

## Proposal to Update PM<sub>2.5</sub> Data from T640/T640X PM Mass Monitors

### OVERVIEW

In April 2023, under the Reference and Equivalent Method Program at 40 CFR § 53.14, the Environmental Protection Agency (EPA) approved a modification of the Federal Equivalent Method (FEM) designation for the Teledyne Advanced Pollution Instrumentation (TAPI) Model T640 PM mass monitor, including the 640X option (hereto T640 and T640X), to allow operation of the monitors with or without a Network Data Alignment. At that time, the potential need for a Network Data Alignment of the T640 and T640X PM<sub>2.5</sub> concentrations had been identified in peer-reviewed literature reporting a generally high bias for the T640 and T640X monitors relative to Federal Reference Method (FRM) and other FEM monitors.<sup>1,2</sup> Subsequently, the Network Data Alignment was developed utilizing a robust national dataset from routinely operated collocated PM<sub>2.5</sub> FRMs and T640 and T640X FEMs. The EPA expects that implementing this Network Data Alignment will result in a much higher number of PM<sub>2.5</sub> monitoring sites using these methods meeting the bias measurement quality objectives (MQOs) found at 40 CFR Part 58, Appendix A, Section 2.3.1.1. Because of the importance of these data for regulatory, scientific, and public use, the EPA is proposing to retroactively apply the Network Data Alignment equation to all of the hourly unaligned T640 and T640X PM<sub>2.5</sub> concentrations in the EPA's Air Quality System (AQS) for data beginning in 2017 when the T640 and T640X monitors started being deployed across the U.S. The Network Data Alignment is also applicable to PM<sub>10</sub> measurements moving forward; however, due to the diminutive effect on PM<sub>10</sub> data relative to its data uses, EPA is not recommending an update to the PM<sub>10</sub> data. This document provides background on EPA's approval of the T640 and T640X monitors, the action EPA is proposing to take to ensure the most accurate PM<sub>2.5</sub> data are available for the EPA and all stakeholders, and the potential implications of this proposal on future EPA actions.

### BACKGROUND

The TAPI Model T640 PM mass monitor (T640) and TAPI Model T640 with 640X option (T640X) were each approved as FEMs for PM<sub>2.5</sub> by EPA's Reference and Equivalency Program and announced in the Federal Register on July 13, 2016 (81 FR 45285). By early 2017, the first State monitoring agency was operating the T640X PM FEM in its network with data reported to EPA's AQS database. The adoption of the T640 and T640X PM<sub>2.5</sub> FEMs began slowly across the country with States reporting at least some data for about 30 such monitors in 2017, and more recently reporting data for about 400 T640 and T640X PM<sub>2.5</sub> FEMs in 2023.

Early adopters of the T640 and T640X PM<sub>2.5</sub> FEMs provided largely positive feedback on the operation of the methods, reporting advantages including less maintenance and the use of fewer

---

<sup>1</sup> Hagler, G.; Hanley, T.; Hassett-Sipple, B.; Vanderpool, R.; Smith, M.; Wilbur, J.; Wilbur, T.; Oliver, T.; Shand, D.; Vidacek, V.; Johnson, C.; Allen, R.; D'Angelo, C.: Evaluation of two collocated federal equivalent method PM<sub>2.5</sub> instruments over a wide range of concentrations in Sarajevo, Bosnia and Herzegovina. *Atmospheric Pollution Research*, 13(4), 101374, 2022.

<sup>2</sup> Long, R.; Urbanski, S.; Lincoln, E.; Colón, M.; Kaushik, S.; Krug, J.; Vanderpool R.; Landis, M.: Summary of PM<sub>2.5</sub> measurement artifacts associated with the Teledyne T640 PM Mass Monitor under controlled chamber experimental conditions using polydisperse ammonium sulfate aerosols and biomass smoke, *Journal of the Air & Waste Management Association*, 73(4), 295-312, 2023.

consumables, highly precise data, availability of high time resolution data, and the ability to provide multiple PM metrics from one instrument (i.e., the T640X provides data for PM<sub>10</sub>, PM<sub>2.5</sub>, and PM<sub>10-2.5</sub>). However, from early in the adoption of the methods, monitoring agencies reported a positive bias resulting in higher concentrations relative to collocated FRMs.

