MPCA Air Dispersion Modeling Guidance

For

Minnesota Title V Modeling Requirements

And

Federal Prevention of Significant Deterioration (PSD) Requirements

(Version 2.2)

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Disclaimer
The Minnesota Pollution Control Agency (MPCA) reserves the right to change this air dispersion modeling guidance and the accompanying Title V Modeling – Fugitive PM_{10} Emission Spreadsheet (Title5_FE01.xls) at any time. These are "living" documents and we intend to update them periodically (e.g., NSR Reform and when USEPA finalizes new dispersion models such as ISC-PRIME and AERMOD-PRIME/AERMET/AERMAP).

Table of Contents

1. Introduction

This document emphasizes MPCA modeling guidance for Prevention of Significant Deterioration (PSD) and State Title V purposes with minimal guidance for air toxic review (ATR) purposes. Highlights of each regulatory program are noted below.

- PSD modeling (most detailed modeling approach: stack-by-stack, source-by-source, pollutant-by-pollutant, scenario-by-scenario, averaging time-by-averaging time, etc.)
- Title V modeling (streamlined version of PSD)

Title V Modeling vs. PSD Modeling

This document summarizes the MPCA Title V modeling policy and discusses procedures for meeting state Title V modeling requirements in Title V permits. It also summarizes modeling requirements for federal Prevention of Significant Deterioration (PSD) purposes. In the event of a conflict between this document and current EPA modeling guidance, sources subject to federal PSD or State Implementation Plan (SIP) requirements should follow EPA modeling guidance in 40 CFR Part 51, Appendix W.

1.1 Title V Policy Background

In 1993, the Minnesota Pollution Control Agency (MPCA) Air Quality Division made a policy decision to include air dispersion modeling requirements in its Title V permits for large Title V sources of PM_{10}, NO_X, and SO_2 (a.k.a. Title V modeling requirement). The Title V source threshold for each of these pollutants was based on allowable (not actual) emissions of 100 tons per year. This initial policy was developed in accordance with Minnesota Rule 7007.0800, subpart 2:

> *The permit shall include emissions limitations, operational requirements and other provisions needed to ensure compliance with all applicable requirements at the time of permit issuance. The permit shall also include any condition the agency determines to be necessary to protect human health and the environment.*

In 2000, MPCA managers expressed concerns regarding resources needed to perform and review Title V modeling, particularly for sources unlikely to exceed ambient standards. At the same time, several PSD modeling analyses showed modeled exceedences of ambient standards with significant contributions from "nearby" sources (i.e., other facilities near the source conducting the analysis). With input from staff, a new Title V modeling policy was sought to target sources most likely to exceed ambient standards while still gathering data from other sources for future PSD/SIP reviews.

In 2001, a more focused and streamlined Title V modeling policy was developed to protect ambient standards and gather data for future PSD/SIP reviews. The new Title V modeling policy was finalized in a memo from David Thornton, Ann Foss, Richard Sandberg, and Marvin Hora to Majors Facilities Supervisors and staff dated June 9, 2001. This policy establishes three levels of submittal information (or "cases"), to comply with

the NAAQS, that depend on the quantity of emissions from a source. These cases are discussed in section 2.1 below.

To obtain a copy of the Title V modeling policy memo, please call the MPCA Customer Assistance Center at 1-800-646-6247 in Minnesota, or 651-297-2274 within the Twin Cities Metropolitan Area and outside Minnesota.

1.2 PSD Policy Background

Reserved.

2. Modeling Requirements by Regulatory Program

The sections below outline MPCA modeling requirements for Title V and PSD programs. In addition, MPCA is developing guidance for submittal of model input parameters from all future approved modeling analyses. MPCA will require facilities to submit MPCA-approved model input data for inclusion in MPCA's DELTA database and will provide formatted spreadsheets for this purpose. The intent of the requirement is to populate our database with accurate modeling data for internal use and to reduce the time needed for facilities to research data on background sources. Guidance is available on MPCA's dispersion modeling internet site: http://www.pca.state.mn.us/air/modeling.html.

2.1 Title V Modeling Requirements

The requirements to conduct Title V modeling may be found in your air permit in *Table B: Submittals*. Some earlier issued permits may have the requirements in *Table A: Limits and Other Requirements*. The 2001 Title V modeling policy divides Title V sources into two categories, "Full Dispersion Modeling" and "Modeling Information." The level of modeling data prepared and submitted is based on maximum allowable emissions (i.e., potential-to-emit for uncontrolled sources) and recent actual emissions. Table 1 summarizes applicability for the two categories and the submittal requirements for each category. Permits issued prior to 2001 may require modeling submittals different than those described here. In that case, facilities must follow their existing permit conditions.

Note: Eligible facilities wanting to switch from their current requirement of "Full Dispersion Modeling" to "Modeling Information" must formally apply for a major permit amendment.

Case 1. Full Dispersion Modeling Requirement

Full Dispersion Modeling Requirement applies if facility allowable emissions are greater than 100 tons/year of PM_{10}, NO_X, or SO_2 (provided actual emissions exceed either 100 tons/year PM_{10}, 250 tons/year SO_2, or 1000 tons/year NO_X). Full dispersion modeling may also be required if evidence exists that modeling would predict an exceedence of the AAQS.

Title V sources with the Full Dispersion Modeling Requirement conduct air dispersion modeling using EPA's Building Profile Input Program (BPIP) and Industrial Source Complex Short-Term (ISCST3) model (or ISC-PRIME or AERMOD-PRIME). Although the modeling is considered "full" total facility modeling, the approach is streamlined from the modeling that would be required under PSD.

The approach is streamlined because less time is spent:

- determining ambient air details;
- determining background concentrations and nearby facilities;
- determining background concentrations;
- characterizing insignificant activities;
- characterizing fugitive PM_{10} sources;

The MPCA is prepared to accept model input parameters from approved modeling analyses for some "Full Dispersion Modeling" sources, as introduced in the first paragraph of Section 2: Modeling Requirements by Regulatory Program. For analyses approved in Fall 2003 or later, MPCA modeling staff will identify individual sources modeled such that the modeling information spreadsheets may be tailored to the specific modeling conducted. If so, the permitee must submit the modeled parameters in the format requested in order to receive final approval of the modeling analysis from the MPCA. MPCA will initially focus on simpler analyses (i.e., stacks only). The MPCA DELTA database cannot currently import modeling data that includes area and volume sources, emissions scalars, and other "complex" parameters. The data and format of the information required will be similar to the Model Information submittals described below.

Case 2. Requirement for Modeling Information

Requirement for Modeling Information applies if facility allowable emissions exceed 100 tons/year for PM_{10}, NO_X, or SO_2 and actual emissions are below 100 tons/year PM_{10}, 250 tons/year SO_2, or 1000 tons/year NO_X. As with the Full Dispersion Modeling Requirement, evidence of possible modeled violations of AAQS may also trip the Modeling Information Requirement. Taconite facilities also must submit Modeling Information.

Sources with the Modeling Information Requirement in their Title V permit submit relevant data about the facility without actually conducting modeling. The Modeling Information includes location data for stacks, fugitive sources, buildings, and property boundaries (or fence lines). It also includes verifying or supplementing facility data the MPCA stores in its database. The data may be related to the stacks, fugitives, buildings, property boundaries, and also emissions. Instructions for submitting Title V modeling information can be found on the MPCA internet site: http://www.pca.state.mn.us/publications/titlev-modelinginstructions.pdf. The MPCA internet site also has a factsheet discussing the applicability of the modeling information requirement: http://www.pca.state.mn.us/publications/aq2-25.pdf.

Case 3. No Modeling Requirement

At this time facilities with allowable emissions less than 100 tons/year for PM_{10}, NO_X, or SO_2 will not be required to submit modeling information by their Title V permit.

Table l. Title V Modeling Policy Applicability and Submittal Contents

Policy Items	**Title V Air Modeling Policy**	
Policy Date	June 2001	
Title V Permit Requirement	Full Dispersion Modeling (streamlined)	Modeling Information Requirement
Pollutant and Threshold	• Actual PM_{10} emissions of 100 tons per year (TPY) or more • Actual SO_2 emissions of 250 TPY or more • Actual NO_X emissions of 1000 TPY or more • Special request by MPCA	• PM_{10}, SO_2 or NO_X allowable emissions of 100 TPY or more, PROVIDED actual emissions are less than threshold values for Full Dispersion Modeling • Taconite facilities with outdated or missing information • Special request by MPCA
Submittal Contents (Electronic files on CD preferred)	• Title V Modeling – Fugitive PM_{10} Emission Spreadsheet (Title5_FE01.xls) • BPIP input/output files (EPA format) • ISCST3 (or alternate) model input/output files • ISCST3 (or alternate) model plot/event/threshold files (if possible) • Meteorological files • DELTA input files (after approval of model parameters & when requested by MPCA reviewer of modeling analysis)	Fill out Model Information Report forms. "Instructions for 'Modeling Information' Requirement in Title V Permits" are available on the MPCA web site at http://www.pca.state.mn.us/air/modeling.html If you do not have internet access, call the MPCA Customer Assistance Center at 1-800-646-6247 in Minnesota, or 651-297-2274 within the Twin Cities Metropolitan Area and outside Minnesota.

Note: eligible facilities wanting to switch from "Full Dispersion Modeling (streamlined)" to "Modeling Information Requirement" must formally apply for a major permit amendment.

2.2 PSD Modeling Requirements

Major new air pollution sources or major modifications to existing sources (a.k.a. PSD Project) must model air pollution impacts of all pollutants for which the PSD Project's potential emissions exceed the significant emission rates listed in Table 2. A source's potential emissions may be reduced by accepting federally enforceable permit limits (e.g., limited hours of operation, advanced pollution control equipment).

Table 2. PSD Significant Emission Rates (SERs)

Pollutant	SER (tons/year)
Carbon Monoxide (CO)	100
Nitrogen Oxides (NO_X)	40
Sulfur Dioxide (SO_2)	40
Particulate Matter less than 10 microns (PM_{10})	15
Total Particulate Matter	25
Ozone (volatile organic compounds)	40
Lead	0.6

The first step in a PSD modeling analysis is a comparison of modeled impacts from the PSD Project to Significant Impact Level (SIL) values in Table 3. The results must include impacts of all stack and fugitive emissions from new construction or modifications. Further modeling is not required if the highest impacts resulting from modeling five years of meteorological data are below SIL values.

The next step is determining the radius of impact for the proposed project. The radius of impact for the modeled source extends from the facility to the farthest impacted receptor and is useful for determining the extent of the receptor grid and identifying nearby sources to include in the modeling analysis.

USEPA's Draft New Source Review Workshop Manual, dated October 1990, includes further details on determining the radius of impact and other PSD issues the will not be elaborated on here. It is available at: http://www.epa.gov/ttn/nsr/gen/wkshpman.pdf.

Increment Analysis

Important note: PSD minor source baseline date (MSBD) emissions may differ from PSD applicability baseline emissions under old NSR rules and NSR Reform rules effective March 3, 2003. Please be careful.

If the PSD Project exceeds SIL values, a full increment analysis will be required. MPCA maintains a list of county baseline dates and a limited collection of source data for increment consuming sources that are available upon request. Source data for an increment analysis may be further refined by an applicant review of MPCA permitting files. If impacts cross state lines, data from sources in adjacent states should also be included.

The following excerpt, taken from the EPA's Draft New Source Review Workshop Manual dated October 1990, explains the method of determining emission rates for increment modeling.

> "For a PSD increment analysis, an estimate of the amount of increment consumed by existing point sources generally is based on increases in actual emissions occurring since the minor source baseline date. The exception, of course, is for major stationary sources whose actual emissions have increased (as a result of construction) before the minor source baseline date but on or after the major source baseline date. For any increment consuming (or increment expanding) emissions unit, the actual ***emissions limit, operating level,*** and ***operating factor*** may all be determined from source records and other information. For the annual averaging period, the change in actual ***emissions rate*** should be calculated as the difference between:
>
> - the current average actual ***emissions rate***, and
> - the average actual ***emissions rate*** as of the minor source baseline date (or major source baseline date for major stationary sources).
>
> In each case, the average rate is calculated as the average over the previous 2-year period (unless the permitting agency determines that a different time period is more representative of normal source operation). For each short-term averaging period (24 hours and less), the change in the actual ***emissions rate*** for the particular averaging period is calculated as the difference between:
>
> - the current maximum actual ***emissions rate***, and
> - the maximum actual ***emissions rate*** as of the minor source baseline date (or major source baseline date for applicable major stationary sources undergoing construction before the minor source baseline date).
>
> In each case, the maximum rate is the highest occurrence for that averaging period during the previous 2 years of operation."

<u>How to Estimate "Maximum" Past Actual 24-Hour Emissions</u>

Estimating past actual annual emissions is much easier (via emission inventory data) than estimating <u>maximum</u> past actual 24-hour emissions (i.e., researching old facility records). A common reoccurring question is how to estimate maximum short-term emissions. EPA speaks to this in "NSR Advisory Memorandum #1: TSP PSD Increment Consumption in North Carolina" dated May 3, 1985. See Appendix B.8 which states:

"As a rule of thumb, one would expect to see such maximums occur at 5 percent of the total 24-hour operating time periods (which means non-operating time periods don't count in making this determination). … The use of the 5% guideline is intended only to

rule out the possibility that a source could deliberately operate only a few times at very high rates in order to decrease increment consumption at some future time."

NSR advisory memorandum #1 should be used to estimate maximum past actual short-term (3-hour and 24-hour) emissions for minor source baseline date (MSBD) conditions. If you have additional questions regarding emission estimating, please contact your MPCA permit engineer.

Human Understanding vs. Computer Speed

There are two different ways to perform PSD increment modeling:

- one entry approach
- two entry approach:
  - negative emission rates for MSBD conditions
  - positive emission rates for post-MSBD conditions

Although emissions may be mathematically equivalent, MPCA will require the two-entry approach for all PSD increment modeling submittals to facilitate our understanding and promote regulatory efficiency and user flexibility. The two-entry approach is becoming increasing important to accommodate several types of post-MSBD non-emission changes (e.g., stack parameters, building profiles, urban/rural land use characteristics, etc.).

PSD sources seeking more computer efficiency, may, if they wish, submit both versions (i.e., two-entry version and one-entry version). The one-entry way is appropriate only if all non-emission terms remain constant. PSD sources may use the one-entry version if they can show both yield the same results. MPCA will use the two-entry version.

PSD Increment Ceilings and Future Growth

PSD modeling results should be compared to appropriate increment value in Table 3. Predictions exceeding PSD increment ceilings must be rectified before MPCA can issue a PSD permit.

Note: MPCA generally requires a future growth "cushion" equal to SIL values. This is important to accommodate future PSD projects, post-MSBD changes, etc. For cases with future growth less than SIL values, MPCA has required previous PSD sources to model any and all subsequent changes including insignificant activities.

NAAQS Analysis

For comparison with NAAQS, shown in Table 3, potential emissions of the new source or existing source with new modifications must be modeled along with nearby sources. Similar to the increment analysis, concentrations must be below relevant NAAQS and a "cushion" should be left for future growth.

