Air Quality Modeling Guidelines

Prepared by
New Source Review Permits Division

RG-25 (Revised)

February 1999

Contents

Summary of Significant Changes

Main Document

General: Permit Modeling Unit (PMU) changed to Air Dispersion Modeling Team (ADMT).

1.1 Clarifies the use of modeled predictions in the technical review process.

1.3 Adds Internet addresses for modeling information.

1.4 Provides information on the use of ambient air monitoring data in state permit review.

2.4 Adds Internet e-mail address for the ADMT.

2.5 Reorganizes guidance on meetings, protocols, and checklists.

3.1 Adds the EPA Internet address for the Support Center for Regulatory Air Models (SCRAM).

3.2 Adds types of air quality analyses for RCRA combustion strategy permits.

3.4 Clarifies procedures for preliminary impact determination.

3.5 Removes requirement to evaluate any constituents under 30 TAC Chapter 113. Adds rationale for use of 1-hour modeled concentrations for 30-minute standards.

3.6 Adds procedure to streamline state NAAQS analysis. Adds procedure to determine background concentrations for state NAAQS analysis.

3.7 Updates effects evaluation procedures to reflect guidance in the *Modeling and Effects Review Applicability* technical guidance package. Outlines TARA's tiered technical review process. Introduces concept of various types of sensitive receptors. Introduces concept of baseline date.

3.9 Advises that the old form of the PM_{10} standard will be used to determine compliance with the new form of the PM_{10} standard and the new $PM_{2.5}$ standards until EPA develops procedures for the new technical reviews. Adds procedure to determine background concentrations for PSD NAAQS analysis.

3.10 Makes ozone preconstruction monitoring case-by-case until EPA develops new procedures for the 8-hour ozone standard.

3.11 Clarifies procedures for PSD increment calculation. Adds definitions for major source baseline date, trigger date, minor source baseline date, actual emissions at baseline date, and actual emissions at modeling date.

3.12 Provides a surrogate procedure to determine for ozone ambient impact because of the change to the ozone standard and the revocation of the 1-hour standard in attainment and unclassifiable areas until EPA develops new procedures.

3.13 Clarifies when a growth analysis would be required. Eliminates requirement for Class II visibility impairment analysis.

3.15 Adds requirement for RCRA combustion permit analyses: boiler and industrial furnace demonstration and multipathway risk assessment.

4.0 Indicates ADMT preference of ISCST for long-term predictions. Announces possibility of a new regulatory model: AERMOD.

4.3 Adds requirement for the applicant to submit data entry software to ADMT.

5.2 Replaces terrain section with information on Digital Elevation Model.

5.5 Reformat of previous version.

5.5.1 Modifies suggested distance for tight receptors.

5.5.2 Adds requirement to provide datum used to determine UTM coordinates.

5.5.3 Adds requirement to include receptors on highest terrain. Addresses the use of USGS DEM data. Changes procedure to set elevation height for receptors below stack base.

5.5.4 Modifies suggested distance for tight receptors.

5.5.5 Changes suggested distance for special receptor spacing. Adds caveat for isolated terrain.

5.5.6 Requires use of ISC-PRIME for cavity calculations.

5.6 Adds Internet address for meteorological data.

5.6.1 Requires submittal of ASCII files for preprocessed meteorological files.

5.6.6 Changes header. Adds requirement to submit supplementary meteorological data.

5.5.7 Clarifies use of isopleths in place of gridded concentration maps.

6.1 Changes parameters for pseudo-point source characterization.

6.2 Clarifies development of volume source characterization parameters.

6.4 Clarifies development of open pit parameters.

6.6 Updates guidance for modeling road emissions.

7.0 Adds the ftp URL for incoming data.

8.0 Removes requirement to send any supporting documentation to EPA Region 6.

9.1 Adds guidance concerning rotation of coordinates.

9.3 Adds guidance concerning rotation of coordinates.

Appendixes

A Updates previous version.

B Clarifies guidance on Ambient Ratio Method.

D Clarifies and updates guidance.

E Clarifies and updates guidance.

F Clarifies and updates guidance.

G Modifies concentration rank.

H Modifies search option, area sources.

I New. Adds increment baseline dates.

J New. Adds attainment/nonattainment counties.

Glossary of Acronyms and Symbols

A	attainment
ADMT	Air Dispersion Modeling Team
AERMOD	AMS/EPA Regulatory Model
AIRS	Aerometric Information Retrieval System
AMS	American Meteorological Society
AOI	area of impact
AP-42	EPA's *Compilation of Air Pollutant Emission Factors*
AQCR	Air Quality Control Region
AQRV	Air quality related value
BACT	Best Available Control Technology
BIF	boiler and industrial furnace
BPIP	EPA's Building Profile Input Program
CAS	Chemical Abstract Service
CFR	Code of Federal Regulations
CO	carbon monoxide
DEM	digital elevation model
DF	dilution factor
EPA	Environmental Protection Agency
EPN	emission point number
ESL	effects screening level
FCAA	Federal Clean Air Act
FTP	file transfer protocol
GAQM	EPA's *Guideline on Air Quality Models*
GEP	good engineering practice
GLC	ground-level concentration
GLCmax	maximum ground-level concentration
GLCr	ground-level concentration at a sensitive receptor, r
HAP	hazardous air pollutant
$\mathbf{H_b}$	building height
HSC	Texas Health and Safety Code
HTTP	hypertext transfer protocol
IDLH	immediately dangerous to life and health
ISC	EPA's Industrial Source Complex model
ISCLT	ISC long-term model

ISCST	ISC short-term model
ISC-PRIME	ISC-plume rise model enhancements model
L	lesser of the building height or maximum projected width
MEI	maximum exposed individual
MSA	metropolitan statistical area
MSDS	material safety data sheet
m/s	meters per second
$\mu g/m^3$	micrograms per cubic meter
µm	micron
MW	molecular weight
NAA	nonattainment area
NAAQS	National Ambient Air Quality Standard(s)
NAMS	national air monitoring station(s)
NCDC	National Climatic Data Center
NWS	National Weather Service
NO_x	nitrogen oxides
NO_2	nitrogen dioxide
NSRPD	New Source Review Permits Division
O_3	ozone
Pb	lead
PC	personal computer
PM_{10}	particulate matter with an aerodynamic diameter of 10 microns or less
$PM_{2.5}$	particulate matter with an aerodynamic diameter of 2.5 microns or less
ppb	parts per billion
ppm	parts per million
PSD	Prevention of Significant Deterioration
PSDB	Point Source Data Base
q	gross heat release
RAC	reference air concentration for noncarcinogens
RAM	three-letter designation for a gaussian-plume, multiple-source model
RAMMET	meteorological preprocessor developed for the RAM model
RCRA	Resource Conservation Recovery Act
RSD	risk-specific dose for carcinogens
σ_{y0}	initial horizontal sigma or dimension
σ_{z0}	initial vertical sigma or dimension
SCRAM	EPA's Support Center for Regulatory Air Models

SLAMS	state or local air monitoring station(s)
SPMS	special purpose monitoring station(s)
SO_2	sulfur dioxide
STAR	stability array
TAC	Texas Administrative Code
TARA	Toxicology and Risk Assessment Section, Chief Engineer's Office
TNRCC	Texas Natural Resource Conservation Commission
TOXST	EPA's toxic modeling system short-term model
tpy	tons per year
U	unclassifiable
URL	uniform resource locator
USGS	United States Geological Survey
UTM	Universal Transverse Mercator projection
§	section

Definitions

Note: The following explanations of terms are included solely for the readers' convenience; they do not take the place of any full, formal definition in state or federal laws, rules, or regulations. All section references are to 30 TAC unless specified otherwise.

Account. For sources required to be permitted under 20 TAC 122, an account means all sources that are aggregated as a site. For all other sources, an account means any combination of sources, under common ownership or control and located on one or more contiguous properties, or properties contiguous except for intervening roads, railroads, rights-of-way, waterways or similar divisions (§101.1).

Air contaminant. Particulate matter, radioactive materials, dust fumes, gas, mist, smoke, vapor, or odor, including any combination of those items, produced by processes other than natural (HSC§382.003). May also be referred to by the staff as *constituent*, *chemical*, *compound*, or *pollutant*.

Air pollution. One or more air contaminants in such concentration and of such duration that they could cause injury; adversely affect human health or welfare, animal life, vegetation, or property; or interfere with the normal use and enjoyment of animal life, vegetation, or property (HSC§382.003).

Air quality-related value. A term used by the National Park Service that includes visibility, odor, flora, fauna; geological resources; archeological, historical, and other cultural resources; and soil and water resources.

Ambient air. That portion of the atmosphere, external to buildings, to which the general public has access (§101.1).

Anthropogenic heat flux. Heat energy generated by human activity. Can usually be ignored outside highly urbanized locations.

Application site. The site where the meteorological data will be applied.

Attainment. Any area that meets the national primary or secondary ambient air quality standard for an applicable criteria pollutant.

Background. Constituent concentrations present in the ambient air that are not attributed to the source or site being evaluated.

Baseline date (State Effects Review). The date the most recent sitewide modeling or ambient monitoring was used in a permit review. In the absence of sitewide modeling or ambient monitoring, the baseline date is July 12, 1993.

Bowen ratio. A measure of the amount of moisture at the earth's surface. The presence of moisture at the earth's surface alters the energy balance, which in turn alters the sensible heat flux and Monin-Obukhov length.

Class I area. An area defined by Congress that is afforded the greatest degree of air quality protection. Class I areas are deemed to have special natural, scenic, or historic value. The PSD regulations provide special protection for Class I areas. Little deterioration of air quality is allowed.

Class II area. An area defined by Congress where moderate deterioration of air quality associated with well-managed industrial growth is allowed.

Constituent. A general term that refers to an individual contaminant, chemical, chemical compound, pollutant, or particulate matter.

Criteria pollutant. A pollutant for which a national ambient air quality standard has been defined.

De minimis impact. A change in ground-level concentration below a specified amount. The de minimis concentration varies with the type of permit review and associated standards or guidelines.

Digital elevation model (DEM). An array of elevations, usually at regularly spaced intervals, for a number of ground positions.

Dilution Factor (DF). Based on a unit emission rate of one gram per second (1 g/s) and expressed in terms of micrograms per cubic meter per gram per second ($\mu g/m^3/g/s$). Required to support the RCRA BIF modeling demonstration and the emission limits on which the demonstration was based.

Effects screening level (ESL). Guideline concentrations derived by TARA and used to evaluate ambient air concentrations of constituents. Based on a constituent's potential to cause adverse health effects, odor nuisances, vegetation effects, or materials damage. Health-based screening levels are set at levels lower than those reported to produce adverse health effects, and are set to protect the general public, including sensitive subgroups such as children, the elderly, or people with existing respiratory conditions. If an air concentration of a constituent is below the screening level, adverse effects are not expected. If an air concentration of a constituent is above the screening level, it is not indicative that an adverse effect will occur, but rather that further evaluation is warranted. (See Attachment C of RG-324, *Modeling and Effects Review Applicability*).

Exceedance. In excess of a pre-established comparison level.

Emission point. Point of constituent emissions release into the air.

Emission point number (EPN). An alphanumeric identifier used to identify an emission point. Each EPN is unique for an individual account.

Facility. A discrete or identifiable structure, device, item, equipment, or enclosure that constitutes or contains a stationary source, including appurtenances other than emission control equipment. A mine, quarry, well test, or road is not considered to be a facility (§116.10). For the purpose of emissions inventory, the term does not refer to the entire site but to individual process units at the site.

Fraction of radiation absorbed at the ground. The flux of heat into the ground during the daytime is characterized as a fraction of the net radiation.

Frequency of exceedance. The number of times a predicted ground-level concentration exceeds an ESL at a receptor.

Fugitive dust. Dust discharged to the atmosphere in an unconfined flow stream such as that from unpaved roads, storage piles, and heavy construction operations. (GAQM).

Grandfathered facility. A facility constructed before the permit requirements of Chapter 116 (§116.10). Must be constructed and operated as it was before September 1, 1971.

Greenfield site. A contiguous area under common control that is an undeveloped site (§116.15).

Ground-level concentration (GLC). The concentration in micrograms per cubic meter ($\mu g/m^3$) as predicted by modeling. May also be observed by ambient air monitoring.

Ground-level concentration—maximum (GLCmax). The maximum predicted off-property ground-level concentration at any receptor.

Ground-level concentration—receptor (GLCr). The predicted ground-level concentration at the maximally affected sensitive receptor, r.

Hazardous air pollutant (HAP). Any pollutant subject to a standard promulgated under FCAA, §112 (relating to hazardous air pollutants).

Isopleth. A line on a map connecting points at which a given variable has a specified constant value.

Major. The term *major* may refer to the total emissions at a stationary source or to a specific facility. For PSD review, once a site or project is major for one pollutant, all other pollutant's emissions are compared to significance levels in 40 CFR 52.21(b)(23).

- A *named* major source is any source belonging to a list of 28 source categories in 40 CFR 52.21(b)(1) which emits or has the potential to emit 100 tons-per-year (tpy) or more of any pollutant regulated by the Federal Clean Air Act.

- A major stationary source is any source not belonging to the 28 named source categories which emits or has the potential to emit such pollutants in amounts of 250 tpy or more.

- A major source is any source that emits 10 tpy or more of any single HAP or 25 tpy or more of any combination of HAPs under FCAA §112(b).

Major modified stationary source or facility. Used in the context of a PSD or Nonattainment permit application, the phrase *major modified stationary source or facility* refers to a change in operation that results in a significant net increase of emissions for any pollutant for which a NAAQS has been issued. New sources at an existing major stationary source are treated as modifications to the major stationary source.

Major source baseline date. For particulate matter and sulfur dioxide, January 6, 1975. For nitrogen dioxide, February 8, 1988. [40 CFR 52.21(b)].

Maximum exposed individual (MEI). Used in the RCRA BIF analysis. The MEI is a hypothetical person assumed to reside at the location of the maximum, off-property concentration (unless people routinely reside on-property).

Measurement site. The site at which the raw meteorological parameters were measured, such as a National Weather Service observing site.

Minor. The term *minor* may refer to the total emissions at a stationary source or to a specific facility. To be minor for PSD review, the emissions must be less than 250 tpy. To be minor for Nonattainment review, the emissions must be less than the major source emission thresholds in 30 TAC Chapter 116. To be minor for HAPs review, the emissions must be less than 10 tpy for a single HAP or 25 tpy for multiple HAPs.

Minor source baseline date. The earliest date after the trigger date on which a major stationary source or a major modification subject to PSD regulations submits a complete application. [40 CFR 52.21(b)].

Modified stationary source or facility

- When used in the context of modeling, the phrase *modified stationary source or facility* refers to a change in the location or stack parameters of an emission point, including emission rate.

- When used in the context of a permit application, the phrase *modified stationary source or facility* refers to a proposed change that results in an increase of emissions.

Monin-Obukhov length. A measure of atmospheric stability. It is negative during the day when surface heating results in an unstable atmosphere and positive at night when the surface cools (stable atmosphere).

Model. A quantitative or mathematical representation or simulation that attempts to describe the characteristics or relationships of physical events. (GAQM).

National Ambient Air Quality Standards (NAAQS). Levels of air quality to protect the public health and welfare. (40 CFR §50.2).

National Geodetic Vertical Datum of 1929. Reference surface established by the U.S. Coast and Geodetic Survey in 1929 as the datum to which relief features and elevation data are referenced in the conterminous United States; formerly called "mean sea level 1929."

New facility. A facility for which is construction started after August 30, 1971, and no contract for construction was executed on or before August 30, 1971, and that contract specified a beginning construction date on or before February 29, 1972 (§116.10).

New source. Any stationary source, the construction or modification of which is started after March 5, 1972 (§116.10).

- When used in the context of modeling, the phrase *new source* refers to a proposed emission point.

- When used in the context of a permit application, the term *new source* refers to a stationary source that was constructed or modified after March 5, 1972. (§116.10).

- When used in the context of a PSD or Nonattainment permit application, the term *new source* refers to the total proposed emissions for a greenfield site when the increase in emissions will be major. Or, *new source* refers to emissions at a minor stationary source when the increase in emissions will be major.

Noon-time albedo. The fraction of the incoming solar radiation that is reflected from the ground when the sun is directly overhead.

Nonattainment. Any area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the national primary or secondary ambient air quality standard for a criteria pollutant.

North American Datum of 1927 (NAD27). NAD27 is defined with an initial point at Meads Ranch, Kansas, and by the parameters of the Clarke 1866 ellipsoid. The location of features on USGS topographic maps, including the definition of 7.5-minute quadrangle corners, are referenced to the NAD27.

North American Datum of 1983 (NAD83). NAD83 is an Earth-centered datum and uses the Geodetic Reference System 1980 (GRS 80) ellipsoid, unlike NAD27, which is based on an initial point (Meads Ranch, Kansas). Using recent measurements with modern geodetic, gravimetric, astrodynamic, and astronomic instruments, the GRS 80 ellipsoid has been defined as a best fit to the worldwide geoid. Because the NAD83 surface deviates from the NAD27 surface, the position of a point based on the two reference datums will be different.

Profile. One method of making DEMs is commonly referred to as profiling. In this technique a stereo pair of photographs is set up in a photogrammetric instrument and referenced to the ground using ground control points. After this process is completed the instrument automatically moves a computer cursor across the stereo model. As the cursor is being driven across the model, the operator controls the motion of the cursor while a recording device captures the elevation figures. Each swath across the stereo model is called a profile.

Project. An operational and/or physical change that may affect air emission rates at a site.

Projection. Orderly system of lines on a plane representing a corresponding system of imaginary lines on an adopted terrestrial or celestial datum surface. Also, the mathematical concept of such a system. For maps of the Earth, a projection consists of (1) a graticule of lines representing parallels of latitude and meridians of longitude or (2) a grid.

Property. All land under common control or ownership coupled with all improvements on such land, and all fixed or movable objects on such land, or any vessel on the waters of this state (§101.1).

Receptor. A location where the public could be exposed to an air contaminant (or constituent) in the ambient air. For the effects evaluation process, receptors are classified as industrial or sensitive.

Reference air concentration (RAC). Used in the RCRA BIF analysis for noncarcinogens. A RAC is a reference concentration converted from a reference dose and is used to predict health impacts.

Refined model. An analytical technique that provides a detailed treatment of physical and chemical atmospheric processes and requires detailed and precise input data. Specialized estimates are calculated that are useful for evaluating source impact relative to air quality standards and allowable increments. The estimates are more accurate than those obtained from conservative screening techniques. (GAQM).

Risk-specific dose (RSD). Used in the RCRA BIF analysis for carcinogens. The RSD is a reference concentration based on a cancer risk of one cancer incident per 100,000 people and is used to predict health impacts.

Screening technique. A relatively simple analysis technique to determine whether a given source is likely to pose a threat to air quality. Concentration estimates from screening techniques are conservative. (GAQM).

Sensitive receptor. A nonindustrial receptor such as a school, residence, recreational area, commercial or business office, land used for agriculture, hospital, day-care center, or church. Other types include roads, railroads, rights-of-way, waterways, or the like; public exposure at these other types of receptors is less likely than at other sensitive receptors.

Site. The area that encompasses all emission sources of constituents. Includes all facilities and other emission sources within the TNRCC account number. See 30 TAC §122.10 for the operating permit definition.

Sitewide modeling. Modeling (refined or screening) of all emission points on a contiguous property or TNRCC account number. Synonymous with plantwide modeling. Includes grandfathered sources and sources exempt from the permitting process pursuant to 30 TAC 106.

Source

- A point of origin of air contaminants, whether privately or publicly owned or operated. (§116.10). Upon request of a source owner, the executive director shall determine whether multiple processes emitting air contaminants from a single point of emission will be treated as a single source or as multiple sources. (§101.1). For PSD and Nonattainment permits, source may refer to all emission points on a site or to a facility.

- When used in the context of modeling, the term *source* refers to the release point of emissions. On the Table 1(a) submitted with the permit application (see TNRCC Air Quality Permit Application Instructions, PI-1 Form) and in the Point Source Data Base (see Appendix H), the EPN identifies the release point of the source of emissions.

Stationary source

- When used in the context of modeling, the term *stationary source* refers to emission points that are fixed and not mobile. For example, exhaust from a stack or baghouse is from a fixed point, and exhaust from a car is from a mobile source because the exhaust moves as the car does.

- When used in the context of PSD and Nonattainment permit applications, the term *stationary source* refers to any building, structure, facility, or installation that emits or may emit any air pollutant subject to regulation under the Federal Clean Air Act. (§116.12).

Also see *modified stationary source or facility* and *major modified stationary source or facility*.

Surface roughness length. A measure of the height of obstacles to the wind flow. This length is not equal to the physical dimensions of the obstacles, but is generally proportional to them.

Surrogate constituent. A substitute constituent.

Unclassifiable. Any area that cannot be classified on the basis of available information as meeting or not meeting the national primary or secondary ambient air quality standard for the pollutant.

Trigger date. The date after which the minor source baseline date may be established. For particulate matter and sulfur dioxide, August 7, 1977. For nitrogen dioxide, February 8, 1988. [40 CFR 52.21(b)].

Universal Transverse Mercator projection (UTM). UTM is a widely used map projection that employs a series of identical projections around the world in the mid-latitude areas, each spanning six degrees of longitude and oriented to a meridian. This projection preserves angular relationships and scale plus it easily allows a rectangular grid to be superimposed on it. Many worldwide topographic and planimetric maps at scales ranging between 1:24,000 and 1:250,000 use this projection.

World Geodetic System 1972 (WGS 72). The definition of Defense Mapping Agency (DMA) DEMs, as presently stored in the USGS database, references the WGS 72 datum. WGS 72 is an Earth-centered datum. The WGS 72 datum was the result of an extensive effort extending over approximately three years to collect selected satellite, surface gravity, and astrogeodetic data available throughout 1972. These data were combined using a unified WGS solution (a large-scale least squares adjustment).

World Geodetic System 1984 (WGS 84). The WGS 84 datum was developed as a replacement for WGS 72 by the military mapping community as a result of new and more accurate instrumentation and a more comprehensive control network of ground stations. The newly developed satellite radar altimeter was used to deduce geoid heights from oceanic regions between 70 degrees north and south latitude. Geoid heights were also deduced from ground-based Doppler and ground-based laser satellite-tracking data, as well as surface gravity data. This system is described in "World Geodetic System 1984," DOD DMA TR8350.2 September 1987. New and more extensive data sets and improved software were used in the development.

1.0 Introduction

The Office of Air Quality's Air Dispersion Modeling Team (ADMT) developed this guideline to document the TNRCC air quality analyses procedures. This publication replaces the previous edition of the *Air Quality Modeling Guidelines,* April 1997. Significant changes are identified in the "Summary of Significant Changes" section. References included in the main portion of the document are identified by the originator, year of publication, and sequence in a series. Section 10 lists the full references.

This document focuses on the application of air dispersion models and general procedures to meet air permitting requirements of the TNRCC. It is assumed that the reader has a basic knowledge of modeling theory and techniques. In addition, the format of the text assumes that the reader is an air dispersion modeler, unless indicated otherwise.

Apply these guidelines as applicable to each individual project. They suggest a minimum level of analysis so that modeling results clearly demonstrate that the public's health, general welfare, and physical property are protected. In addition, these guidelines provide consistency in the selection and application of air models to ensure a common basis for estimating pollutant concentrations, assessing control strategies, and specifying emission limits—without compromising accuracy.

General procedures are updated as required. The applicant is responsible for determining current modeling procedures between formal publications of this document. See Section 1.3.

1.1 What Is Air Dispersion Modeling?

Air dispersion modeling is a tool to predict concentrations from one or more sources of air pollution. Equations and algorithms representing atmospheric processes are incorporated into various computer models. Agency personnel use the results from these models in their review of permit applications. A modeled prediction alone does not mean that there will be a condition of air pollution but is one of many indicators that the staff considers in the technical review process. However, a modeled prediction of an exceedance of a standard or guideline value may be used as the basis to modify permit allowable emission rates, stack parameters or operating conditions, or to require a state implementation plan review for criteria pollutants.

1.2 Authority for Modeling

The authority for air dispersion modeling is contained in TNRCC 30 TAC Chapter 116 (TNRCC, 1998b), which states that modeling may be required by the TNRCC New Source Review Permits Division (NSRPD) to determine the air quality impacts from a proposed new facility or source modification. In some cases, such as for federal permits, modeling analyses are mandatory. In addition, modeling may be required for other permitting purposes, such as modeling for permit renewals, commission orders, etc.

1.3 Guidance Philosophy

This document is a guide to typical air dispersion modeling techniques and procedures and generally expands on modeling procedures contained in the EPA *Guideline on Air Quality Models* (GAQM) (EPA, 1995a) or model user's guides. The ADMT's goal is to use worst-case assumptions and conditions to conduct the minimum amount of modeling necessary to demonstrate that the modeled sources should not cause or contribute to a condition of air pollution.

