Air Quality Modeling Procedures

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The Louisiana Department of Environmental Quality – Office of Environmental Assessment, Air Quality Assessment Division (LDEQ) established the *Air Quality Modeling Guidelines* for the following reasons: (1) streamline procedures; (2) minimize modeling efforts; and (3) ensure compliance with both federal and state Ambient Air Quality Standards. Modeling is performed to demonstrate compliance with National Ambient Air Quality Standards, Federal New Source Review Guideline Program Prevention of Significant Deterioration (PSD) requirements (40 CFR 52.21) and Louisiana Air Toxic Pollutant (LTAP) ambient air standards (AAS) (LAC 33:III.Chapter 51). The LDEQ requests modeling to support the following:

- PSD Review (Section 2.0);
- LTAP Analyses (Section 3.0); and
- Other Air Quality Related Actions (Section 4.0).

The Guidelines incorporate the latest regulatory guidance and compliance methodologies (please note that Section 8 includes references). Routinely, LDEQ modifies the Guidelines to reflect recent developments, to correct prior deficiencies, and to incorporate regulatory changes. LDEQ encourages applicants to both (1) submit a modeling protocol and (2) consult with LDEQ before initiating any modeling exercises. An authorization letter should be submitted from facilities that utilize a consultant to perform modeling analyses; the letter should include appropriate contact information for the facility and the consultant. LDEQ's timely review of modeling results requires a previously approved modeling protocol.

A Prevention of Significant Deterioration (PSD) – Air Quality Analysis may consist of two distinct phases:

- Phase I represents a significance analysis to determine if the PSD regulations require a full impact analysis to demonstrate compliance. Section 2.1 describes the PSD Significant Impact Analysis (SIA). In addition, the SIA determines both the area of impact for the full impact/refined analysis (NAAQS and PSD increment) and the need for preconstruction monitoring data.

- Phase II represents a full impact analysis (i.e., National Ambient Air Quality Standards (NAAQS) and PSD Increment models). Section 2.2 describes the NAAQS analysis that demonstrates compliance with federal ambient concentration standards. Section 2.3 describes the PSD Increment analysis that demonstrates compliance with federal limits on industrial expansion.

Table 2-1 lists the applicable standards for compounds that may be subject to PSD review.

Table 2-1
NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS), PSD INCREMENT SIGNIFICANT EMISSION, MODELING SIGNIFICANCE LEVELS, AND MONITORING DE MINIMIS CONCENTRATIONS

POLLUTANT	AVERAGING PERIOD	NAAQS (μg/m³) PRIMARY	NAAQS (μg/m³) SECONDARY	PSD INCREMENTS (μg/m³) CLASS I	PSD INCREMENTS (μg/m³) CLASS II	PSD INCREMENTS (μg/m³) CLASS III	SIGNIFICANT EMISSION RATES (TON/YEAR)	MODELING SIGNIFICANCE LEVEL (μg/m³)	MONITORING DE MINIMIS CONCENTRATIONS (μg/m³)
PM-10									
Particulate Matter	Annual	50	Same as Primary	5	17	34	15 or 25 (TSP)	1	-
	24-hour	150[a]	Same as Primary	10	30	60		5	10
SO_2	Annual	80(0.03ppm)	-	2	20	40	40	1	-
	24-hour	365[a](0.14ppm)	-	5[a]	91[a]	182[a]		5	13
	3-hour		1300[a](0.5ppm)	29[a]	512[a]	700[a]		25	-
NO_x	Annual	100	Same as Primary	2.5	25	50	40	1	14
Ozone[c]	8-hour	157(0.08ppm)	Same as Primary	-	-	-	40[b]	-	14
CO	8-hour	10,000[a](9ppm)	Same as Primary	-	-	-	100	500	575
	1-hour	40,000[a](35ppm)	Same as Primary	-	-	-		2,000	
Lead	Calendar Quarter	1.5	Same as Primary	-	-	-	0.6	-	0.1[d]
Fluorides	24-hour	-	-	-	-	-	3.0	-	0.25
H_2SO_4 mist	-	-	-	-	-	-	7	-	-
H_2S	1-hour	-	-	-	-	-	10	-	0.2
TRS	1-hour	-	-	-	-	-	10	-	10
CFC'S 11,12,112,114,115		-	-	-	-	-	1	-	-
HALONS 1211,1301,2402		-	-	-	-	-	1	-	-
Acid Gas (MWC)		-	-	-	-	-	1	-	-
Metals & Organics (MWC)		-	-	-	-	-	1	-	-

[a]Concentration not to be exceeded more than once per year
[b]Emission of volatile organic compounds.
[c]Increase in volatile organic compounds or NO_x of greater than 100 tons/year.
[d]Twenty-four-hour-average.

2.1 PSD SCREENING ANALYSIS

The PSD screening analysis consists of three separate determinations. Section 2.1.1 describes the Significant Impact Analysis (SIA), which determines if a full impact analysis is required. Section 2.1.2 describes the Area of Impact (AOI) analysis, which determines the required region for the full impact analysis. Section 2.1.3 describes the preconstruction monitoring analysis, which determines if ambient monitoring is required prior to construction.

2.1.1 Significant Impact Analysis (SIA)

The SIA determines if a proposed project requires NAAQS and PSD Increment models to demonstrate compliance with 40 CFR 52.21 regulations. Table 2-1 presents the significance level for compounds that may be subject to PSD review due to a proposed project. The net emission increase as determined for the PSD applicability analysis should be modeled for the SIA.

The SIA compares the maximum concentration from the significance model to the appropriate Table 2-1 significance level. If the modeled concentration is less than the significance level, the project’s impact is insignificant (i.e., the project increases will not cause or significantly contribute to an exceedance of the NAAQS or PSD Increment standards); therefore, no further analysis is required. If the modeled concentration is greater than or equal to the significance level, PSD regulations require a full impact analysis (i.e., NAAQS and PSD Increment models).

