QUALITY ASSURANCE PROJECT PLAN

SOUTHERN CALIFORNIA PARTICULATE CENTER and SUPERSITE

April 2001

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Approval:

9/4/01

Dr. Constantinos Sioutas, ~~UCLA~~ USC
Principal Investigator, Supersite Project Manager — Date

9/4/01

Ed Avol, USC
SCPCS Supersite QA/QC Coordinator — Date

5/2/01

David Bush, Parsons Engineering Science
SCPCS External Quality Assurance Officer — Date

9/17/01

Dennis Mikel, EPA/OAQPS
OAQPS Supersite QA Manager — Date

9/17/01

Michael Jones, EPA/OAQPS
OAQPS Supersite Project Officer — Date

9-25-01

Dr. Richard Scheffe, EPA/OAQPS
OAQPS Supersite Program Manager — Date

DOCUMENT DISTRIBUTION LIST

The following individuals will receive copies of the approved Quality Assurance Project Plan.

Individual	Organization	Revison	Receipt Confirmation Date
S. Colome	UCLA	0	
E. Avol	USC	0	
D. Bush	Parsons ES	0	
R.C. Yu	UCLA	0	
C. Sioutas	USC	0	
P. Jaques	UCLA	0	
A. H. Miguel	UCLA	0	
D. Mikel	EPA	0	
M. Jones	EPA	0	

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LIST OF ABBREVIATIONS

APS	Aerodynamic Particle Sizer
AQMD	Southern California Air Quality Management District
ARB	California Air Resources Board
CAMM	Continuous Ambient Mass Monitor
CFR	U.S. Code of Federal Regulations
DQO	Data Quality Objective
DQSR	Data Quality Summary Reports
EPA	U.S. Environmental Protection Agency
FRM	Federal Reference Method
HEI	Health Effects Institute
IDL	Instrument Detection Limit
LAB	Los Angeles Basin
MDL	Minimum Detection Limit
MQO	Monitoring Quality Objective
NARSTO	North American Research Strategy for Tropospheric Ozone
NIEHS	National Institute of Environmental Health Sciences
PAH	Polycyclic Aromatic Hydrocarbons
PIU	Particle Instrumentation Unit
PM	Particulate Matter
PM10	Particulate Matter with an aerodynamic diameter of 10 ì m or less
PM2.5	Particulate Matter with an aerodynamic diameter of 2.5 ì m or less
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QAPP	Quality Assurance Project Plan
QC	Quality Control
RAM	Real-Time Ambient Monitor
SCPCS	Southern California Particulate Center and Supersite
SIP	State Implementation Plan
SMPS	Scanning Mobility Particle Sizer
TEOM	Tapered Element Oscillating Mircobalance
UCLA	University of California, Los Angeles
USC	University of Southern California

SECTION 1

PROJECT PLANNING AND ORGANIZATION

1.1 INTRODUCTION

The Los Angeles Basin is home to more than 15 million individuals and it has been described as the most polluted airshed in the nation, with a complex, persistent and unique airborne particulate matter (PM). Despite considerable improvements in air quality over the past two decades, Los Angeles continues to exhibit the most severe ozone and PM air quality problems in the U.S. Los Angeles should be studied as a region by itself because it epitomizes a noticeable and yet distinct fine particle air quality problem in terms of particle composition, source mix, and meteorology. These factors indicate that Southern California is a particularly important environment and opportunity for additional studies. The Southern California Particle Center & Supersite (SCPCS) activities are integrated with the multidisciplinary research in exposure assessment, toxicology, and epidemiology. The SCPCS interacts with the California Air Resources Board (ARB) and the South Coast Air Quality Management District (AQMD) to maximize the use and value of the data collected by the SCPCS, the State and Local Agencies on PM.

Intensive aerosol measurements that collect PM data beyond the traditional PM2.5 mass, sulfate and nitrate concentrations will be conducted at six discrete areas of the Los Angeles Basin. These areas will be chosen to provide a wide geographical coverage, and thus to be as representative as possible of human exposures to these pollutants. A mobile Particle Instrumentation Unit (PIU) will be deployed to these locations to conduct PM measurements. Sampling in each site will last for 6 months and measurements will be repeated on a 2.5-year cycle. A number of existing PM sites operated by AQMD will be used as satellite sites, in addition to the six Supersite sampling locations, to obtain spatial PM variability in the Los Angeles Basin as a function of size and composition.

This document is written in the format developed by the North American Research Strategy for Tropospheric Ozone (NARSTO) for Quality Assurance Project Plans (QAPP). The QAPP is a reformatted version of the Quality Assurance Project Plans (QAPP) required by the EPA for monitoring programs. The QAPP incorporates all of the elements required for QAPPs.

1.2 BACKGROUND

The “Supersite” program was first conceived as a set of special studies extending beyond national regulatory networks for PM to elucidate source-receptor relationships and atmospheric processes in support of State Implementation Plans (SIPs)[1]. The program

would be established in 4-7 airsheds representing a spectrum of PM problems across the country. In addition to supporting SIPs, the program would

- accelerate the testing of advanced sampling methods to replace current technologies,
- provide advanced measurements that simultaneously support PM and ozone SIPs,
- foster collaborative partnerships across the research and regulatory monitoring communities, and
- provide additional information useful in upcoming health risk assessments of PM and its components.

EPA staff further developed the mission of the Supersite program to address priority health and exposure related research needs identified by the committee through a coordinated monitoring/ coordinated science planning effort. An important part of the effort has been instituting a dialogue among health and atmospheric science disciplines and research and regulatory groups, such as took place at the July 1998 workshop on PM Measurements held in Chapel Hill, North Carolina[1].

The view of the Supersites program that took shape at the July workshop is that of an integrated measurement approach that combines a mix of intensive or advanced measurements at a central location combined with other monitoring sites. The Supersite should not be looked on as a single site making research grade measurements.

1.3 PROJECT SCOPE AND WORK OBJECTIVES

The overall objective of the SCPCS is to conduct research and monitoring that contributes to a better understanding of the measurement, sources, size distribution chemical composition and physical state, spatial and temporal variability and health effects of suspended PM in the Los Angeles Basin. The research objectives of the SCPCS are:

1. To characterize PM, its constituents and precursors, to better understand sources and transport affecting human exposure and to support development of SIPs.
2. To obtain atmospheric measurements to support health studies designed to address causal factors; etiologic pathways and mechanisms of PM related morbidity and mortality with particular emphasis on PM source-receptor-exposure-effects pathways.
3. To conduct methods testing that will enable comparisons and evaluation of different technologies for characterizing PM including evaluation of new instrumentation, sampling methods and federal reference methods.

1.4 PROJECT DESCRIPTION

The monitoring activities of the Supersite will be linked with toxicology studies in the Los

Angeles Basin using a mobile PM concentrator facility to investigate health effects associated with exposures to ultrafine, fine and coarse particles. These studies are funded by the SCPCS, the Health Effects Institute (HEI), the ARB and the National Institute of Environmental Health Sciences (NIEHS). The Supersite will therefore become an invaluable resource to the major ongoing and planned PM health and modeling studies in the Los Angeles Basin. Specific projects in the category of PM Characterization provide the information that is needed to understand the relationship between PM sources and receptors, as well as providing insight into the factors that affect the spatial and temporal variability of PM characteristics. These projects are:

- Comprehensive characterization of Particulate Matter in the Los Angeles Basin and correlations between particle size distribution, chemical composition and gaseous co-pollutants
- Determination of the occurrence, frequency and prevalence of PM2.5 sub-modes in different locations of the Los Angeles Basin
- Systematic evaluation of sampling artifacts of the Federal Register Method (FRM) in measuring PM2.5, PM10 and Coarse PM concentrations
- Study of PM formation and growth mechanisms in different locations of the Los Angeles Basin
- Testing of the hypothesis that 2.5 μm represents a clear cut point between coarse and fine PM and does not depend on location or season
- Determination of the seasonal and spatial variation of ultrafine PM in the Los Angeles Basin and their relation to sources (These studies will be conducted in collaboration with AQMD and ARB.)
- Comparison between measured PM2.5, PM10 and coarse PM concentrations with those determined gravimetrically with a FRM and evaluate sampling artifacts related to the loss of volatile or semi-volatile PM compounds.

Projects in the category of Support of Health Effects and Exposure Research are:

- Detailed physical and chemical characterization of concentrated PM used in ongoing toxicity studies currently under way in the Los Angeles Basin
- Measurement of the size distribution as well as the spatial and seasonal variation of particle bound PAH, nitro-PAH, quinones and other polar PAHs, elemental and organic carbon in the Los Angeles Basin
- Determination of the contribution of volatile and semi-volatile species to Total Suspended PM2.5 mass and assess any resulting bias in interpreting epidemiological results
- Analysis of particle-bound PAH and related compounds as a function of distance from freeways

- Measurement of protein, allergens and other biological constituents of urban airborne particulate matter.

Projects in the category of Methods Testing are:

- Comparison between the actual 24-hour averaged PM10 and PM2.5 concentrations with those determined using continuous PM mass monitors, including the Scanning Mobility Particle Sizer (SMPS), Aerodynamic Particle Sizer (APS), Tapered Element Oscillating Microbalance (TEOM), Continuous Ambient Mass Monitor (CAMM) and the Real-Time Ambient Monitor (RAM)
- Comparison between the real-time size distribution and mass concentration determined with the SMPS and APS with the 24-hour averaged mass-based size distribution measured with the Micro-orifice Uniform Deposit Impactor
- Development of a semi-continuous monitor for size-dependent nitrate, carbon and sulfate measurement
- Evaluation and comparison of new and emerging measurement methods for single-particle analysis.
- Development of a continuous coarse particle monitor.

1.5 PERSONNEL QUALIFICATIONS

The SCPCS draws upon the expertise of preeminent scientists, researchers and educators from throughout Southern California to support its training and research efforts. Center members are based at the University of California campuses in Los Angeles, Riverside and Irvine, the University of Southern California, the California Institute of Technology and Rancho Los Amigos Medical Center.

Dr. John Froines is the Director and Principle Investigator for the SCPCS. Dr. Froines is currently a Professor with the UCLA Environmental Health Sciences Department. He joined the faculty of the School of Public Health in 1981. He received a B.S. in chemistry from UC Berkeley (l963), a M.S. in chemistry (1964) and Ph.D. in physical-organic chemistry (1967) from Yale University. Before coming to the UCLA School of Public Health, Dr. Froines served as Director of Toxic Substances at the Occupational Safety and Health Administration and Deputy Director of the National Institute for Occupational Safety and Health. Dr. Froines is currently the Director of the Center for Occupational and Environmental Health and he co-directs the UCLA Pollution Prevention Education and Research Center. Dr. Froines' area of expertise is Toxicology and Industrial Hygiene. His research interests are in the qualitative and quantitative characterization of risk factors in occupational disease, with special emphasis on exposure assessment and hazard surveillance research; the use of genetic toxicology, biomarkers and toxicokinetics in the study of chemical carcinogenesis; and studies on the carcinogenicity of arsenic and chromium and the toxicity of lead.

Dr. Costas Sioutas is the Deputy Director and Co-Principle Investigator for the SCPCS. After receiving his undergraduate degree in mechanical engineering from the University of Thessaloniki, Greece, he came to the U.S. as a Fulbright Foundation fellow in order to continue his graduate studies. He received a Master of Science degree in Mechanical Engineering and a Master of Science degree in Aerospace Engineering, both from the University of Minnesota. Subsequently, Dr. Sioutas worked as an Advanced Product Development Engineer for 3M for two years, prior to continuing his doctoral studies at Harvard School of Public Health in the department of Environmental Engineering, where he received his Doctor of Science degree in 1994. Dr. Sioutas started his academic career in September 1995 as an Assistant Professor of aerosol science at the Harvard School of Public Health in the department of Environmental Engineering, prior to joining the faculty of the University of Southern California (USC) in January 1998. He is currently Associate Professor of Civil and Environmental Engineering at USC. Dr. Sioutas' research is focusing on developing technologies for measuring the physico-chemical characteristics of air pollutants and determining their toxic properties. In addition, Dr. Sioutas and his group are developing novel technologies for reducing the emissions of air pollutants. Dr. Sioutas has been the principal investigator in the design of a variety of air pollutant monitors, including the Harvard/EPA Particle Concentrator, continuous PM2.5 particulate monitor (CAMM), Ultrafine and Coarse Particle Concentrators and a High-Volume PM Size-Classifier for collecting coarse, fine and ultrafine PM for toxicological studies. These technologies are being currently used by agencies such as the U.S. EPA, the National Institute of Public Health and the Environment of the Netherlands, and the Canadian Government.

Dr. Peter Jaques is the SCPCS PIU Field Operations Manager. He graduated from the University of California, Irvine with a BA in Applied Ecology and BS in Chemistry, and continued with his graduate training at New York University's Norton Nelson Institute of Environmental Health, where he received a MS and PhD in Environmental/Industrial Hygiene. Prior to joining the SCPCS, Peter worked as a Postdoctoral Research Fellow for the US Environmental Protection Agency and the Center for Environmental Medicine and Lung Biology, at the University of North Carolina at Chapel Hill. Dr. Jaques' primary interests are in the assessment of environmental and industrial exposures to particulate aerosols and gases in the respiratory tract of healthy and sensitive individuals, especially asthmatic children. He is interested in measuring the total and regional deposition, and the clearance of particulate matter in human subjects during their exposures to controlled "real" ambient atmospheres. Dr. Jaques' primary contributions to the SCPCS are to assist with the particle concentrator unit, and to participate and supervise post-doctoral researchers and graduate students in the operation of air monitoring equipment within the particle instrumentation unit.

Dr. Antonio H. Miguel, is Director of the Chemical Analysis Laboratory for the SCPCS. One of it's function is to quantify air toxics contained in airborne aerosols, including PAH, quinones, carbonyls, black and organic carbon, and other particle-phase and semivolatile organics. Dr. Miguel is an established analytical chemist with extensive experience on the

characterization of ambient aerosols. He received a M.S. degree in Chemistry from Northeastern University, Boston, and a Ph.D. degree in Analytical Chemistry from the University of Illinois, Champaign-Urbana. He was a National Institutes of Environmental Health Sciences (NIEHS) postdoctoral fellow at the California Institute of Technology, Pasadena. Dr. Miguel taught graduate and undergraduate chemistry courses in Brazilian universities, where his students and post-docs conducted research in the development and deployment of analytical methods to measure air pollutants in ambient air, in the exhaust of oxygenated-fuel vehicles, and in emissions from biomass burning in the Brazilian Amazons. Prior to joining the SCPCS, Dr. Miguel was a Senior Development Engineer at the University of California, Riverside, and a Visiting Research Engineer at the University of California, Berkeley where he worked on studies sponsored by the California Air Resources Board. Dr. Miguel's research interests include the development of analytical methods and instrumentation for the characterization of atmospheric aerosols, apportionment of their sources, and their atmospheric transformation.

Mr. David H. Bush is the external Quality Assurance Officer for the SCPCS. Mr. Bush is currently the Quality Assurance Officer or Manager for a number of PM, air quality, and health effects studies, including the Children's Health Study, the California Regional $PM_{10}/PM_{2.5}$ Air Quality Study (CRPAQS), the Central California Ozone Study (CCOS), the Fresno Asthmatic Children's Environment Study (FACES), the $PM_{2.5}$ FRM auditing contract for the South Coast Air Quality Management District, and several auditing efforts for the Health Effects Institute. He currently employed with Parsons Engineering Science, Inc., and is therefore independent of all routine monitoring and data collection associated with the SCPCS. He has conducted over 400 audits of air quality monitoring systems and health effect data collection efforts.

