DRISI
Caltrans Division of Research, Innovation and System Information

Research Notes

Environmental

APRIL 2023

Project Title:
Quantify the Effect of Roadside Barrier on Near Road Air Pollutant Dispersion and Concentration

Task Number: 3263

Start Date: January 02, 2019

Completion Date: December 31, 2022

Task Manager:
Simon Bisrat
Senior Environmental Planner
simon.bisrat@dot.ca.gov

Quantify the Effect of Roadside Barrier on Near Road Air Pollutant Dispersion and Concentration

Using a tracer field study to quantify the effects of solid roadside barriers on dispersion of traffic-generated pollutants.

WHAT IS THE NEED?

Near road air quality continues to be an important issue for transportation agencies. State and federal publications identify roadside barriers, such as sound walls, as potential measures to improve air quality along the roadway. Yet, there is currently no acceptable air quality dispersion model that meets the federal modeling guideline to quantify the effect of roadside barriers on pollutant dispersion and concentration. Even the U.S. Environmental Protection Agency's (EPA's) preferred dispersion model, Air Quality Dispersion Modeling (AERMOD), does not consider the physical effects of roadside barriers on air flow and pollutant dispersion. The lack of an acceptable dispersion model or computational algorithm to analyze roadside barriers prevents transportation agencies from constructing barriers to receive air quality improvement credits for conformity determination on transportation projects. Without a quantifiable analysis method, it is also a challenge for agencies to justify expending resource to construct roadside barriers solely for air quality improvements.

WHAT ARE WE DOING?

It is critical that any effort to develop a dispersion algorithm for roadside barriers comply with the federal modeling guideline, to ensure that the air quality improvement benefits the barriers provide are acceptable for environmental analysis on federal and federal-aid transportation projects. A dispersion algorithm which is compatible with AERMOD would allow Caltrans to quantify roadside barriers' effects on air quality in accordance with federal modeling guidance.

Caltrans

DRISI provides solutions and knowledge that improves California's transportation system

The research team will conduct a tracer field study to quantify the effects of solid roadside barriers on dispersion of traffic-generated pollutants, using tracer gas with a controllable and measurable emission rate under a range of meteorological and traffic conditions.

WHAT IS OUR GOAL?

The goal of this research is to develop a dispersion algorithm and dataset suitable for evaluation of dispersion model performance in close collaboration with U.S. EPA.

WHAT IS THE BENEFIT?

California, which has the most sound walls in the nation, has not been able to account for the secondary air quality benefit that its roadway assets have been providing for the public. Additionally, consideration to construct roadside barriers along existing roadway to improve air quality for nearby sensitive receptors, such as schools and hospitals, would be limited to qualitative assessment rather than quantitative analysis. To ensure the deployment potential, this Task is developed in close collaboration with U.S. EPA staff serving as technical advisors.

WHAT IS THE PROGRESS TO DATE?

This research Task was part of the Division of Research, Innovation and System Information (DRISI) call for submissions in 2018-19 funding cycle following the completion of Preliminary Investigation in June 2018. A contract for the research was developed and a University of California Riverside research group led by Dr. Akula Venkatram was selected. The research project was progressing well until some of the field investigation was stopped because of COVID-19 in 2020. For this reason, a contract extension was requested twice and granted. The project was successfully completed on December 2022. The project manager is currently in the process of closing out this project.