Monitoring, Source Identification, and Health Impacts of Air Toxics in Albuquerque, NM

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Category: Community-scale monitoring

Project Cost: $ 499,815.00

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1 Project Summary

The City of Albuquerque Air Quality Division (AQD) proposes to carry out a community-scale monitoring program in order to characterize air toxics concentrations and assess their effects on living standards and human health in and around the city of Albuquerque, NM, under the frame of U.S. Environmental Protection Agency "Local-Scale Air Toxics Ambient Monitoring - RFA NO: OAR-EMAD-05-16" solicitation for demonstration projects. The specific tasks of this project are to determine the air toxics concentration gradient (spatial and temporal) and factors (sources, meteorology) controlling their ambient levels, to develop a detailed air toxics database for Albuquerque that will contribute to EPA's Integrated Urban Air Toxics Strategy, and to assess potential health impacts of air toxics using standard EPA models.

The proposed study includes monitoring of most of the 33 high-priority air toxics including volatile organic compounds, carbonyls, polycyclic aromatic hydrocarbons and heavy metals. PM_{10}, $PM_{2.5}$, sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen oxides (NO_x), and meteorological data collected as part of Albuquerque's existing infrastructure will be leveraged for this study. The monitoring strategy includes the year-long sampling of air toxics at three fixed sites and two intensive monitoring periods where ground level and vertical profiles of HAPs and associated pollutants (CO, NO_x, O_3 and PM) will be measured using on-line gas chromatography and a tethered-balloon system. Using the resultant chemical, spatial, and temporal information – compiled into a central project database-, a series of tools will be employed to assess air toxics sources, characterize seasonal and diurnal patterns and spatial variation, and assess the health risk posed to the residents of Albuquerque.

AQD will be responsible for the overall coordination of the study, preparation of sites, and collection of integrated (i.e. 24-h) samples at the three fixed sites. The New Mexico Department of Health Scientific Laboratory Division (SLD) will complete the chemical analyses of integrated atmospheric samples for VOCs, carbonyls and PAHs. The Desert Research Institute (DRI) will develop standard operation procedures for sampling, carry out inorganic (metals and ions) and elemental and organic carbon (EC/OC) analyses, coordinate and conduct the intensive monitoring periods (IMP) – including intensive (1-hr) monitoring of VOC and tethered balloon- based measurements (vertical profiles of VOCs, NOx , O_3, and meteorological parameters). DRI will also be responsible for completing a source apportionment, relating source contributions to measured air toxics, utilizing dispersion models to supplement/confirm source apportionment results, and applying health risk assessment models for Air toxics exposure.

The infrastructure afforded by and the results of this project will allow AQD to determine the air toxics most relevant to Albuquerque, determine their likely sources or source categories, and use experience gained to perform future targeted air toxics and/or risk assessment studies. This information, along with the tools developed and utilized as part of this project, can be modified and used to evaluate air toxics impacts and sources by other local, state, and tribal agencies. If funded, this project would represent the first major effort for AQD - which to date has focused largely on NAAQS compliance monitoring – to preemptively uncover potential air quality health risks and their likely sources.

2 Background

The 1990 Clean Air Act Amendments (CAAA) included the identification and classification of 188 chemical compounds as Hazardous Air Pollutants (HAPs) that require specific attention, long-term monitoring, health-risk assessment and, eventually regulation, because of their association with long-term severe health effects. The implementation of CAAA led to the development of the Integrated Urban Air Toxics Strategy (IUATS) and the Air Toxics Program (ATP) which included the detailed investigation of a subset of 33 HAPs such as aromatic hydrocarbons (e.g. benzene and its derivatives), halocarbons, heavy metals (e.g. As, Hg, Ni), polycyclic aromatic hydrocarbons (PAHs) and diesel particles in order to minimize cumulative public health risks in urban areas. The National Air Toxics Assessment (NATA) program, a major component of ATP, has been developed to monitor ambient concentrations, evaluate the impact of sources nationwide and assess the health risks. Other nation-wide programs such as the Urban Air Toxics Monitoring Program (UATMP) launched in 2001 and the Pilot City Monitoring Program (PCMP) in 2001-2002 include year-long measurements of HAPs in up to 30 urban areas. The outcomes of the NATA program[1] showed that the upper-bound lifetime cumulative cancer risk (54-190 in a million) and hazard index (4.9-27) in Bernalillo County, New Mexico are among the highest estimated in the US, posing a significant public health risk. The AQD was funded by EPA Region 6 for a short term toxics study. Some data from that study appear in Table 1.

