State of California
AIR RESOURCES BOARD

RESEARCH PROPOSAL

Resolution 08-19

February 28, 2008

Agenda Item No.: 08-2-2

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 2651-259, entitled "Source Apportionment of Carbonaceous Aerosols Using Integrated Multi-Variant and Source Tracer Techniques and a Unique Molecular Marker Data Set," has been submitted by the University of Wisconsin-Madison.

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 2651-259 entitled "Source Apportionment of Carbonaceous Aerosols Using Integrated Multi-Variant and Source Tracer Techniques and a Unique Molecular Marker Data Set," submitted by the University of Wisconsin-Madison, for a total amount not to exceed $409,962.

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 2651-259 entitled "Source Apportionment of Carbonaceous Aerosols Using Integrated Multi-Variant and Source Tracer Techniques and a Unique Molecular Marker Data Set," submitted by the University of Wisconsin-Madison, for a total amount not to exceed $409,962.

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 $409,962.

I hereby certify that the above is a true and correct copy of Resolution 08-19, as adopted by the Air Resources Board.

Lori Andreoni

Lori Andreoni, Clerk of the Board

ATTACHMENT A

Source Apportionment of Carbonaceous Aerosols Using Integrated Multi-Variant and Source Tracer Techniques and a Unique Molecular Marker Data Set

Background

Carbonaceous material contributes to the human health effects of atmospheric aerosols, and affects their visibility and regional climate forcing impacts. Although significant advances have been made in mechanistic and receptor based source apportionment models, there still exists significant uncertainty in the contributions of primary and secondary sources to carbonaceous particulate matter in non-attainment areas of California. There is a great need to apply tools that can provide a more definitive understanding of the impacts of gasoline powered vehicles, diesel engines, biogenic derived secondary organic aerosol and anthropogenic derived secondary organic aerosol in California to develop effective particulate matter control strategies and to support health and climate forcing studies. Of equal significance is the need to develop a platform that can be used to compare different source apportionment tools and to provide a framework for assessing the accuracy and stability of such source apportionment tools.

Objective

The major objectives of the project are to generate a full year of hourly organic and elemental carbon (ECOC) measurements and daily molecular markers measurements at a central site in the Los Angeles (LA) Basin and to use the statistical analysis methods to apportion the contributions of primary and secondary sources on carbonaceous aerosol concentrations. A secondary objective of the project is to quantitatively determine the viability and uncertainty of using simple measurements, such as water soluble carbon, elemental carbon and water soluble potassium, as source tracers in the LA Basin.

Methods

The proposed project can be divided into two major thrusts: measurements and data analysis. The measurement thrust of the project would be to generate a year long time series of hourly PM2.5 ECOC measurements, daily PM2.5 molecular marker measurements, and daily PM2.5 measurements of bulk fine particle parameters including water soluble organic carbon (WSOC), water soluble potassium (WSP), and ultrafine particle number. The data analysis thrust of the project involves the applications of parallel source apportionment models methods including molecular marker chemical mass balance modeling (MM-CMB), molecular marker positive matrix factorization (MM-PMF) modeling, molecular marker iterative confirmatory factor analysis modeling, as well as statistical analysis to identify trends in day-of-the-week, time-of-day, and plume analysis to identify the strengths and weaknesses of these complementary models.

Expected Results
The data set will include daily measurements of fine particle primary and secondary organic aerosol molecular makers (365 days), as well as daily measurements of fine particle PM2.5 ECOC, PM2.5 WSOC, and WSP. Complementing these 24-hour integrated measurements will be continuous measurements of ECOC, particle mass, and ultrafine particle number. The measurements will be used in source apportionment models and novel data analysis tools.

The proposed data set will be analyzed using a MM-CMB model. In parallel to the MM-CMB analysis, the MM-PMF and other multivariate receptor models will be applied to the data for source apportionment analysis. In addition, other statistical methods will be used for the analysis of the data including day-of-the-week analysis, hour-of-the-day analysis, and plume analysis will be employed to further elucidate information about sources.

Significance to the Board
There is a great need to apply tools that can provide a more definitive understanding of the impact of gasoline powered vehicles, diesel engines, biogenic derived secondary organic aerosol and anthropogenic derived secondary organic aerosol in California to develop effective particulate matter control strategies and to support health and climate forcing studies. Of equal significance is the need to develop a platform that can be used to compare different source apportionment tools and to provide a framework for assessing the accuracy and stability of such source apportionment tools.

Contractor:
University of Wisconsin-Madison

Contract Period:
36 months

Principal Investigator (PI):
Professor James J. Schauer

Contract Amount:
$409,962

Basis for Indirect Cost Rate:
The State and the University of Wisconsin-Madison have agreed to a ten percent indirect cost rate.

Past Experience with this Principal Investigator:
The University of Wisconsin-Madison, particularly Professor Schauer, has extensive experience in the collection, trace chemical analysis, and source apportionment of atmospheric aerosols. Additionally, this research project will utilize collaborations with research scientists from the University of Southern California and the University of California, Riverside to complete the research targets described. The proposed research will generate a tremendous data set of ECOC and molecular marker

measurements for use in future studies and also provide a California-specific evaluation of several different source apportionment tools, both of which are currently needed.

Prior Research Division Funding to the University of Wisconsin-Madison:

Year	2007	2006	2005
Funding	$0	$0	

BUDGET SUMMARY

Contractor: University of Wisconsin-Madison

Source Apportionment of Carbonaceous Aerosols Using Integrated Multi-Variant and Source Tracer Techniques and a Unique Molecular Marker Data Set

DIRECT COSTS AND BENEFITS			
1.	Labor and Employee Fringe Benefits	$ 188,308	
2.	Subcontractors	$ 124,760	
3.	Equipment	$ 0	
4.	Travel and Subsistence	$ 17,010	
5.	Electronic Data Processing	$ 0	
6.	Reproduction/Publication	$ 50	
7.	Mail and Phone	$ 3,615	
8.	Supplies	$ 25,550	
9.	Analyses	$ 5,400	
10.	Miscellaneous	$ 8,000	
	Total Direct Costs		$372,693
INDIRECT COSTS			
1.	Overhead	$ 37,269	
2.	General and Administrative Expenses	$ 0	
3.	Other Indirect Costs	$ 0	
4.	Fee or Profit	$ 0	
	Total Indirect Costs		$37,269
TOTAL PROJECT COSTS			**$409,962**

Attachment 1

SUBCONTRACTORS' BUDGET SUMMARY

Subcontractor: University of Southern California

Description of subcontractor's responsibility: University of Southern California (USC) will serve as the lead for sample collection and operation of the real time instruments. USC will also participate in the data analysis and reporting, which leverages existing collaboration with University of Wisconsin-Madison and USC.

DIRECT COSTS AND BENEFITS				
1.	Labor and Employee Fringe Benefits	$	90,033	
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	$	7,717	
	Total Direct Costs			$97,750
INDIRECT COSTS				
1.	Overhead	$	27,010	
2.	General and Administrative Expenses	$	0	
3.	Other Indirect Costs	$	0	
4.	Fee or Profit	$	0	
	Total Indirect Costs			$27,010
TOTAL PROJECT COSTS				**$124,760**