Table 3. National Ambient Air Quality Standards, PSD Increments, and Significant Impact Levels

Pollutant	Averaging Period	Primary NAAQS (ug/m3)	Secondary NAAQS (ug/m3)	PSD Class II Increment (ug/m3)	PSD Class I Increment (ug/m3)	Significant Impact Level# (ug/m3)
SO_2	1-Hour*	1300	1300	512	25	25
	3-Hour	None	1300***	512	25	25
	24-Hour	365	None	91	5	5
	Annual	60**	None	20	2	1
PM_{10}	24-Hour	150	150	30	8	5
	Annual	50	50	17	4	1
$PM_{2.5}$	24-Hour	65	65	None	None	None
	Annual	15	15	None	None	None
NO_2	Annual	100	100	25	2.5	1
CO	1-Hour	40,000	40,000	None	None	2000
	8-Hour	10,000	10,000	None	None	500
O_3	1-Hour	235	235	None	None	None
	8-Hour	157	None	None	None	None
Pb	Quarterly	1.5	1.5	None	None	None

*Minnesota state 1-hour SO2 standard and surrogate PSD and SIL values. No federal 1-hour values exist.
**Minnesota state annual SO2 standard. Federal annual standard is 80 ug/m3.
***Minnesota state 3-hour SO2 standard for Northern Minnesota is 915 ug/m3.
PSD Class II Areas. PSD Class I Area 24-Hour value is 1 ug/m3.

Minnesota ambient air quality standards are located at: http://www.revisor.leg.state.mn.us/arule/7009/0080.html.
Minnesota episode levels can are located at: http://www.revisor.leg.state.mn.us/arule/7009/1060.html.
National ambient air quality standards are listed at: http://www.access.gpo.gov/nara/cfr/cfrhtml_00/Title_40/40cfr50_00.html.

3. Model Selection

The AERMOD suite of modeling programs (AERMOD, AERMET, AERMAP) is expected to be approved for regulatory use soon but, as of October 2004, has not yet been approved as a regulatory guideline model.* AERMOD version 02222 contains the PRIME algorithm for better treatment of plume dispersion in complex terrain as well as other improvements over ISC-type models. EPA has approved the use of AERMOD on a case-by-case basis for PSD purposes (e.g., Rochester Public Utilities). When AERMOD is formally approved for regulatory, there will likely be a 1-year grace period where either ISC3 or AERMOD may be used. Following that period, AERMOD will be the standard model for most regulatory purposes. From a technical accuracy standpoint, for current PSD projects, we prefer AERMOD over ISC-PRIME over ISC3 (best science to worst science). ISC or AERMOD with the PRIME algorithm should be used for facilities with non-GEP stacks.

Version 3 of EPA's Industrial Source Complex – Short Term model (ISCST3 or ISC3) is currently the main air dispersion model used for regulatory purposes. However, MPCA prefers the ISC-PRIME model with its new building downwash algorithms for most remaining Title V modeling.

Note: Dispersion models using the PRIME algorithm require additional building information not needed in ISC3. Fortunately, both versions of BPIP (with and without PRIME) use the same input file – this means it is easy to generate the additional PRIME values once the BPIP input file is created. EPA approves of the use of ISC-PRIME for regulatory purposes. Facilities wishing to forgo the use of the PRIME algorithm should demonstrate that building downwash is not expected to affect modeling results or explain other extenuating circumstances that warrant the use of ISC3.

Modeling analyses should use "DEFAULT or DFAULT" model options and should not employ the "NO ECHO" option.

*Trial data for AERMOD applications is available for testing purposes at: http://www.pca.state.mn.us/air/modeling-data.html. It is generally **not** intended for regulatory applications – see instructions in the README files on the "Trial Data for AERMOD Applications (September 2004)" web page.

Required Source Information

Source Identifiers

Stack source identifiers (SVnnn ids.) should match those used in the Title V permit. Emission sources without SV identifiers (e.g., area and volume sources used to simulate fugitive emissions from roads, storage piles, and material handling) may use other user-specified identifiers, such as:

"AS" for square/rectangular area sources (i.e., AREA);
"AC" for circular area sources (i.e., AREACIRC);
"AP" for polygon area sources (i.e., AREAPOLY);
"VS" for volume sources (i.e., VOLUME);
"OP" for open pit sources (i.e., OPENPIT).

In general, the MPCA permit engineer will specify the identifiers per MPCA DELTA database requirements.

Location Information

The MPCA is working to retain all source data (stack and fugitive), building data, and property boundary/fence line receptor points in its electronic (DELTA) database. This will allow the MPCA to provide source and location data to companies explicitly including "nearby sources" in their modeling analysis. Thus, it is very important that all location data submitted to the MPCA meet the same specifications. The State of Minnesota and MPCA standard for location data is as follows:

Coordinate System:	Universal Transverse Mercator (UTM) zone 15 (extended)
Datum:	North American Datum of 1983 (NAD83)
Spheriod:	GRS1980
Units:	Meters

There are several software packages and utilities that can convert data between NAD27 UTM coordinates, NAD83 UTM coordinates, and geographic values (latitude/longitude). One way to convert NAD27 UTM coordinates to NAD83 UTM coordinates is the three-step National Geodetic Survey (NGS) procedure involving UTM coordinates (meters) and geographic coordinates (latitude/longitude):

- Convert NAD27 UTM coordinates to NAD27 geographic coordinates using the NGS "Universal Transverse Mercator Coordinates – UTM to Geodetic" utility;
- Convert NAD27 geographic coordinates to NAD83 geographic coordinates using the NGS NADCON utility;
- Convert NAD83 geographic coordinates to NAD83 UTM coordinates using the NGS "Universal Transverse Mercator Coordinates – Geodetic to UTM" utility;

The above utilities can be obtained directly from the National Geodetic Survey at http://www.ngs.noaa.gov/TOOLS/. Note: NADCON is the Federal standard for NAD27 to NAD83 datum transformations for latitude/longitude. The NGS version does not directly convert NAD27 UTM coordinates to NAD83 UTM coordinates. NADCON is also an option in the ArcView software projection utility extension, and is the default transformation routine in ArcInfo software. Any method used should correspond to the accuracy of the data collected.

Other Location Information

The source base height (i.e., ground level height or grade elevation) should be in meters above mean sea level. The source release height (e.g., stack height, or height of area and volume sources) should be in meters above the stack base height.

5. Meteorological Data

The MPCA internet site contains several sets of preprocessed meteorological data (http://www.pca.state.mn.us/air/modeling.html#data) for ISC3 or ISC-PRIME. These data sets will be used in most cases, with exceptions for sites with special meteorological conditions. Preprocessed data for AERMET is currently not available from MPCA.

Facilities that wish to use on-site or other data should include details on the proposed data in the modeling protocol submitted to MPCA.

6. Building Downwash

Structures can interrupt the wind flow near an emissions source and create an area of building downwash. Emissions from short stacks and other low elevation sources are more likely to be caught in the disturbance.

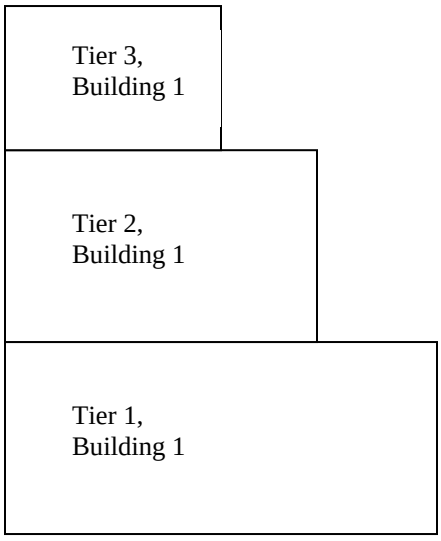
ISCST3, ISC-PRIME, and AERMOD-PRIME are all capable of calculating the impacts of building downwash on downwind concentrations but the PRIME algorithm is much more advanced than earlier algorithms in ISCST3. Only the PRIME algorithm can predict concentrations in the cavity of a building. EPA's BPIP or BPIP-PRIME programs should be used to determine dominant downwash structures, depending on which model will be used.

Buildings with complex rooflines (i.e., multiple levels and varying height) should be entered into BPIP or BPIP-PRIME as tiers ("wedding cake" style) rather than vertically separated blocks (see Figure 1). MPCA staff have found that the tiered approach:

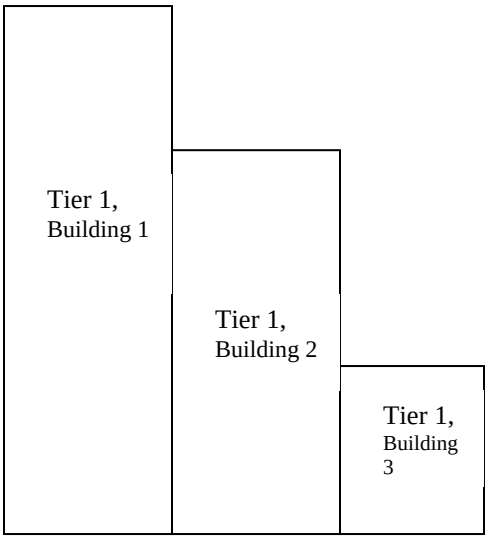
- better comports with BPIP user's guidance;
- is less sensitive to small differences in adjacent building coordinates; and
- frequently yields lower predicted concentrations.

Figure 1. Building Layout

Tiered Division (Preferred)



Block Division (Not Preferred)



7. Urban/Rural Classification

For ISCST3 and ISC-PRIME, MPCA recommends use of the Auer method to determine whether urban or rural dispersion coefficients should be used in a modeling analysis. The Auer method evaluates land uses within a 3 km radius of a facility. Areas with mainly industrial, commercial, or compact residential development nearby should use urban coefficients. Other areas should use rural coefficients.

Note: AERMOD better represents surface conditions using site-specific values of albedo, bowen ratio, and roughness height.

8. Receptors

All PSD and Title V modeling should consider terrain. This is important so that all information can be consistently entered into the MPCA computer database and used in future analyses. AERMOD, when promulgated as a guideline model, is expected to require terrain in "regulatory default" mode (unlike ISC3).

As described in Section 4, all submittals should use UTM coordinates in the NAD83, zone 15 datum. Receptor grids from prior analyses using NAD27 or other coordinate systems should be converted to NAD83. Local coordinate grids should be avoided.

Many people think ambient air is simply the air outside – they give little consideration to regulatory matters such as property ownership, fencing, physical barriers, and trespassing. However, such considerations distinguish the federal definition from the state definition and its implication for receptor locations.

See Table 4: What is Ambient Air for Different State and Federal Regulatory Programs?

8.1 PSD Modeling

To promote greater standardization, consistency, and regulatory efficiency for PSD modeling, the MPCA generally recommends the ambient air approach in Table 4.

Please see "FLAGPOLE Receptors" in section 8.3, and "Receptor Goals" in section 8.4, and "Receptor Summary" in section 8.5 below, and 40 CFR Part 51, Appendix W.

8.2 Title V Modeling

To achieve similar goals for state Title V modeling purposes only, the MPCA is using different ambient air criteria for "industry settings" versus "campus settings" in Table 5.

Most Title V facilities will use the "industry setting". It considers impacts at & beyond the company property line and on public roads/trails running through company property. Because it ignores many on-site locations, it may not meet other state and federal requirements.

Title V facilities with campus-like settings (e.g., colleges, universities, and research and development centers) will use the campus setting to consider impacts on & off their property.

Note: the distinction between "industry setting" and "campus setting" applies only to state Title V modeling of PM_{10}, SO_2, and NO_X. Prior to this distinction being made, most modeling analyses used the more stringent federal definition of ambient air so that the results of the modeling could be used for state and federal purposes.

8.3 FLAGPOLE Receptors

EPA dispersion models can calculate predicted concentrations at above ground-level locations called "FLAGPOLE" receptors. FLAGPOLE receptors, when used, are a small number of all receptors (ground-level receptors and above ground-level receptors) used to protect NAAQS. FLAGPOLE receptors are rarely needed for most PSD projects because most PSD projects occur in rural areas or small towns, and these areas often lack sufficiently tall structures that are close enough to require their use (e.g., within ~1mile). However, they are needed in dense urban environments with multiple tall buildings such as the downtown areas of Minneapolis, St. Paul, Duluth, Rochester, and other major cities.

Examples include upper-level open-air decks, restaurants, tennis courts, balconies, patios, pools, parking ramps, and the like at hotels, motels, apartments, schools, colleges, hospitals, etc. More examples: bridges, public observation towers, lookouts, etc.

In Feb. 2003, EPA Region V surveyed other EPA Regional offices and reported that above grade (flagpole) receptors are not needed for structures with "less" public exposure – ground-level receptors are "good enough". Above grade (flagpole) receptors are important for structures with "more" public exposure.

Less ambient protection is generally needed for "industrial/worker" situations with less public exposure. As a first approximation, evaluate impacts at h=0m only instead of h>0m to protect against "undue exposure" (i.e., ground-level receptors are "good enough" but you may use flagpole receptors if you wish.)

Better ambient protection is necessary for situations involving more public exposure (e.g., "public prone" and "non-industrial/non-worker" cases). If a facility is in an urban environment where above grade FLAGPOLE receptors are needed to evaluate key multiple heights (esp. tall structures within ~1 mile), several possible approaches (least rigorous to most rigorous) are:

A) Blatant FLAGPOLE omissions – we will question this.
B) Ground-level receptors in lieu of FLAGPOLE receptors.
C) Multiple levels (e.g., BPIP corners and fractional heights).

Approach A should be used cautiously. MPCA will discourage its use if similar or higher predictions are likely elsewhere. We will also discourage its use to minimize questions by EPA and others, and, to a lesser extent, to promote more efficient (automated) ground-level receptor grids using Approach B.

Approach B is expected to apply to most situations (i.e., all situations not covered by Approach A or C).

Approach C may apply to several "non-industrial" situations. Full multi-level analyses may be needed but shortcuts are possible for multiple adjacent structures with different heights. Check photos, BPIP files, etc.

When flagpole receptors may be necessary for a facility's air dispersion analysis, the modeling protocol should describe the procedures that will be used to determine what approach will fit the buildings in the receptor area. The facility shall determine which buildings, if any, should use Approach A., Approach B, or Approach C.

Examples of procedures may include some combination of windshield surveys, inspection of geographic or zoning data, interviews with building personnel to categorize building uses or alternative methods. The results of this local building survey need to be included in the modeling report for the facility and will be part of the public record and notice. Incorrect determinations may result in schedule delays, public comments, etc.

Open/Operable Windows and Building Air Intakes: For state air toxic modeling, Ford Motor Company considered open/operable windows, and Hennepin Energy Resource Center considered air intakes. In Appendix B.7, EPA states: "we would not consider air at open or operable windows, or at the intakes of mechanically-ventilated buildings, as ambient air for purposes of determining attainment of the national ambient air quality standards. States are free to interpret their own State ambient air quality standards in a more restrictive manner."

8.4 Receptor Goals

We seek to promote multiple efficiencies: reduce output size, increase output usefulness, faster model runs, faster reviews, and fewer public comments. Our philosophy is summarized below.

FLAGPOLE receptors should clearly focus on elevated areas likely to see plume "hits". Short structures and lower portions of tall structures may use ground-level receptors only – this is reasonable for building downwash areas (building cavity and near wake regions) with relatively uniform vertical concentrations. This means using ground-level receptors (Approach B: h=0m) instead of multi-level FLAGPOLE receptors (Approach C: h>0m) if FLAGPOLE receptors are less than key stack heights – a nominal breakpoint height of 20m may be reasonable for most FLAGPOLE receptors in most areas.

