

Attachment B

EMFAC Off-Model Adjustment Factors to Account for Emissions Benefits of Clean Truck Check

March 26, 2026

I. Summary

Emission FACTors (EMFAC) is California's federally approved on-road mobile source emissions inventory model. California Air Resources Board (CARB) staff have developed off-model adjustment factors for the 2021 version of Emission FACTors (EMFAC2021) to account for tailpipe oxides of nitrogen (NO_x) and total direct-vehicle particulate matter (PM) emissions benefits of CARB's Clean Truck Check Program (CTC), otherwise known as the Heavy-Duty Vehicle Inspection and Maintenance Program. Once approved, these "CTC off-model adjustment factors" would be used for the purposes of State Implementation Plan (SIP) development and conformity determinations, including regional emissions analysis for transportation plan and transportation improvement program conformity determinations, as well as hot-spot analysis for project-level conformity determinations. CTC off-model adjustment factors are needed because the emissions effects of this regulation are not included in the emissions baseline of EMFAC2021, which is the latest EMFAC version approved by U.S. EPA for SIP and conformity analyses.

In February 2026,¹ U.S. EPA took final action to partially approve and partially disapprove the inclusion of CARB's CTC in the California SIP. This partial SIP disapproval is applicable only to portions of the regulation that apply to out-of-state vehicles. EPA's action does not impact CARB's ability to enforce and implement CTC. Therefore, these CTC off-model adjustment factors only account for emissions reductions from the portion of the regulation approved into the SIP for in-state vehicle categories subject to CTC. The off-model CTC adjustment factors for EMFAC2021 are listed in the attached Appendix B.

II. Background on EMFAC

EMFAC reflects California-specific driving and environmental conditions, fleet mix, and most importantly, the benefits of California's unique mobile source regulations. These include the Low-Emission Vehicle (LEV) program, including the LEV II and LEV III standards, and California's in-use diesel fleet rules. The EMFAC model supports CARB's regulatory and air quality planning efforts and meets the federal Clean Air Act.

¹ The EPA's final action to partially approve and partially disapprove CA's HD I/M regulation was published on February 6, 2026. (91 FR 5325, Link: <https://www.govinfo.gov/content/pkg/FR-2026-02-06/pdf/2026-02350.pdf>).

EMFAC2021 with the adjustment factors that EPA approved on November 21, 2025 is the latest approved method for modeling emissions in California, per 40 CFR 93.111.² On November 15, 2022, U.S. EPA approved EMFAC2021 for use in SIP development and transportation conformity analyses, which reflected CARB's latest understanding of California's on-road vehicle emissions, activities, and the benefits of regulations adopted prior to March 31, 2021.³ However, on June 12, 2025, three Congressional resolutions, which CARB is contesting as illegal, purported to disapprove U.S. EPA's actions to grant California waivers for several regulations in the model, including Advanced Clean Trucks (ACT), Zero-Emission Airport Shuttle, Heavy-Duty Vehicle and Engine Emission Warranty and Maintenance Provisions (Warranty Phase 1), and Heavy-Duty Omnibus (Omnibus).⁴ While those actions are being contested, CARB staff released EMFAC Off-Model Adjustment Factors to remove the benefits of these targeted regulations from EMFAC2021 v1.0.2 for SIP development and conformity determination purposes. These adjustment factors, tabulated in Appendix A,⁵ were approved by U.S. EPA on November 21, 2025.

III. Background on the Clean Truck Check Program and Impact on Tailpipe NOx and PM Emissions

The CTC regulation⁶ was approved by the Office of Administrative Law (OAL) on October 5, 2022, and implementation began on January 1, 2023. CTC applies to nearly all on-road non-gasoline heavy-duty vehicles with a gross vehicle weight rating over 14,000 pounds that operate in California, including vehicles registered in-state, as well as out of state and out of the country. CTC requires vehicle owners to demonstrate that their emissions control systems are properly functioning, thereby reducing excess NOx and PM emissions resulting from mal-maintenance and tampering. The emission benefits from CTC that were calculated in the CTC off-model adjustment factors reflect lower rates of emissions-related deterioration due to induced repairs and better maintenance.