If additional refinement is needed, then only the level of refinement necessary to achieve the modeling demonstration's goal is required. However, conduct the most refined analysis possible if one of the purposes of the modeling demonstration is to determine baseline concentrations for an entire site.

If the modeler can demonstrate that techniques other than those recommended in this document are more appropriate, the ADMT may approve their use. Discuss this demonstration with the ADMT and document it in the air quality analysis.

Periodically, the ADMT develops new techniques or changes procedures to reflect improvements in regulatory models, to correct deficiencies that have been discovered, or to be consistent with requirements of other regulatory agencies. These changes to standard practices and other useful information will be placed on the ADMT Internet page. The http and ftp URLs are

- http://www.tnrcc.state.tx.us/air/nsr_permits *and click on the link to the Air Dispersion Modeling Team*, and
- ftp://ftp.tnrcc.state.tx.us/pub/AirQuality/NewSourceReviewPermits/Modeling. *Note that this URL has mixed cases.*

In addition, interested parties can contact the ADMT via the Internet at the following address:

- admt@tnrcc.state.tx.us.

1.4 Use of Monitoring Data in State Permit Review

Occasionally, modeling predictions may not clearly indicate whether emissions from a site or individual source could cause or contribute to a condition of air pollution. In those cases, the use of ambient monitoring data in the technical review process may be an option to supplement modeled predictions. With few exceptions, the monitoring demonstration must be conducted before a permit is issued to ensure that permit conditions and allowable emissions are protective. See Section 3.10 for monitoring guidance for federal permits.

If the use of monitored data is an option, the applicant should contact the permit engineer to arrange a meeting. The engineer will convene a team consisting of representatives from ADMT, TARA, Monitoring Operations, the applicable region, and any other applicable agency staff. The staff will help the applicant determine whether monitored data from an existing network can be used in the permitting process. Or, if a network does not exist, the staff will help the applicant determine whether monitoring is technically feasible for the constituent of concern. If it is, the applicant should consider the following issues, at a minimum, to develop a monitoring strategy:

- *Amount and type of monitoring*. This is decided on a case-by-case basis and would depend on such factors as air constituent; types and locations of sources; source parameters and operating hours; meteorology; location of sensitive receptors; and location of other sources of the constituent. For example, several weeks of data may by sufficient for evaluating the impact of short-term emissions of an acute toxicant, but several months to a year of data may be necessary for evaluating long-term exposure levels to a chronic toxicant.

- *Monitoring method*. The method must be an approved method or a generally accepted alternate or modified method. In addition, the applicant must keep track of production and operations during the monitoring period and note any unusual occurrences that would invalidate the data, such as truck traffic within the exclusionary boundary around a particulate monitor.

- *Siting of monitors*. Monitors must be sited to obtain concentrations and meteorological data that are representative. To be representative, the concentrations obtained must result from significant sources emitting at near maximum operating conditions and under near worst-case meteorological conditions. More than one ambient and meteorological monitor may be required.

- *Significant sources.* These sources are the ones that cause the highest concentrations or cause high concentrations frequently. In certain cases, there may be many sources on the site but only one or two whose resulting concentrations drive the effects review. That is, they either have the largest emissions; stack parameters that cause the highest concentrations or the most frequent exceedances of the ESL; or are located near a property line or sensitive receptor. Therefore, it is these sources that the applicant should ensure are sampled. In addition, if significant sources are separated by more than about 100 meters, representative samples should be obtained from each source or source grouping as applicable.

- *Determination of significant sources.* Significant sources can be determined by engineering judgment or by a culpability analysis using the ISC model. An analysis based on modeling results can identify such information as culpable sources; magnitude of concentrations; frequency of occurrence at different multiples of an ESL; location of worst-case concentrations; and meteorological parameters by time of day.

- *Upwind and downwind ambient air monitors.* Multiple monitors may be needed for property line and effects review if there are other sources of the constituent in the local area. In addition, upwind and downwind meteorological monitors may be needed to account for changes in wind speed and direction in cases where there are large distances between emission points and property lines; for large distances from emission points to the monitor; or for geographic features that could affect air flow.

The monitoring plan must be in accordance with EPA *Requirements for Quality Assurance Project Plans for Environmental Data Operations* (QA/R5) (EPA, 1993b), and be designed to acquire monitoring data that represents, as closely as possible, worst-case operating conditions. The staff will consider siting limitations, such as power and security constraints, as well as the location of sensitive receptors and off-property sources of the same constituent during the review of the monitoring plan.

2.0 The Air Quality Analysis Process

The air quality analysis is an evaluation of the potential impact of a new facility or source modification on the environment [§116.111(9)]. Analyses are conducted for state permits and federal permits; analyses for federal permits are usually more detailed than those for state permits. Because there are several terms, such as the term *source*, that have different state, federal, and modeling usage definitions, the process could be confusing. Misunderstanding of terms could lead to an incomplete analysis. Therefore, applicants and staff should ensure that when using these terms the context of usage is understood. See the "Definitions" section.

The air quality analysis process may involve a number of TNRCC staff, depending on the complexity of the application and the potential impact of the associated facility or source on air quality. The permit engineer determines the need for modeling and the scope of involvement of other TNRCC staff. Therefore, the applicant should contact the permit engineer for guidance before involving other TNRCC staff in the air quality analysis process.

2.1 Permit Engineer Coordination

The applicant should provide sufficient information to the permit engineers so that they are able to determine the need for regulatory modeling. Regulatory modeling is any air dispersion modeling requested by the permit engineer that is used in the permitting process.

2.2 Coordination with Other TNRCC Staff

Individual members of the public who wish to inquire about the information contained in permit public notices or to inquire about other agency permit applications or permitting processes, should call the TNRCC Office of Public Assistance, toll free, at 1-800-687-4040. *Applicants should not contact the Office of Public Assistance but should work with the NSRPD.*

Other staff that may be involved in the permitting process include, but are not limited to, the following:

- Toxicology and Risk Assessment Section (TARA), Chief Engineer's Office: for effects screening levels and other information required for a toxicological review.

- Customer Reports & Services, Information Resources Division: for PSDB retrievals.

- Emissions Inventory Section, Air Quality Planning Division: for correction of errors, found in the PSDB.

- Data Management and Analysis Section, Monitoring Operations Division: for ambient air quality monitoring data and county attainment status.

- Quality Assurance Section, Monitoring Operations Division: for review of monitoring quality assurance plans.

- Industrial & Hazardous Waste Permits Section, Permits Division: for RCRA combustion permits.

- Legal Division: for legal opinions about interpretation of regulations, control of property, ambient air, and other points.

2.3 ADMT Responsibilities

- Provide technical guidance for the modeling process to staff, applicants, and the public.

- Review modeling performed by permit engineers or perform modeling in support of a permit application.

- Evaluate the technical quality of air quality analyses submitted by applicants. Ensure that predicted concentrations accurately represent potential impacts, demonstrate compliance with federal and state regulations and guidelines, and can be used by the staff in the technical review process.

- Help small business applicants meet modeling requirements needed to obtain a permit, or perform modeling for them as necessary.

- Provide modeling support for other agency needs such as enforcement, pollution prevention, or superfund activities, as directed.

2.4 Modeling Request

The permit engineer determines the need for air dispersion modeling and advises the applicant by letter to contact the ADMT team leader to discuss the project and pre-modeling requirements. Contact may be made by phone at (512) 239-1508 or by e-mail at admt@tnrcc.state.tx.us. At a minimum, include a name, phone number, and a short message.

2.5 Guidance Meetings, Protocols, and Checklists

Guidance Meetings: Guidance meetings are optional and may be combined for state, PSD, and RCRA BIF permit applications.

- *To schedule a meeting*. Contact the ADMT team leader to schedule a modeling guidance meeting (see Section 2.4). The meeting may be conducted in-person with modelers, engineers, and other applicable staff; or, for simple projects, by phone between a member of the ADMT and the applicant's modeler. The team leader collects the required information and assigns the project to one of the staff, who will provide detailed guidance for the project.

- *ADMT staff responsibility.* The staff member coordinates with the permit engineer and contacts the applicant to set up a time for a guidance meeting. The staff will respond to the applicant either by phone or via e-mail.

Protocols and Checklists: Protocols and modeling guidance checklists serve as outlines of how modeling analyses should be conducted—they are not mandatory. A protocol or checklist may be helpful to an inexperienced permit modeler, or if the permit modeler is proposing new modeling techniques or changes to normal modeling practices. A protocol contains more detail than a checklist. The checklist contains similar data but prompts the modeler rather than providing detailed instructions. The ADMT encourages applicants to submit protocols instead of checklists for PSD and complex state permit modeling and RCRA BIF projects. In addition, the ADMT suggests that no regulatory modeling be conducted before staff comments are received.

- *To develop a protocol or checklist without a meeting.* Applicants may submit a protocol or checklist to the ADMT team leader without participating in a face-to-face meeting. If applicants determine that they require a protocol or checklist for a project, they should follow the guidance in Appendix D to develop it. Since a protocol is a more formal presentation and contains more detail than a modeling checklist, applicants should submit a protocol by letter.

- *To develop a protocol and have a meeting.* If applicants want to meet and then submit a protocol, they should prepare to discuss the project and address the items in Appendix D at the meeting. After the meeting they should submit a protocol for ADMT review.

- *To develop a checklist and have a meeting.* If applicants want to meet and want the guidance in the meeting documented by using a checklist, they should prepare the modeling guidance checklist—or obtain as much information required to complete the checklist as possible—before the meeting (see Appendixes D and E). The checklist can be sent to ADMT via e-mail before a meeting. At the guidance meeting, an ADMT modeler signs the checklist if it is complete or assists the applicant with the final checklist, which the applicant should include in the air quality analysis report.

- *Protocol or checklist review.* The team leader assigns the protocol or checklist to one of the staff to review and provide comments to the applicant.

3.0 Conducting the Air Quality Analysis

The air quality analysis is an evaluation of the impact on the environment of increased emissions from a new facility or modified source based on the predicted concentrations obtained through modeling. [§116.111(1), (6), (9)].

3.1 Levels of Modeling Used in the Air Quality Analysis

There are two levels of modeling sophistication used in the air quality analysis process: screening and refined. Modeling results from either level, as appropriate, may be used to demonstrate compliance with standards or guidelines.

3.1.1 Screening Modeling

The first level of sophistication involves the use of screening procedures or models. Screening models use simple algorithms and conservative techniques to indicate whether more detailed modeling is necessary.

Screening models are usually designed to evaluate a single source or sources that can be collocated (Section 3.3.2). Multiple sources can be modeled individually and then the maximum concentration from each source summed for an overall estimate of the sitewide maximum concentration. This technique is conservative since the concentrations from each source are added without regard to distance. Appendix B contains factors to convert one-hour concentrations to other averaging periods.

The permit engineer generally conducts an initial screening analysis using EPA’s SCREEN model, or the staff may ask the applicant to conduct an analysis. The screening analysis should be consistent with guidance contained in the GAQM (EPA, 1995a), and appropriate screening modeling guidance documents, such as the *Screening Procedures for Estimating the Air Quality Impact of Stationary Sources* (EPA, 1992b). The SCREEN model is available for download from the EPA's SCRAM Internet page at http://www.epa.gov/scram001.

3.1.2 Refined Modeling

The permit engineer may determine that refined modeling is necessary if the screening analysis results indicate that predicted concentrations from the evaluated sources could exceed a standard, guideline (such as an effects screening level), a de minimis amount, or a staff-identified percentage of a standard or guideline. It is usually the applicant's responsibility to perform refined modeling. However, the permit engineer may ask the ADMT to perform this type of modeling under certain circumstances, such as for small businesses that cannot afford the costs associated with refined modeling.

This second level of modeling requires more detailed and precise input data and more complex models in order to provide refined concentration estimates. The primary model used is the EPA's Industrial Source Complex (ISC) model, which is available for download from the EPA's SCRAM Internet page.

3.2 Types of Air Quality Analyses

The type of air quality analysis depends on the category of permit and pollutants to be evaluated. There are two general categories of permits: state and federal. State permit types of analyses are property line, NAAQS, effects evaluation, and disaster review. Federal permits are known as PSD or RCRA combustion permits and may include several analyses. For PSD: NAAQS, increment, monitoring, ozone ambient impact, additional impacts, and Class I area impacts. And for RCRA: BIF and multipathway risk assessment. *Note that several types of analyses could be required for a single permit*. Before conducting any analysis, a modeling emissions inventory must be developed.

3.3 Modeling Emissions Inventory

The modeling emissions inventory consists of the emission points of the sources to be permitted, as well as other applicable on- and off-property emission points, including exempt and grandfathered points. These points are identified by emission point numbers (EPNs) but are usually referred to as *sources* in air dispersion model guidance documents. Modeling parameters for off-property sources can be obtained from the agency's PSDB (see Appendix H).

The PSDB is a computerized database containing information about point and area sources of air pollutants, as defined by TNRCC permit and exemption activities and emission inventory surveys. Standard retrievals have been developed to obtain required source information. Include all known sources in the modeling demonstrations, even if they are not found in the PSDB.

If errors are found in the PSDB retrieval (for example, incorrect stack parameters), notify the Emissions Inventory staff and the ADMT. Provide the needed corrections for any of the applicant's sources, if applicable.

3.3.1 Ratio Techniques

Since predicted ambient air quality impacts from a source are proportional to its emission rate, it may be appropriate to use a ratio technique to simplify the evaluation of on-property sources and/or to reduce the number of pollutants requiring individual refined modeling runs to a manageable number. Please refer to Appendix B for a description of two ratio techniques. Other techniques may be approved on a case-by-case basis. Document in the modeling checklist or protocol, and in the air quality analysis, the rationale for the choice of ratio technique.

3.3.2 Collocation of Emission Points

Regulatory modeling should reflect the actual characteristics of the proposed or existing emission points. Therefore, emission points should not be collocated except in well-justified circumstances. For example, collocation may be appropriate when the number of points at a large site exceeds the capability of the model. Modeling convenience or the desire to reduce model run time are not, by themselves, acceptable justifications.

Collocating fugitive emission points may be appropriate for a screening analysis. If so, collocate all emissions at the point located nearest to the property line, or fence line for PSD analyses.

Collocating stacks may be appropriate for both screening and refined analyses if the individual emission points emit the same pollutant(s); have stack heights, volumetric flow rates, or stack gas exit temperatures that do not differ by more than about 20 percent; and are within about 100 meters of each other.

Use the following equation (EPA, 1992b) to determine the worst-case stack:

$$M = \frac{h_s \, V \, T_s}{Q}$$

where

M = a parameter that accounts for the relative influence of stack height, plume rise, and emission rate on concentrations;

h_s = the physical stack height in meters;

V = $(\ \ /4)\, d_s^2\, v_s$ = stack gas flow rate in cubic meters per second;

d_s = inside stack diameter in meters;

v_s = stack gas exit velocity in meters per second;

T_s = the stack gas exit temperature in Kelvin; and,

Q = pollutant emission rate in grams per second.

The stack that has the lowest value of M is used as a *representative* stack. The sum of the emissions from all stacks is assumed to be emitted from the representative stack; that is, the stack whose parameters resulted in the lowest value of M.

3.4 Preliminary Impact Determination

The following air quality analyses begin with a preliminary impact determination: State Property Line, State NAAQS, PSD NAAQS, PSD Monitoring, and PSD Increment. The purpose is to determine whether a new source, modification of an existing source, or a combination of the two could cause a significant off-property impact. Petitions for single property designation (§101.2) do not apply to federal permits.

The general procedure for preliminary impact determination involves five steps. Either screening or refined modeling can be used as appropriate.

Step 1: Identify All Sources of Emissions. Include emissions from all new equipment, even if the emissions are released through existing emission points.

Step 2: Determine Whether There Is a Net Emissions Increase. If there is a net increase, conduct the preliminary impact determination. See the *Modification of Existing Facilities under Senate Bill 1126* guidance package for projects that qualify for consideration under that bill.

- State permits, except those for effects evaluation. Evaluate emissions of new sources and emissions increases and decreases directly associated with the permit application or project.

- PSD permits.
    - For a major source, evaluate emissions from new sources and emissions increases and decreases at any source sitewide over a contemporaneous five-year period to

determine whether there is a net emissions increase. If emissions decreases are used in the netting calculations, they cannot be used in future PSD applications, and cannot be banked. (30 TAC §116.160).

  - For a minor source, evaluate emissions from new sources. For a Minor Source, with a project that is considered to be major, netting is not allowed.

Step 3: Evaluate Modifications to Existing Sources. Carry out this step even if there is no net increase in emission. For both state and PSD modeling, include these sources in the preliminary impact determination if there is a change in operating hours or stack parameters, and previous modeling demonstrations were limited to those hours or parameters—that is, the permit conditions were based on those limits.

Step 4: Develop the Emission Inventory. Include all sources identified in the previous steps. Both new and modified sources can be included in a single determination. Some of the possible modeling combinations for the preliminary impact follow

- New source:
  - State: Use the proposed allowable emission rate.
  - PSD: Use the proposed allowable emission rate.
- Modified source:
  - State: Applies to the sources directly related to the permit application or project, and those identified in Step 3 with a change in operating hours or stack parameters.
    - If there is no change in location or stack parameters, use the difference between the proposed allowable emission rate and the existing allowable emission rate.
    - If there is a change in location or stack parameters, include the source in the model twice, once at the current location or with current stack parameters, and once at the proposed location or with proposed stack

parameters. Enter an allowable emission rate increase as a positive number and an allowable emission rate decrease as a negative number. Include sources that will be shut down permanently and sources that will not be operating or operating at a reduced rate during operating scenarios specified in the permit.

- PSD: Applies to all sources used in the netting calculations, and those identified in Step 3 with a change in operating hours or stack parameters. Actual [1] emissions are based on a representative two-year average for both short- and long-term rates.

  - If there is no change in location or stack parameters, use the difference between the proposed allowable emission rate and the existing actual emission rate for the source. Or for decreases in emissions, use the difference between the existing actual emission rate for the source and the proposed allowable emission rate.

  - If there is a change in location or stack parameters, include the source in the model twice, once at the existing location or with current stack parameters, and once at the proposed location or with proposed stack parameters. Enter an allowable emission rate increase as a positive number and an actual emission rate decrease as a negative number. Include sources that will be shut down permanently and sources that will not be operating or operating at a reduced rate during operating scenarios specified in the permit.

Step 5: Conduct Modeling. Carry out the preliminary impact determination modeling as indicated for the applicable modeling analysis (3.5 through 3.7, 3.9 through 3.11). If there is a significant impact, model all sources on site as they will operate after the permit is issued using allowable emission rates. Model off-site sources as applicable using allowable emission rates as well.

3.5 State Property Line Analysis

[1] This definition of "actual" is different from the one used for increment analyses.

The purpose of the property line analysis (also referred to as state regulation analyses) is to demonstrate compliance with state standards for net ground-level concentrations. These analyses are performed for particulate matter [30 TAC Chapter 111 (TNRCC, 1996)] and sulfur compounds [30 TAC Chapter 112 (TNRCC, 1997a)].

This analysis must demonstrate that resulting air concentrations from all on-property sources that emit the regulated pollutant should not exceed the applicable standard. Although all on-property sources should be modeled, in many cases the proposed emissions or changes in emissions may not be substantial when compared to the total emissions from the site. The basic procedure involves four steps, described in the following paragraphs.

Property Line Step 1: Determine whether monitoring data has shown that a standard for the pollutant under review has been exceeded nearby (within 8-10 kilometers of the property line); whether previous modeling has shown that the standard could be exceeded; or whether the engineer has any concerns about air quality.

- If yes, sitewide modeling is usually required. Go to Step 2.

- If not, model allowable emission rates for all new and modified sources that emit the regulated pollutant (Section 3.4).

    - Use 1-hour modeled predictions to compare with 30-minute standards. This is a conservative technique since the model's dispersion coefficients were derived based on sampling times of much less than 1 hour but are held constant during a modeled hour. Also, if an hour was divided into segments based on the time for which a coefficient was derived, the results obtained would be equal for each segment, since all other data are constant throughout the hour. For example, if the coefficients were derived based on 10-minute sampling periods, results from each of the six periods that comprise a modeled hour, or from each of the three periods that comprise 30 minutes, would be equal, and the corresponding period averages would be equal as well.

    - If the predicted concentration—at or beyond the property line—is less than about 2 percent of the standard, the demonstration is complete. If not, sitewide modeling maybe required by the permit engineer after the evaluation of such factors as previous modeling results or monitoring data. Go to Step 2.

Property Line Step 2: If sitewide modeling is required, model the allowable emission rates for all sources on the applicant's property that emit the regulated pollutant. Determine rates for grandfathered and exempted facilities in consultation with the permit engineer.

Property Line Step 3: Compare predicted concentrations to the appropriate state standard (see Appendix A and Appendix G). If the concentrations are less than the standard, the demonstration is complete. If not, additional modeling, technical analyses, or monitoring may be appropriate. Go to Step 4.

Property Line Step 4: Determine whether one of the following four options could apply to the project. The applicant may propose other approaches for consideration as well.

- *Option 1: modeling*. Conduct additional modeling to reflect actual operating conditions, such as batch operations, or special provisions such as limits to hours of operation or *bubble* allowable emission rate limits.

- *Option 2: air quality improvement*. Demonstrate that air quality could be improved by issuance of the permit. For example, air quality could be improved by replacing existing control technology at a facility with Best Available Control Technology (BACT) that would reduce sitewide emissions.

- *Option 3: technical analyses*. Two approaches are summarized below:

    - Evaluate existing, representative monitoring data for the site to demonstrate that the predicted maximum concentrations from a proposed source when added to monitored concentrations would not exceed a standard.

    - Determine whether the concentration aligns with the form of the standard. Some standards are based on a fixed ambient temperature. Use the ideal gas law to convert parts per million (or billion) to micrograms per cubic meter based on the modeled ambient temperature for the exceedance. For example, the 1021 micrograms per cubic meter ($\mu g/m^3$) concentration standard for sulfur dioxide (SO_2) is based on the conversion of the 0.4 parts per million standard at an ambient temperature of 90 degrees Fahrenheit. At a lower temperature, the equivalent concentration in $\mu g/m^3$ would be higher, and the standard might not be exceeded.

- *Option 4: monitoring*. If monitoring is an alternative, the TNRCC staff will help the applicant develop a monitoring plan. In most cases, the monitoring demonstration must be conducted before a permit is issued, to ensure that permit conditions and allowable emissions are protective.

3.6 State NAAQS Analysis

The purpose of the State NAAQS analysis is to demonstrate that emissions of criteria pollutants from a new source or from a modification of an existing source that does not trigger PSD will not cause or contribute to an exceedance of the NAAQS. The criteria pollutants of concern are carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2) [surrogate is nitrogen oxides (NO_x)], lead (Pb), and particulate matter with an aerodynamic diameter of 10 microns or less (PM_{10}). Compliance with the pre-1997 form of the PM_{10} NAAQS will be the surrogate for compliance with the 1997 form of the PM_{10} NAAQS, and the new $PM_{2.5}$ NAAQS, until EPA publishes new technical review procedures. The ADMT will post the new procedures on the ADMT Internet page when they are effective. Compliance with any NAAQS is based upon the total estimated air quality, which is the sum of the maximum modeled concentration plus a background concentration. The basic procedure consists of nine steps, described in the following paragraphs.

State NAAQS Step 1: Conduct a preliminary impact determination to predict whether the proposed source(s) could make a significant impact on existing air quality—that is, equal or exceed a NAAQS de minimis. (Section 3.4).

- Model all new and modified sources. Compare the predicted high concentration at or beyond the property line for each pollutant and each averaging time to the appropriate NAAQS de minimis level in Appendix A. If the sources do not make a significant impact for a pollutant of concern, the demonstration is over. If they do, an area of impact (AOI) is defined, and a full NAAQS analysis may be required. Go to Step 2.

State NAAQS Step 2**:** Obtain a screening background concentration from the ADMT Internet page. Add the background concentration to the modeled concentration. If the total concentration is less than 90 percent of the NAAQS, the demonstration is complete. If the concentration is 90 percent or more, go to Step 3.

State NAAQS Step 3: Determine the radius of impact for the AOI for each pollutant and averaging period subject to the NAAQS analysis.

- The radius is the farthest distance from the sources under review to the location where concentrations are predicted to equal or exceed de minimis for each applicable averaging time and pollutant.

- Use the largest radius for each pollutant, regardless of averaging period, for the rest of the analysis. This radius is limited to the actual distance or 50 kilometers (km), whichever is less.

State NAAQS Step 4: Obtain a retrieval using the *secondary* radius search option from the PSDB (Appendix H). This retrieval identifies point and area sources within the radius of impact and other point and area sources outside the radius of impact that should be evaluated with the sources in the permit application.