2.1.2 Area of Impact (AOI) Analysis

For compounds with a modeled concentration greater than the Table 2-1 significance level, the applicant must determine the Area of Impact (AOI). The AOI is defined as a circle around the facility with a radius equal to the distance from the center of the facility to the furthest significant off-property receptor in the SIA model. For each compound, the AOI represents the greatest distance from all applicable averaging periods (please note that the calculated AOI will not exceed 50 kilometers due to accuracy constraints of the dispersion models). The AOI influences the full impact analysis (i.e., NAAQS and PSD Increment models) in two ways:

- Applicant places receptors in the AOI for NAAQS and PSD Increment models; and

- Applicant orders an off-property inventory from LDEQ based upon the AOI plus 50-kilometers (please note the maximum distance for an off-property inventory is 100-kilometers due to accuracy constraints of the dispersion models). If the AOI crosses the Arkansas, Mississippi, or Texas border, the applicant should approach LDEQ for the appropriate path forward.

For additional information on the area of impact, applicants can refer to Page C-26 of the New Source Review Workshop Manual (EPA, 1990).

2.1.3 Preconstruction Monitoring Analysis

For compounds with a modeled concentration greater than the Table 2-1 significance level, PSD regulations require a preconstruction monitoring analysis. A preconstruction monitoring analysis compares the maximum concentration from the SIA model to the appropriate Table 2-1 monitoring exemption level. If the modeled concentration is less than its respective exemption level, the analysis does not require preconstruction monitoring data. If the modeled concentration is greater than or equal to its respective exemption level, the analysis may require one year of preconstruction monitoring data (please note that the minimum duration may be less than one year at the discretion of the administrative authority). LDEQ may allow a facility to use existing monitoring data to satisfy preconstruction monitoring requirements for the proposed project (please note that Section 6-1 presents additional information on ambient monitoring activities in Louisiana). If the significance model indicates that preconstruction monitoring data is required, applicants should discuss monitoring requirements with LDEQ.

If the proposed project includes a net Volatile Organic Compound (VOC) emission increase greater than 100 tons-per-year (tpy), 40 CFR 52.21 requires preconstruction ozone monitoring data for the facility. LDEQ may allow a facility to use existing monitoring data to satisfy preconstruction monitoring requirements for the proposed project (please note that Section 6-1 presents additional information on ambient monitoring activities in Louisiana). In addition, ozone may be considered a regional compound; therefore, LDEQ may require a regional ozone analysis. If preconstruction monitoring data is required for ozone, applicants should discuss monitoring requirements with LDEQ.

2.2 NAAQS ANALYSIS

For compounds with modeled concentrations greater than the Table 2-1 significance level, PSD regulations require a National Ambient Air Quality Standards (NAAQS) analysis. The NAAQS analysis demonstrates that the post-project, ambient concentration (i.e., the sum of the modeled concentration and the appropriate background concentration) will not cause or contribute to an exceedance of the applicable federal air quality standards. Table 2-1 presents the NAAQS standards for compounds that may be subject to PSD review.

For each compound that requires a NAAQS analysis, the model incorporates both facility-wide (both permitted and grandfathered sources) and off-property emission sources at their post-project, potential emission rate (PTE). For facility sources, the appropriate emission rate depends upon the averaging period. For short-term averaging periods (1-hour, 3-hour, 8-hour, or 24-hour), the analysis uses the maximum, hourly PTE. For the annual averaging periods, the analysis uses the average, annual PTE. The PTE reflects the emission rate from Emission Inventory Questionnaire (EIQ) sheets in the latest approved permit or submitted permit application. For off-property emission sources, the analysis will include emission rates from electronic LDEQ Emission Inventory Survey (EIS) retrievals. The NAAQS off-property inventory will include all emission sources located within the AOI plus 50 km (please note that 100-kilometers is the maximum distance based upon accuracy constraints of the dispersion models). LDEQ may request that the model incorporate additional off-property sources. To reduce the number of sources included in the NAAQS inventory, the analysis may merge similar off-property emission sources according to the procedures provided in *Screening Procedures for Estimating the Air Quality Impact of Stationary Sources (Revised)* (EPA, 1992a).

The analysis compares the post-project, expected ambient concentration to the appropriate Table 2-1 NAAQS threshold. The expected ambient concentration is the appropriate modeled concentration from the NAAQS model added to the adjusted background concentration for the facility (please note that Section 6 provides additional information on background estimation). For annual averaging periods, the appropriate modeled concentration is the maximum concentration in the NAAQS analysis (please note that the PM_{10} annual model may use the maximum concentration modeled over five years). For short-term averaging periods, the appropriate modeled concentration depends upon the compound under review. For short-term CO and SO_2 NAAQS models, the appropriate modeled concentration is the highest second-high (H_2H) concentration from the NAAQS model. For the PM_{10} 24-hour NAAQS model, the appropriate modeled concentration is the highest fourth-high (H_4H) concentration in the NAAQS model over five years. If the expected ambient concentration is less than the NAAQS standard, the proposed project does not cause or contribute to an exceedance of the NAAQS standard; therefore, no further analysis is required. If the expected ambient concentration is greater than or equal to the NAAQS standard, the applicant must determine the proposed project’s contribution to the potential exceedance.

The analysis compares the proposed project's contribution to a potential NAAQS exceedance(s) to the Table 2-1 significance level. If the maximum contribution from the proposed project is less than the significance level at the receptor(s) and time(s) of the potential exceedance(s), the proposed project will not cause nor significantly contribute to the potential NAAQS exceedance(s); therefore, no further analysis is required. The analysis will document the potential NAAQS exceedance(s) for LDEQ review. If the maximum contribution from the proposed project is greater than or equal to the significance level at the receptor(s) and time(s) of the potential exceedance(s), the analysis will further examine the receptor location(s) of the potential NAAQS exceedance(s).