Mr. Ed Avol is the Supersite QA/QC Coordinator. He received his undergraduate degree in mathematics, with a minor in chemistry, at the University of California San Diego,and continued his education at Caltech. There, he earned a Masters' Degree in Environmental Engineering Sciences. In 1976, he began employment with the Environmental Health Service of Rancho Los Amigos Medical Center as a Research Associate, providing technical expertise in the monitoring and generation of exposure atmospheres for studying acute respiratory effects of ambient air pollution on human volunteers. In 1992, Mr. Avol was recruited by the USC School of Medicine to direct the Children's Health Study (CHS), a ten-year investigation of the respiratory health development and growth of California school children. He became an Associate Professor in the Department of Preventive Medicine, and has collaborated or designed a range of air quality and health investigations at USC. With over 50 peer-reviewed publications, Mr. Avol continues to design and perform health studies to understand the respiratory effects of inhaled particles and gases. His current research interests include respiratory effects of ambient air pollution, development of improved exposure assessment methodologies for determination of allergens in homes, ambient endotoxin, the chronic respiratory effects on continuing volcanic eruptions on Hawaiian children, and environmental justice issues relating to air quality in Southern California.

Rong Chun Yu is the SCPCS Data Manager. He earned his Ph.D. in Environmental Sciences and Engineering from the University of North Carolina at Chapel Hill in 1996. He also earned a master degree in Environmental Health from Harvard University in 1991 and in Industrial Hygiene from the University of North Carolina at Chapel Hill in 1986. He has been a Visiting Scientist at Chemical Industry Institute of Toxicology at Research Triangle Park, North Carolina and a Research Industrial Hygienist at University of Massachusetts Medical Center at Worcester, Massachusetts. He has broad experience in the research of occupational and environmental health, especially in modeling particle clearance and dosimetry of the lung. He continued his career as a postgraduate research fellow at UCLA Public Health in 1996 and staff research associate in 1998. For the SCPCS, he participates in the research of the dosimetry core and is in charge of overseeing the activities of data management in the Center.

All monitoring and modeling activities will be conducted by qualified and trained personnel.

1.6 TRAINING REQUIRED

Operation and maintenance of the individual research instruments will be managed by the PI's in charge of their implementation. These PI's will provide SOPs for all responsible users of the equipment detailing operation, quality assurance functions, and data analysis. It will also be the PI's responsibility to insure that responsible users receive the training or certification required to operate and/or maintain these instruments. The Field Operations Manager will be responsible for providing the training. Key areas of training will include:

- Operating principles and instrument configuration,
- Flow calibrations and leak checks,
- Preventive and corrective maintenance,
- Use of checklists to document and communicate site activities,
- Basic troubleshooting procedures for instrument malfunctions, and
- Health and safety issues related to the monitoring operations.

1.7 COMMUNICATIONS PLAN

Dr. Costas Sioutas, the principal investigator (PI), will have the overall responsibility for performance of the project and for interactions with the SCPCS management. He will work with SCPCS personnel to resolve conflicts and problems as they arise.

Mr. Ed Avol, the SCPCS QA/QC Coordinator, is responsible for the implementation of routine QA/QC procedures. He will communicate routinely with the PI and Field Operations Manager

Dr. Peter A. Jaques, the Field Operations Manager of the PIU, will be responsible for

generating data from the instruments listed in Table 3.2 and collecting samples that will be analyzed by SCPCS Chemical Analysis Laboratory, directed by Dr. Antonio H. Miguel. Level 0 and 1 validation checks will be performed prior to submitting the data to the SCPCS Data Management Office.

Dr. R.C Yu, the Data Manager of SCPCS, will be in charge of receiving data from PIU and Analytical Lab, performing Level 2 validation checks, formatting the data compatible to the format of NARSTO's conventions, storing and archiving the data in a SCPCS data server, and submitting to NARSTO Permanent Data Archive that is maintained by the Distributed Active Archive Center located at the NASA/Langley Research Center.

Data for each period will be submitted approximately seven months after the end of the period. When issues are found during audits or when data problems are identified, the PI will be notified rapidly so that corrective action can be taken.

At the end of the measurement period, reports will be submitted by the manager of the PIU to the SCPCS Principal Investigators, who will prepare field and laboratory activities summary reports. These reports will summarize the field and laboratory activities associated with the anchor site operations. They will include descriptions of field sampling sites and equipment, laboratory analysis techniques, unusual events encountered in the field, and periods of suspect data. In addition to the activities reports, data quality summary reports (DQSR) will be submitted for each major measurement type. These reports will summarize the completeness, accuracy, precision, and the minimum detection limit (MDL) for each measurement over the entire study period.

Quarterly status reports in the format stipulated in the Supersite terms and conditions will be submitted within 30 days of the calendar quarter. A Final Report in the EPA specified format will be submitted within 90 days of the expiration of the project period.

The anticipated recipients of authorized information are:

- Dr. John Froines, Director, Principal Investigator
  UCLA
  (310) 206-6141
  jfroines@ucla.edu
- Dr. Costas Sioutas, Deputy Director, co-Principal Investigator
  USC
  (213) 740-6134
  sioutas@usc.edu
- Dr. Steve Colome, Quality Assurance Manager
  UCLA
  (949) 786-0206
  scolome@pop.ucla.edu
- Mr. Ed Avol, QA/QC Coordinator
  USC Department of Preventive Medicine

(323) 442-1090
avol@hsc.usc.edu

- Dr. Peter A. Jaques, PIU Field Operations Manager
  UCLA
  (310) 825-9035
  pjaques@ucla.edu
- Dr. Antonio H. Miguel, Chemical Analysis Laboratory Director
  UCLA
  (310) 825-9576
  ahmiguel@ucla.edu
- Dr. R.C Yu, Data Manager
  UCLA
  (310) 794-1408
  rcyu@ucla.edu
- Mr. David H. Bush
  Parsons Engineering Science, Inc.
  (530) 642-2312
  david.bush@parsons.com

SECTION 2

MANAGEMENT ASSESSMENT AND AUDITS

2.1 ASSESSMENT RESPONSIBILITY

Both internal and external management assessments will be performed for SCPCS. The SCPCS employees and the external SCPCS auditor will all have responsibilities for various assessment activities. Several of the SCPCS employees will have internal assessment responsibilities, including the SCPCS site operators, the SCPCS Principle Investigators, and the SCPCS QA/QC Coordinator. The SCPCS external Quality Assurance Officer will take external assessment responsibilities.

2.2 ASSESSMENT TYPES

Both internal and external management assessments will be performed for SCPCS. The SCPCS site operators, the SCPCS PI, and the SCPCS QA/QC coordinator will perform the internal assessments on a daily to monthly basis. An external auditor will perform the external assessments on a quarterly basis.

Internal assessment responsibility chain of command

SCPCS Site Operators (Peter Jaques, Field Operations Manager**)**

- Performing and reviewing the calibrations and audits according to the procedures established in the QAPP and SOPs.
- Maintaining site and instrument lab books.
- Resolving issues raised in audits, calibrations, daily data reviews, and monthly data report reviews by the QA/QC Coordinator and Principal Investigator.

SCPCS QA/QC Coordinator (Ed Avol)

- Coordinating and documenting the daily project QC activities.
- Ensuring project QC activities (audits and calibrations) established in the QAPP and SOPs are being followed.
- Seeing that issues raised during project QC activities are resolved.
- Reviewing site and instrument lab books.
- Overseeing preparation of monthly data reports.

SCPCS Principal Investigator (Costas Sioutas)

- Reviewing project QC activities (audits, calibrations, and resolution of problems) on a monthly basis.
- Reviewing monthly data reports.
- Working with the external SCPCS auditor to schedule, perform, and resolve any potential problems.

External assessment responsibility chain of command

External SCPCS Quality Assurance Officer (David Bush, Parsons Engineering Science)

- Working with the SCPCS internal assessment team to perform periodic external audits according to the external audit schedule.
- Documenting the findings and resolution (if any) of the quarterly external audits.
- Conducting periodic systems audits of the SCPCS data management group.

2.3 ASSESSMENT USAGE

Internal assessment usage

Internal assessments will be used to insure that the precision and accuracy goals of the instruments are being met on a daily and semi-annual (i.e., per move) basis. During daily reviews, routine maintenance, and semi-annual calibrations by the SCPCS site operators, and as a result of the review of the monthly data reports, any problems that are identified will be resolved by the field technician and QA/QC Coordinator.

External assessment usage

External assessments will also be used to insure that the precision and accuracy goals of the instruments are being met on a periodic basis. As a result of external audits, any problems that are identified will be resolved by the field technician and QA/QC Coordinator.

2.4 ASSESSMENT CRITERIA

Internal assessment criteria

All internal assessments will be performed by the SCPCS field technicians, the SCPCS QA coordinator, or by the SCPCS PI. These individuals are all directly involved with the work. The SCPCS QA/QC Coordinator and SCPCS PI both have technical expertise in the field. The SCPCS field technicians will be trained to be proficient at the operation, maintenance, and troubleshooting of the instruments, and will document daily activity on a site and instrument basis.

External assessment (measurement expert) criteria

- Reviewers/auditors are not directly involved with the work
- Reviewers/auditors have technical expertise in the field
- Reviewers/auditors are provided sufficient information about the work
- Results of the review/audit are documented

Mr. David Bush with Parsons Engineering Science, Inc. will be the external auditor for the SCPCS. He has provided external audits for several large air quality and particulate monitoring programs, including the California Regional $PM_{10}/PM_{2.5}$ Air Quality Study (CRPAQS), the Fresno PM Supersite, and the Southern California AQMD $PM_{2.5}$ Monitoring Network.

2.5 ASSESSMENT DOCUMENTATION

Many aspects of assessment will be documented for SCPCS to track the data QC and measurements made over the course of the project.

The following aspects of assessment will be documented for SCPCS:

- Site and instrument lab book preparation by SCPCS field technicians
- Site and instrument lab book review by SCPCS QA/QC Coordinator
- Data report review by SCPCS PI
- External audit report preparation by SCPCS external auditor
- Data quality summary report

Reviews will contain the following pieces of information:

- Date and signature of qualified reviewer

Assessment Reports will contain the following pieces of information:

- Date of review
- Place
- Participants
- Activities reviewed
- Evaluation process used
- Results of evaluation
- Recommendations

The data quality summary report will contain the following pieces of information:

- Date of report

- Place
- Participants
- Completeness, accuracy, precision, and the minimum detection limit for each measurement over the study period

SECTION 3

PROJECT IMPLEMENTATION

The SCPCS will support a number of projects addressing the three major objectives detailed by the EPA for the Supersite program. These projects are present in Table 3-1. At the heart of the SCPCS is a mobile PIU. The PIU is designed to collect intensive aerosol measurements that go beyond the traditional $PM_{2.5}$ mass, sulfate and nitrate concentrations collected at existing sites.

3.1 PROJECT RESPONSIBILITIES

The management of the SCPCS is presented in Figure 3-1. The Principal Investigator is Dr. John Froines, Professor in the School of Public Health. A Deputy Director of the SCPCS, Dr. Costas Sioutas of the University of Southern California, will head the Supersite unit. An Executive Subcommittee has been established to assist guidance of the Supersite. The committee is a subcommittee of the SCPCS Executive Committee and will have different representation in order to include representatives from ARB and AQMD. The Deputy Director and the Executive Subcommittee will have the responsibility for planning, day-to-day operation of the PIU, quality assurance/control, data management, and program evaluation and consultation with the PI and the relevant committees.

Dr. Peter Jaques will be the Field Operations Manager for the PIU. He will be responsible for coordinating and assisting in the daily operation of the PIU. Dr. R. C. Yu will is the SCPCS Data Manager, and will oversee the processing and management of the collected data. Mr. Ed Avol will be the QA/QC Coordinator for the Supersite effort, and will be responsible for verifying the monitoring, analysis, and data processing QA/QC activities associated with the Supersite. General QA oversight of the SCPCS is provided by Dr. Steve Colome. Mr. David Bush is the independent External QA Officer, and it responsible for conducting routine audits of the Supersite effort and monitoring the status of the Supersite's QA program.

Dr. Antonio Miguel is the Director of the SCPCS Chemical Analysis Laboratory. The SCPCS Chemical Analysis Laboratory will be responsible for the analysis of samples for the determination of speciated organics (e.g. PAH, quinones, aldehydes/ketones) and EC/OC. In addition, he will oversee the several subcontracted laboratory analysis efforts, including ion analysis (Rancho Los Amigos), and trace elements analysis (Chester Labnet).

Managers of the individual projects are presented in Table 3-1.

3.2 PROJECT DESIGN CRITERIA

Monitoring Locations

Monitoring locations are selected taking into account logistical and infrastructure considerations relevant to the implementation and support of the facility including the locations of existing agency-sponsored air monitoring stations, which offer the availability of secure sites. Also considered are the scientific goals and hypotheses of the participating investigators and the needs of the collaborating health effects researchers affiliated with the PM Center based at UCLA. An important consideration in site selection was the location of the communities serving as sites in the USC Children's Health Study, a 10-year study supported by the California Air Resources Board and the Health Effects Institute, where about 4000 school children living in 12 communities with differing levels and types of pollution have been under study since 1993.

Six monitoring locations have been chosen from this study. The site at Downey is situated in the middle of the Los Angeles "Alameda Corridor," a 20-mile corridor joining the coastal area of Long Beach, which contains a number of industrial plants and oil distilleries, with downtown Los Angeles. The corridor is a main transportation artery for heavy-duty Diesel truck. Located in the middle of the corridor, Downey has some of the highest inhalable particle concentrations in the U.S. Claremont and Rubidoux are two receptor areas in the inland valleys of the central and eastern basin of the Los Angeles Basin, both with high inhalable particle concentrations. Azusa is a light industrial region upstream of known ammonia sources, whereas Rubidoux is a semi-rural residential are downstream of ammonia sources. Riverside is a Children's Health Study site with high PM levels that are considered to be "mature" or "aged", and noticeably different in composition from those at Rubidoux.

Selected monitoring locations are presented in Figure 3-2. Photographs of the PIU and the six monitoring locations (including close-up maps) are presented in Figures 3-3 through 3-9.

Sample schedule

Measurements will be made using the PIU at the selected sites following a 2.5-year repeating cycle. While the schedule is intended to be flexible, the following schedule is anticipated:

Location	Period
Downey	June 2000 - January 2001
Riverside	February 2001- May 2001
Rubidoux	June 2001 - August 2001

Claremont	September - November 2001
Long Beach	November 2001 - April 2002
Azusa	May 2002- October 2002
Rubidoux	November 2002- April 2003
Riverside	May 2003 - October 2003
Azusa	November 2003 - April 2004
Long Beach	May 2004 - October 2004

Sample type and methodology

Table 3-2 summarizes the samples to be collected by the PIU.

Sampling frequency

Table 3-2 summarizes the sample frequency for the SCPCS data. Continuous or near-continuous data will be collected daily over the 5- year study period. The time-integrated data will be generated approximately one day every week (typically on Tuesday, Wednesday, or Thursday), except for episodes, during which they will be generated daily. These measurements will also be coordinated when possible with the time-integrated speciation measurements conducted by the AQMD, which are every 6th day.

Sample handling

- All substrates and samples will be handled with clean tweezers and nitrile gloves. Under no circumstance will substrates be touched while handling!
- Collected samples will be refrigerated at all times after sampling.
- All sample filters will be inspected prior to use.

Sample custody

- A chain of custody form (hard copy, see Section 7) will accompany each substrate at all stages of sampling: from setup to transport to the laboratory facilities.

Sample substrate preparation

- The filter sampling substrates will be prepared according to available EPA guidelines.

Sample holding time

- Store the samples under frozen blue-ice and protect it from UV light to prevent

photo-decomposition of analytes.

- If the time span between sample collection and receipt at the laboratory for chemical analysis is to exceed 24 hours, refrigerate sample at 4 ^{o}C.