State NAAQS Step 5: Determine predicted concentrations over the AOI—at and beyond the property line—from all retrieved sources and sources to be permitted. [2]

- Model allowable emission rates for all sources that emit the regulated pollutant. Off-property sources may be eliminated from the modeling demonstration if screening modeling indicates that the sources' contributions would not equal or exceed the applicable de minimis within the AOI. If any sources are omitted from the modeling demonstration, explain in the air quality analysis why they were omitted.

State NAAQS Step 6: Determine the background concentration. As defined by the EPA, background air quality includes pollutant concentrations due to natural sources, nearby sources other than the one(s) under consideration, and unidentified sources.

- Obtain the data from the EPA AIRSWEB at the following URL: http/www.epa.gov/airsweb/monreps.htm, or by contacting the ADMT or the Data Management and Analysis Section, Monitoring Operations Division.

State NAAQS Step 7: Compare the predicted concentration plus background concentration for each pollutant to the appropriate NAAQS (Appendix A, Appendix G). This concentration should be conservative since both nearby and distant background point sources are included in both the predicted and background concentrations. If the maximum concentrations are below the NAAQS,

[2] Area sources in the PSDB must be manually entered into the model at this time.

the demonstration is complete. If not, determine whether the background concentrations are representative. If they are conservative for the project, then attempt to refine them.

State NAAQS Step 8: Refine the background concentration to remove or limit the contributions from the background point sources. Contact the ADMT for assistance as necessary or check the ADMT Internet page. Several methods are suggested. The goal is to obtain a background concentration with the least amount of time and effort. Therefore, the options do not need to be followed in sequence.

State NAAQS Step 9: Conduct additional modeling if a predicted concentration will exceed a NAAQS and the permitted sources are predicted to make a significant impact at the same time and location of a NAAQS exceedance (EPA, 1990, TNRCC, 1998b).

3.7 State Effects Evaluation Analysis

The purpose of the effects evaluation analysis (also known as health effects reviews or effects reviews) is to demonstrate that the public health and welfare are protected. Perform this analysis for noncriteria pollutants following the procedures in TNRCC's RG-324, *Modeling and Effects Review Applicability* technical guidance package (TNRCC, 1998a).

Agency toxicologists use a three-tiered approach to evaluate the effects of emissions on a constituent-by-constituent basis. The objectives of the analysis are to:

- establish off-property ground-level air concentrations (GLCs) of constituents resulting from proposed emissions, and

- evaluate these GLCs for their potential to cause adverse health or welfare effects.

TARA staff compare the GLC to an effects screening level (ESL) An ESL is a guideline—not a standard. This format provides the flexibility required to easily revise the value to incorporate the newest toxicity data. TARA publishes a list of ESLs annually, which can be obtained from TARA or the NSRP Internet page at http://www.tnrcc.state.tx.us/air/nsr_permits. Consult with a toxicologist to ensure that the most recent ESL list is used; to obtain additional information concerning the basis for ESLs; or to obtain ESLs for constituents not on the published list. For constituents not on the published list, provide the chemical abstract service registry number and a material safety data sheet to the staff so that they can positively identify the constituent and derive an ESL.

The two primary averaging periods are 1-hour (due to short-term emissions) and annual (due to average annual emissions). Occasionally, other short-term periods (such as 8-hour or 24-hour) are of interest. In those cases, toxicologists will provide the appropriate ESL to use.

If a review of long-term impacts is required along with short-term impacts, long-term concentrations do not need to be obtained separately if the maximum short-term concentration is lower than the corresponding long-term ESL. For example, no long-term modeling would be required if the pollutant's short- and long-term ESLs were 10 and 1 microgram per cubic meter ($\mu g/m^3$), respectively, and the maximum short-term concentration was less than 1 $\mu g/m^3$.

Subsections 3.7.1 through 3.7.5 summarize the effects evaluation analysis process.

3.7.1 Tier I Effects Analysis

Use the flowchart in the *Modeling and Effects Review Applicability* guidance package. The following comments refer to steps in the flowchart.

- If Step 3 applies, refined modeling may be required after TARA's review.
- For Step 4, *netting* does not apply. If the project includes both increases and decreases, Step 7 offers an assessment of whether the reductions are sufficient to determine acceptable impacts.
- If Step 4B applies, refined modeling may be required after TARA's review.
- If the project's emissions cannot pass Step 5, Step 6, or Step 7, sitewide modeling is required by Step 8.
- For Step 8, design a receptor grid, select appropriate averaging periods, and use maximum allowable emission rates, or applicable emission increases, for all applicable on-property sources associated with the project.
    - Compare the maximum off-property concentration (GLCmax)—at or beyond the property line—to the applicable ESL. If the concentration is below 10 percent of the ESL for the project, *and* cumulative concentrations from this and previous projects are less than 25 percent of the ESL, the demonstration is complete. If not,

and the increased emissions cannot pass Step 10, or Step 11B is not an option, then sitewide modeling is required for Step 11A.

- For Step 11A, design a receptor grid, select appropriate averaging periods, and use maximum allowable emission rates for *all* on-property sources. ADMT suggests that discrete receptors be included in this tier even though they are not required. This may save time if exceedances of the ESL are predicted. In addition, select model output options to ensure that gridded data plots can be created.

    - Compare the GLCmax—at or beyond the property line—to the applicable ESL. If the concentration is below the ESL, the demonstration is complete. If not, go to Tier II.

3.7.2 Tier II Effects Analysis

In the Tier II effects analysis, the evaluation focuses on potential exposure based on the type of receptor where the ESL exceedance occurs. There are two types of receptors: industrial and sensitive. Examples of sensitive receptors are residences, schools, hospitals, churches, businesses, lakes, rivers, waterways, and roads. In addition, if land that is zoned industrial is leased for another purpose such as cattle grazing or farming, treat the industrial area as sensitive. Contact TARA to discuss the types and locations of sensitive receptors. Additional model runs may be needed if sensitive receptors were not included in the original receptor grid.

- Determine the type of receptor if an exceedance of an ESL is predicted in Tier I. In order to pass Tier II, the GLCmax must be no higher than twice the ESL at an industrial receptor; and, the GLC at the maximally affected sensitive receptor (GLCr) must not exceed the ESL. If both conditions are met, the demonstration is over. If not, go to Tier III.

3.7.3 Tier III Effects Analysis

While the first two tiers are based on predicted concentrations, the third tier incorporates case-specific factors which bear on the exposure scenario. The factors considered include surrounding land use; magnitude of exceedance; frequency of exceedance; existing levels of the same constituent; type of toxic effect caused by the constituent; margin of safety between the ESL and known effects levels; degree of confidence in the toxicity database; and acceptable reductions from existing concentrations. Additional model runs may be needed to generate files needed to create frequency of exceedance plots for various magnitudes of exceedance; such as 2, 4, or 10 times the ESL.

- Provide case-specific factors to TARA. In addition, provide the toxicological staff as much modeling diagnostic information as possible concerning the production process or operating conditions. For example, the culpable sources; the type of operation, limited or continuous; an evaluation of the potential for multiple sources to operate at the same time.

- Design model output options to obtain the data TARA requests

- Provide results to the permit engineer and to TARA.

3.7.4 Modeling Postprocessing Requirements

Provide the following data if requested by the toxicologists to assist them with their Tier II and Tier III evaluations. Include gridded maps in the air quality analysis that depict:

- maximum concentrations at each receptor on the grid;

- the magnitude of the ESL exceedance (concentration divided by ESL) at each receptor with a predicted exceedance;

- the number of times the ESL is predicted to be exceeded at each receptor, with a predicted exceedance; and

- the location of sensitive receptors.

Before conducting additional modeling or postprocessing the modeling data, contact TARA to discuss the appropriate format to use to present modeled results to meet the objectives of the Tier III analysis.

3.7.5 Baseline Date for Effects Reviews

Sitewide modeling establishes baseline concentrations for effects reviews that can be used in future evaluations. To assist the staff and to shorten the evaluation process for future permitting actions, provide the maximum concentration predicted for each source in the sitewide modeling demonstration. This can be done by modeling each source as a separate source group. With these results, the staff may be able to evaluate the change in overall impact resulting from an increase in emissions of an existing source or addition of a new source without the need to require additional sitewide modeling.

3.8 State Disaster Review

The purpose of a disaster review is to demonstrate that the public health and welfare are protected from sources with a potential for catastrophic release of a chemical of concern. Disaster review guidelines are included in TNRCC Air Quality Permit Application Instructions PI-1 Form.

Permit applications involving certain chemicals require additional information necessary to assess disaster potential. If the permit engineer identifies a potential for a catastrophic release of any applicable chemical, then conduct a disaster review, which could include modeling. The engineer determines the need for disaster modeling and reviews the release scenarios and associated emission rates to be modeled on a case-by-case basis. Agency toxicologists will compare modeled concentrations to ESLs and to concentrations immediately dangerous to life and health (IDLH) for each chemical. Coordinate with ADMT before conducting the modeling demonstration.

This disaster review is not a substitute for the risk management plan required under Section 112(r) of Title III of the Clean Air Act. However, modeling performed to demonstrate compliance with this section may be used as applicable for the state disaster review. Numerous disaster models are available; several are on the EPA's SCRAM Internet site.

3.9 PSD NAAQS Analysis

The purpose of the PSD NAAQS analysis is to demonstrate that emissions of criteria pollutants—and selected noncriteria pollutants—from a new major source or major modification of an existing major source will not cause or contribute to an exceedance of the NAAQS—or other health guidelines in the case of the noncriteria pollutants. The criteria pollutants of concern are carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2) [surrogate is nitrogen oxides (NO_x)], lead (Pb), and particulate matter with an aerodynamic diameter of 10 microns or less (PM_{10}). Compliance with the pre-1997 form of the PM_{10} NAAQS will be the surrogate for compliance with the 1997 form of the PM_{10} NAAQS and the new $PM_{2.5}$ NAAQS. The ADMT will post the new procedures on the ADMT Internet page when they are effective. The noncriteria pollutants that could be considered for a modeling analysis are sulfuric acid mist, total reduced sulfur (TRS), reduced sulfur compounds (RSC), and fluorides (Fl) not including hydrogen fluoride.

The PSD NAAQS analysis is similar to the state NAAQS analysis, but there are differences. For example, selected noncriteria pollutants must be reviewed. However, since there are no federal de minimis concentration levels for noncriteria pollutants, ADMT uses appropriate de minimis or threshold concentrations for state property line or effects evaluation analyses to develop impact analysis requirements, including the definition of the AOI.

More detailed guidance for PSD NAAQS analyses is contained in the EPA *Draft New Source Review Workshop Manual* (EPA, 1990). Note that the term de minimis (TNRCC, 1998b) and the phrase significance level (EPA, 1990) are synonymous.

Compliance with any NAAQS is based upon the total estimated air quality, which is the sum of the maximum modeled concentration plus a background concentration. The basic procedure involves eight steps described in the following paragraphs.

PSD NAAQS Step 1: Conduct a preliminary impact determination to predict whether the proposed source(s) could make a significant impact on existing air quality—that is, equal or exceed a NAAQS de minimis. (Section 3.4).

- Model all new and modified sources. Compare the predicted high concentration at or beyond the fence line for each pollutant and each averaging time to the appropriate NAAQS de minimis level in Appendix A. If the sources do not make a significant impact for a pollutant of concern, the demonstration is over. If they do, an AOI is defined and a full NAAQS analysis is required. Go to Step 2.

PSD NAAQS Step 2: Determine the radius of impact for the AOI for each pollutant and averaging period subject to the NAAQS analysis.

- The radius is the farthest distance from the sources under review to the location where concentrations are predicted to equal or exceed de minimis for each applicable averaging time and pollutant.

- Use the largest radius for each pollutant, regardless of averaging period, for the rest of the analysis. This radius is limited to the actual distance or 50 kilometers (km), whichever is less.

PSD NAAQS Step 3: Obtain a retrieval using the *primary* radius search option from the PSDB (Appendix H). The primary retrieval is made for the radius of impact *plus 50 km (31 miles)* and identifies point and fugitive sources that could cause a significant impact within the AOI. This retrieval identifies all point and area sources within the radius of impact that should be evaluated in addition to sources in the permit application. Since the maximum AOI is limited to a radius of 50 km, the maximum retrieval radius of impact is 100 km.

PSD NAAQS Step 4: Predict concentrations at and beyond the fence line over the AOI from all retrieved sources and sources to be permitted.

- Model allowable emission rates for all sources that emit the regulated pollutant. Off-property sources may be eliminated from the modeling demonstration if screening modeling indicates that the sources' contributions would not equal or exceed the applicable de minimis within the AOI. If any sources are omitted from the modeling demonstration, explain in the air quality analysis why they were omitted.

PSD NAAQS Step 5: Determine the background concentration (see the memo on the ADMT Internet page.) As defined by the EPA, background air quality includes pollutant concentrations due to natural sources, nearby sources other than the one(s) under consideration, and unidentified sources.

- Obtain the data from the EPA AIRSWEB at the following URL: http/www.epa.gov/airsweb/monreps.htm, or by contacting the ADMT or the Data Management and Analysis Section, Monitoring Operations Division.

PSD NAAQS Step 6: Compare the predicted concentration plus background concentration for each pollutant to the appropriate NAAQS (Appendix A, Appendix G). This concentration should be conservative since both nearby and distant background point sources are included in both the predicted and background concentrations. If the maximum concentrations are below the NAAQS, the demonstration is complete. If not, determine whether the background concentrations are representative. If they are conservative for the project, then attempt to refine them.

PSD NAAQS Step 7: Refine the background concentration to remove or limit the contributions from the background point sources. Contact the ADMT for assistance as necessary or check the ADMT Internet page. Several methods are suggested. The goal is to obtain a background concentration with the least amount of time and effort. Therefore, the options do not need to be followed in sequence.

PSD NAAQS Step 8: Conduct additional modeling if a predicted concentration will exceed a NAAQS and the permitted sources are predicted to make a significant impact at the same time and location as a NAAQS exceedance (EPA, 1990, TNRCC, 1998b).

3.10 PSD Monitoring Analysis and Exemptions

The purpose of the PSD monitoring analysis is to determine whether preconstruction monitoring may be required to evaluate existing air quality before the permit is issued. Note that preconstruction and postconstruction monitoring could be required if a potential threat to the NAAQS is identified by modeling predictions. A threat is defined, in the *Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD)* (EPA 1987a), as 90 percent of the NAAQS or PSD increment.

Use the following procedure to determine whether preconstruction monitoring is required.

PSD Monitoring Step 1: Compare the pollutant concentration obtained from the applicable preliminary impact determination to the preconstruction monitoring significance level in Appendix A.

PSD Monitoring Step 1a:. For criteria pollutants except ozone, compare the concentrations obtained from the NAAQS AOI modeling demonstration to the monitoring significance level for the pollutant of interest. If the maximum concentration does not exceed the preconstruction monitoring significance level, the demonstration is complete. If not, go to Step 2.

PSD Monitoring Step 1b:. For ozone, emissions of 100 tpy or more of volatile organic compounds (VOCs) are the surrogate for ozone and were used as a trigger for the pre-1997 form of the NAAQS. However, the pre-1997 standard has been repealed for all counties in Texas except those in nonattainment for the 1-hour ozone standard, and the 1997 8-hour form of the standard is not compatible with the 100 tpy threshold. Therefore, preconstruction monitoring for ozone will be required on a case-by-case basis until EPA develops an appropriate technique.

PSD Monitoring Step 1c: For noncriteria pollutants, use the preliminary impact determination results from the appropriate state regulation or effects review demonstration. If the maximum concentration does not exceed the preconstruction monitoring significance level, the demonstration is complete. If not, go to Step 2b.

PSD Monitoring Step 2: The permit engineer, in coordination with ADMT, has discretionary authority to exempt an applicant from the preconstruction monitoring requirement under the following conditions:

PSD Monitoring Step 2a: For criteria pollutants,

- Determine whether the predicted concentration from background point sources is below the monitoring significance level. Obtain a NAAQS primary retrieval from the PSDB (Appendix H). Multiple retrievals are not required. The primary retrieval for the NAAQS analysis (see Section 3.9) can be used for this demonstration.

  Evaluate all sources identified in the retrieval over the area where the sources under review make a significant impact, the same AOI as defined in the NAAQS analysis (see Section 3.9). Do not include the sources in the permit application. If the predicted concentration is below the monitoring significance level, an exemption can be granted.

- Determine whether a representative monitored concentration is below the monitoring significance level. Obtain data from an existing monitoring network as was done previously (see Section 3.9, PSD NAAQS Step 4). If this concentration is below the monitoring significance level, an exemption can be granted.

PSD Monitoring Step 2b: For noncriteria pollutants, coordinate with applicable agency staff to determine whether there is an environmental concern. If there is no concern, an exemption can be granted.

3.10.1 Monitor Siting and Monitoring Quality Assurance Plan

If existing data are not available, or are judged not to be representative, then the applicant should establish a site-specific monitoring network. The applicant should follow the guidance in the *Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD)* (EPA, 1987a) and the *On-Site Meteorological Program Guidance for Regulatory Modeling Applications*, (EPA, 1987b) to determine potential locations for monitoring sites. Before implementing any plan, the applicant should consult with the permit engineer, the ADMT, and the Monitoring Operations staff. In addition, the applicant should contact the Quality Assurance Section, Monitoring Operations Division for assistance in the preparation of a monitoring quality assurance plan.

3.11 PSD Increment Analysis

The purpose of the PSD increment analysis is to demonstrate that emissions of SO_2, PM_{10}, or NO_2 (NO_X is used as a surrogate) from a new major source or major modification of an existing major source will not cause or contribute to an exceedance of an increment. The PSD increment is the maximum allowable increase in concentration that is allowed to occur above a baseline concentration for a pollutant.

Baseline and Trigger Dates. There are several dates that are used in the increment analysis:

- *Major source baseline date*. January 6, 1975, for PM_{10} and SO_2, and February 8, 1988, for NO_2. This is the date after which actual emissions associated with physical changes or changes in the method of operation at a major stationary source affect the available increment. Changes in actual emissions occurring at any source after this date do not affect the increment, but instead contribute to the baseline concentration until the minor source baseline date is established.

- *Trigger date*. August 7, 1977, for PM_{10} and SO_2, and February 8, 1988, for NO_2. The date after which the minor source baseline date may be established.

- *Minor source baseline date.* This is the earliest date after the trigger date on which a PSD application for a new major source or modification to a major source is considered complete for a particular Air Quality Control Region (AQCR).

The *baseline concentration* means the ambient concentration level that existed in the baseline area at the time of the applicable minor source baseline date, hereafter referred to as the *baseline date*. The baseline concentration is the reference point for determining air quality deterioration in an area, and is based on concentrations from the calendar year prior to the baseline date.

Baseline dates have been established for SO_2 and PM_{10} for all counties in Texas by AQCR. Baseline dates for NO_2 have been established but have not been identified for all regions; use February 8, 1988 as the default date (see Appendix I). Contact the ADMT to obtain a conversion from AQCR to TNRCC region.

Increment Calculation Terms. The amount of PSD increment that has been consumed in an attainment or unclassified area is determined from the emissions increases and decreases that have occurred from sources in operation since the applicable baseline date. An applicant does not need to obtain the baseline ambient concentration—if one exists—to determine the amount of PSD increment consumed or the amount of increment available. Instead, modeled increment consumption calculations reflect the change in ambient pollutant concentration attributable to increment-affecting emissions. Increment consumption (or expansion) calculations are determined by evaluating the difference between the actual emissions at the baseline date ($Actual_{BD}$) and actual emissions as of the date of the modeling demonstration ($Actual_{MD}$) .

$Actual_{BD}$ is defined as the representative two-year average for long-term rates, or the maximum short-term rate in the same two-year period immediately before the applicable baseline date. If little or no operating data are available, as in the case of permitted sources not yet in operation at the time of the baseline date, the permit allowable emission rate as of the baseline date must be used.

$Actual_{MD}$ is defined as the most recent, representative two-year average for long-term rates, or the maximum short-term rate in the same two-year period immediately before the modeling demonstration. If little or no operating data are available, as in the case of permitted sources not yet in operation at the time of the increment analysis, the permit allowable emission rate must be used.

The ADMT suggests a tiered approach to this analysis to limit the amount of research needed to determine actual emission rates. The basic five-step procedure is described in the following paragraphs.

PSD Increment Step 1: Determine whether the predicted concentration (excluding background concentration) for NO_2, SO_2, or PM_{10} obtained in the PSD NAAQS analysis is below the applicable increment. If yes, the demonstration is complete because all sources were modeled at allowable emission rates. If not, go to Step 2.

PSD Increment Step 2: Determine the radius of impact for each pollutant that had an AOI defined in the NAAQS analysis (see Section 3.9). The radius of impact will be the same one used in the PSD NAAQS analysis.

PSD Increment Step 3: Obtain a retrieval using the *primary* radius search option from the PSDB (Appendix H). The primary retrieval is made for the radius of impact *plus 50 km (31 miles)* and identifies sources that could affect the increment within the AOI. Since the maximum AOI is limited to a radius of 50 km , the maximum retrieval radius of impact is 100 km. This retrieval identifies all increment-affecting sources within the radius of impact that should be evaluated along with the sources in the permit application.

PSD Increment Step 4: Adjust the emission inventory.

- For all sources, including grandfathered and exempted sources, use allowable emission rates from the PSDB; these rates are provided in the electronic copy of the retrieval. Do not use the actual emission rates indicated in the paper copy of the retrieval unless they meet EPA criteria. Ensure all of the applicant's sources are included in the modeling inventory.

- Omit any source from the inventory that has a negative emission rate unless the source existed and was in operation at the baseline date. Also, omit any source that was permitted but not placed into operation.

- For proposed sources, use proposed allowable emission rates.

Note: A source must have existed and been in operation on or before the baseline date to be considered for increment expansion. The source must be shut down as part of the project or have lower actual emissions to expand the increment. That is, there is no credit for contemporaneous shutdowns or for sources permitted after the baseline date that have reduced emissions, have been shut down, or will be shut down as part of the current project, since modeling is used to determine the amount of increment consumed or expanded. Therefore, a source that did not exist—or was not operating—on the baseline date would not have contributed to the air quality at that time, and there would be no need to model the source with an emission rate of zero. Omit these sources from the inventory.

PSD Increment Step 5: Conduct the modeling demonstration using the following tiered approach, as applicable.

Increment Modeling Tier I. Model all sources using their allowable emission rates, as adjusted in Step 3. This approach is conservative since the *difference* in increment is the entire allowable emission rate. Compare the predicted concentration to the appropriate increment (Appendix A, Appendix H). If the increment is not exceeded, the demonstration is complete. Otherwise, go to Tier II

Increment Modeling Tier II. Model selected sources with $Actual_{MD}$ emission rates and all other sources at allowable emission rates. The selected sources are usually the applicant's, since actual emission rates may be difficult to obtain for off-property sources. This process assumes that the *difference* in increment for the selected sources is the entire actual emission rate. If the increment is not exceeded, the demonstration is complete. Otherwise, go to Tier III.

Increment Modeling Tier III. Model selected sources that existed and were in operation at the baseline date with the *difference* between $Actual_{MD}$ and $Actual_{BD}$.

- For major sources permitted at or after the major source baseline date but not in operation as of the minor source baseline date, use the difference between $Actual_{MD}$ and the allowable emission rate.

- For sources that existed at the baseline date, where a change in actual emission rates involved a change in stack parameters, use the emission rates associated with both the baseline date and the existing situation. That is, enter the $Actual_{BD}$ as negative numbers along with the baseline source parameters, and enter $Actual_{MD}$ for the same source as positive numbers along with the existing source parameters.

- Model grandfathered and exempted sources as the difference between $Actual_{MD}$ and $Actual_{BD}$.

- Use emission rates found in Tier I or II for other sources, as applicable.

If the increment is not exceeded, the demonstration is complete. Otherwise, continue to refine increment emission rates or demonstrate that the project's impact will not be significant (EPA, 1990).

3.12 PSD Ozone Ambient Impact Analysis

The purpose of the ozone ambient impact analysis is to demonstrate that a new major source or major modification of an existing major source that could emit 100 tpy or more of VOCs would not cause or contribute to a violation of the 1-hour ozone standard in attainment or unclassifiable areas. However, this standard has been repealed for all counties in Texas except those in nonattainment for the 1-hour ozone standard, and the 1997, 8-hour form of the standard is not compatible with the 100 tpy threshold.

The 1-hour standard was exceedance based; that is, the NAAQS could not be exceeded more than once per year at an ambient air monitoring site. A violation of the NAAQS occurred only if there were four or more exceedances within a 3-year period—one exceedance per year at the same ambient air monitoring site. The 8-hour standard is not exceedance based. The NAAQS is violated only if the 3-year average of the fourth highest 8-hour averages for each year at the same ambient air monitoring site is 85 ppb or higher—EPA convention is to round down for concentrations of 4.9 ppb or less. It is not readily apparent at this time whether a single project could significantly affect an 8-hour average concentration over a 3-year period to such a degree that the NAAQS would be violated.