Beginning with CTC's first phase in 2023, CARB deployed a network of stationary and mobile roadside emissions monitoring devices (REMD) in the South Coast and San Joaquin Valley regions. Under CTC, CARB screens high-emitting trucks using REMD, and any needed repairs are required for high-emitting trucks based on follow-up tests. Therefore, emissions benefits from CTC were quantified on a regional basis to reflect the additional benefits in these two regions. Another important component of CTC is the enforcement of

² For more information, see the [EMFAC section](#) on EPA's Policy and Technical Guidance for State and Local Transportation website.

³ 87 Fed. Reg. 68,483 (Nov. 15, 2022)

⁴ Other affected regulations include Zero-Emission Powertrain Certification and Advanced Clean Cars II. Zero-Emission Powertrain Certification does not affect pollutant emissions in EMFAC2021, and Advanced Clean Cars II was adopted after the release of EMFAC2021.

⁵ [EMFAC2021 Off-Model Adjustment Factors](#)

⁶ Cal. Code Regs., tit. 13, §§ 2195-2199.1.

compliance certification requirements, which began in mid-2024; the California Department of Motor Vehicles (DMV) began withholding vehicle registrations of non-compliant California-registered vehicles. In January 2025, vehicle owners began demonstrating compliance with the periodic vehicle testing (e.g., on-board diagnostics, opacity tests, visual inspections). Currently, semi-annual testing is in effect for most vehicles.

IV. Development of CTC Off-Model Adjustment Factors

Since CTC was adopted after March 31, 2021, its emissions benefits are not included in EMFAC2021. Therefore, CARB staff used the methodology implemented in Appendix D of the CTC staff report and the latest U.S. EPA-approved version of the EMFAC model, EMFAC2021 v1.0.2 with the November 2025 adjustment factors (Appendix A), to assess the NO_x and PM emissions benefits of CTC. Note that the CTC off-model adjustment factors account for in-state vehicle emissions benefits only to be consistent with the portions of the CTC regulation that U.S. EPA recently approved into the SIP. Using the "Annual" setting, the model was run for calendar years 2023 through 2050 to estimate emissions under two scenarios, while keeping all other settings (e.g., vehicle activity) constant:

1. **Adjusted Baseline** scenario where emissions are estimated without accounting for the benefits of CTC. This scenario was achieved by applying EMFAC2021 off-model adjustment factors from Appendix A to the output of the public version of the EMFAC2021 v1.0.2 model to remove the benefits of ACT, Omnibus, Warranty Phase 1, and Zero-Emission Airport Shuttle.
2. **Include Regulation** scenario where the 'Adjusted Baseline' scenario was updated off-model to reflect emissions reductions from CTC only for in-state vehicle categories. The in-state emissions reductions were based on the methodology described in the CTC staff report mentioned above, which modeled a decrease in high-emitting vehicles operating on the road due to CTC requirements (e.g., periodic vehicle testing). Emissions for out-of-state vehicle categories (e.g., T6 out-of-state, Class 4-7, T7 non-neighboring out-of-state Class 8, T7 neighboring out-of-state Class 8) were kept the same as the 'Adjusted Baseline' scenario.

The emissions results from these two scenarios were used to assess the benefits of CTC and derive the CTC off-model adjustment factors presented in Appendix B. The factors for each calendar year, vehicle category and region (described further below) were calculated based on the following equation:

$$CTC \text{ off-model adjustment factors} = \text{Include Regulation} / \text{Adjusted Baseline}$$

