



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
RESEARCH TRIANGLE PARK, NC 27711

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OFFICE OF  
AIR QUALITY PLANNING  
AND STANDARDS

**MEMORANDUM**

**SUBJECT:** Use of Modeling Techniques to Demonstrate General Conformity for Ozone (O<sub>3</sub>), Fine Particulate Matter (PM<sub>2.5</sub>) and Nitrogen Dioxide (NO<sub>2</sub>)

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**TO:** Regional Air Division Directors, Regions 1 – 10

The purpose of this memorandum is to clarify that air quality “modeling”<sup>1</sup> for secondary criteria pollutants is acceptable for demonstrating conformity to an “applicable implementation plan”<sup>2</sup> under the provisions of the General Conformity Rule (40 CFR part 93 subpart B, as amended).<sup>3,4</sup> The term, “secondary pollutants,” for the purpose of this memorandum, refers to certain criteria pollutants defined by the National Ambient Air Quality Standards (NAAQS),<sup>5</sup> and includes ozone (O<sub>3</sub>), fine particulate matter (PM<sub>2.5</sub>) and nitrogen dioxide (NO<sub>2</sub>). These three pollutants are closely related to each other in that they share common sources of similar precursor pollutants, such as the family of nitrogen oxides (NO<sub>x</sub>) and volatile organic compounds (VOCs) that participate in a process through which the precursors are transformed into other chemicals through atmospheric photochemical and thermal reactions.<sup>6</sup> The release of NO<sub>x</sub> and VOCs into the

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<sup>1</sup> “Modeling,” for the purpose of this memorandum, refers to the use of modeling techniques, databases or computer air quality models recommended by the U.S. Environmental Protection Agency (EPA) in Appendix W to 40 CFR part 51 *Guideline on Air Quality Models*.

<sup>2</sup> “Applicable implementation plan” as defined in 40 CFR § 93.152 *Definitions*, refers to either a State Implementation Plan (SIP), a Tribal Implementation Plan (TIP) or a Federal Implementation Plan (FIP).

<sup>3</sup> Includes 40 CFR part 51 Subpart W *Determining Conformity of General Federal Actions to State or Federal Implementation Plans*, § 51.851 *State Implementation Plan (SIP) or Tribal Implementation Plan (TIP) Revision*.

<sup>4</sup> The Clean Air Act (CAA) section 176(c) conformity requirement for general federal actions is implemented under the General Conformity regulations at 40 CFR part 93 subpart B *Determining Conformity of General Federal Actions to State or Federal Implementation Plans*.

<sup>5</sup> See 40 CFR part 50 *National Primary and Secondary Ambient Air Quality Standards*.

<sup>6</sup> EPA. 2017a, paragraph 5.1.a., *Models for Ozone and Secondary Formed Particulate Matter*. There are other precursors for fine particulate matter (PM<sub>2.5</sub>) that are not common to the other secondary pollutants, such as sulfur dioxide (SO<sub>2</sub>) and ammonia (NH<sub>3</sub>); EPA. 2016, part IX.B.2.a. *Conformity Requirements*, p. 58126.

ambient air is caused by, but not limited to, burning fossil fuel for transportation (*e.g.*, cars, trucks, buses and aircraft); use of off-road equipment (*e.g.*, construction equipment and dredging to excavate material from a water environment); power generation (*e.g.*, power plants and diesel steam boilers); and evaporative emissions (*e.g.*, fuel storage, vehicle fuel systems and chemical manufacturing).

If a federal agency chooses to use modeling to demonstrate conformity for the secondary pollutants, the procedures given under 40 CFR § 93.159(c) apply, and the modeling analyses must be based on the applicable air quality models, databases and other requirements specified in the most recent version of the Environmental Protection Agency’s (EPA) “Guideline on Air Quality Models” published as Appendix W to 40 CFR part 51 (the *Guideline*) (EPA, 2017a). Further, under 40 CFR § 93.158(b),<sup>7</sup> the analyses of such modeling must show that the action does not –

- cause or contribute to any new violation of any standard in any area; or
- increase the frequency or severity of any existing violation of any standard in any area.<sup>8,9,10</sup>

However, the 2010 final rule (EPA, 2010a) makes it clear under 40 CFR § 93.158(a)(3) and (a)(4) that the modeling option does not apply to the secondary pollutants but are specifically intended only for the “directly emitted criteria pollutants.”<sup>11</sup> Thus, the General Conformity Rule is silent on what would be an acceptable approach for modeling the secondary pollutants.<sup>12</sup>

