DRISI

CALTRANS DIVISION OF RESEARCH, INNOVATION AND SYSTEM INFORMATION

TRANSFORMING IDEAS INTO SOLUTIONS

Research Notes

Plastic GHG Emissions Field Measurement Along Caltrans ROW

This task will conduct statewide field experimentation on plastics found in the highway system and determine if the conditions in the highway will cause plastics to photochemically degrade to greenhouse gasses (GHG).

Environmental

May 2025

Project Title: Plastic GHG Emissions Field Measurement Along Caltrans ROW

Task Number: 4347

Start Date: April 1, 2024

Completion Date: March 31, 2027

Task Manager:

Simon Bisrat
Senior Environmental Planner
Simon.Bisrat@dot.ca.gov

WHAT IS THE NEED?

A California Department of Transportation (Caltrans) District 7 Study has shown that distribution of trash by mass collected at drainage outfalls is 33% plastic, 10% cigarette butts, 19% paper, 16% wood, 13% metal, 6% cloth, 1% glass, and 2% other. Therefore, highway trash is predominantly composed of plastic which is composed of oxygen, hydrogen, and predominantly carbon. In addition, road materials such as thermoplastic paint (used in traffic stripes) and RHMA (with recycled rubber from scrap tires) contain plastic. A preliminary study by HWANP (2022) finds that photochemical degradation of plastic is likely to occur under conditions that normally exist along Caltrans right of way. Plastic due to its composition when photochemically degraded will release greenhouse gas (GHG), such as carbon dioxide (CO2), methane (CH4) and other species. Plastic GHG emissions along Caltrans highways if unrecognized will be uncontrolled and will offset the benefits of project features promoting GHG reduction (e.g., HOV, bike lanes, etc.), including reduction of vehicular GHG emissions (regulated by CARB). Determining plastic GHG emissions will help in decisions and guidance on trash removal and disposal, highway materials and projects.

WHAT ARE WE DOING?

This study will conduct statewide field experimentation on plastics found in the highway from trash, thermoplastic stripes, etc. and determine if the conditions in the highway will cause plastics to photochemically degrade to GHG. We will also experiment on the different types of plastics and different weather (i.e. dry and wet) to quantify rate of degradation.

Caltrans

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

WHAT IS OUR GOAL?

The goal is to determine to what extent plastics from state highway system contribute to GHG emissions.

WHAT IS THE BENEFIT?

This study will provide information that will benefit Caltrans projects in two ways. First, GHG emission reduction can be quantified by maintenance in managing roadside trash removal and choosing the optimum disposal strategy. Second, the results will guide selection of materials used in the highway (e.g. thermoplastic paint, recycled tire crumbs for HMA, etc.) such that projects (i.e. striping, pavement rehabilitation, road widening, etc.) will provide GHG benefits. Plastic GHG emissions will then be recognized and controlled and with decrease in exhaust emissions (through CARB regulation) will provide all Californians better air quality. These benefits also apply to all agencies and counties that build roads and remove trash, for they too will reduce non-exhaust GHG emissions from plastic degradation.

WHAT IS THE PROGRESS TO DATE?

The University of California Riverside based research team has been selected and the project is progressing well. The team collected their first plastic samples utilizing a street sweeper on the Caltrans right of way. They sorted and identified the plastics and began testing them in a new state-of-the art laboratory with flow-through, ultraviolet, and oxidation chambers to evaluate the GHGs they produce. The laboratory testing phase is progressing as planned.