

State of California
AIR RESOURCES BOARD

Resolution 04-4

January 22, 2004

Agenda Item No.: 04-1-3

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 2544-233, entitled "Hourly, In-situ Quantitation of Organic Aerosol Marker Compounds," has been submitted by the University of California, Berkeley;

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 2544-233 entitled "Hourly, In-situ Quantitation of Organic Aerosol Marker Compounds," submitted by the University of California, Berkeley, for a total amount not to exceed \$269,330.

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 2544-233 entitled "Hourly, In-situ Quantitation of Organic Aerosol Marker Compounds," submitted by the University of California, Berkeley, for a total amount not to exceed \$269,330.

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 \$269,330.

I hereby certify that the above is a true and correct copy of Resolution 04-4, as adopted by the Air Resources Board.



Stacey Dorais, Clerk of the Board

ATTACHMENT A

"Hourly, In-situ Quantitation of Organic Aerosol Marker Compounds "

Background

Regulatory efforts to achieve fine particulate matter (PM_{2.5}) standards require improvements in our knowledge of the factors controlling the concentration, size and chemical composition of PM_{2.5}. While many advances have been made in measuring and modeling the inorganic ionic species that are found in PM_{2.5}, much less is known about the organic fraction. Yet organic matter is a major constituent of airborne particles, comprising 20-40% of the PM_{2.5} mass in many regions. Quantitative knowledge of the composition of PM_{2.5} organic matter is key to tracing its sources and understanding its formation and transformation processes. Traditional methods for organic compound identification and quantification involve collection by filtration, with subsequent extraction and analysis by liquid or gas chromatography. However, organic analysis of extracts from filters requires large samples, typically milligrams of collected organic material. The cost is high, and generally the time resolution is poor. This research proposal will address the critical need for on-line, time-resolved, quantitative measurement of atmospheric PM_{2.5} organics at the molecular level.

Objective

The objectives of this research study are to demonstrate the capability of a new technique for hourly measurement of the organic composition of ambient PM_{2.5} aerosols, to deploy the instrument for one month in the summer and one in the winter at a site in California, and to analyze the combined data sets to resolve organic aerosol source contributions based on factor analysis.

Methods

This research study will be conducted in two phases. In Phase I, the investigators would test the performance of their on-line aerosol GC/MS (gas chromatography followed by mass spectrometry) instrument in a field campaign. The instrument development and field study are completely funded by the U.S. Department of Energy (DOE). In Phase I, the investigators will prepare a written report for the ARB providing evidence that the new instrumentation is ready for field measurements in California. A small amount of ARB funding (less than \$10,000) will be used for Phase I to prepare the written report. Upon ARB's approval for continuation of the study, in Phase II, the investigators will deploy the instrument for measurements during one winter and one summer field campaign in order to investigate seasonal differences in organic aerosol sources and potential new source tracers. The field component of this research study includes 22-23 hourly samples per day, collected over a period of four weeks at during each deployment, which should result in approximately 600 samples per deployment. With quantitative data, at minimum, for 20 organic compounds per sample, this would provide 12,000 concentration values that can be used for the determination of organic particulate sources. This data density is much higher than ever achieved in past studies, and accordingly will provide a more robust data set for source apportionment data analysis.

Expected Results

The results of all parts of the project will be documented as a technical report submitted to ARB and as technical papers submitted to peer-reviewed journals. The investigator will provide to the ARB electronic copy of all the data collected during this research contract. The investigator will also present the results of the project to ARB staff at two 1-hour long technical seminars, one in Sacramento and the second in El Monte.

Significance to the Board

This research proposal will address the critical need for on-line, time-resolved, quantitative measurement of atmospheric PM_{2.5} organics at the molecular level. The sampling approach provides time-resolution not possible through filter sampling, while avoiding many of the well-documented artifacts associated with filter collection and sample storage and transport. This research will provide useful new data of immediate value for air quality attainment strategies for the Central Valley and the development of the State Implementation Plan.

Contractor:

University of California, Berkeley

Contract Period:

24 Months

Principal Investigator (PI):

Professor Allen Goldstein

Contract Amount:

\$269,330

Cofunding:

No co-funding but this project will be highly leveraged by approximately \$500,000 support from Department of Energy in Phase I.

Basis for Indirect Cost Rate:

The State and UC System have agreed to a ten percent indirect cost rate.

Past Experience with this Principal Investigator:

This Principal Investigator has performed very successfully on past contracts. Professor Allen Goldstein has experience in quantifying organic compounds and Dr. Susanne Hering has extensive experience in particle measurement and developing and refining PM sampling techniques. Both investigators have extensive experience in building automated methods for continuous, unattended operation in the field and their research studies are well-published.

BUDGET SUMMARY

University of California, Berkeley

"Hourly, In-situ Quantitation of Organic Aerosol Marker Compounds"

DIRECT COSTS AND BENEFITS

| | | |
|-----|------------------------------------|-----------------|
| 1. | Labor and Employee Fringe Benefits | \$133,532 |
| 2. | Subcontractors | \$ 90,000 |
| 3. | Equipment | \$ 0 |
| 4. | Travel and Subsistence | \$ 10,000 |
| 5. | Electronic Data Processing | \$ 0 |
| 6. | Reproduction/Publication | \$ 1,500 |
| 7. | Mail and Phone | \$ 500 |
| 8. | Supplies | \$ 13,000 |
| 9. | Analyses | \$ 0 |
| 10. | Miscellaneous | <u>\$ 3,500</u> |

Total Direct Costs \$252,032

INDIRECT COSTS

| | | |
|----|-------------------------------------|-------------|
| 1. | Overhead | \$ 17,298 |
| 2. | General and Administrative Expenses | \$ 0 |
| 3. | Other Indirect Costs | \$ 0 |
| 4. | Fee or Profit | <u>\$ 0</u> |

Total Indirect Costs \$17,298

TOTAL PROJECT COSTS \$269,330

SUBCONTRACTORS' BUDGET SUMMARY

Subcontractor: Dr. Susanne Hering, Aerosol Dynamics Inc.

Description of subcontractor's responsibility: Subcontractor will work closely with UCB on the 2004 summer field study (Phase I), the two field deployments of the aerosol GC/MS systems during Phase II, and the subsequent source attribution efforts.

DIRECT COSTS AND BENEFITS

| | | |
|-----|------------------------------------|-----------------------|
| 1. | Labor and Employee Fringe Benefits | \$80,315 ¹ |
| 2. | Subcontractors | \$ 0 |
| 3. | Equipment | \$ 0 |
| 4. | Travel and Subsistence | \$ 6,707 ² |
| 5. | Electronic Data Processing | \$ 0 |
| 6. | Reproduction/Publication | \$ 0 |
| 7. | Mail and Phone | \$ 0 |
| 8. | Supplies | \$ 2,978 |
| 9. | Analyses | \$ 0 |
| 10. | Miscellaneous | <u>\$ 0</u> |
| | Total Direct Costs | <u>\$90,000</u> |

INDIRECT COSTS

| | | |
|----|-------------------------------------|-------------|
| 1. | Overhead | \$ 0 |
| 2. | General and Administrative Expenses | \$ 0 |
| 3. | Other Indirect Costs | \$ 0 |
| 4. | Fee or Profit | <u>\$ 0</u> |

Total Indirect Costs

TOTAL PROJECT COSTS

\$90,000

¹ Salary funds are requested for Dr. Susanne Hering to work 80 hours per year, Dr. Nathan Kreiberg to work 160 hours per year, and a research scientist to work 180 hours per year on this project for two years.

² Travel and subsistence are requested for two field campaigns of one-month duration each.