If the receptor of the potential exceedance(s) is located on another facility's property, the analysis subtracts the other facility's contribution to the potential exceedance(s) from the modeled concentration. If the revised concentration is less than the NAAQS standard, the analysis demonstrates compliance; therefore, no further analysis is required. For any remaining potential NAAQS exceedance(s), the analysis should include a file review to update any emission sources that may contribute to the potential exceedance(s). The emission source may be updated by either reviewing LDEQ permit files or contacting the facility directly. The updates may include both stack parameters and emission rates.

2.3 PSD INCREMENT ANALYSIS

For compounds with a modeled concentration greater than the Table 2-1 significance level, PSD regulations require a PSD Increment analysis. The PSD Increment analysis demonstrates that the proposed project will neither cause nor contribute to an exceedance of federal ordinances on industrial expansion. The federal government has three PSD Increment zoning classifications: a Class I area for restricted industrial growth (federal protected lands, etc.); a Class II area for controlled industrial growth; and a Class III area for expanded industrial growth. Most facilities in Louisiana are located within Class II areas; therefore, PSD Class II Increment standards apply. Table 2-1 presents the PSD Increment standards for compounds that may be subject to PSD review due to a proposed project.

For each compound that requires a PSD Increment analysis, the model incorporates both facility-wide (both permitted and grandfathered sources) and off-property emission sources at both their current emission rate and their actual emission rate during a specified baseline year. This increment analysis predicts the change in concentration from the baseline date to what is expected post-project by modeling the difference between emission rates for those time periods. The analysis models current emission rates as positive numbers. For short-term averaging periods (1-hour, 3-hour, 8-hour, or 24-hour), the current emission rate for new or physically modified sources should be the maximum hourly PTE. For the annual averaging periods, the current emission rate for new or physically modified sources should be the average annual PTE. For all other emission sources, the current emission rate is the actual emissions.

The analysis includes baseline emission rates as negative numbers. For PM_{10} and SO_2, the major and minor source baseline dates are January 6, 1975 and August 7, 1977, respectively. For NO_x, the major and minor source baseline date is February 8, 1988. Although mobile and area sources are known to impact PSD Increment, LDEQ may not require the inclusion of emission changes for mobile and area sources in the PSD Increment analysis due to a lack of readily available data for these sources. Applicants should negotiate with LDEQ to ensure the appropriate data is used.

Off-property emission sources are obtained from electronic LDEQ Emission Inventory Survey (EIS) retrievals. The PSD Increment off-property inventory will include all emission sources located within the AOI plus 50 km (please note that 100-kilometers is the maximum distance based upon accuracy constraints of the dispersion model). LDEQ may request that the model incorporate additional off-property sources. The retrievals include source parameters and actual emission rates both for current and baseline years. In the event that the off-property emission sources require data from neighboring states, it is the responsibility of the applicant to obtain this data. It is also the responsibility of the applicant to examine the retrieval data and to bring any suspicious data within the retrieval to the attention of he modeling coordinator. Recently proposed sources and permitted sources not found in the retrieval should be included. To reduce the number of sources included in the PSD Increment inventory, the analysis may merge similar off-property emission sources according to the procedures provided in *Screening Procedures for Estimating the Air Quality Impact of Stationary Sources (Revised)* (EPA, 1992a).

The analysis compares the appropriate modeled concentration to the Table 2-1 PSD Increment standard. For the annual averaging periods, the appropriate modeled concentration is the maximum concentration from the PSD Increment model. For short-term averaging periods, the appropriate modeled concentration is the highest second-high (H_2H) concentration from the PSD Increment model. If the appropriate modeled concentration is less than the PSD Increment standard, the proposed project does not cause nor contribute to an exceedance of the PSD Increment standard; therefore, no further analysis is required. If the appropriate modeled concentration is greater than or equal to the PSD Increment standard, the applicant must determine the proposed project's contribution to the potential exceedance.

The analysis compares the proposed project's contribution to a potential PSD Increment exceedance(s) to the Table 2-1 significance level. If the maximum contribution from the proposed project is less than the significance level at the receptor(s) and time(s) of the potential exceedance(s), the proposed project will not cause nor significantly contribute to the potential PSD Increment exceedance(s); therefore, no further analysis is required. The analysis will document any potential PSD Increment exceedance(s) for LDEQ review. If the maximum contribution from the proposed project is greater than or equal to the significance level at the receptor(s) and time(s) of the potential exceedance(s), the analysis will further examine the receptor location(s) of the potential PSD Increment exceedance(s).

If the receptor of the potential exceedance(s) is located on another facility's property, the analysis subtracts the other facility's contribution to the potential exceedance(s) from the modeled concentration. If the revised concentration is less than the PSD Increment standard, the analysis demonstrates compliance; therefore, no further analysis is required. For any remaining potential PSD Increment exceedance(s), the analysis proposes a file review to update any emission sources that contribute to potential PSD Increment exceedance(s). The emission source may be updated by either reviewing LDEQ permit files or directly contacting the facility. The updates may include both stack parameters and emission rates. Culpable off-property sources will be checked for shutdowns or upset conditions.

2.4 OZONE AMBIENT IMPACT ANALYSIS

If the proposed project includes a net Volatile Organic Compounds (VOC) emission increase greater than 100 tons per year (tpy), 40 CFR 52.21 requires an ozone impact analysis. LDEQ should be consulted to determine the appropriate methodology for the ozone impact analysis.

2.5 NON-ATTAINMENT

Modeling is generally not required for non-attainment pollutants from facilities located in non-attainment areas. However, toxic air pollutant modeling may be required. If an applicant triggers non-attainment review for a given pollutant, it is recommended that they discuss an appropriate path forward with the LDEQ.

