OTHER ATTACHMENTS:

ATTACHMENT 1: Meteorological Monitoring Guidance for Regulatory Modeling Applications, EPA-454/R-99-005 (cover and page 3-1)

ATTACHMENT 2: Quality Assurance Handbook for Air Pollution Measurement Systems, March 2008 (page 4 of Volume 4, Appendix C)

ATTACHMENT 3: AERMOD Implementation Guide, dated March 19, 2009 (cover and page 8).

ATTACHMENT 4: AERMOD: Description of Model Formulation, EPA-454/R-03-004 dated September 2004 (cover, and page 2, 75-76)

ATTACHMENT 5: User's Guide for the AERMOD Meteorological Preprocessor (AERMET) Addendum, EPA-454/B-03-002, November 2004 (cover and Table B-3b).

ATTACHMENT 6: 40 CFR Part 51, Appendix W, FR Vol. 70, No. 216, November 9, 2005 Sections 8.3, 8.3.3.1, reference 5

ATTACHMENT 7: EPA Guidance for Siting Ambient Air Monitors around Stationary Lead Sources, EPA-454/R-92-009, and August 1997 (cover and page 7).

ATTACHMENT 8: Photo extracted from Petitioner's Quinones' Exhibit 1 NOAA Buoy Center Website for meteorological station AROP4.

ATTACHMENT 9: EPA Region 2 Interim Environmental Justice Policy, December 2000, (cover and section 2.2.2, Table 1 and Table 2, and section 2.2.3)

ATTACHMENT 10: Email from George Bridgers, Air Quality Modeling Group, OAQPS to Annamaria Coulter, Region 2, regarding temporal representativeness of Cambalache meteorological data, dated July 26, 2013.

ATTACHMENT 11: Screening Procedures for Estimating the Air Quality Impact of Stationary Sources Revised, EPA 454/R-92-019, October 1992, (cover and page 2-2 to 2-3.)

OTHER ATTACHMENTS

ATTACHMENT 1

Meteorological Monitoring Guidance for Regulatory Modeling Applications, February 2000.

EPA-454/R-99-005

Meteorological Monitoring Guidance for Regulatory Modeling Applications

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Radiation
Office of Air Quality Planning and Standards
Research Triangle Park, NC 27711

February 2000

3. SITING AND EXPOSURE

This section provides guidance on siting and exposure of meteorological towers and sensors for the in situ measurement of the primary meteorological variables. Specific guidance is provided for siting in simple terrain (Section 3.2), in complex terrain (Section 3.3), in coastal locations (Section 3.4), and in urban locations (Section 3.5). The issue of representativness is addressed in Section 3.1.

As a general rule, meteorological sensors should be sited at a distance which is beyond the influence of obstructions such as buildings and trees; this distance depends upon the variable being measured as well as the type of obstruction. The other general rule is that the measurements should be representative of meteorological conditions in the area of interest; the latter depends on the application. Secondary considerations such as accessibility and security must be taken into account, but should not be allowed to compromise the quality of the data. In addition to routine quality assurance activities (see Section 8), annual site inspections should be made to verify the siting and exposure of the sensors. Approval for a particular site selection should be obtained from the permit granting agency prior to any site preparation activities or installation of any equipment.

3.1 Representativeness

One of the most important decisions in preparing for an air quality modeling analysis involves the selection of the meteorological data base; this is the case whether one is selecting a site for monitoring, or selecting an existing data base. These decisions almost always lead to similar questions: "Is the site (are the data) representative?" Examples eliciting a negative response abound; e.g., meteorological data collected at a coastal location affected by a land/sea breeze circulation would generally not be appropriate for modeling air quality at an inland site located beyond the penetration of the sea breeze. One would hope that such examples could be used in formulating objective criteria for use in evaluating representativeness in general. Though this remains a possibility, it is not a straight forward task - this is due in part to the fact that representativeness is an exact condition; a meteorological observation, data base, or monitoring site, either is, or is not representative within the context of whatever criteria are prescribed. It follows that, a quantitative method does not exist for determining representativeness absolutely. Given the above, it should not be surprising that there are no generally accepted analytical or statistical techniques to determine representativeness of meteorological data or monitoring sites.

3.1.1 Objectives for Siting

Representativeness has been defined as "the extent to which a set of measurements taken in a space-time domain reflects the actual conditions in the same or different space-time domain taken on a scale appropriate for a specific application" **[10]**. The space-time and application aspects of the definition as relates to site selection are discussed in the following.

<u>ATTACHMENT 2</u>

Quality Assurance Handbook for Air Pollution Measurement Systems, March 2008.

Quality Assurance Handbook for Air Pollution Measurement Systems

Volume IV: Meteorological Measurements Version 2.0 (Final)