Therefore, ADMT will use the procedures developed to evaluate a project's impact on the 1-hour ozone standard as a surrogate for its impact on the 8-hour standard until EPA develops an appropriate evaluation technique for the new standard.

- *For VOC-dominated sources*. Use the VOC/NO_X Point Source Screening Tables developed by Richard Scheffe (Scheffe, 1998) if the methane-normalized VOC to NO_X ratio is about 2:1. Another alternative would be to assume that all the project's VOC emissions (or the site's VOC emissions, as applicable) were ozone emissions and use the ISC model to predict a maximum 1-hour concentration This concentration would be added to a 1-hour background concentration and the result compared to the 1-hour ozone standard.

- *For NO_X-dominated sources*. If the methane-normalized VOC to NO_X ratio is 2:1 or less, no significant increase of ozone would be expected.

3.13 PSD Additional Impacts Analyses

The purpose of the additional impacts analyses is to provide an assessment of the project's effect on the overall environment. There are three types of analyses: growth, soil and vegetation, and visibility impairment.

The ***growth analysis*** evaluates the impact associated with the project on the general commercial, residential, and industrial growth within the AOI. An in-depth growth analysis would only be required if the project would result in a significant shift of population and associated activity into an area—that is, a population increase on the order of thousands of people.

The ***soils and vegetation analysis*** evaluates the impact associated with the project on soils and vegetation within the AOI. Modeling results from the NAAQS analysis can usually be used for this analysis.

The ***visibility impairment analysis*** evaluates the impact associated with the project on the visibility within the AOI (usually within a Class II area), and upon any Class I areas within 100 km of the project. The applicant can meet the requirement for the Class II visibility analysis by acknowledging compliance with the visibility and opacity requirements in 30 TAC Chapter 111. However, additional modeling for a Class I visibility impairment analysis, if required, should follow EPA's *Workbook for Plume Visual Impact Screening and Analysis* (EPA, 1992c) or *User's Manual for the Plume Visibility Model (PLUVUE II)* (EPA, 1992d) as applicable.

3.14 PSD Class I Impact Area Analysis

Class I analyses involve the federal land manager as a participant in the permit review process. A Class I analysis is required for PSD sources that locate within 10 km of a Class I area whose emissions of any regulated pollutant would have a 24-hour average impact of 1 $\mu g/m^3$ or greater. In addition, a Class I analysis is required for PSD sources that locate within 100 km of a Class I area whose emissions exceed applicable significance levels; this analysis could be required if the sources will be located more than 100 km away, if there is a concern that the emissions could adversely affect the Class I area. The only Class I areas in Texas are Big Bend National Park and Guadalupe Mountains National Park. However, other Class I areas in adjacent states, for example, Carlsbad Caverns National Park, New Mexico, could trigger a Class I analysis.

The air dispersion modeling requirements for Class I areas include more stringent PSD increments, air quality-related values, and a visibility impairment analysis. Due to the fact that PSD Class I analyses are rare in Texas, refer to the *Draft New Source Review Workshop Manual* (EPA, 1990) Chapter E for procedural and technical guidance, as well as the applicable Class I increments.

3.15 RCRA Combustion Permits Analysis

The purpose of the RCRA combustion permits analysis is to determine waste feed limits or allowable emissions that will protect public health from emissions from sources burning hazardous waste or from associated sources in hazardous waste service. Two modeling demonstrations are required for these permits under the TNRCC's combustion strategy: boiler and industrial furnace (BIF) and multipathway risk assessment. The applicant must conduct the BIF demonstration, and the TNRCC staff conducts the risk assessment. Waste feed limits or emission rates will be based on the results of both demonstrations.

3.15.1 BIF Demonstration

The BIF demonstration follows the guidance in 40 CFR §266.103–04, 40 CFR §266.106–09, and EPA 530-R-92-011, *Technical Implementation Document for EPA's Boiler and Industrial Furnace Regulations* (EPA, 1992a). Refined modeling may be required if the facility does not qualify for screening techniques. The maximum predicted annual average off-property ground-level concentration due to emissions from all BIF sources within a facility is used to determine compliance for each constituent. This concentration is commonly referred to as the maximum exposed individual (MEI) concentration. *Note: The on-property concentration must be used if a person resides on the property and the concentration is the MEI concentration*. The following items should be evaluated and included in the modeling demonstration, as applicable.

- *For noncarcinogenic metals, HCl, and* Cl_2. The predicted MEI concentration must not exceed the reference air concentration (RAC) specified in Appendix IV of the BIF guidance document.

- *For carcinogenic constituents*. The MEI concentration must not exceed the risk-specific doses (RSDs) specified in Appendix V of the BIF guidance document.

- *For carcinogenic constituents*. In addition to the RSD evaluation, the sum of the ratios of predicted maximum concentrations to their respective RSDs must not exceed 1.0.

- *For constituents not listed in Appendixes IV or V*. The default MEI concentration cannot exceed 0.1 $\mu g/m^3$.

- *For dioxins and furans*. The ratio of the MEI concentration to the RSD for 2,3,7,8-TCDD must not exceed 1.0.

- *Dilution factor (DF)*. Required to support the modeling demonstration and the emission limits on which the demonstration was based. The DF is source-specific and pertains to the maximum predicted air concentration for each constituent. The model calculates a DF concentration based on an emission rate of 1 g/s that is expressed in units of $\mu g/m^3/g/s$.

3.15.2 Multipathway Risk Assessment

The multipathway risk assessment evaluates the potential cancer risk from hazardous waste combustion sources and from noncombustion emission sources (fugitive and point) in hazardous waste service. The ADMT provides concentration and deposition values for on- and off-property receptors to TARA to determine an overall health risk. The receptors include watersheds and water bodies and specified sensitive receptors, such as dairy and beef farms and locations where people fish.

4.0 Acceptable Dispersion Models

In general, use the models and follow the modeling procedures identified in the GAQM (EPA, 1995a). Although the GAQM was developed to address PSD and State Implementation Plan modeling issues, the ADMT applies the general guidance contained in the GAQM to other modeling demonstrations in order to maintain a consistent approach for all projects.

Appendix A of the GAQM lists preferred air quality models, and Appendix B lists models that may be considered on a case-by-case basis. Occasionally, it may be appropriate to use models that are not specified in the GAQM; for example, some disaster models and other models, such as the Toxic Modeling System Short-Term model. To use these models, demonstrate that no GAQM Appendix A model is appropriate for the required modeling analysis. Use the most recent version of each model in all cases. Guidance on demonstrating the need for non-Appendix A or non-GAQM models is found in Section 3.2.2 of the GAQM.

The ISCST and SCREEN models are the most commonly used models for state and PSD modeling in Texas. These models can be used to assess the impacts from point, area, and volume sources, and can incorporate the effects of building wakes upon plumes (building downwash). EPA is evaluating the AMS/EPA Regulatory Model (AERMOD) for regulatory use. Check the ADMT Internet page for guidance on the use of AERMOD after its release. Much of the following discussion applies to ISCST, since it is the most commonly used model at this time.

The ISCST model can be used to obtain short-term concentrations for multiple averaging periods simultaneously, if worst-case stack parameters and emission rate for any averaging period are used. Short-term is defined as any time period less than or equal to 24 hours. This approach is conservative if worst-case stack parameters are used, since the emission rate for the shortest time period will equal or exceed emission rates for subsequent time periods. For example, the 1-hour emission rate can be used to predict 3- and 24-hour concentrations.

The ISCST model can be used to obtain long-term concentrations as well, and the ADMT prefers its use instead of ISCLT. The general procedure follows:

- *If a State NAAQS or effects review is required for SO_2, PM_{10}, or constituents with ESLs*, use the appropriate time-averaging option to obtain annual average concentrations. This is a conservative approach if worst-case stack parameters are used since short-term emission rates can be equal to but are usually higher than long-term emission rates.

- *If a State NAAQS review is required for NO_2*, select the appropriate time-averaging option and run the ISCST model with the appropriate state year of meteorological data. If the maximum predicted concentration is less than 75 percent of the appropriate de minimis or standard, no further modeling is needed. Otherwise, run the model for each of five years of meteorological data to ensure that a representative maximum concentration is identified (Section 5.6.1). The ambient ratio method outlined in Appendix B may be used.

- *If a PSD review is required for NO_2*, select the appropriate time-averaging option and run the ISCST model separately for each of five years of meteorological data (Section 5.6.1). The ambient ratio method outlined in Appendix B may be used.

- *If a multiple-year, concatenated meteorological data set is used*, do not select the *annual* option because the model will provide a multiple-year average instead of a single-year average.

These approaches may not be applicable in cases where the worst-case short-term emission rate results in unrepresentative concentrations for some averaging periods. In those cases, the short-term model may be used with the appropriate emission rate for the period being evaluated.

For example, the ISCST model may be run separately with the maximum 1-hour emission rate to obtain 1-hour concentrations, and run again with the annualized average hourly emission rate based on the maximum ton-per-year rate to obtain annual concentrations.

The GAQM suggests that the ISCLT model should be used for modeling evaluations conducted for pollutants that have only long-term standards. However, there is no reason to require the use of ISCLT. The main difference between ISCST and ISCLT is the form of the meteorological data files. The meteorological data for ISCLT are based on climatological data (Section 5.6.2) and cannot be used in conjunction with gravitational settling or deposition. In addition, EPA does not allow climatological data to be averaged. For example, meteorological data must be developed for each quarter of the year (for Pb) or year (for NO_2), and each quarter or year must be evaluated separately.

Acceptable models for complex terrain are discussed in the GAQM Section 5.0. These are essentially screening models. The Valley model is incorporated into the SCREEN model, and the Complex I model is incorporated into the ISCST model. Use of screening models is sufficient unless exceedances of a standard or increment are predicted; then a refined model may be used.

Use of a refined complex terrain model, such as CTDMPLUS, requires extensive meteorological information, which must be collected over a one-year period. Contact the ADMT to discuss complex terrain modeling as applicable.

4.1 Distance Limitations

The GAQM indicates that the useful distance for guideline models is 50 km (31 miles). Occasionally, some sources may be located beyond 50 km from portions of the AOI. When this occurs, include these sources in the demonstration unless their contribution would be insignificant. Modeled impacts from sources beyond 50 km are conservative estimates that may provide an indication of a threat to the NAAQS.

4.2 Modification of Models

The EPA has established procedures to request changes to model algorithms. Applicants should submit requests with suggested changes to model source codes to EPA with a copy to the ADMT.

The internal source codes for regulatory models should not be modified in a manner that would change the basic algorithms used by the model to calculate ground-level concentrations without ADMT review and comment. Minor changes unrelated to model algorithms, such as re-dimensioning of source or receptor arrays, do not require ADMT coordination.

Document and submit substantial preprocessor or postprocessor programs or subroutines to the ADMT. For example, a program used to calculate downwash parameters for entry into the ISC models is a substantial preprocessor program. An example of a substantial postprocessor program would be one that is used to count the number of exceedances at each receptor for the appropriate averaging period.

4.3 Use of Data Entry Software

There are several consultants who have developed more user-friendly computer programs to assist with data entry for EPA dispersion models as well as some preprocessing programs. If these programs are used, submit the software and program documentation to assist the ADMT in the technical review process, unless the ADMT has the software and documentation. Check with ADMT to determine the software the staff maintains.

5.0 Basic Model Input Data Requirements

Always select the regulatory default option, unless the ADMT approves the use of other model options. This option is defined in the *User's Guide for the Industrial Source Complex (ISC3) Dispersion Models* (EPA, 1995d) (ISC User's Guide) and other GAQM Appendix A model user's guides.

5.1 Urban versus Rural Dispersion Options

The classification of the land use in the vicinity of sources of air pollution is needed because dispersion rates differ between urban and rural areas. In general, urban areas cause greater rates of dispersion because of increased turbulent mixing and buoyancy-induced mixing. This mixing is due to the combination of greater surface roughness caused by more buildings and structures and greater amounts of heat released from concrete and similar surfaces.

EPA guidance provides two procedures to determine whether the character of an area is predominantly urban or rural. One procedure is based on land-use typing and the other is based on population density. Both procedures require an evaluation of characteristics within a 3-km radius from a source. The land-use typing method is based on the work of August Auer (Auer, 1978) and is preferred because it is more directly related to the surface characteristics of the evaluated area that affect dispersion rates.

While the Auer land-use typing method is more direct, it can be labor-intensive to apply. A simplified technique referred to in the hazardous waste combustion screening approach contained in the Title 40 Code of Federal Regulations, Part 266 (40 CFR 266), Appendix IX, Section 6.0 can be used as a screening tool. If the land-use designation is clear—that is, about 70 percent or more of the total land use is either urban or rural—then further refinement is not required.

5.1.1 Simplified Auer Land-Use Analysis

The Auer land-use approach considers four primary land-use types: Industrial (I), Commercial (C), Residential (R), and Agricultural (A). Within these primary types, subtypes are identified in Table 5-1.

Table 5-1. Land-Use Types and Corresponding Dispersion Classification

Type	Description	Class
I1	Heavy Industrial	Urban
I2	Light/Moderate Industrial	Urban
C1	Commercial	Urban
R1	Common Residential (Normal Easements)	Rural
R2	Compact Residential (Single Family)	Urban
R3	Compact Residential (Multi-Family)	Urban
R4	Estate Residential (Multi-Acre)	Rural
A1	Metropolitan Natural	Rural
A2	Agricultural	Rural
A3	Undeveloped (Grasses/Weeds)	Rural
A4	Undeveloped (Heavily Wooded)	Rural
A5	Water Surfaces	Rural

The goal in a land-use analysis is to estimate the percentage of the area within a 3-km radius of the source to be evaluated that is either urban or rural. Both types do not need to be evaluated since the type that has the greatest percentage will be the representative type.

The most difficult evaluation involves the residential types depicted in the table. The degree of resolution between subtypes for residential areas often cannot be determined without conducting a site area inspection and referring to zoning maps and aerial photographs. The Auer land-use typing process can require extensive analysis, which—for many applications—can be greatly streamlined without sacrificing confidence in the selection of a representative land-use type.

The primary assumption for the simplified procedure is based on the premise that many facilities should have clear-cut urban or rural designations; that is, the percentage of the primary designation should be greater than about 70 percent. The color coding on United States Geological Survey (USGS) 7.5-minute topographic maps provides an effective means of simplifying the typing scheme. The suggested typing designations for the color codes found on the maps are:

- Blue—water (rural)
- Green—wooded areas (rural);
- White—parks, unwooded, nondensely packed structures (rural);
- White—industrial; identified by the large buildings, tanks, sewage disposal or filtration plants, rail yards, roadways, intersections (urban);
- Pink—densely packed structures (urban); and,
- Red—roadways, intersections (urban).

Use the simplifying approach if the topographic map is within three years old, or is older but still considered representative, and the land-use designation represents about 70 percent of the total.

If the land-use designation represents less than 70 percent of the total, supplement the topographic map analysis with a current aerial photograph of the area surrounding the permitted sources or with a detailed drive-through summary, to support the land-use designation to be used in the modeling demonstration.

5.1.2 Multiple Modeling Technique

Alternatively, consider using the following screening modeling technique in place of the land-use analysis.

Step 1. Run the screening model twice, once for each dispersion option, and use the higher of the two modeled results. If refined modeling is required, go to Step 2.

Step 2. Run the refined model twice, once for each dispersion option, and use the higher of the two modeled results.

- If predicted concentrations from both refined model runs are below the value of concern for the modeling demonstration, the demonstration is complete. If not,

- Conduct an Auer land-use analysis, and use the appropriate dispersion option. This extra detail would be needed if predicted concentrations exceed the value of concern from either refined model run, or if the location, frequency, and magnitude of an exceedance is needed. Depending upon the source configuration and dispersion coefficient selected, the dispersion pattern and predicted concentrations could be significantly different and adversely affect the staff’s technical review.

5.2 Digital Elevation Model

A digital elevation model (DEM) is a digital file consisting of terrain elevations for ground positions at regularly spaced intervals. The USGS distributes two digital elevation data products in the standard DEM tape format that could be used in state and federal air dispersion modeling demonstrations in Texas: large-scale and small-scale.

Large Scale: USGS-produced 7.5-minute DEMs that correspond to standard USGS 1:24,000-scale 7.5- by 7.5-minute quadrangles.

- The data are produced in 7.5- by 7.5-minute blocks either from map contour overlays that have been digitized or from automated or manual scanning of photographs usually taken at an average height of 40,000 feet (1:80,000-scale).

- The data are processed to produce a DEM with a 30-meter sampling interval. Each 7.5-minute unit of DEM coverage consists of a regular array of elevations referenced horizontally in the UTM projection coordinate system. These horizontally referenced data may be in the North American Datum (NAD) 27 or NAD83 for the continental U.S. Elevation units are in meters or feet relative to the National Geodetic Vertical Datum of 1929 (NGVD29).

Small Scale: Defense Mapping Agency-produced 1-degree DEMs that correspond in coverage to 1-degree by 1-degree blocks (one-half of standard 1:250,000-scale 1-degree by 2-degree quadrangles).

- The data are produced by interpolating elevations at intervals of 3 arc-seconds from contours, ridge lines, and drains digitized from 1:250,000-scale topographic maps. Three seconds of arc represents approximately 90 meters in the north-south axis and a variable dimension (approximately 90 meters at the equator to 60 meters at 50 degrees latitude) in the east-west axis due to convergence of the meridians. The area of each map is divided into an east half and a west half to accommodate the large volume of data required to cover the 1-degree by 2-degree topographic map.

- The 1-degree DEM consists of a regular array of elevations referenced horizontally on the geographic coordinate system of the World Geodetic System (WGS) 72, which was converted to WGS84. Elevations are in meters relative to NGVD29 in the continental US.

The 7.5-minute and 1-degree DEM data files are identical in logical data structure but differ in sampling interval, geographic reference system, areas covered, and accuracy of data. USGS 7.5-minute DEM data are available for selected quadrangles in the United States; DMA 1-degree DEM data are available for most of the United States.

Keep in mind that the UTM is just one of many map projections used to represent locations on a flat surface. Also, be aware that there are several horizontal data coordinate systems or datum (NAD27, WGS72, NAD83, and WGS84) that are used to represent locations on the earth's surface in geographic coordinates (latitude and longitude). Spatial data (Global Positioning System output, digitized maps, DEMs, etc.) used to obtain receptor, building, and source locations can be in any one of these systems.

When representing receptor, building, and source locations in UTM coordinates, make certain that all of the coordinates originated in, or are converted to, the same horizontal datum. There are many free and commercial computer programs available to convert from geographic coordinates to UTM coordinates; however, not all of these programs are appropriate for conversion between horizontal data coordinate systems. For example, programs that do not prompt the user for a specific horizontal datum are not appropriate.

5.3 Variable Emission Rate Option

When sources can operate only during specified hours, the variable emission rate option may be used to restrict the modeling analysis to the hours of operation only. If this option is used, permit conditions should restrict the operation of the permitted source to the time period modeled.

The variable emission rate option may also be used to simulate other operating scenarios as necessary to design permit conditions.

5.4 Building Wake Effects (Downwash)

Modeling of point sources with stack heights that are less than good engineering practice (GEP) stack height should consider the impacts associated with building wake effects (also referred to as downwash). Building wake effects are not considered for area or volume sources.

As defined by the *Guideline for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations)* (EPA, 1985), GEP height is calculated as:

$$GEP = H_b + 1.5L,$$

where

H_b = the building height; and

L = the lesser of the building height or the greatest crosswind distance of the building—also known as maximum projected width.

This formula defines the stack height above which building wake effects on the stack gas exhaust may be considered insignificant.

Region of Influence: A building or structure is considered sufficiently close to a stack to cause wake effects when the minimum distance between the stack and the building is less than or equal to five times the lesser of the height or projected width of the building (5L). This distance is commonly referred to as the building's *region of influence*. If the source is located near more than one building, assess each building and stack configuration separately.

Apparent Width: If a building's projected width is used to determine 5L, determine the apparent width of the building. The *apparent width* is the width as seen from the source looking towards either the wind direction or the direction of interest. For example, for short-term modeling, the ISCST model requires the apparent building widths (and also heights) for every 10 degrees of azimuth around each source.

To account for downwash, the SCREEN model requires the entry of a building or structure height and the respective maximum and minimum horizontal dimensions. Generally, include the building with dimensions that result in the highest GEP stack height for that source, to evaluate the greatest downwash effects.

Be aware that when screening tanks, the tank diameter should not be used. The SCREEN model uses the square root of the sum of the individual squares of both the width and length for a structure in order to calculate the projected width. Because most tanks are round, the projected width is constant for all flow vectors. However, using the actual tank diameter for both width and length will result in a projected width that is too large. Therefore, when screening tanks, a modeler should divide the diameter of the tank by the square root of 2.

The ISC models also contain algorithms for determining the impact of downwash on ambient concentration; use them to determine refined concentrations estimates. Methods and procedures to determine the appropriate entries to account for downwash are discussed in the EPA’s GEP guidance document (EPA, 1985).

Due to the complexity of GEP guidance, the EPA has developed a computer program for calculating downwash parameters for use with the ISC models. This program is called the BPIP (EPA, 1993a), and it is available from the EPA SCRAM Internet page. Use the most current version of the BPIP to determine downwash parameters for use with the ISC models.

5.5 Receptor Grid

Place receptors to determine the maximum ground-level concentration in an off-property area or an area not controlled by the applicant. If an AOI has been defined, receptors should cover the entire area of de minimis impact.

5.5.1 Receptor Grid Design

Design the receptor grid by considering such factors as the results of screening analyses; a source's release height; the proximity of emission points, fugitive areas, and other sources to the property line; the location of nearest residents and other sensitive receptors and monitors; as well as topography, climatology, and other relevant factors. Generally, the spacing of receptors increases with distance from the sources being evaluated.

In general, do not use coarse-grid spacing to determine a *hot spot*, the suspected area of the maximum concentration, followed by the use of a tighter grid spacing to *zero in* on the maximum concentration. For example, if the highest concentration was predicted to occur to the east of a source and the next highest concentration to the west, it would not be appropriate to ignore the area to the west. However, if an area has predicted concentrations several orders of magnitude higher than any other areas, it may be appropriate to focus on that area.

Tight receptors should cover a large enough area to demonstrate that the maximum predicted concentration has been located. Determine the extent of the tight receptor grid on a case-by-case basis. Usually tight receptors may be required as far as about 200-300 meters from the sources being evaluated, depending upon the emission release heights and property or fence line location. However, extend the tight receptors if the concentrations are increasing or are within approximately 75 percent of a standard, guideline, or staff-identified threshold.

When multiple sources are modeled, use the most restrictive of the suggested types of spacing in order to determine representative concentrations from each source type. For example, in order to determine the overall maximum predicted concentration and location for a mix of tall and short sources, it may be necessary to extend the grid several kilometers away from the property line to identify concentrations related to tall stacks. It is appropriate to use a smaller receptor spacing located close to the property line to identify concentrations caused by short stacks or fugitive sources.

In addition, the location of *ambient air* receptors should guide the design of the receptor grid. Ambient air for state modeling starts at the applicant's property line. However, for PSD modeling, ambient air starts at the applicant's fence line or other physical barrier to public access. Also, no receptors are required on the applicant's property because the air over an applicant's property is not ambient; therefore, in a regulatory sense, applicants cannot cause a condition of air pollution on their property from their own sources.

5.5.2 Coordinate System

Enter receptor locations into dispersion models in UTM coordinates, in order to be consistent with on- and off-property emission point locations represented in the Table 1(a) contained in the permit application and PSDB, and other reference material, such as USGS topographic maps.

Provide the datum used for UTM coordinates (Section 5.2). Applicable UTM zones in Texas are either 13 (from the west border to 102 degrees longitude), 14 (between 102 and 96 degrees longitude), or 15 (east of 96 degrees longitude to the east border). Please do not use coordinate systems based on plant coordinates or other applicant-developed coordinate systems. Also, polar grids should not be used unless the ADMT suggests their use.

5.5.3 Receptor Elevations

Much of Texas can be characterized as having relatively flat terrain; however, some areas of the state have simple-to-complex terrain. The ADMT defines *flat terrain* as terrain equal to the elevation of the stack base; *simple terrain* as terrain lower than the height of the stack top; and, *complex terrain* as terrain above the height of the plume center line. (For screening modeling, *complex terrain* is terrain above the height of the stack top). Terrain above the height of the stack top but below the height of the plume center line is known as *intermediate* terrain. Evaluate the geography near each facility to determine how terrain elevations should be addressed. Use USGS 7.5-minute topographic maps or their digital equivalents to determine the terrain in the area surrounding the facility.

