State of California
AIR RESOURCES BOARD

Heavy-Duty On-Road Vehicle Inspection and Maintenance Program

RESEARCH PROPOSAL

Resolution 16-1

January 21, 2016

Agenda Item No.: 16-1-1

WHEREAS, the Air Resources Board (ARB or 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 2799-284, titled, "Heavy-Duty On-Road Vehicle Inspection and Maintenance Program" has been submitted by the University of California, Riverside for a total amount not to exceed $500,000;

WHEREAS, the Research Division staff has reviewed Proposal Number 2799-284 and finds that in accordance with Health and Safety Code section 39701, research is needed to develop and demonstrate a heavy-duty vehicle inspection and maintenance program that will improve existing programs, and result in improved air quality and reduced exposure to pollutant emissions; 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 $500,000.

I hereby certify that the above is a true and correct copy of Resolution 16-1 as adopted by the Air Resources Board.

Tracy Jensen

Tracy Jensen, Clerk of the Board

ATTACHMENT A

"Heavy-Duty On-Road Vehicle Inspection and Maintenance Program"

Background
Over the past twenty years, ARB has reduced on-road heavy-duty (HD) engine emissions standards for oxides of nitrogen (NO_X) and diesel particulate matter (PM) by about 97 percent. Despite these significant improvements, HDVs over 8,500 pounds are still responsible for approximately a third of California's total NO_X emissions and over a quarter of the diesel PM. While new engines employ improved engine designs and exhaust aftertreatment to certify to more stringent emissions standards, California still needs a more comprehensive HDV I/M program to ensure that in-use engines continue to meet emissions performance requirements, as these engines are used in HDVs that operate for 20 or more years and travel nearly a million miles.

Objective
The objectives of this project are to develop a prototype Inspection and Maintenance (I/M) program for on-road heavy-duty vehicles (HDVs), and to perform an economic cost analysis of this prototype HDV I/M program. These objectives will be accomplished by conducting four tasks that include literature reviews, HD I/M program development and demonstration, and economic cost analysis.

Methods
The contractor will conduct a comprehensive literature review to identify candidate I/M methods, develop and demonstrate a prototype HDV I/M program, and then conduct an economic cost analysis of this prototype, including possible initial and annual operating costs, and projected cost-effectiveness for a full-scale program.

Expected Results
The expected results are the development of a prototype HDV I/M program, including recommendations for test methods and test equipment, and an economic cost analysis of this prototype HD I/M program, scaled up to the statewide level. These results will inform the design of a new HD I/M program for consideration by the Board.

Significance to the Board
Control of in-use HDV emissions is critical to achieving the ARB's goals of meeting the ambient air quality standards for ozone, and reducing public exposure to diesel PM emissions. Results from this project will be used to inform the design of an improved HDV I/M program for consideration by the Board.

Contractor
University of California, Riverside (UCR)

Contract period
24 months

Principal Investigators (PIs):
Thomas Durbin, Ph.D.
Kent Johnson, Ph.D.
Georgios Karavalakis, Ph.D.
J. Wayne Miller, Ph.D.
Nigel Clark Ph.D. (West Virginia University (WVU))
Mark Carlock, Ph.D. (consultant)

Contract Amount:
$500,000

Basis for Indirect Cost Rate:
The indirect cost rate is ten percent and is calculated in accordance with the State Contracting Manual.

Past Experience with this Principal Investigator:
ARB has previous and ongoing research projects with UCR investigators on HD research projects. ARB has previously contracted with Dr. Clark and WVU on HDV research projects. Mark Carlock has not previously contracted with ARB. Previous research projects have been successfully completed.