The bias on the T640 and T640X PM<sub>2.5</sub> FEMs has been reported as relatively consistent across sites and methods with continuous FEMs reading about 20% higher than collocated FRMs. Even higher positive biases have been reported for sites with smoke impacts from fires. In addition to evaluating bias by comparing continuous FEMs collocated with FRMs operated by the same monitoring agency, EPA and the States run an independent audit program for PM<sub>2.5</sub> methods known as the Performance Evaluation Program (PEP). This program brings portable PM<sub>2.5</sub> FRM samplers to sites across the country each year where a primary sampler of a subset of sites in each Primary Quality Assurance Organization (PQAO) are independently audited. Data from the PM<sub>2.5</sub> PEP indicates a consistent positive bias for the T640 and T640X PM<sub>2.5</sub> FEMs compared to audit FRMs; however, this bias is not as pronounced as the bias data from FRM samplers run by the monitoring agencies. Nonetheless, the network of T640 and T640X PM<sub>2.5</sub> FEMs continued to grow.

During the scientific review of EPA's Policy Assessment for the Reconsideration of the PM NAAQS, the Clean Air Scientific Advisory Committee (CASAC) provided advice in a March 18, 2022 letter<sup>3</sup> suggesting that, "The FEM bias needs to be addressed to make the FRMs and FEMs more comparable." To support that recommendation, EPA included in its Notice of Proposed Rulemaking for the reconsideration of the PM NAAQS a proposal to calibrate PM FEMs using routinely operated PM FRMs from state, local and Tribal air agencies (SLTs). After notice and comment on this proposal, which was widely supported, this part of the proposal was finalized in the recent final rulemaking<sup>4</sup> (78 FR 3086).

In parallel with the EPA and CASAC dialogue on improving the comparability of FRMs and FEMs, TAPI started evaluating the comparability of the FRM and their FEMs operating in routine SLT agency networks. This led to TAPI applying to EPA for a modification to the T640 and T640X PM FEMs to better align their reported concentrations with collocated FRMs. TAPI provided this application under existing rules in 40 CFR § 53.14. The modification request was approved by EPA ORD's Reference and Equivalency Program in April 2023, with TAPI thereafter launching the change via a firmware update that became available in June 2023.