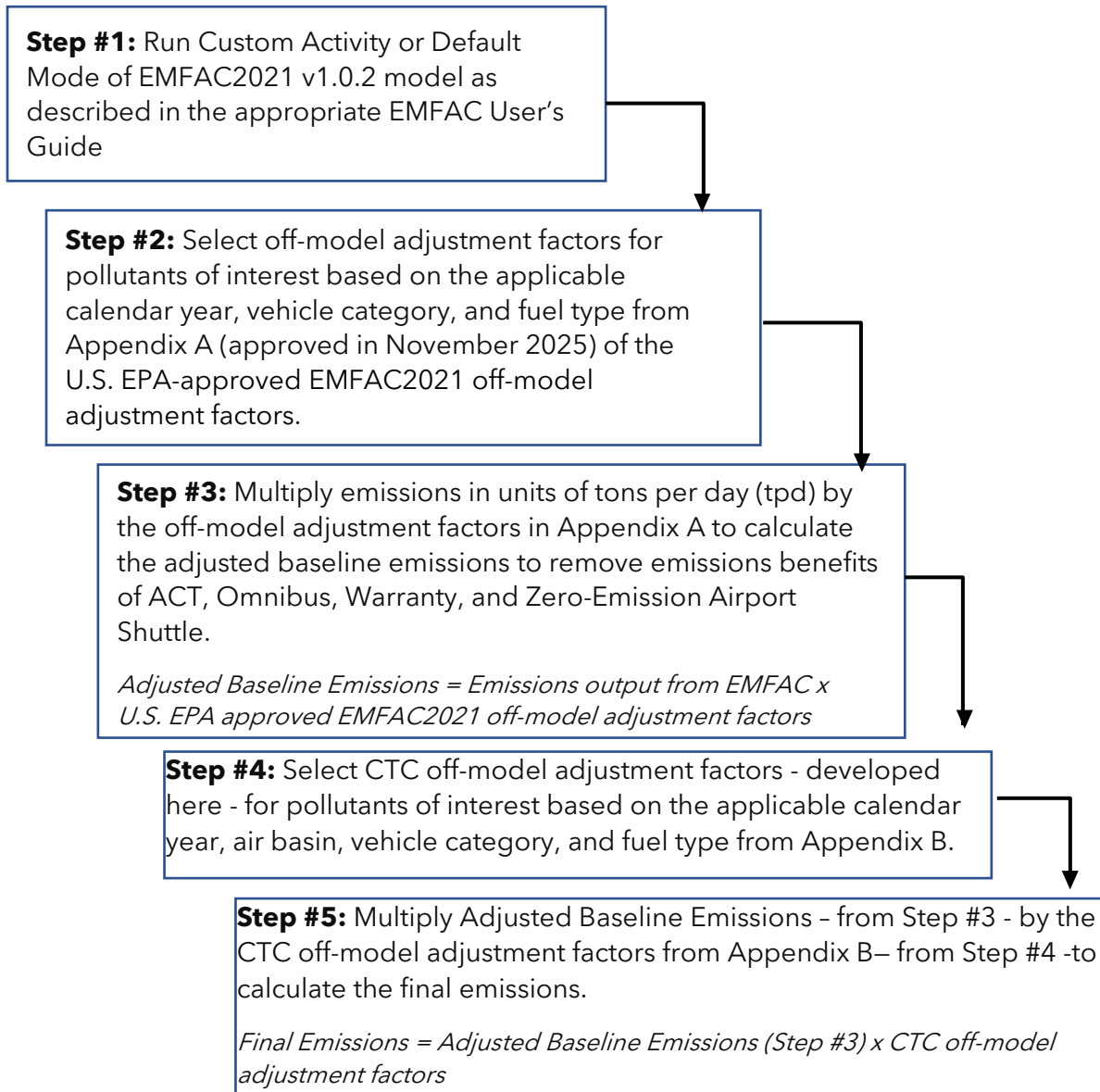
V. Application of Off-Model Adjustment Factors

The CTC off-model adjustment factors are tabulated in Appendix B. Note that these off-model adjustment factors are applied to the results from EMFAC2021 v1.0.2 with the

November 2025 adjustment factors, as described in Figure 1 below. They supplant the previous EMFAC2021 interim adjustment factors that were approved by U.S. EPA in May 2023 that accounted for 50% of the total CTC benefits from in-state and out-of-state fleets subject to the regulation.⁷ The factors in Appendix B should be applied to exhaust emissions for each calendar year, air basin, vehicle category, and fuel type in the EMFAC model. Note that factors from Appendix B can only be used after Appendix A factors have been applied, and neither Appendix A nor Appendix B can be used with the 50% factors approved in May 2023. Factors are provided by the air basin to reflect the additional emissions benefits from REMD deployment within the South Coast and San Joaquin Valley Air Basins. To facilitate the application of these factors to the EMFAC2021 model outputs, the appendices include a list of EMFAC factors at the sub-area level, categorized by air basin. The flowchart in Figure 1 outlines the methodology to apply these adjustment factors.

⁷ https://ww2.arb.ca.gov/sites/default/files/2023-05/appendix_a_emfac2021_interim_50_percent_off-model_adj_factors_v1.0.2.xlsx

Figure 1. Process to apply EMFAC2021 CTC off-model adjustment factors



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Contact

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