For refined modeling with the ISCST model, use both the simple and complex terrain calculation options if other than flat terrain applies. That is, if terrain elevations for receptors are used, activate both simple and complex options. In cases where multiple sources with varying heights of emissions must be evaluated, use the ISCST model rather than the SCREEN model. Since the SCREEN model can only evaluate one source at a time, combined results for sources in intermediate-to-complex terrain might not be representative.

If other than flat terrain is modeled, use appropriate receptor elevations. Ensure that the higher terrain is always included in any direction from the source, not just the highest terrain. For example, if the highest terrain is to the north of the property, but the second highest terrain is to the south, include receptors at and in the general vicinity of each location. Conservative options may be used though to reduce the effort of determining specific receptor heights for dense grid networks. For example:

- Omit terrain if only ground-level fugitive sources are modeled. Terrain is generally not a consideration when modeling releases from fugitive sources. Releases from these sources are typically neutrally buoyant and are essentially at ground level. Maximum concentrations from fugitive releases are thus expected to occur at the nearest downwind receptor location. However, include terrain near a property or fence line for elevated fugitive releases, or if nonfugitive point sources are included in the modeling demonstration.

- Use the highest elevation of any receptor in the grid for all receptors in the grid, only if the plume depletion option is not used.

- Set receptors to the stack base elevation, if some elevations are below stack base.

- If the terrain is all below stack base, choose the FLAT terrain height option keyword in the Control Pathway of the ISC model, which will cause the model to ignore terrain heights. *Note: do not select the elevated terrain height option without including receptor elevations in the Source Pathway*.

If worst-case terrain heights are used with coarse grids, and more refined heights are used on progressively denser grids (medium, fine, tight), the modeled concentrations could decrease as the heights decrease.

If 7.5-minute DEM data are not available for the entire receptor grid, use 7.5-minute DEM data for receptors within approximately 3–5 km of the property line and 1-degree or mixed scale DEM data for other receptors. In addition, ensure that ridges or small terrain features that may be missing from either the 7.5-minute, 1-degree, or mixed scale DEM data are included in the receptor grid.

If there are significant problems with the resolution of the data, that is, a mix of scales that could result in the omission of terrain features or significant changes in elevation, the applicant may need to add discrete receptors with appropriate elevations obtained from 7.5-minute data sources.

5.5.4 Receptor Spacing

Use one or more of the following sets of receptors.

Tight receptors**—**spaced 25 meters apart. Tight receptors could extend up to 200–300 meters from the sources being evaluated. Consider the distance between the source and the property or fence line. For example, if a low-level fugitive source is located more than 200–300 meters from the property line, it is unlikely that a 25-meter receptor spacing would be required. However, receptors would be required along the property boundary at the next appropriate grid spacing. In general, use a receptor spacing of 25 meters in the following cases:

- sources with heights less than 15 meters and not affected by building downwash;
- sources with heights less than 50 meters and affected by building downwash.

Fine receptors**—**spaced 100 meters apart. Fine receptors could extend 1 km from each source being modeled.

Medium receptors**—**spaced 500 meters apart. Medium receptors could cover the area that lies between 1 and 5 km from each source.

Coarse receptors**—**spaced 1 km apart. This spacing could cover the area that lies beyond the medium receptors out to 50 km.

5.5.5 Special Receptor Spacing

Conduct additional modeling in the vicinity of each receptor when a predicted concentration exceeds 75 percent of an applicable standard or guideline. Use the next lower receptor set spacing. For example, use fine spacing if medium spacing was used initially. This guidance does not apply for predictions at individual discrete receptors that represent a known location, such as a residence or business. In addition, this approach would not apply if the predicted concentration occurred at a receptor with the highest terrain elevation.

5.5.6 Cavity Calculations

In August, 1998, the EPA proposed changes to the ISC model to incorporate the Plume Rise Model Enhancements (PRIME) model; the integrated model will be called ISC-PRIME. This model can compute concentrations in a cavity region. Therefore, use ISC-PRIME to resolve any cavity issues resulting from the use of ISC. Do not use the draft ISC-CAV model.

5.5.7 Concentration Maps

Include gridded concentration maps demonstrating that the maximum predicted concentration has been found in the air quality analysis. Use isopleths rather than actual concentration plots only if the presentation shows that concentrations are clearly decreasing away from the sources being modeled and comparisons with de minimis or significance levels, or ESL exceedances or frequencies of exceedance are not an issue. When isopleths are used, the maximum off-property concentration must be clearly identified in the report and modeling output files.

5.6 Meteorological Data

The ADMT has prepared meteorological data sets for state modeling analyses. These data sets are available for download from the ADMT Internet page. The http and ftp URLs are

- http://www.tnrcc.state.tx.us/air/nsr_permits *and click on the link to the Air Dispersion Modeling Team*; and
- ftp://ftp.tnrcc.state.tx.us/pub/AirQuality/NewSourceReviewPermits/Modeling *(note that this URL has mixed cases).*

The ADMT's goal is to obtain and process meteorological data sets for PSD modeling analyses. The staff will place these sets on the ADMT Internet page as they are completed. The applicant is responsible for obtaining and preparing any required meteorological data not available from the ADMT.

For PSD permit applications, some unprocessed meteorological data are available on the EPA's SCRAM Internet page. The SCRAM address is http://www.epa.gov/scram001.

Data not available on the SCRAM may be obtained from the National Climatic Data Center. Process the data using the PCRAMMET (EPA, 1998) program. In addition, on-site meteorological data may be used if appropriate and if obtained in accordance with EPA guidance (EPA, 1987b). Certain complex terrain models, such as CTDMPLUS, require on-site meteorological data.

For the commonly used ISC models, the ADMT can provide guidance on meteorological data processing and input options including mixing height, temperature, and anemometer height.

5.6.1 Short-Term Meteorological Data

Short-term meteorological data include standard hourly surface and upper-air observations. These observations must be processed before they can be used in the ISCST model (EPA, 1996; EPA, 1998). For state permit applications, use data for 1988 or 1989 as specified in Appendix C. For PSD demonstrations, process and use the most recent, readily available five years of data available on the SCRAM Internet page, unless the ADMT has placed processed data sets on the ADMT Internet page. Provide an ASCII version of the data with the modeling submittal.

5.6.2 Long-Term Meteorological Data

Long-term meteorological data are used in the ISCLT model. These data—known as STAR summaries—are obtained by processing hourly surface observations (EPA, 1996; EPA, 1998) and include joint frequency distributions of wind speed class, by wind direction sector, by stability category.

For state permit applications, use STAR summaries for each of five years as specified in Appendix C. For PSD permit applications, create a STAR summary for each of the most recent, readily available five years of data (EPA, 1998) unless the ADMT has placed processed data sets on the ADMT Internet page. The meteorological data period used to determine PSD compliance can also be used for any associated state permit modeling.

5.6.3 Anemometer Height

Use the actual height of the anemometer that measured the wind speed observations at the surface station used in the modeling demonstration. Anemometer heights for selected surface stations in Texas are available from the ADMT and also on the ADMT Internet page.

5.6.4 Replacement of Meteorological Data

Replace missing meteorological data before processing them for dispersion modeling. Follow the guidance in *Procedures for Substituting Values for Missing NWS Meteorological Data for Use in Regulatory Air Quality Models* (Atkinson, 1992) to replace missing values.

Replacement of missing data must follow standard procedures. Document and submit all occurrences of missing data and proposed replacement values for the ADMT's approval for any meteorological data that are not available on the SCRAM Internet page or data that are available on the SCRAM Internet page but not complete. Do this *before* performing any modeling.

5.6.5 Replacement of Low Mixing Heights

Occasionally, the PCRAMMET program will generate low hourly mixing heights. These low heights may cause a model to predict unrealistically high concentrations for ground-based and other sources with low release heights. To mitigate this effect, the ADMT has developed a procedure to replace low mixing heights to provide more representative concentrations. The procedure is documented in a memo on the ADMT Internet page.

For state modeling, the ADMT has adjusted all short-term meteorological data sets and placed them on the ADMT Internet page. However, for PSD modeling, the ADMT should approve changes to any data set *before* a modeler uses it.

5.6.6 Gravitational Settling and Deposition Modeling

Contact the ADMT for assistance in developing the additional parameters required to process data sets to support gravitational settling and deposition modeling. Also, ADMT should review the sets and all the data used to develop the specific meteorological parameters required by the PCRAMMET program *before* these sets are used. Provide the following information:

- Surface and upper-air data. Provide how the data were obtained (NCDC, SCRAM, or other source) and station pressure, precipitation amounts, and present weather with precipitation type.

- The procedure used to determine minimum Monin-Obukhov length; anemometer height; surface roughness length at both the measurement and application sites; noontime albedo; Bowen ratio; anthropogenic heat flux; and fraction of net radiation absorbed at the ground. *Note: All parameters are determined for the measurement site except for surface roughness length.*

6.0 Guidance for Determining Nonpoint Source Characterization

The guidance discussed in this section addresses some, but not all, possible ways to model certain types of nonpoint, nontraditional sources. Discuss new procedures with the ADMT before final modeling is conducted. In addition, include a complete description of how a source is characterized and how the applicable modeling parameters were developed in the air quality analysis report.

6.1 Pseudo-Point

If the permit engineer determines it is necessary to model emissions from fugitive sources, and if a pseudo-point characterization is appropriate, then use the following modeling parameters:

- stack exit velocity = 0.001 meter per second;
- stack exit diameter = 0.001 meter;
- stack exit temperature = 0 Kelvin (causes the ISC model to use the ambient temperature as the exit temperature); and
- actual release height.

In addition, there are a number of sources that do not release to the atmosphere through standard stacks. Examples are stacks or vents with rain caps, and stacks or vents that release emissions horizontally. Model these release points using pseudo-point parameters as well.

Other approaches may be taken. Show that the nonstandard point sources being modeled have buoyancy or momentum flux and that their suggested modeling parameters will provide representative impacts.

6.2 Volume

Use the volume source characterization to simulate emissions that initially disperse in three dimensions with little or no plume rise, such as emissions from vents on building roof; multiple vents from a building; and fugitive emissions from pipes, conveyor belts, and roads. Parameters needed are the emission rate, the release height, and the initial horizontal and vertical dimensions of the volume.

The release height is the center of the volume above the ground. Determine the initial horizontal (σ_{y0}) and vertical (σ_{z0}) dimensions—also known as the initial sigmas—for the volume source based on the characterization of the source. That is, first define the height, width, and depth of the release and then use these limiting dimensions to calculate the initial horizontal and vertical dispersion dimensions.

For example, if the length and width of a piping structure is 10 meters and the piping extends from the surface to 20 meters, and the emissions could come from multiple locations throughout the entire structure, then σ_{y0} would be 10 meters divided by 4.3, σ_{z0} would be 20 meters divided by 2.15, and the height of release would be 10 meters. However, if emissions could only come from the upper portions of the piping, for example 10 to 20 meters, then σ_{y0} would be 10 meters divided by 4.3, σ_{z0} would be 10 meters divided by 4.3, and the height of release would be 15 meters.

General guidance for developing σ_{y0} and σ_{z0} is contained in the ISC User's Guide (EPA, 1995d). The ADMT can provide additional ways to characterize emissions from sources such as roads and tanks.

The base of the volume source must be square. If the base is not square, model the source as a series of adjacent volume sources, each with a square base. For relatively uniform sources, determine an equivalent square by taking the square root of the area of the length and width of the volume base.

6.3 Area

Use the area source characterization to simulate emissions that initially disperse in two dimensions with little or no plume rise, such as ground-level or low-level emissions from a storage pile, slag dump, landfill, or holding pond. The area source may be characterized as a rectangle, irregularly shaped polygon, or circle. The model integrates over the portion of the area that is upwind of a receptor so receptors may be placed within the area and at the edge of the area. The model does not integrate for portions of the area that are closer than 1 meter upwind of a receptor. Use an emission rate per unit area instead of total emissions; that is, divide the total emissions in grams per second by the total area in square meters. Detailed guidance is contained in the ISC User's Guide (EPA, 1995d).

6.4 Open Pit

Use the open pit source characterization to simulate emissions that initially disperse in three dimensions with little or no plume rise, such as a surface coal mine or rock quarry. Parameters needed are the open pit emission rate, the average release height, the initial lengths of the X and Y sides of the open pit, the volume of the open pit, and the orientation angle in degrees from 360 degrees (north). While detailed guidance is contained in the ISC User's Guide (EPA, 1995d), some factors to consider follow.

- As with the area source, an emission rate per unit area is used; that is, the total emissions in grams per second divided by the total area in square meters.

- The release height above the base of the open pit cannot exceed the pit's effective depth, which is calculated by the model based on the pit's length, width, and volume. A release height of zero indicates emissions that are released from the base of the pit.

- The length-to-width aspect ratio for open pit sources should be less than 10 to 1. Unlike the area source, the open pit cannot be subdivided because the assumption used to develop the algorithm is that the emissions are mixed throughout the pit before being dispersed. Characterize irregularly shaped pit areas by a rectangular shape of equal area.

- Unlike the area source, receptors cannot be placed within the boundaries of the pit.

6.5 Flares

Flares are a special type of elevated source that may be modeled as a point source. The technique to calculate buoyancy flux for flares generally follows the technique described in the *SCREEN3 Model User's Guide* (EPA, 1995b).

Use the following parameters:

- effective stack exit velocity = 20 meters per second;

- effective stack exit temperature = 1273 Kelvin;

- actual height of the flare tip; and

- effective stack exit diameter.

The effective stack diameter (D) in meters is calculated using the following equations:

$$D = \sqrt{(10^{-6} q_n)} \qquad \text{and} \qquad q_n = q(1 - 0.048\sqrt{MW})$$

where

q = gross heat release in cal/sec;
q_n= net heat release in cal/sec; and
MW = weighted (by volume) average molecular weight of the compound being flared.

Note that enclosed vapor combustion units should not be modeled with the preceding parameters but instead with stack parameters that reflect the physical characteristics of the unit.

6.6 Road Emissions

The permit engineer will evaluate fugitive dust from road emissions as part of the technical review of the permit as applicable; however, road emissions should only be included in the modeling analysis in limited circumstances.

6.6.1 When to Exclude from Modeling

In general,

- Do not include road emissions in permit modeling analyses for short-term averaging periods—periods less than annual.

- Do not include road emissions in permit modeling analyses for an annual averaging period if:

  - they cannot be accurately quantified; *or*

  - they will not be generated in association with the transport, storage, or transfer of materials (raw, intermediate, and waste), including sand, gravel, caliche, or other road-base aggregates; *and*

  - the engineer omits them from the modeling demonstration because the applicant will use best management practices to control them.

Rationale: This guidance is based on the process developed to quantify an emission rate for fugitive dust generated by vehicle traffic over roads. Calculations to determine emissions from roads involve a number of parameters, most of which cannot be accurately estimated unless they are measured at a specific site. In addition, the values for these parameters can vary over a wide range and in many cases depend upon recent meteorological events, such as rainfall. The *Compilation of Air Pollutant Emission Factors (*AP-42) (EPA, 1995c) indicates that unless site-specific information is used, lower confidence levels are placed upon emission estimates based on time periods of less than one year.

However, even with higher confidence levels, unrepresentative predictions of concentrations from road emissions are likely due to the modeling process. The modeling process is based on the assumption that emissions are continuous. The amount of road emissions is directly related to the type and amount of road traffic, which is usually not continuous or uniform. Combined with worst-case operating scenarios, the modeling tool will overpredict concentrations, particularly in the vicinity of the source, and may incorrectly identify road emissions as the major cause of air pollution at a site. Often the use of control measures and best management practices are the most effective means to address off-property impacts from road sources. In addition, road emissions must meet the opacity limits in 30 TAC Chapter 111 [§111.111(a)(8)] and the nuisance provision in 30 TAC Chapter 101 (§101.4).

6.6.2 Modeling Road Emissions

If road emissions must be modeled, the emissions can be represented as volume sources, as suggested in the ISC User's Guide (EPA, 1995d). A procedure to develop model input parameters follows. The applicant can use other procedures on a case-by-case basis but must demonstrate that those procedures would be appropriate.

Volume Source Characterization: Follow the eight steps described in the following paragraphs.

Volume Step 1: Determine the adjusted width of the road. The adjusted width is the actual width of the road plus 6 meters. The additional width represents turbulence caused by the vehicle as it moves along the road. This width will represent a side of the base of the volume.

Volume Step 2: Determine the number of volume sources, N. Divide the length of the road by the adjusted width. The result is the maximum number of volume sources that could be used to represent the road.

Volume Step 3: Determine the height of the volume. The height will be equal to twice the height of the vehicle generating the emissions—round to the nearest meter.

Volume Step 4: Determine the initial horizontal sigma for each volume.

- If the road is represented by a single volume, divide the adjusted width by 4.3.

- If the road is represented by adjacent volumes, divide the adjusted width by 2.15.

- If the road is represented by alternating volumes, divide twice the adjusted width—measured from the center point of the first volume to the center point of the next represented volume—by 2.15. Start with the volume nearest to the property line. This representation is often used for long roads.

Volume Step 5: Determine the initial vertical sigma. Divide the height of the volume determined in Step 3 by 2.15.

Volume Step 6: Determine the release point. Divide the height of the volume by two. This point is in the center of the volume.

Volume Step 7: Determine the emission rate for each volume used to calculate the initial horizontal sigma in Step 4. Divide the total emission rate equally among the individual volumes used to represent the road, unless there is a known spatial variation in emissions.

Volume Step 8: Determine the UTM coordinate for the release point. The release point location is in the center of the base of the volume. This location must be at least one meter from the nearest receptor.

6.7 Wind-Generated Particulate Emissions

Wind-generated particulate emissions from drop operations and working storage piles depend upon the wind speed, with the emission rate normally calculated based upon an average wind speed. Additionally, the fastest-mile wind speed is used to determine the threshold friction velocity in order to estimate windblown emissions from standing storage piles (EPA, 1995c).

The predicted concentrations from these sources may be too conservative, since wind speeds will vary in the model—but the emission rates are based on a fixed wind speed. Adjust the screening or refined analysis to compensate for this effect. The following paragraphs give examples.

Case 1: Average Wind Speed; Screening Analysis; SCREEN Model: Use the wind speed nearest to the speed used to determine the emission rate with each applicable stability class according to Table 2 in the SCREEN user's guide (EPA, 1995b). For example, if the wind speed were 11 meters/second (m/s), run the model twice: once for a wind speed of 10 m/s and stability class C, and again for stability class D. Use the highest predicted concentration.

Case 1: Average Wind Speed; Refined Analysis; ISCST Model*:* Use the appropriate emission-rate scalar for each wind-speed category that contains wind speeds less than the average wind speed used to determine the emission rate. Calculate the scalar based on the ratio of each applicable wind-speed category upper-bound value to the average wind speed used to determine the emission rate. The upper bounds of the wind-speed categories 1 through 6 are 1.54 meters/second (m/s) 3.09 m/s, 5.14 m/s, 8.23 m/s, 10.8 m/s, and unlimited, respectively. Raise the ratio to the 1.3 power and use the resulting scalar for each applicable wind-speed category. Enter a one (1) for all wind-speed categories equal to or greater than the average wind speed.

For example, assume the average wind speed used to calculate the emission rate is 5.36 m/s. To determine the scalar for the first wind-speed category, divide the upper bound of the first category by the average wind speed and raise the result to the 1.3 power, or $(1.54 \text{ m/s} \div 5.36 \text{ m/s})^{1.3}$ = 0.198. The scalar for the second and third wind-speed categories would be 0.489 and 0.947, respectively. The scalars for the remaining wind-speed categories would be 1.

Case 2: Fastest-Mile Wind Speed; Screening Analysis; SCREEN Model: Determine the lowest fastest-mile wind speed applicable for the project. Determine the threshold friction velocity. Determine the lowest 10-meter wind speed that would result in an exceedance of the threshold friction velocity. Find the corresponding wind speed if the wind were measured at a height less than 10 meters. Use the lowest wind speed or corresponding wind speed nearest to the wind speed that would result in an exceedance of the threshold friction velocity with each applicable stability class according to Table 2 in the SCREEN user's guide (EPA, 1995b). Use the appropriate anemometer height.

For example, if the wind speed were 9 m/s, run the model twice: once for a wind speed of 9 m/s and stability class C, and again for stability class D. Use the highest predicted concentration.

Case 2: Fastest-Mile Wind Speed; Refined Analysis; ISCST Model: Determine the lowest fastest-mile wind speed applicable for the project. Determine the threshold friction velocity. Determine the lowest 10-meter wind speed that would result in an exceedance of the threshold friction velocity. Find the corresponding wind speed if the speed were measured at a height less than 10 meters. Enter a zero (0) in each wind-speed category whose upper bound is less than the corresponding wind speed. Enter a one (1) for all wind-speed categories that equal or exceed the 10-meter or corresponding wind speed.

There may be other approaches. Obtain ADMT review and comment on any approach before using it.

7.0 Reporting Requirements

Include in the air quality analysis report a written discussion covering the project, the modeling performed, and the results. This analysis should contain at least the items in Appendix F.

The air quality analysis report is a stand-alone document. Results from the report should be sufficient to make a decision without input from other reports. Do not refer to other documents or reports for data required to be in the report. In addition, do not exclude items without coordination with the ADMT, unless the items are clearly not applicable to the project. Follow the reporting requirements to expedite the technical review of the air quality analysis and to eliminate unnecessary modeling.

Occasionally, the staff may ask for additional data files. An efficient way to transmit them is via the New Source Review Permits ftp site. The ftp URL for incoming data is

- ftp://ftp.tnrcc.state.tx.us/incoming/AirQuality/NewSourceReviewPermits/Modeling. *Note that this URL has mixed cases.*

8.0 Transmittal of the Air Quality Analysis Report

Send the air quality analysis report to the permit engineer that requested the analysis. In addition, for PSD applications send a copy of the report—with no disks or paper copies of the modeling and downwash files—to EPA Region 6 at the following address:

U.S. Environmental Protection Agency Region 6
New Source Review Section (6PD-R)
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

The permit engineer reviews the report and determines the need for a technical review, or audit, by the ADMT.

8.1 Request for ADMT Technical Review

Frequently, the permit engineer requests that the ADMT conduct a technical review, or audit, of an air quality analysis. The purpose of the review is to ensure that the procedure used to demonstrate compliance with applicable standards or guidelines was technically correct and that the predicted concentrations can be used in the technical review process.

If a review is required, the permit engineer sends an audit request to the ADMT team leader, who then assigns the project to one of the staff.

Normal turnaround time is from two to four weeks depending on overall unit workload, complexity of the project, completeness of the submittal, and deficiencies that must be evaluated.

8.2 Modeling Technical Review Process

Before the technical review begins, the ADMT modeler contacts the applicant's modeler to advise that he or she will review the air quality analysis. The review is done to ensure that the modeling output is technically representative and sufficient and that any deviations from guidance do not significantly affect the compliance demonstration. As the review progresses, the ADMT provides the status of the review as appropriate to the applicant's modeler and the permit engineer.

To assist the ADMT, follow reporting requirements and provide clear documentation of how the modeling was done and what assumptions were made. In addition, include in the air quality analysis any calculations that were necessary to develop the input data required to run the selected model.

If the ADMT staff finds errors or discrepancies, they attempt to evaluate them and determine whether they would cause a significant change in the magnitude or location of predicted concentrations—that is, whether the concentrations would be technically representative and usable by the staff to determine whether the permit should be issued. The ADMT will work closely with the permit engineer and the applicant's modeler to resolve omissions, unclear documentation, or other problems.

If the ADMT cannot resolve a modeling deficiency, then the modeling submittal is not accepted, and recommended corrective actions are forwarded to the permit engineer.

9.0 Common Shortfalls in Modeling Reports

Evaluating or correcting modeling shortfalls during the modeling technical review process takes time, which lengthens the overall permitting process. The ADMT routinely finds similar errors, discrepancies, or omissions in modeling reports. The staff believes that modelers can identify and correct most shortfalls during the quality control process if they understand the audit process and can recognize them. Therefore, some specific examples of potential shortfall areas follow.

9.1 Modeling Emissions Inventory

The modeling emissions inventory is one of the most important parts of the modeling demonstration. Ensure that the data entered into the modeling files match the data represented in the body of the report. For example:

- Ensure that emission rates, source locations, or stack parameters entered into the modeling input files agree with corresponding parameters listed on the Table 1(a) of the permit application or other data represented in the report. Table 1(a) data are representations in the permit application, and the modeling should reflect these data.

- Match emission point identifiers used in the Table 1(a) with those used in the modeling input files. That is, the nomenclature or emission point identification scheme used in the modeling should be the same as the one used in the permit application or air quality analysis.

- Include in the modeling demonstration all emission points represented in the permit application.