CRITICAL CRITERIA TABLE – METEOROLOGICAL MEASUREMENT METHODS

S - single instrument hourly value, G - group of hourly values from 1 instrument

Parameter	Criteria	Acceptable Range	Frequency	Samples Impacted	EPA -454/R-99-005 Feb 2000	EPA Regulation & Guidance	ADEC AM&QA QAPP
All parameters	Hourly average		Quarterly	All	Chapter 5 Section 1		Section 7
	Data Completeness						
All parameters	Valid data capture	≥75 %	Hourly	G	Chapter 5 Sections 3 & 4	QA Handbook Vol IV Section 0 Tables 0-3, 0-4, 0-5, 0-6	Section 7 18 AAC 50.010
	(PSD Quality Monitoring) Valid data capture	≥ 90% hourly data, joint collection of WS, WD , and stability (SRDT, σθ, or σw depending upon model selection)	Quarterly (4 consecutive quarters)	G			
	Calibration						
WS, VWS	**Multi-point Calibration**	5 points including zero, 2 m/s and 3 additional evenly spaced upscale points covering expected wind speeds for the site All test points ≤ ± **(2 m/s + 5% of observed)** WS bearing torque threshold ≤ **PSD quality sensor's manufacturer's specs**	Initially, 1/6 months thereafter	G	Chapter 5	QA Handbook Vol IV , All Sections and 0 Tables 0-3, 0-4, 0-5, 0-6	Section 7 MQO Table A8
WS/WD Sonic Anemometer	**Multi-point Calibration**	Multipoint calibration via wind tunnel by manufacturer	Initially, 1/year thereafter				
WD, VWD	**Multi-point Calibration**	Alignment to True North + linearity test points at: 0°, 45°, 90°, 135°, 180°, 225°, 270°, 315°, 360° Alignment ≤ ± 5° Linearity (All Points) ≤ ± 3° **(included in ≤ ± 5° above)** WD bearing torque threshold ≤ **PSD quality sensor's manufacturer's specs**	Initially, 1/6 months thereafter	G	Chapter 5 Chapter 8		

<u>ATTACHMENT 3</u>

AERMOD Implementation Guide, March 19, 2009.

AERMOD IMPLEMENTATION GUIDE

Last Revised: March 19, 2009

AERMOD Implementation Workgroup

U. S. Environmental Protection Agency
Office of Air Quality Planning and Standards
Air Quality Assessment Division
Research Triangle Park, North Carolina

1) all levels,
2) mandatory and significant levels, or
3) mandatory levels only.

Options 1 and 2 are both acceptable and should provide equivalent results when processed through AERMET. The use of mandatory levels only, Option 3, will not provide an adequate characterization of the potential temperature profile, and is not acceptable for AERMOD modeling applications.

3.3 PROCESSING SITE-SPECIFIC METEOROLOGICAL DATA FOR URBAN APPLICATIONS (01/09/08)

The use of site-specific meteorological data obtained from an urban setting may require some special processing if the measurement site is located within the influence of the urban heat island and site-specific turbulence measurements are available (e.g., σ_θ and/or σ_w). As discussed in Section 5.4, the urban algorithms in AERMOD are designed to enhance the turbulence levels relative to the nearby rural setting during nighttime stable conditions to account for the urban heat island effect. Since the site-specific turbulence measurements will reflect the enhanced turbulence associated with the heat island, site-specific turbulence measurements should not be used when applying AERMOD's urban option, in order to avoid double counting the effects of enhanced turbulence due to the urban heat island.

As also discussed in Section 5.4, the AERMOD urban option (URBANOPT) should be selected for urban applications, regardless of whether the meteorological measurement site is located in an urban setting. This is due to the fact that the limited surface meteorological measurements available from the meteorological measurement program (even with measured turbulence) will not adequately account for the meteorological characteristics of the urban boundary layer included in the AERMOD urban algorithms.

ATTACHMENT 4

AERMOD: Description of Model Formulation, September 2004.

United States Environmental Protection Agency

AERMOD: DESCRIPTION OF MODEL FORMULATION

EPA-454/R-03-004
September 2004

AERMOD: DESCRIPTION OF MODEL FORMULATION

By:

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7 APPENDIX: Input / Output Needs and Data Usage

7.1 *AERMET Input Data Needs*

Besides defining surface characteristics, the user provides several files of hourly meteorological data for processing by AERMET. At the present time AERMET is designed to accept data from any for the following sources: 1) standard hourly National Weather Service (NWS) data from the most representative site; 2) morning soundings of winds, temperature, and dew point from the nearest NWS upper air station; and 3) on-site wind, temperature, turbulence, pressure, and radiation measurements (if available).

The minimum measured and/or derived data needed to run the AERMOD modeling system are as follows:

7.1.1 METEOROLOGY

wind speed (u); wind direction; cloud cover - opaque first then total (n); ambient temperature (t); morning sounding

Cloud cover is also used in dry deposition calculations in the AERMOD model. Therefore, if cloud cover is missing and the Bulk Richardson Number Scheme is being used (see 3.3.1) then an equivalent could cover is calculated as follows, based on van Ulden and Holtslag (van Ulden and Holtslag 1985):

$$n_{eq} = \left(\frac{1 - \theta_* / 0.09}{0.5} \right)^{0.5} \tag{108}$$

where θ_* is the temperature scale as calculated from eq. **(18)**.

7.1.2 DIRECTIONALLY AND/OR MONTHLY VARYING SURFACE CHARACTERISTICS

Noon time albedo (r'); Bowen ratio (B_o); roughness length (z_o) - For AERMET, the user can specify monthly variations of three surface characteristics for up to 12 upwind direction sectors. These include: the albedo (r), which is the fraction of radiation reflected by the surface; the Bowen ratio (B_o), which is the ratio of the sensible heat flux to the evaporation heat flux; and the surface roughness length (z_o), which is the height above the ground at which the horizontal wind velocity is typically zero. The user will be guided by look-up tables (in the AERMET user's guide) of typical values for these three variables for a variety of seasons and land use types. The information presented in the user's guide is not be considered regulatory guidance. The user is encouraged to research the literature to determine the most appropriate values for surface characteristics, for a specific application.

7.1.3 OTHER

Latitude; longitude; time zone; wind speed instrument threshold for each data set (u_{th}).