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

Year	2015	2014	2013
Funding	$ 0	$ 1,288,560	$ 819,131

BUDGET SUMMARY

Contractor: The University of California, Riverside

"Heavy-Duty On-Road Vehicle Inspection and Maintenance Program"

DIRECT COSTS AND BENEFITS			
1.	Labor and Employee Fringe Benefits	$ 89,797	
2.	Subcontractors	$ 179,101	
3.	Equipment	$ 0	
4.	Travel and Subsistence	$ 3,870	
5.	Electronic Data Processing	$ 0	
6.	Reproduction/Publication	$ 0	
7.	Mail and Phone	$ 0	
8.	Supplies	$ 5,225	
9.	Analyses	$ 0	
10.	Miscellaneous	$ 196,622[1]	
	Total Direct Costs		$ 474,615
INDIRECT COSTS			
1.	Overhead	$ 25,385	
2.	General and Administrative Expenses	$ 0	
3.	Other Indirect Costs	$ 0	
4.	Fee or Profit	$ 0	
	Total Indirect Costs		$ 25,385
TOTAL PROJECT COSTS			**$ 500,000**

NOTE:

[1] This item includes $102,000 (for 150 vehicle emissions tests @ $660/test, and an additional $3000 provision for obtaining repair records), $21,000 for rental of emissions test equipment, $7620 for incentives, and $66,002 for a facilities fee.

ATTACHMENT 1

SUBCONTRACTORS' BUDGET SUMMARY

Subcontractor: West Virginia University

Description of subcontractor's responsibility: Nigel Clark, Ph.D. is co-PI and David McCain will be responsible for project data management

DIRECT COSTS AND BENEFITS

1.	Labor and Employee Fringe Benefits	$	30,135	
2.	Subcontractors	$	0	
3.	Equipment	$	0	
4.	Travel and Subsistence	$	5,800	
5.	Electronic Data Processing	$	0	
6.	Reproduction/Publication	$	0	
7.	Mail and Phone	$	0	
8.	Supplies	$	500	
9.	Analyses	$	0	
10.	Miscellaneous	$	0	
	Total Direct Costs			$ 36,435

INDIRECT COSTS

1.	Overhead	$	13,549	
2.	General and Administrative Expenses	$	0	
3.	Other Indirect Costs	$	0	
4.	Fee or Profit	$	0	
	Total Indirect Costs			$ 13,549

TOTAL PROJECT COSTS **$ 49,984**

ATTACHMENT 2

SUBCONTRACTORS' BUDGET SUMMARY

Subcontractor: Mark Carlock

Description of subcontractor's responsibility: Mark Carlock, Ph.D., will be a co-PIs for the project.

DIRECT COSTS AND BENEFITS

1.	Labor and Employee Fringe Benefits	$ 67,500[1]		
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		$	67,500

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 **$ 67,500**

NOTE
[1] The salary shown is a fully loaded rate of $150/hour for 450 hours of labor.

ATTACHMENT 3

SUBCONTRACTORS' BUDGET SUMMARY

Subcontractor
HAGER Environmental and Atmospheric Technologies, LLC :

Description of subcontractor's responsibility: H.E.A.T. will provide remote sensing device (RSD) technology to the project.

DIRECT COSTS AND BENEFITS

1.	Labor and Employee Fringe Benefits	$	21,700	
2.	Subcontractors	$	0	
3.	Equipment	$	0	
4.	Travel and Subsistence	$	12,770[1]	
5.	Electronic Data Processing	$	0	
6.	Reproduction/Publication	$	0	
7.	Mail and Phone	$	8,000[2]	
8.	Supplies	$	0	
9.	Analyses	$	3,000	
10.	Miscellaneous	$	5,700	
	Total Direct Costs			$ 51,170

INDIRECT COSTS

1.	Overhead	$	2,947	
2.	General and Administrative Expenses	$	0	
3.	Other Indirect Costs	$	0	
4.	Fee or Profit	$	0	
	Total Indirect Costs			$ 2,947

TOTAL PROJECT COSTS **$ 54,117**

Note:
[1] Cost for travel and per diem for the field demonstration of H.E.A.T.'s remote sensing instrument.
[2] Cost for shipping and insurance, from Tennessee to California and back, for H.E.A.T.'s remote sensing instrument.

ATTACHMENT 4

SUBCONTRACTORS' BUDGET SUMMARY

Subcontractor: Robert B. Harris

Description of subcontractor's responsibility: Robert Harris, Ph.D., will be the project lead for the cost analysis portion of the project.

DIRECT COSTS AND BENEFITS

1.	Labor and Employee Fringe Benefits	$ 7,500[1]		
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		$	7,500

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 **$ 7,500**

Note
[1] The salary shown is a fully loaded rate of $150/hour for 50 hours of labor.