For all receptors, use efficient automated grids ("GRIDPOLR" and "GRIDCART") as much as possible and limit the use of "DISCCART" receptors to FLAGPOLE receptors and special ground-level receptors (e.g., facility fenced areas, property boundary, ambient monitor locations, etc.)

8.5 Receptor Summary

Please do all of the following as appropriate.

Protect MN/NAAQS at tall “public prone” FLAGPOLE locations via multiple h>0m receptors (e.g., BPIP corners and fractional heights, say, 0%, 25%, 50%, 75%, 100%). For multiple adjacent structures with different heights, may be use rooftops only. Attach local building survey to public notice.

Protect MN/NAAQS at short “public prone” FLAGPOLE locations via ground-level receptors only – don’t waste time on less important (short) flagpole heights covered by more important (higher) flagpole heights.

Protect MN/NAAQS at other “industrial” locations via ground-level receptors only.

Protect MN/NAAQS at other ground-level and near ground-level locations via ground-level receptors.

State air toxic modeling should also use FLAGPOLE receptors for above grade residential open/operable windows and residential air intakes (i.e., places with 24/7 living conditions such as apartments, nursing homes, etc.). This will apply to “tall” residential structures with open/operable windows or air intake heights that are approximately the same height or taller than nearby emission source stack heights.

State air toxic modeling may use ground-level receptors for elevated windows/air intakes for commercial, industrial, and other non-residential situations (regardless of window/air intake heights), and other ambient areas at or near ground-level.

Table 4. Ambient Air Receptor Locations for Federal PSD/SIP Modeling Purposes (complex SIP areas may need more receptors)

Federal Citation	40 CFR, Part 50, Section 50.1(e)	
Federal Definition	"Ambient air means that portion of the atmosphere, external to buildings, to which the general public has access." EPA has interpreted this to mean that areas owned or controlled by an owner/operator and enclosed by a fence or other effective physical barriers are not considered ambient air.	
Receptor Locations	**What to Consider:**	**Recommended Receptor Placement**
Facility Modeling	**1.** Model all areas (on & off company property) to see if any model violations occur. **2.** Unfenced areas with modeled violations are examined further regarding its ambient air status (i.e. other effective physical barriers).	- Discrete receptors every 10 m along fence lines, if any; - Discrete receptors every 25m along the property line; - Polar grids centered on largest source(s): - Polar grid with 36 directions and distances of 25m to 250m every 25m; - Polar grid with 36 directions and distances of 300m to 500m every 50m; - Polar grid with 36 directions and distances of 600m to 1000m every 100m; - Polar grid with 36 directions and distances of 1200m to 2000m every 200m; - Polar grid with 36 directions and distances of 2500m to 4500m every 500m; - Polar grid with 36 directions and distances of 5000m to 9000m every 1000m; - Polar grid with 36 directions and distances of 10000m to 50000m every 10000m; - Discrete FLAGPOLE receptors as appropriate (esp. dense urban environments); - Discrete receptors at PSD Class I locations as appropriate – ask Federal Land Managers
Terrain	Must be considered using 7.5 minute digital elevation model (DEM) data (or 1 degree data if 7.5 minute data is not available) from the US Geological Survey (USGS).	

USGS Web Site: http://edcwww.cr.usgs.gov/doc/edchome/ndcdb/ndcdb.html

Table 5. Ambient Air Receptor Locations for State Title V Modeling Purposes

State Citation	MN Rule 7009.0020 (Prohibited Emissions):	
State Definition	"No person shall emit any pollutant in such an amount or in such a manner as to cause or contribute to a violation of any ambient air quality standard beyond such person's property line, provided however, that in the event the general public has access to the person's property or portion thereof, the ambient air quality standards shall apply in those locations. The general public shall not include employees, trespassers, or other categories of people who have been directly authorized by the property owner to enter or remain on the property for a limited period of time and for a specific purpose."	
Receptor Locations	**What to Consider:**	**Recommended Receptor Placement**
Title V Modeling Campus settings	Areas on & off company property. This checks all areas; MPCA makes ambient air determinations only if unfenced company areas have modeled violations. This option is intended for sources with campus-like settings (e.g., colleges, universities, and research & development centers).	- Discrete receptors every 10m along fence lines, if any; - Discrete receptors every 25m along the property line; - Discrete receptors every 50m inside the property line; - Cartesian grid every 100m outside the property line for 2km (or polar grid with 36 directions with distances of 100m to 2000m every 100m).
Title V Modeling Industry settings	Off-property locations (property line & beyond) and public roads/trails running through company property. This option is intended for heavy industrial sources without campus-like settings (e.g., mining, refining, manufacturing, power plants, pulp/paper, etc.). Most Title V facilities will use this option.	- Discrete receptors every 10m along fence lines, if any; - Discrete receptors every 25m along the property line; - Discrete receptors or Cartesian grid receptors every 100m outside the property line for 2km (or a polar grid with 36 directions, distances out to 2km every 100m); - Discrete receptors every 100m on roads/trails running through company property.
Terrain	Must be considered using 7.5 minute digital elevation model (DEM) data (or 1 degree data if 7.5 minute data is not available) from the US Geological Survey (USGS).	

USGS Web Site: http://edcwww.cr.usgs.gov/doc/edchome/ndcdb/ndcdb.html

9. Nearby Sources and Background Concentrations

9.1 Nearby Sources

Modeling analyses must often include explicit modeling of nearby sources whose emissions may impact ambient concentrations near the facility under study. Upon request, MPCA will provide modeling parameters for nearby sources. Data supplied by MPCA will consist of parameters available from the MPCA DELTA permitting database. The data set may or may not be complete and should be used as a starting point for assembling complete model parameters for nearby sources. Additional file review by the facility or its representatives may be required.

MPCA's Criteria Pollutant Emission Inventory web site may be useful for determining which nearby sources emit significant quantities of various pollutants – emissions can be searched by year, pollutant, or county. Please see
http://www.pca.state.mn.us/air/emissions/emissearch.cfm

MPCA also keeps electronic files for some increment consuming sources in counties where the minor source baseline date (MSBD) has been triggered.

9.2 Background Concentrations

Background concentrations account for sources not modeled explicitly (e.g., small nearby sources, very distant sources, unidentified sources, and natural conditions). It is intended for sources without significant concentration gradients near the facility under review.

The modeling protocol should describe the values to be used to represent background concentrations, the rationale for selecting those values, and the source of the values. Table 6 provides some values that may be used for Title V modeling purposes and examples of values used in past PSD projects. Future PSD projects should, as much as possible, use local monitoring data to determine background concentrations.

Table 6. Background Concentrations for Federal PSD and Title V Modeling

Federal PSD Modeling Approach	State Title V Modeling Approach
Follow EPA modeling guidance in 40 CFR Part 51, Appendix W. This means using a low background value when modeling the PSD facility and any nearby facilities with overlapping significant impact levels. **Recent Examples:** 1. Boise Cascade, International Falls, MN PSD application (March 1999): SO_2: 32 ug/m3 (1-hour), 29 ug/m3 (3-hour), 13 ug/m3 (24-hour), 3 ug/m3 (annual) PM_{10}: 18 ug/m3 (24-hour) and 10 ug/m3 (annual) NO_X: 8 ug/m3 (annual) 2. Northshore Mining, Silver Bay, MN PSD application (Dec. 1999): SO_2: 90 ug/m3 (1-hour), 25 ug/m3 (3-hour), 11 ug/m3 (24-hour), 3 ug/m3 (annual) PM_{10}: 14 ug/m3 (24-hour) and 7 ug/m3 (annual) NO_X: 12 ug/m3 (annual) 3. District Energy, St. Paul, Minnesota PSD application (Dec. 2000-Jan. 2001): PM_{10}: 44 ug/m3 (24-hour) and 21.5 ug/m3 (annual) NO_X: 32 ug/m3 (annual)	The choice of background concentrations depends on the number, size, and proximity of nearby sources being modeled. **Option 1:** use larger background values when modeling the Part 70 facility only. 1. SO_2 (EPA web site, 2000 data): 181 ug/m3 (1-hour), 128 ug/m3 (3-hour), 60 ug/m3 (24-hour), 5 ug/m3 (annual) 2. NO_X (EPA web site, 2000 data): Minneapolis, MN: 41 ug/m3 (annual) Ramsey County: 32 ug/m3 (annual) Rest of TC*: 23 ug/m3 (annual) Rest of MN**: 17 ug/m3 (annual) 3. PM_{10} (EPA web site, 2000 data): LOCATION 24-HOUR ANNUAL Minneapolis 103 ug/m3 31 ug/m3 St. Paul, MN 74 ug/m3 36 ug/m3 Rest of TC*: 42 ug/m3 21 ug/m3 Duluth, MN: 69 ug/m3 29 ug/m3 Rest of MN**: 37 ug/m3 23 ug/m3 **Option 2:** use option 1 values multiplied by 0.8 when modeling the Title V facility and other nearby sources within ~2 miles. **Option 3:** federal PSD modeling approach.

* "Rest of TC" denotes rest of the Twin Cities metropolitan area (Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington counties).
**"Rest of MN" denotes the remaining portions of the state not included in any of the other named locations.

10. Insignificant Activities

The federal Part 70 program requires each state to include an "insignificant activities list" in its Title V Operating Program. Minnesota rule 7007.1300 subpart 1 to subpart 4 meets this requirement.

A common misconception is that if an emission source or unit is insignificant for permitting purposes, then it is also insignificant for modeling purposes. *This is not necessarily true for marginally insignificant sources, intermittent/seasonal sources, or sources with stub stacks (e.g., asphalt plants, diesel generators, and natural gas sources with back-up fuels), material handling (coal, sand, gravel, ores, sawdust, etc.), and wind erosion.* The problem is that permitting thresholds often reflect average annual emissions and they are a poor estimator of maximum 24-hour emissions. This shortcoming is important because short-term impacts are often more important than long-term impacts.

Based on past modeling experience, insignificant activities can exceed significant impact levels (SILs). This is important if they cause or contribute to modeled violations (i.e., exceed SIL values of 1 ug/m3 (annual), 5 ug/m3 (24-hour), 25 ug/m3 (3-hour and 1-hour)). Recent PM_{10} modeling for a major source indicated that short stacks with emission rates as low as 0.1 pounds per hour could have maximum 24-hour impacts of 5 ug/m3. This implies that sources with emission rates as low as 2.6 pounds per hour could have maximum 24-hour impacts of 150 ug/m3 (24-hour PM_{10} standard). This is very comparable to 2.28 pounds per hour in MN rule 7007.1300 subpart 4.B when adjusted for typical 24-hour PM_{10} background concentrations.

What does this mean for Title V modeling? It means "insignificant activities" can be important, especially those items listed in MN rule 7007.1300 subparts 3 and 4. On the other hand, detailed information for many such sources is often unnecessary. Thus, we are retaining and streamlining such sources as follows:

First, we apply a working definition of "insignificant activities" for Title V modeling purposes: *individual stacks, vents, and processes with emissions between 0.1 and 2.28 pounds/hour* based on maximum allowable hourly emissions (i.e., generally this means uncontrolled emissions since no controls would generally be required by the permit or rule). Sources less than 0.1 pounds/hour can be ignored for Title V modeling purposes, while sources greater than 2.28 pounds/hour should be modeled explicitly. Second, all sources between 0.1 and 2.28 pounds/hour should be consolidated into a single area source represented by the smallest rectangular area source enclosing these sources (or use a commensurate sized volume source). Third, the release height is set at either 1 meter or its emission-weighted release height. These simplifications acknowledge the existence and relative importance of such sources while minimizing time spent determining precise locations, proximity to nearby buildings, spatial extents, and release heights.

Table 3 summarizes PSD modeling and Title V modeling requirements for insignificant activities listed in Minnesota Rule 7007.1300.

Table 7. When and How to Model "Insignificant Activities"

Federal PSD/SIP Modeling	Model each insignificant activity individually if it exceeds SILS anywhere. Otherwise, consolidate and model them **collectively** as area/volume sources using emission-weighted release heights. Use maximum allowable hourly emissions.
State Title V Modeling	The Title V "insignificant activities" listed in Minnesota Rule 7007.1300 subparts 3 and 4 is: individual stacks/vents/processes each between 0.1 and 2.28 pounds per hour based on maximum allowable (uncontrolled) hourly emissions. Model all such sources at their maximum allowable emission rate. Consolidate all sources between 0.1 and 2.28 pounds/hr into one area source represented by the smallest rectangular area source enclosing the "insignificant activities". Or use a volume source with commensurate dimensions. Use a release height of 1 meter or the emission-weighted release height: SUM (EiHi) / SUM (Ei) where Ei = emission rate and Hi = release height of the i^{th} source. Ignore individual stacks/vents/processes less than 0.1 pounds/hour. Explicitly model individual sources greater than 2.28 pounds/hour.

11. Fugitive PM_{10} Emissions

Appendix A discusses two approaches to estimate fugitive PM_{10} emissions for Title V modeling purposes (streamlined Title V approach vs. traditional PSD approach).

To reduce MPCA staff resources, the time-consuming PSD approach will not generally be allowed for Title V modeling. Most Title V facilities will use the streamlined approach because they lack measurable/enforceable site-specific values in an existing PSD permit, Title V permit, or agency-approved fugitive dust control plan.

The PSD approach will only be allowed in Title V modeling if there are measurable/enforceable site-specific terms in an existing PSD permit, Title V permit, or agency-approved fugitive dust control plan. To use the PSD approach, the modeling protocol/information submittal must attach a copy of the existing PSD permit, Title V permit, or fugitive dust control plan with highlighted text that documents any user-specified site-specific values/assumptions.

PM_{10} emissions from fugitive sources (e.g., paved and unpaved roads, storage piles, material handling) should be included in PSD modeling analyses unless their exclusion is explicitly allowed by MPCA. Small emission sources may have nontrivial impacts.

12. PSD Special Topics

Visibility Screening

Facilities performing PSD modeling must show they will not adversely impact any Class I areas. EPA's VISCREEN model (http://www.epa.gov/scram001/tt22.htm#viscreen) is available for this purpose. PSD projects may run a VISCREEN level-1 analysis, and perform more refined visibility modeling if it fails the level-1 test.

Projects located within 100 km of a Class I area should notify the Federal Land Manger (FLM) of the proposed project. Some contact information is listed below. "Very large" facilities located at distances greater than 100 km from Class I areas may also need to notify the FLM. The notification is subjective but depends on the size of the facility/project, size of other nearby sources, current conditions in Class I areas, and the potential for growth in the area.

Contact List:

Chief, Policy, Planning and Permit Review Branch
National Park Service Air Resources Division
PO Box 25287
Denver, CO 80225-0287

Midwest Regional Office, National Park Service
1709 Jackson St.
Omaha, NE 68102

Chief, Air Quality Branch, US Fish and Wildlife Service
c/o National Park Service
PO Box 25287
Denver, CO 80225-0287

Fish and Wildlife Service – Region 3
Fort Snelling
Minneapolis, MN 55111

PM_{10} Emissions from Off-Site Roads

PSD projects must account for the increase in emissions related to the proposed project. However, explicit modeling of project-related vehicle traffic on off-site roads is generally not required. Appropriate PM_{10} background concentrations should be used to account for nearby vehicle traffic impacts on ambient PM_{10} levels.

Project Approvals and Timing

PSD projects must get MPCA permitting, air dispersion modeling, and often environmental review approval prior to completion. Any of these steps may be time consuming if the project is complex or contentious. Dispersion modeling for a "simple" PSD project may be approved in as little as one month after MPCA begins reviewing modeled results.