EPA did not recommend modeling for the secondary pollutants in the preambles to the 1993 rulemaking (EPA, 1993a, 1993b), nor did EPA do so later in the preamble of its final rule revision in 2010 (EPA, 2010a). At that time, EPA noted several reasons why modeling for secondary pollutants was neither appropriate nor sufficient for demonstrating General Conformity.<sup>13,14</sup> Of particular concern were the difficulties of modeling emissions from a federal action (*i.e.*, single-source) when the models were intended for the regional nature of O<sub>3</sub> and PM<sub>2.5</sub> problems, and the technical “limitations of current [*circa 1993*] air quality models” to account for the complex physical and chemical processes that lead to the formation of secondary pollutants.<sup>15</sup>

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<sup>7</sup> See CAA section 176(c)(1)(B)(i) and (ii).

<sup>8</sup> Under 40 CFR § 93.158(c), notwithstanding any other requirements to demonstrate conformity, an action subject to the General Conformity Rule may not be determined to conform unless the action’s emissions are consistent with all relevant requirements and milestones contained in the applicable implementation plan. This includes elements identified as part of the reasonable further progress schedules, assumptions specified in the attainment or maintenance demonstration, prohibitions, numerical emission limits and work practice requirements. See also CAA section 176(c)(1)(B)(iii).

<sup>9</sup> Under 40 CFR § 93.158(d), any analyses required to demonstrate conformity must be completed, and any mitigation requirements necessary for a finding of conformity must be identified before the determination of conformity is made.

<sup>10</sup> EPA. 2010a, preamble part III.B.6., *Conformity Determination*, pp. 17255-17256.

<sup>11</sup> “*Directly emitted criteria pollutants*,” for the purpose of this memorandum, refers to carbon monoxide (CO), lead (Pb), directly emitted PM and SO<sub>2</sub>.

<sup>12</sup> Alternative options for meeting conformity, including for ozone, are provided in 40 CFR § 93.158(a)(2) and (a)(5), where if one or more of these alternatives is met, the federal action conforms to the air quality criteria (EPA. 1993a, part III.O., *Air Quality Criteria*, p. 13845).

<sup>13</sup> EPA. 2010a, preamble part III.B.6., *Conformity Determination*, pp. 17255-17256.

<sup>14</sup> EPA. 1993b, preamble part IV.Y.3. *Air Quality Modeling –General*, p. 63244.

<sup>15</sup> EPA. 1993a, preamble part III.O., *Air Quality Criteria*, p. 13845.



Instead, the General Conformity Rule provides alternative methods for meeting conformity for secondary pollutants under 40 CFR § 93.158(a)(2) and (a)(5), such as through mitigation and offsets; applying the emissions budget in the existing applicable implementation plan (or the federal agency can request a revision to the plan) to account for an action’s net emissions increase; development of a facility-wide emission budget for inclusion in a revision to the applicable implementation plan; or the creation of Early Emissions Reduction Credits (EERCs). However, with any of these options, the net increase in emissions caused by the federal action must be “fully offset”<sup>16</sup> so there is no net annual increase in emissions of the precursor pollutants.

EPA understands that some nonattainment and maintenance areas do not have sufficient budgets in the applicable implementation plans to fully offset emissions of the secondary precursors, particularly for emissions of NO<sub>x</sub> and VOCs. In addition, there are nonattainment and maintenance areas of the country where opportunities for emission reduction strategies through mitigation and offsets for the precursors are difficult to secure. And even when emissions reduction strategies might be available, the *Guideline* advises under paragraph 5.1.d. that control measures to reduce O<sub>3</sub> and PM<sub>2.5</sub> precursor emissions may not lead to proportional reductions in these secondary pollutants. Further, a revision to an applicable implementation plan takes time, and the development of facility-wide budgets and EERCs are meant to be developed before a federal agency needs them for its future actions. Therefore, these options may not be available at the time an action is ripe for development. Consequently, over the years federal agencies, state air agencies, industry, consultants and other interested stakeholders have expressed a need for the development of modeling techniques that would be acceptable to EPA for demonstrating General Conformity for the secondary pollutants.

