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MEMORANDUM

TO: MIKE KOERBER, LADCO
FROM: JAY TURNER, ENVIRONMENTAL ENGINEERING PROGRAM
SUBJECT: ST. LOUIS - MIDWEST SUPERSITE
DATE: DECEMBER 4, 2001
CC: N/A

This memo summarizes cost estimates generated for a second full year of monitoring (nominally May 2002 through April 2003) at the St. Louis - Midwest Supersite. These measurements are suitable to support source-receptor studies, PM modeling validation, regional haze characterization, health effects studies, and instrument development and characterization. The proposed scope of work includes semicontinuous monitoring, daily-integrated sampling and chemical analysis, QA audits, data validation, and baseline analysis and interpretation (e.g., PM mass balances, time series analysis, aerosol climatology characterization). The following considerations should be noted when reviewing the proposed scope of work and cost estimates.

- The cost estimates are non-binding. While they were developed in consultation with the collaborating investigators, I do not have formal price quotes in writing from each of the participants. This will be expeditiously completed upon receiving feedback from potential funding sources of the preferred options.
- The St. Louis - Midwest Supersite core monitoring location is located in East St. Louis, Illinois. It is collocated with an IEPA compliance monitoring site which provides sustained measurements for all criteria gases at 5-minute time resolution. This data will be incorporated into the overall data set.
- Task 1 sets forth the baseline semicontinuous and integrated sampling scheme with three options for the frequency of integrated sampling. We recommend a frequency of at least every third day because, in addition to the intrinsic value of such integrated data, it provides a very important tool for tracking the performance of the semicontinuous monitors.
- Task 4 provides for an additional summer of sampling at our site in Bonne Terre, Missouri. This would be particularly valuable for investigations of regional scale transport as this is a rural setting which is upwind of St. Louis for prevailing summertime meteorological conditions.

There are several other options that could be explored upon request, including (but not limited to): conducting Tasks 1-3 for a period less than a full additional year (e.g., through Summer 2002); conducting Task 4 at alternative site(s) in the Midwest region; conducting some Task 5 options at a satellite site rather than the core site; expanding the monitoring strategy to include additional measurements beyond those presented in this memo.

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TASK 1. Semicontinuous Monitoring and 24-Hour Integrated Sampling, East St. Louis Core Site

One year of sustained semicontinuous monitoring with attendant 24-hour integrated sampling at the St. Louis - Midwest Supersite core location in East St. Louis, MO. This task includes the basic infrastructure costs (shelter rental, electricity, telephone, and other miscellaneous site operations expenses); personnel; data validation; analysis and interpretation; and QA audits. Project Team: Washington University, Harvard School of Public Health, University of Wisconsin, Desert Research Institute.

Semicontinuous Methods

- PM_{2.5} mass (Andersen CAMM) (1-hour resolution or better)
- PM_{2.5} black carbon (aethalometer) (5-minute time resolution)
- PM_{2.5} sulfate (Harvard method) (20-minute time resolution)
- PM_{2.5} organic carbon (Sunset ECOC) (2-hour time resolution)
- PM_{2.5} elemental carbon (Sunset ECOC) (2-hour time resolution)
- PM_{2.5} nitrate¹ (e.g., Harvard Method) (1-hour time resolution)
- Meteorology (10 meter T, P, RH, WS, WD; 2 meter T; Solar Radiation, Precipitation) (5-minute time resolution)

Integrated Methods

- PM_{2.5} mass
- PM₁₀ mass
- PM_{2.5} elemental and organic carbon
- PM_{2.5} sulfate, nitrate, ammonium (HEADS)
- PM_{2.5} elements (e.g., XRF)
- denuder precursor gases (H₂SO₄, HNO₂, HNO₃, NH₃)

Option 1A - Semicontinuous and daily integrated	\$ 450,000
Option 1B - Semicontinuous and every third day integrated	\$ 320,000
Option 1C - Semicontinuous and every sixth day integrated	\$ 265,000

TASK 2. Semicontinuous Monitoring by PILS, East St. Louis Core site

One year of sustained sampling and analysis by the Particle-into-Sampler at the St. Louis - Midwest Supersite core location in East St. Louis, MO. This task assumes Task A is funded, and represents the incremental costs of: sampling and analysis; personnel; data validation, analysis and interpretation; and QA audits. Project Team: Washington University, Georgia Institute of Technology.