7.1.4 OPTIONAL

Solar radiation; net radiation (R_n); profile of vertical turbulence (σ_w); profile of lateral turbulence (σ_v)

7.2 *Selection and Use of Measured Winds, Temperature and Turbulence in AERMET*

7.2.1 THRESHOLD WIND SPEED

The user is required to define a threshold wind speed (u_{th}) for on-site data sets. Although the current version of AERMOD cannot accept a separate u_{th} for NWS data, a separate u_{th} should be selected for each on-site data set being used.

7.2.2 REFERENCE TEMPERATURE AND HEIGHT

The reference height for temperature (z_{Tref}), and thus the reference temperature, is selected as the lowest level of data which is available between z_o & 100 m.

7.2.3 REFERENCE WIND SPEED AND HEIGHT

The reference height for winds (z_{ref}), and thus the reference wind speed (u_{ref}), is selected as the lowest level of data which is available between 7 z_o & 100m. Although the current version of AERMOD cannot accept a separate z_{ref} for offsite data, we believe that a separate z_{ref} should be selected for each data set being used.

If no valid observation of the reference wind speed or direction exists between these limits the hour is considered missing and a message is written to the AERMET message file. For the wind speed to be valid its value must be greater than or equal to the threshold wind speed. AERMOD processes hours of invalid wind speed, e.g. calms, in the same manner as ISC (EPA calms policy).

All observed wind speeds in a measured profile that are less than u_{th} are set to missing and are therefore not used in the construction of the wind speed profile (profiling of winds is accomplished in AERMOD).

7.2.4 CALCULATING THE POTENTIAL TEMPERATURE GRADIENT ABOVE THE MIXING HEIGHT FROM SOUNDING DATA

AERMET calculates $d\theta/dz$ for the layer above z_i as follows:

- If the sounding extends at least 500 m above z_i the first 500 m above z_i is used to determine $d\theta/dz$ above z_i.
- If the sounding extends at least 250 m above z_i (but not 500 m) then the available sounding above z_i is used to determine $d\theta/dz$ above z_i.
- AERMET limits $d\theta/dz$ above z_i to a minimum of 0.005 K m^{-1}.
- If the sounding extends less than 250 m above z_i then set $d\theta/dz$ = 0.005 K m^{-1} (a default value).

ATTACHMENT 5

User's Guide for the AERMOD Meteorological Preprocessor (AERMET) Addendum, November 2004.

ADDENDUM

USER'S GUIDE FOR THE AERMOD METEOROLOGICAL PREPROCESSOR (AERMET)

(EPA-454/B-03-002, November 2004)

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Air Quality Assessment Division
Research Triangle Park, North Carolina 27711

December 2012

TABLE B-3b

VARIABLE AND QA DEFAULTS FOR THE ONSITE (SITE-SPECIFIC) MULTI-LEVEL VARIABLES

Variable Name	Description	Units	Type	Missing Indicator	Lower Bound	Upper Bound
HTnn	Height	meters	<	9999	0	4000
SAnn	Std. dev. horizontal wind	degrees	<	99	0	35
SEnn	Std. dev. vertical wind	degrees	<	99	0	25
SVnn	Std. dev. v-comp. of wind	meters/second	<	99	0	3
SWnn	Std. dev. w-comp. of wind	meters/second	<	99	0	3
SUnn	Std. dev. u-comp. of wind	meters/second	<	99	0	3
TTnn*	Temperature	°C	<	99	-30	40
WDnn*	Wind direction	degrees from north	<=	999	0	360
WSnn*	Wind speed	meters/second	<=	99	0	50
VVnn	Vertical wind component	meters/second	<	999	0	5
DPnn	Dew-point temperature	°C	<	99	-65	35
RHnn	Relative humidity	whole percent	<=	999	0	100
V1nn	User's vector #1	user's units	<	999	0	100
V2nn	User's vector #2	user's units	<	999	0	100
V3nn	User's vector #3	user's units	<	999	0	100

'*nn*' in variables HT to V3 refers to the level at which the observation was taken; e.g., TT01 is the temperature at the first level and WS02 is wind speed at the second level.

*Automatically included in audit report.

Note: Shaded parameters are not currently used in AERMET.

<u>ATTACHMENT 6</u>

40 CFR Part 51, Appendix W, FR Vol. 70, No. 216, November 9, 2005.

Federal Register

Wednesday,
November 9, 2005

Part III

Environmental Protection Agency

40 CFR Part 51

Revision to the Guideline on Air Quality Models: Adoption of a Preferred General Purpose (Flat and Complex Terrain) Dispersion Model and Other Revisions; Final Rule

c. If there are no monitors located in the vicinity of the source, a "regional site" may be used to determine background. A "regional site" is one that is located away from the area of interest but is impacted by similar natural and distant man-made sources.

8.2.3 Recommendations (Multi-Source Areas)

a. In multi-source areas, two components of background should be determined: contributions from nearby sources and contributions from other sources.

