BOARD MEETING DATE: February 6, 2026 AGENDA NO. 5

PROPOSAL: Execute Contracts to Evaluate Secondary Particulate Matter Emissions from Tire Off-Gassing, and On-Road Brake and Tire Wear Emissions from Light-, Medium-, and Heavy-Duty Vehicles

SYNOPSIS: Brake and tire wear research has primarily focused on direct emissions of particles in laboratory simulated conditions, while gaseous organic compounds emissions and emission rates from tires remain understudied. To address this, the University of California, Riverside College of Engineering - Center for Environmental Research and Technology (UCR/CE-CERT) is starting to study and quantify the amount of secondary particulate matter (PM) emissions forming from tire off-gassing and evaluate on-road particulate and gaseous emissions from brake and tire wear from light-, medium-, and heavy-duty vehicles. These actions are to execute two contracts with UCR/CE-CERT using Clean Fuels Program Fund (31) to evaluate: 1) secondary PM emissions from tire off-gassing in an amount not to exceed $200,000; and 2) on-road particulate and gaseous emissions from brake and tire wear from light-, medium-, and heavy-duty vehicles in an amount not to exceed $600,000.

COMMITTEE: Technology, January 23, 2026; Recommended for Approval

RECOMMENDED ACTIONS:
Authorize the Executive Officer to execute the following contracts with University of California, Riverside College of Engineering - Center for Environmental Research and Technology (UCR/CE-CERT) from the Clean Fuels Program Fund (31) to evaluate:

1. Secondary PM emissions from tire off-gassing, in an amount not to exceed $200,000, and

2. On-road particulate and gaseous emissions from brake and tire wear from light-, medium-, and heavy-duty vehicles, in an amount not to exceed $600,000.

Wayne Nastri
Executive Officer

AK:MW:VP:SC:FX:NS:HL:BD

Background

Over the past decades, non-exhaust vehicle emissions, such as those from brake and tire wear, are an increasingly significant source of particulate pollution. Non-exhaust particulate emissions are typically from abrasion wear of brake pads, wear of tire material from contact with road surfaces, as well as abrasive wear of the road surface itself. Most brake and tire wear research to date has focused on the emissions of primary aerosol particles in laboratories; the on-vehicle real-world brake and tire wear rates remain comparatively understudied.

Tires consist of elastomers, polymers, fillers, processing oils and resins, additives, reinforcements, and vulcanizing agents. Due to the variety of additives used in tire production to meet different performance standards and the different manufacturing and processing techniques, gaseous organic compounds can be continuously emitted directly from tires throughout their useful life. These organic chemical compounds can transform in the atmosphere into secondary PM that can contribute to the overall emissions inventory. The atmospheric reactions of tire off-gassing emissions are not well understood.

UCR/CE-CERT is proposing two studies:

Study 1: Evaluation of Secondary PM Emissions from Tire Off-Gassing

New tires and existing tires release petroleum-based compounds, natural rubber, and other chemicals into the surrounding environment, as the tires age and break down. Off-gassing emissions from tires can be precursors to secondary organic aerosol formation, also known as secondary PM. There is a need to understand emission impacts from tire off-gassing, to quantify the amount of secondary organic aerosols that form from those gaseous emissions and the overall contribution of PM from tire off-gassing into the atmosphere.

Study 2: Evaluation of On-Road Brake and Tire Wear Emissions

CARB has been leading a comprehensive research initiative to study on-road non-exhaust emissions from mobile sources. The initial phase of the study, which is near completion, was fully funded by CARB and focused on the development of robust sampling systems for brake and tire wear particulate matter emissions from a light-

duty vehicle, as well as the development of reproducible on-road testing measurement protocols. Since then, multiple agencies have been requested by CARB to expand the initial work. Coordinating Research Council (CRC) and South Coast AQMD are together proposing to expand the initial CARB study to include a mix of zero and non-zero emission light-, medium-, and heavy-duty vehicles to help obtain real-world brake and tire wear emission estimates.