It should be noted that if an applicant triggers PSD review for any attainment pollutants, they must still provide the required PSD review for those pollutants.

2.6 CLASS I AREAS

Certain locations near the New Orleans / Slidell area may impact the Breton Wilderness Area and locations near Arkansas may impact the Caney Creek National Wilderness Area; therefore, PSD Class I Increment standards may apply. Class I and Class II standards may apply to facilities located within 100 km of a Class I area. Applicants should negotiate with LDEQ to ensure the appropriate PSD Increment standards are used. Following is the contact information for the Federal Land Managers (FLMs):

Breton Wilderness Area – U. S. Fish & Wildlife Service
Southeast Louisiana Refuges
61389 Hwy 434
Lacombe, LA 70445
Phone: (985) 882-2024
Email: southeastlouisianrefuges@fws.gov

Caney Creek National Wilderness Area – U.S. Forest Services
Ouachita National Forest
Box 1270, Federal Building
Hot Springs National Park, AR 71902
Phone: (501) 321-5324

Future Best Available Retrofit Technology (BART) requirements will include a Class I screening analysis. Facilities should consult with the LDEQ for detailed guidance to perform this screening analysis.

2.7 ADDITIONAL IMPACT ANALYSIS

40 CFR 52.21 requires an Additional Impacts Analysis for compounds under PSD review. The additional impact analysis should include the following analyses:

- Project's potential impact on growth;
  The air quality analysis should discuss the project's potential impact on industrial, commercial, and residential growth in the surrounding area. LDEQ may request that emissions from any significant growth to be incorporated into the PSD NAAQS analysis.

- Project's potential impact on soil and vegetation;
  The air quality analysis should discuss the project's potential impact on soil and vegetation in the surrounding area. The analysis should ensure the proposed emission increases will not adversely impact surrounding soils and vegetation.

- Project potential impact on visibility surrounding the facility.
  Although Class II visibility standards do not currently exist, the analysis requires a screening analysis for the area surrounding the facility according to the procedures in EPA's *Workbook for Plume Visual Impact Screening and Analysis (Revised)* (EPA, 1992b). This visibility analysis is distinct from the analysis required for a Class I area. Initially, a Level I screening analysis will be performed to ensure the project does not contribute to a significant degradation of the visibility in the area. The latest version of VISCREEN will be used to determine the visibility impact of the project. If the Level I screening analysis does not pass the appropriate thresholds, a Level II analysis will be implemented. The Level II analysis replaces the default meteorology with data obtained from the representative meteorological station (please refer to Section 5.2.2). If the Level II analysis does not pass the appropriate thresholds, the applicant should consult with LDEQ for the next step.

For any LTAP that is emitted at a greater rate than the Table 51.1 Minimum Emission Rate (MER), LAC 33:III.5109.B requires that a major source determine the “status of compliance” with the Table 51.2 Ambient Air Standards (AAS) over publicly accessible property. Applicants should discuss modeling requirements with the LDEQ Modeling Coordinator for any LTAP that exceeds the MER due to a proposed project. Applicants should submit a “determination request” that includes the following information: the potential increases in LTAP emissions due to a proposed project; the total permitted LTAP emission rate for the post-project facility; any prior LTAP modeling that may exist for that compound; the LDEQ MER; and the LDEQ AAS. LDEQ may or may not require LTAP modeling based upon the information contained in the determination request. LDEQ may request modeling for pollutants that currently do not have an established AAS.

Section 3.1 describes Step 1 of the LTAP analysis, the initial screening model. Section 3.2 describes Step 2 of the LTAP analysis, the initial refined model. Section 3.3 describes Step 3 of the LTAP analysis, additional refined modeling. Model Selection and Inputs are discussed in Section 5.

3.1 INITIAL SCREENING MODEL

If modeling is requested by LDEQ based on the review of the determination request, initial screening may include all permitted LTAP sources at the facility (when MER is initially exceeded) or only sources that are being modified (when the resulting LTAP increase exceeds the MER). For annual standards, the emission rate represents the sustainable, maximum potential-emission-rate (PTE) for the source. For 8-hour standards, the maximum hourly emission rate should be modeled unless other emission rates are approved by LDEQ. For the latest year of meteorological data (please note one year only), the analysis compares the maximum modeled concentration to the appropriate Table 51.2 AAS. If the results are less than 7.5% of the Table 51.2 AAS at all off-property receptors, the analysis demonstrates compliance; therefore, no further analysis is necessary. If the results are greater than or equal to 7.5% of the Table 51.2 AAS at any off-property receptor, the analysis requires the initial refined model (Section 3.2).

Refined modeling requires a determination of the Area of Impact (AOI) from the initial screening model. The AOI is defined as a circle with a radius equal to the greatest distance from the facility to an off-property receptor in the initial screening model with a concentration equal to 7.5% of the Table 51.2 AAS (please note that the calculated AOI will not exceed 50 kilometers due to accuracy constraints of the ISCST3 model).

3.2 INITIAL REFINED MODEL

To create the initial refined model, all on-property and off-property LTAP sources within the AOI should be included. LDEQ Emission Inventory Survey (EIS) retrievals provide off-property locations and stack parameters; LDEQ Toxic Emission Data Inventory (TEDI) provides the actual emission rate during the previous year.

For the latest year of meteorological data (please note one year only), the analysis compares the maximum modeled concentration to the Table 51.2 AAS. If the results are less than 75% of the Table 51.2 AAS at all off-property receptors, the analysis demonstrates compliance; therefore, no further analysis is necessary. If the results are greater than or equal to 75% of the Table 51.2 AAS at any off-property receptor, the analysis requires additional refined modeling.