- Do not rotate source coordinates to align them with true north if they were converted from a plant coordinate system to the UTM projection.

9.2 Plot Plans or Area Maps

The plot plans and area maps submitted with the permit application do not normally need the detail required for a modeling demonstration. However, once the permit engineer requests that modeling be conducted, annotate the plans and maps as necessary to conduct modeling or audit the modeling process. That is, ensure that plot plans or area maps have enough information to accurately determine the location of emission points; locations and dimensions of downwash structures (length, width, and height); property lines; locations of sensitive receptors; and terrain elevations.

9.3 Building Wake Effects (Downwash)

Downwash can significantly affect dispersion. Use the BPIP to determine downwash parameters. Ensure that the data entered into the BPIP match the data represented in the body of the report. For example:

- Ensure matching among data listed in downwash input files, Table 1(a) of the permit application, plot plan, and modeling input files. These data include source location, source base elevation, source height, and source identifiers referred to in the Modeling Emissions Inventory Section (9.1).

- On the plot plan or in a supplemental table, annotate the base elevations and dimensions (length, width, and height) of the structures used in the BPIP.

- Include all structures indicated on the plot plan in the BPIP unless they clearly could not be downwash structures for the stacks being modeled.

- Consider all potential downwash structures. While wake effects are commonly referred to as *building downwash*, tanks and permanent land features could also be "structures."

- Do not rotate building or structure coordinates to align them with true north if they were converted from a plant coordinate system to the UTM projection.

9.4 Receptor Grid

The number of receptors in a grid is one of the key factors modelers consider when determining computer run time. However, ensure that time or cost considerations do not adversely affect the completeness of the modeling demonstration. For example:

- Design grids with receptors spaced close enough to each other and that extend far enough from the emission point to demonstrate that the maximum concentration was found. If receptors are spaced too far apart, predicted concentrations could be significantly lower than they would be if intermediate receptors were added. In addition, extend the grid far enough to show that concentrations are decreasing. More receptors are needed if concentrations increase at the edge of the grid.

- Design grids to completely define the AOI. Extend the grid far enough to demonstrate that concentrations have decreased below the applicable de minimis.

- Avoid using a hot-spot technique. That is, do not place fine or tight grids only near the highest concentration found on the coarse receptor grid. Evaluate concentrations slightly below the maximum concentration that may be predicted in other areas.

- Use receptor elevations in simple-to-complex terrain. Predicted concentrations can increase significantly if the terrain in the vicinity of the sources is near or above the height of the sources.

9.5 Auer Land-Use Analysis

The selection of dispersion coefficients is an important part of the modeling process. The primary method to determine these coefficients is the Auer land-use analysis. This analysis should have enough detail to justify the selection of the coefficient. If the land-use designation represents less than 70 percent of the total, supplement the analysis as discussed in Section 5.1.

9.6 Omitted or Incomplete Data

Ensure that all required concentration maps, modeling and downwash input and output files, boundary files, plot files, and other required data are complete and submitted with the modeling report. Most data can be submitted on a diskette rather than in paper format. This saves paper yet gives the ADMT access to the data as required during the technical review process. In addition, if the ADMT finds an error, access to all the input files can be useful to determine whether the error would cause a significant change in the magnitude or location of the predicted concentrations.

9.7 Meteorological Data

Several years ago the National Weather Service (NWS) had a goal to standardize anemometer heights at 10 meters. Consequently, most models, including the ISC models, have default anemometer heights set at 10 meters. Unfortunately, the NWS program was delayed. Since surface meteorological data may have been obtained from anemometers at various heights, ensure that the proper anemometer height is used in the modeling demonstration. Heights are available on the ADMT Internet page.

10.0 References

Atkinson, Dennis and Russell F. Lee, 1992: *Procedures for Substituting Values for Missing NWS Meteorological Data for Use in Regulatory Air Quality Models.*

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

EPA, 1985: *Guideline for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations),* (Revised), EPA-450/4-80-023R, June, 1985. U.S. Environmental Protection Agency, Office of Air and Radiation, Office of Air Quality Planning and Standards, Research Triangle Park, NC.

EPA, 1987a: *Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD)*, EPA-450/4-87-007, May, 1987. U.S. Environmental Protection Agency, Research Triangle Park, NC.

EPA, 1987b: *On-Site Meteorological Program Guidance for Regulatory Modeling Applications*, EPA-450/4-87-013, June, 1987. U.S. Environmental Protection Agency, Research Triangle Park, NC.

EPA, 1990: *Draft New Source Review Workshop Manual*, Draft, October, 1990. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC.

EPA, 1992a: *Technical Implementation Document for EPA's Boiler and Industrial Furnace Regulations,* EPA 530-R-92-011, March, 1992. U.S. Environmental Protection Agency, Office of Solid Waste, Washington DC.

EPA, 1992b: *Screening Procedures for Estimating the Air Quality Impact of Stationary Sources*, Revised, EPA-450/R-92-019, October, 1992. U.S. Environmental Protection Agency, Office of Air and Radiation, Office of Air Quality Planning and Standards, Research Triangle Park, NC.

EPA, 1992c: *Workbook for Plume Visual Impact Screening and Analysis*, EPA-454/R-92-023, October, 1992. U.S. Environmental Protection Agency, Office of Air and Radiation, Office of Air Quality Planning and Standards, Research Triangle Park, NC.

EPA, 1992d: *User's Manual for the Plume Visibility Model (PLUVUE II)*, (Revised), EPA-454/B-92-008, September, 1992. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Technical Support Division, Research Triangle Park, NC.

EPA, 1993a*: User's Guide to the Building Profile Input Program*, October, 1993. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Technical Support Division, Research Triangle Park, NC.

EPA, 1993b: *Requirements for Quality Assurance Project Plans for Environmental Data Operations* (QA/R5) July, 1993. U.S. Environmental Protection Agency, Quality Assurance and Management Staff, Washington, DC.

EPA, 1995a*: Guideline on Air Quality Models,* (Revised), EPA-450/2-78-027R-C August, 1995. U.S. Environmental Protection Agency, Office of Air and Radiation, Office of Air Quality Planning and Standards, Research Triangle Park, NC.

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

EPA, 1995c: *Compilation of Air Pollutant Emission Factors,* AP-42, January, 1995. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC.

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

EPA, 1996*: Meteorological Processor for Regulatory Models (MPRM) User's Guide*, EPA-454/B-96-002, August, 1996. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Technical Support Division, Research Triangle Park, NC.

EPA, 1998*: PCRAMMET User's Guide*, August, 1998. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Emissions, Monitoring, and Analysis Division, Research Triangle Park, NC.

Scheffe Richard D., 1988: *VOC/NOx Point Source Screening Tables*, *draft.*

TNRCC, 1996: 30 TAC Chapter 111, *Control of Air Pollution from Visible Emissions and Particulate Matter*, September, 1996.

TNRCC, 1997a 30 TAC Chapter 112, *Control of Air Pollution from Sulfur Compounds*, July, 1997.

TNRCC, 1997b: 30 TAC Chapter 101, *General Rules*, December, 1997.

TNRCC, 1998a: *Modeling and Effects Review Applicability* technical guidance package, RG-324, August, 1998.

TNRCC, 1998b: 30 TAC Chapter 116, *Control of Air Pollution by Permits for New Construction or Modification*, December, 1998.

40 CFR, 51: Code of Federal Regulations, Title 40 (Protection of Environment), Part 51. Office of the Federal Register National Archives and Records Administration.

40 CFR, 52: Code of Federal Regulations, Title 40 (Protection of Environment), Part 52. Office of the Federal Register National Archives and Records Administration.

40 CFR, 266: Code of Federal Regulations, Title 40 (Protection of Environment), Part 266. Office of the Federal Register National Archives and Records Administration.

Appendix A

Values for Comparison with Modeling Results

Table A-1. Values for Comparison with Modeling Results

Air Constituent	Averaging Time	NAAQS Primary ($\mu g/m^3$)	NAAQS Secondary ($\mu g/m^3$)	TNRCC Regulation Standard	PSD Monitoring Significance ($\mu g/m^3$)	De Minimis ($\mu g/m^3$)	PSD Increment Class II Area ($\mu g/m^3$)
Sulfur Dioxide	30-min. [a]	---	---	0.4 ppm [b] (1021 $\mu g/m^3$)	---	---	---
	3-hr.	---	1300	---	---	25	512
	24-hr.	365	---	---	13	5	91
	Annual	80	---	---	---	1	20
Hydrogen Sulfide	30-min. [a]	---	---	0.08 ppm [c] (108 $\mu g/m^3$)	---	---	---
	30-min. [a]	---	---	0.12 ppm [d] 162 $\mu g/m^3$	---	---	---
Sulfuric Acid	1-hr.	---	---	50 $\mu g/m^3$	---	---	---
	24-hr.	---	---	15 $\mu g/m^3$	---	---	---
Total Reduced Sulfur	1-hr.	---	---	---	10 [e]	---	---
Reduced Sulfur Compounds	1-hr.	---	---	---	10 [e]	---	---
Particulate Matter (PM)	1-hr.	---	---	400 $\mu g/m^3$	---	---	---
	3-hr.	---	---	200 $\mu g/m^3$	---	---	---
Inhalable Particulate Matter (PM_{10}) [f]	24-hr.	150	150	---	10	5	30
	Annual	50	50	---	---	1	17
Fine Particulate Matter ($PM_{2.5}$) [g]	24-hr.	65	65	---	---	---	---
	Annual	15	15	---	---	---	---
Nitrogen Dioxide	Annual	100	100	---	14	1	25
Carbon Monoxide	1-hr.	40,000	---	---	---	2,000	---
	8-hr.	10,000	---		575	500	---
Lead (Elemental)	3-mo. (Calendar Quarter)	1.5	---	---	0.1	---	---
Ozone [h]	1-hr. 8-hr.	235 80	235 80	---	---	100 tons VOC	---
Fluorides [I]	24-hr.				0.25		
Other Constituents	1-hr.	---	---	j	---	k	---
	Annual	---	---	j	---	k	---

Notes to Table A-1

a Use the predicted 1-hour concentration to compare with 30-minute standards.

b Conversion from parts-per-million (ppm) to micrograms-per-cubic meter (µg/m$^{3)}$ assuming temperature = 90 degrees Fahrenheit (F) (TNRCC, 1997). Standard is 0.28 ppm (715 µg/m3) for Galveston and Harris Counties and 0.32 ppm (817 µg/m3) (net ground level concentration from all sources on-property) for Jefferson and Orange Counties.

c Conversion from ppm to µg/m^3 assuming temperature = 90 degrees F (TNRCC, 1997). Use this standard if property downwind is used for residential, recreational, business or commercial purposes.

d Conversion from ppm to µg/m^3 assuming temperature = 90 degrees F (TNRCC, 1997). Use this standard if property downwind is used for other than residential, recreational, business or commercial purposes.

e 40 CFR 52.21 (I)(8)(I). Acceptable monitoring techniques may not be available at this time (40 CFR, 52).

f There was no change to the numerical value of the standards or increment; however, the form of the 1997 24-hour standard changed. Both pre-1997 and 1997 standards apply to both attainment and unclassified areas until revoked by EPA.

g Implementation procedures under development by EPA.

h The 1-hour standard applies to nonattainment areas. The 8-hour standard applies everywhere else.

I Does not include hydrogen fluoride.

j Not defined in a specific regulation but determined on a case-by-case basis. See the NSRP Internet page or contact the Toxicology and Risk Assessment Section to obtain current ESLs.

k See the *Modeling and Effects Review Applicability* guidance package for values that may be applicable on a project-by-project basis (TNRCC, 1998b).

Appendix B

Screening Factors and Ratio Techniques

Screening Factors. For averaging times greater than one hour, the maximum concentration will generally be less than the 1-hour value. Use the factors in Table B-1 to convert point and volume source related concentrations (EPA, 1992a and ADMT memo on the ADMT Internet page for lead modeling). Do not use the multiplying factors to obtain concentrations from area sources for averaging times greater than one hour. Concentrations close to an area source will not vary as much as those for point and volume sources in response to varying wind directions, and the meteorological conditions which are likely to give maximum 1-hour concentration can persist for several hours. Therefore, to be conservative, ADMT recommends that the maximum 1-hour concentrations for area sources be assumed to apply for averaging periods out to 24 hours.

Table B - 1. Multiplying Factors to Convert 1-Hour Point and Volume Source Concentrations to Other Averaging Times

Averaging Time	Multiplying Factor
3-Hour	0.9
8-Hour	0.7
24-Hour	0.4*
Quarterly	0.2*
Annual	0.08*

* Can be used for area sources.

Ratio Technique 1. This technique uses a unit emission rate (1 pound per hour or 1 gram per second) to determine if the maximum contribution from each permitted source when added together, independent of time and space, could exceed a standard or ESL. This is a conservative procedure since the maximum concentration from all sources modeled concurrently cannot be more than the sum of the maximum concentration from each source modeled separately.

Each source is evaluated separately with a unit emission rate, such as 1 pound per hour or 1 gram per second; the source's actual location; and the source's proposed stack parameters represented in the permit application. In the ISC models this is done by setting up a separate source group for each source. The SCREEN model can also be used for this demonstration with a separate SCREEN model run for each source.

The maximum predicted concentration for each source is then multiplied by the appropriate emission rate factor for each source and for each pollutant. The emission rate factor is the ratio of the approved emission rate divided by the unit emission rate.

The sum of the maximum concentrations (for each pollutant, independent of time and space) is then compared with the threshold of concern for each pollutant. If the sum for any pollutant is greater than that value, then refined modeling may be required and if so, enter the emission rate for each source for this pollutant into the model for additional evaluation so that time and space are considered.

Determining individual source contributions to the ALL source group maximum concentration in the ISC model is not appropriate unless there is only one source or the pollutants are emitted in exactly the same amount for all sources, or pollutants are emitted in exactly the same ratio for all sources.

Ratio Technique 2. One pollutant is modeled for all sources with TNRCC approved emission rates and stack parameters. Other TNRCC approved pollutant emission rates are then compared with the modeled pollutant emission rate to determine the source which has the maximum ratio. This maximum ratio is then multiplied by the predicted maximum off-property concentration for the pollutant modeled. If the resulting maximum concentration exceeds a value of concern, then additional refined modeling may be needed and, if so, enter the emission rate for each source of this pollutant into the model.

Ambient Ratio Method. The EPA adopted a new method to predict annual NO_2 concentrations [GAQM, Section 6.2.3 (EPA, 1995a)] that can be applied during screening modeling or refined modeling. This method consists of two approaches. One approach applies a conversion factor to the emission rate, and the other applies a conversion factor to the predicted concentration. The process is outlined in the following steps that do not need to be applied in sequence.

Step 1: Assume total conversion of NO_X to NO_2. Use the NO_X emission rate as a surrogate for the NO_2 emission rate. Conduct screening or refined modeling, as applicable. This approach is conservative but is not realistic. If the concentration exceeds the de minimis or NAAQS (with background concentration added), go to Step 2.

Step 2: Apply a conversion factor to the predicted concentration.

Step 2a: Assume limited conversion of NO_X to NO_2. Multiply the predicted annual NO_X concentration by the national default of 0.75. This approach is conservative. If additional refinement is needed, go to Step 2b if applicable.

Step 2b: Obtain a representative factor for conversion of NO_X to NO_2. Multiply the predicted annual NO_X concentration by a measured NO_2 / NO_X ratio obtained from a site-specific or representative regional air monitor.

Step 3: Apply a conversion factor to the emission rate.

Step 3a: Assume limited conversion of NO_X to NO_2. Multiply the NO_X emission rate by the national default of 0.75. This approach is conservative. Conduct screening or refined modeling, as applicable. If additional refinement is needed, go to Step 3b, if applicable.

Step 3b: Obtain a representative factor for conversion of NO_X to NO_2. Multiply the emission rate by a measured NO_2 / NO_X ratio obtained from a site-specific or representative regional monitor. Conduct screening or refined modeling, as applicable.

Appendix C

Meteorological Stations by County

Table C-1 contains a composite listing of meteorological stations and counties to standardize the selection of meteorological data for Texas permit applications. Suggested NWS surface, upper-air, and STAR stations are specified for each county. A modeler may suggest other data sets if they would be more representative for the source location. Table C-2 contains NWS stations, call signs, and identification numbers. Table C-3 shows new NWS upper-air stations. The relocation of these stations results in different upper-air stations for several counties for PSD demonstrations. Of immediate interest are the counties that use Victoria upper-air station data, as that station was moved to Corpus Christi and became operational in 1989, with 1990 as the first year with usable data.

The ADMT has preprocessed meteorological data sets for state modeling, but has not preprocessed sets for PSD modeling yet. However, a staff goal is to provide all meteorological data for both state and PSD modeling. The staff will place a notice on the ADMT Internet page as data sets are created.

The required year for short-term state modeling is currently 1988 (or 1989 for Shreveport data sets). The required years for long-term state modeling are currently 1985 through 1989 (1985-1987, 1989-1990 for Shreveport). Required years for PSD modeling are the most recent, readily available five years of data for both short-term and long-term modeling. Most recent, readily available means that the data are available on the EPA SCRAM or the ADMT Internet page. For example, for permit modeling in Anderson County:

- State Permit
  Short term - Waco surface and Longview upper-air data from 1988;
  Long term - Waco STAR data for each year of the five-year period from 1985 through 1989.

- PSD Permit
  Short term - Waco surface and Longview upper-air data for each year of the appropriate five-year period;
  Long term - Waco STAR data for each year of the appropriate five-year period.

Table C-1. Meteorological Stations by County

County	Surface	Upper Air	STAR
Anderson	Waco	Longview	Waco
Andrews	Midland	Midland	Midland
Angelina	Shreveport	Longview	Shreveport
Aransas	Corpus Christi	Victoria	Corpus Christi
Archer	Wichita Falls	Stephenville	Wichita Falls
Armstrong	Amarillo	Amarillo	Amarillo
Atascosa	San Antonio	Del Rio	San Antonio
Austin	Austin	Victoria	Austin
Bailey	Lubbock	Amarillo	Lubbock
Bandera	San Antonio	Del Rio	San Antonio
Bastrop	Austin	Victoria	Austin
Baylor	Wichita Falls	Stephenville	Wichita Falls
Bee	Corpus Christi	Victoria	Corpus Christi
Bell	Waco	Stephenville	Waco
Bexar	San Antonio	Del Rio	San Antonio
Blanco	Austin	Del Rio	Austin
Borden	Midland	Midland	Midland
Bosque	Waco	Stephenville	Waco
Bowie	Shreveport	Longview	Shreveport
Brazoria	Houston Intercontinental	Lake Charles	Houston Intercontinental
Brazos	Austin	Victoria	Austin
Brewster	El Paso	El Paso	El Paso
Briscoe	Amarillo	Amarillo	Amarillo
Brooks	Brownsville	Brownsville	Brownsville
Brown	San Angelo	Stephenville	San Angelo
Burleson	Austin	Victoria	Austin
Burnet	San Angelo	Stephenville	San Angelo
Caldwell	Austin	Victoria	Austin
Calhoun	Victoria	Victoria	Victoria
Callahan	Abilene	Stephenville	Abilene

County	Surface	Upper Air	STAR
Cameron	Brownsville	Brownsville	Brownsville
Camp	Shreveport	Longview	Shreveport
Carson	Amarillo	Amarillo	Amarillo
Cass	Shreveport	Longview	Shreveport
Castro	Amarillo	Amarillo	Amarillo
Chambers	Houston Intercontinental	Lake Charles	Houston Intercontinental
Cherokee	Shreveport	Longview	Shreveport
Childress	Amarillo	Amarillo	Amarillo
Clay	Wichita Falls	Stephenville	Wichita Falls
Cochran	Lubbock	Amarillo	Lubbock
Coke	San Angelo	Midland	San Angelo
Coleman	San Angelo	Stephenville	San Angelo
Collin	Dallas/Ft. Worth	Stephenville	Dallas/Ft. Worth
Collingsworth	Amarillo	Amarillo	Amarillo
Colorado	Victoria	Victoria	Victoria
Comal	San Antonio	Del Rio	San Antonio
Comanche	San Angelo	Stephenville	San Angelo
Concho	San Angelo	Stephenville	San Angelo
Cooke	Dallas/Ft. Worth	Stephenville	Dallas/Ft. Worth
Coryell	Waco	Stephenville	Waco
Cottle	Lubbock	Amarillo	Lubbock
Crane	Midland	Midland	Midland
Crockett	Midland	Midland	Midland
Crosby	Lubbock	Amarillo	Lubbock
Culberson	El Paso	El Paso	El Paso
Dallam	Amarillo	Amarillo	Amarillo
Dallas	Dallas/Ft. Worth	Stephenville	Dallas/Ft. Worth
Dawson	Midland	Midland	Midland
Deaf Smith	Amarillo	Amarillo	Amarillo
Delta	Shreveport	Longview	Shreveport

County	Surface	Upper Air	STAR
Denton	Dallas/Ft. Worth	Stephenville	Dallas/Ft. Worth
De Witt	Victoria	Victoria	Victoria
Dickens	Lubbock	Amarillo	Lubbock
Dimmit	San Antonio	Del Rio	San Antonio
Donley	Amarillo	Amarillo	Amarillo
Duval	San Antonio	Del Rio	San Antonio
Eastland	Abilene	Stephenville	Abilene
Ector	Midland	Midland	Midland
Edwards	San Antonio	Del Rio	San Antonio
Ellis	Dallas/Ft. Worth	Stephenville	Dallas/Ft. Worth
El Paso	El Paso	El Paso	El Paso
Erath	Abilene	Stephenville	Abilene
Falls	Waco	Stephenville	Waco
Fannin	Dallas/Ft. Worth	Stephenville	Dallas/Ft. Worth
Fayette	Austin	Victoria	Austin
Fisher	Abilene	Stephenville	Abilene
Floyd	Lubbock	Amarillo	Lubbock
Foard	Wichita Falls	Stephenville	Wichita Falls
Fort Bend	Houston Intercontinental	Lake Charles	Houston Intercontinental
Franklin	Shreveport	Longview	Shreveport
Freestone	Waco	Longview	Waco
Frio	San Antonio	Del Rio	San Antonio
Gaines	Midland	Midland	Midland
Galveston	Houston Intercontinental	Lake Charles	Houston Intercontinental
Garza	Lubbock	Amarillo	Lubbock
Gillespie	San Angelo	Del Rio	San Angelo
Glasscock	Midland	Midland	Midland
Goliad	Victoria	Victoria	Victoria
Gonzales	San Antonio	Victoria	San Antonio
Gray	Amarillo	Amarillo	Amarillo

County	Surface	Upper Air	STAR
Grayson	Dallas/Ft. Worth	Stephenville	Dallas/Ft. Worth
Gregg	Shreveport	Longview	Shreveport
Grimes	Houston Intercontinental	Victoria	Houston Intercontinental
Guadalupe	San Antonio	Victoria	San Antonio
Hale	Lubbock	Amarillo	Lubbock
Hall	Amarillo	Amarillo	Amarillo
Hamilton	San Angelo	Stephenville	San Angelo
Hansford	Amarillo	Amarillo	Amarillo
Hardeman	Wichita Falls	Stephenville	Wichita Falls
Hardin	Beaumont	Lake Charles	Beaumont
Harris	Houston Intercontinental	Lake Charles	Houston Intercontinental
Harrison	Shreveport	Longview	Shreveport
Hartley	Amarillo	Amarillo	Amarillo
Haskell	Abilene	Stephenville	Abilene
Hays	Austin	Victoria	Austin
Hemphill	Amarillo	Amarillo	Amarillo
Henderson	Waco	Longview	Waco
Hidalgo	Brownsville	Brownsville	Brownsville
Hill	Waco	Stephenville	Waco
Hockley	Lubbock	Amarillo	Lubbock
Hood	Dallas/Ft. Worth	Stephenville	Dallas/Ft. Worth
Hopkins	Shreveport	Longview	Shreveport
Houston	Waco	Longview	Waco
Howard	Midland	Midland	Midland
Hudspeth	El Paso	El Paso	El Paso
Hunt	Dallas/Ft. Worth	Stephenville	Dallas/Ft. Worth
Hutchinson	Amarillo	Amarillo	Amarillo
Irion	San Angelo	Midland	San Angelo
Jack	Abilene	Stephenville	Abilene
Jackson	Victoria	Victoria	Victoria

