State of California
AIR RESOURCES BOARD

RESEARCH PROPOSAL

Resolution 07-33

September 27, 2007

Agenda Item No.: 07-9-2

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 2632-257, entitled "On-Road Motor Vehicle Emissions Measurements Including Ammonia, Sulfur Dioxide, and Nitrogen Dioxide," has been submitted by the University of Denver;

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 2632-257, entitled "On-Road Motor Vehicle Emissions Measurements Including Ammonia, Sulfur Dioxide, and Nitrogen Dioxide," submitted by the University of Denver, for a total amount not to exceed $90,042.

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 2632-257, entitled "On-Road Motor Vehicle Emissions Measurements Including Ammonia, Sulfur Dioxide, and Nitrogen Dioxide," submitted by the University of Denver, for a total amount not to exceed $90,042.

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 $90,042.

I hereby certify that the above is a true and correct copy of Resolution 07-33, as adopted by the Air Resources Board.

Lori Andreoni

Lori Andreoni, Clerk of the Board

ATTACHMENT A

"On-Road Motor Vehicle Emissions Measurements Including Ammonia, Sulfur Dioxide, and Nitrogen Dioxide"

Background
Particulate matter smaller than 2.5 μm in diameter (PM2.5) is of concern due to its association with increased human morbidity and mortality, and its contribution to decreased visibility. Ammonia (NH_3), nitrogen dioxide (NO_2), and sulfur dioxide (SO_2) emissions are important particle precursors, and NO_2 is a direct and immediate ozone-forming compound. All three pollutants are important to inventory since they result in up to 35 percent of PM2.5 in California.

Objective
The objectives of this project are to: 1) use a remote sensing device (RSD) to monitor three unregulated emissions (NH_3, NO_2, and SO_2) along with three regulated emissions carbon monoxide(CO), volatile organic compounds (VOC), and nitrogen oxide (NO) from on-road light duty vehicles at three major regions of California: the South Coast Air Basin, the San Joaquin Valley, and the San Francisco Bay area, 2) provide a fuel-based emission inventory, in combination with fuel sales data, and 3) assess the variability among the three regions in terms of emissions.

Methods
The University of Denver's RSD mobile laboratory will be used in three testing sites in California to conduct RSD measurements of six pollutants (NH_3, NO_2, SO_2, CO, VOC, and NO) from on-road light-duty vehicles.

Expected Results
The University of Denver is expected to provide valid NH_3, NO_2, SO_2, CO, VOC, and NO emissions data collected from approximately 60,000 light duty vehicles, 20,000 each in three major regions.

Significance to the Board
The project is intended to provide the Air Resources Board with previous unavailable data with respect to on-road emissions of NH_3, NO_2, and SO_2. The outcome of this project is expected to improve our understanding of the current mobile-source NH_3, NO_2, and SO_2 emissions inventory and assess whether these emissions vary from region to region within California.

Contractor:
University of Denver

Contract Period:
18 months

Principal Investigator:
Donald H. Stedman, Ph.D.
Gary A. Bishop, Ph.D.

Contract Amount:
$90,042

Basis for Indirect Cost Rate:
The Air Resources Board staff was able to negotiate with the University of Denver and lower the overhead rate from 54 percent to 15 percent.

Past Experience with this Principal Investigator:
Professor Donald Steadman and Dr. Gary Bishop of the University of Denver were instrumental in the development of these first RSDs, indeed Professor Donald Steadman is credited as the inventor of remote sensing as he developed the first CO only device under a U.S. Environmental Protection Agency grant in 1987. Professor Steadman and Dr. Bishop have now developed the next generation of RSD's with the added capability of measuring NH_3, NO_2, and SO_2. They currently have the only device capable of measuring these additional pollutants as their invention is patented and has not been commercialized.

Prior Research Division Funding to the University of Denver:

Year	2007	2006	2005
Funding	$0	$0	$0

BUDGET SUMMARY

University of Denver

On-Road Motor Vehicle Emissions Measurements Including Ammonia, Sulfur Dioxide, and Nitrogen Dioxide

DIRECT COSTS AND BENEFITS				
1.	Labor and Employee Fringe Benefits	$	55,742	
2.	Subcontractors	$	0	
3.	Equipment	$	0	
4.	Travel and Subsistence	$	11,385[1]	
5.	Electronic Data Processing	$	0	
6.	Reproduction/Publication	$	0	
7.	Mail and Phone	$	0	
8.	Supplies	$	2,061	
9.	Analyses	$	0	
10.	Miscellaneous	$	10,476[2]	
	Total Direct Costs			$ 79,664
INDIRECT COSTS				
1.	Overhead	$	6,919	
2.	General and Administrative Expenses	$	3,459	
3.	Other Indirect Costs	$	0	
4.	Fee or Profit	$	0	
	Total Indirect Costs			$ 10,378
TOTAL PROJECT COSTS				**$ 90,042**

[1] Travel and Subsistence: Air transportation, Ground transportation cost for University of Denver's RSD mobile laboratory (Denver-LA-Fresno-San Diego-Denver), and Per Diem.
[2] Miscellaneous: Tuition for one student.