Sample analysis

- The filter substrates will be analyzed according to available procedures approved by the EPA.
- Chemical analysis of organics and EC/OC will be analyzed using the following SCPCS Chemical Analysis Laboratory SOPs:

  - Title: Substrate Cleaning Procedure
  - Title: Storage Vials/Containers Cleaning Procedure
  - Title: Determination of Gas- and Particle-phase PAH and PAH-Quinones in Ambient Air by HPLC-FL and GC/MS
  - Title: Determination of Gas-Phase Carbonyls by HPLC-DAD
  - Title: Determination of Organic and Elemental Carbon (OC/EC) on Quartz Fiber Filters

Continuous data collected on-site, typically, is to be recorded at 1, 2, or 5 minute cycles, and averaged over the averaging intervals presented in Table 3-2. Data from automatic calibration activities will be recorded during the calibrations. High-resolution data will be uploaded daily to the SCPCS Data Center for review and processing and for rapid identification of instrument problems.

3.3 DATA QUALITY OBJECTIVES

It is the policy of the Supersite participants that all ambient air quality monitoring and research measurement data generated for internal and external use shall meet specific qualitative requirements, referred to as Data Quality Objectives. The DQO process is required to be performed by any project that receives EPA/governmental funding as stated in "EPA Quality Manual for Environmental Programs."[3] The DQO process is detailed in US-EPA's "Guidance for the Data Quality Objectives Process, EPA QA/G-4[4] . Measurement Quality Objectives (MQOs) are the set of objectives for each individual instrument that is utilized during the study. These vary from instrument to instrument. For some instruments, i.e., the $PM_{2.5}$ Federal Reference Method samplers and most gaseous instruments, the MQOs are known due to the extensive testing that has been performed.[11] However, there will be many instruments employed during the study where the MQOs will not be known. It will be part of the principle investigators and the Quality Assurance Manager's responsibility to attempt to determine the individual MQOs.

The MQO indicators for the SCPCS will be determined in the usual way for a research

project. The typical MQO indicators associated with data measurements are: Precision, Accuracy, Representativeness, Completeness, Estimation of Bias, Minimum Detection Limits (MDLs) and Comparability. These MQOs can be measured on most of the instrument and the project as a whole. The MQOs will be determined for each individual instrument/system. However, some of the experimental instruments perform analyses that are not easily reproducible or cannot be compared against conventional analyzers. Therefore, the SCPCS provides an interesting scenario in terms expanding the relationship of quality assurance and data quality. It is also conceivable that some MQOs will be developed during the course of the study. The typical MQOs can be used as indicators of error or bias in a data set, however, there are a number of additional indicators that can be documented and can assess the data qualitatively. These are: Inference of Analysis, Inter-comparison and Trend Analysis. By using all indicators, the following statements can be made about the quality of the data set:

- Attempts will be made to quantify the error of the data generated. This shall be accomplished by performing performance audits against gas phase instruments, accuracy flow checks and external performance audits. The QA data collected will be used to document accuracy, precision and bias.
- Data generated shall be of sufficient quality to facilitate inter-comparison with differing methodologies measuring the same parameters. The QAM and principal investigators will perform statistical evaluation of data. Inter-comparisons should only be performed on Field Analyses data.
- All researchers shall strive to provide the maximum quantity of data possible for the duration of the study to allow for a robust inter-comparison of data.
- Communication will be encouraged throughout the study. Sharing of Level 0 data is encouraged but not required. Level 0 inter-comparisons may clue different investigators into whether their instruments are operating correctly.

Each of the MQOs are discussed in detail below.

3.3.1 Accuracy

The accuracy of the continuous gas monitors will be determined from performance audits of the individual gas phase instruments. The performance audit will challenge the instrument with standards, from an independent, NIST traceable source not used for calibration, encompassing the operational range of the instrument. A minimum of three data points, including zero will be used to conduct the performance audit. The following equation will be employed:

$$y = mx + b \qquad (1)$$

where the audit standard concentration is the independent (x) variable, the instrument reading is the dependent (y) variable, m is the slope, and b

is the y intercept. The slope will be the indicator of the relative accuracy of the analyzer response.

For gravimetric and speciated fine particle samplers, the accuracy will be defined as an accuracy flow check. The estimation of accuracy for this method is:

$$\%\text{Accuracy} = [(Q_m - Q_a)/Q_a] \times 100 \quad (2)$$

where Q_a is the flow rate measured using a NIST traceable flow device, Q_m is the flow rate measured by investigator.

In addition, for the particulate samplers and sizers, the SCPCS will pursue the feasibility of alternative audit standards, such as particle generators, as they are developed by the monitoring community.

3.3.2 Bias

Due to the unique research nature of many of the measurements to be conducted by the SCPCS, the situation may arise where primary standards are unavailable to determine bias. Bias will be calculated under three distinct situations:

- comparison against a standard when a primary standard does not exist to determine instrumental accuracy
- comparison of two discrete methodologies using ambient data
- comparison of two discrete methodologies using ambient data, one of which is a Federal reference method.

When a primary standard method is not available, bias will be calculated using the equation:

$$\text{Bias} = 1/n \sum_{i=1}^{n} [(X_i - S)/S] * 100 \quad (3)$$

where S is the standard value and X_i is the instrument results of the i^{th} measurement of the standard.

For comparison of two methodologies, neither of which is considered a reference standard, bias will be calculated by the equation:

$$\text{Bias} = 1/n \sum_{i=1}^{n} [((M1_i - M2_i)/((M1_i + M2_i)/2))] \times 100 \quad (4)$$

where $M1_i$ and $M2_i$ are the ith measurement of the two methodologies (M1

and M2) being subjected to comparison. The use of the average of the two methodologies in computing bias recognizes that a primary standard is not available.

If the results of a particular methodology are being compared to a primary standard then the following equation:

$$\text{Bias} = 1/n \sum_{i=1}^{n} \left[(M2_i - M1_i)/M1_i\right]^{x} 100 \qquad (5)$$

where the numerator has been replaced with the i^{th} measurement of the primary standard will be used to determine bias.

3.3.3 Precision

Precision of the continuous gas monitors will be determined from replicate analyses of calibration standards, instrument span check standard and/or precision check standard records. A minimum of 5 data points should be used for the precision to be calculated. Precision should be determined for data time periods between calibrations or other major maintenance periods that may effect the operation performance of the instrument. Precision for filter based instruments will be performed by comparing the percent difference between similar methods or collocated samplers. Precision will be determined from the standard deviation using the following equations.

$$Standard\ Deviation(s) = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}} \qquad (6)$$

where x_i is the percent difference for the i^{th} measurement, n is the number of measurements performed, and x is the mean of the percent difference of the replicate or collocated analysis.

The precision will be determined as percentage of the average concentration of the span check standard or precision check standard using the following equation.

$$Precision = \{x\}_{avg} \pm 1.96 * s \qquad (7)$$

where $\{x\}_{avg}$ is the average of the span or precision percent difference measurements, s is the standard deviation of the percent difference measurements. The upper and lower 95% probability limits are set

using this statistical test.

3.3.4 Minimum Detection Limits

The MDL is defined as a statistically determined value above which the reported concentration can be differentiated, at a specific probability, from a zero concentration. Analytical procedures and sampling equipment impose specific constraints on the determination of detection limits. For the gaseous parameters, MDLs are determined by challenging the instruments with purified zero air, however, for filter-based instruments, the MDLs of particle mass concentrations are determined by blanks. It is recommended that all filter-based instruments perform the following filter blank tests: field blanks and laboratory blanks. Field blanks are defined as a filter that travels with the filters that will be utilized in sample collection. The filter should be treated in the same manner as any other filters with the exception of begin loaded into the filter mechanism. It is a good field practice to take the field blank up to the sampler and leave it inside the instrument housing with the filter cover on. When the sample filters are removed after the sample run, the field blank is also removed and processed in the same manner as all filters. It should also travel in the same carry case as all filters. Storage and handling should be as identical to all processed filters. Laboratory (lab) blanks are filters that are pre-weighed and processed in the same manner as all filters. It is a good laboratory practice to randomly pick a filter and leave it covered in the weighing room. This filter is then post-weighed and handled in the same manner as all filters arriving from the field. It is recommended that about 10% of all filters handled should be lab and field blanks. The following sections will illustrate how MDLs are quantified for filter and non-filter methods.

3.3.4.1 Continuous Measurements

The continuous gas analyzers used in the PIU are commercial models that have MDLs that have been previously determined by the EPA and presented in the EPA Quality Assurance Handbook.[11] However, in general, the MDL for continuous gas monitor will be determined through statistical evaluation of the zero check standard. The following equation will be used to determine the method detection limit[7]:

$$MDL = t_{(n-1,1-a = 0.99)} * s \qquad (8)$$

where s is the standard deviation of the replicate zero analyses, and t is the students t value appropriate to a 99% confidence level and a standard deviation estimate with n-1 degrees of freedom.

3.3.4.2 Discrete Measurements

The instrument detection limit (IDL) for the laboratory analytical instrumentation is

indicative of the ability of the instrument to differentiate, at a specific probability, between zero and a specific non-zero concentration. For speciated organic and inorganic measurements, the instrument detection limit is defined as the minimum concentration of a target analyte that can be measured, using a particular instrument, and reported with confidence. The IDL for each analytical method will be determined through statistical evaluation as described in equation 8. For mass related samples, the MDL will be determined following EPA methods presented in 40 CFR Part 50, Appendices L and M, which discuss the estimate of MDLs for Federal Reference Method $PM_{2.5}$ samplers and Dichotomous samplers, respectively.

3.3.5 Completeness

When applicable, completeness will be determined for routine measurements from the data generated using the following equation:

$$\text{Completeness} = (D_x - D_c)/D_c \times 100 \qquad (9)$$

where D_x is the number of samples for which valid results are reported and D_c is the number of samples that are scheduled to be collected and analyzed during the year.

A goal of 75% data completeness has been established for each parameter and each monitoring period.

3.3.6 Representativeness

Generally, representativeness expresses how closely a sample reflects the characteristics of the surrounding environment. This is usually quantified in terms of monitoring scale. 40 CFR 58, Appendix D[8] discusses monitoring scale in great detail. It is not the scope of this manual to discuss monitoring scale in detail, however, monitoring scale must be understood for many of the project goals.

The selected monitoring locations give a wide geographical coverage of the Los Angeles Basin (LAB) and are located along the two primary air mass routes from the Los Angeles County and Orange County coastal areas toward the inland valleys. The sites at Long Beach, UCLA and Anaheim lie in residential-commercial areas with vehicular traffic influences. The facility at Rancho Los Amigos Medical Research Center in Downey would be situated in the middle of the Los Angeles “Alameda corridor.” Downey has some of the highest inhalable particle concentrations in the US, often exceeding the National Ambient Air Quality Standard. The 20-mile long Alameda corridor is named after Alameda Street, joining the coastal area of Long Beach, where a large number of industrial plants and oil distilleries are currently operating, to downtown Los Angeles. It is a main transportation

artery for heavy-duty Diesel trucks. This site is expected to be enriched in diesel and organic PM emitted by mobile sources. San Dimas and Mira Loma are two “receptor” areas in the inland valleys of the central and eastern region of the LAB. They both have some of the highest inhalable particle concentrations in the US; they often exceed the National Ambient Air Quality Standard. Azusa is a light industrial region upstream of known ammonia sources, whereas Rubidoux is a semi-rural residential area downstream of ammonia sources. Riverside is a Children’s Health Study site with high PM levels and this PM would be considered to be “mature” or “aged”, being on the far eastern end of the LAB. The nature of the PM in Riverside is different than that found in Mira Loma, with high ammonia source in the latter area. San Dimas, Mira Loma, Riverside and Long Beach are sites of the Children’s Health Study.

Table 3-1. SCPCS Projects

PROJECT TITLE	LEAD INVESTIGATORS
· **Characterization of PM**	
Comprehensive characterization of PM in LAB: Correlations between size distribution, chemical composition, and gaseous pollutants	Sioutas/Hinds
Studies of the occurrence, frequency, and prevalence of $PM_{2.5}$ sub-modes in PM formation and growth mechanisms in different locations of the LAB	Hinds/Sioutas
Evaluation of FRM sampling artifacts in measuring true $PM_{2.5}$, PM_{10}, and coarse ($PM_{2.5}$ to PM_{10}) concentrations	Sioutas/Hinds
Is 2.5ì m an appropriate cutpoint between coarse and fine PM in LAB?	Sioutas/Hinds
Spatial and seasonal variation of ultrafine, accumulation and coarse PM in the LAB and their relation to sources	Sioutas/Hinds
· **Health Effects and Exposure Research**	
Physiochemical characterization of concentrated PM in toxicity studies in the LAB	Sioutas
Size distribution and spatial seasonal variation in PAHs, polar PAHs including nitro compounds and quinones in the LAB	Cho/Froines/Arey/Miguel
Characterization of PAH derivatives in ultrafine and accumulation mode at a source site impacted by vehicle emissions – Analysis of PAHs and related compounds as a function of distance from freeways	Cho/Miguel/Froines

PROJECT TITLE	LEAD INVESTIGATORS
Measurement of the aerosol oxidant partitioning in the ultrafine, accumulation, and coarse PM modes	Friedlander
Measurement of protein, allergens, and other biological constituents of urban PM	Cass
· **Development of New Technologies for Characterizing PM**	
Comparison between PM_{10} and $PM_{2.5}$ using continuous PM mass monitors	Hinds/Jaques/Sioutas
Automated semi-continuous measurement of NO_3, SO_4, and C aerosol size distributions	Hering
New and emerging methods for single-particle analysis	Friedlander and others
Development of a continuous coarse particle monitor	Sioutas

Table 3-2. SCPCS SUPERSITE Measurements

Monitor	PM Property	Averaging Time	Sampling Frequency and Studies that will Use these Data*
Continuous PM Measurements			
Scanning Mobility Particle Sizer (SMPS 3934, TSI Inc.)	Particle number, surface and volume size distribution (size range: 0.01–0.7 μm)	15-min, 1-hr, 24 hr	Daily [1,2,4, 6, 7]
Aerodynamic Particle Sizer (APS 3310, TSI Inc.)	Particle number, surface and volume size distribution (size range: 0.5–20 μm)	15-min, 1-hr, 24 hr	Daily [1,2,4, 6, 7]
PM_{10} and $PM_{2.5}$ Tapered Element Oscillating Microbalance (TEOM Model 1400, R&P Inc.)	Continuous PM_{10} and $PM_{2.5}$ non-volatile particulate mass concentrations	1-hr	Daily[1,2,4, 6, 7]
$PM_{2.5}$ Continuous Ambient Mass Monitor (CAMM; Babich et al, 1999)	Continuous PM_{10} and $PM_{2.5}$ particulate mass concentrations (DataRAM)	1-hr	Daily[1,2,4, 6, 7]
Real-Time Ambient Mass (RAM) Monitor (DataRAM, Mie Inc.)	Near-continuous PM_{10} and $PM_{2.5}$ particulate mass concentrations	1-hr	Daily[1,2,4, 6, 7]
Continuous Nitrate, Sulfate, and Carbon Monitor (ADI/R&P)	Size-segregated measurement of PM_{10} carbon, nitrate, and sulfate content	1-hr	Daily[1,2,4, 6, 7]
Scanning Mobility Particle Sizer (SMPS 3934, TSI Inc.)	PM_{10} size distributions at three locations to investigate PM formation mechanisms. 3 SMPS that will be placed in selected locations along the air parcel trajectory	5-min	Two-week Intensive studies, during episodes, for model validation; Candidate locations: Long Beach-San Dimas- Riverside [6,7]