Option 2A

- PM_{2.5} ions (sulfate, nitrate, selected organic acids; ammonium, selected other cations) (15-minute time resolution)

Option 2B

- PM_{2.5} ions (sulfate, nitrate, selected organic acids; ammonium, selected other cations) (30-minute time resolution)
- denuder precursor gases (e.g., H₂SO₄, HNO₂, HNO₃, NH₃) (30-minute time resolution)

¹ PM_{2.5} nitrate measurement status to be confirmed.

- PM_{2.5} water soluble total organic carbon (one month only) (30-minute time resolution)

Option 2A - PM_{2.5} ions (one year) \$ 60,000

Option 2B - PM_{2.5} ions & precursor gases (one year) \$ 125,000
and PM_{2.5} water soluble total organic carbon (1 month)

TASK 3. Particle Size Distributions, East St. Louis Core site

One year of sustained sampling and analysis by the University of Minnesota Particle Size Distribution Measurement System at the St. Louis - Midwest Supersite core location in East St. Louis, MO. This task assumes Task A is funded, and represents the incremental costs of: sampling and analysis; personnel; data validation, analysis and interpretation; and QA audits. Project Team: Washington University, University of Minnesota.

- Detailed particle size distributions over the range 3 nm to 10 µm using a nano-scanning mobility particle spectrometer (SMPS), regular SMPS, LasAir optical particle counter, and Climet optical particle counter. (5-minute time resolution)

Option 3 - Particle size distributions \$ 165,000

TASK 4. Semicontinuous and Integrated Sampling, Bonne Terre Satellite Site

One quarter (Summer 2002) of sustained semicontinuous monitoring and daily 24-hour integrated sampling and analysis at the Bonne Terre (MO) satellite site located in a rural setting upwind of St. Louis for prevailing summertime meteorological conditions. This task assumes Task A is funded, and represents the incremental costs of: sampling and analysis; personnel; data validation, analysis and interpretation; and QA audits. Project Team: Washington University, Harvard School of Public Health, University of Wisconsin, Desert Research Institute.

Semicontinuous Methods

- PM_{2.5} mass (Andersen CAMM) (1-hour resolution or better)
- PM_{2.5} black carbon (aethalometer) (5-minute time resolution)
- PM_{2.5} sulfate (Harvard method) (20-minute time resolution)
- PM_{2.5} organic carbon (Sunset ECOC) (2-hour time resolution)
- PM_{2.5} elemental carbon (Sunset ECOC) (2-hour time resolution)

Daily 24-Hour Integrated Methods

- PM_{2.5} mass
- PM₁₀ mass
- PM_{2.5} elemental and organic carbon
- PM_{2.5} sulfate, nitrate, ammonium (HEADS)
- PM_{2.5} elements (e.g., XRF)
- denuder precursor gases (H₂SO₄, HNO₂, HNO₃, NH₃)

Option 4 - Continued Satellite Site Operations (one quarter) \$ 110,000

TASK 5 - Other

Cost estimates for the following options will be provided upon request:

- 24-hour integrated coarse particle sampling and analysis at the East St. Louis core site. Either daily sampling for mass and elements, or every-other day sampling for mass, elements and organic/elemental carbon. Washington University, Harvard School of Public Health, University of Wisconsin.
- Toxicological Sampling at the East St. Louis core site. Weekly-integrated PM_{2.5} samples collected on PUF substrates (loadings approximately 1 gram of aerosol), suitable for toxicological studies. Washington University and Harvard School of Public Health.
- 24-hour integrated PM_{2.5} carbon sampling at the East St. Louis core site and/or Bonne Terre satellite site with speciated organics analysis by GC-MS. Washington University and the University of Wisconsin.
- 1-hour integrated PM₁ slurry sample collection at the East St. Louis Core site with analysis for fifteen metals by Graphite Furnace AAS.