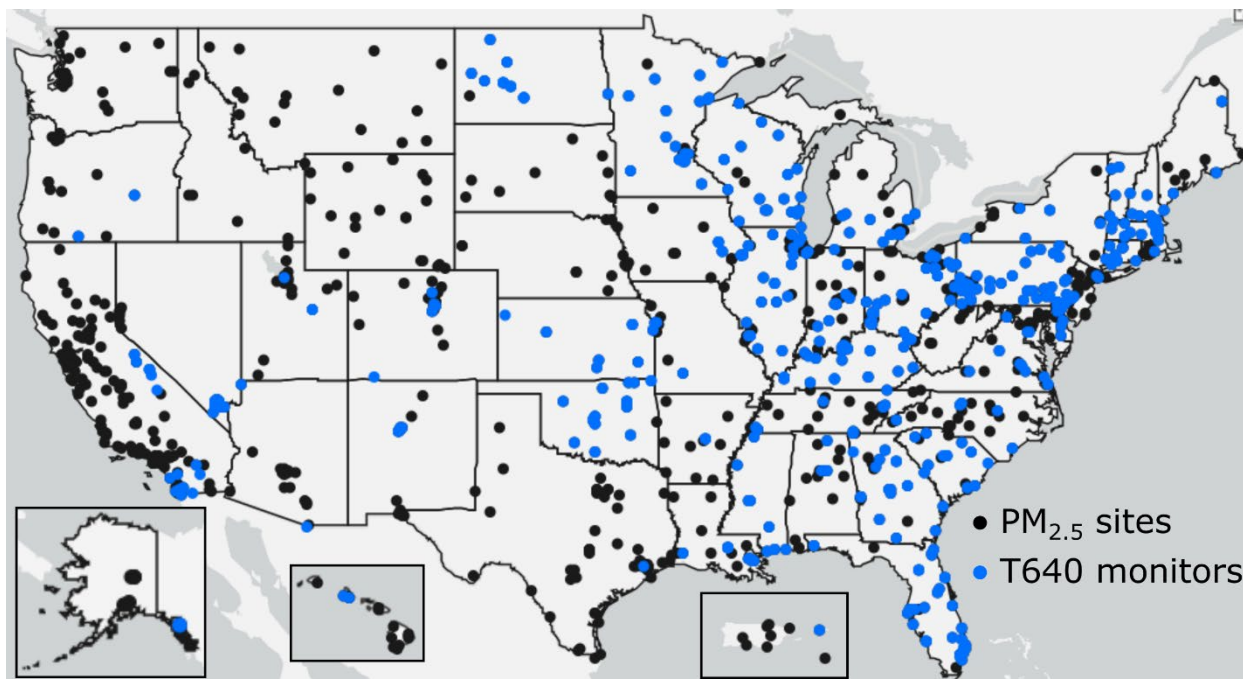
Within several days of the launch of the update by TAPI, EPA and SLTs held calls through their stakeholder groups (i.e., National Association of Clean Air Agencies, the Association of Air Pollution Control Agencies, and the National Tribal Air Association) to discuss the availability of the new firmware, recommendations, options for testing the update, and plans for ensuring that data produced with the update are clearly identified in EPA's databases AIRNow and AQS. Air agencies are currently transitioning to the updated methods. By January of 2024, SLTs indicated that almost 100% of the T640 and T640X PM<sub>2.5</sub> FEMs reporting data to AIRNow for locations in the United States have the updated Network Data Alignment. Early assessments by the EPA of

---

<sup>3</sup> EPA-CASAC-22-002, [CASAC Review of the EPA's Policy Assessment for the Reconsideration of the National Ambient Air Quality Standards for Particulate Matter \(External Review Draft – October 2021\)](#) 03/18/2022

<sup>4</sup> See: <https://www.epa.gov/pm-pollution/national-ambient-air-quality-standards-naaqs-pm>

collocated FEM and FRM data submitted by the SLTs to AQS for July through September of 2023 indicate that the updated methods are working as intended.



## UPDATE OF HISTORICAL DATA

The data update EPA is proposing to implement is expected to be conducted entirely within AQS on all hourly unaligned T640 and T640X PM<sub>2.5</sub> concentration data with a Parameter Code of 88101 starting in 2017, when the TAPI FEMs first reported data to AQS. It should be noted that the POC 88101 data as originally reported by the TAPI FEMs will remain in AQS as discussed in more detail below, so the originally collected data will remain publicly available after the data update is implemented.

EPA intends to utilize the following steps to implement the data update. The data utilizing the updated method will be added automatically to AQS as a new Parameter Occurrence Code (POC) at the site with the same 88101 Parameter Code and an AQS Method Code that reflects the fact that it is calculated using the updated FEM designation (C636 for the T640 and C638 for the T640X). In order to most closely replicate the methodology of the Network Data Alignment equation used in the updated FEM designation, hourly ambient temperature data (described in AQS as “Outdoor Temperature” - parameter code 62101) associated with the site will be utilized. The hourly ambient temperature data may be measured at the site or from the designated meteorological station associated with that site. If hourly ambient temperature data are unavailable at the site in AQS, the more conservative warmer temperature correction will be used. For this reason, EPA strongly encourages monitoring agencies to submit the hourly ambient temperature data.