3.3 ADDITIONAL REFINED MODELING

Additional refined modeling executes the initial refined model for an additional four years of meteorological data. Using the worst-case year (i.e., the year with the highest off-property concentration), the analysis compares the maximum modeled concentration to the Table 51.2 AAS. If the results are less than the Table 51.2 AAS at all off-property receptors, the analysis demonstrates compliance. For LDEQ's review, the applicant will include a USGS map marked with an isopleth (i.e., line of constant concentration) for 75% of the Table 51.2 AAS. If the results are greater than or equal to the Table 51.2 AAS at any off-property receptor, the applicant will include a USGS map marked with isopleths of 75% and 100% of the Table 51.2 AAS.

A modeling analysis may be requested at LDEQ's discretion to demonstrate compliance with state or federal ambient air standards. Examples include but are not limited to variances, operating permits, minor source permits and enforcement issues.

LDEQ requires certain models / model inputs to demonstrate compliance. Section 5.1 describes the computer models for the analysis. Section 5.2 describes the meteorological data. Section 5.3 describes the selection of a dispersion regime for the facility. Section 5.4 describes the good engineering practice (GEP) stack height analysis. Section 5.5 describes the building downwash analysis. Section 5.6 describes the receptor grid. Section 5.7 describes terrain characteristics. Section 5.8 discusses the coordinate system. Section 5.9 describes additional information requirements for certain sources.

5.1 DISPERSION MODELS

For Prevention of Significant Deterioration (PSD) modeling (PSD permits, state permits, Part 70 permits, variances, and exemptions), LDEQ requires the most recent version of the **A**merican Meteorological Society/**E**nvironmental Protection Agency **R**egulatory **M**odel (AERMOD). Use of the **I**ndustrial **S**ource **C**omplex **S**hort-**T**erm (ISCST3) model is acceptable during the one-year transition period after promulgation of AERMOD on December 9, 2005. To supplement the ISCST3 model, the applicant may use the latest version of ISC-PRIME to analyze concentrations influenced by building downwash (i.e., building cavity regions). All regulatory default options should be input to the model (please note that flat terrain may be used under certain circumstances). Both the AERMOD and ISCST3/ISC-PRIME executable files and user's guides may be downloaded from the EPA SCRAM website: http://www.epa.gov/scram001/.

For toxic air pollutant modeling, the applicant may elect to use ISCST3, ISC-PRIME, or AERMOD.

5.2 METEOROLOGICAL DATA

Section 5.2.1 describes the procedures and data sources for raw meteorological data processing. Section 5.2.2 describes the selection of appropriate meteorological stations. Section 5.2.3 describes Quality Assurance (QA) information for AERMOD meteorological data processing. Section 5.2.4 describes the collection of on-site meteorological data for modeling purposes. Section 5.2.5 describes the AERMOD meteorological parameters (LDEQ default values and a procedure to calculate "site-specific" values). Section 5.2.6 describes screening AERMOD meteorological data available from LDEQ. Unless screening meteorological data is used (AERMOD only), LDEQ requires the most recent, readily available 1 or 5 year processed meteorological data.

5.2.1 Raw Meteorological Data Processing

Both AERMOD and ISCST3 models require processed meteorological data to estimate ambient concentrations. Processed meteorological data is developed from raw hourly surface data and raw twice-daily, mixing-height data. Raw meteorological data may be obtained from the National Climatic Data Center (NCDC) from the following website: http://nndc.noaa.gov/. Occasionally, raw data includes missing information. Minor gaps in surface data (i.e., 4 consecutive hours or less) may be filled by step-wise, linear interpolation. Major gaps in surface data (i.e., greater than four consecutive hours) may be filled by surrogate data from a nearby station listed in Table 5-1. Minor gaps in mixing-height data (i.e., 1 missed observation) may be filled by reasonable interpolation from sounding on the previous and succeeding day. Major gaps in mixing-height data may be filled by the seasonal average of morning or evening soundings. ISCST3 meteorological data is processed with PCRAMMET; AERMOD meteorological data is processed with AERMET. Both PCRAMMET and AERMET executable files and user's guide are available from the EPA SCRAM website: http://www.epa.gov/scram001/. After processing meteorological data, it is recommended that the applicant submit a report that details the data sources, missing data procedures, processing routines, and the final meteorological data. Approval of meteorological processing procedures is recommended before submittal of modeling results.

5.2.2 Meteorological Station Selection

LDEQ determines the appropriate meteorological stations for a facility on a "case-by-case" basis. Typically, LDEQ selects stations based upon the LDEQ regional offices as shown at: (http://www.deq.louisiana.gov/portal/tabid/112/Default.aspx).

Table 5-1 LDEQ Primary Meteorological Data Sources

Regional Office	Primary Surface Station	Surrogate Surface Station	Surrogate Cloud Cover Station	Upper Air Station
Acadiana	Case-by-case	Case-by-case	Case-by-case	Lake Charles (NWS 03937)
Capital	Baton Rouge (NWS 13970)	Baker LDEQ site[1]	Lafayette (NWS 13976)	Lake Charles (NWS 03937)
Northeast	Shreveport (NWS 13957)	Barksdale (WBAN 12958)	Longview, TX (WBAN 03901)	Shreveport (NWS 13957)
Northwest	Shreveport (NWS 13957)	Barksdale (WBAN 12958)	Barksdale (WBAN 12958)	Shreveport (NWS 13957)
Southeast	New Orleans (NWS 12916)	Belle Chase (WABAN 12958)	New Orleans (NWS 12942)	Slidell (NWS 53813)
Southwest	Lake Charles (NWS 03937)	NA	Port Arthur (NWS 12917)	Lake Charles (NWS 03937)

Footnotes:

1. LDEQ Baker ambient monitoring site collects meteorological data.

Additional surrogate stations may be approved by LDEQ; therefore, a list of potential surface stations may be determined from http://www.ncdc.noaa.gov/oa/climate/stationlocator.html. Applicants should verify the anemometer heights for any surface station used (please note that anemometer heights may change over time due to installation or replacement of equipment).