PSD projects involving complex facilities, many or large nearby sources, contentious non-modeling issues (e.g., mercury, $PM_{2.5}$, timber sales), or modeled exceedences of NAAQS or increments may all delay approval of facility modeling. In extreme cases, the entire modeling and permitting process may take several years.

13. What If Model Results Exceed Critical Values?

In the event modeled impacts exceed critical values (ambient standards, PSD increment ceilings, air toxic benchmarks), there are several possible solutions.

- Emission reductions using pollution control equipment;
- Emission reductions without using pollution control equipment (e.g., limits on throughput or hours of operation);
- Increased stack height;
- Fence property to exclude it from ambient air;
- Alternative operating scenarios;
- Collect site-specific background monitoring data.

If the high modeled values are due to fugitive dust impacts rather than process equipment or stacks, other solutions may be useful:

- Pave key unpaved roads;
- Water key unpaved roads;
- Apply chemical dust suppressants to key unpaved roads;
- Sweep/vacuum key paved roads;
- Enclose storage piles;
- Water storage piles.

14. Submittal Requirements

Protocols and final reports should be provided in hard copies to MPCA. Modeling input, output, and related files should be included on a CD.

Title V:
Table 1 lists the required elements of submittals for Title V Full Dispersion Modeling and Modeling Information requirements. When MPCA receives the information, we intend to:

- Check it (simple QA/QC tests; view/plot it);
- Store it (AQ DELTA database or elsewhere);
- Extract it (ready-to-run model formats);
- Share it (esp. nearby PSD projects*).

As time permits, we intend to:

- Model it (identify NAAQS/MAAQS problems*).
- Change it (fix NAAQS/MAAQS problems*).
- Amend permits & "attach" modeling inputs (especially maximum allowable emission rates and/or related stack parameters)*.

* This is very important for PSD projects when modeling other nearby sources.

Checking and storing data will be the first priority. Extracting the data into ready-to-run formats to share/model will occur later. If modeled violations occur, facilities must change their model inputs (esp. maximum allowable emission rates) and amend their Title V permit accordingly. We may "attach" revised modeling inputs to the permit to document the modeling information/assumptions (and make it federally enforceable).

PSD Modeling Protocol Requirements:
A modeling protocol should be submitted to MPCA prior to modeling impacts from a facility or modification. The protocol should describe how the modeling evaluation will treat the following issues:

- Model selection, options;
- Meteorological data;
- Building downwash;
- Receptor grid;
- Background sources/concentrations;
- Source emission rates and modeling parameters;
- If possible, include preliminary BPIP input/output files;
- If possible, include a preliminary VISCREEN level-1 analysis.

PSD Modeling Final Report Requirements:

- Full discussion of items listed in modeling protocol and used in analysis;
- Building Profile Input Program (BPIP) input/output electronic files (EPA format);
- ISCST3 (or alternate) model input/output electronic files;
- ISCST3 (or alternate) model plot/event/threshold electronic files (if possible);
- Meteorological electronic data files;
- Isopleth maps (from PLOTFILE outputs)
    - Concentration maps for all models
    - Terrain elevations for AERMOD
    - Hill scale factors for AERMOD
- Culpability tables (from EVENTFIL runs)
- PSD Class I analyses (per FLM recommendations)

AERMOD/AERMAP/AERMET will increase the number of required electronic files:

AERMAP

- input runstream file(s)
- input DEM file(s)
- output SOURCLOC file(s)
- output RECEPTOR file(s)

AERMET

- stage 1 input runstream files
- stage 1 input raw hourly surface observation files
- stage 1 input raw upper air soundings files
- stage 1 input raw on-site meteorology files (if applicable)
- stage 1 output surface observations extract files
- stage 1 output surface observations QA/QC files
- stage 1 output upper air soundings extract files
- stage 1 output upper air soundings QA/QC files
- stage 1 output on-site meteorology QA/QC files (if applicable)
- stage 1 output message files
- stage 1 output report files

- stage 2 input runstream files
- stage 2 output merged files
- stage 2 output message files
- stage 2 output report files

- stage 3 input runstream files
- stage 3 output surface files
- stage 3 output profile files
- stage 3 output message files
- stage 3 output report files

AERMOD

- input runstream files
- input HOUREMIS files (if applicable)
- output listing files
- output PLOTFILE files
- output POSTFILE files
- output MAXIFILE files
- EVENTFIL input files
- EVENTFIL output files

MPCA may soon provide limited National Weather Service data that has undergone stage 1 and stage 2 processing.

15. Suggestions and Troubleshooting

Title V Modeling Comparisons to Minnesota Ambient Air Quality Standards
When conducting Title V modeling for Minnesota Ambient Air Quality Standards, use the appropriate model predictor (i.e., high-first-high (H1H) or high-second-high (H2H) or high-sixth-high (H6H) predicted concentrations). This means comparing:

- H2H 1-hour SO_2 modeled impacts + background to 1300 ug/m3;
- H2H 3-hour SO_2 modeled impacts + background to 1300 ug/m3 (southern MN);
- H2H 3-hour SO_2 modeled impacts + background to 915 ug/m3 (northern MN);
- H2H 24-hour SO_2 modeled impacts + background to 365 ug/m3;
- H6H 24-hour PM_{10} modeled impacts + background to 150 ug/m3;
- H1H annual PM_{10} modeled impacts + background to 50 ug/m3;
- H1H annual SO_2 modeled impacts + background to 60 ug/m3;
- H1H annual NO_X modeled impacts + background to 100 ug/m3;

H1H is for each year, H2H is for each year, and H6H is over 5 years of meteorology.

Helpful Hints – Title V Modeling
- Use multiple source groups to identify the most important groups (the "big picture"):
- "SO SRCGROUP T5_PSRCS…" for Title V facility point sources;
- "SO SRCGROUP T5_FSRCS…" for Title V facility fugitive sources;
- "SO SRCGROUP T5_ASRCS…" for Title V facility area sources;
- "SO SRCGROUP T5_VSRCS…" for Title V facility volume sources;
- "SO SRCGROUP T5_OSRCS…" for Title V facility openpit sources;
- "SO SRCGROUP T5_TOTAL…" for Title V facility total;
- "SO SRCGROUP NEARBYBG…" for nearby background sources;
- "SO SRCGROUP ALL" for all sources;
- Use "EVENTFIL" to identify the most important sources (detailed culpability tables);
- Use "EVENTFIL" with "MAXIFILE" threshold equal to short-term ambient standard minus background concentration to identify all events exceeding ambient standards (this is most useful when modeling all sources – "SO SRCGROUP ALL");
- Use "PLOTFILE" to create contour maps – this helps us understand the spatial extent of high predicted concentrations.

Helpful Hints – PSD Modeling
- Use H1H for each year for long-term PSD increment modeling (40 CFR 52.21(c));
- Use H2H for each year for short-term PSD increment modeling (40 CFR 52.21(c));
- Use H6H over 5 years for 24-hour PM_{10} ambient standard (Minnesota standard);
- Use "EVENTFIL" with "MAXIFILE" threshold equal to short-term ambient standard (or increment) minus background concentration and SIL value to identify all events exceeding ambient standards with minimal future growth.
- See "Helpful Hints - Title V Modeling".

Common Modeling Mistakes

Here are some common modeling mistakes to watch-out for:

- Math errors & logic errors.
- Wrong anemometer height.
- Not using regulatory options (e.g., DFAULT).
- Ignoring condensable PM_{10} emissions (e.g., stack tests).
- Outdated emission factors (esp. fugitive sources for PSD purposes).
- Overly optimistic assumptions (esp. fugitive sources).
- Actual emissions greater than allowable emissions (esp. fugitive sources).
- Hardcopy report and modeling files are inconsistent (cut and paste mistakes).
- Using H6H values for 24-hour PM_{10} increment modeling. Should use H2H values for each year!
- Using H2H values for 24-hour PM_{10} NAAQS modeling. Should use H6H values over 5 years of meteorology!

Preferred file names – Title V Modeling & PSD Modeling

Please use DOS-friendly file names (8-character name and 3-character extension). For example: "FFFpttyy.xxx", where "FFF" is the facility, "p" is the pollutant, "tt" is the averaging time, "yy" is the year of meteorology, and "xxx" is the extension id.

Examples for "FFF":

- "ACC" for American Crystal - Crookston;
- "ACE" for American Crystal - East Grand Forks;
- "PCK" for Potlatch – Cook;
- "PCQ" for Potlatch – Cloquet;
- "XBD" for Xcel Energy - Black Dog;
- "XHB" for Xcel Energy - High Bridge;

Examples for "p":

- "N" for NO_X;
- "S" for SO_2;
- "P" for PM_{10}.

Examples for "tt":

- "01" for 1-hour averages;
- "03" for 3-hour averages;
- "24" for 24-hour averages;
- "AN" for annual averages;

Examples for "yy":

- "81" for 1981;
- "82" for 1982;
- "83" for 1983, etc.

Examples for “xxx”:

- “in_” for input files;
- “ou_” for output files;
- “pl_” for plot files (i.e., PLOTFILE);
- “ev_” for event files (i.e., EVENTFIL);
- “th_” or “mx_” for threshold files (i.e., MAXIFILE)

Underscore characters may be anything you wish (e.g., ‘i’ for increment modeling, and ‘a’ or ‘s’ for ambient standards).

Longer file names may be more descriptive and convenient in some cases. Please check with MPCA modeling staff reviewing your submittal to ensure they will not be using a DOS-based program for their review prior to using alternate file naming conventions.

16. Contacts

MPCA Customer Assistance Office
Ph: (651) 297-2274 or (800) 646-6247
- MPCA Title V & PSD modeling policy (to obtain a copy).
- Facility-specific Title V "Modeling Information Forms" and detailed instructions if you do not have internet access.

Dennis Becker
Ph: (651) 297-7364
e-mail: dennis.becker@pca.state.mn.us
- MPCA NSR Reform modeling policy.
- MPCA PSD/Title V modeling policy.
- MPCA PSD/Title V modeling guidance.
- MPCA Title V modeling - fugitive PM_{10} emission spreadsheet.
- PSD modeling and Title V modeling for individual sources.
- Criteria Air Pollutant and Toxic Air Pollutant Screening (CAPTAPS).
- Status of recently proposed EPA models (AERMOD, ISC-PRIME, CALPUFF).

Margaret McCourtney
Ph: (651) 297-7894
e-mail: margaret.mccourtney@pca.state.mn.us
- Title V Modeling Information submittals (electronic information requests)*.
- PM-2.5/regional haze modeling.

*Contact the MPCA Customer Assistance Center (see above) to obtain facility specific Modeling Information Forms and ask basic questions.

Chris Nelson
Ph: (651) 296-7750
e-mail: christopher.nelson@pca.state.mn.us
- PSD increment files & nearby sources for PSD modeling.
- PSD minor source baseline dates by county (NO_X, SO_2, and PM_{10}).
- PSD modeling and Title V modeling for individual sources.

Greg Pratt
Ph: (651) 296-7664
e-mail: gregory.pratt@pca.state.mn.us
- Feedlots modeling
- Toxic air pollutants modeling
- Deposition modeling.

Please contact any of the above persons if you have general modeling questions.

17. Resources

MPCA air dispersion modeling web site (http://www.pca.state.mn.us/air/modeling.html) with:

- MPCA Modeling Guidance for Title V/PSD Air Dispersion Modeling;
- MPCA Title V Modeling – Fugitive PM_{10} Emission Spreadsheet;
- Instructions for "Modeling Information" Requirement in Title V permits;
- Several ready-to-run meteorological data sets for models like ISCST3 and ISC-PRIME.

EPA Support Center for Regulatory Air Models (SCRAM) has EPA modeling guidance, dispersion models, and related items. Click on http://www.epa.gov/scram001/

USEPA Draft New Source Review Workshop Manual. October 1990. Click on http://www.epa.gov/ttn/nsr/gen/wkshpman.pdf

EPA ClearingHouse for Inventory and Emission Factors (CHIEF) has information on EPA emission factors (e.g., AP-42). Click on http://www.epa.gov/ttn/chief/

EPA Air Graphics displays air emissions data and ambient air quality monitoring data. Click on http://www.epa.gov/agweb/

United States Geological Survey (USGS) has digital elevation model (DEM) terrain data. Click on http://edcwww.cr.usgs.gov/doc/edchome/ndcdb/ndcdb.html

A web site with USGS topographic maps and USGS aerial photos on-line. Click on http://terraserver.homeadvisor.msn.com/default.asp

National Climatic Data Center. Click on http://www.ncdc.noaa.gov/

Appendix A: Estimating Fugitive PM-$_{10}$ Emissions

Fugitive PM_{10} Emissions for PSD/SIP Modeling

Use site-specific data if available, otherwise use the last version of AP-42. Select wisely because modeled values may become permit conditions! Permit conditions for fugitive sources are most likely when:

- Not using EPA-recommended values (e.g., using a very low silt content/silt loading for roads).
- Not using dry, uncontrolled conditions (e.g., using greater than 0.2% moisture for unpaved roads).
- Predicted impacts threaten or exceed ambient standards or PSD increment ceilings.

Fugitive PM_{10} Emissions for Title V Modeling

There are two Title V modeling approaches (streamlined vs. traditional PSD) to estimate fugitive PM_{10} emission from paved roads, unpaved roads, heavy construction operations, aggregate handling and storage piles, and industrial wind erosion. Both approaches require that all fugitive sources are identified and quantified even though the methods of quantifying PM_{10} emissions are different (i.e., simpler for the streamlined approach).

The streamlined approach often uses current EPA emission factor equations and MPCA-specified values – it is intended for cases without site-specific values incorporated into a current PSD permit, Title V permit, or agency-approved fugitive dust control plan. This approach is more conservative which means less review time and fewer permit conditions if it shows modeled attainment. Most Title V modeling analyses will use this approach because they lack measurable/enforceable site-specific terms in a current PSD permit, Title V permit, or agency-approved fugitive dust control plan. The agency has developed a spreadsheet (TITLE5_FE01.XLS) to expedite calculations for several fugitive emission source types for Title V modeling purposes. It includes MPCA-specified PM_{10} emission factors for the most common fugitive emission sources: paved & unpaved roads, material handling, and wind erosion of storage piles and other open/exposed areas.

The traditional PSD approach uses user-specified values (often semi-conservative or non-conservative) with adequate supporting documentation. The PSD approach is intended for cases where such values are incorporated into a current PSD permit, Title V permit, or agency-approved fugitive dust control plan. Since user-specified values are often less conservative, this means more review time. To reduce staff resources, the PSD approach will not generally be allowed unless there are measurable/enforceable site-specific terms in a current PSD permit, Title V permit, or agency-approved fugitive dust control plan*.

* Modeling protocol/information submittal must attach a copy of the fugitive dust control plan (or reference specific permit conditions) to verify user-specified values/assumptions.

Paved Roads (AP42 section 13.2.1 dated 10/97):

$$E = k\,(sL/2)^{0.65}\,(W/3)^{1.5}$$

where E is the emission factor (lb/VMT), k is the particle size multiplier (dimensionless), sL is the silt loading (grams/square meter), W is the average vehicle weight (tons), and VMT denotes vehicle miles traveled. The spreadsheet assumptions are described below.