Condensation Paritlce Counter (CPC 3022, TSI Inc.)	Ultrafine PM counts in 13 sites (ARB, USC children's sites)	15-min, 1-hr-, 24 hr	Daily. [1,2,4,6,7]
Dual-beam Aethalometer (Andersen RTAA-900)	Elemental carbon and (qualitative only) PAH content	15-min, 1-hr-, 24 hr	Daily. [1,2,3, 4,6,7]

Time-Integrated PM Measurements

Micro-Orifice Uniform Deposit Impactor (MOUDI, MSP Corp.)	Size-fractionated PM_{10} mass, sulfate, nitrate (5 size groups; 0-0.1-0.1-0.5, 0.5-1.0, 1-2.5, 2.5-10 µm)	24-hr	Once per week [1,2,3,4,7]
MOUDI	Size-fractionated PM_{10} mass, sulfate, nitrate, EC/OC, metals (5 size groups; 0-0.1-0.1-0.5, 0.5-1.0, 1-2.5, 2.5-10 µm)	4-to-8 hr 4/day	2 weeks intensive studies in each PIU location; same time with SMPS measurements [6,7]
MOUDI	Size-fractionated PM_{10} trace elements	24-hour	Once per week, [1,2,3,4,7]
MOUDI	Size-fractionated PM_{10} PAH, nitro-PAH (3 size groups; 0.-0.1; 0.1-2.5; 2.5-10 µm)	24-to-72 hr	Intensive studies [1,2,3,4,7]
MOUDI	Size-fractionated PM_{10} EC/OC (artifact-free)	24-hour	Once per week, during human or animal exposures [1,2,3,4,7]
High-Volume Particle Size Classifier (HVPSC)	Size-fractionated PM_{10} PAH, nitro- PAH	24-hr	Once per week [1,2,3,4,7]
PM_{10} and $PM_{2.5}$ FRM (Partisol, R&P Inc.)	PM_{10} and $PM_{2.5}$ mass, nitrate, sulfate concentrations	24-hr	Once per week [1,2,3,4,7]
PM_{10} Organic Denuder Sampler (URG Inc.)	PM_{10} and $PM_{2.5}$ artifact-free EC/OC concentrations	24-hr	Once per week [1,2,3,4,7]

$PM_{2.5}$ Honeycomb Denuders Samplers (HDS)	PM_{10} and $PM_{2.5}$ nitrate concentration	24-hr	Once per week [1,2,3,4,7]
Low-Pressure Impactor (LPI; Hering and Friedlander, 1978)	Size Distribution of particle-bound reactive oxidants and PM surface anaysis	24-hr	Selected sample days
2-channel volatile and semi-volatile sampler (Tisch Model 1202).	PAH, quinones, elemental and organic carbon	24-hr	Once per week [1,2,3,4,7]
High-Volume PM10 Sampler (Tisch Environmental (TE-6070)	PM_{10} collection for aeroallergen analysis	1 week	2-3 composite samples per site [5]

Gaseous Pollutant Measurements

Continuous Chemiluminescence Analyzer (Monitor Labs Model 8840)	Nitrogen Dioxide	15 min, 1, 4, 12 and 24 hr	Daily [1,2,3,4,6]
Thermo Environmental Inc. Model 48C trace level	Carbon Monoxide	15 min, 1, 4, 12 and 24 hr	Daily [1,2,3,4,6]
UV photometer (Dasibi Model 1003 AH)	Ozone	15 min, 1, 4, 12 and 24 hr	Daily [1,2,3,4,6]
NMHC Thermo Environmental Inc., Model 55	Ammonia	15 min, 1, 4, 12 and 24 hr	Daily

Other Parameters

Vaisala Model MP113Y	Temperature & Relative Humidity	15 min, 1, 4, 12 and 24 hr	Daily

Met One High-Sensitivity Wind Vane	Wind Direction	15 min, 1, 4, 12 and 24 hr	Daily
Met One High Sensitivity Anemometer	Wind Velocity	15 min, 1, 4, 12 and 24 hr	Daily

* Study Notation: 1. Freeway Study; 2. Source-Receptor Study; 3. In vitro studies; 4. Human clinical studies; 5. Allergens; 6. Regional Model development; 7. PM characterization in source and receptor sites

Figure 3-1. SCPCS Organizational Chart

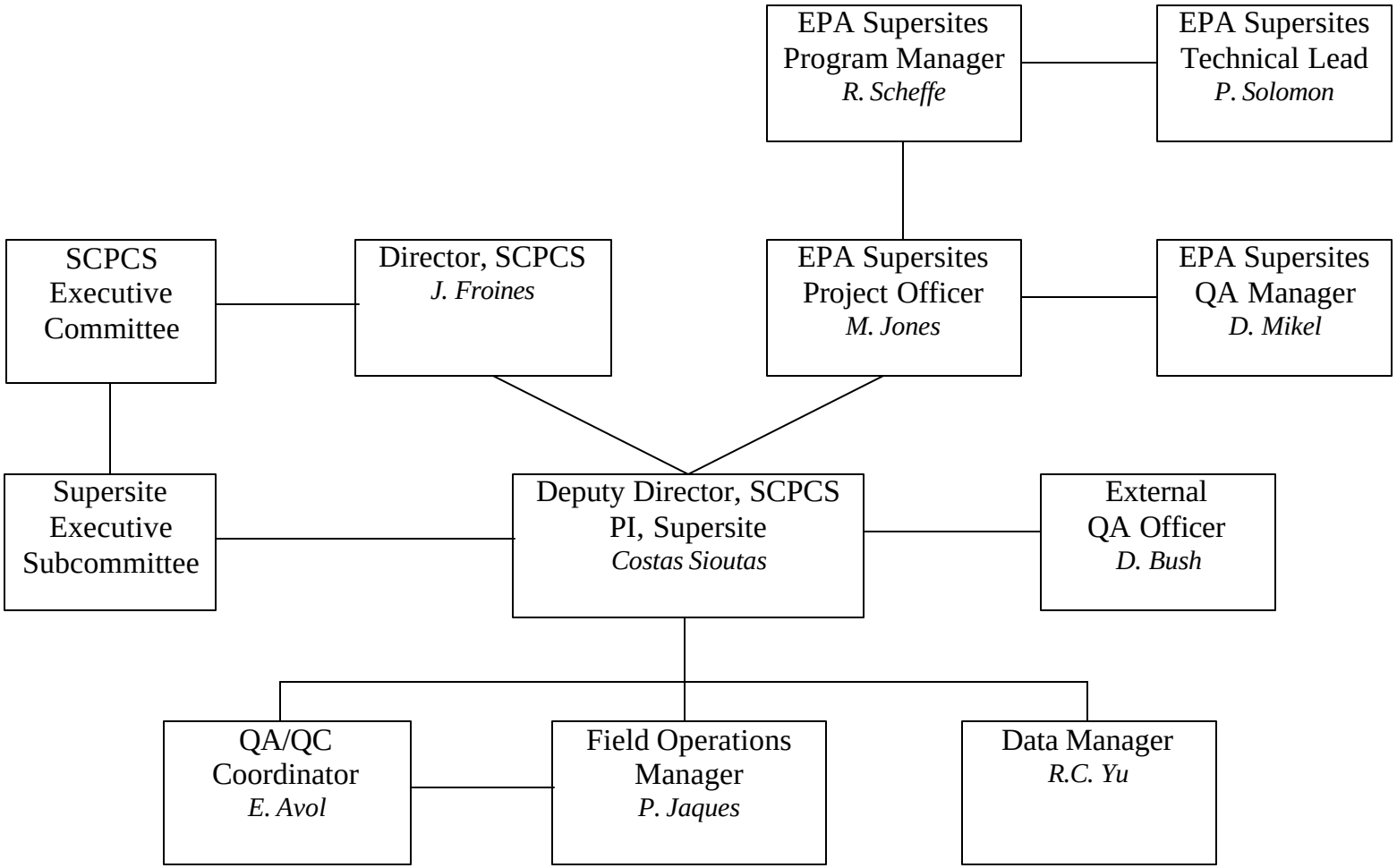

Figure 3-2. Monitoring Locations

Figure 3-3. View of PIU - Riverside

View from North

View from East

View from South

View from West

Figure 3-4. Riverside

View North

View East

View South

View West

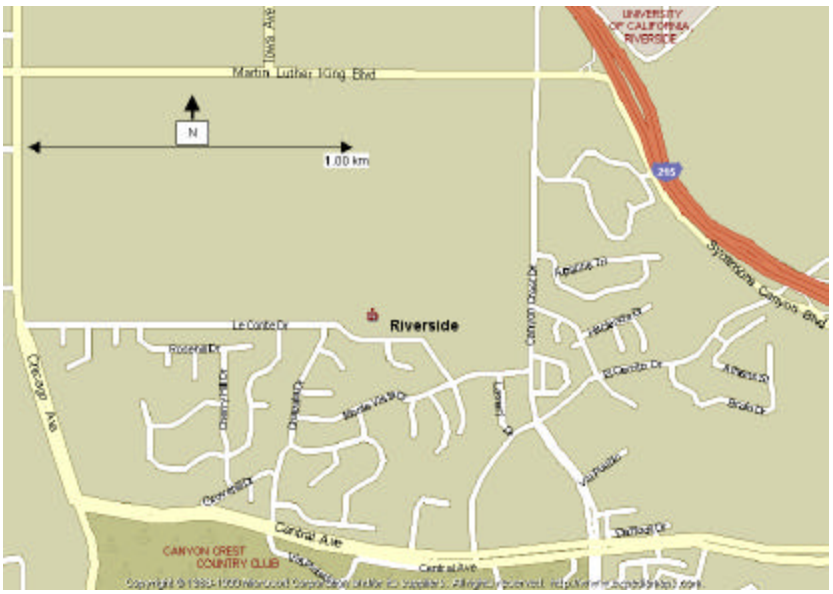

Figure 3-5. Claremont

View North

View East

View South

View West

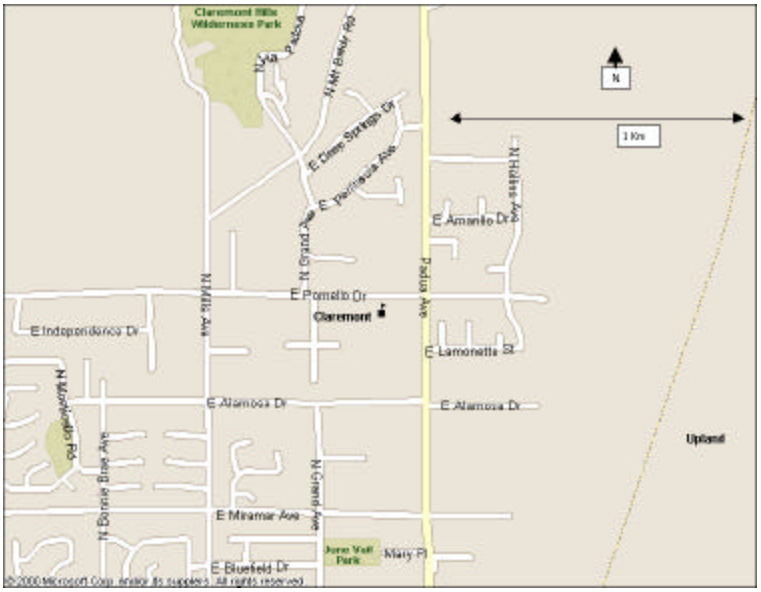

Figure 3-6. Downey

View North

View East

View South

View West

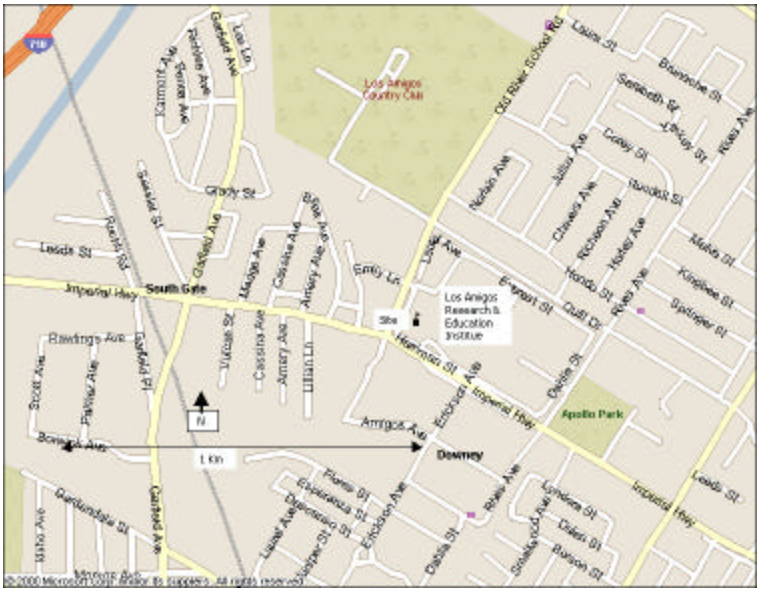

Figure 3-7. Long Beach

View North

View East

View South

View West

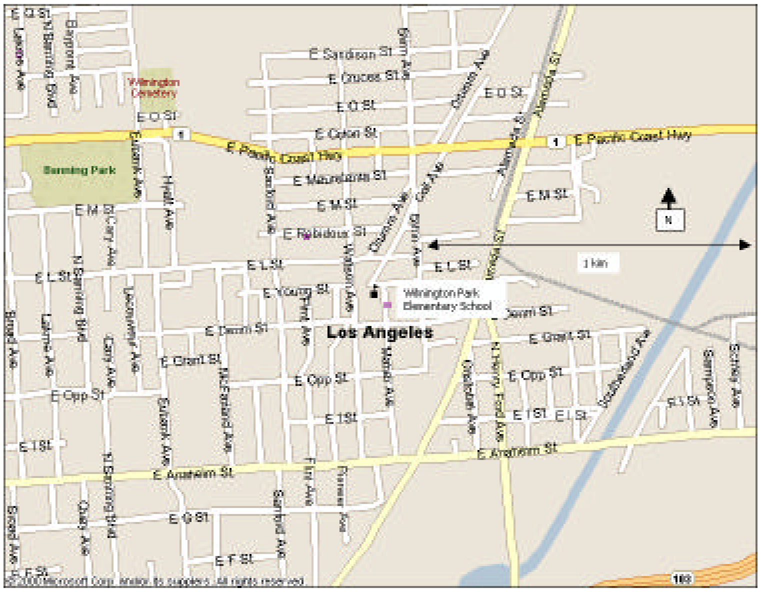
Wilmington Park
Elementary School
Los Angeles
Banning Park
E Pacific Coast Hwy
E Anaheim St
E L St
E M St
E Opp St
E Grant St
E G St
E F St
1 km
N
1
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Figure 3-8. Rubidoux

View North

View East

View South

View West

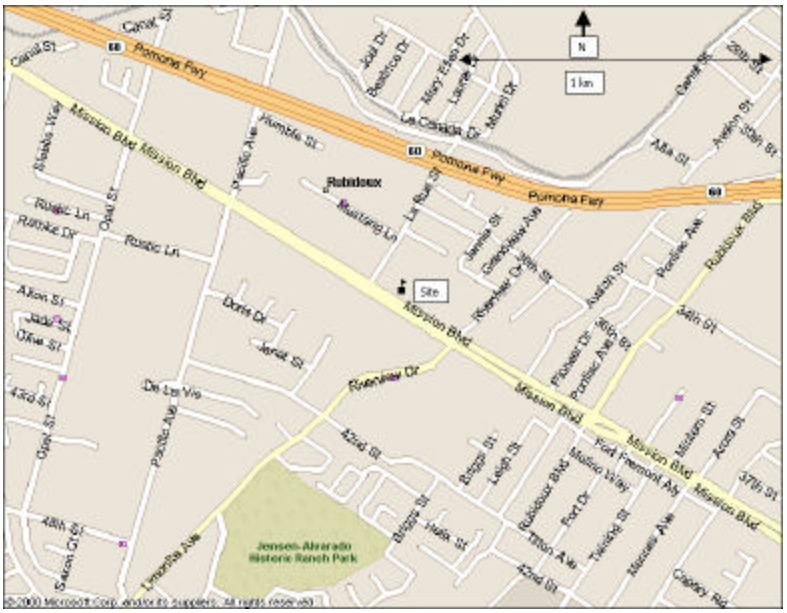


Figure 3-9. Azusa

The Azusa location has not yet been finalized. Photos will be included in a future revision.