5.2.3 Quality Assurance Information for Meteorological Stations

AERMET requires a Quality Assurance (QA) review of raw meteorological data used in the dispersion model. For raw surface data, the NCDC publishes *Normals, Means, and Extremes* for all primary surface stations listed in Table 5-1. The *Normals, Means, and Extremes* are part of the Local Climatological Data – Edited Annual Summary available on NCDC's website (http://nndc.noaa.gov/). The publication provides summary statistics on previously measured data (up to 30-years). The applicant should compare the raw surface data to minimums and maximums listed in the *Normals, Means, and Extremes* publication. For raw mixing-height data, seasonal mixing height data is available from Holzworth's *Mixing Heights, Wind Speeds, and Potential for Urban Air Pollution Throughout the Contiguous United States* (Holzworth, 1972). The applicant should compare the raw mixing-height data to the seasonal values in this publication.

5.2.4 On-Site Meteorological Data Collection

EPA considers on-site, surface meteorological data to better reflect actual conditions at a facility; therefore if an applicant uses on-site data for a PSD or LTAP analysis, LDEQ requires only the latest year to demonstrate compliance. For on-site data to be approved, the meteorological station must meet EPA's minimum requirements (EPA, 2000) and successfully pass LDEQ inspections. Applicants use the on-site surface data as the primary data source when processing for AERMOD or ISCST3 models. For quality assurance purposes, the applicant should compare the on-site surface data to minimums and maximums listed in the *Normals, Means, and Extremes* publication. Periods of missing data should be filled with the primary surface stations listed in Section 5.2.2.

5.2.5 AERMOD Meteorological Parameters

AERMET requires the calculation of several meteorological parameters for a facility. LDEQ allows applicants to use the following variables without additional negotiation (please note that these factors should be applied to all sectors in the AERMOD model):

Table 5-2 Default AERMOD Meteorological Variables

Regional Office	Albedo	Bowen Ratio	Rural Surface Roughness[1]	Urban Surface Roughness[2]
Acadiana	0.18	0.65	0.10	0.22
Capital	0.16	1.47	0.10	0.93
Northeast	0.18	2.04	0.10	0.86
Northwest	0.18	2.04	0.10	0.86
Southeast	0.16	1.58	0.10	0.87
Southwest	0.18	0.65	0.10	0.22

Footnotes:

1. Calculated based on primary surface station, except Acadiana (since Acadiana has two distinct geographic regions), which is based on the most conservative value from all airports in Louisiana. The default variables calculated for the Northwest are assumed to be also representative of the Northeast region as the land use land classifications for the two regions are similar.

2. EPA surrogate for surface roughness at NWS station (grassland / summer). EPA Human Health Risk Assessment Protocol (EPA, 2005).

Attachment A presents the USGS Land Use Classifications. Attachment B presents detailed calculations for each urban surface roughness value. The analysis should use the listed surface roughness for all wind sectors.

If an applicant wishes to calculate "site-specific" meteorological variables, the applicant should seek approval from the LDEQ and provide justification. To calculate site-specific surface roughness, the following procedure should be followed:

1. Draw a 3 or 5-kilometer radius from the center of the on-site meteorological station;

2. Divide the circle into a maximum of eight specific wind sectors for evaluation (please note that the sectors do not need to be evenly distributed);

3. Use the USGS Land Use Classification (Attachment A) to classify each sector's land use according to AERMET categories (please note that aerial photographs and a site inspection may be used to update the maps since the USGS publication date); and

4. Estimate the seasons of the year based upon the classification in the AERMET User's Guide (please note that LDEQ will accept the following categories without additional negotiation);

Table 5-3 Default Louisiana Seasons for AERMOD Meteorological Variables

Season	Months	Fraction
Spring:	3	25%
Summer:	6	50%
Autumn:	3	25%
Winter:	0	0%

5. Calculate a surface roughness for each sector; and

6. Input surface roughness into AERMET for meteorological data processing.

Please note that LDEQ must approve the "site-specific" surface roughness in each sector prior to submittal of any modeling results. The analysis should be repeated every 15-years to reflect the most current conditions at the site. On a "case-by-case" basis, LDEQ may accept alternative methodologies to calculate other AERMOD surface parameters.

5.3 LAND USE AND DISPERSION REGIME

For PSD analyses, AERMOD automatically uses the "worst-case" of rural or urban dispersion coefficients. On a "case-by-case" basis, LDEQ may allow only urban coefficients for certain sources in the analysis. If this option is used, the approximate population should be estimated by US census data.

For LTAP analyses, LDEQ requires an Auer Land Use analysis (Auer, 1978) to determine dispersion coefficients for a facility when using ISCST3 or ISC-PRIME. The Auer Land Use analysis examines a 3-kilometer radius surrounding the facility. If greater than 50% of the land in this circle is considered urban, the analysis uses urban dispersion coefficients. On a "case-by-case" basis, LDEQ may allow urban coefficients for a large heat source in a rural area, such as an isolated petroleum refinery.

5.4 Good Engineering Practice (GEP) Stack Height Analysis

A good engineering practice (GEP) stack height evaluation determines if avoidance of building wake effects allow a point source to be modeled at a height greater than 65-meters (m). If an applicant has a stack height greater than 65-m, the applicant can model the stack at 65-m with no further approval. If the applicant wants to model the actual stack height, the applicant must demonstrate to LDEQ that the non-default GEP height conforms to EPA guidelines (EPA, 1985). LDEQ must agree prior to submittal of any modeling results. For LDEQ to make a determination, the applicant must provide the following information:

- Scaled plot plan indicating both GEP stack and influencing downwash structures;
- Height comparison of GEP stack and influencing downwash structures;
- Approximate distance between GEP stack and influencing downwash structures;
- Photographs of GEP stack in relation to influencing downwash structures; and
- Output from fluid modeling (BPIP or BPIP-PRIME) used to calculate the non-default GEP stack height.

