State of California
AIR RESOURCES BOARD

Collection of Tractor-Trailer Activity Data

RESEARCH PROPOSAL

Resolution 14-38

November 20, 2014

Agenda Item No.: 14-9-1

WHEREAS, the Air Resources Board (ARB) has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code sections 39700 through 39705;

WHEREAS, a research proposal, number 2782-281, titled "Collection of Tractor-Trailer Activity Data," (Research Proposal) has been submitted by the University of California, Riverside, for a total amount not to exceed $488,560;

WHEREAS, the Research Division staff has reviewed the Research Proposal and finds that in accordance with Health and Safety Code section 39701, research is needed to study the possible inclusion of additional tractor-trailer types in the tractor-trailer greenhouse gas reduction regulation pursuant to goals specified in California's Global Warming Solutions Act of 2006 (Assembly Bill 32); and

WHEREAS, in accordance with Health and Safety Code section 39705, the Research Screening Committee has reviewed and recommends funding the Research Proposal.

NOW, THEREFORE BE IT RESOLVED that the Air Resources Board, pursuant to the authority granted by Health and Safety Code section 39700 through 39705, hereby accepts the recommendations of the Research Screening Committee and staff and approves the Research Proposal.

BE IT FURTHER RESOLVED that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the Research Proposal as further described in Attachment A, in an amount not to exceed $488,560.

I hereby certify that the above is a true and correct copy of Resolution 14-38 as adopted by the Air Resources Board.

Tracy Jensen

Tracy Jensen, Clerk of the Board

ATTACHMENT A

"Collection of Tractor-Trailer Activity Data"

Background

In order to meet the greenhouse gas (GHG) emission reduction goals specified in California's Global Warming Solutions Act of 2006 (Assembly Bill 32, or AB32), GHG emission reductions are needed from heavy-duty tractors. The Tractor-Trailer GHG regulation (title 17, California Code of Regulations, sections 95300 – 95312, hereafter referred to as 'GHG regulation') adopted in 2008 was one of the discrete early action measures by the ARB to contribute to the goals of AB 32. The GHG regulation applies to tractors pulling 53-foot or longer box trailers, and requires them to be equipped with aerodynamic technologies and low rolling resistance tires, but does not apply to other trailer types.

The GHG regulation is intended to reduce GHG emissions from heavy-duty tractors by decreasing the load on the engine by reducing trailer aerodynamic drag and tire rolling resistance. In order for aerodynamic technologies to work most effectively to lessen aerodynamic drag, vehicle speed is a critical parameter since drag is proportional to the square of the vehicle's speed, and maximum benefits occur at higher vehicle speeds, such as highway cruise operation. Because of this, the GHG regulation focused on long-haul trucking operations which accrues high annual vehicle miles traveled.

It is possible that similar GHG benefits may be obtained from different trailer types such as 'pup' trailers, 48-foot or shorter trailers, flatbed trailers, tankers, etc., but there are little to no data available about the impacts of aerodynamic technologies on heavy-duty tractors and trailers that operate under non-extended-highway- cruise conditions. Hence, data is needed to assess the potential benefits of aerodynamic technologies for trailer types and vehicle operating conditions beyond those included in the current GHG regulation.

Objective

The objective of this project is to investigate the potential benefits of extending the current heavy-duty tractors GHG aerodynamic technologies regulation for 53-foot box trailers to include other trailer types such as flatbeds, tankers, etc., and box trailers shorter than 53 feet in length.

Methods

The project objective will be accomplished by determining the vehicle 'activity' patterns such as daily and annual vehicle miles traveled (VMT), average speeds, etc., for selected candidate trailer types.

The project includes three tasks: 1) trailer fleet surveys of activity, 2) on-vehicle data logging, 3) data analyses and reporting. The contractor will utilize tractor and trailer registration information obtained from R.L. Polk to determine trailer populations, and to obtain tractor and trailer owner contact information for administering the fleet surveys.

The Principal Investigators (PIs) will prepare a technical memorandum for review and approval by ARB staff before beginning each task.

Task 1 - Fleet surveys
ARB staff will provide the contractor with a list of four to six trailer types to be studied during the project. Using this list, the PIs will conduct the trailer fleet owner surveys seeking information about VMT and average speed for specific trailer types. This task consists of five subtasks: 1) development of fleet survey questionnaire, 2) survey administration, 3) solicitation of fleets for participation in data logging task, 4) analysis of survey data, and 5) selection of fleets for data logging. As noted above, Polk data will be used for this task to identify owners of trailers of interest. The goal is to obtain a minimum of 30 survey responses for each of up to six trailer categories.