MPCA-specified values for Title V modeling:
k=0.016 lb/VMT for PM_{10};
sL=100 grams/square meter for industrial paved roads for sand/gravel/asphalt sites;
sL=10 grams/square meter for industrial paved roads for other industrial sites;
sL=0.4 grams/square meter for public paved roads with less than 5,000 vehicles/day;
sL=0.1 grams/square meter for public paved roads with 5,000 vehicles/day or more;
W=average vehicle weight (tons) to be specified by user.
No control efficiency is allowed except via sL.

The spreadsheet requires entry of the average vehicle weight (tons) and average and maximum daily vehicle miles traveled.

Unpaved Roads (AP42 section 13.2.2 dated 9/98):

$$E = k(s/12)^{0.8}\,(W/3)^{0.4}\,(M/0.2)^{-0.3} \quad \text{[multiply by (S/15) only if S<15mph]}$$

where E is the emission factor (lb/VMT), k is the particle size multiplier (dimensionless), s is the surface material silt content (percent), and W is the average vehicle weight (tons), S is the average vehicle speed (mph), M is the surface material moisture content (%), and VMT denotes vehicle miles traveled. The spreadsheet assumptions are described below.

MPCA-specified values for Title V modeling:
k=2.6 lb/VMT for PM_{10};
s=10.0 percent;
M=0.2 percent;
W=average vehicle weight (tons) to be specified by user.
No control efficiency (CE) is allowed except via M or with chemical dust suppression.

The spreadsheet requires entry of the average vehicle weight (tons) and average and maximum daily vehicle miles traveled.

Heavy Construction Operations (AP42 section 13.2.3 dated 1/95):

E=1.2 tons/acre/month of activity, where E is the emission factor for PM_{10}.

This oversimplified emission factor estimates emissions during the construction of a building or road due to the related land clearing, drilling, ground excavation, cut and fill operations (i.e., earth moving), and construction of the facility itself.

Aggregate Handling and Storage Piles (AP42 section 13.2.4 dated 1/95):

$$E = k(0.0032)\ (U/5)^{1.3}\ (M/2)^{-1.4}$$

where E is the emission factor (lb/ton), k is the particle size multiplier (dimensionless), U is the mean wind speed (mph), and M is the material moisture content (percent).

MPCA-specified values for Title V modeling:
k=0.35 for PM_{10};
U=20 mph for worst-case 24-hour conditions; 10 mph for annual average conditions;
M= mean moisture contents in Table 13.2.4-1.- Typical Silt and Moisture Contents of Materials at Various Industries (EPA, AP-42, 1/95);
No control efficiency (CE) is allowed except via M.

The spreadsheet currently contains the following mean moisture contents:

Category	Mean Moisture Content
Crushed Limestone	0.7 percent
Various Limestone Products	2.1 percent
Taconite Pellets	0.9 percent
Taconite Tailings	0.4 percent
Coal (as received)	4.5 percent
Sand	7.4 percent
Clay/dirt mixture	14 percent
Clay materials	10 percent
Fly Ash – landfill waste	27 percent
Wood/bark (tentative)	45 percent

The spreadsheet requires information on the amount of material handled (i.e., throughput in tons), and the number of times it is handled. Below are two examples of the number of times coal might be handled.

Coal handled three times: dumping to main storage pile, unloading from main storage pile, and dumping to conveyor to boiler house.

Coal handled five times: dumping to temporary overflow/reclaim pile, unloading from overflow/reclaim pile, dumping to main storage pile, unloading from main storage pile, and dumping to conveyor to boiler house.

Industrial Wind Erosion (AP42 section 13.2.5 dated 1/95):

Older methods of quantifying wind erosion were easy to use but they often only focused on annual emissions (e.g., old versions of AP-42, Control of Open Fugitive Dust Sources, and MPCA Title V permitting guidance). These were generally fine for annual averages but not short-term averages (24-hours or less).

The most current version of AP-42, Section 13.2.5 (Industrial Wind Erosion) is harder to use but better represents annual averages and short-term averages. It quantifies hour-by-hour wind erosion via hourly values of wind speed with on-site values of roughness height, friction velocity, and threshold friction velocity.

For Title V modeling purposes, we will accept the current federal approach as well as a two-step approach using simpler older methods to estimate annual emissions combined with commensurate wind-speed dependent scalars (developed for NSP-SHERCO using 1973-1977 MSP meteorology) to scale/distribute the annual emissions. See Table A1.

Table A1. Industrial Wind Erosion Calculation Methods

Federal PSD Requirements	**State Title V Modeling Requirement**
Use the most current version of AP-42, section 13.2.5 (Industrial Wind Erosion).	**Option 1:** Use the most current version of AP-42, section 13.2.5. **Option 2:** Calculate annual emissions using any past or present EPA-approved methodology or MPCA Title V Modeling-Fugitive PM_{10} Emission spreadsheet, and apply the following ISCST wind-speed dependent scalars: `SO EMISFACT sourceid STAR 0.0 8.833 32.423 64.878 106.669 286.309` `SO EMISFACT sourceid STAR 0.0 8.833 32.423 64.878 106.669 286.309` `SO EMISFACT sourceid STAR 0.0 8.833 32.423 64.878 106.669 286.309` `SO EMISFACT sourceid STAR 0.0 8.833 32.423 64.878 106.669 286.309` `SO EMISFACT sourceid STAR 0.0 8.833 32.423 64.878 106.669 286.309` `SO EMISFACT sourceid STAR 0.0 8.833 32.423 64.878 106.669 286.309` ME WINDCATS 8.0 10.0 12.0 14.0 16.0

The spreadsheet assumes a nominal PM10 emission factor of one ton/acre/year for wind erosion for areas disturbed throughout the day (i.e., ongoing activities). Below are wind erosion PM_{10} emission factors for eight activity levels (disturbance frequencies):

- 1.00 tons/acre/year for areas disturbed throughout the day;
- 0.33 tons/acre/year for areas disturbed once a day;
- 0.25 tons/acre/year for areas disturbed once a week;
- 0.20 tons/acre/year for areas disturbed twice a month;
- 0.15 tons/acre/year for areas disturbed once a month;
- 0.10 tons/acre/year for areas disturbed once a season (i.e., quarter);
- 0.05 tons/acre/year for areas disturbed twice a year;
- 0.03 tons/acre/year for areas disturbed once a year.

Fugitive Emission Grading System for Title V Modeling

To encourage standardized fugitive estimates for Title V modeling purposes, a fugitive emission grading system will grade how conservative the fugitive emission assumptions are with regard to facility throughputs and emission factors. It is intended to discourage non-conservative short cuts/omissions, and make simple evaluations using a simple A-F grading system ("A" is the most conservative and lesser grades are less conservative).

This grading system is primarily for internal review (i.e., is the data "good enough" for other regulatory purposes such as permit shield or PSD modeling). In general, grades less than "B" will not be useful for other regulatory purposes, and grades less than "C" will be viewed as inadequate/incomplete without extensive additional review/revision. Because 24-hour averages are often most limiting, the final grade will focus on 24-hour averages (or we may separately grade 24-hour averages and annual averages).

Table A2. MPCA Fugitive Emission Grading System for Title V Modeling

Grade	***Daily Throughputs***	***Annual Throughputs***	***Emission Factors***
A	Maximum Values	1.1 * Average Values	Recommended Equations/Values
B	Reduced Values	1.0 * Average Values	Recommended Equations/Values
C	Maximum Values	1.1 * Average Values	Non-Recommended Eqns/Values
D	Reduced Values	1.0 * Average Values	Non-Recommended Eqns/Values
E	Indeterminate or Inadequate Values	Indeterminate or Inadequate Values	Unknown/questionable reference
F	Fully Ignored	Fully Ignored	

Throughputs

Maximum values mean maximum daily values (e.g., maximum daily VMT for paved roads, maximum daily VMT for unpaved roads, and maximum daily amount of material handled). VMT denotes vehicle miles traveled.

Average values mean average daily values (e.g., average daily VMT for paved roads, average daily VMT for unpaved roads, and average daily amount of material handled).

Reduced values for daily throughputs mean 2.0 * annual average values (not to exceed maximum daily values if known).

Emission Factors

Recommended items include:

- Current AP-42 equations with MPCA-specified values (Title5_FE01.xls spreadsheet);
- Measurable/enforceable site-specific values in a PSD permit, Title V permit, or MPCA-approved fugitive dust control plan (e.g., MCP-Marshall paved road tests);
- Non-recommended items include outdated AP-42 equations or non-MPCA values.

Title V Modeling - Fugitive PM_{10} Emission Spreadsheet

To help expedite our review, we have developed a Title V Modeling – Fugitive PM_{10} Emission Spreadsheet (Title5_FE01.xls). The spreadsheet and grading system provide a simple way to understand how conservative the fugitive emissions are represented in the Title V modeling, and, hopefully, discourage non-conservative short cuts and omissions. We are also considering "attaching" modeling files to Title V permits.

Required Information for Title V Modeling - Fugitive PM_{10} Emission Spreadsheet (TITLE5_FE01.XLS)

Worst-Case Daily Conditions (24-hour Averages)

- Estimate **maximum** daily VMT and **average** vehicle weight (tons) for paved roads.
- Estimate **maximum** daily VMT and **average** vehicle weight (tons) for unpaved roads.
- Estimate **maximum** daily material handled (tons). Prepare separate estimates for items listed in Table A3.

Typical Average Conditions (Annual Averages)

- Estimate **average** daily VMT and **average** vehicle weight (tons) for paved roads.
- Estimate **average** daily VMT and **average** vehicle weight (tons) for unpaved roads.
- Estimate **average** daily material handled (tons). Prepare separate estimates for items listed in Table A3.
- Estimate **average** area of **"active"** storage piles or open/exposed areas (acres). Prepare separate estimates for items listed in Table A3.
- Estimate **average** area of **"inactive"** storage piles or open/exposed areas (acres). Prepare separate estimates for items listed in Table A3.

Note: VMT denotes vehicle miles traveled.

Table A3. Materials Requiring Separate Fugitive Emission Calculations

Crush Limestone (e.g., roadbed materials)
Various Limestone Products (e.g., cement)
Taconite Pellets
Taconite Tailings
Coal (as received)
Sand
Clay/Dirt Mixture
Clay Materials
Fly Ash – Landfill Waste
Wood/Bark

Appendix B: Selected USEPA Policy Guidance

Appendix B.1 contains a 6/11/84 USEPA memo titled "Applicability of PSD Increments to Building Rooftops". It discusses NAAQS receptors vs. PSD increment receptors, and generally concludes rooftops are ambient air for NAAQS purposes but not PSD increment purposes.

Appendix B.2 contains a 1/30/87 USEPA memo titled "Ambient Air". Five cases are discussed, and its conclusions are summarized below:

- noncontiguous pieces of fenced owned by the same source is not ambient air; the public road separating each piece of land is ambient air
- a river is conditionally an effective physical barrier (if posted and patrolled); however, the river its self is ambient air
- one source's property – regardless of whether it is fenced – is ambient air relative to another source's emissions; waterways are ambient air
- the public also includes other industrial users of the river; waterways are ambient air; railroads only serving one company (railroad spurs) are not ambient air if the railroad entrance to the plant is clearly marked and patrolled; railroad through lines are ambient air
- Plant A's property is considered ambient air in relation to Plant B's emissions

Appendix B.3 contains a 1/30/87 USEPA memo titled "Ambient Air" that responds to five scenarios that are summarized in a 12/18/86 USEPA memo titled "EPA Definition of Ambient Air" describing several scenarios posed by the North Carolina Division of Environmental Management. Its conclusions:

- public roads and unfenced company areas are ambient air
- noncontiguous pieces of fenced owned by the same source is not ambient air; the public road separating each piece of land is ambient air
- drainage ditches are not effective physical barriers; "no parking" signs by themselves are not effective barriers, however, unfenced areas can be excluded from ambient air if these areas are "clearly posted and regularly patrolled by security guards"; areas that might even remotely be used by the public are ambient air

Appendix B.4 contains a 1/26/86 USEPA memo titled "Receptor Locations in Ambient Air" stating past ambient air policy has been clearly defined and does not require review. It refers to a 1/22/86 USEPA letter from Gerald A Emison to William F. O'Keefe, a 12/90/80 letter from Douglas Costle to Senator Jennings Randolf, and 5/16/85 USEPA memo from EPA Regional Meteorologists to Joseph Tickvart. The later states:

> "Specifically, for stationary source modeling, receptors should be placed anywhere outside inaccessible plant property. For example, receptors should included over bodies of water, over unfenced plant property, on buildings, over roadways, and over property owned by other sources."

Appendix B.5 contains a 10/17/89 USEPA memo titled “Ambient Air”. It discusses one company impacting another company. It states:

- a plant’s contribution can be subtracted from the total concentrations for receptors on that plant’s non-ambient air property
- one source’s property is ambient air relative to another source’s emissions
- care should be taken to avoid situations that could result in undue exposure to excessive concentrations and adverse public health impacts

Appendix B.6 contains a 6/5/88 USEPA memo titled “Air Quality Analysis for Prevention of Significant Deterioration (PSD)”. It discusses three possible modeling outcomes:

1) No modeled violations
2) Modeled violations with proposed source concurrent impacts < SIL values
3) Modeled violations with proposed source concurrent impacts > SIL values

Appendix B.7 contains a 4/13/92 EPA letter from Mr. John Seitz to Mr. Daniel Gutman. It indicates EPA does not consider open or operable windows, and air intakes to be ambient air for NAAQS purposes.

Appendix B.8 contains a 5/3/85 EPA memo titled “NSR Advisory Memorandum #1: TSP PSD Increment Consumption for North Carolina”. Regarding 24-hour increment consumption calculations, it states:

“(2) 24-Hour Increment Consumption Calculations. The February 25 Bozof/Schneeberg memo specifies that the baseline 24-hour boiler emissions are calculated using actual emissions and "assuming maximum actual operation over any typical 24-hour period during the two years prior to baseline triggering or other representative figure." As detailed as this instruction seems, it still leaves room for several interpretations because of the use of "typical." Suppose, for example, that the source actually operated at 100% capacity during one 24-hour period over a two-year time span. This constitutes the maximum actual operation level, but certainly isn't typical. The problem, of course, is at what frequency does the maximum actual operating rate become typical? Would five 24-hour periods at 100% capacity be acceptable as typical? If not, would 10 or 50 or even 100, or would it take operation at a certain level at least 50% of the time to be called typical?

We tentatively decided at the April 9 meeting to use the maximum actual operating rate unless that rate was so unusual as to constitute the equivalent of circumvention. As a rule of thumb, one would expect to see such maximums occur at least 5 percent of the total 24-hour operating time periods (which means nonoperating time periods don't count in making this determination). This conforms with an earlier Region IV policy determination (copy attached July 31, 1981, summary of policy determinations; Reference #2.18, item #4, in the Region IV New

Source Review: PSD Nonattainment Policy Reference Guide), which specifies use of the maximum 3-hour and 24-hour emissions rates. The use of the 5% guideline is intended only to rule out the possibility that a source could deliberately operate only a few times at very high rates in order to decrease increment consumption at some future time. Of course, this affects the amount of increment consumed. The higher the "actual" operating rate used, the less increment consumed in comparison to the allowable (future) operating rate. Since we would not be accepting the highest actual rate without question, our interpretation is at least as stringent as prior policy."