Once EPA creates the updated dataset for each site, data from the unaligned monitor will be set to the Monitor Type “SPM” and will be considered NAAQS Excluded but will remain in AQS. At sites where the unaligned data monitor was designated the Primary Monitor for PM<sub>2.5</sub>, the Primary Monitor designation will be assigned to the monitor with updated data. SLTs will have the opportunity to review the list of updated monitors and the updated data in AQS during the month of April, before the certification date of May 1, 2024. SLTs will also have the opportunity to request to opt-out for any FEM monitor data that they conclude are inappropriate to be updated in this way. Opt-outs should only be considered by an agency if the agency can demonstrate that the unaligned data better meets MQOs than the updated data for a specific use. Justification for this opt-out will be handled on a case-by-case basis and should be based on scientific and technical information and should fully explain the purpose for which the SLT wishes to use the non-updated data. This request should be submitted to the appropriate EPA Regional office as a one-time addendum to the Annual Monitoring Network Plan due July 1, 2024. This addendum is only necessary if the SLT wishes to explore opting out of this data update. The EPA intends to use the updated data in AQS in subsequent actions after the May 1, 2024 certification date, and will work on next steps with SLTs that request opting out of the update.

The EPA expects that a small number of monitors may have unaligned T640 or T640X data and/or associated ambient temperature data submitted to AQS after the initial batch update of retroactive data has been conducted. In these cases, EPA will ensure these data are processed with the Network Data Alignment.

## **CONSIDERATIONS**

Updated data for the TAPI Model T640 and T640X are important to ensure EPA considers data that accurately represent ambient air concentrations in our actions. Below are some specific considerations that illustrate the importance of updating the historical data in AQS.

### *NAAQS Implementation*

EPA anticipates that the updated data will be relevant to upcoming PM<sub>2.5</sub> implementation-related activities, including any forthcoming initial area designations, any future redesignation actions, and findings of attainment that may rely on monitoring data from the previous 3 to 5 years. EPA encourages air agencies to work with EPA Regional offices to address any outstanding needs related to updating historical data and PM<sub>2.5</sub> implementation.

With respect to any upcoming initial area designations associated with the 2024 PM<sub>2.5</sub> NAAQS, EPA expects that the updated data will impact the ambient monitoring data for such designations process due to the widespread use of the TAPI T640 and 640X monitors, particularly in the eastern United States. The Clean Air Act requires states to submit, and gives Tribes the opportunity to submit, initial area designation recommendations within 12 months after the EPA has issued a new or revised NAAQS. With regard to ongoing attainment planning, states with areas designated nonattainment under any PM<sub>2.5</sub> NAAQS will have state implementation planning obligations that may be impacted by the updated data. EPA expects to consider any regulatory implications (e.g., attainment planning and redesignations to attainment) on a case-by-case basis and encourages air agencies to consult with their EPA Regional office contacts on this

topic. Similarly, with regard to exceptional events demonstrations, EPA anticipates the possibility that affected and adjusted T640 and T640X monitors also may have experienced event-influenced exceedances/violations. This data update may impact exceptional events demonstrations associated with any initial area designations process, or any other action of regulatory significance regarding a PM<sub>2.5</sub> NAAQS. For this reason, EPA encourages air agencies to work with EPA regional offices to determine a path forward on the updated data and its impact on any upcoming exceptional event demonstrations.

EPA further recognizes that the data update will impact prevention of significant deterioration (PSD) permit applicants that require historical ambient PM<sub>2.5</sub> data to develop background concentrations for NAAQS and PSD increment compliance demonstrations. The data update will include the five-year period of time required for these demonstrations. EPA intends to use the same updated ambient data to develop new PM<sub>2.5</sub> Significant Impact Levels (SILs), to be provided in upcoming supplemental guidance.

#### *Academic and Research*

EPA believes it is important to update the historical data in AQS to ensure that the most scientifically accurate data are utilized in peer-reviewed research, in particular in human health and ecosystem research and analyses that support the NAAQS review process.