SECTION 4

DATA ACQUISITION

An on-site data acquisition system, located aboard the PIU, will interface with continuous measurement equipment (see Table 1) to acquire continuous raw data in both digital and analog signals. Analog signals are logged onto an Automet (Met-One Corp.) multichannel system, which houses an A/D converter. The multi-instrument digital signals from the Automet are transmitted to a Data Acquisition PC via RS232 connection. The combined analogue-digital signals are downloaded to the PC through a 8 cable multi-port digital board (Keithley Products), and finally converted into digital format for storage. Filter- and impactor-media samples will also be collected and analyzed by the SCPCS Analytical Lab

4.1 DATA RECORDING

The data acquisition system (DAS) is a Celeron-based computer equipped with Zip drive (Iomega) to transfer data from the hard drive to the Central Archiving Computer. These data can be directly generated from digital instruments or originated from analog instruments and converted into digital format. Field lab notes will be reported in a consistent manner and may be converted into digital format, if necessary (such as serving for validation flags). The analytical results of the filter-based bulk samples will be recorded in laboratory notebooks and converted into digital format in Excel file. These digital data will be duplicated in a central server-type computer.

4.2 IDENTIFICATION OF DATA

Data with different levels of validation will be identified in four depository areas: the data acquisition computer of PIU, the analytical lab, the central server computer, and NARSTO Permanent Data Archive. A database depository map will be created in the central server-type computer to track what databases will have been generated, and where will these databases have been transformed and transferred. Submission slip and receiving confirmation will be attached to each database between transfer process, including submission of SCPCS databases to NARSTO Permanent Database Archive.

4.3 CONTROL OF ERRONEOUS DATA

Erroneous data will be controlled by collecting quality control information, and by performing preliminary data reviews on a daily basis. QA/QC procedures will be followed to generate field and analysis data by PIU and Analytical Lab personnel, respectively. Should erroneous data be generated due to instrumental malfunction, (e.g., calibration s

out of normal range), these data will be saved. The events will be documented in field operation or laboratory notes, and made available for the data validation QA/QC phase of analysis. Section 5 details the flags and procedures for data validation.

4.4 DATA VALIDATION

All the data generated by SCPCS activities will be validated. Four levels of validation processes, Level 0, 1, 2, and 3, will be performed, depending upon the data status. These levels include:

- **Level 0:** This validation indicates a reasonably complete data set of unspecified quality that consists of raw data subjected to minimum processing in the PIU and in the Analytical Lab. Level 0 designations will be given to raw data that have not been audited or peer reviewed. Level 0 status will remain in force until all audits or peer reviews associated with Level 1 validation of the product have been completed. Data at this level contain all available measurement data and may also contain data in the form of quality control checks and flags indicating missing or invalid data. They consist of instrument outputs expressed in engineering units using nominal calibrations. Missing data from on-site backup loggers or strip charts have been filled in. Level 0 data may include flags indicating QC check data, power failures, and excessive rate-of-change, insufficient data for the averaging period, or other logger programmed occurrences.

- **Level 1:** This validation focuses upon quality assurance, quality control checks, and data management procedures associated with the primary raw data. Site documentation will be reviewed for completeness and performance will be evaluated. Compliance with documented data quality objectives, standard operating procedures (SOPs), and research protocols will be evaluated at this level. Audit and peer reviews by PIU director or Analytical Lab Director will be performed. Necessary corrective actions will be taken if data are potentially erroneous. The PIU group and the Analytical Lab will be responsible for conducting the Level 1 validation. In case of any audits and data being found to be erroneous, data may be adjusted. Continuous ambient measurements will be adjusted for "zero drift". The PIU group and Analytical Lab will also determine precision and accuracy. These internal consistency checks, in coordination with Data Management Office, may include diurnal analyses to look for expected patterns or time series analyses to detect outliers, extreme values, or time periods with too little or too much variation. Level 1 designation will be assigned after the project group has performed all quality control activities identified in their QAPP and addressed all quality issues stemming from audits and reviews. The appropriate project group, responsible for generating the data, will fill in missing data, if necessary, and transfer the data to the Data Management Office. Data management staff will format the data (see 5.6 for more details) and submit to NARSTO Permanent Database Archive.

- **Level 2:** This validation process indicates complete and externally consistency checks of specified quality that include interpretative and diagnostic analysis using appropriate statistical procedures by the project and data management staff and other investigators within the SCPCS. Data under validation at this level may have been extensively processed by statistical procedures or mathematical modeling. A validation note will be included in the metadata records. The SCPCS investigators may compare data to other related database, either generated within the Center or outside of the SCPCS, to examine the cross-center consistency. If comparisons suggest that data fail to meet specified monitoring quality objectives, the measurement records and other information will be reviewed. If a check of measurement records uncovers a process error, the value will be corrected. If such errors are not found, then an annotation will be entered. If the value is invalidated, it will be deleted from the database and replaced by a missing value and flagged appropriately. A record of changes will be permanently retained. Level 2 designation will be assigned after the project data manager and/or data users have performed comparative tests and addressed the quality issues. It will be given after the project staff has evaluated the test results and supporting QA documents.
- **Level 3**: Data undergoing this validation process may have received intense scrutiny through analysis or use in modeling by investigators in scientific community outside of the SCPCS (the data users). As analysis of the data proceeds, analysts may raise questions about the validation at Level 2. Additional checks and tests will be performed on such data and the Level 3 code will be affixed to data passing these tests. If this scrutiny reveals an inconsistency that appears to be caused by a measurement error, the entire chain of validation for the measurements will be reviewed. This includes reviewing instrumentation QA/QC procedure, field logs, as well as reviewing performance audit results, and any other relevant documents. The data users will recommend a Level 3 designation to project staff on the basis of such re-evaluations. Alteration of the data validation codes, if warranted, will only be made by the Data Manager Office.

SECTION 5

DATA MANAGEMENT

The Data Management Office will coordinate the activities of data acquisition, evaluation/processing, formatting/validation, and archiving in the SCPCS. The office will be equipped with a central server-type computer to process and store the SCPCS databases.

5.1. TYPES OF DATA TO BE COLLECTED, PROCESSED, AND UTILIZED

The data that are collected, processed, and utilized in the SCPCS will be categorized into five major classes: primary raw data, secondary processed data, publication-ready data, archival data, and supportive programs and algorithms. The primary raw data are those originally generated from the PIU and the Analytical Lab, data recorded in field logbooks and lab notebooks, as well as data obtained from other third-party investigators or collaborators, and subcontracted laboratories. These data may be provided in different formats, depending upon the origin of data acquisition activities. All of the data will be ultimately transformed into digital format, if the original format is non-digital. These data will be carefully evaluated and validated with flags (described in 5.6). After passing the validation processes, the data will be qualified for further uses as secondary processed data and archiving data. Data of this category will have gone through Level 1 validation.

The secondary processed data will consist of essential variables of the records from the primary raw data, which will be locally used in support of SCPCS research activities for publication. These data may include those generated from statistical procedures and mathematical models. Secondary data will be subjected to Level 2 validation.

The publication-ready data consist of processed data that will be included in the SCPCS research papers and reports. These data, in Figures or Tables, will be abstracted from the secondary processed data and thoughtfully evaluated based on scientific principles. Particular attentions will be paid to document the source of the secondary processed data and what procedures used to process them. Data in this category must have undergone at least Level 2 validation.

The archival data will be transformed from the primary raw data and secondary processed data with specifications according to the guidelines provided by NARSTO Quality Systems Science Center (see details in 5.7).

Lastly, the supporting programs and algorithms will be those procedures and computer codes designed by the Data Management Office or other supporting affiliations. They will be used to process the primary raw data, convert or transform the data into different

formats, generate results for statistical influences and model predictions. These programs and algorithms will be a part of generating research publications.

Figure 5-1 presents the data flow for the Supersite effort.

5.2 DATA SOURCES

The major sources of data will be from the PIU, the Analytical Lab, subcontracted laboratories, and internal processing (for the secondary processed data). Third-party data will include, but not limit to, data of CalTrans traffic counts, AQMD, and ARB. It is anticipated that a large database will be generated in the operation of the PIU over the five-year study period. Table 5-3 is an initial estimate of the size of the databases that will be generated from the PIU. It is estimated that a total of more than 7 gigabytes of primary raw data will be generated. The initial estimate of the size of the secondary processed data will be about 1/3 of the primary raw data, i.e., about 2.3 gigabytes. Computer programs and algorithms used to process the data will need an estimated 1 gigabytes. Third-party data will probably need another 2-3 gigabytes. Under such estimates, a total of about 12-13 gigabytes will be needed.

5.3 DATA MANAGEMENT RESOURCES NEEDED

Three types of resources are needed to accomplish the goals of data management plans in the SCPCS: computer hardware, software, and personnel. In addition to an on-site data acquisition computer, a central server-type computer will be required. This computer will allow the data that will be generated from the PIU to be transferred manually (in the initial phase) and automatically through the phone line (in the later phase). The computer will also be used to process, archive, and format the data that will be transferred from the PIU, the Analytical Lab, and third parties. A link to SCPCS website (http://www.ph.ucla.edu/scpcs/) will be created to allow remote access, with secured permission, to the databases through the Internet.

The Data Management activities will require special computer software, in addition to those for word processing and spreadsheet, to accomplish the goals. SAS (SAS Institute, Cary, NC) will be the default statistical software used. The SAS computer codes (and other codes as well), which will be used to process, format, and archive the databases, will become the 'supporting programs and algorithms,' as described in 5.1. These computer codes will be part of the data for permanent archiving. Other computer software that will enable the server computer include, but not limited to, Microsoft SQL Server 2000 (or SQL Server 7.0, a relational database management system) and Windows 2000 Data Center Server (a server operating system, or Windows 2000 Advanced Server).

The Data Management Office will take the lead in coordinating the data management activities in the SCPCS. The Office will be in charge of, with assistance of SCPCS QA/QC staff, designing and implementing the overall data management plans.

5.4 DATA ACQUISITION ACTIVITIES

Data will be received routinely from a number of sources, which are discussed in the following sections. In order to assure that no data are lost, the Data Management Office will utilize a data login procedure to document the receipt of all routinely scheduled data. Separate entries will be created for each of the data sources, and the period of the data received along with the dates the data were received and loaded into the SCPCS Central Server Computer. Any gaps in data periods noted during this login sequence will be investigated and resolved immediately.

5.4.1 Primary Raw Data Generated from the PIU

The majority of the primary raw data will be generated from the PIU. The PIU contains a variety of aerosol instrumentation, as shown in Table 5-1. The table details the units, signal format and process, path or media of transfer, interval, and type of analysis. These data will be used to characterize the physical, chemical, and spatial components of particulate air pollutants in the Southern California air shed. An on-site data acquisition computer, located aboard the PIU (see 5.3), will be utilized to track and initially process the primary raw data.

The primary raw data generated from the PIU will be in digital format. These will include those of SMPS (for particle size distribution), APS (for particle size distribution), TEOM (for particle mass concentration), Partisol (for particle gravimetric analysis), DataRAM (for particle mass concentration), Aethalometer (for black carbon in ambient particles), APS NOx Gas analyzer (for gaseous NOx), and Dasibi CO Gas analyzer (for gaseous CO). A multi-cable (8) adaptor board (Keithley Products), installed into a dedicated Data Acquisition Computer, has the capability of accessing multiple digital signals simultaneously, including that supplied by the A/D Met-One Data Logger. The data will be saved in storage media in the PIU Data Acquisition Computer and later transferred to the SCPCS Central Server Computer.

Some of the primary raw data will be generated in analog format from the instruments, such as Vaisala Temp/RH systems (for ambient and indoor temperature, and relative humidity), Met-1 Wind system (for wind speed and direction), Dasibi CO Gas analyzer (for gaseous CO), and Dasibi Ozone Gas analyzer (for gaseous ozone). These instruments will require an analog-to-digital multichannel (9-input) system (supplied by Met-One instruments), specially designed to interpret pulsed multidirectional wind signals, but also able to read general pulsed analog signals. These instruments will be coupled into a single signal that is supplied through a RS232 serial cable for digital transmission of the data into the Data Acquisition Computer.

Samples collected by MOUDI (rotating and non-rotating) will be shifted to the Analytical Lab of the SCPCS for chemical/species analyses.

5.4.2 Primary Raw Data generated from the Chemical Analysis Lab

For those instruments generating sampling mediums (such as air filters) rather than purely electronic data, analyses will be conducted by in-house Analytical Lab or other external laboratories, as necessary. Table 5-2 highlights the analytical methods that will be used for chemical analysis of PM samples collected by the SCPCS. All information related to analysis of the samples is considered as primary raw data as well. The analytical results will be transferred to the Central Server computer, which will be linked with sampling notes associated with original conditions taken in the PIU.

5.4.3 Primary Raw Data Requested from "Third" Parties

Data from third-party sources may be used to enhance the research activities in the SCPCS. Data of Cal Tran traffic counts represent the density of major highways (such as Interstate Highway 710), which will be used to correlate with biological effects of air pollution for *In vivo* as well as epidemiologic studies. These data will be requested from Cal Tran and be treated as primary raw data. The other sources of third-party data include those from AQMD and ARB, where they have been periodically collected air quality along with meteorological data. These data will be served an external sources for cross-checking the validity of the data measured by the PIU.

5.5 DATA EVALUATION AND PROCESSING ACTIVITIES

5.5.1 Expressing the Amount of a Substance

Ambient gas pollution measurements will be reported in mixing ratio units of parts per billion by volume (ppbv), for example. Chemical species collected in the unit of mass per air volume (e.g., nitric acid, organic nitrates, and sulfate) will be converted to mixing ratio units with specific mention of the conversion factor. Where appropriate, concentrations of aerosol particles, measured in mass units per standard cubic meter of air (e.g., $\mu g/m^3$ or ng/m^3) will be standardized to STP (temperature: 25º C and pressure: 760 mm Hg). Table 5-4 lists the reporting units and formats of the chemical species, substances, and parameters that will be obtained in the SCPCS.

5.5.2 Data Below MDL

Section 3.3.4 describes measurements reported below MDL. Values below the MDL will be reported as measured in the database. In addition, flags (V1, see 5.5.7) will be provided in the data records containing below-MDL measurements and those derived from them (e.g., averages derived from some of data that are below MDLs).

5.5.3 Time Integrated Data

Time-integrated data may include times of the beginning and the end of the time-averaging period. A valid time-averaged data must contain at least 75% of validated data

points out of the total data points possible for the averaged time period. For example, a 60-minute time-averaged data based on 1-minute samples must contain at least 45 validated 1-minute data points. Otherwise, the time-averaged value will be flagged, reported, and potentially considered as missing datum. It should also be emphasized that the Supersite's objectives include instrument technology development and research that supports health studies, and thus, this criteria may primarily be the case for providing data for the SIPs.

5.5.4 Date and Time Formats

Sample dates and times will be reported for all measurements and in two formats: Pacific Standard Time (PST) and Coordinated Universal Time (UTC, where UTC=PST+8 hr). Both the begin time and end time will be reported in both time formats. Begin and end times are the beginning and the end of the averaging period, respectively. The daily time cycle runs from 00:00:00 to 23:59:59 (24:00:00 is not a legitimate value). Sampling times should be reported as hh:mm:ss (or hh:mm if no seconds), when practical and possible. The colon(s) must be used. Reported dates must include the day, month, and year and be formatted as yyyy/mm/dd (e.g., 1997/08/15 or 1997-08-15). Character values may not be used to denote sampling or analysis months and leading zeros should be used for day and month entry values less than ten (i.e., 08 to represent August, not 8 or AUG).