Appendix B.1 (EPA SCRAM Memo: AMA1.TXT)

United States Environmental Protection Agency
Washington, D. C. 20460

June 11, 1984

MEMORANDUM

SUBJECT: Applicability of PSD Increments to Building Rooftops

FROM: Joseph A. Cannon /s/
Assistant Administrator
for Air and Radiation

TO: Charles R. Jeter
Regional Administrator, Region IV

The following is in response to your letter of November 10, 1983, concerning issues which you felt required review for national consistency relating to a new source review for an Alabama Power facility in downtown Birmingham, Alabama.

On September 29, 1983, your office informed the State of Alabama that a source's compliance with the PSD increments must be measured on the tops of buildings, as well as at ground level. Since then we have discussed the question extensively among ourselves and with representatives of the State of Alabama and the company. For the reasons that follow, I do not believe we are in a position to definitively assert that PSD increments apply to rooftops without further information as to the consequences for the PSD system as a whole. Accordingly, I recommend that we inform Alabama that we do not now require that compliance with PSD increments be measured at the tops of buildings. A State may, of course, adopt such an approach if it so desires.

Between 1970 and 1983, it appears to have been general EPA practice to determine compliance with both NAAQS and PSD increments at ground level, not at roof level. On March 18, 1983, however, Kathleen Bennett, in a letter to the State of New York, determined that the "national ambient air quality standards are designed to protect the public health and welfare and apply to all ambient air which does include the rooftops and balconies of buildings accessible by the public."

I believe this conclusion was correct. Apartment balconies, rooftop restaurants, and the like present a potential for human exposure that the primary ambient air quality standards should be interpreted to address.

Given this conclusion, one could argue, based on the text of the relevant regulations and the Clean Air Act, that the PSD increments apply wherever the NAAQS apply, and that both must apply throughout the "ambient air." However, the PSD system, unlike the NAAQS system, does not aim at achieving one single goal. Rather it represents a balance struck first by Congress between a given level of protection against degradation and a given potential for economic growth. It appears that the calculations on which that

balancing judgment was based all assumed that PSD increments would be measured at ground level.

A number of state officials who are now administering PSD have argued to me that by measuring PSD increments on rooftops as well as at ground level, EPA would make the PSD system appreciably more stringent than Congress contemplated. Although major urban areas are all Class II areas, this approach, it is argued, could result in constraints on growth comparable to those that apply in Class I areas - national parks and wilderness areas. Such an outcome would not, it is argued, be consistent with Congressional intent.

In these circumstances, I think that preserving the status quo is particularly advisable because:

ø It is likely that Alabama did not contemplate adopting a "rooftops" approach to PSD when it took over the PSD program. That expectation, though not decisive, does provide some reason not to change the situation without formal rulemaking.

ø The consequences of a erroneous decision to consider increment consumption on rooftops will be more severe than those of an erroneous decision not to consider them. The adoption of such an approach will present at least a procedural, and, probably a substantive obstacle to development in urban areas, while in its absence air quality will still be protected by the NAAQS, by the PSD increments supplied at ground level, and by the other aspects of PSD review such as Best Available Control Technology.

Therefore, I have concluded that since the State of Alabama has authority under an approved implementation plan for administering the PSD program within Alabama, it is their responsibility to apply this principle of maintaining the status quo to this case, taking all the relevant facts into account.

Please advise the State of Alabama of the Agency's position on these points as our response to the issues which they raised in meetings with both of us.

cc: A. Alm
P. Angell
T. Devine
G. Emison
W. Pedersen
P. Wyckoff
S. Meiburg

Appendix B.2 (EPA SCRAM Memo: AMA2.TXT)

United States Environmental Protection Agency
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

April 30, 1987

MEMORANDUM

SUBJECT: Ambient Air

FROM: G. T. Helms, Chief /s/
Control Programs Operations Branch (MD-15)

TO: Steve Rothblatt, Chief
Air Branch, Region V

My staff and I have discussed the five ambient air cases which you submitted for our review on January 16, 1987. The following comments are our interpretation of the ambient air policy. However, this memorandum is not a discussion of the technical issues involved in the placement of receptors for modeling.

Our comments on each of the cases follow:

Case 1 (Dakota County, MN): This case involves two noncontiguous pieces of fenced property owned by the same source, divided by a public road. We agree that the road is clearly ambient air and that both fenced pieces of plant property are not.

Case 2 (Warrick County, IN): This case involves two large sources on both sides of the Ohio River. We agree that receptors should be located over the river since this is a public waterway, not controlled by the sources. We also agree that the river does indeed form a sufficient natural boundary/barrier and that fencing is not necessary, since the policy requires a fence or other physical barrier. However, some conditions must be met. The riverbank must be clearly posted and regularly patrolled by plant security. It must be very clear that the area is not public. Any areas where there is any question--i.e., grassy areas, etc.--should be fenced and marked, even if there is a very remote possibility that the public would attempt to use this property.

However, we also feel that current policy requires that receptors should be placed in ALCOA and SIGECO property for modeling the contribution of each source's emissions to the other's ambient air. Thus, ALCOA's property--regardless of whether it is fenced--is still "ambient air" in relation to SIGECO's emissions and vice-versa.

Case 3 (Wayne County, MI): This case involves the air over the Detroit River, the Rouge River and the Short-cut Canal. We agree that the air over all three of these is ambient air, since none of the companies owns them or controls public access to them. Note, however, that one source's property--regardless of whether it is fenced--is the "ambient air" relative to another source's emissions.

Case 4 (Cuyahoga County, OH): This case involves LTV Steel's iron and steel mill located on both sides of the Cuyahoga River.

We do not feel that LTV Steel "controls" the river traffic in that area sufficiently to exclude the public from the river, whether it be recreational or industrial traffic. The fact that there is little or no recreational traffic in that area is not sufficient to say that all river traffic there is LTV traffic. The public also includes other industrial users of the river that are not associated with LTV.

It is difficult to tell from the map whether the railroad line is a through line or not. If the railroad yard serves only the plant then it would not be ambient but the railroad entrance to the plant would have to be clearly marked and patrolled. However, if the line is a through line then that would be ambient air. We would need additional information to make a final determination.

The unfenced river boundaries should meet the same criteria as in Case 2 above.

Case 5 (involves the placement of receptors on another source's fenced property): As mentioned above in Case 2, we feel that present policy does require that receptors be placed over another source's property to measure the contribution of the outside source to its neighbor's ambient air. To reiterate, Plant A's property is considered "ambient air" in relation to Plant B's emissions.

I hope that these comments are helpful to you and your staff. This memorandum was also reviewed by the Office of General Counsel.

cc: S. Schneeberg
P. Wyckoff
R. Rhoads
D. Stonefield
Air Branch Chiefs, Region I-X

Appendix B.3 (EPA SCRAM Memo: AMA3.TXT)

United States Environmental Protection Agency
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

April 30, 1987

MEMORANDUM

SUBJECT: Ambient Air

FROM: G. T. Helms, Chief /s/
Controlled Programs Operations Branch (MD-15)

TO: Bruce Miller, Chief
Air Programs Branch, Region IV

My staff and I have discussed the five situations involving the definition of ambient air that you sent on December 18, 1986. The following comments represent our interpretation of the ambient air policy. However, this memorandum is not a discussion of the technical issues involved in the placement of receptors for modeling. Our comments on each scenario follow:

Scenario One: We agree with you that the road and the unfenced property are ambient air and could be locations for the controlling receptor.

Scenario Two: We agree with your determination in this case also.

Scenario Three: We agree with you that the road is ambient air. However, Area B is not ambient air; it is land owned or controlled by the company and to which public access is precluded by a fence or other physical boundary.

Scenario Four: We do not think that any of the barriers mentioned here are sufficient to preclude public access so as to allow the source to dispense with a fence. An example of an unfenced boundary that would qualify is a property line along a river that is clearly posted and regularly patrolled by security guards. Any area, such as grassy areas that might even remotely be used by the public, would have to be fenced even in this situation. We would not think that a drainage ditch would meet these criteria.

Scenario Five: Both fenced pieces of plant property, even though noncontiguous, would not be considered ambient air (see Scenario Three). The road, of course, would be ambient air. Again, ownership and/or control of the property and public access are the keys to ambient air determination.

I hope that these comments are helpful to you and your staff. This memorandum was also reviewed by the Office of General Counsel. Please call me if you have any comments.

cc: S. Schneeberg

P. Wyckoff
R. Rhoads
D. Stonefield
Air Branch Chiefs, Regions I-X

(Incoming Request Follows)

United States Environmental Protection Agency

DATE: December 18, 1986

SUBJECT: EPA Definition of Ambient Air

FROM: Bruce P. Miller, Chief /s/
Air Programs Branch
Air, Pesticides & Toxics Management Division

TO: Tom Helms, Chief
Control Programs Operation Branch (MD-15)

SUMMARY

The North Carolina Division of Environmental Management has asked for a clarification of ambient air in regards to a certain source located in North Carolina. The Regional Meteorologist's memorandum dated May 16, 1985, provides that for modeling purposes receptors are located everywhere outside of the continuous property of a plant to which the public is precluded due to a fence or other effective physical barriers. Attached are a number of scenarios for the source where we request a response on whether the receptors at certain locations are considered ambient air and whether the calculated modeling result at these receptors are to be considered in establishing an emission limit if one or more of these receptors is controlling. The Region IV opinion for each scenario is provided.

Most of the scenarios we believe are dealt with adequately in the May 16, 1985 memorandum, however, there is a major concern on our part about how to interpret the modeling results in scenario numbers three, four and five.

Please provide us with a written response by January 27, 1987. Please contact me or Mr. Lewis Nagler of my staff at FTS 257-2864 if you require additional information.

Enclosure (1)

cc: Joseph Tikvart (MD-14)
RTP, NC

NORTH CAROLINA AMBIENT AIR SCENARIOS

Scenario One

The plant property is divided by a public road. The portion of the property on which a point source is located (Area A) is completely fenced. The property on the other side of the road (Area B) is unfenced.

The Region IV position is that the road and the unfenced property are ambient air and if air quality modeling locates the controlling receptor in Area B, the emission limit will be determined based on the calculated concentration at that receptor.

Scenario Two

This scenario is the same as scenario one except that Area B is fenced except for the property along the public road.

The Region IV position is identical to that provided in scenario one.

Scenario Three

This scenario is the same as scenario one except that all of Area B is fenced.

The Region IV position is that the road is ambient air and that Area B should have receptors located there for modeling purposes. We also believe that since Area B is not continuous to that property that is needed for plant operation, even though fenced, Area B is ambient air. We further believe that if a receptor located in Area B is found to contain the controlling receptor for establishing the source emission rate then that receptor value must be used.

There is a concern on our part that the May 16, 1985 memorandum could be interpreted to allow the Air Quality Management officials to discard the calculated concentrations within Area B. We believe a clarification of the ambient air policy on this point is needed.

Scenario Four

Area A is fenced except for the property along the public road.

The Region IV position is that Area A is ambient air unless the source can demonstrate that the public is precluded to entry by an effective physical barrier. However, since a physical barrier other than a fence is subject to various interpretation, we are seeking advise on what we can accept as meeting that requirement. For instance, a drainage ditch alongside a road with no shoulder for parking or the use of "NO PARKING" signs could be considered an effective barrier. As you can see, the concept can be quite subjective and we require additional guidance in this area.

For this actual situation, would you concur or non concur that no parking signs in association with no shoulder to park upon constitute a physical barrier? The Region IV position is that this situation does not constitute an effective physical barrier, but the addition of a drainage ditch would constitute an effective barrier.

Scenario Five (Hypothetical)

The entire plant is fenced. As a result of the county or state's power of eminent domain, a road is built through the property. Does the area that is no longer contiguous to the plant operation area lose its exemption from the ambient air definition even if the source fences off the area taken by the road?

The Region IV position is that the area should be grandfathered in that situation.

Appendix B.4 (EPA SCRAM Memo: AMA4.TXT)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

January 21, 1986

MEMORANDUM

SUBJECT: Receptor Locations In Ambient Air

FROM: Joseph A. Tikvart, Chief /s/
Source Receptor Analysis Branch (MD-14)

TO: Regional Modeling Contacts, Regions I-X

As the attachments indicate, OAQPS has reinforced the position that the ambient air policy has been clearly defined and does not require review. The Regional Meteorologists' memorandum (dated 5/16/85) harmonizes modeling procedures with this long-standing policy. In future Model Clearinghouse actions we will use that memorandum to ensure consistent Regional implementation of that policy and to resolve questions about pollutant concentrations at receptor locations where the public has access.

Attachments

cc: R. Campbell
T. Helms
R. Rhoads
D. Tyler
D. Wilson

(Attachments Following)

Attachment

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

January 22, 1986

William F. O'Keefe, Vice President
American Petroleum Institute
1220 L Street Northwest
Washington, D. C. 20005

Dear Mr. O'Keefe:

Mr. Elkins has asked me to respond to your letter of December 18, 1985, in which you perceive a change in our policy with regard to the location of receptors for air quality dispersion modeling.

Let me assure you there is no change in our long-standing national policy with regard to the definition of ambient air. That policy is based

on 40 CFR Part 50.1 (e) which defines ambient air as ". . . that portion of the atmosphere, external to buildings, to which the general public has access." A letter dated December 19, 1980, from Douglas Costle to Senator Jennings Randolph, reaffirmed and clarified this definition by stating the exemption from ambient air is available only for the atmosphere over land owned or controlled by the source and to which public access is precluded by a fence or other physical barriers. A copy of Mr. Costle's letter is enclosed. The codified definition plus the 1980 clarification essentially constitute the national policy on ambient air.

The Regional Meteorologists' memorandum to which you refer does not imply any change in this national policy and simply harmonizes modeling procedures with our long-standing policy. It is intended to ensure consistent Regional implementation of that policy and to dispel any questions about pollutant concentrations at locations where the general public has access.

Thus, since the Regional Meteorologists' memorandum does not imply any change in our policy, I do not believe there is any need for policy review at this time.

Sincerely,

/s/

Gerald A. Emison
Director
Office of Air Quality Planning
and Standards

Enclosure

cc: W. Quanstrom
E. Elkins

Attachment

December 19, 1980

Honorable Jennings Randolph
Chairman, Committee on Environment
and Public Works
United States Senate
Washington, D.C. 20510

Dear Mr. Chairman:

Thank you for your letter of October 23, 1980 expressing your continued interest in the Agency's definition of "ambient air." During the time since David Hawkins, my Assistant Administrator for Air, Noise, and Radiation, met with you last February, the definition has been extensively reviewed and debated.

After reviewing the issues and alternatives, I have determined that no change from the existing policy is necessary. We are retaining the policy that the exemption from ambient air is available only for the atmosphere over land owned or controlled by the source and to which

public access is precluded by a fence or other physical barriers. EPA will continue to review individual situations on a case-by-case basis to ensure that the public is adequately protected and that there is no attempt by sources to circumvent the requirement of Section 123 of the Clean Air Act.

I hope that this has been responsive to your needs.

Sincerely yours,

/s/ Douglas M. Costle

Douglas M. Costle

Attachment

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region V

DATE: May 16, 1985

SUBJECT: Ambient Air

FROM: Regional Meteorologists, Regions I-X

TO: Joseph Tikvart, Chief (MD-14)
Source Receptor Analysis Branch

At the recent Regional Meteorologists' meeting in Dallas, we identified inconsistencies among the Regional Offices on what areas are to be considered as ambient air for regulatory purposes. The existing inconsistency on ambient air is due to both the lack of clear National guidance and the allowed Regional Office discretion. A standardized approach is necessary both to satisfy the consistency requirements of Section 301 of the Clean Air Act and in order for those responsible for Regional modeling activities to provide effective and efficient review of and guidance on modeling analysis. Accordingly, the Regional Meteorologists have decided to address the problem at the working level through the use of a consistent modeling approach.