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

c. For compliance with the short-term and annual ambient standards, the nearby sources as well as the primary source(s) should be evaluated using an appropriate Appendix A model with the emission input data shown in Table 8–1 or 8–2. When modeling a nearby source that does not have a permit and the emission limit contained in the SIP for a particular source category is greater than the emissions possible given the source's maximum physical capacity to emit, the "maximum allowable emission limit" for such a nearby source may be calculated as the emission rate representative of the nearby source's maximum physical capacity to emit, considering its design specifications and allowable fuels and process materials. However, the burden is on the permit applicant to sufficiently document what the maximum physical capacity to emit is for such a nearby source.

d. It is appropriate to model nearby sources only during those times when they, by their nature, operate at the same time as the primary source(s) being modeled. Where a primary source believes that a nearby source does not, by its nature, operate at the same time as the primary source being modeled, the burden is on the primary source to demonstrate to the satisfaction of the appropriate reviewing authority (paragraph 3.0(b)) that this is, in fact, the case. Whether or not the primary source has adequately demonstrated that fact is a matter of professional judgement left to the discretion of the appropriate reviewing authority. The following examples illustrate two cases in which a nearby source may be shown not to operate at the same time as the primary source(s) being modeled. Some sources are only used during certain seasons of the year. Those sources would not be modeled as nearby sources during times in which they do not operate. Similarly, emergency backup generators that never operate simultaneously with the sources that they back up would not be modeled as nearby sources. To reiterate, in these examples and other appropriate cases, the burden is on the primary source being modeled to make the appropriate demonstration to the satisfaction of the appropriate reviewing authority.

e. The impact of the nearby sources should be examined at locations where interactions between the plume of the point source under consideration and those of nearby sources (plus natural background) can occur. Significant locations include: (1) the area of maximum impact of the point source; (2) the area of maximum impact of nearby sources; and (3) the area where all sources combine to cause maximum impact. These locations may be identified through trial and error analyses.

f. *Other Sources:* That portion of the background attributable to all other sources (*e.g.*, natural sources, minor sources and distant major sources) should be determined by the procedures found in subsection 89.2.2 or by application of a model using Table 8–1 or 8–2.

8.3 Meteorological Input Data

a. The meteorological data used as input to a dispersion model should be selected on the basis of spatial and climatological (temporal) representativeness as well as the ability of the individual parameters selected to characterize the transport and dispersion conditions in the area of concern. The representativeness of the data is dependent on: (1) The proximity of the meteorological monitoring site to the area under consideration; (2) the complexity of the terrain; (3) the exposure of the meteorological monitoring site; and (4) the period of time during which data are collected. The spatial representativeness of the data can be adversely affected by large distances between the source and receptors of interest and the complex topographic characteristics of the area. Temporal representativeness is a function of the year-to-year variations in weather conditions. Where appropriate, data representativeness should be viewed in terms of the appropriateness of the data for constructing realistic boundary layer profiles and three dimensional meteorological fields, as described in paragraphs (c) and (d) below.

b. Model input data are normally obtained either from the National Weather Service or as part of a site specific measurement program. Local universities, Federal Aviation Administration (FAA), military stations, industry and pollution control agencies may also be sources of such data. Some recommendations for the use of each type of data are included in this subsection.

c. Regulatory application of AERMOD requires careful consideration of minimum data for input to AERMET. Data representativeness, in the case of AERMOD, means utilizing data of an appropriate type for constructing realistic boundary layer profiles. Of paramount importance is the requirement that all meteorological data used as input to AERMOD must be both laterally and vertically representative of the transport and dispersion within the analysis domain. Where surface conditions vary significantly over the analysis domain, the emphasis in assessing representativeness should be given to adequate characterization of transport and dispersion between the source(s) of concern and areas where maximum design concentrations are anticipated to occur. The representativeness of data that were collected off-site should be judged, in part, by comparing the surface characteristics in the vicinity of the meteorological monitoring site with the surface characteristics that generally describe the analysis domain. The surface characteristics input to AERMET should be based on the topographic conditions in the vicinity of the meteorological tower. Furthermore, since the spatial scope of each variable could be different, representativeness should be judged for each variable separately. For example, for a variable such as wind direction, the data may need to be collected very near plume height to be adequately representative, whereas, for a variable such as temperature, data from a station several kilometers away from the source may in some cases be considered to be adequately representative.

d. For long range transport modeling assessments (subsection 6.2.3) or for assessments where the transport winds are complex and the application involves a non-steady-state dispersion model (subsection 7.2.8), use of output from prognostic mesoscale meteorological models is encouraged.[84 85 86] Some diagnostic meteorological processors are designed to appropriately blend available NWS comparable meteorological observations, local site specific meteorological observations, and prognostic mesoscale meteorological data, using empirical relationships, to diagnostically adjust the wind field for mesoscale and local-scale effects. These diagnostic adjustments can sometimes be improved through the use of strategically placed site specific meteorological observations. The placement of these special meteorological observations (often more than one location is needed) involves expert judgement, and is specific to the terrain and land use of the modeling domain. Acceptance for use of output from prognostic mesoscale meteorological models is contingent on concurrence by the appropriate reviewing authorities (paragraph 3.0(b)) that the data are of acceptable quality, which can be demonstrated through statistical comparisons with observations of winds aloft and at the surface at several appropriate locations.

8.3.1 Length of Record of Meteorological Data

8.3.1.1 Discussion

a. The model user should acquire enough meteorological data to ensure that worst-case meteorological conditions are adequately represented in the model results. The trend toward statistically based standards suggests a need for all meteorological conditions to be adequately represented in the data set selected for model input. The number of years of record needed to obtain a stable distribution of conditions depends on the variable being measured and has been estimated by Landsberg and Jacobs[87] for various parameters. Although that study indicates in excess of 10 years may be required to achieve stability in the frequency distributions of some meteorological variables, such long periods are not reasonable for model input data. This is due in part to the fact that hourly data in model input format are frequently not available for such periods and that hourly calculations of concentration for long periods may be prohibitively expensive. Another study [88] compared various periods from a 17-year data set to determine the minimum number of years of data needed to approximate the concentrations modeled with a 17-year period of meteorological data from one station. This study indicated that the variability of model estimates due to the meteorological data input was adequately reduced if a 5-year period of record of meteorological input was used.

