

SMAT-CE

Utah Division of Air Quality

Introduction

Utah DAQ used the Software for Model Attainment Test - Community Edition (SMAT-CE) v.1.2 utility from EPA¹. The SMAT-CE utility faithfully follows EPA guidance² on conducting a modeled attainment test for daily PM_{2.5}.

Species fractions

The State of Utah has three Chemical Speciation Network (CSN) monitors: Hawthorne, Bountiful and Lindon. Hawthorne is located in Salt Lake County, while Bountiful is in Davis to the North, and Lindon is located in Utah County to the South (outside of the Salt Lake nonattainment area). Speciation data gets collected on 1-in-3 day sampling schedule at Hawthorne and 1-in-6 day sampling schedule at Bountiful and Lindon.

Because of the mismatch in sampling frequency, Utah DAQ found that the interpolated speciation profiles SMAT-CE initially created were not representative of typical inversion episodes. To create more realistic PM_{2.5} speciation profiles, Utah DAQ used only the Hawthorne CSN monitoring data. In other words, the FRM monitor in the Logan nonattainment area used the same (Hawthorne) species profile for assigning species fractions. Utah DAQ believes this is reasonable based on prior special studies. The speciation profile created is representative of typical inversion episodes previously observed in the Logan non-attainment area.

SMAT-CE options used

Utah DAQ used 2016 CSN data to create species fractions profiles for the FRM monitor at Smithfield in the Logan non-attainment area. Smithfield is the only location in the Logan non-attainment area when FRM data is collected. 2016 CSN data presented a profile representative of typical wintertime peak daily PM_{2.5} speciation. 2016 CSN data was used for species fractions as well as for CSN filter mass.

A grid of 3-by-3 (9) cells surrounding the monitors was used for relative response factor (RRF) calculations. Utah DAQ's grid resolution is relatively high at 1.33 km, implying a nine-cell window of 4 km x 4 km centered around monitor location. Since the grid-cell window was small in extent, Utah DAQ felt comfortable using the mean statistic for computing RRF values. A

¹ <https://www.epa.gov/scram/photochemical-modeling-tools>

² <https://www3.epa.gov/ttn/scram/guidance/guide/final-03-pm-rh-guidance.pdf>

larger window could extend into upper elevation areas, where PM2.5 would naturally be less concentrated.

Utah DAQ used the most up-to-date AQS PM2.5 monitoring data for its baseline design value (BDV) calculations. EPA guidance² (page 22) says one possibility for deriving baseline design values is using : “The design value period that straddles the baseline inventory year”. Therefore, a 3-year period (2016 - 2018) that straddles the 2017 baseline inventory year was selected to get a representative estimate of Utah air quality.

The table below (Table 1) shows a list of settings used in SMAT-CE by Utah DAQ to complete their maintenance demonstration modeling. Options not listed should be assumed to be default.

Table 1: List of different SMAT-CE parameters used in Utah DAQ’s modeled attainment demonstration.

SMAT-CE Option	Setting
Species Fraction Options	
Improve-CSN Monitor Data Years	2016 - 2016 (1-year)
Use top X percent of daily monitor days	15%
PM2.5 Monitor Data Years	2016 - 2016 (1-year)
Use top X percent of daily monitor days	15%
PM2.5 Monitor Data Years	
PM2.5 Monitor Data Years	2016 - 2018 (3-year)
Model Data Options	
Grid for Point Forecast	3x3
Grid for Spatial Forecast	3x3
Statistic	Mean
Use top X number of daily model days (RRF)	3

The results of the modeled attainment test are discussed in the next section.