40 CRF Part 50.1(e) defines ambient air as ". . . that portion of the atmosphere, external to buildings, to which the general public has access." A letter dated December 19, 1980, from Douglas Costle to Senator Jennings Randolph, clarified this definition by stating that the exemption from ambient air is available only for the atmosphere over land owned or controlled by the source and to which public access is precluded by a fence or other physical barriers." The codified definition plus the 1980 clarification essentially constitute the National policy on ambient air.

The Regional Meteorologists propose that for modeling purposes the air everywhere outside of contiguous plant property to which public access is precluded by a fence or other effective physical barrier should be considered in locating receptors. Specifically, for stationary source modeling, receptors should be placed anywhere outside inaccessible plant property. For example, receptors should be included over bodies of water, over unfenced plant property, on buildings, over roadways, and

over property owned by other sources. For mobile source modeling (i.e., CO modeling), receptors should continue to be sited in accordance with Volume 9 of the "Guidelines for Air Quality Maintenance Planning".

Unless you disagree with our position, we will require new actions with modeling analyses submitted to EPA after January 1, 1986, to conform to this modeling policy. Please note that all 10 Regional Meteorologists have reviewed and concur with this memo.

cc: Regional Meteorologist, Regions I-X

Appendix B.5 (EPA SCRAM Memo: AMA5.TXT)

October 17, 1989

MEMORANDUM

SUBJECT: Ambient Air

FROM: Robert D. Bauman, Chief
SO2/Particulate Matter Programs Branch (MD-15)

TO: Gerald Fontenot, Chief
Air Programs Branch, Region VI (6T-A)

My staff and I have discussed the ambient air case outlined in the August 24, 1989 memorandum from Jim Yarbrough of your staff to Doug Grano of my staff. Specifically, Region VI and the Texas Air Control Board propose that prevention of significant deterioration (PSD) modeling for Mitsubishi Industries can discount the contribution of a background source to the predicted concentration as follows:

1. Assume Mitsubishi and background plants B and C.

2. Mitsubishi and plants B and C are modeled and total concentrations are estimated.

3. Where a receptor is located on plant B's nonambient air property, the contribution from plant B (only) may be subtracted from the total concentration.

This situation is similar to a case raised to OAQPS's attention in 1987 by Region V. Guidance on this case was provided by OAQPS to Region V in a memorandum dated April 30, 1987 (attached). That guidance is consistent with your proposed approach and, therefore, we agree with your position.

However, the State should be advised that, when modeling Mitsubishi, all receptors off Mitsubishi property are in ambient air and that the ambient air policy does not allow sources to excessively pollute their neighbors. Note that a background source could, in the future, change their operation and make portions of their property accessible to the public. Care should be taken to avoid situations that could result in undue exposure to excessive concentrations and which could result in adverse public health impacts.

In response to your position on issuance of the permit where Mitsubishi makes a significant contribution to predicted violations of either the national ambient air quality standards (NAAQS) or PSD increments, policy contained in the July 5, 1988 memorandum from OAQPS to Region 3 should be applied (attached). For a new or existing NAAQS violation, the permit may be granted under specific conditions. However, for any increment violation for which the proposed source has a significant impact, the permit should not be approved unless the increment violation is corrected prior to operation of the proposed source.

If you have any questions regarding this memorandum, please call Doug Grano at FTS-629-5255.

Attachments

cc: Air Branch Chief, Regions I-V, VII-X
SO2 Contacts

bcc: John Calcagni
Dan deRoeck
Gary McCutchen
Joe Tikvart
Dean Wilson
Jim Yarbrough
Regional Modeling Contact, Regions I-X

(Attachments may be found in generic/recurring issues section on the BBS as AMA#2 under Ambient Air and SAQ#1 under Significant Air Quality Impacts)

Appendix B.6 (EPA SCRAM Memo: SAQ1.TXT)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

July 5, 1988

MEMORANDUM

SUBJECT: Air Quality Analysis for Prevention of
Significant Deterioration (PSD)

FROM: Gerald A. Emison, Director /s/
Office of Air Quality Planning and Standards (MD-10)

TO: Thomas J. Maslany, Director
Air Management Division (3AM00)

Your memorandum of May 9, 1988, pointed out that two different procedures are currently being used by the Regional Offices in certain PSD permit analyses. The inconsistency involves the question of how to interpret dispersion modeling results to determine whether a source will cause or contribute to a new or existing violation of a national ambient air quality standard (NAAQS) or PSD increment. This memorandum serves to resolve the inconsistency by reaffirming previous Office of Air Quality Planning and Standards guidance provided in a December 1980 policy memorandum (attached).

As you know, the regulation for PSD stipulate that approval to construct cannot be granted to a proposed new major source or major modification if it would cause or contribute to a NAAQS or increment violation. Historically, the Environmental Protection Agency's (EPA's) position has been that a PSD source will not be considered to cause or contribute to a predicted NAAQS or increment violation if the source's estimated air quality impact is insignificant (i.e., at or below defined de minimis levels). In recent years, two approaches have been used to determine if a source would "significantly" (40 CFR 51.165(b) defines significant) cause or contribute to a violation. The first is where a proposed source would automatically be considered or contribute to any modeled violation that would occur within its impact area. In this approach, the source's impact is modeled and a closed circle is drawn around the source, with a radius equal to the farthest distance from the source at which a significant impact is projected. If, upon consideration of both proposed and existing emissions contributions, modeling predicts a violation of either a NAAQS or an increment anywhere within this impact area, the source (as proposed) would not be granted a permit. The permit would be denied, even if the source's impact was not significant at the predicted site of the violation during the violation period. You have indicated that this is the approach you currently use.

The second approach similarly projects air quality concentrations throughout the proposed source's impact area, but does not automatically assume that the proposed source would cause or contribute to a predicted NAAQS or increment violation. Instead, the analysis is carried one step further in the event that a modeled violation is predicted. The additional step determines whether the emissions from the proposed source will have a significant ambient impact at the point of the modeled NAAQS or increment

violation when the violation is predicted to occur. If it can be demonstrated that the proposed source's impact is not "significant" in a spatial and temporal sense, then the source may receive a PSD permit. This approach is currently being used by Region V and several other Regional Offices, and is the approach that you recommend as the standard approach for completing the PSD air quality analysis.

In discussing this matter with members of my staff from the Source Receptor Analysis Branch (SRAB) and the Noncriteria Pollutant Programs Branch (NPPB), it appears that different guidance has been provided, resulting in the two separate approaches just summarized. We have examined the history and precedents which have been set concerning this issue. I also understand that this issue was discussed extensively at the May 17-20, 1988 Regional Office/State Modelers Workshop, and that a consensus favored the approach being used by Region V and several other Regions. Based on this input, as well as your own recommendation, I believe the most appropriate course of action to follow is the second approach which considers the significant impact of the source in a way that is spatially and temporally consistent with the predicted violations.

By following the second approach, three possible outcomes could occur:

(a) First, dispersion modeling may show that no violation of a NAAQS or PSD increment will occur in the impact area of the proposed source. In this case, a permit may be issued and no further action is required.

(b) Second, a modeled violation of a NAAQS or PSD increment may be predicted within the impact area, but, upon further analysis, it is determined that the proposed source will not have a significant impact (i.e., will not be above de minimis levels) at the point and time of the modeled violation. When this occurs, the proposed source may be issued a permit (even when a new violation would result from its insignificant impact), but the State must also take the appropriate steps to substantiate the NAAQS or increment violation and begin to correct it through the State implementation plan (SIP). The EPA Regional Offices' role in this process should be to establish with the State agency a timetable for further analysis and/or corrective action leading to a SIP revision, where necessary. Additionally, the Regional Office should seriously consider a notice of SIP deficiency, especially if the State does not provide a schedule in a timely manner.

(c) Finally, the analysis may predict that a NAAQS or increment violation will occur in the impact area and that the proposed source will have a significant impact on the violation. Accordingly, the proposed source is considered to cause, or contribute to, the violation and cannot be issued a permit without further control or offsets. For a new or existing NAAQS violation, offsets sufficient to compensate for the source's significant impact must be obtained pursuant to an approved State offset program consistent with SIP requirements under 40 CFR 51.165(b). Where the source is contributing to an existing violation, the required offsets may not correct the violation. Such existing violations must be addressed in the same manner as described in (b) above. However, for any increment violation (new or existing) for which the proposed source has a significant impact, the permit should not be approved unless the increment violation is corrected prior to operation of the proposed source (see 43 FR p.26401, June 19, 1978; and 45 FR p.52678, August 7, 1980).

Your memorandum also states that other air quality analysis issues exist within the NSR program which need consistent national guidance. You recommend a more coordinated effort between SRAB and NPPB to review outstanding NSR issues. We agree; however, rather than establishing a formal work group as you propose, we are optimistic that the formal participation of representative of the NSR program in the Modeling

Clearinghouse will help resolve coordination problems. Earlier in the year, the Modeling Clearinghouse was officially expanded to include representation from the NPPB to coordinate PSD/NSR issues which have a modeling component.

I trust that this is responsive to the concerns which you have raised. By copy of this memorandum, we are also responding to a Region V request for clarification on the same issue (memorandum from Steve Rothblatt to Joe Tikvart/Ed Lillis, date February 18, 1988).

Should you have any further questions concerning this response, please feel free to contact Gary McCutchen, Chief, New Source Review Section, at FTS 629-5592.

Attachment

cc: Air Division Directors, Regions I-X
Air Branch Chiefs, Regions I-X
D. Clay
J. Calcagni
J. Tikvart
E. Lillis
G. McCutchen
D. deRoeck

Appendix B.7 (EPA letter memo-x.txt)

APR 13 1992

Mr. Daniel Gutman
407 West 44th Street
New York, New York 10036

Dear Mr. Gutman:

This is in response to your March 12, 1992 letter requesting further clarification regarding the Environmental Protection Agency's (EPA's) definition of "ambient air." My February 19, 1992 letter to you indicated that the definition of ambient air is based on two tests: whether the location is external to buildings and whether it is accessible to the general public.

You suggest in your letter that EPA adopt a policy which would state that, except in special cases, air at the intakes of mechanically ventilated buildings would not be considered ambient air, while air at open (or operable) windows generally would be considered ambient air (subject to case-by-case exceptions). However, in determining compliance with annual national ambient air quality standards, it is highly unlikely that the air at all or most operable window openings (which would not remain open all year round) would represent a reasonable or plausible exposure scenario. Outdoor-to indoor attenuation studies, even in open-windows situations, have shown reductions in the concentrations people actually breathe indoors. The indoor-to outdoor (I/O) ratio varies depending on the averaging time, the outdoor air exchange rate (expressed as the number of air changes per hour), reactivity of the pollutant, building orientation to the wind, etc. Enclosed for your information is an analysis from a study we are working on involving exposure to ozone. The data show that the I/O ration for ozone generally ranges from 0.5 to 0.8, with buildings with high air exchange rates (likely due to open windows or doors) at the upper end of the range and closed buildings with air conditioning at or below 0.5. While pollutants like sulfur dioxide and carbon monoxide are less reactive than ozone and thus would likely exhibit higher I/O ratios, this merely confirms the case-by-case nature of these situations. Once indoors, air is no longer "external to buildings" and is thus not considered ambient air.

Thus, except in very unusual situations, we would not consider air at open or operable windows, or at the intakes of mechanically-ventilated buildings, as ambient air for purposes of determining attainment of the national ambient air quality standards. States are free to interpret their own State ambient air quality standards in a more restrictive manner.

I appreciate this opportunity to be of service and trust this information will be helpful to you.

Sincerely,

John S. Seitz
Director
Office of Air Quality Planning
and Standards

Enclosure

bcc: (w/o) enclosure)
Bill Baker, Region II
T. Helms, AQMD (MD-15)
E. Lillis, AQMD (MD-15)
J. Paisie, AQMD (MD-15)
Mike Prosper, OGC (LE-132A)

OAQPS:AQMD:KBERRY/nmiller:NCM:MD-15:X5505:3-27-92
F:\NMILLER\BERRY\GUTMAN.2 Rerun 3-31, 4-3, 4-8-92
Control No. AQPS-92-0016 Due to AQPS 4-06-92

This has been coordinated with Mike Prosper (OGC) and Bill Baker (Region II).

Appendix B.7 (EPA letter from Mr. John Seitz to Mr. Daniel Gutman) [inserted from PDF file]

APR 13 1992
Mr. Daniel Gutman
407 West 44th Street
New York, New York 10036
Dear Mr. Gutman:
This is in response to your March 12, 1992 letter requesting further clarification regarding the Environmental Protection Agency's (EPA's) definition of "ambient air." My February 19, 1992 letter to you indicated that the definition of ambient air is based on two tests: whether the location is external to buildings and whether it is accessible to the general public.
You suggest in your letter that EPA adopt a policy which would state that, except in special cases, air at the intakes of mechanically ventilated buildings would not be considered ambient air, while air at open (or operable) windows generally would be considered ambient air (subject to case-by-case exceptions). However, in determining compliance with annual national ambient air quality standards, it is highly unlikely that the air at all or most operable window openings (which would not remain open all year round) would represent a reasonable or plausible exposure scenario. Outdoor-to indoor attenuation studies, even in open-windows situations, have shown reductions in the concentrations people actually breathe indoors. The indoor-to outdoor (I/O) ratio varies depending on the averaging time, the outdoor air exchange rate (expressed as the number of air changes per hour), reactivity of the pollutant, building orientation to the wind, etc. Enclosed for your information is an analysis from a study we are working on involving exposure to ozone. The data show that the I/O ration for ozone generally ranges from 0.5 to 0.8, with buildings with high air exchange rates (likely due to open windows or doors) at the upper end of the range and closed buildings with air conditioning at or below 0.5. While pollutants like sulfur dioxide and carbon monoxide are less reactive than ozone and thus would likely exhibit higher I/O ratios, this merely confirms the case-by-case nature of these situations. Once indoors, air is no longer "external to buildings" and is thus not considered ambient air.

Thus, except in very unusual situations, we would not consider air at open or operable windows, or at the intakes of mechanically-ventilated buildings, as ambient air for purposes of determining attainment of the national ambient air quality standards. States are free to interpret their own State ambient air quality standards in a more restrictive manner.
I appreciate this opportunity to be of service and trust this information will be helpful to you.

Sincerely,
John S. Seitz
Director
Office of Air Quality Planning
and Standards
Enclosure
bcc: (w/o) enclosure)
Bill Baker, Region II
T. Helms, AQMD (MD-15)
E. Lillis, AQMD (MD-15)
J. Paisie, AQMD (MD-15)
Mike Prosper, OGC (LE-132A)
This has been coordinated with Mike Prosper (OGC) and Bill Baker (Region II).

Appendix B.8 (NSR Advisory Memorandum #1)
[inserted from PDF file]

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711
MEMORANDUM
DATE: May 3, 1985
SUBJECT: NSR Advisory Memorandum #1:
TSP PSD Increment Consumption in North Carolina
FROM: Gary McCutchen, Senior Engineer
New Source Review Section, SIB, CPDD (MD-15)
TO: Mike Trutna, Chief
New Source Review Section

In response to an October 29, 1984, request from Archie Lee, Region IV, to you regarding whether a change in the North Carolina State implementation plan consumes increment, I have reviewed a September 20, 1984, letter from - Bill Johnson, Chief, Air Quality Section, North Carolina Division of Environmental Management, as well a paper by Robert Wooten and a December 21, 1984, Federal Register notice dealing with this SIP change.