8.3.1.2 Recommendations

a. Five years of representative meteorological data should be used when estimating concentrations with an air quality model. Consecutive years from the most recent, readily available 5-year period are preferred. The meteorological data should be *adequately representative*, and may be site specific or from a nearby NWS station. Where professional judgment indicates NWS-collected ASOS (automated surface observing stations) data are inadequate {for cloud cover observations}, the most recent 5 years of NWS data that are observer-based may be considered for use.

b. The use of 5 years of NWS meteorological data or at least 1 year of site specific data is required. If one year or more (including partial years), up to five years, of site specific data is available, these data are preferred for use in air quality analyses. Such data should have been subjected to quality assurance procedures as described in subsection 8.3.3.2.

c. For permitted sources whose emission limitations are based on a specific year of meteorological data, that year should be added to any longer period being used (*e.g.*, 5 years of NWS data) when modeling the facility at a later time.

d. For LRT situations (subsection 6.2.3) and for complex wind situations (paragraph 7.2.8(a)), if only NWS or comparable standard meteorological observations are employed, five years of meteorological data (within and near the modeling domain) should be used. Consecutive years from the most recent, readily available 5-year period are preferred. Less than five, but at least three, years of meteorological data (need not be consecutive) may be used if mesoscale meteorological fields are available, as discussed in paragraph 8.3(d). These mesoscale meteorological fields should be used in conjunction with available standard NWS or comparable meteorological observations within and near the modeling domain.

e. For solely LRT applications (subsection 6.2.3), if site specific meteorological data are available, these data may be helpful when used in conjunction with available standard NWS or comparable observations and mesoscale meteorological fields as described in paragraph 8.3.1.2(d).

f. For complex wind situations (paragraph 7.2.8(a)) where site specific meteorological data are being relied upon as the basis for characterizing the meteorological conditions, a data base of at least 1 full-year of meteorological data is required. If more data are available, they should be used. Site specific meteorological data may have to be collected at multiple locations. Such data should have been subjected to quality assurance procedures as described in paragraph 8.3.3.2(a), and should be reviewed for spatial and temporal representativeness.

8.3.2 National Weather Service Data

8.3.2.1 Discussion

a. The NWS meteorological data are routinely available and familiar to most model users. Although the NWS does not provide direct measurements of all the needed dispersion model input variables, methods have been developed and successfully used to translate the basic NWS data to the needed model input. Site specific measurements of model input parameters have been made for many modeling studies, and those methods and techniques are becoming more widely applied, especially in situations such as complex terrain applications, where available NWS data are not adequately representative. However, there are many model applications where NWS data are adequately representative, and the applications still rely heavily on the NWS data.

b. Many models use the standard hourly weather observations available from the National Climatic Data Center (NCDC). These observations are then preprocessed before they can be used in the models.

8.3.2.2 Recommendations

a. The preferred models listed in Appendix A all accept as input the NWS meteorological data preprocessed into model compatible form. If NWS data are judged to be adequately representative for a particular modeling application, they may be used. NCDC makes available surface [89 90] and upper air [91] meteorological data in CD–ROM format.

b. Although most NWS measurements are made at a standard height of 10 meters, the actual anemometer height should be used as input to the preferred model. Note that AERMOD at a minimum requires wind observations at a height above ground between seven times the local surface roughness height and 100 meters.

c. Wind directions observed by the National Weather Service are reported to the nearest 10 degrees. A specific set of randomly generated numbers has been developed for use with the preferred EPA models and should be used with NWS data to ensure a lack of bias in wind direction assignments within the models.

d. Data from universities, FAA, military stations, industry and pollution control agencies may be used if such data are equivalent in accuracy and detail to the NWS data, and they are judged to be adequately representative for the particular application.

8.3.3 Site Specific Data

8.3.3.1 Discussion

a. Spatial or geographical representativeness is best achieved by collection of all of the needed model input data in close proximity to the actual site of the source(s). Site specific measured data are therefore preferred as model input, provided that appropriate instrumentation and quality assurance procedures are followed and that the data collected are adequately representative (free from inappropriate local or microscale influences) and compatible with the input requirements of the model to be used. It should be noted that, while site specific measurements are frequently made "on-property" (*i.e.*, on the source's premises), acquisition of adequately representative site specific data does not preclude collection of data from a location off property. Conversely, collection of meteorological data on a source's property does not of itself guarantee adequate representativeness. For help in determining representativeness of site specific measurements, technical guidance [92] is available. Site specific data should always be reviewed for representativeness and consistency by a qualified meteorologist.

8.3.3.2 Recommendations

a. EPA guidance [92] provides recommendations on the collection and use of site specific meteorological data. Recommendations on characteristics, siting, and exposure of meteorological instruments and on data recording, processing, completeness requirements, reporting, and archiving are also included. This publication should be used as a supplement to other limited guidance on these subjects.[93 94] Detailed information on quality assurance is also available.[95] As a minimum, site specific measurements of ambient air temperature, transport wind speed and direction, and the variables necessary to estimate atmospheric dispersion should be available in meteorological data sets to be used in modeling. Care should be taken to ensure that meteorological instruments are located to provide representative characterization of pollutant transport between sources and receptors of interest. The appropriate reviewing authority (paragraph 3.0(b)) is available to help determine the appropriateness of the measurement locations.

b. All site specific data should be reduced to hourly averages. Table 8–3 lists the wind related parameters and the averaging time requirements.