Task 2 - On-Vehicle Data logging
This task will be accomplished by collecting data from data loggers equipped with Global Positioning System (GPS) receivers placed on selected tractors, and from existing trailers equipped with GPS receivers. The PIs will procure data loggers capable of collecting GPS data, and, for a subset of data loggers, engine parameter data from the vehicle computer. These data loggers will be installed on selected vehicles to collect real-time activity data for a time duration, still to be determined, but expected to range between one and six months, depending on how the tractor-trailers are used. The data loggers will be deployed in fleets throughout the state and nationally. In addition, the PIs will also download vehicle speed data stored in the engine control module. Surveys asking about trailer use will supplement the data logger data collection. The goal is to perform a total of 180 data logger exchanges for up to six trailer types.

Task 3 - Data analysis and reporting
The PIs will handle data processing, protecting fleet owner identities as necessary, and will address GPS data collection issues such as GPS signal drop out by filtering, data gap filling, and map matching. Subsequent to data processing, the contractor will conduct data analyses for each trailer type, determining average speeds, speed distributions, vehicle miles traveled, etc. Data will be summarized and reported in the draft final report.

Expected Results
The expected results will include an assessment, for each of the tractor-trailer types studied, of the fraction of total activity which could potentially have emissions benefits from the installation of aerodynamic devices.

Significance to the Board
Results will support the development of second-generation GHG control measures for heavy-duty tractors and trailers.

Contractor:
University of California, Riverside
Contract Period:

24 months

Principal Investigators (PIs):
Kent Johnson, Ph.D. , Kanok Boriboonsomsin, Ph.D., Georgios Karavalakis, Ph.D., Thomas Durbin, Ph.D.

Contract Amount:
$488,560

Basis for Indirect Cost Rate:
The State and the UC system have agreed to a ten percent indirect cost rate.

Past Experience with these Principal Investigators:
Drs. Johnson and Durbin have conducted, and are conducting, mobile source related research projects for ARB, and other clients. This includes light- and heavy-duty vehicle and engine emissions testing, heavy-duty vehicle over-the-road emissions testing using on-board portable emissions measurement systems, and collecting heavy-duty vehicle activity and engine operating parameter data using on-board data loggers.

Prior Research Division Funding to the University of California, Riverside:

Year	2013	2012	2011
Funding	$777,062	$0	$390,004

BUDGET SUMMARY

Contractor: University of California, Riverside

Collection of Tractor-Trailer Activity Data

DIRECT COSTS AND BENEFITS			
1.	Labor and Employee Fringe Benefits	$ 269,835	
2.	Subcontractors	$ 41,580	
3.	Equipment	$ 0	
4.	Travel and Subsistence	$ 17,800	
5.	Electronic Data Processing	$ 0	
6.	Reproduction/Publication	$ 0	
7.	Mail and Phone	$ 0	
8.	Supplies	$ 41,063	
9.	Analyses	$ 0	
10.	Miscellaneous	$ 85,425[1]	
	Total Direct Costs		$ 455,703
INDIRECT COSTS			
1.	Overhead	$ 32,857	
2.	General and Administrative Expenses	$ 0	
3.	Other Indirect Costs	$ 0	
4.	Fee or Profit	$ 0	
	Total Indirect Costs		$ 32,857
TOTAL PROJECT COSTS			**$ 488,560**

[1] As an off-campus facility of the University of California, Riverside, CE-CERT recovers direct, lease-based facilities rental charges. Facilities rental is charged at 26 percent of Modified Total Direct Costs (MTDC; total direct costs less any equipment, graduate student tuition/partial fee remission, and subcontracts beyond the first $25,000).

ATTACHMENT 1

SUBCONTRACTORS' BUDGET SUMMARY

Subcontractor: R. L. Polk & Company

Description of subcontractor's responsibility:
R. L. Polk will provide the project contractor, UC Riverside, with a database containing contact information about different selected heavy-duty trailer types. This information will be used during the project to help conduct fleet-owner surveys to obtain information about how the different trailer types are used, such as annual vehicle miles traveled, average trailer speeds, etc.

DIRECT COSTS AND BENEFITS			
1.	Labor and Employee Fringe Benefits	$ 41,580	
2.	Subcontractors	$ 0	
3.	Equipment	$ 0	
4.	Travel and Subsistence	$ 0	
5.	Electronic Data Processing	$ 0	
6.	Reproduction/Publication	$ 0	
7.	Mail and Phone	$ 0	
8.	Supplies	$ 0	
9.	Analyses	$ 0	
10.	Miscellaneous	$ 0	
	Total Direct Costs		$ 41,580
INDIRECT COSTS			
1.	Overhead	$ 0	
2.	General and Administrative Expenses	$ 0	
3.	Other Indirect Costs	$ 0	
4.	Fee or Profit	$ 0	
	Total Indirect Costs		$ 0
TOTAL PROJECT COSTS			**$ 41,580***

* The cost for the Polk data is a fixed-fee, fully-loaded rate.