County	Surface	Upper Air	STAR
Jasper	Shreveport	Lake Charles	Shreveport
Jeff Davis	El Paso	El Paso	El Paso
Jefferson	Beaumont	Lake Charles	Beaumont
Jim Hogg	San Antonio	Del Rio	San Antonio
Jim Wells	Corpus Christi	Brownsville	Corpus Christi
Johnson	Dallas/Ft. Worth	Stephenville	Dallas/Ft. Worth
Jones	Abilene	Stephenville	Abilene
Karnes	San Antonio	Victoria	San Antonio
Kaufman	Dallas/Ft. Worth	Stephenville	Dallas/Ft. Worth
Kendall	San Antonio	Del Rio	San Antonio
Kenedy	Brownsville	Brownsville	Brownsville
Kent	Lubbock	Amarillo	Lubbock
Kerr	San Antonio	Del Rio	San Antonio
Kimble	San Angelo	Del Rio	San Angelo
King	Lubbock	Amarillo	Lubbock
Kinney	San Antonio	Del Rio	San Antonio
Kleberg	Corpus Christi	Brownsville	Corpus Christi
Knox	Wichita Falls	Stephenville	Wichita Falls
Lamar	Shreveport	Longview	Shreveport
Lamb	Lubbock	Amarillo	Lubbock
Lampasas	San Angelo	Stephenville	San Angelo
La Salle	San Antonio	Del Rio	San Antonio
Lavaca	Victoria	Victoria	Victoria
Lee	Austin	Victoria	Austin
Leon	Waco	Longview	Waco
Liberty	Houston Intercontinental	Lake Charles	Houston Intercontinental
Limestone	Waco	Stephenville	Waco
Lipscomb	Amarillo	Amarillo	Amarillo
Live Oak	Corpus Christi	Victoria	Corpus Christi
Llano	San Angelo	Del Rio	San Angelo

County	Surface	Upper Air	STAR
Loving	Midland	Midland	Midland
Lubbock	Lubbock	Amarillo	Lubbock
Lynn	Lubbock	Amarillo	Lubbock
Madison	Waco	Longview	Waco
Marion	Shreveport	Longview	Shreveport
Martin	Midland	Midland	Midland
Mason	San Angelo	Del Rio	San Angelo
Matagorda	Victoria	Victoria	Victoria
Maverick	San Antonio	Del Rio	San Antonio
McCulloch	San Angelo	Stephenville	San Angelo
McLennan	Waco	Stephenville	Waco
McMullen	San Antonio	Del Rio	San Antonio
Medina	San Antonio	Del Rio	San Antonio
Menard	San Angelo	Stephenville	San Angelo
Midland	Midland	Midland	Midland
Milam	Austin	Victoria	Austin
Mills	San Angelo	Stephenville	San Angelo
Mitchell	Midland	Midland	Midland
Montague	Wichita Falls	Stephenville	Wichita Falls
Montgomery	Houston Intercontinental	Lake Charles	Houston Intercontinental
Moore	Amarillo	Amarillo	Amarillo
Morris	Shreveport	Longview	Shreveport
Motley	Lubbock	Amarillo	Lubbock
Nacogdoches	Shreveport	Longview	Shreveport
Navarro	Waco	Stephenville	Waco
Newton	Shreveport	Lake Charles	Shreveport
Nolan	Abilene	Stephenville	Abilene
Nueces	Corpus Christi	Brownsville	Corpus Christi
Ochiltree	Amarillo	Amarillo	Amarillo
Oldham	Amarillo	Amarillo	Amarillo

County	Surface	Upper Air	STAR
Orange	Beaumont	Lake Charles	Beaumont
Palo Pinto	Abilene	Stephenville	Abilene
Panola	Shreveport	Longview	Shreveport
Parker	Dallas/Ft. Worth	Stephenville	Dallas/Ft. Worth
Parmer	Amarillo	Amarillo	Amarillo
Pecos	Midland	Midland	Midland
Polk	Shreveport	Lake Charles	Shreveport
Potter	Amarillo	Amarillo	Amarillo
Presidio	El Paso	El Paso	El Paso
Rains	Dallas/Ft. Worth	Longview	Dallas/Ft. Worth
Randall	Amarillo	Amarillo	Amarillo
Reagan	Midland	Midland	Midland
Real	San Antonio	Del Rio	San Antonio
Red River	Shreveport	Longview	Shreveport
Reeves	Midland	Midland	Midland
Refugio	Corpus Christi	Victoria	Corpus Christi
Roberts	Amarillo	Amarillo	Amarillo
Robertson	Waco	Stephenville	Waco
Rockwall	Dallas/Ft. Worth	Stephenville	Dallas/Ft. Worth
Runnels	San Angelo	Stephenville	San Angelo
Rusk	Shreveport	Longview	Shreveport
Sabine	Shreveport	Longview	Shreveport
San Augustine	Shreveport	Lake Charles	Shreveport
San Jacinto	Houston Intercontinental	Longview	Houston Intercontinental
San Patricio	Corpus Christi	Victoria	Corpus Christi
San Saba	San Angelo	Stephenville	San Angelo
Schleicher	San Angelo	Midland	San Angelo
Scurry	Midland	Midland	Midland
Shackleford	Abilene	Stephenville	Abilene
Shelby	Shreveport	Longview	Shreveport

County	Surface	Upper Air	STAR
Sherman	Amarillo	Amarillo	Amarillo
Smith	Shreveport	Longview	Shreveport
Somervell	Dallas/Ft. Worth	Stephenville	Dallas/Ft. Worth
Starr	San Antonio	Del Rio	San Antonio
Stephens	Abilene	Stephenville	Abilene
Sterling	San Angelo	Midland	San Angelo
Stonewall	Abilene	Stephenville	Abilene
Sutton	San Angelo	Del Rio	San Angelo
Swisher	Amarillo	Amarillo	Amarillo
Tarrant	Dallas/Ft. Worth	Stephenville	Dallas/Ft. Worth
Taylor	Abilene	Stephenville	Abilene
Terrell	Midland	Midland	Midland
Terry	Lubbock	Amarillo	Lubbock
Throckmorton	Abilene	Stephenville	Abilene
Titus	Shreveport	Longview	Shreveport
Tom Green	San Angelo	Midland	San Angelo
Travis	Austin	Victoria	Austin
Trinity	Waco	Longview	Waco
Tyler	Shreveport	Lake Charles	Shreveport
Upshur	Shreveport	Longview	Shreveport
Upton	Midland	Midland	Midland
Uvalde	San Antonio	Del Rio	San Antonio
Val Verde	San Antonio	Del Rio	San Antonio
Van Zandt	Dallas/Ft. Worth	Longview	Dallas/Ft. Worth
Victoria	Victoria	Victoria	Victoria
Walker	Houston Intercontinental	Longview	Houston Intercontinental
Waller	Houston Intercontinental	Lake Charles	Houston Intercontinental
Ward	Midland	Midland	Midland
Washington	Austin	Victoria	Austin

County	Surface	Upper Air	STAR
Webb	San Antonio	Del Rio	San Antonio
Wharton	Victoria	Victoria	Victoria
Wheeler	Amarillo	Amarillo	Amarillo
Wichita	Wichita Falls	Stephenville	Wichita Falls
Wilbarger	Wichita Falls	Stephenville	Wichita Falls
Willacy	Brownsville	Brownsville	Brownsville
Williamson	Austin	Victoria	Austin
Wilson	San Antonio	Victoria	San Antonio
Winkler	Midland	Midland	Midland
Wise	Dallas/Ft. Worth	Stephenville	Dallas/Ft. Worth
Wood	Shreveport	Longview	Shreveport
Yoakum	Lubbock	Amarillo	Lubbock
Young	Abilene	Stephenville	Abilene
Zapata	San Antonio	Del Rio	San Antonio
Zavala	San Antonio	Del Rio	San Antonio

Table C-2. National Weather Service Stations, Call Signs, and Identification Numbers

Station	Call Sign	Number
Abilene	ABI	13962
Amarillo	AMA	23047
Austin	AUS	13958
Beaumont/Pt. Arthur	BPT	12917
Brownsville	BRO	12919
Corpus Christi	CRP	12924
Dallas/Ft. Worth	DFW	03927
Del Rio	DRT	22010
Fort Worth	FWD	03990
El Paso	ELP	23044
Houston Intercontinental	IAH	12960
Lake Charles	LCH	03937
Longview	GGG	03951
Lubbock	LBB	23042
Midland	MAF	23023
San Angelo	SJT	23034
San Antonio	SAT	12921
Santa Theresa, NM	EPZ	03020
Shreveport, LA	SHV	13957
Stephenville	SEP	13901
Victoria	VCT	12912
Waco	ACT	13959
Wichita Falls	SPS	13966

Table C-3. National Weather Service Upper-Air Station Changes

Old Station	Moved	Last Usable Year	New Station	First Usable Year
El Paso	1995	1994	Santa Theresa, NM	1996
Longview	1995	1994	Shreveport, LA	1996
Stephenville	1994	1993	Fort Worth	1995
Victoria	1989	1988	Corpus Christi	1990

Appendix D

Protocol and Permit Modeling Guidance Requirements

A protocol or checklist serves as an outline of how to conduct a modeling analysis. Protocols are more formal and more detailed than checklists. Protocols and checklists are not mandatory; however the ADMT encourages the applicant to submit them for PSD and complex state permit modeling and RCRA BIF projects.

The applicant should follow the guidance in Table D-1 to develop protocols, or permit modeling guidance checklists shown in Appendix E. Items in the table apply to all analyses unless noted otherwise. Do not exclude items without prior coordination with the ADMT. Send the original copy of a PSD or RCRA BIF protocol or a guidance checklist to the ADMT team leader with copies to the permit engineer and other interested parties as appropriate. A PSD protocol does not need to be sent to EPA Region 6.

Table D-1. Protocol and Permit Modeling Guidance

1.0	**Project Identification Information** Provide the following information to clearly identify the analysis:
	Applicant
	Facility
	Permit Application Number
	Air Quality Account Number
	Nearest City and County
	Applicant's Modeler
2.0	**Project Overview** Provide a brief discussion of the plant process(es), and types and locations of emissions under consideration. **For RCRA BIF**, provide a brief discussion of each BIF unit and the nature of wastes being generated or burned.
	Attach additional data as applicable for project overview.
2.1	**Type of Permit Review** Indicate the type of permit review required by the permit engineer. The State modeling demonstration can be addressed separately from the PSD or RCRA BIF demonstration.
2.2	**Constituents to be Evaluated** List all constituents to be evaluated.

3.0	**Plot Plan** Depending on the scope of the project, several plot plans may be needed to present all requested information. Provide a plot plan that includes:
	A clearly marked scale.
	All property lines. **For PSD**, include fence lines.
	A true-north arrow.
	UTM coordinates along the vertical and horizontal borders (Please do not use plant or other coordinates). Provide the datum of your coordinates.
	Reference UTM coordinates and locations of all emission points including fugitive sources modeled.
	Buildings and structures on-property or off-property which could cause downwash. Provide length, width, and height.
	An indication of the shortest distance to the property line from any of the sources in the facility to be permitted.
4.0	**Area Map** (More than one map may be required.)
	For State Analyses Provide a copy of the area map submitted with the permit application. If the map is an extract, it should be full scale (no reduction or enlargement) and cover the area within a 1.9-mile (3-kilometer) radius of the facility if used for the Auer land-use analysis.
	Add UTMs to the horizontal and vertical dimensions of the map section, as well as the date and title of the map. Provide the datum of your coordinates.
	Annotate schools within 3,000 feet of the sources nearest to the property line.
	For Effects Review, also annotate the nearest sensitive receptors of any type and nearest residents. Be prepared to identify and annotate other sensitive receptors if required by TARA.
	For hazardous waste landfill or land treatment facility permits, or an areal expansion of an existing facility. Also annotate locations of established churches, day care centers, surface water body used for a public drinking water supply, or dedicated public parks. If any of these locations are within 1000 feet of the facility or expansion boundary, no permit should be issued.
	For commercial hazardous waste management facility permits, or an areal expansion of an existing facility or unit of the facility. Also annotate locations of established churches, day care centers, surface water body used for a public drinking water supply, or dedicated public parks. If any of these are within 2640 feet of the facility or expansion boundary, no permit should be issued. For amendments, distance limits apply as of the date of the original permit.
	For PSD Analyses Provide a copy of the area map submitted with the permit application. If the map is an extract, it should be full scale (no reduction or enlargement) and cover the area within a 1.9-mile (3-kilometer) radius of the facility if used for the Auer land-use analysis.
	Add UTMs to the horizontal and vertical dimensions of the map section, as well as the date and title of the map. Provide the datum of your coordinates.
	Provide maps that show the location of: PSD Class I areas within 100 kilometers (km) (62 miles).

	Urban areas, nonattainment areas, and topographic features within 50 km (31 miles) or the distance to which the source has a significant impact, whichever is less.
	Any on-site or local meteorological stations, both surface and upper-air.
	State/local/on-site ambient air monitoring sites used for background concentrations within 50 km (31 miles) or the distance to which the source has a significant impact, whichever is less.
	For RCRA BIF Analyses
	Provide a copy of the area map submitted with the permit application. If the map is an extract, it should be full scale (no reduction or enlargement) and cover the area within a 1.9-mile (3-kilometer) radius of the facility if used for the Auer land-use analysis.
	Add UTMs to the horizontal and vertical dimensions of the map section, as well as the date and title of the map. Provide the datum of your coordinates.
	Annotate the location of any on-property residence. Include as a receptor in the analysis.
5.0	**Air Quality Monitoring Data**
	For State and PSD NAAQS
	Discuss how ambient background concentrations will be obtained. That is, preconstruction monitoring or state/local/on-site monitoring network. Ideally, conduct the monitoring analysis before a PSD permit application is submitted, as monitoring could take as long as one year if representative monitored data are not available.
	Provide a summary of observations for each constituent and averaging time, if available.
	Discuss how concentrations will be adjusted, if all nearby and background point sources are modeled in the vicinity of a monitor, if applicable.
	For Effects Review, identify any on-site or local monitored data that could be used to supplement or substitute for modeling. Demonstrate that the data represent near worst-case operational and meteorological conditions.
6.0	**Modeling Emissions Inventory**
6.1	**On-Property Sources to be Permitted**
	Provide a copy of the Table 1(a) that was submitted with the permit application. Note that if stack parameters for any averaging period or load level are different, additional entries are required on the Table 1(a).
	Identify special source types such as covered stacks, horizontal exhausts, fugitive sources, area sources, open pit sources, volume sources, roads, stockpiles, and flares and how they will be modeled.
	Provide all assumptions and calculations used to determine as appropriate the size, sides, rotation angles, heights of release, initial dispersion coefficients, effective stack diameter, gross heat release and weighted (by volume) average molecular weight of the mixture being burned.
	Specify particulate emissions as a function of particle size; mass fraction for each particle size category; and particle density for each particle size category, as applicable.
	In addition, it would be helpful to provide a table with stack parameters converted to metric units.
6.2	**Other On-Property and Off-Property Sources** Advise how other on- and off-property sources' modeling parameters will be obtained.

6.3	**Table Correlating the Emission Inventory Source Name and EPN with the Source Number in the Modeling Output** Provide a table that cross-references the source identification numbers used in the modeling if they are different from the emission point numbers in the Table 1(a) or from any additional list of sources.
6.4	**Stack Parameter Justification** Provide the basis for using the listed stack parameters (flow rates, temperatures, stack heights, velocities) if known before the protocol is submitted. This should include calculations if necessary for justification.
	Evaluate at least 25 percent, 50 percent, 75 percent and 100 percent production or load levels, if the source could be operated at these reduced levels.
6.5	**Scaling Factors** Discuss how emission scalars will be developed and used in the modeling, if applicable.
7.0	**Models Proposed and Modeling Techniques** Identify proposed models, model version numbers, and the model entry data options such as the regulatory default option and the period option.
	Discuss any proposed specialized modeling techniques such as screening, collocating sources, ratioing.
	Provide assumptions and sample calculations as applicable.
8.0	**Selection of Dispersion Option** Submit an Auer land-use analysis, if required, for the area within 3 km of the sources being permitted. Base the selection of urban or rural dispersion coefficients on the Auer land-use analysis; however, the population density method could also be used but is not a preferred method.
	Provide a color copy of the USGS map, if a USGS map was used in the analysis.
	Supplement the topographic map analysis with a current aerial photograph of the area surrounding the permitted sources, or with a detailed drive-through summary, to support a land-use designation, that represents less than 70 percent of the total area evaluated.
9.0	**Building Wake Effects (Downwash)** State whether the EPA's Building Profile Input Processor (BPIP) or a software package that employs the BPIP algorithms will be used. Provide any computer assisted drawing files.
10.0	**Receptor Grid—Terrain** Discuss if terrain should be considered and how the terrain for individual receptors will be determined.
	Ensure that the higher terrain in any direction from the source is included in the modeling—not just the highest.
	DEM. Provide the datum of your coordinates. If 7.5-minute DEM data are not available for the entire receptor grid, ensure 7.5-minute DEM data are used for receptors within approximately 3–5 km of the property line/fence line.
11.0	**Receptor Grid—Design** Discuss how the receptor grids will be determined for each type of analysis.
	Provide a diagram of each grid and include any reference labels or nomenclature, if available before the protocol is submitted.
	Provide the datum of your coordinates.

12.0	**Meteorological Data** Indicate the surface station, surface station anemometer height, upper-air station, and period of record. (See ADMT Internet page for anemometer height data.)
	For PSD and RCRA BIF, five consecutive years of the most recent, readily available, hourly and annual National Weather Service (NWS) data, or one or more years of on-site data.
	Discuss how any meteorological data was determined or replaced, if done before the protocol is submitted. ADMT should approve substitutions before modeling begins. In addition, submit all the supplementary data used to develop the specific input meteorological parameters required by the PCRAMMET program.
13.0	**Modeling Results** Discuss how the modeling results for each averaging period relative to applicable de minimis values, standards, guidelines, reference air concentrations, risk-specific doses, or risk-specific dose ratios will be presented. Tabulated results are preferred when several constituents are addressed. **For PSD**, use Appendix G of the modeling guidelines format.
13.1	**Additional Impacts Analysis (For PSD)** Discuss what methods will be used to evaluate each of the following: growth, and soils and vegetation analyses, if any, for this project.
13.2	**Class I Area Impacts Analysis (For PSD)** Discuss what methods will be used to evaluate Class I area impacts, if any, for this project.
13.3	**Dilution Factor (For RCRA BIF)** Discuss how the dilution factor for each constituent will be calculated for this project.

Appendix E

Permit Modeling Guidance Checklist

A checklist is an abbreviated protocol for the modeling project; include the checklist in the air quality analysis report. By using a checklist instead of a protocol, the ADMT assumes that the applicant is aware of routine modeling practices and procedures. A checklist is less detailed than a protocol and serves to prompt the applicant to consider certain items and procedures—as well as to document them—and to assist in the conduct of the modeling demonstration. Table E-1 contains the Permit Modeling Guidance Checklist format. The table can be reproduced and filled out by hand or electronically.

Use the Table E-1 in conjunction with Table D-1, Protocol and Permit Modeling Guidance Requirements, and Table F-1, Air Quality Analysis Reporting Guidance, as applicable. Enter required information and mark all items that apply. Include any explanatory information and deviations from standard practice or procedures in the checklist or attach additional pages as necessary. Complete a project-specific checklist and send it to the ADMT before a guidance meeting if possible.

Table E-1. Permit Modeling Guidance Checklist

1.0	**Project Identification Information**
	Applicant/Facility:
	Permit Application Number: Air Quality Account Number:
	Nearest City: County:
	Applicant's Modeler:
2.0	**Project Overview** Plant process(es) and types and locations of emissions under consideration ___ **For RCRA BIF**, each BIF unit and the nature of wastes being generated or burned____
2.1	**Type of Permit Review**
	State Property Line____ State NAAQS___ State Effects Review___ State Disaster Review___
	PSD___ RCRA BIF______ Other_____
2.2	**Constituents to be Evaluated**
	PM___ PM_{10}___ CO_____ NO_2___ Pb___
	SO_2___ H_2S____ H_2S0_4___ TRS___

	Speciated VOCs____ Speciated Metals ____ Other____
3.0	**Plot Plan**
	Clearly marked scale_____ All property lines_____ **For PSD**, fence lines_____
	A true-north arrow_____ UTM coordinates along the vertical and horizontal border _____
	Datum of UTM coordinates? NAD27______ NAD83______ Other_____
	Reference UTM coordinates and locations of all emission points including fugitive sources modeled_____
	Buildings and structures on-property or off-property which could cause downwash with length, width, and height identified____
4.0	**Area Map** (More than one map may be required)
	For State Analyses
	Full-scale (no reduction or enlargement)_____ Cover area within a 1.9-mile (3-kilometer) radius of the facility for Auer land-use analysis _____
	UTM coordinates along the vertical and horizontal borders ___ Date and title of the map____ Datum of UTM coordinates? NAD27______ NAD83______ Other_____
	School within 3000 feet?_______ (Include as a sensitive receptor in the analysis.)
	For Effects Review Distance to nearest sensitive receptor other than a school_________ Distance to nearest residents_______
	For hazardous waste landfill or land treatment facility permits, or an areal expansion of an existing facility. Any churches, day care centers, surface water body used for a public drinking water supply, or dedicated public parks within 1000 feet of the facility or expansion boundary? ____ If this is the case, no permit should be issued.
	For commercial hazardous waste management facility permits, or an areal expansion of an existing facility or unit of the facility. Any churches, day care centers, surface water body used for a public drinking water supply, or dedicated public parks within 2640 feet? ___ If this is the case, no permit should be issued. For amendments, distance limits apply as of the date of the original permit.
	For PSD Analyses
	Full-scale (no reduction or enlargement)_____ Cover area within a 1.9-mile (3-kilometer) radius of the facility for Auer land-use analysis _____
	UTM coordinates along the vertical and horizontal borders ___ Date and title of the map____ Datum of UTM coordinates? NAD27______ NAD83______ Other_____
	Class I area within 10 km (6.2 miles)?______ Class I area within 100 km (62 miles)?______
	Urban areas, nonattainment areas, and topographic features within 50 km (31 miles)? _____
	On-site or local meteorological stations, both surface and upper-air?______
	State/local/on-site ambient air monitoring sites within 50 km (31 miles)? ______
	For RCRA BIF Analyses

	Full-scale (no reduction or enlargement)_____ Cover area within a 1.9-mile (3-kilometer) radius of the facility for Auer land-use analysis _____
	UTM coordinates along the vertical and horizontal borders ___ Date and title of the map____ Datum of UTM coordinates? NAD27______ NAD83______ Other_____
	On-property residence? _____ Include as a receptor in the analysis.
5.0	**Air Quality Monitoring Data**
	For State NAAQS and PSD, are monitoring data for background concentrations available? ____ If not, are there regional data that could be used? _____
	For Effects Review, identify any monitored data that could be used to supplement or substitute for modeling. Demonstrate that the data represent near worst-case operational and meteorological conditions.
6.0	**Modeling Emissions Inventory**
6.1	**On-Property Sources in the Permit Application**
	Stack parameters for any averaging period or load level different than Table 1(a)?_____
	For gravitational settling applications (for each applicable source): Particle size____ Mass fraction for each particle size category___ Particle Density for each particle size category ____
	Special Source Types/Characterizations? ____ Fugitive source____ Covered stack____ Horizontal exhaust___
	Tilted stack____ Area source____ Open pit_____ Volume source____
	Flare____ Stockpile____ Road____ Other_____
	Techniques to Model Special Sources? ____ Follow *Air Quality Modeling Guidelines*_____ ADMT Technical Memo_____ Other______
6.2	**Other On-Property and Off-Property Sources**
	Sitewide modeling required? _______
6.3	**Table Correlating the Emission Inventory Source Name and EPN with the Source Number in the Modeling Output** Source identification numbers used in the modeling different from the emission point numbers in the Table 1(a) or from any additional list of sources? ______
6.4	**Stack Parameter Justification** Basis/calculations for stack parameters (flow rates, temperatures, stack heights, velocities)? ______ Stack parameters for any averaging period different? ______ If yes, include on the Table 1(a).
	Load evaluation required? _____ Evaluate at least 25 percent, 50 percent, 75 percent and 100 percent production or load levels, if the source could be operated at these levels.
	Any stack parameters for any averaging period different for maximum load? ___

6.5	**Scaling Factors**
	Scaling factors applicable?____
7.0	**Models Proposed and Modeling Techniques**
	Model (Version Number) ISCST (________) ___ SCREEN (_________) ___ OTHER _________ (_________)
	Specialized Techniques? ____ Collocated Sources_____ Ratio______ Other___
8.0	**Selection of Dispersion Coefficients**
	Urban ____ Rural ____ How determined? Auer land-use analysis____ Supplemented Auer land-use analysis____ Population___
9.0	**Building Wake Effects (Downwash)**
	EPA BPIP ______ Version _______ or Software package that employs BPIP algorithms?_____
10.0	**Receptor Grid—Terrain**
	Flat___ Simple___ Complex___
	Elevated receptors? _____ (Ensure that the higher terrain in any direction is included in the modeling—not just the highest.)
	DEMs Used? 7.5-Minute ___ 1-Degree ___ Mixed ____ Datum of UTM coordinates? NAD27________ NAD83______ Other________ 7.5-minute DEM data available for the entire receptor grid? _____ If not, use 7.5-minute DEM data for receptors within approximately 3-5 km of the property/fence line.
11.0	**Receptor Grid—Design**
	Datum of UTM coordinates? NAD27________ NAD83______ Other________
12.0	**Meteorological Data**
	Surface/Upper-Air Data Set (Five Years For PSD, RCRA BIF)? Set(s)__________________________ Year(s)______________________
	Anemometer Height? _______
13.0	**Modeling Results** Compare results for each averaging period to applicable de minimis values, standards, guidelines, reference air concentrations, risk-specific doses, or risk-specific dose ratios____.
	For PSD, use Appendix G of the modeling guidelines format _____
	For Effects Review, separate results for sensitive receptors______
13.1	**Additional Impacts Analysis (For PSD)** Additional impacts analysis for growth, and soils and vegetation, as applicable____

13.2	**Class I Area Impacts Analysis (For PSD)** Class I area impacts analysis, as applicable_____
13.3	**Dilution Factor (For RCRA BIF)** Dilution factor for each constituent for this project_____
14.0	**Modeling Runs and Hard Copy Output** Output per constituent showing emission point numbers, locations, base elevation, and stack parameters_______
	Table of selected model options and any selected data such as meteorological stations and period of record, roughness heights, scalars _____
	Gridded maps showing the maximum predicted ground-level concentration for each modeled receptor for each type of analysis required_____
	Property lines on each map ____ For PSD, fence lines on each map_____
	For Effects Review, gridded maps for each constituent's concentration that exceeds an ESL___ Exceedances and magnitude of exceedance at each receptor____ Property lines on each map______
15.0	**Disks (Model Input/Output and Associated Computer or Electronic Files)** Provide:
	All input and output files for each dispersion model run, including data, grid and plot file____
	All files produced by a software entry program_____
	All automated downwash program input and output files and any computer assisted drawing files ____
	All meteorological data files in ASCII format_____
	Boundary files—including computer assisted drawing files—specifying coordinates for property lines_____
	For PSD, boundary files—including computer assisted drawing files—specifying coordinates for fence lines_____
	All spreadsheet files used for comparison of predicted concentrations with standards or guidelines______ (This includes spreadsheet files used for ratio techniques.)
16.0	**Meeting Record**
	Date:
	Participants / Affiliation / Telephone #s:
17.0	**Remarks**
18.0	**TNRCC ADMT Staff Signature** ____ Date:

Appendix F

Air Quality Analysis Reporting Guidance

The air quality analysis submitted to the TNRCC in support of a state, PSD, or RCRA BIF permit application becomes an addendum to the permit application. The analysis should include the items in Table F-1 as appropriate. Items apply to all analyses unless otherwise noted. Items should not be excluded without prior coordination with the ADMT.

