State of California
AIR RESOURCES BOARD

RESEARCH PROPOSAL

Resolution 12-12

March 22, 2012

Agenda Item No.: 12-2-1

WHEREAS, the Air Resources Board 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 2734-273, entitled "Investigate the Durability of Diesel Engine Emissions Controls," has been submitted by the University of Denver, in response to RFP No. 11-309;

WHEREAS, the Research Division staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Research Screening Committee has reviewed and recommends for funding:

> Proposal Number 2734-273 entitled "Investigate the Durability of Diesel Engine Emissions Controls," submitted by the University of Denver, for a total amount not to exceed $289,678.

NOW, THEREFORE, BE IT RESOLVED that the Air Resources Board, pursuant to the authority granted by Health and Safety Code section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

> Proposal Number 2734-273 entitled "Investigate the Durability of Diesel Engine Emissions Controls," submitted by the University of Denver, for a total amount not to exceed $289,678.

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 effort proposed herein, and as described in Attachment A, in an amount not to exceed $289,678.

I hereby certify that the above is a true and correct copy of Resolution 12-12, as adopted by the Air Resources Board.

Mary Alice Morency, Clerk of the Board

ATTACHMENT A

"Investigate the Durability of Diesel Engine Emissions Controls"

Background
New emissions standards for heavy-duty vehicles implemented for particulate matter (PM) and oxides of nitrogen (NO_X) in 2007 and 2010 are leading to the introduction of exhaust aftertreatment devices in diesel trucks. These include diesel particle filters (DPFs) and selective catalytic reduction (SCR). While various studies have been performed to assess the efficiency of these aftertreatment devices, so far minimal data exists on their durability and deterioration. It is important to measure pollutant concentrations in the real world because trucks with malfunctioning aftertreatment devices could emit tens to hundreds of times more emissions than a truck meeting certification standards. Potential aftertreatment failures and related emissions increases would reduce the air quality and health benefits of the new engine standards and also generate inaccurate emission inventories.

Objective
The objective of this study is to collect emissions data over a course of multiple years from on-road heavy-duty diesel trucks in the state of California. The data gathered from this study will be used to assess durability and deterioration of the aftertreatment devices used to reduce PM and NO_X concentration. This will help assess the effectiveness of the Air Resources Board's diesel fleet rules, aid in the development of accurate emissions inventories, and shed light on any need for consideration of additional durability requirements.

Methods
On-road measurements will be performed to collect carbon monoxide (CO), total hydrocarbon (THC), black carbon (BC), PM and NO_X during 2013, 2015 and 2017 in the Los Angeles basin area, (i) near a port; and (ii), on the on-ramp to a highway not dominated by port trucks. License plate information will be recorded and used to build an engine model year database. The presence or absence of SCR will also usually be identified. Integrated pollutant ratios to carbon dioxide (CO_2) will be calculated and converted to fuel-based emissions.

Expected Results
The investigators have collected remote sensing data at the proposed sites in the last few years. The current study will complement the previously collected data and extend the record through 2017. This multi-year dataset will allow a robust analysis of durability and deterioration of aftertreatment devices.

Significance to the Board
The data generated from this study will be used to evaluate the durability and deterioration of aftertreatment devices which are being introduced to comply with diesel fleet rules. The study will directly help assess the air quality and health benefits of the new engine standards and assist in generating more accurate emission inventories.

Additionally, the data generated from this study may provide clues about tampering/mal-maintenance of these devices.

Contractor:
University of Denver

Contract Period:
72 months

Principal Investigators (PIs):
Donald H. Stedman, Ph.D.
Gary A. Bishop, Ph.D.

Contract Amount:
$289,678

Basis for Indirect Cost Rate:
The University of Denver proposal was received using a competitive bid process in which the cost proposal is rated. Therefore, the federally approved indirect cost rate of 47.4 percent is accepted as proposed. The overhead rate corresponds to the University of Denver's budgetary requirements.

Past Experience with this Principal Investigator:
The University of Denver has performed nine different on-road remote sensing studies in California (including the Port of Los Angeles) with others in Texas, Colorado and Switzerland. Additional light-duty remote sensing on-road measurements have also been taken by the investigators in California and other parts of the world. Both the co-investigators have collaborated on on-road measurement projects for more than two decades and possibly are the leading world experts in heavy-duty diesel remote-sensing measurements. ARB staff has a good relationship with the investigators and has collaborated with Professor Bishop in the past on a remote-sensing study to collect on-road emissions of ammonia (NH_3), nitrogen dioxide (NO_2), and sulfur dioxide (SO_2).

Prior Research Division Funding to University of Denver:

Year	2011	2010	2009
Funding	$0	$0	$0

BUDGET SUMMARY

Contractor: University of Denver

"Investigate the Durability of Diesel Engine Emissions Controls"

DIRECT COSTS AND BENEFITS			
1.	Labor and Employee Fringe Benefits	$ 141,973	
2.	Subcontractors	$ 24,990	
3.	Equipment	$ 0	
4.	Travel and Subsistence	$ 20,768[1]	
5.	Electronic Data Processing	$ 0	
6.	Reproduction/Publication	$ 0	
7.	Mail and Phone	$ 0	
8.	Supplies	$ 8,794	
9.	Analyses	$ 0	
10.	Miscellaneous	$ 0	
	Total Direct Costs		$196,525
INDIRECT COSTS			
1.	Overhead	$ 93,153	
2.	General and Administrative Expenses	$ 0	
3.	Other Indirect Costs	$ 0	
4.	Fee or Profit	$ 0	
	Total Indirect Costs		$93,153
TOTAL PROJECT COSTS			**$289,678**

[1]Travel and Subsistence (10.5 percent of the total direct cost)
Air fare, ground transportation, lodging and per-diem estimates used by the University of Denver are based upon ARB's current per diem rates and contractors own experience in performing on-road measurements in California. Based on their experience, the contractor believes that the goals of this project can be met with a week of operation at each site. Two airline trips to LA for site selection purposes are also being taken into account. The bulk of travel is the six weeks of sampling campaigns to be performed in 2013, 2015 and 2017.