Proposal

Study 1: Evaluation of Secondary PM Emissions from Tire Off-Gassing

UCR/CE-CERT will utilize a custom-built temperature-controlled photochemical chamber to expose popular brand tires to varying temperatures to measure primary and secondary off-gassing emissions – mimicking real-world conditions. The project will also perform statistical analyses for real-world factors – including tire type, manufacturers, tire age, and temperature – to better understand how tire emissions influence formation of secondary PM and ambient air quality in the South Coast Air Basin (Basin).

Study 2: Evaluation of On-Road Brake and Tire Wear Emissions

UCR/CE-CERT will utilize robust sampling systems and measurement protocols developed under the CARB study to collect on-road brake and tire wear emissions from vehicles of different vocations and technologies under real-world usage conditions. The study will measure the particulate and gaseous emissions from brake and tire wear, characterize their physicochemical compositions, braking technologies, and analyze the influence of different tires/road surfaces on emissions. The study will provide insights into how to mitigate emissions, limit exposure, and develop an initial set of tire/brake wear emission estimates.

Sole Source Justification

Section VIII.B.2 of the Procurement Policy and Procedure identifies four major provisions under which a sole source award may be justified. The request for a sole source award with UCR CE-CERT is made under provision B.2.d.(8): Research and development efforts with educational institutions or nonprofit organizations. UCR is an educational institution and CE-CERT is a research center with multidisciplinary resources to engage in diverse environmental and transportation research programs including advanced vehicle technologies and systems; emission measurements, analyses and control technologies; atmospheric measurements and modeling; and renewable energy. The proposed projects will include in-kind contributions and cost-share by CE-CERT.

Benefits to South Coast AQMD
The health and environmental impacts of non-exhaust emissions from mobile sources are increasingly a concern, especially with the widespread use of heavier electric vehicles.

Ultrafine and fine particles originating from brake and tire wear can be linked to respiratory issues, cardiovascular problems, and other health effects, particularly in urban populations and vulnerable communities living near major traffic corridors. Gaseous emissions from the off gassing of tires can include carcinogenic and toxic compounds to humans and can act as precursors to secondary PM formation. Understanding secondary PM formation is significant as it affects air toxics levels in South Coast AQMD's jurisdiction.

Projects that support the evaluation and characterization of real-world on-road non-exhaust particulate and gaseous emissions from vehicles in the Basin are included in the Technology Advancement Office Clean Fuels 2025 Plan Update under the category "Fuel and Emissions Studies." These proposed projects will provide a better understanding of the emissions from vehicle brake and tire wear.

Resource Impacts
South Coast AQMD's funding for Study 1: Evaluation of Secondary PM Emissions from Tire Off-Gassing to be conducted by UCR/CE-CERT shall not exceed $200,000 from the Clean Fuels Program Fund (31).

Study 1: Evaluation of Secondary PM Emissions from Tire Off-Gassing

Funding Source	Funding Amount	Percent
UCR (in-kind)	$100,000	33.33%
South Coast AQMD *(requested)*	$200,000	66.67%
Total	**$300,000**	**100%**

South Coast AQMD's funding for Study 2: Evaluation of On-Road Brake and Tire Wear Emissions to be conducted by UCR/CE-CERT shall not exceed $600,000 from the Clean Fuels Program Fund (31). The funding breakdown for the larger research initiative for the on-road brake and tire wear emissions evaluation project is the following:

Study 2: Evaluation of On-Road Brake and Tire Wear Emissions

Funding Agency	Funding Amount
California Air Resources Board	$850,000
Coordinating Research Council	$500,000*
South Coast AQMD *(requested)*	$600,000
Total	**$1,950,000****

* Currently under review by the CRC; funding may change

** Total funding may change pending finalization of the CRC-funded project

Sufficient funds are available from the Clean Fuels Program Fund (31), established as a special revenue fund resulting from the state-mandated Clean Fuels Program. The Clean Fuels Program, under Health and Safety Code Sections 40448.5 and 40512 and Vehicle Code Section 9250.11, establishes mechanisms to collect revenues from mobile sources to support projects to increase the utilization of clean fuels, including the development of the necessary advanced enabling technologies. Funds collected from motor vehicles are restricted by statute to projects and program activities related to mobile sources that support the objectives of the Clean Fuels Program.