Relevant to this need, EPA revised the *Guideline* in 2017 to provide modeling techniques and databases that it considers scientifically credible and appropriate for modeling the impact of secondary pollutants. As such, clarifying that these modeling techniques and databases are available for demonstrating conformity of secondary pollutants is beneficial to all interested parties. In addition to providing clarification, this memorandum identifies the relevant guidance portions of the *Guideline* related to modeling secondary pollutants and provides links to additional helpful modeling guidance and related resources.

For O<sub>3</sub> and PM<sub>2.5</sub>, the *Guideline* identifies no preferred model to assess impacts from specific or multiple sources. Instead, EPA recommends a two-tiered approach where the first tier does not involve direct application of an air quality model, but rather, “consists of using existing technically credible and appropriate relationships between emissions and impacts developed from previous modeling that is deemed sufficient for evaluation of a source’s impacts.”<sup>17</sup> The second tier consists of more sophisticated case-specific modeling analyses. Recommendations for O<sub>3</sub> are provided in Section 5.3 of the *Guideline*, and in Section 5.4 of the *Guideline* for secondarily formed PM<sub>2.5</sub>. Additional guidance is available on the Support Center for Regulatory Atmospheric Modeling (SCRAM) website (EPA, 2017b and EPA, 2020).

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<sup>16</sup> “Fully offset” means reducing or otherwise controlling or accounting for the net emissions increase of secondary pollutants or precursors that equals or exceeds the *de minimis* threshold rates applicable in the tables at 40 CFR § 93.153(b)(1) and (2), until there is no net annual emissions increase. See also 40 CFR § 93.158(a)(2) and (a)(5)(iii).

<sup>17</sup> EPA. 2017a, paragraph 5.2.e., *Models for Ozone and Secondarily Formed Particulate Matter: Recommendations*.



For NO<sub>2</sub>, recommendations for modeling techniques have been addressed in the 2017 and previous versions of the *Guideline* and are provided in Section 4.2.3.4 *Models for Nitrogen Dioxide*. Due to the complexity of modeling NO<sub>2</sub>, a multi-tiered screening approach is recommended to obtain hourly and annual average estimates of NO<sub>2</sub>. Each tier of the approach accounts for increasingly complex considerations of NO<sub>2</sub> chemistry as shown in Figure 4-1<sup>18</sup> of the *Guideline*. Air quality models that account for more explicit NO<sub>2</sub> chemistry may also be considered as an alternative to estimate ambient impacts of NO<sub>2</sub> sources.<sup>19</sup> Additional guidance is available on the SCRAM website (EPA, 2010b, 2011 and 2014).

In summary, through this memorandum, we are informing all interested parties that the 2017 regulatory revisions to the *Guideline* adequately resolve the modeling challenges that constrained federal agencies from modeling the secondary pollutants in earlier rulemaking. The *Guideline* can be used to provide a basis for consistent analyses of secondary pollutants that EPA considers acceptable and sufficient.

While the *Guideline's* approaches to modeling secondary pollutants can be used for demonstrating conformity, we have noted that there are other methods provided in the General Conformity Rule that a federal agency may prefer to use. Thus, applying the modeling techniques and recommendations in the *Guideline* should not be considered mandatory or preferable for demonstrating conformity. The federal agency's choice of a modeling approach for a secondary pollutant is the responsibility of, and at the sole discretion of the federal agency taking the action that requires a demonstration sufficient to support an affirmative determination of General Conformity.

Federal agencies required to prepare a General Conformity demonstration may consult with EPA Regional offices regarding the appropriateness of modeling impacts of secondary pollutants. Regional office staff are advised that they may refer to the most recent version of the *Guideline* in advising the consulting agency. Regional offices with questions or requests for information about this memorandum may contact Ms. Virginia Raps, Air Quality Policy Division, telephone (919) 541-4383, email address: [raps.virginia@epa.gov](mailto:raps.virginia@epa.gov), or Mr. George Bridgers, Air Quality Assessment Division, telephone (919) 541-5563, email address: [bridgers.george@epa.gov](mailto:bridgers.george@epa.gov).

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<sup>18</sup> EPA. 2017a, Figure 4-1, *Multi-tiered Approach for Estimating NO<sub>2</sub> Concentrations*.

<sup>19</sup> EPA. 2017a, paragraph 4.2.3.4.f., *Guideline on Air Quality Models*.

## REFERENCES

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