5.5.5 Reporting Missing Data

All data fields should have a value present - either the measured, the adjusted, or a missing value. There should be no blank data fields. Data generators should report data where possible and use flag codes (see 5.5.7 for details). All missing values should be numerical values, not character or alphanumeric values, to aid quality-control efforts. Missing values for data parameters should be represented by a value of -9999.

5.5.6 Reporting Calibration Values and Uncertainty Estimates

The calibration values, estimates of precision and MDL for all measurements will be maintained by the research investigators and reported to the Data Management Office in separate files other than the main databases. Access to these data is crucial for future quality-assurance, analytical, and modeling exercises.

Uncertainty estimates, if available, should be reported. These estimates will be reported either in the measurement method information table or in the primary data table as separate data fields. The method of calculating uncertainty for each parameter will also be reported.

5.5.7 Data Flags

Every data record will have an associated data qualification flag code, in addition to any field or laboratory data qualifiers, if applicable. Table 5-5 shows the data qualification flags that will be used in the SCPCS. Flags begin with the letter "V" for valid values, "M" for

missing values, and "H" for historical data and third-party data that are unable to be assessed or validated by the SCPCS. Invalid data will not be submitted to the NARSTO Permanent Database Archive, but will kept in Data Management Office as well as individual investigators, the PIU and the Analytical Lab.

5.5.8 Site Identifier

The site identifier is a unified code to identify a particular Supersite among the EPA Supersites Program. It consists of 12 characters (columns), 01-04 for study or network, 05-06 for country code, 07-08 for state or province code, and 09-12 for site code. In the SCPCS, we will use the following:

- Study or Network: ES2L (**E**PA **S**upersite phase **2** project at **L**os Angeles)
- Country Code: US
- State Code: CA
- Site Code: AZSA – Azusa,
  CLMT – Claremont,
  DWNY – Downey,
  LNGB – Long Beach,
  RVSD – Riverside,
  RBDX – Rubidoux.

For example: All data collected from our mobile unit at Downey site will be coded with a site identifier “ES2LUSCADWNY.”

5.6 DATA FORMATTING AND VALIDATION ACTIVITIES

5.6.1 Data Formatting Activities

Databases in the SCPCS will be created for fulfilling different purposes. Because these databases will be generated by various sources, data formatting will be performed in a collaborative manner in software level. Excel and SAS will be primary programs to store and process data. A text format with a comma as a variable separator (.csv format) will be in the SCPCS for data exchanges between software. The primary raw data generated from the PIU will be kept in their original formats if possible. For example, data generated from SMPS and APS can only be read using the company software. These data will be transformed into .csv format. The data generated from the Analytical Lab will be stored in Excel file and be converted into .csv format for data exchange. Data obtained from third parties will be kept in their original format and will be converted into .csv format if not yet do so. The format used to transmit data from the SCPCS to NARSTO Permanent Database Archive is similar to .csv format, but requires a specific file structure, as shown in a data template provided by NARSTO Quality Systems Science Center (see http://cdiac.esd.ornl.gov/programs/NARSTO/).

5.6.2 Data Validation Activities

Sections 4.4 and 5.5.7 contain the structure and the flags of data validation, respectively. Raw data are required for performing Levels 0 and 1 data validation. Secondary processed data need Level 2 validation. The publication-ready data requires Level 3 validation. Validation reports will be prepared quarterly, which summarizes data validation activities. The reports will become permanent records for future references. To perform data validation at Levels 0 and 1, quality control information will be needed, as follows:

- Site and instrument logbook records
- Station checks
- Control charts with all daily zero, span, and maximum value data
- Instrument calibration data
- Transfer standard certification information
- Performance audit data
- Site systems audit data
- Data review and instrument log
- Extract and report QC data
- Screen QC data for invalid calibration points
- Calculate calibration slopes, intercepts, and baseline zeros
- Apply zero corrections and calibrations
- Graphically review corrected time-series plots
- Run range checks on corrected data set to screen for remaining outliers
- Annotate all modifications to the data set in an electronic log
- Data that are flagged due to a power failure, calibration, audit, or other reasons, are invalidated later
- Level 1A validation performed to review the results of Level 0 validation and further screen the data. Range checks are also used to detect and flag, or remove, any remaining outliers. The raw data will be retained, if needed, for future investigations.

For all validation levels, data requiring invalidation or editing will be documented on specifically designed Data Validation Forms. These forms will address individual problems, and will specify the parameter and period affected and the reason the data require invalidation/editing. The signature of both the Data Manager and the Principal Investigator must be obtained prior to changing the database. The form will also document

the date the changes were made and the person responsible for making the changes, as well as similar information regarding an independent check that the changes were made correctly.

5.7 DATA ARCHIVING ACTIVITIES

5.7.1 Data Archiving Activities in the SCPCS

In addition to data originators (such as the PIU, the Analytical Lab, and other research investigators), Data Management Office of the SCPCS will maintain a copy of the databases generated by all research and monitoring activities, as described in Section 5.4. The databases will be stored in a central server-capability computer at UCLA Campus.

5.7.2 NARSTO Permanent Database Archive

Data after performing Level 2 validation will be submitted to NARSTO Permanent Database Archive within 120 days of the end of the monitoring quarter. The data structure and format have been developed by NARSTO Quality Science Center staff and are currently under revision by the Data Management Working Group. The details of these structure and format can be referred to the Data Management Plan of the SCPCS.

Table 5-1. UCLA SCPCS PIU Routine Raw Data Acquisition Summary

	Instrument Description		Signal		Sample		
	Name	Units	Format*	Process**	Path/ Media	Duration	Type/Analysis***
1	SMPS	Particles/cm3 and µg/M^3	Digital	On-Line/Integrated	Electronic	15 min	Size Dist
2	APS	Particles/cm3 and µg/M^3	Digital	On-Line/Integrated	Electronic	15 min	Size Dist
3	TEOM	µg/M^3	Digital	On-Line/Integrated	Filter/Electronic	10 min	Mass Conc
4	Partisol	µg/M^3	Digital	Sample	Filter	24 hours	Grav
5	DataRAM	µg/M^3	Digital	Automatic	Electronic	10 sec	Mass Conc
6	MOUDI (Rotating)	µg/M^3	N/A	Sample	Aluminum Substrate	24 hours	Elem/Ion/Org
7	MOUDI (Non-Rot)	µg/M^3	N/A	Sample	Filter Substrate	24 hours	Grav
8	Aethalometer	µg/M^3	Digital	Continuous	Qtz-Filter/Electronic	10 min	BC
9	Vaisala Temp/RH 1	Deg-C, %RH	2-Analogs	On-Line/Continuous	Electronic	1 hour	T/RH
10	Vaisala Temp/RH 2	Deg-C, %RH	2-Analogs	On-Line/Continuous	Electronic	1 hour	T/RH
11	Met-1 Wind System	mph/N,S,E,W	2-Analogs	On-Line/Continuous	Electronic	1 hour	WS, WD
12	APS NOx Gas	ppb	Digital	On-Line/Continuous	Electronic	1 hour	Gas
13	Dacibi CO Gas	ppm	Analog	On-line/Continuous	Electronic	1 hour	Gas
14	Dasibi Ozone Gas	Ppb	Analog	On-Line/Continuous	Electronic	1 hour	Gas

* Computer Signal. I = Integrated, C = Continuous, Org = Organic

** Data is Automatically transmitted to Data Acquisition System, or Sample is collected for gravimetric and/or chemical analysis.

*** Grav = Gravimetric; Elem = Elemental, BC = Black Carbon, T = Temperature, RH = Relative Humidity, WS = Wind Speed, WD = Wind Dir'

Table 5-2. SCPCS Analytical Methods

Analysis Method Code	Analysis Method Description
CAR	Cartridge
FIL	Filter
GCM	Gas Chromatography/Mass Spectrometry (GS/MS)
GRA	Gravimetric
HPL	High Performance Liquid Chromatography
ICG	Ion Chromatography
IMP	Impactor
TOR	Thermal Optical Reflectance
TUB	Tube
XRF	X-Ray Fluorescence

Table 5-3. Estimate of the Number of Records Generated from PIU Instruments

Instrument*	Samples/day	Days	Years	Outcomes	Stages	Total Records**	Comments
SMPS	96	365	4	1–2 Modes	N.A.	140,160 - 280,320	4 data points per hr
APS	96	365	4	2-3 Modes	N.A.	280,320 – 420,480	4 data points per hr
MOUDI-1 (NR)	1	52	4	2	5	2080 (?)	Weekly: PM, Inorganic Ions ($NO3^-$, $SO4^=$)
MOUDI-2 (R)	1	52	4	10	3 or 5	6,240 or 10,400	Weekly: PAHs (about 10 species)
MOUDI-3 (R)	1	52	4	2	3 or 5	1,248 or 2,080	EC and OC (2 species)
MOUDI-4 (R)	1	52	4	12	3 or 5	7,488 or 12,480	Elements, including Metals (about 12 species)
Dual Beam Aethalometer	96	365	4	2	N.A.	140,160	Black Carbon
High Vol	1	52	4	D	1	208(D)	PAH derivatives (D), No. to be determined
Partisol dichot' PM10/PM2.5	1	52	4	1	2	416	2 filters per Week (PM_{10}-$PM_{2.5}$, $PM_{2.5}$)
3 Gas Analyzers	24	365	4	3		105,120	24 samples per day for NO_x, O_x, and CO
Meteorological data	288	365	4	4		1,681,920	5 min avgs; Wind direction & speed, relative humidity, and Temp.
Total						2,365,360 – 2,655,664	Total Number of records depends on the MOUDI Stages or Outcomes.

* NR = Non Rotating, R = Rotating Version.

** Maximum ideal number of records. Intensive research-based efforts will temporarily borrow (between one day and several weeks) any and sometimes possibly all of the above listed instruments, thereby temporarily reducing the "Ideal" Total Number of Records.

Table 5-4. Reporting Units and Formats of the Chemical Species, Substances, or Parameters

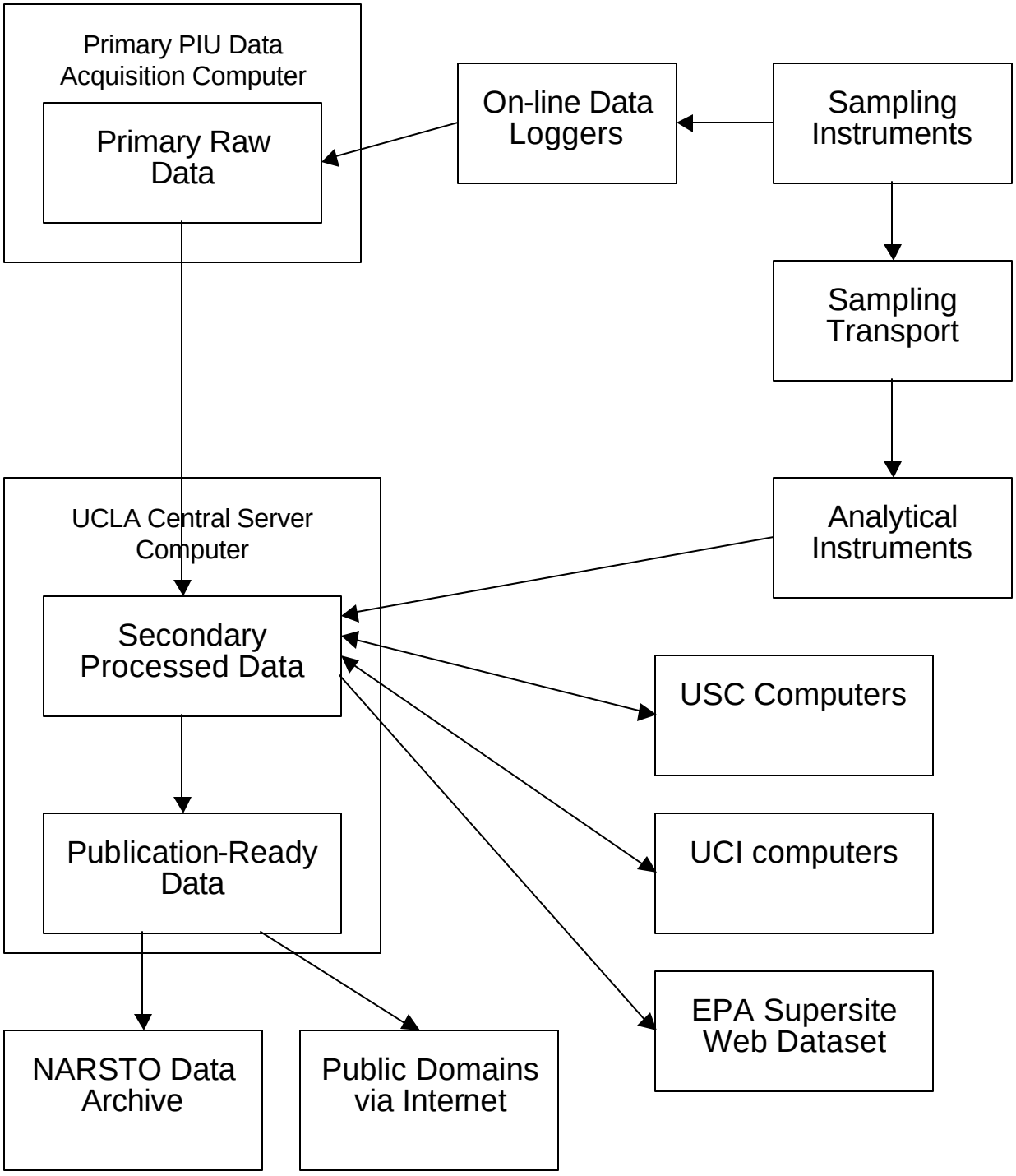
Chemical Species, Substances, or Parameters	Units	Format*
Gas Air Pollution species (O_3, CO, NO_x, PAHs)	ppbv	7.2
Particulate Matter (particle count)	#	7.2
Particulate Matter (surface)	μm^2	7.2
Particulate Matter (mass)	µg	7.2
Particulate Matter (mass concentration)	$\mu g/m^3$	7.2
Speciated Organics	ng/m^3	7.2
Wind speed	m/s	7.2
Wind direction	degrees, radial	7.2
Temperature, or Dew point	degrees, °C	7.2
Mixing height	m	7.0
Relative humidity	%	7.2
Solar and UV radiation	$Watts/m^2$	7.2
Pressure or partial pressure	pascals	9.2
Precipitation	mm	7.2
Altitude	m (above sea level)	7.2
Latitude and Longitude	degrees	±8.5

* Format x.y represents a number having a maximum of x digits with y decimal points. For example, format 7.2 may contain the numbers from 0.00 to 99999.99.

Table 5-5. Data Qualification Flags

Code	Name	Description
V0	Valid value	Apply to valid data values.
V1	Valid value but comprised wholly or partially of below-MDL data	Apply to both single and averaged data values.
V2	Valid estimated value	Apply to calculated values, approximate/out-of-range values, and values with EPA "J" flag.
V3	Valid interpolated value	Apply to valid interpolated values. Provide interpolation method in documentation.
V4	Valid value despite failing to meet some QC or statistical criteria	Apply this flag based on evaluation of field and laboratory QC sample data and subsequent statistical outlier tests on the entire data set.
V5	Valid value but qualified because of possible contamination	Apply this flag for possible contamination of blanks and regular samples.
V6	Valid value but qualified due to non-standard sampling conditions	Provide description of sampling conditions or variance from SOP in documentation.
M1	Missing value because no value is available	Use this flag when no result was reported. Identify in documentation the missing value code that is used in the result field.
M2	Missing value because invalidated by Data Originator	Use this flag when the result reported to a site database was invalid. Invalid results are not sent to the NARSTO archive. Identify in documentation the missing value code that is used in the result field.
H1	Historical and third-party data that could not be assessed or validated	Historical data may have been used for preliminary characterization or range finding purposes. Third-party data will also be flagged 'H1.' The validation of both data could not be assessed in the SCPCS. These data will be kept in the SCPCS Data Management Office, but not be submitted to NARSTO Permanent Database Archive.