As shown in Table 1, the cancer risk and toxicity due to inhalation, calculated using EPA's Prioritized Chronic Dose-Response values[4] for screening risk assessments, indicated that concentration levels of HAPs in the greater Albuquerque area can potentially pose a significant threat to the local population, especially those residing in the vicinity of industrial/commercial/warehousing activities. Based on the findings of NATA[1] and pilot studies[2,3], it is clear that a detailed Air Toxics monitoring study should be carried out in the city of Albuquerque. More recently, the AQD was contacted by citizens groups and neighborhood associations who expressed concerns about the health effects of emissions from nearby industries and urban emissions in general. In addition, the urban area is undergoing tremendous growth which could be contributing to the air toxics problem. The AQD has received funding for limited, small scale survey projects to study localized emissions over a relatively short period of time. The long term data obtained from this proposed project would provide policy makers the information needed for the air shed as a whole as well as problematic community areas. If funded, the proposed work would represent the first major effort by AQD to preemptively gather air quality metrics outside of the mandatory NAAQS monitoring.

Table 1 Urban air toxics data from Rio Rancho, Bernalillo and Albuquerque during the PCMP study [2,3]

Compound	Mean Conc (in μg/m^3)	URE (in m^3/μg)	RfC (in mg/m^3)	Cancer risk (in one million)	Toxicity
Benzene	1.6	7.80E-06	0.03	12.44	0.05
Chloroform	1.5		0.098	0.00	0.01
Dichlorobenzene	0.6	1.10E-05	0.8	6.61	0.00
Ethyl-benzene	0.9		1	0.00	0.00
Dichloromethane	3.5	4.7E-07	1	1.63	0.00
Toluene	4.1		0.4	0.00	0.01
Xylenes	2.1		0.1	0.00	0.02
Formaldehyde	2.9	5.5E-09	0.0098	0.02	0.30
Acetaldehyde	2.5	2.20E-06	0.009	5.54	0.28

