Connecticut Department of Energy and Environmental Protection

Connecticut Department of
ENERGY &
ENVIRONMENTAL
PROTECTION

Ambient Impact Analysis Guideline

A Guideline to Performing Stationary Source Air Quality Modeling In Connecticut

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Connecticut Department of Energy and Environmental Protection

A Quick Review-2009 AIAG Revisions

- The combination of AERMOD replacing ISCST3 & PTMTPA-CONN in 2006, and DEEP's permit modeling LEAN PROGRAM in 2008, prompted DEEP to revise the AIAG in July 2009 for the first time in 20 years;
- Reformatted the AIAG to a more user friendly document for DEEP's new modeling web-page;
- Links to EPA's SCRAM site (models, guidance, met, background)
- The 2009 update was a summary of EPA's Revisions to Appendix W, Guideline On Air Quality Models (2005);
- Updated and added NWS ASOS Meteorological Data sets to reflect the most recent years; DEEP staff processes the data to be consistent for all of CT's Permit modeling projects.

A Quick Review-2009 AIAG Revisions

- Revised background data procedures to included $PM_{2.5}$ design values at the time;
- Added the 24-hour and annual $PM_{2.5}$ revised NAAQS, SILs and AILs', and
- Another revision was released in December 2009 to reflect AERMOD UPDATES, including the AERMOD Implementation Guide, Guidance Documents, pre-processors and user's guides.
  -AERMAP
  -AERMET
  -AERSURFACE

2018 Revised Ambient Impact Analyses Guideline

This is the first revision to AIAG since December 2009.

This revision summarizes EPA's latest revisions to Appendix W Modeling Guidance (Jan 17, 2017) and implements EPA memorandums on modeling guidance since '09. The AIAG 2018 proposed revisions include:

- Eliminate Section 2 Definitions (Definitions included in CT. Regs)
- AERSCREEN replaces SCREEN3 (add in screening emissions Threshold Values Table, and revised screening factors Table based on AERSCREEN)
- New 24-Hour and Annual $PM_{2.5}$ Increments
- New 1-Hour NO_2 & SO_2 NAAQS Modeling (3 Tiered Screening for NO_2);
  - EPA has not proposed PSD Increments for 1-Hour Standards to date

- Revised 24-hour and annual SILs, NAAQS and PSD modeling for $PM_{2.5}$
- $PM_{2.5}$ & O_3 Secondary Impacts - **M**odeled **E**mission **R**ate **P**recursors (MERPS)
  MERPS Tier 1 Demonstration Tool = Critical Air Quality Threshold Equation
  MERPS Reduced Form Model - applied for permitted sources of NO_x and VOC precursors for **Ozone; SO_x and NO_X for $PM_{2.5}$**

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- Revised meteorological data processing
- Revised background procedures for SO_2, NO_2 and $PM_{2.5}$
- AERMOD replaces CALINE and CALC3H models, 3 year grace period, effective May 22, 2020 for MOBILE Source Modeling (LINE and VOLUME SOURCE Enhancements)!
- AERMOD revisions always based on the latest science (from both the regulated community/stakeholders/State/EPA studies, and technology)!

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Section 3.2.2 Meteorological Data

Meteorological Data Processing (AERMET, AERMINUTE and AERSURFACE)
Site Specific, NWS ASOS, WRF prognostic data

- Site Specific and NWS Minimum Wind Speed Threshold = 0.5m/s (EPA, 2013)
- 1-yr of site-specific surface data & 1 year of upper air data
- 5 yrs. of upper air sounding and NWS surface data
- AERMINUTE pre-processor eliminates excess calm hours
  - program accepts 1 & 5 minute data files
- 3 yrs. of WRF Prognostic Met Data: at least 3-5TB of computer storage space
  Use of MMIF preprocessor

CTDEEP does not anticipate much use of WRF data for major sources in Ct.

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Section 3.3 SIGNIFICANT IMPACT LEVELS

- Single Source Refined Modeling - Insignificant, SILs and SIA

  Insignificant Impact – Compliance with NAAQS and PSD-No further modeling

  Significant Impact Level for pollutant (s) modeled, determine the Significant Impact Area for multi-source modeling

Significant Impact Area –include all receptors even insignificant receptors within the SIA

TABLE 4-3 Revision add in $PM_{2.5}$ and Ozone SILs based on EPA SIL Guidance

- *Guidance On Significant Impact Levels for Ozone and Fine Particles in the Prevention of Significant Deterioration Permitting Program* (EPA April 17, 2018)
  - SILs for $PM_{2.5}$ 24-hour 1.2µg/m^3, annual 0.2µg/m^3
  - SILS for O_3 8-Hour 1.0ppb
  - A quantitative analysis is only required for now

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Section 4.3 1-Hour NO_2 NAAQS Modeling

- 3-Tiered Screening Methods-Applicable for Annual NO_2 NAAQS & PSD modeling

  - Tier1 Full Conversion

  -Tier2 ARM2 Regulatory Option – 0.9 and 0.5 ambient ratios built into AERMOD as default values for the subject source. Cumulative modeling 0.2 default for sources beyond 3km of the subject source. Source-specific ratios from EPA data bases or literature always preferred, but must be approved by DEEP.

