State of California
AIR RESOURCES BOARD

Research Screening Committee Meeting
Cal/EPA Headquarters Building
1001 I Street
Conference Room 510
Sacramento, California 95814
(916) 445-0753

March 30, 2017
9:00 a.m.

ADVANCE AGENDA

I. Approval of Minutes of Previous Meeting:

January 13, 2017 meeting

II. Discussion of Draft Final Reports:

1) "Effectiveness of Sound Wall-Vegetation Combination Barriers as Near-Roadway Pollutant Mitigation Strategies," University of California, Los Angeles, $516,139, Contract No. 13-306

Traffic-related air pollutants are a significant public health concern near freeways. While California has made tremendous progress in reducing vehicular emissions, a growing population and corresponding increase in the number of on-road traffic continues to be an important source of air pollution exposures, especially for those living close to major roadways. In particular, traffic generated air pollutants including black carbon, carbon monoxide, ultrafine particles, and nitrogen oxides continue to be elevated around freeways and major roadways.

Researchers have demonstrated that solid sound barriers placed along the sides of major roadways are successful in reducing downwind pollutant concentrations by aiding in the dispersion of traffic emissions. Additionally, some researchers have postulated that adding additional physical barriers like vegetation could potentially increase the dispersive action and aid in further reducing near-roadway pollution. However, studies on the combined effects of sound walls and vegetative barriers have not yet produced definitive quantitative results, and data for vegetation and other conditions common in California are very limited.

This study attempts to explain the effectiveness of sound wall and vegetative barriers in dispersing pollutants under near-roadway conditions common in California. The project utilized a combination of mobile and stationary measurement and modeling approaches to evaluate the impact of various barrier configurations at four sites along major highways in California. The results provide insights into the value and best practices for siting of sound walls, and vegetation in combination with sound walls, to reduce air pollution downwind from roadways. The project team summarized the results using comprehensive analyses, and produced a semi empirical dispersion model that can be used to evaluate pollution dispersion from the addition of vegetation to sound barrier installations. A more general guideline based on the data collected has been distilled from this same information. The analytical results, the physical dispersion model, and the simplified guidance can be useful to the research community as well as planners and decision makers to evaluate and consider potential near-roadway air pollution mitigation options for existing and future development. This information is also increasingly relevant as regional and local sustainability strategies under SB 375 programs may result in increased population densities in urban microenvironments.

2) "Evaluating Technologies and Methods to Lower Nitrogen Oxide Emissions from Heavy-Duty Vehicles," Southwest Research Institute, $1,599,744,
Contract No. 13-312

The 2010 emission standards for heavy-duty engines have established a limit for oxides of nitrogen (NO_X) emissions of 0.20 g/bhp-hr, a 90 percent reduction from the previous emission standards. However, it is projected that even when the entire on-road fleet of heavy-duty vehicles operating in California is compliant with the 2010 NO_X emission standards, the upcoming National Ambient Air Quality Standards (NAAQS) requirements for ambient particulate matter (PM) and ozone will not be achieved in California without further significant reduction in NO_X emissions from the heavy-duty vehicles. The main goal of this project was to demonstrate that modern heavy duty engines can achieve a target of 0.02 g/bhp-hr for tailpipe NO_X emission, which represents a 90 percent reduction from the 2010 standard, with currently available control technology. An additional goal of the project was that the final configurations of engine and aftertreatment systems should be consistent with a path toward meeting current and future heavy-duty greenhouse gas (GHG) and fuel economy standards. The project team selected two different engine platforms: a compressed natural gas (CNG)-based engine system and a diesel-based engine system. To identify advanced, production feasible, ultra-low NO_X control solutions for both of these platforms, extensive work on calibrating engine control strategies, screening advanced aftertreatment technologies, selecting optimal combinations of engine and aftertreament technologies, and demonstrating ultra-low NO_X emissions was performed in sequence. The final system selected for the CNG engine was a combination of advanced air-fuel control strategies, close-coupled three-way catalyst (TWC), and conventional under-floor TWC. NO_X emissions measured from the final CNG engine were 0.010 g/bhp-hr over the FTP certification cycle, well below the project target level of 0.02 g/bhp-hr. The final system selected for the diesel engine was a combination of cold-start engine calibration and an advanced aftertreatment system. NO_X emissions from the final diesel system were measured with three different aftertreatment catalyst aging stages: degreened, thermal aging, and thermal and chemical aging. The NO_X emissions over the FTP cycle were 0.008 g/bhp-hr, 0.012 g/bhp-hr, and 0.034 g/bhp-hr for the degreened, thermal aging only, and thermal and chemical aging, respectively. The project team suspects that the slightly high NO_X with the thermal and chemical aged catalysts was due in part to an incident happened during the final aftertreatment aging, failure and crumbling of the matting material holding the Passive NO_X Adsorber (PNA) in its metal canister. As a result of this incident, there was an abnormally large build-up of soot and hydrocarbon on the PNA that likely caused uneven flow distribution that resulted in localized soot build-up on the selective catalytic reduction filter (SCRF) system. This research project found multiple ultra-low NO_X technology pathways applicable for many diesel engine and aftertreatment configurations. The results will be very important when developing air quality plans and regulatory priorities to achieve further NO_X reductions from heavy-duty fleet in California.