Figure 5-1. Data Flow



6.0 RECORDS MANAGEMENT

6.1 RECORDS MANAGEMENT SYSTEM

Raw instrument data files and original copies of all site documentation are stored at the SCPCS data management center. Only the site logbooks and instrument logbooks are kept at the monitoring stations. Preliminary data reports will be prepared by the QA/QC Coordinator based on the records sent from site operators once per month. The data packet contains all data collected through the end of the month. The data packet is sent within a week following the end of the data period contained in the packet. These data packets include all information generated during normal site operations including:

- Copies of completed site logbook pages
- Copies of completed instrument logbook pages
- Control charts
- Copies of precision check results
- Copies of calibration forms, if a calibration was performed
- Documentation of any visits by monitoring support personnel

Data quality summary reports (DQSR) will be submitted for each major measurement type and for the laboratory analyses. These reports will summarize the completeness, accuracy, precision, and the lower quantifiable limit (LQL) for each measurement over the entire study period. DQSRs are organized and written for the data user, to enable them to evaluate the uncertainties associated with the data and factor them into their work.

6.2 RECORDS IDENTIFICATION, AUTHENTICATION, AND INDEXING

The NARSTO Quality Systems Science Center has provided a data template (Template_excel_97_19990816 in "Data Exchange Standard Template – Excel 97" in http://cdiac.esd.ornl.gov/programs/NARSTO/) that will be used to format monitoring data generated by the SCPCS. Site identifiers, reporting and formatting conventions, and data flags are discussed in detail in Section 5.

6.3 RECORDS DISTRIBUTION AND STORAGE

In addition to being maintained on the databases presented in Section 5, the data will be submitted to the EPA in two forms. First, the Level 1 validated data will be submitted within 60 days of the monitoring quarter to EPA's web-based data web site or FTP site. Second, within 120 days of the monitoring quarter, data will be submitted to the NARSTO Permanent Data Archive that will be maintained in NASA Langley Research Center

Distributed Active Archive Center.

6.4 RECORDS RETRIEVAL

In addition to access via the NARSTO Permanent Data Archive, a link to SCPCS website (http://www.ph.ucla.edu/scpcs/) will be created to allow remote access of, with secured permission, to the databases through the Internet.

6.5 RECORDS RETENTION

To accommodate data issues that may arise subsequent to the study, all continuous raw data, data processing documentation, and the resulting final data will be stored by the SCPCS for at least five years after monitoring.

SECTION 7

ROUTINE CONTROLS AND PROCEDURES

Standard Operating Procedures (SOPs) for each of the measurement instruments are included in the document "Southern California particle Center & Supersite – Particle Instrumentation Unit (PIU) Standard Operating Procedures" (SCPCS SOPs)[9], which is maintained separately. This document contains a detailed description of the routine operation of all monitoring equipment, including routine quality control (QC) procedures. The remainder of this section briefly addresses the key elements of these routine procedures.

Control and calibration of measurement and test equipment

Table 7-1 summarizes the calibration types and schedule for the PIU instrumentation. Detailed calibration procedures are included in the SCPCS SOPs and associated manufacturers' operating manuals.

Procedures

Routine station check and operational procedures are presented in the SCPCS SOPs. More detailed procedures regarding periodic maintenance and instrument troubleshooting are included in the manufactures' operating manuals, and are referenced by section in the SCPCS SOPs. In the event that procedures are developed that are not included in the manufacturers' operating manuals, they will be detailed in the SCPCS SOPs. Checklists have been developed for each piece of monitoring equipment to document operations.

Establishing the adequacy of technical practices

Whenever possible, existing EPA guidelines and protocols will be used for monitoring operations. However, many of the samplers being used are new technology or experimental in nature, and consequently do not have well established SOPs. As SOPs are developed and refined, they will be included in the SCPCS SOPs. In addition, many of the study goals deal directly with the investigation of the sampling methodology, in which case adequacy of technical practices will be addressed in the study reports.

Maintenance of equipment

Procedures for routine, frequently conducted maintenance of the analyzers and samplers are described in the SCPCS SOPs. More complicated, less frequently performed maintenance items are included in the manufactures' operating manuals, and are referenced by section in the SCPCS SOPs. Instrument-specific logbooks will accompany

Quality of Consumables

NIST-traceable standards will be used whenever possible. All sampling media will be obtained and prepared following existing EPA protocols and guidelines and accepted sampling practices. Specifically, all filters will be carefully inspected prior to use.

Labeling

Since many of the monitoring parameters consist of discrete measurements, proper labeling of samples is critical. Unique sample numbers will be associated with each filter. Figure 7-1 presents the Chain-of-Custody form that will accompany each sample.

Acceptance of equipment and materials

All equipment will be checked out thoroughly prior to routine monitoring. All sampling media will be inspected prior to use.

Storage of equipment and materials

Transport and storage of samples will be conducted under refrigerated conditions at all times, with the exception of gravimetric and metal samples. Portable temperature data loggers accompany the samples to verify storage conditions.

Table 7-1. PIU Calibration Schedule

	Instrument Name	Units	Size/ Range	Flow Rate Calibration Range, LPM	Flow Rate Calibration Frequency	Detector Calibration Description	Detector Calibration Frequency	Comments
1	SMPS	Microns	0.02 - 0.7	0.3 LPM	Monthly/per move	Standard PSL	Per Move	0.03, 0.21, 0.67 microns
2	APS	Microns	0.6 - ~15-20	5.0 LPM	Monthly/per move	Standard PSL	Per Move	0.67, 2.5, 3.6 microns
3	TEOM	mg/m^3	PM10	3.0 LPM	Monthly/per move	Comparative	Quarterly	non-Volatile PM at 50C
4	Partisol	mg/m^3	PM10/2.5	1.67/15.0 LPM	Monthly/per move	Comparative	Quarterly	Mass Balance Meas'
5	DataRAM	mg/m^3	PM 2.5	2.0 LPM	Monthly/per move	Comparative	Quarterly	
6	MOUDI (Rot) *	mg/m^3	Mass/Size	30.0 LPM	per experiment	Comparative	Quarterly	Mass Balance Meas'
7	2-MOUDIs (Non-R) #	mg/m^3	Mass/Size	30.0 LPM	per experiment	Comparative	Quarterly	Mass Balance Meas'
8	Aethelometer	mg/m^3	Submicron	1 - 6 LPM	Monthly/per move	Comparative	Quarterly	
9	Vaisala (Outdoor)	Deg-C/%	NA	NA	NA	Sling Hygrometer	Monthly	PIU Roof
10	Vaisala (Indoor)	Deg-C/%	NA	NA	NA	Sling Hygrometer	Monthly	Inside PIU
11	Met One ^	mph/drctn'	NA	NA	NA	Compas/Voltmeter	Per Move	Compass
12	APS NOx Gas	ppb	0 - 500 ppb	NA	NA	Standard Gas	Per Move	SCAQMD Assisted
13	TEI CO Gas	ppb	0 - 50 ppb	NA	NA	Standard Gas	Per Move	SCAQMD Assisted
14	Dasibi Ozone Gas	ppb	0 - 1000 ppb	NA	NA	Standard Gas	Per Move	SCAQMD Assisted

* Rot = Rotating MOUDI, Non = Non Rotating MOUDI
\# Vaisala unit measures Temp/RH 1
^ Wind System: wind speed and direction

Figure 7-1. SCPCS Chain-of-Custody Form

UCLA's Southern California Particle Center & Supersite

Chain of Custody Documentation

Date Sent	
Sent By	
Type of Sample	
Number of Samples	

Shipper:_____ Tracking Number:_____
Packing Conditions: _____
Attached Documents: _____

Date Received	
Received By	

Condition of Samples: _____

Comments: _____

Date Received	
Received By	

Condition of Samples: _____

Comments: _____

Date Received	
Received By	

Condition of Samples: _____

Comments: _____

Please Complete and Return this Document To:

Southern California Particulate Center Supersite
46-070 CHS
650 Charles Young Drive South

LA, CA 90095
TELEPHONE: (310) 825-9025 Facsimile: (310) 206-9903

SECTION 8

TECHNICAL ASSESSMENT AND RESPONSE

8.1 ASSESSMENT PROCEDURES

Internal Assessment

Maintenance and regular system checks will be performed on a routine schedule for each instrument according to their SOP. The daily data reviews will allow us to detect most problems with continuous instruments within one or two days of occurrence. On each site visit, all instruments will be inspected for problems.

In addition, a technical assessment of the downloaded data will be performed Bi-weekly to control erroneous data.

Preliminary data review steps:

- QA/QC Coordinator (Mr. Ed Avol) reviews running 7-day time series plots M-F by 10am to identify any potential problems or issues to be resolved.
- QA/QC Coordinator calls Field Operations Manager (Mr. Peter Jaques) to confirm that problems are observed mutually.
- Identified (non-DAS) instrument problems will be discussed with the PI (Dr. Costas Sioutas) who will recommend the approach to be used.
- If a solution to the problem cannot be quickly identified and the problem resolved, or if the problem is persistent, then the problem will be discussed with an instrument expert and a more-detailed analysis will be performed.
- If the problem cannot be fixed within several hours, outside repair support (from the manufacturer, for example) may be called in, or the monitor may be swapped with a spare, if available, and repaired later.

External Assessment

The external Quality Assurance Officer (Mr. David Bush) will conduct routine technical systems and performance audits of the PIU.

- Technical systems audits will be conducted to verify that procedures are being followed according to established SOPs. The audit will be conducted using a

systems audit checklist similar to that presented in the Atlanta Supersite QAPP. The systems audit will concentrate on sample handling and chain-of-custody procedures, since the majority of the measurements made at the PIU are discrete filter samples. As part of the systems audit, a siting audit will also be performed. The siting audit will evaluate the representativeness of the site location, checking probe exposures and local sources.

- Performance audits will be conducted to evaluate the accuracy of the measurements by comparing instrument performance against known standards. NIST-traceable standards will be used whenever possible. All standards will be maintained independently from standards used at the PIU. Since the majority of the measurements made at the PIU are of particulate matter, the majority of the performance checks will consist of flow measurements using a Gilibrator 2 automated bubble flow meter. When possible, flow measurements will be made both at the sample train inlet and at the inlet to the sampler in order to verify that the sample train was not damaged in any way during relocation. Similarly, during auditing of the meteorological sensors, emphasis will be placed on verifying the orientation of the wind direction sensor, as this too can be altered during relocation.

8.2 ASSESSMENT EVALUATION

Performance and systems audits of all monitoring instrumentation will be conducted per relocation of PIU (approximately on a 4 to 6 month basis). The audits will be conducted within one month of the relocation in order to quickly identify any problems that may have occurred due to the relocation. Problems noted during the audit will be discussed with the station operators at the time of the audit, and summarized in a formal report within three weeks of the audit.

8.3 ASSESSMENT RESPONSE AND FOLLOW-UP

In the event a potential problem is discovered, the following actions will be taken:

Data reviewers:

- Contact the SCPCS QA/QC Coordinator and/or PI and describe the problem
- The information will be passed to a site operator or to a repair technician who will visit the site within 24 hours

Site operator:

- Contact SCPCS QA/QC Coordinator and describe problem
- Continue to troubleshoot instrument
- Consult SOP and instrument manual first

- Consult measurement specialists and vendor technical support second
- If the problem cannot be resolved within two hours, contact SCPCS QA/QC Coordinator who will arrange for replacement

QA/QC Coordinator:

- Arrange for initial checkout and troubleshooting when first notified
- Arrange for a repair technician or a site operator to take a spare, if available, to the site along with a calibration system
- Replace the malfunctioning equipment, if necessary, according to the SOP and perform a full calibration on the new instrument
- Return the malfunctioning instrument for repair

External Quality Assurance Officer:

- Verify that all issues noted during the external audits are addressed

8.4 QUALITY ASSURANCE FINAL REPORT

The QA/QC Coordinator and Principal Investigator will prepare a Quality Assurance Final Report (QAFR) to summarize the quality management and assessment activities conducted during the previous monitoring period. The scope of a project QAFR will be dependent upon the level of effort involved in the particular project and the end usage of the data generated. A project QAFR should address the following items, as applicable, in sufficient detail to provide the EPA Quality Assurance Manager with a clear understanding of the quality of the data generated:

- Summary of quality assurance and quality control (QA and QC) activities
- Summary of QA and QC problems
- Certification of the implementation of QAPP quality management activities
- Documentation of the implementation of QAPP quality management activities
- Corrective actions
- Technical/statistical evaluation of quality control (QC) data
- Results of audits
- Summary of the uncertainty of the data sets in terms of the MQOs as stated in the QAPP
- Summary of success/failure to meet data quality objectives

SECTION 9

REFERENCES

1. PM Measurement Workshop Report, “Atmospheric Observations: Helping Build the Scientific Basis for Decisions Related to Air Borne Particulate Matter” EPA/NARSTO, October 1998
2. Cooperative Agreement between the National Exposure Research Laboratory at Research Triangle Park of the U.S. Environmental Protection Agency and The Georgia Institute of Technology for The Southern Oxidant Study Phase II Program on Analysis and Assessment of Alternate Strategies, June 1, 1996
3. “EPA Quality Manual for Environmental Programs”, EPA Order 5360.1 CHG1 July 1998
4. EPA QA/G-4, “Guidance for the Data Quality Objectives Process”, EPA document EPA/600/R96/055, September 1994
5. SuperSites Conceptual Plan, Draft prepared by Office of Air Planning and Standard and Office of Research and Development, Research Triangle Park, NC, November 9, 1998
6. Atlanta SuperSite ’99 Study, Draft Protocol June 1, 1999
7. Code of Federal Regulations, Title 40 Part 136, Appendix B
8. Code of Federal Regulations, Title 40 Part 58, Appendix D
9. Southern California Particle Center & Supersite – Particle Instrumentation Unit (PIU) Standard Operating Procedures (SOP), Revision 0, March 6, 2001
10. Federal Register, Vol. 62, No. 138 / Friday, July 18, 1997 / Prepublication
11. “EPA Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Part 1, EPA document EPA-454/R-98-004, August 1998

APPENDIX A

PROJECT SUMMARIES

Initial QA Documentation of Supersite Projects

Project Title:Comprehensive Characterization of Particulate Matter in LAB

Principal Investigator: Sioutas/Hinds Today's Date: June 13, 2000

Project Summary:.
Research projects proposed in this section will aim at characterizing PM and its precursors and will) provide the information that is needed to understand the relationship between PM sources and receptors, as well as providing insight into the factors that affect the spatial and temporal variability of PM characteristics. The relationships between PM components, including their gaseous precursors, are important for the apportionment of PM sources, which permits the development of effective control s strategies. The SCPMS measurements will provide a comprehensive database for the PM10 State Implementation Plan (SIP) and for the Air Quality Management Plan (AQMP

Project Period of Performance:February 2000- december 2004 Project Start Date: February 2000

Sample Collection (what methods will be used?):
SMPS/APS
MOUDI
ADI continuous nitrate, sulfate, carbon monitor

Key Instrumentation (what instrumentation will be used?):
see above

Key Field Investigators (who will collect data?):

