carbon monoxide
H_2S	Hydrogen sulfide
ISCST3	Industrial Source Complex Short Term Model version 3
NAAQS	National Ambient Air Quality Standards
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides
NMAAQS	New Mexico Ambient Air Quality Standards
OLM	Ozone limiting method
Pb	Lead
PM-10	Particulate matter equal to or under 10 μm in aerodynamic diameter
PPM	Parts per million (volume ratio)
PSD	Prevention of Significant Deterioration
ROI	Radius of Impact
SO_2	Sulfur dioxide
TSP	Total suspended particulates
UTM	Universal Trans Mercator
VOC	Volatile organic compounds