c. *Missing Data Substitution.* After valid data retrieval requirements have been met [92], hours in the record having missing data should be treated according to an established data substitution protocol provided that data from an adequately representative alternative site are available. Such protocols are usually part of the approved monitoring program plan. Data substitution guidance is provided in Section 5.3 of reference 92. If no representative alternative data are available for substitution, the absent data should be coded as missing using missing data codes appropriate to the applicable meteorological pre-processor. Appropriate model options for treating missing data, if available in the model, should be employed.

d. *Solar Radiation Measurements.* Total solar radiation or net radiation should be measured with a reliable pyranometer or net radiometer, sited and operated in accordance used. Background concentrations should be added to the estimated impact of the source. The most restrictive standard should be used in all cases to assess the threat of an air quality violation. For new or modified sources predicted to have a significant ambient impact [83] in areas designated attainment or unclassifiable for the PM–10 NAAQS, the demonstration of whether or not the source will cause or contribute to an air quality violation should be based on sufficient data to show whether: (1) The projected 24-hour average concentrations will exceed the 24-hour NAAQS more than once per year, on average; (2) the expected (i.e., average) annual mean concentration will exceed the annual NAAQS; and (3) the source contributes significantly, in a temporal and spatial sense, to any modeled violation.

10.2.3.3 PSD Air Quality Increments and Impacts

a. The allowable PSD increments for criteria pollutants are established by regulation and cited in 40 CFR 51.166. These maximum allowable increases in pollutant concentrations may be exceeded once per year at each site, except for the annual increment that may not be exceeded. The highest, second-highest increase in estimated concentrations for the short term averages as determined by a model should be less than or equal to the permitted increment. The modeled annual averages should not exceed the increment.

b. Screening techniques defined in subsection 4.2.1 can sometimes be used to estimate short term incremental concentrations for the first new source that triggers the baseline in a given area. However, when multiple increment-consuming sources are involved in the calculation, the use of a refined model with at least 1 year of site specific or 5 years of (off-site) NWS data is normally required (subsection 8.3.1.2). In such cases, sequential modeling must demonstrate that the allowable increments are not exceeded temporally and spatially, *i.e.*, for all receptors for each time period throughout the year(s) (time period means the appropriate PSD averaging time, *e.g.*, 3-hour, 24-hour, *etc.*).

c. The PSD regulations require an estimation of the SO_2, particulate matter (PM–10), and NO_2 impact on any Class I area. Normally, steady-state Gaussian plume models should not be applied at distances greater than can be accommodated by the steady state assumptions inherent in such models. The maximum distance for refined steady-state Gaussian plume model application for regulatory purposes is generally considered to be 50km. Beyond the 50km range, screening techniques may be used to determine if more refined modeling is needed. If refined models are needed, long range transport models should be considered in accordance with subsection 6.2.3. As previously noted in Sections 3 and 7, the need to involve the Federal Land Manager in decisions on potential air quality impacts, particularly in relation to PSD Class I areas, cannot be overemphasized.

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[a] The documents listed here are major sources of supplemental information on the theory and application of mathematical air quality models.

ATTACHMENT 7

EPA Guidance for Siting Ambient Air Monitors around Stationary Lead Sources, August 1997.

United States
Environmental Protection
Agency

Office of Air Quality
Planning and Standards
Research Triangle Park, NC 27711

EPA-454/R-92-009
August 1997

Air

GUIDANCE FOR SITING AMBIENT AIR MONITORS AROUND STATIONARY LEAD SOURCES

Metallurgical processes that may be sources of lead emissions include lead ore mining; smelting/refining of lead, copper, and zinc; and production of iron and steel, gray iron, brass and bronze. Taken together, this category of sources currently comprises about 50 percent of nationwide lead emissions. As industries, the largest contributors are primary and secondary lead smelters and producers of iron, gray iron, and steel.