Peter Jaques, Seongheon Kim, Bill Grant, Oliver Chang, Suresh

Sample Analyses (what analyses will be done?)):
gravimetry
ion chromatography
thermal desorption for EC/OC
inductively-coupled plasma mass spectroscopy
HPLC

Key Instrumentation (what instrumentation will be used?):

see above

Key Lab Investigators (who will do analyses?):
gravimetry (Kim, Grant, Chang, Suresh)
ion chromatography (Rancho Los Amigos)
thermal desorption for EC/OC (Kochi Fung)
HPLC (Toni Miguel)
inductively-coupled plasma mass spectroscopy (WCAS laboratories)

Analytical Lab Location(where will analyses be done?):
see above

Sample Storage Location (where will samples be kept?):
UCLA school of Public Health

Data Analysis Support (identify who will be performing analyses):
Sioutas; Hinds; Kim, Chang, Jaques

Data Storage Location (where will data be kept?):
UCLA School of Public health

Initial QA Documentation of Supersite Projects

Project Title:Evaluation of Sampling Artifacts of the FRM in Measuring the True PM2.5, PM10 and Coarse (2.5-10 μm) Concentrations

Principal Investigator:Sioutas Today's Date: June 13, 2000

Project Summary: The research hypothesis to be tested here is whether the true 24-hour average PM2.5, PM10 and Coarse (2.5-10 μm) concentrations and those determined gravimetrically with a FRM are the same. In each intensive sampling site, the 24-hour average true actual mass concentrations for PM10, PM2.5 and coarse particles will be compared to those obtained with the FRM to determine how the differences depend on season, temperature, relative humidity, PM mass concentration and chemical composition.
We will estimate the sampling bias of the FRM for both nitrate and organic carbon. This will be expressed as the percentage of the sampling error for different locations and seasons as a function of parameters such as temperature, RH, particle mass concentration, sampling duration,
Project Period of Performance:September 2000- december 2004 Project Start Date: September 2000

Sample Collection (what methods will be used?):
FRM
MOUDI with organic denuder
HEADS sampler

Key Instrumentation (what instrumentation will be used?):
see above

Key Field Investigators (who will collect data?):

Peter Jaques, Seongheon Kim, Bill Grant, Oliver Chang, Suresh

Sample Analyses (what analyses will be done?)):
gravimetry
ion chromatography HPLC (for PAH)
thermal desorption for EC/OC

Key Instrumentation (what instrumentation will be used?):

see above

Key Lab Investigators (who will do analyses?):
gravimetry (Kim, Grant, Chang, Suresh) HPLC (Toni Miguel)
ion chromatography (Rancho Los Amigos)
thermal desorption for EC/OC (Kochi Fung)

Analytical Lab Location(where will analyses be done?):
see above

Sample Storage Location (where will samples be kept?):
UCLA school of Public Health

Data Analysis Support (identify who will be performing analyses):
Sioutas; Hinds; Kim, Chang, Jaques

Data Storage Location (where will data be kept?):
UCLA School of Public health

Initial QA Documentation of Supersite Projects

Project Title:Is 2.5 □m an Appropriate Cutpoint between Coarse and Fine PM in LAB?

Principal Investigator: Sioutas/Hinds Today's Date: June 13, 2000

Project Summary..The studies proposed here will examine the nature of this minimum in the PM mass size distributions, presumably occurring in the 1-2.5 □m range and its dependence on location and season within the LAB. A key issue to be addressed by these studies will be to investigate the extent of contamination of fine particle fraction by coarse particles and vice versa.
The PM10 data will be classified into 3 size groups; 0-1, 1-2.5 and 2.5-10 □m. A 24-hr average chemical profile of each group will be created consisting of the following components: sulfate, nitrate, EC, OC, sodium, ammonium, and crustal plus metals. For each of the 3 size groups, the relative fractions of each chemical component will be determined. Differences between the chemical profiles of sampling location, each size group will be noted as a function of season, relative humidity, temperature, wind direction and sampling location.
Project Period of Performance: August2000- december 2004 **Project Start Date August2000**

Sample Collection (what methods will be used?):

MOUDI

Key Instrumentation (what instrumentation will be used?):
see above

Key Field Investigators (who will collect data?):

Peter Jaques, Seongheon Kim, Bill Grant, Oliver Chang, Suresh

Sample Analyses (what analyses will be done?)):
gravimetry
ion chromatography
thermal desorption for EC/OC
inductively-coupled plasma mass spectroscopy
HPLC

Key Instrumentation (what instrumentation will be used?):

see above

Key Lab Investigators (who will do analyses?):
gravimetry (Kim, Grant, Chang, Suresh)
ion chromatography (Rancho Los Amigos)
thermal desorption for EC/OC (Kochi Fung)
HPLC (Toni Miguel)
inductively-coupled plasma mass spectroscopy (WCAS laboratories)

Analytical Lab Location(where will analyses be done?):
see above

Sample Storage Location (where will samples be kept?):
UCLA school of Public Health

Data Analysis Support (identify who will be performing analyses):
Sioutas; Hinds; Kim, Chang, Jaques

Data Storage Location (where will data be kept?):
UCLA School of Public health

Initial QA Documentation of Supersite Projects

Project Title:Studies of the Occurrence, Frequency and Prevalence of PM2.5 Sub-modes in PM Formation and Growth Mechanisms in Different Locations of the LAB.
Principal Investigator: Sioutas/Hinds Today's Date: June 13, 2000

Project Summary:
Several studies over the past 10 years in Southern California have indicated that the accumulation mode may consist of two sub-modes, one peaking at around 0.25-0.3 □m and the other at about 0.6-0.7 □m the first mode is created by gas-to-particle conversion, whereas the second mode results from growth of hygroscopic sulfate and nitrates. These preliminary studies suggest that PM2.5 in the LAB does not follow the classic Whitby distribution of a single accumulation mode
The occurrence, frequency and prevalence of these modes as well as their chemical composition have their dependence on climatological parameters and geographical conditions within the LAB.
been based on a rather limited number of field tests. The Supersite program offers an opportunity to expand on these studies to improve our understanding on particle formation mechanisms in the LAB and
Project Period of Performance:June 2000- December 2004 Project Start Date: June2000

Sample Collection (what methods will be used?):
SMPS/APS
MOUDI
ADI continuous nitrate, sulfate, carbon monitor

Key Instrumentation (what instrumentation will be used?):
see above

Key Field Investigators (who will collect data?):

Peter Jaques, Seongheon Kim, Bill Grant, Oliver Chang, Suresh

Sample Analyses (what analyses will be done?)):
gravimetry
ion chromatography
thermal desorption for EC/OC
inductively-coupled plasma mass spectroscopy
HPLC

Key Instrumentation (what instrumentation will be used?):

see above

Key Lab Investigators (who will do analyses?):
gravimetry (Kim, Grant, Chang, Suresh)
ion chromatography (Rancho Los Amigos)
thermal desorption for EC/OC (Kochi Fung)
HPLC (Toni Miguel)
ICPMS (WCAS laboratories)

Analytical Lab Location(where will analyses be done?):
see above

Sample Storage Location (where will samples be kept?):
UCLA school of Public Health

Data Analysis Support (identify who will be performing analyses):
Sioutas; Kim, Jaques
Data Storage Location (where will data be kept?):
UCLA School of Public health

Initial QA Documentation of Supersite Projects

D 1 5

Project Title: Measurement of the Spatial and Seasonal Variation of Ultrafine, Accumulation and Coarse PM in the LAB and their relation to sources

Principal Investigator:Sioutas/Hinds Today's Date: June 13, 2000

Project Summary:.The purpose of this research is to determine whether coarse, accumulation and ultrafine particle concentrations are affected mainly by local sources rather than having a uniform spatial distribution. The 24-hour averaged ultrafine number concentrations measured in each site will be correlated to those concurrently measured in the USC Children's Health Study sites . The 24-hour average coarse PM concentrations will be compared to all of the existing monitoring sites operated by AQMD

Project Period of Performance:September 2000- december 2004 Project Start Date: September 2000

Sample Collection (what methods will be used?):
FRM
Condensation Particle Counter

Key Instrumentation (what instrumentation will be used?):
see above

Key Field Investigators (who will collect data?):

Hinds, Sioutas, Zhu

Sample Analyses (what analyses will be done?)):
gravimetry

Key Instrumentation (what instrumentation will be used?):

see above

Key Lab Investigators (who will do analyses?):
Zhu

Analytical Lab Location(where will analyses be done?):
see above

Sample Storage Location (where will samples be kept?):
UCLA school of Public Health

Data Analysis Support (identify who will be performing analyses):
Hinds, Sioutas, Zhu, Kim

Data Storage Location (where will data be kept?):
UCLA School of Public health

Initial QA Documentation of Supersite Projects

Project Title: Physico-chemical characterization of concentrated PM used in ongoing toxicity studies currently under way in the LAB.
Principal Investigator:Sioutas Today's Date: June 13, 2000

Project Summary: The research objectives of this Supersite category will be targeted atmospheric monitoring to address specific hypothesis-driven studies developed by the SCPCS. These studies will make use of a mobile concentrator facility, which will be transported to the SCPCS intensive sites. Exposures to animals or human subjects will be conducted to concentrated ultrafine, fine and coarse PM while detailed physico-chemical characterization of the ambient and concentrated aerosols will be conducted Human and animal inhalation exposure studies using the mobile concentrators will focus on identifying relationships between heath outcomes observed in human and/or animals and the concentrations

Project Period of Performance:March 2000- december 2004 Project Start Date: March 2000

Sample Collection (what methods will be used?):

SMPS/APS	Teflon filters
MOUDI	HDS (honeycomb denuder sampler)
Organic denuder + MOUDI	Dual-beam aethalometer

Key Instrumentation (what instrumentation will be used?):
see above

Key Field Investigators (who will collect data?):

Kim, Chang

Sample Analyses (what analyses will be done?)):

gravimetry	inductively-coupled plasma mass spectroscopy
ion chromatography	HPLC
thermal desorption for EC/OC	

Key Instrumentation (what instrumentation will be used?):

see above

Key Lab Investigators (who will do analyses?):

gravimetry (Kim, Chang)	HPLC (Toni Miguel)
ion chromatography (Rancho Los Amigos)	inductively-coupled plasma mass spectroscopy (WCAS laboratories)
thermal desorption for EC/OC (Kochi Fung)	

Analytical Lab Location(where will analyses be done?):
see above

Sample Storage Location (where will samples be kept?):
UCLA school of Public Health

Data Analysis Support (identify who will be performing analyses):
Sioutas, Kim, Chang

Data Storage Location (where will data be kept?):
UCLA School of Public health

Initial QA Documentation of Supersite Projects

Project Title: Size distribution and spacial variation of PAHs and PAH-quinones in the LA Basin

Principal Investigator: Antonio H. Miguel/John froines/Art Chou Today's Date: 13 June 00

Project Summary:
Measurements of size-resolved PAH and PAH-quinones in sites located near sources and downwind from major sources. Determine whether PAH-quinones are formed during transport, and occurrance of PAH partitioning during aerosol transport across the Los Angeles Basin. Use size-resolved data to estimate respiratory tract deposition; use filter based PAH and EC measurements for source apportionment.

Project Period of Performance: September 2000- december 2004 Project Start Date: September 2000

Sample Collection (what methods will be used?):

Key Instrumentation (what instrumentation will be used?):
PIU: PM2.5 cyclone-denuder-MOUDI-PUF-pump (for Size-resolved species)
Filter based: PM2.5 cyclone-quartz filter-pump (for CHS)

Key Field Investigators (who will collect data?):
Peter Jaques, Seongheon Kim, Bill Grant, Oliver Chang, Suresh

Sample Analyses (what analyses will be done?)):

PAHs and PAH-quinones

Key Instrumentation (what instrumentation will be used?):
HPLC and GC-MS

Key Lab Investigators (who will do analyses?):
Toni Miguel and Arantza E. Fernandez

Analytical Lab Location(where will analyses be done?):
PCAL-UCLA, 51.297

Sample Storage Location (where will samples be kept?):
Freezer, PCAL

Data Analysis Support (identify who will be performing analyses):
Toni Miguel and Arantza E. Fernandez

Data Storage Location (where will data be kept?):
PCAL, freezer 01

Note PCAL = Particle Center Analytical Lab

QA PAH sum sheet_Ed

Initial QA Documentation of Supersite Projects

Project Title:Comparison between the True PM10 and PM2.5 Concentrations and those Determined using Continuous PM Mass Monitors (SMPS, APS, TEOM, CAMM, DataRAM) and Estimation of Sampling Bias
Principal Investigator:Sioutas/Hinds Today's Date: June 13, 2000

Project Summary: Over the past decade, a number of continuous mass monitors have been developed and used in laboratory and field studies (TEOM, DataRAM, CAMM, SMPS and APS)
We will compare the 3-hr, 6-hr and 24-hr average mass concentrations measured with the Tapered Element Oscillation Microbalance (TEOM), the Continuous Ambient Mass Monitor (CAMM), the Real-Ambient Monitor (DataRAM) and the combined SMPS/APS monitors to the true actual mass concentration for PM2.5 and PM10 (e.g., including its volatile components
The 1-hr, 3-hr and 24-hr average mass concentrations of each continuous monitor will be compared and to those concentrations measured by the 24-hour averaged FRM. Data will be stratified by SCPMS sampling site and season
Project Period of Performance:July 2000- december 2004 Project Start Date: July 2000

Sample Collection (what methods will be used?):
SMPS/APS FRM (Partisol)
DataRAM
CAMM

Key Instrumentation (what instrumentation will be used?):
see above

Key Field Investigators (who will collect data?):

Jaques, Suresh, Grant, Kim

Sample Analyses (what analyses will be done?)):
gravimetry

Key Instrumentation (what instrumentation will be used?):

see above

Key Lab Investigators (who will do analyses?):
gravimetry (Grant, Suresh)

Analytical Lab Location(where will analyses be done?):
see above

Sample Storage Location (where will samples be kept?):
UCLA school of Public Health

Data Analysis Support (identify who will be performing analyses):
Sioutas, Hinds, Jaques

Data Storage Location (where will data be kept?):
UCLA School of Public health

Initial QA Documentation of Supersite Projects

Project Title: Size distribution and spacial variation of PAHs and PAH-quinones in the LA Basin

Principal Investigator: Antonio H. Miguel/John froines/Art Chou Today's Date: 13 June 00

Project Summary:
Measurements of size-resolved PAH and PAH-quinones in sites located near sources and downwind from major sources. Determine whether PAH-quinoes are formed during transport, and occurrance of PAH partitioning during aerosol transport across the Los Angeles Basin. Use size-resolved data to estimate respiratory tract deposition; use filter based PAH and EC measurements for source apportionment.

Project Period of Performance:September 2000- december 2004 Project Start Date: September 2000

Sample Collection (what methods will be used?):

Key Instrumentation (what instrumentation will be used?):
PIU: PM2.5 cyclone-denuder-MOUDI-PUF-pump (for Size-resolved species)
Filter based: PM2.5 cyclone-quartz filter-pump (for CHS)

Key Field Investigators (who will collect data?):
Peter Jaques, Seongheon Kim, Bill Grant, Oliver Chang, Suresh

Sample Analyses (what analyses will be done?)):

PAHs and PAH-quinones

Key Instrumentation (what instrumentation will be used?):
HPLC and GC-MS

Key Lab Investigators (who will do analyses?):
Toni Miguel and Arantza E. Fernandez

Analytical Lab Location(where will analyses be done?):
PCAL-UCLA, 51.297

Sample Storage Location (where will samples be kept?):
Freezer, PCAL

Data Analysis Support (identify who will be performing analyses):
Toni Miguel and Arantza E. Fernandez

Data Storage Location (where will data be kept?):
PCAL, freezer 01

Note PCAL = Particle Center Analytical Lab

QA PAH sum sheet_Ed.xls