  -Tier 3 PVMRM-recommended for medium to tall stack, OLM for a cluster of sources and low level point sources and mobile sources. In stack ratios 0.5 default, preferably source specific data from EPA approved data bases, stack test data and other approved literature.

TIER 3 METHOD MUST BE APPROVED BY CONSULTATION with DEEP and EPA Region 1 PRIOR TO MODELING.

Only a phone call or email is needed. Alternative model, clearinghouse approval procedures no longer required!

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Section 4.4 Single Source Air Quality Assessments for Secondary $PM_{2.5}$ & O_3 Impacts

Based on EPA 2016 Guidance of the development of **M**odeled **E**mission **R**ates for **P**recursors (MERPS) as a Tier 1 Tool for O_3 and $PM_{2.5}$ from single sources.

- As per Section 5.3.2. of Appendix W (EPA 2017)
- MERPS must be applied for major sources of **NO_x and or VOC precursors for O_3; NO_x and or SO_x precursors for $PM_{2.5}$**
- Example of a MERP Tier 1 Demonstration Tool
- Simple Form of the MERP Equation

= Applicable SILs *(Modeled emission rate from hypothetical source)/Modeled air quality impact from hypothetical source as a concentration for $PM_{2.5}$ ($\mu g/m^3$) or O_3 (ppb)

Example of the MERP Tier 1 Demonstration Tool

New turbine is proposed to have 20tpy of PM2.5, 130tpy of NOx & 25tpy of SO2

- MERP = **Applicable SILs *(Modeled emission rate from hypothetical source)/Modeled air quality impact from hypothetical source as a concentration for $PM_{2.5}$ ($\mu g/m^3$) or O_3 (ppb)**

(Project Emissions/Hypothetical Emissions) *Hypothetical Source Impacts=Project Impact

=(130/170) + (25/628)*0.68=0.54..

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Section 5 Cumulative Modeling

NAAQS Cumulative Modeling Analysis - Emissions Threshold Requirements

- Add in $PM_{2.5}$ significant emissions threshold of >=10tpy per stack
- SO_2, NO_2, PM_{10}, and CO remains at 15tpy per stack for NAAQS modeling
- PSD sources are based on Minor-Source Baseline Dates
  - Added in the $PM_{2.5}$ minor source baseline date of August 24, 2014 (Section 4.2)

DEEP will determine if major sources near the edge of the SIA need to be modeled

- Trade off: no longer required to model major sources of 50 tpy out to 20km, and 500tpy out to 50km
- Another big tradeoff cumulative modeling only requires actual emissions based on recent 2 years of data (Section 8 and Tables 8-1 and 8-2 Appendix W)

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Section 5 Additional PSD Analysis

Air Quality Related Values (AQRV) Section – Only for MAJOR PSD Sources

- Notification and impact analysis requirements based on PSD Reg-40CFR 51.666(p) and 40 CFR 52.21(p)

- Federal Land Managers (FLMs) must be notified based on latest FLAG Documents
  -Major PSD Sources located within 300 km from a Class I Area in the northeast
  - Must submit emissions information to Federal Land Managers hit "FORM" in AIAG
  - Acadia National Park, Maine; Lye Brook Wilderness, Vermont; or Brigantine National Wildlife Refuge, New Jersey

CTDEEP's Ambient Impact Analyses Guideline

Section 6: Revised Background Analysis

- AERMOD automatically add background to modeled predicted impacts and allows the use of more than 1 monitor based on wind direction to avoid double counting
  - Applicable for all for pollutants
  - Not so much for NO_2 - only 2 monitors, inland use East Hartford, coast use New Haven
  - If source is near the MA, NY and RI borders, could include nearest out of states' monitored background design values for applicable pollutants

- Two Tier Approach To Adding Background 1-hour SO_2, NO_2, and 24 hour $PM_{2.5}$ based on the most recent 3 years of monitored data
  - Tier 1 98^{th} and 99^{th} percentile of 1-hour NO_2 and 1-hour SO_2 monitored, respectively.
  - Tier 2 98^{th} and 99^{th} percentile of 1- hour SO_2 and NO_2 by season/hour of day, respectively
  - Tier 1 98^{th} percentile of monitored 24-hour $PM_{2.5}$
  - Tier 2 98^{th} percentile of the 24-hour $PM_{2.5}$ monitored by season

For now, DEEP modeling staff will continue to process all background data and post on our WEB-PAGE.

What's Next

- Draft document will become available on DEEP's website for review & comment
- Submit comments to samuel.sampieri@ct.gov
- Consider comments and make final within 60 days

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