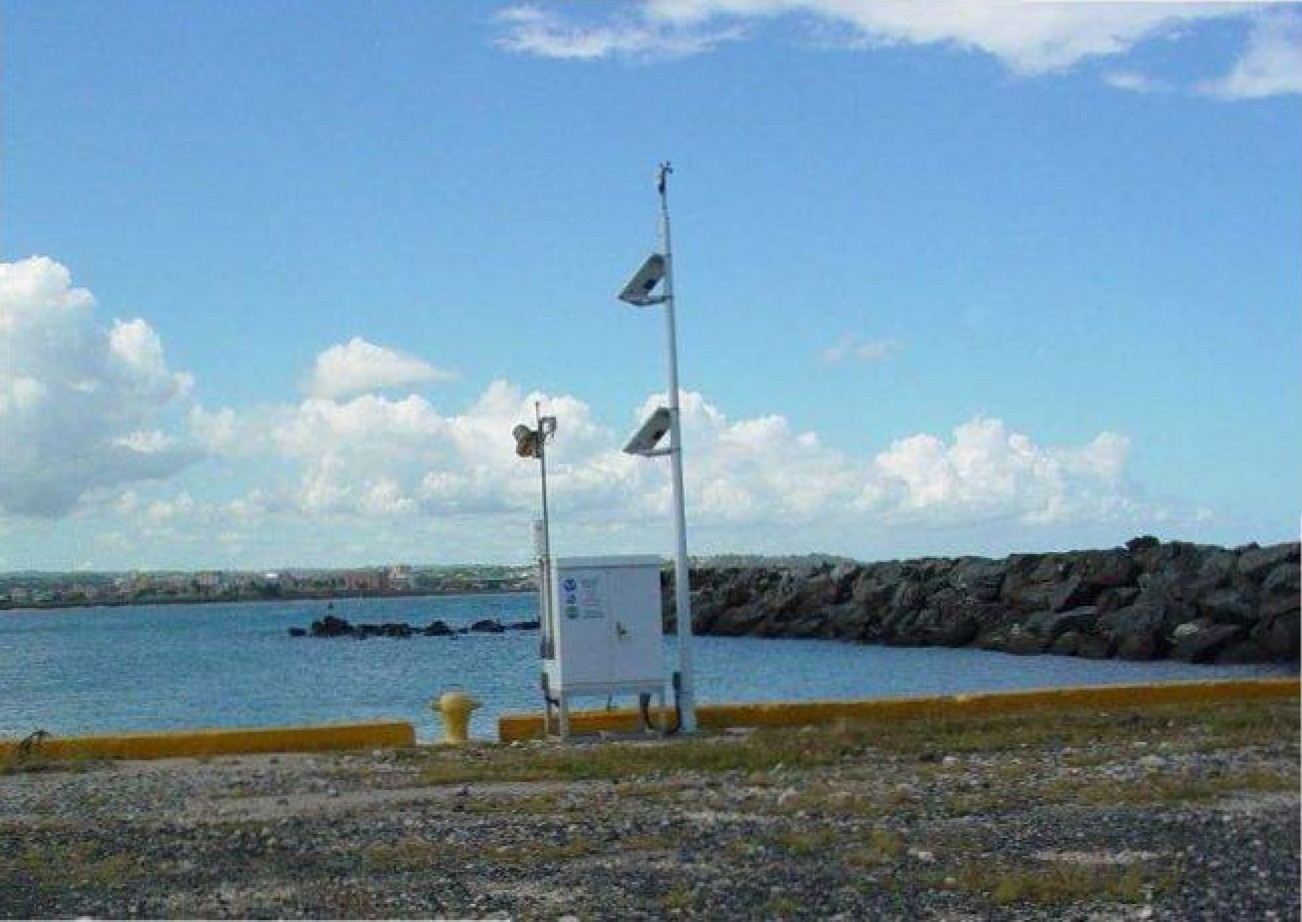
Results of dispersion modeling around various point sources suggest that metallurgical processes are the greatest contributors to high ambient concentrations of lead.[3] Observed maximum quarterly average lead concentrations near primary and secondary lead smelting and refining plants have exceeded the former NAAQS concentration of 1.5 $\mu g/m^3$. For primary lead smelters, both stack and fugitive emissions contribute to high predicted ambient impacts while fugitive emissions contribute the most at secondary smelters.

Overall, about 85 percent of the primary lead produced in the U.S. is from native mines which are often associated with minor amounts of zinc, cadmium, copper, bismuth, gold, silver, and other minerals.[2] In addition, a new source of lead emissions emerged in the mid-1960s when the "Viburnum Trend" or "New Lead Belt" was opened in southeastern Missouri. This area consists of eight mines and three accompanying lead smelters which makes it the largest lead-producing district in the world. This area has also made the U.S. the world's leading lead-producing nation. The Missouri lead ore mining operations account for about 80 to 90 percent of the domestic production of lead.

Figure 1 shows the relative locations of major lead operations in the U.S. including mines, primary and secondary smelters, refineries and alkyl lead plants. Maximum quarterly average lead concentrations for the nation in 1995 are illustrated in Figure 2. Sources of lead emissions are found throughout the entire U.S. Both mobile and point sources of lead emissions are found mostly in areas of high population density with the exception of lead smelters. Primary lead smelters are located mostly in rural areas. Secondary lead smelters are located mostly near large

ATTACHMENT 8

Photo extracted NOAA Buoy Center Website for meteorological station AROP4.



ATTACHMENT 9

EPA Region 2 Interim Environmental Justice Policy, December 2000.

United States Environmental Protection Agency
Region 2

Interim
Environmental Justice Policy

December 2000

Excerpt from Page EPA Region 2 Interim EJ Policy

2.2.2 Step 2: Compare COC Demographics to a Statistical Reference Area

Statistical reference areas are evaluated to determine appropriate cutoffs for demographic factors: minority and low income. This evaluation provides a basis for comparison to determine if the COC meets the demographic EJ criteria. A description of the statistical analysis follows.

Statistical Reference Area
Demographic data were analyzed using the 1990 Census. Moreover, the statistical cluster analysis approach was applied using Census block group data. The block group represents the resolution of least-size where the most important data sets are readily available (i.e., both for population and income). Data were evaluated on a state-specific basis. All of the statistical methods evaluated indicated that minority populations in urban areas were skewing the results for the states of New York and New Jersey. Specifically, state-wide benchmarks were similar to those derived from using only urban areas, while the results for only rural areas were considerably lower. Consequently, minority data were evaluated separately for urban and rural areas within these states. These separate analyses yield one statistical reference area for urban and one for rural for percent minority for New York and New Jersey. The following Census Bureau definitions for urban and rural were utilized:

Urban All territory, population, and housing units located in urbanized areas (UA) and in places of 2,500 or more inhabitants outside of UAs. An urbanized area is a continuously built-up area with a population of 50,000 or more.

Rural Territory, population, and housing units that the Census Bureau does not classify as urban are classified as rural.

Cluster Analysis
Block group data were analyzed using the cluster methodology statistical approach. With the use of a cluster analytical approach, data are divided into two distinct groups (e.g., minority and non-minority; low income and non-low income). Cluster analysis examines the natural break of the data. Data on percent minority and percent poverty were ranked separately in descending order for each State. (Note, as discussed above, for minority data in New York and New Jersey, the data were evaluated based on urban and rural settings). An iterative process was employed in which the data were (1) split into two groups; (2) the means for each of the two groups were calculated; (3) the difference between the means for each group was determined; and (4) Steps 1- 3 were repeated until the greatest difference between the means was found. This method results in dividing the data into two groups that are as different as possible.