Send the original copy of the air quality analysis report to the permit engineer that requested the modeling. The engineer will review the report and determine if an evaluation by ADMT is needed.

Table F-1. Air Quality Analysis Reporting Guidance

1.0	**Project Identification Information** Provide the following information to clearly identify the analysis:
	Applicant
	Facility
	Permit Application Number
	Air Quality Account Number
	Nearest City and County
	Applicant's Modeler
2.0	**Project Overview** Include a brief discussion of the plant process(es), and types and locations of emissions under consideration. **For RCRA BIF**, include a brief discussion of each BIF unit and the nature of wastes being generated or burned.
2.1	**Type of Permit Review** Indicate the type of permit review required by the permit engineer.
2.2	**Constituents Evaluated** List all constituents that were evaluated.
3.0	**Plot Plan** Depending on the scope of the project, several plot plans may be needed to present all requested information. Include a plot plan that includes:
	A clearly marked scale.
	All property lines. **For PSD**, include fence lines.
	A true-north arrow.
	UTM coordinates along the vertical and horizontal borders. Please do not use plant or other coordinates. Include the datum of your coordinates.

	Reference UTM coordinates and locations of all emission points including fugitive sources modeled. Labels and coordinates given emission points on the plot plan should correlate with the information contained in the air quality analysis.
	Buildings and structures on-property or off-property which could cause downwash. Include length, width, and height.
4.0	**Area Map**
4.1	**For State Analyses** Include a copy of the area map submitted with the permit application. If the map is an extract, it should be full scale (no reduction or enlargement) and cover the area within a 1.9-mile (3-kilometer) radius of the facility if used for the Auer land-use analysis.
	Add UTMs to the horizontal and vertical dimensions of the map section, as well as the date and title of the map. Include the datum of your coordinates.
	Annotate schools within 3,000 feet of the sources nearest to the property line.
	For Effects Review, annotate the nearest sensitive receptor of any type and nearest residents. Include any additional sensitive receptors required by TARA.
	For hazardous waste landfill or land treatment facility permits, or an areal expansion of an existing facility. Also annotate locations of established churches, day care centers, surface water body used for a public drinking water supply, or dedicated public parks. If any of these locations are within 1000 feet of the facility or expansion boundary, no permit should be issued.
	For commercial hazardous waste management facility permits, or an areal expansion of an existing facility or unit of the facility. Also annotate locations of established churches, day care centers, surface water body used for a public drinking water supply, or dedicated public parks. If any of these are within 2640 feet of the facility or expansion boundary, no permit should be issued. For amendments, distance limits apply as of the date of the original permit.
4.2	**For PSD Analyses** Include a copy of the area map submitted with the permit application. If the map is an extract, it should be full scale (no reduction or enlargement) and cover the area within a 1.9-mile (3-kilometer) radius of the facility if used for the Auer land-use analysis.
	Add UTMs to the horizontal and vertical dimensions of the map section, as well as the date and title of the map. Include the datum of your coordinates.
	Include maps that show the location of:
	PSD Class I areas within 10 kilometers (km) (6.2 miles) or 100 km (62 km).
	Urban areas, nonattainment areas, and topographic features within 50 km (31 miles) or the distance to which the source has a significant impact, whichever is less.
	All NAAQS and increment consuming sources within 50 km which have a significant impact within the AOI *if exceedances of a NAAQS or increment are predicted*.
	Any on-site or local meteorological stations, both surface and upper air.
	State/local/on-site ambient air monitoring sites used for background concentrations within 50 km (31 miles) or the distance to which the sources have a significant impact, whichever is less.
4.3	**For RCRA BIF Analyses**

	Include a copy of the area map submitted with the permit application. If the map is an extract, it should be full scale (no reduction or enlargement) and cover the area within a 1.9-mile (3-kilometer) radius of the facility if used for the Auer land-use analysis.
	Add UTMs to the horizontal and vertical dimensions of the map section, as well as the date and title of the map. Include the datum of your coordinates.
	Annotate the location of any on-property residence.
5.0	**Air Quality Monitoring Data**
	For State NAAQS and PSD
	Discuss how ambient background concentrations were obtained. That is, preconstruction monitoring or from a state/local/on-site monitoring network.
	Include a summary of observations for each constituent and averaging time, if available.
	If all nearby and background point sources were modeled how was double-counting of monitored background values addressed, if applicable?
	For Effects Review, identify monitored data that was used to supplement or substitute for modeling. Demonstrate that the data represent near worst-case operational and meteorological conditions.
6.0	**Modeling Emissions Inventory**
6.1	**On-Property Sources to be Permitted**
	Include a copy of the Table 1(a) that was submitted with the permit application and subsequently approved by the permit engineer. Ensure additional entries are provided on the Table 1(a) if stack parameters for any averaging period or load level could be different.
	Identify special source types or characterizations such as covered stacks, horizontal exhausts, fugitive sources, area sources, open pit sources, volume sources, roads, stockpiles, and flares.
	Include all assumptions and calculations used to determine as appropriate the size, sides, rotation angles, heights of release, initial dispersion coefficients, effective stack diameter, gross heat release and weighted (by volume) average molecular weight of the mixture being burned.
	Specify particulate emissions as a function of particle size; mass fraction for each particle size category; and particle density for each particle size category, as applicable.
	In addition, it would be helpful to have a table with stack parameters converted to metric units.
6.2	**Other On-Property and Off-Property Sources** Include a paper copy of the PSDB retrieval for each constituent.
	Include an additional list for each constituent for any sources modeled but were not included in the PSDB retrieval. This list should contain all the information required by the Table 1(a).
	For PSD, include a list of secondary emissions, if applicable. Secondary emissions occur from any facility that is not a part of the facility being reviewed, that would only be constructed or would have an increase of emissions as a result of the permitted project.
6.3	**Table Correlating the Emission Inventory Source Name and EPN with the Source Number in the Modeling Output** Include a table that cross-references the source identification numbers used in the modeling if they are different from the emission point numbers in the Table 1(a) or from any additional list of sources.

6.4	**Stack Parameter Justification** Include the basis for using the listed stack parameters (flow rates, temperatures, stack heights, velocities). This should include the calculations used to determine the parameters.
	If the production or load levels could be less than 100 percent, demonstrate how the modeled emission rates and stack parameters were obtained to produce the worst-case impacts (in certain cases lower production levels may result in higher predicted impacts).
	Include at least 25 percent, 50 percent, 75 percent and 100 percent production or load levels analyses, if the source could be operated at these reduced levels.
6.5	**Scaling Factors** Discuss how emission scalars were developed and used in the modeling demonstration. In addition, identify those scalars that should be included in an enforceable permit provision, such as restricted hours of operation.
7.0	**Models Proposed and Modeling Techniques** Include a detailed discussion of the models that were used, model version numbers, and the model entry data options such as the regulatory default option and the period option.
	Discuss any specialized modeling techniques such as screening, collocating sources, and ratioing.
	Include assumptions and sample calculations.
8.0	**Selection of Dispersion Option** Submit an Auer land-use analysis for the area within 3 km of the sources being permitted. Base the selection of urban or rural dispersion coefficients on the Auer land-use analysis; however, the population density method could also be used but is not a preferred method.
	Include a color copy of the USGS map, if a USGS map was used in the analysis.
	Supplement the topographic map analysis with a current aerial photograph of the area surrounding the permitted sources, or with a detailed drive-through summary, to support a land-use designation, that represents less than 70 percent of the total area evaluated.
9.0	**Building Wake Effects (Downwash)** Discuss how downwash structures were determined and Include applicable information required to use the EPA's Building Profile Input Processor (BPIP). Submit all input files and files generated by the BPIP program, and any computer assisted drawing files.
10.0	**Receptor Grid—Terrain** Discuss if terrain was applicable. If so, discuss how terrain for individual receptors was determined.
	Identify any discrete receptors used for locations of higher terrain.
	If DEM files were used, discuss if the file contained 7.5-minute, 1-minute, or mixed data. If 7.5-minute DEM data were not available for the entire receptor grid, was 7.5-minute DEM data used for receptors within approximately 3–5 km of the property line/fence line? Include the datum of your coordinates.
11.0	**Receptor Grid—Design** Discuss how the receptor grids were determined for each type of analysis.
	Include a diagram of each grid and include any reference labels or nomenclature.
	Include the datum of your coordinates..
12.0	**Meteorological Data** Indicate the surface station, surface station anemometer height, upper-air station, and period of record.
	Include the meteorological data files used for all demonstrations if not obtained from the TNRCC.

	Discuss how meteorological data was determined or replaced. Include ADMT approval of replacement data. In addition, submit all the supplementary data used to develop the specific input meteorological parameters required by the PCRAMMET program.
13.0	**Modeling Results** Summarize and compare the modeling results relative to all applicable de minimis values, standards, guidelines, reference air concentrations, risk-specific doses or risk-specific dose ratios. Tabulated results are preferred when several constituents are addressed.
	For Effects Review, present the maximum concentrations predicted for sensitive receptors separately and include the location of the receptor.
	For PSD, present tables for each analysis similar to the examples in Appendix G of the modeling guidelines.
13.1	**Additional Impacts Analysis (For PSD)** Include the results of the additional impacts analysis for growth, and soils and vegetation, as applicable.
13.2	**Class I Area Impacts Analysis (For PSD)** Include the results of the Class I area impacts analysis, as applicable.
13.3	**Dilution Factor (For RCRA BIF)** Include the dilution factor for each constituent and demonstrate how the dilution factor was calculated for this project.
14.0	**Modeling Runs and Hard Copy Output** Include model output for each constituent showing emission point numbers, locations, base elevation, and stack parameters. These entries should correlate with the Table 1(a), PSDB retrieval, and any other list of sources modeled.
	Include a table of selected model options and any selected data such as meteorological stations and period of record, roughness heights, or scalars. The summary page produced by the model can be used, if appropriate.
	Include gridded maps showing the maximum predicted ground-level concentration for each modeled receptor for each type of analysis required. For large modeling projects, with numerous constituents, maps for all receptor grids may not be required if the modeler can demonstrate with the grids submitted that the maximum concentrations have been found. In addition, if predicted concentrations from a tight grid are less than about 50 percent of a threshold of concern, only a map depicting the receptor grid—without concentrations—is necessary.
	For complex projects, concentration isopleths may be used if the concentration gradient can be clearly shown to decrease, the maximum concentration has been found, and no standard or ESL has been exceeded. A mix of grid point maps and isopleth maps may be used as appropriate.
	Depict property lines on each map. **For PSD**, depict fence lines on each map.
	Include gridded maps for each constituent's concentration that exceeds an ESL showing the number of exceedances and magnitude of exceedance at each receptor. Show property lines on each map.
15.0	**Disks (Model Input/Output and Associated Computer or Electronic Files)** Include:
	All input and output files for each dispersion model run, including data, grid and plot files.
	All files produced by a software entry program.
	All automated downwash program input and output files and any computer assisted drawing files.
	All meteorological data files in ASCII format.

	All boundary files—including computer assisted drawing files—specifying coordinates for property lines.
	For PSD, *all* boundary files—including computer assisted drawing files—specifying coordinates for fence lines.
	Include all spreadsheet files used for comparison of predicted concentrations with standards or guidelines. This includes, but is not limited to, spreadsheet files used for ratio techniques.
16.0	**Permit Modeling Guidance Checklist** The permit modeling checklist is optional. However, if a checklist was prepared include it with the air quality analysis.

Appendix G

PSD NAAQS and Increment Analyses Summary Sheets

Each PSD AOI, NAAQS, or Increment analysis should contain a summary table of modeled results similar to those in Tables G-1, G-2, and G-3, that addresses the following elements:

Constituent. Include a separate summary for each constituent; however, the summaries may be combined if appropriate. For example, for multiple constituents emitted from a single stack and a ratio technique used to obtain a unit concentration.

Averaging Time, Standard or De minimis. Provide the applicable averaging time and standard or de minimis.

Grid Size. Identify the grid size (tight, fine, medium, coarse) used to locate the maximum impact for the year evaluated.

Date, Time, and Location. Include these data for the maximum concentration for each year evaluated.

Radius of Impact. Include the radius for the analysis, if applicable, for each time period and year evaluated.

Concentration Rank. Indicate the rank of the reported concentration, such as high, first high (H1H), high, second high (H2H) as applicable. The H1H is the highest concentration at any receptor; that is, the highest concentration at each receptor has been tabulated and the highest concentration of all the first highest concentrations is reported as the H1H. The H2H is the second highest concentration at any receptor; that is, the highest concentration at each receptor has been tabulated, then the second highest concentrations at each receptor has been tabulated, and the highest of any second highest concentration is reported as the H2H.

The AOI and state analyses use the H1H concentrations. PSD NAAQS and increment analyses use the H2H concentrations for short-term standards and the highest average concentration at any receptor for any year for long-term standards, with the exception of PM_{10}. The ADMT will provide additional guidance when EPA publishes technical procedures for the 1997 24-hour PM_{10} NAAQS.

- For the pre-1997 24-hour PM_{10} NAAQS. Use the H6H concentration at any receptor for a five-year evaluation period.

- For the annual PM_{10} NAAQS. Use the highest five-year average concentration at any receptor.

Note that for any demonstration a higher concentration rank may be used to compare with a standard or guideline. That is, the H1H concentration could be used instead of the H2H concentration, since the H1H concentration would be higher and thus more conservative.

Maximum Concentration. Identify the applicable predicted maximum concentration from any of the years evaluated. For example, the H1H and H2H.

Background Concentration. Identify the background concentration for NAAQS analyses.

Total Concentration. Provide the total concentration; that is, predicted maximum concentration plus applicable background concentration.

Tables G-1, G-2, and G-3 are on the following three pages.

Table G-1. Area of Impact Analysis Summary

Constituent: Grid:

Date/Time, Location, H1H ($\mu g/m^3$)	Averaging Time _______ De Minimis_______$\mu g/m^3$	Averaging Time _______ De Minimis _______$\mu g/m^3$	Averaging Time _______ De Minimis _______$\mu g/m^3$
First Year/ Day/Hour			
Receptor UTM Easting			
Receptor UTM Northing			
H1H Concentration			
Radius of Impact (m)			
Second Year/ Day/Hour			
Receptor UTM Easting			
Receptor UTM Northing			
H1H Concentration			
Radius of Impact (m)			
Third Year/ Day/Hour			
Receptor UTM Easting			
Receptor UTM Northing			
H1H Concentration			
Radius of Impact (m)			
Fourth Year/ Day/Hour			
Receptor UTM Easting			
Receptor UTM Northing			
H1H Concentration			
Radius of Impact (m)			
Fifth Year/ Day/Hour			
Receptor UTM Easting			
Receptor UTM Northing			
H1H Concentration			
Radius of Impact (m)			
Maximum Concentration			
Maximum Radius of Impact (m)			

Table G-2. NAAQS Analysis Summary

Constituent: Grid:

Rank:

Date/Time, Location, Concentration ($\mu g/m^3$)	**Averaging Time _______ Standard ________$\mu g/m^3$**	**Averaging Time _______ Standard ________$\mu g/m^3$**	**Averaging Time _______ Standard ________µg/m3**
First Year/ Day/Hour			
Receptor UTM Easting			
Receptor UTM Northing			
Maximum Concentration			
Second Year/ Day/Hour			
Receptor UTM Easting			
Receptor UTM Northing			
Maximum Concentration			
Third Year/ Day/Hour			
Receptor UTM Easting			
Receptor UTM Northing			
Maximum Concentration			
Fourth Year/ Day/Hour			
Receptor UTM Easting			
Receptor UTM Northing			
Maximum Concentration			
Fifth Year/ Day/Hour			
Receptor UTM Easting			
Receptor UTM Northing			
Maximum Concentration			
Overall Maximum Concentration			
Background Concentration			
Total Maximum Concentration			

Table G-3. Increment Analysis Summary

Constituent: Grid:

Rank:

Date/Time, Location, Concentration (μg/m^3)	3-Hour Increment ________μg/m^3	24-Hour Increment________μg/m^3	Annual Increment_________μg/m^3
First Year/ Day/Hour			
Receptor UTM Easting			
Receptor UTM Northing			
Maximum Concentration			
Second Year/ Day/Hour			
Receptor UTM Easting			
Receptor UTM Northing			
Maximum Concentration			
Third Year/ Day/Hour			
Receptor UTM Easting			
Receptor UTM Northing			
Maximum Concentration			
Fourth Year/ Day/Hour			
Receptor UTM Easting			
Receptor UTM Northing			
Maximum Concentration			
Fifth Year/ Day/Hour			
Receptor UTM Easting			
Receptor UTM Northing			
Maximum Concentration			
Overall Maximum Concentration			

Appendix H

Point Source Data Base Retrievals

Request PSDB retrieval information from the Customer Reports & Services, Information Resources (IR) Division at (512) 239-DATA(3282). Written requests are required to obtain a retrieval, and may be sent by fax to (512) 239-0888. Provide the following impact area parameters with your PSDB request:

Constituent. Identify the constituent using one of the following designators: CO, NO_x, SO_2, TSP (total suspended particulate matter, designated at PM in the permit), PM_{10} (particulate matter with an aerodynamic diameter of 10 microns or less), Pb, VOC, or the specific 5-digit contam (contaminant) code for noncriteria constituents. Contact the Emissions Inventory staff to obtain the contam codes.

Type. Indicate the type of request: NAAQS or PSD Increment. The term *NAAQS* refers to both criteria and noncriteria constituents. Therefore, a retrieval for benzene, for example, would also be identified as a *NAAQS* retrieval.

- PSD Increment retrievals are available for NO_x, SO_2, and PM_{10}.

Term. Indicate the term of interest: Short (used to determine concentrations of 24 hours or less) or Long (used to determine concentrations of greater than 24 hours).

Search Option. Indicate the search option for the radius of impact: Primary (for PSD) or Secondary (for State).

- The *Primary* radius search option provides a report that includes all emission points located within the circle defined by the designated radius of impact. This option is used for PSD permit modeling retrievals.

- The *Secondary* radius search option provides a report that includes all emission points located within the circle defined by the designated radius of impact. In addition, it causes the retrieval program to search for points out to 60 km beyond the primary radius and factor emissions against distance to determine if the emission points have potential impact. If the emissions are found to be significant, they are included in the report.

UTM Zone. Provide the zone that the center point of the radius of impact is located in for each search option. The retrieval program will automatically take care of any overlap from one zone to another. Use either 13 (from the west border to 102 degrees longitude), 14 (between 102 and 96 degrees longitude), or 15 (east of 96 degrees longitude to the east border).

Center Point of the Radius of Impact. Use UTM coordinates in meters to identify the center point of the radius of impact: UTM East (meters) and UTM North (meters).

Radius of Impact. Provide the length of the radius of impact in meters. The maximum length is 9,999,999 meters. There is no minimum length; however, a minimum length of 1,000 meters is suggested.

- For PSD modeling projects, add 50,000 meters to the modeled radius of impact and provide the resultant value as the length. For example, if the modeled radius of impact is 1,000 meters, add 50,000 meters and request a retrieval for a radius of impact of 51,000 meters.

This information is used by the retrieval program to locate all sources for the given constituent which are within the radius of impact or sources which could have a significant impact within the radius of impact. For the requested constituent, the program generates a written report that includes for each source: the source identification, the TNRCC permit number or the TNRCC account number, source parameters needed for modeling, and the location of the source. IR staff can provide a computer diskette with all sources—except area sources—found in the retrieval with the modeling parameters placed in the proper format for use with certain EPA models. Enter area source data manually into the model.

Appendix I

Increment Minor Source Baseline Dates

The following table contains the minor source baseline dates for SO_2 and PM_{10}. Use 02/08/88 as a default for NO_2. To determine the actual baseline date for NO_2, the applicant must identify the first complete PSD application for the AQCR. ADMT can assist with the conversion of the current TNRCC Region to the old Texas Air Control Board (TACB) Region.

Table I-1. **Minor Source Baseline Date For SO_2, PM, and NO_2**

TACB Region	AQCR	Constituent	Baseline Date
1	210	SO_2	08/04/78
		PM_{10}	05/16/80
2	211	SO_2	11/04/77
		PM_{10}	11/04/77
3	212	SO_2	10/17/77
		PM_{10}	10/17/77
4	213	SO_2	03/17/80
		PM_{10}	03/17/80
5	214	SO_2	03/30/78
		PM_{10}	03/30/78
6	218	SO_2	08/04/78
		PM_{10}	07/17/80
7	216	SO_2	08/03/78
		PM_{10}	08/03/78
8	215	SO_2	11/17/77
		PM_{10}	11/17/77
9	217	SO_2	11/30/77
		PM_{10}	11/30/77
10	106	SO_2	11/03/77
		PM_{10}	11/03/77
11	153	SO_2	07/25/80
		PM_{10}	07/25/80
12	022	SO_2	09/12/77
		PM_{10}	09/12/77

Appendix J

Attainment/Nonattaiment Areas

The list in this appendix is for information only and is not official. That is, areas may be added or deleted after the publication of this document. See 40 CFR Part 81 and pertinent Federal Register notices for legal lists and boundaries.

Table J-1. **List of Attainment/Unclassifiable and Nonattainment Counties by Constituent**

Constituent	MSA	County	Status (NAA or A/U)
Ozone (O_3)	Beaumont- Port Arthur	Hardin Jefferson Orange	NAA-Moderate (Proposed Serious)
	Dallas-Fort Worth	Collin Dallas Denton Tarrant	NAA-Serious
	El Paso	El Paso	NAA-Serious
	Houston-Galveston- Brazoria	Brazoria Chambers Fort Bend Galveston Harris Liberty Montgomery Waller	NAA-Severe-17
		All Others	A/U
Particulate Matter (PM_{10})		El Paso	NAA-Moderate *
		All Others	A/U
Carbon Monoxide (CO)		El Paso	NAA-Moderate *
		All Others	A/U
Sulfur Dioxide (SO_2)		All	A/U
Nitrogen Dioxide (NO_2)		All	A/U
Lead (Pb)		Collin	NAA *
		All Others	A/U

* Only a portion of the county is designated nonattainment