5.5 BUILDING DOWNWASH ANALYSIS

EPA requires the inclusion of Huber-Snyder and Schulman-Scire building downwash effects in the modeling analysis. The purpose of the evaluation is to determine if the emission discharges might become caught in the turbulent wakes of structures. For AERMOD analyses, LDEQ requires the latest version of Building Profile Input Program (BPIP) PRIME algorithm. For LTAP analyses, LDEQ requires the latest version of either the Building Profile Input Program (BPIP) PRIME or Building Profile Input Program (BPIP). The models determine wind direction-specific downwash dimensions and the dominant downwash structures. Both BPIP/BPIP-PRIME executable file and user's guide may be downloaded from the EPA SCRAM website: http://www.epa.gov/scram001/.

5.6 RECEPTOR GRID

Receptor grids are locations where models calculate off-property, ground-level concentrations. LDEQ requires Cartesian receptor grids to facilitate mapping software. For both PSD and LTAP analyses, the initial receptor grid places receptors at 100-meter (m) spacing along the property boundary and any public roads, public railroads,[1] or navigable waterways which bisect the property. Extending from the property boundary to 1-kilometer (km), the initial receptor grid places receptors every 100-m. From 1-km to 10-km from the property boundary, the initial receptor grid places receptors every 1-km. If the AOI extends beyond the initial receptor grid, the grid should be extended to encompass the entire AOI (please note that the AOI will not extend greater than 50 km from the facility due to accuracy constraints of the dispersion models). If the maximum concentrations are located in areas where the receptor spacing is greater than 100-m, a 100-m receptor grid should be placed around the maximum concentration to ensure the maximum concentration location is accurately identified.

[1] This does not include rail spurs that are only accessible by the applicant facility.

5.7 TERRAIN CONSIDERATIONS

LDEQ determines the requirements for terrain elevations on a "case-by-case" basis. Due to predominantly flat terrain, LDEQ typically does not require receptor elevations for the following regions (please refer to http://www.deq.louisiana.gov/portal/tabid/112/Default.aspx):

- Acadiana Regional Office;
- Capital Regional Office;
- Southeast Regional Office; and
- Southwest Regional Office.

For AERMOD, if the applicant considers terrain, it is recommended to follow the EPA procedures for AERMAP as listed on EPA's SCRAM website (http://www.epa.gov/ttn/scram/).

5.8 COORDINATE SYSTEM

A consistent UTM coordinate system should be utilized for determining the location of all receptors and modeling data including the property line, buildings, terrain, and inventory sources.

5.9 SOURCE CHARACTERISTICS

LDEQ considers certain emission sources as "special cases"; therefore, additional information is required. The following summarizes specific requirements for special emission sources:

5.9.1 Default Source Parameters

For missing or unavailable data, LDEQ requires the following source parameters or documentation for use of parameters from comparable equipment:

- Default height is 3.28-feet (1-meter);
- Default exit temperature is -459.67 ºF (0 ºK). Please note that absolute zero causes AERMOD/ISCST3 to extract hourly temperatures from meteorological data;
- Default exit velocity is 0.00328-feet-per-second (0.001-meters-per-second); and
- Default diameter is 3.28-feet (or 1-meter). Please note that the default diameter should not be used for flares (Section 4.8.4).

5.9.2 Fugitive Emission Sources

Fugitive emission sources are not released to the atmosphere by stacks; examples include the following: process leaks from piping components; evaporation from wastewater treatment facilities; or wind transport from storage piles. Fugitive emissions should only be modeled if emission rates can be reliably quantified. LDEQ requires fugitive emissions to be modeled as pseudopoint (i.e., LDEQ default parameters), area, or area-polygon emission sources.

An elevated pseudopoint, elevated area, elevated area-polygon, or volume sources for a fugitive emission source may be used on a “case-by-case” basis. Documentation of assumptions should be provided and LDEQ may require photographs to evaluate the applicant’s assumption.

5.9.3 Wind Blown Emissions

Particulate wind blown emissions from storage piles and haul roads are not required to be included in short-term modeling analyses. The emission rate for these sources is calculated with average wind speed, which over predicts emission rates at low wind speeds. Toxic emissions from these source types should be considered in any short-term toxic modeling analysis.

5.9.4 Flares

Flares are a special type of source that depends upon the heat release of the flared gas. A high-velocity flare should be modeled as a point source with the following parameters:

- Modeled height is lesser of actual or GEP stack height;
- Modeled temperature is 1832 ºF (1,273 ºK);
- Modeled velocity is 65.6-feet-per-second (20-m/s); and
- Modeled diameter is calculated by the following formula, which is based upon total heat release (H) of the flared gas (calories per second):

$$Diameter\ (meters) \equiv 9.88 \times 10^{-4} \sqrt{0.45 \times H(cal/\sec)}$$

Parameters for flares that are not considered high-velocity should be determined on a "case-by-case" basis.

5.9.5 Rain-caps or Horizontal Releases

Rain-caps or horizontal releases are modeled as a point source; however, the release parameters must reflect the mechanism of dispersion. For these sources, LDEQ recommends the following parameters:

- Model height is lesser of actual or GEP stack height;
- Model temperature is actual stack temperature;
- Model velocity is 0.00328-feet-per-second (0.001-meters-per-second); and
- Model diameter is 3.28-feet (or 1-meter).

5.9.6 Utility Sources with Variable Loads

Some sources (e.g. utility boilers for power plants) do not operate at 100% capacity at all times. The stack parameters (exit velocity and temperature) may reflect worse dispersion conditions than normal, even though emission rates are lower. LDEQ may require these sources to be modeled at 25%, 50%, and 75% capacity.