GIS Comparison of COC to Statistical Reference Area

Region 2 has developed a GIS application to evaluate the demographics of the COC and compare them to a statistically derived reference area. To facilitate the statistical analysis, first the boundaries of the COC are drawn. The GIS application then calculates the percent minority and low income individuals within those boundaries using Census block group data. Where portions of a block group are inside the boundary of the COC, the total block group population is prorated based on the area included. (For example, if ½ of the block group is inside the boundary of the COC, ½ of the population in the block group would be utilized). The following tables were developed to provide a comparison of those percentages to the statistical reference area thresholds as discussed above.

Table 1. State-Wide Urban & Rural Percentage Thresholds for Minority Populations

State	Urban	Rural
New York	51.51	34.73
New Jersey	48.52	29.39
Puerto Rico	na[7]	na
Virgin Islands	na[8]	na
Indian Nations[9]	na	na

Table 2. State-Wide Percentage Thresholds for Low-Income Populations

State	Percentage
New York	23.59
New Jersey	18.58
Puerto Rico	52.0
Virgin Islands	45.2
Indian Nations	41.2

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2.2.3 Step 3: Determine if Demographic Criteria are Met

In accordance with the Executive Order, a community is a potential EJ community if it is either minority or low income. The GIS application described above indicates whether either of the demographic criteria is met, based on a comparison of the COC demographics to statistical reference area cutoffs. If the COC demographics are equal to or above either cutoff then the COC is considered a potential EJ area that should be more fully evaluated

ATTACHMENT 10

Email from George Bridgers, OAQPS, to Annamaria Coulter, Region 2, July 26, 2013.

-----Original Message-----
From: Bridgers, George
Sent: Friday, July 26, 2013 11:50 AM
To: Coulter, Annamaria
Cc: Brode, Roger; Fox, Tyler
Subject: RE: temporally representative

Annamaria,

We concur with your position that the August 1992-93 site-specific meteorological data is still "temporally representative" and is much more appropriate for dispersion modeling of this facility than the meteorological data from the NOAA buoy. We would recommend including a reference, Section 8.3.2.1 (b), to Appendix W's clear preference for even 1 year of site-specific met data over 5 years of NWS data in the response. Roger also adds that you could cite the precedent set in the NJ 126 petition where one year (1994-95) of site-specific met data was used in the AERMOD modeling conducted to support our action.

Please let us know if you would like further coordination on this issue or if you desire feedback on any of the other issues in the EAB brief.

George

George M. Bridgers, CPM, Environmental Scientist U.S. Environmental Protection Agency Office of Air Quality Planning and Standards AQAD - Air Quality Modeling Group
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Research Triangle Park, NC 27711
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Fax: 919-541-0044

ATTACHMENT 11

Screening Procedures for Estimating the Air Quality Impact of Stationary Sources Revised, October 1992.

United States
Environmental Protection
Agency

Office of Air Quality
Planning and Standards
Research Triangle Park, NC 27711

EPA 454/R-92-019
~~EPA-450/R-92-019~~
October 1992

Air

EPA

Screening Procedures for Estimating the Air Quality Impact of Stationary Sources Revised

Office of Air Quality
Clean Air
OAQPS
Planning and Standards

of the week, and hour of the day. In most cases, emission rates vary with the source production rate or rate of fuel consumption. For example, for a coal-fired power plant, emissions are related to the kilowatt-hours of electricity produced, which is proportional to the tonnage of coal used to produce the electricity. Fugitive emissions from an area source are likely to vary with wind speed and both atmospheric and ground moisture content. If pollutant emission data are not directly available, emissions can be estimated from fuel consumption or production rates by multiplying the rates by appropriate emission factors. Emission factors can be determined using three different methods. They are listed below in decreasing order of confidence:

1. Stack-test results or other emission measurements from an identical or similar source.

2. Material balance calculations based on engineering knowledge of the process.

3. Emission factors derived for similar sources or obtained from a compilation by the U.S. Environmental Protection Agency.[5]

In cases where emissions are reduced by control equipment, the effectiveness of the controls must be accounted for in the emissions analysis. The source operator should be able to estimate control effectiveness in reducing emissions and how this effectiveness varies with changes in plant operating conditions.

2.2 Merged Parameters for Multiple Stacks

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

$$M = \frac{h_s V T_s}{Q} , \tag{2.1}$$

where:

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

h_s = stack height (m)

$V = (\pi/4)\, d_s^2\, v_s$ = stack gas volumetric flow rate (m^3/s)

d_s = inside stack diameter (m)

v_s = stack gas exit velocity (m/s)

T_s = stack gas exit temperature (K)

Q = pollutant emission rate (g/s)

The stack that has the lowest value of M is used as a "representative" stack. Then the sum of the emissions from all stacks is assumed to be emitted from the representative stack; i.e., the equivalent source is characterized by h_{s_1}, V_1, T_{s_1} and Q, where subscript 1 indicates the representative stack and $Q = Q_1 + Q_2 + \ldots + Q_n$.

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

2.3 Topographic Considerations

It is important to study the topography in the vicinity of the source being analyzed. Topographic features, through their effects on plume behavior, will sometimes be a significant factor in determining ambient ground-level pollutant concentrations. Important features to note are the locations of large bodies of water, elevated terrain, valley configurations, and general terrain roughness in the vicinity of the source.