The position taken by North Carolina appears to be this:

(1) Operators of several power plant boilers have indicated that they are unable to meet the State's original particulate mass emission limits (ranging from 0.10 to 0.14 pounds per million Btu).

(2) In June 1979, the State granted a 3-year variance, setting interim limits of 0.20 to 0.25 pounds per million Btu, with the requirement that the utilities conduct a series of stack tests which would provide data for setting permanent limits.

(3) The State proposes permanent limits of 0.10 to 0.25 pounds per million Btu, which are generally lower than the variance limits but higher than the original limits.

(4) The State alleges that PSD increment is not consumed by these new permanent limits because there has been no change in actual particulate matter emissions from these units. North Carolina based this statement on the following reasons:

(a) The general equipment design is the same as when originally installed or improved.

(b) The companies have good incentive to maintain their equipment and operate it properly because of a mass - opacity correlation used to find a 365 - day emission total to compare to an annual limit. (Note: EPA proposed

no action on the annual limits in the December 21, 1984, Federal Register because such limits do not protect short-term increment.)

(c) The coal burned before and during the variance is of similar quality and its quality can be monitored at will.

(d) The new limits are set at levels appropriate to what the control equipment can meet on a continuous compliance basis if properly operated and maintained.

North Carolina submitted the Wooten paper to support that there has been (and would be) no increase in actual emissions from these utilities as a result of the new limits.

It is EPA's position that a PSD increment-consuming emissions increase would result from the new emissions limits and that the acceptability of this increment consumption must be determined before the new limits could be approved. This position is presented in the attached February 25, 1985, memorandum from Bozof and Schneeberg to Archie Lee.

There are several additional issues raised by the State's proposal. First, the State evidently concludes that these utilities cannot meet the original limits. However, as Wooten points out on page 12 of his paper (although in a negative tone), these units at one time emitted at rates low enough to provide support for an NSPS of 0.03 pounds per million Btu. There is no evidence given in the Wooten paper that any effort was made to improve operation or maintenance of the control equipment to attempt to at least meet the original emissions limits, much less the NSPS levels. Acceptance of the current control levels should not have occurred without a careful and detailed study of the reasons for the decrease in efficiency, particularly the possibility of improved maintenance. Second, the concept of continuous (opacity) versus intermittent (stack test) compliance is

a good one, but much more extensive attempts than North Carolina's have failed to find a workable mass-to-opacity correlation. The State has not indicated in the Wooten paper:
(1) What the continuous opacity limit would be,
(2) How this opacity limit would differ from the usual opacity limits placed on boilers,
(3) How it would protect the short-term increments, since it appears to be intended for use with the State's annual emissions limits,
(4) How the opacity limits were derived from the mass emissions limits.
Third, the Wooten paper presents a lengthy statistical approach for determining the new emissions limits, but what it boils down to is to take all of the test data (including results which exceeded even the variance) and add a safety factor to contain a limit that none of the units would exceed, then call this the new limit. At best, this is an odd approach to standard setting.
3
Finally, the State contends that actual emissions would not increase because:
(1) The control equipment is the same. Operators, of course, could do many things that would decrease the control equipment effectiveness, including turning the equipment off.
(2) Day-to-day compliance would be encouraged by the opacity limits. Since there are usually opacity limits on boilers anyway, this argument doesn't seem appropriate. In addition, the opacity limits referred to are for an annual limit rather than the short-term limits.
(3) The coal burned is (and presumably will be) of similar quality. First, the Wooten paper compares a factor alpha, which is pounds sulfur per million Btu divided by the percent ash. According to the paper, a higher alpha should improve precipitator performance, all else being equal. Wooten concludes that there has been "little practical change" in alpha over the years; I disagree. Roxboro's alpha decreased over 25 percent, from 0.072 to 0.053. The H. F. Zee alpha increased 30 percent from 0.059 to 0.077. Changes in alpha have, therefore, occurred. In addition, the State indicates that it can monitor coal quality at will, but implies that it is not doing so. Therefore, coal quality could change (and has changed) greatly.
(4) The new emissions limits are more appropriate to what the control equipment can meet on a continuous compliance basis. I can understand why this is considered a reason for believing that actual emissions rates have not increased, at least when comparing emissions under the new limits to emissions under the variance, but this has little to do with whether increment is consumed if allowable, rather than actual, emissions limits are used for PSD increment consumption calculations. Of course, as stated earlier, there is nothing in the Wooten paper which supports the underlying assumption that the test data presented by the State represent the best control that can be achieved by the units tested.
Despite the above-mentioned quirks in the State's submission, EPA has elected to accept the SIP revision providing North Carolina conducts an increment consumption demonstration in accordance with the February 25 Bozof/Schneeberg memo. However, telephone conversations with Roger Pfaff, Region IV, on April 1, 1985, and Lee Daniel, North Carolina, on April 2, indicated that there were still some issues on this. A meeting with Roger and Ken Woodard was scheduled for April 9, 1985, to resolve the issues.
At the April 9 meeting, three issues were identified and resolved:
(1) Annual Average Increment Consumption. In calculating "future" (post-SIP revision) emissions, should actual or allowable capacity and operating hour values be used? Since these are existing sources with data on operating hours and capacity utilization (btu per hour) and since there are no changes or modifications contemplated by this SIP revision which would affect or influence these operating characteristics, it would seem reasonable to assume that the same operating patterns would occur in the future. Thus, "future" emissions calculations would most closely resemble "actual" future emissions if present operating parameters were assumed to continue in the future.
4
Although agreeing with the above, we concluded as a group to require calculation of allowable levels, not actual levels, of emissions. The definition of actual emissions states that when actual emissions cannot be determined (and how can we determine actual 1986, 1987, etc., emissions?), then allowable emissions are to be used. Allowable emissions, of course, would use maximum (100% capacity and 8760 hours per year unless there were enforceable constraints on the source. Therefore, we concluded that for annual emissions (and annual TSP increment consumption), future emissions would be represented by allowable emissions. It should be noted that this does represent a departure from the previous Region IV thinking of using maximum actual operating hours and rates instead of allowable.
Actual emissions would be calculated using the average of all valid test results. Capacity would be based on the average btu per hour for each boiler, calculated by taking an average yearly btu heat input and dividing this yearly total by 8760 hours per year to obtain an average btu per hour heat input rate. The average yearly btu heat input would be based on two years of data

representative of normal unit operation during the baseline year. The first two years to be looked at would be the baseline date year and the preceding year. If no baseline date has been triggered, then increment consumption calculations are not necessary.

Note that this method of calculating actual emissions provides the same tons-per-year (tpy) emissions rate that we would obtain if we simply averages the tpy for two representative years. However, by obtaining an average per hour "actual" emissions rate, we have an emissions rate that can be input into the model, since we have resolved the question of what "hours per year" to use.

The approach outlined above provides the maximum amount of PSD increment consumption consistent with the Federal regulations and conforms with the intent of the August 7, 1980, preamble to the PSD rules. Of course, a source which meets this maximum test of increment consumption is evaluated on the basis of actual emissions when the next PSD source applies for a permit, so the use of the more conservative maximum increment consumption approach does not in the long run artificially limit growth in an area.

Another interesting sidelight to the question of emissions calculations is the policy of determining compliance with long-term (annual) National Ambient Air Quality Standards (NAAQS). A 1983 letter from Sheldon Meyers to Richard E. Grusnick (copy attached) specifies modeling at maximum capacity, defined as the allowable emission rate and the "statistical maximum operating date based on the last three years of operation." The latter cautions, however, that the "three year" concept can be affected by economic conditions, and that operating rates should "truly reflect the rates that can be expected during good economic times." This policy was confirmed in a March 25, 1985, memorandum from G. T. Helms to Winston A. Smith, with additional explanation.

As a result of the different objectives on the PSD and NAAQS calculations maximizing PSD increment consumption and maximizing actual emissions, respectively, the calculations used to determine "actual" emissions are quite different. We

5

should make certain that New Source Review personnel remain aware of these differences and that the correct approach is used.

(2) 24-Hour Increment Consumption Calculations. The February 25 Bozof/Schneeberg memo specifies that the baseline 24-hour boiler emissions are calculated using actual emissions and "assuming maximum actual operation over any typical 24-hour period during the two years prior to baseline triggering or other representative figure." As detailed as this instruction seems, it still leaves room for several interpretations because of the use of "typical." Suppose, for example, that the source actually operated at 100% capacity during one 24-hour period over a two-year time span. This constitutes the maximum actual operation level, but certainly isn't typical. The problem, of course, is at what frequency does the maximum actual operating rate become typical? Would five 24-hour periods at 100% capacity be acceptable as typical? If not, would 10 or 50 or even 100, or would it take operation at a certain level at least 50% of the time to be called typical?

We tentatively decided at the April 9 meeting to use the maximum actual operating rate unless that rate was so unusual as to constitute the equivalent of circumvention. As a rule of thumb, one would expect to see such maximums occur at least 5 percent of the total 24-hour operating time periods (which means nonoperating time periods don't count in making this determination). This conforms with an earlier Region IV policy determination (copy attached July - 31, 1981, summary of policy determinations; Reference #2.18, item #4, in the Region IV New Source Review: PSD Nonattainment Policy Reference Guide), which specifies use of the maximum 3-hour and 24-hour emissions rates. The use of the 5% guideline is intended only to rule out the possibility that a source could deliberately operate only a few times at very high rates in order to decrease increment consumption at some future time. Of course, this affects the amount of increment consumed. The higher the "actual" operating rate used, the less increment consumed in comparison to the allowable (future) operating rate. Since we would not be accepting the highest actual rate without question, our interpretation is at least as stringent as prior policy.

(3) Use of Test Data. The State of North Carolina has indicated that the actual emission rate should be based on the highest of the test results available. Region IV has insisted that the best estimate of emissions rates is the average of all valid test results. The best rationale North Carolina could develop was that the high value was "likely" to occur (or to have occurred) during at least some periods of time.

We felt that the only rationale for use of high values would have to be based on a parallel with the use of a maximum operating rate. However, the actual emission rate estimate itself does not appear to have been intended to be the highest value found when a stack is tested, but to consist of a value as close as possible to actual emissions. The best estimate of actual emissions is,

of course, an average value, so we decided to continue to insist on use of the average of all valid test results. The 24-hour actual emissions level would therefore be based on:
6
(1) An emission factor based on the average of all valid test results,
(2) Maximum 24-hour heat input rates for the 24-hour increment consumption calculation,
(3) Average 2-year heat input rate (in btu per hour) for the annual increment consumption rate.
Attachments
cc: NSR Network
R. Bauman
T. Helms

Appendix C: Selected USEPA Technical Guidance

Appendix C.1 contains a 7/9/93 USEPA memo titled “Proposal for Calculating Plume Rise for Stacks with Horizontal Releases or Rain Caps for Cookson Pigment, Newark, New Jersey”. It discusses stacks with horizontal releases or rain caps. See note below.

Note: Although MPCA generally follows EPA guidance, we do have some procedural concerns about turning off stack-tip downwash for horizontal and/or capped vertical stacks. Current EPA models run in regulatory (DEFAULT) mode automatically include stack-tip downwash. So, EPA’s 1993 suggestion to turn off stack-tip downwash differs from today’s current models and their regulatory mode settings. To eliminate vertical plume rise and yet retain regulatory settings, MPCA prefers the much simpler approach of using a very small exit velocity (e.g., 0.001 meters per second).

Appendix C.2 is section 2.2 of “Screening Procedures for Estimating the Air Quality Impact of Stationary Sources”. Section 2.2 discusses merged parameters for multiple stacks. MPCA generally discourages merging because it is confusing and saves very little time (esp. with the speed of today’s computers). If merging is really necessary, MPCA prefers using a simpler (more conservative) approach which uses the shortest stack height, smallest stack diameter, lowest stack exit velocity, and lowest stack exit temperature.

Appendix C.1 (EPA SCRAM Memo: CFYM89.TXT)

July 9, 1993

MEMORANDUM

SUBJECT: Proposal for Calculating Plume Rise for Stacks with Horizontal Releases or Rain Caps for Cookson Pigment, Newark, New Jersey

FROM: Joseph A. Tikvart, Chief
Source Receptor Analysis Branch, TSD (MD-14)

TO: Ken Eng, Chief
Air Compliance Branch, Region II

In response to your request, the Model Clearinghouse has reviewed your proposal for treating horizontal and capped stacks at Cookson Pigment so that the model (SCREEN or ISC2) will properly treat plume rise from the Cookson Pigment stacks. We concur in principle with the approach, with some relatively minor changes.

First, the analysis provided by New Jersey Department of Environmental Protection is technically correct. We suggest, however, that the exit velocity for horizontal and capped stacks be set to a lower figure than 0.1 m/s. A 0.1 m/s exit velocity may still result in significant momentum plume rise being calculated, even though these kinds of sources should have zero momentum rise. We therefore suggest setting the stack exit velocity to a lower value, such as .001.

For horizontal stacks that are not capped, we suggest turning stack tip downwash off, whether there are buildings or not. Stack tip downwash calculations are inappropriate for horizontal stacks.

For 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. The resulting concentrations may err slightly on the high side. For stacks with small diameters, such as those at Cookson Pigment, the error should be quite small. Note, however, that this approach may not be valid for large diameter stacks (say, several meters).

cc: A. Colecchia
D. Wilson

Appendix C.2 (Merging Stacks)
[from PDF file]

2.2 Merged Parameters for Multiple Stacks

Sources that emit the same pollutant from several stacks with similar parameters that are within about 100m of each other may be analyzed by treating all of the emissions as coming from a single representative stack. For each stack compute the parameter M:

M = (H * F * T) / Q

where M = merged stack parameter which accounts for the relative influence of stack height, plume rise, and emission rate on concentrations, and where:

H = stack height (m)

F = (3.14159/4) * D * D * V [stack gas volumetric flow rate (m3/s)]

D = inside stack diameter (m)

V = stack gas exit velocity (m/s)

T = stack gas exit temperature (K)

Q = pollutant emission rate (g/s)

The stack that has the lowest value of M is used as a "representative" stack. Then the sum of the emissions from all stacks is assumed to be emitted from the representative stack; i.e., the equivalent source is characterized by hs1, V1, Ts1 and Q, where subscript 1 indicates the representative stack and Q = Q1 + Q2 + . . . + Qn.

The parameters from dissimilar stacks should be merged with caution. For example, if the stacks are located more than about 100m apart, or if stack heights, volumetric flow rates, or stack gas exit temperatures differ by more than about 20 percent, the resulting estimates of concentrations due to the merged stack procedure may be unacceptably high.

Appendix D: Guidance Document Revision Record

October 2004

- Section 9. Corrected typographical error in Table 6. Guidance and values supplied in the table remained unchanged.
- Section 8. Added request that modeling analyses use NAD83, zone 15 location data for receptor grids.
- Section 11. Clarified requirement that fugitive PM10 emissions be included in PSD modeling analyses.
- Section 9.1. Clarified procedure for collecting nearby source modeling parameters.
- Section 6. Added guidance on entering building data into BPIP.
- Section 10. Fixed incorrect table number.
- Section 3. Clarified guidance on use of models with PRIME algorithm.