LDEQ requires the approval of certain modeling techniques and modeling data sources in the modeling protocol. Section 6.1 discusses background concentrations for the NAAQS analysis. Section 6.2 discusses the ambient ratio method that compares modeled NO_x concentrations to the NO_2 NAAQS standard. Section 6.3 describes the ozone impact analysis.

6.1 BACKGROUND CONCENTRATIONS

The PSD regulations require a background estimate for the NAAQS compliance demonstration. Section 6.1.1 describes the LDEQ monitoring program in Louisiana. Section 6.1.2 describes the use of a background estimate in the NAAQS compliance demonstration.

6.1.1 Background Monitors

LDEQ operates ambient monitoring sites throughout Louisiana. A map with locations of both current and previous monitoring data is available from LDEQ (http://www.deq.louisiana.gov/portal/tabid/112/Default.aspx). Please note that ambient monitoring data must reflect the latest three years). Actual ambient monitoring data is available from the EPA at the following website: http://www.epa.gov/air/data/geosel.html. In addition, applicants may request hourly monitoring data from LDEQ's Air Quality Analysis section. Section 6.1.1.1 describes the data selection methodology for primary compounds (i.e., CO, NO_2, PM_{10}, or SO_2). Section 6.1.1.2 describes the data selection methodology for secondary compounds (i.e., ozone). LDEQ must approve monitoring sites for PSD applications. If preconstruction monitoring is required for the proposed project, the applicant should submit a determination request to LDEQ for approval.

6.1.1.1 Primary Compounds

Primary compounds (i.e., CO, NO_2, PM_{10}, and SO_2) are not formed by atmospheric reactions; therefore, the measured concentration depends upon the location and prevalence to emission sources. Typically, LDEQ considers the surrounding area, the availability of data, and the proximity to the facility to select the monitors.

6.1.1.2 Secondary Compounds

Secondary compounds are formed by atmospheric reactions; therefore, the measured concentration depends upon the atmospheric conditions that surround the facility. Typically, LDEQ considers the surrounding area, the availability of data, and the proximity to the facility to select a representative monitor. LDEQ considers ozone as a regional pollutant; therefore, LDEQ may require the analysis of several sites to assess regional concentrations.

6.1.2 Background Concentration Use

The appropriate background concentration depends upon both the PSD compound and the applicable averaging period. Section 6.1.2.1 describes the adjusted background concentration for primary compounds (i.e., CO, NO_2, PM_{10}, or SO_2). Section 6.1.2.2 describes the background concentration used for the secondary compound of ozone.

6.1.2.1 Primary Compounds

The NAAQS analysis for primary compounds (i.e., CO, NO_2, PM_{10}, and SO_2) uses the adjusted background concentration to evaluate the influence of the surrounding industry on the measured background concentration. The adjusted background concentration should be calculated by the following formula:

$$\text{Adjusted Background Conc.} \equiv \left[(\text{Monitored Conc.}) - (\text{Modeled Conc. at Monitor})\right]$$

The equation uses different concentrations based upon the compound and the appropriate averaging period. For the annual period, the analysis uses the annual concentration from the ambient monitor and the annual concentration from the dispersion model in the adjusted background calculation. For the PM_{10} 24-hour period, the analysis uses the sixth-highest concentration over five years from the ambient monitor and the sixth-highest concentration over five years from the dispersion model in the adjusted background calculation. For the CO and SO_2 short-term periods, the analysis uses the second-highest concentration from the ambient monitor and the second-highest concentration from the dispersion model in the adjusted background calculation. A comparison of more conservative concentrations (i.e. comparison of second-highest for PM_{10}) may be used as desired. Please note that the adjusted background concentration should be set to zero if the results are negative.

6.1.2.2 Secondary Compounds

The ozone NAAQS analysis uses different background concentrations depending upon the methodology used to obtain the background estimate. LDEQ should be consulted to determine the appropriate methodology for establishing the ozone background, including the number of stations required for the analysis.

6.2 AMBIENT RATIO METHOD

Most facilities report NO_x emissions based upon the stack testing results. Due to the instability of NO_x compounds in the atmosphere, the PSD program regulates ambient concentrations of NO_2. LDEQ allows the use of the ambient ratio method (ARM) to convert modeled NO_x concentrations to the PSD NO_2 standard (please refer to 40 CFR part 51 Appendix W for additional information). The ARM may be used for the following PSD analyses: Significant Impact Analysis, NAAQS Analysis, and PSD Increment Analysis.

LDEQ generally allows facilities to use the default ARM ratio of 0.75, which is based upon national EPA monitoring data. An applicant may propose a more site-specific ratio based on existing monitoring data; however, LDEQ must approve the revised ratio before its use in the air quality analysis.

LDEQ requires a clear, concise report presenting the modeling results. The report should include the following information:

- Brief overview of proposed project;
- Facility plot plan indicating sources, property line, clear scale, and true north;
- Emission rate summary for all facility sources, with units consistent with modeling;
- Stack parameter summary for all facility sources, with units consistent with modeling;
- Any calculations for stack parameters (i.e., combined stacks, flares, etc.) unless previously approved by LDEQ;
- Approved modeling protocol;
- Technical basis for any non-standard procedure (please note that any non-standard procedure requires prior approval);
- Summary of all model inputs (e.g., model used, met data, rural or urban dispersion coefficients, etc.);
- Comparison of all modeling results to the applicable standards (please include figures if required);
- Electronic copies of all modeling files, including model input files, output files, met data with appropriate documentation if processing performed, and building downwash files; and
- Paper copy of the output files for the worst-case year for each pollutant and averaging period.

LDEQ may request additional information before reviewing the modeling report. LDEQ uses the content of the modeling submittal and adherence to modeling protocol as a basis for acceptance.

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