3 Objectives

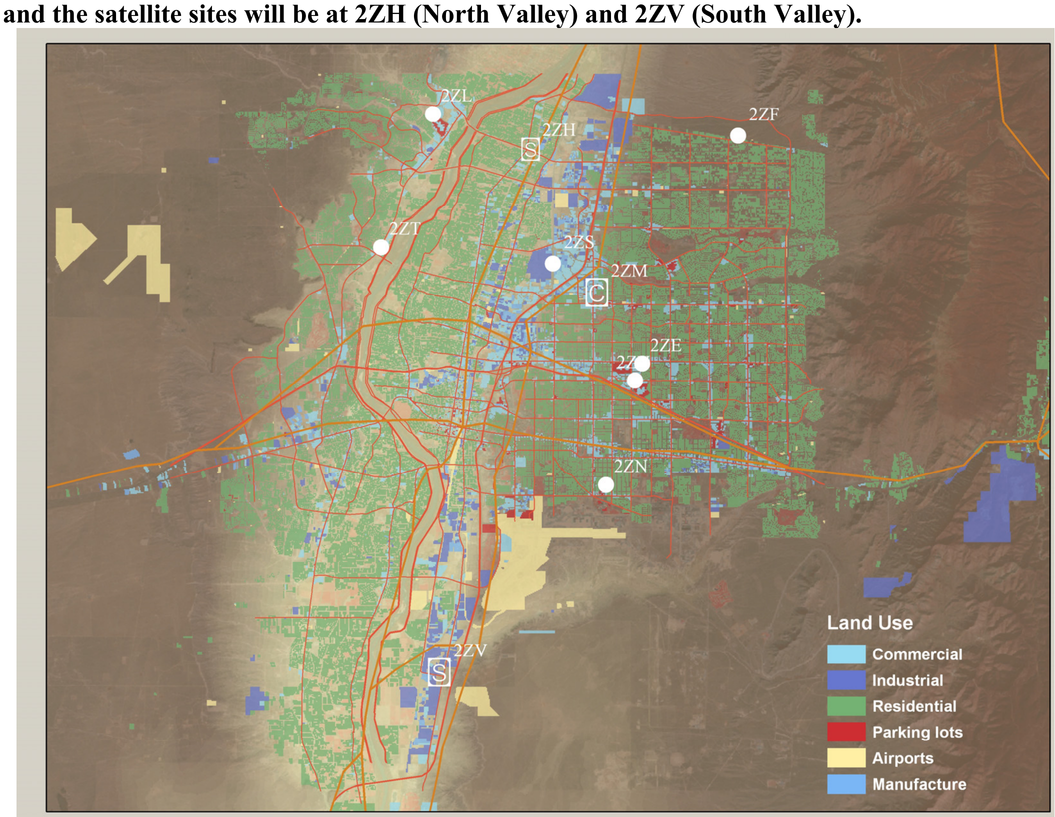
The overall goal of this study is to measure the concentrations of toxic air pollutants, characterize their temporal and spatial gradients, identify their potential and likely sources, and determine the associated health risks. Efforts are focused on volatile organic compounds (VOCs), heavy metals and persistent organic pollutants, e.g. polynuclear aromatic hydrocarbons (PAHs). The specific objectives of the proposed work plan are:

1. develop a HAPs monitoring network
2. measure ambient concentration levels of HAPs within specific community settings and geographic and demographic regions in the city of Albuquerque
3. assess spatial variations in HAPs concentrations
4. identify and evaluate the impact of local HAPs sources
5. quantify the relative contributions from local sources and long-range transport to HAPs
6. determine the impact of meteorological conditions on diurnal, daily, and seasonal time scales
7. assess adverse health impacts from exposure using risk assessment models
8. emplace infrastructure within the City of Albuquerque Air Quality Department for future efforts in air toxics assessment.

4 Site Description and Methodology

A map of the Albuquerque area, showing major interstate highways, land use and the 10 existing local air quality (AQ) monitoring sites is presented in Figure 1. As NM's largest city, Albuquerque has almost 500,000 residents (about 800,000 for the greater Albuquerque metropolitan area). The city is located by the Rio Grande River and the intersection of I-40 and I-25 highways. It is divided into ten distinct communities, namely, Northwest Mesa, Southwest Mesa, South Valley, Central Albuquerque, North Valley, Near Heights, Mid-Heights, East Gateway, Foothills, and North Albuquerque. Urban growth and recent improvements in the transportation network have contributed to Albuquerque's development of industry and as a regional service area. The major industries include manufacturing (electronic equipment, semiconductors, missile guidance systems, surgical appliances, transportation equipment and parts), printing and publishing, and food processing. The U.S. Air Force, the Department of Energy, and the University of New Mexico are major regional employers who have processes that are permitted by the AQD. The principal point sources in the area are two gas-fired power plants and a coal fired cement plant. The coal-fired Four Corners Power Plant is one of the largest fossil-fuel steam-driven power plants in the world. There is also a power plant to the west, between Grants and Gallup. Other facilities include production of perlite, pumice and mica. The state also has oil refineries located in communities outside of Albuquerque. Most of these activities are controlled through the Maximum Achievable Control Technology (MACT) standards (Section 112j of the Clean Air Act)[5]. The City of Albuquerque and County of Bernalillo have their own jurisdiction and the applicable policies are promulgated by a local Air Quality Control Board

Figure 1. Map of Albuquerque, NM showing major highways, land use and the existing air quality monitoring sites (white bullets). The reference site for the proposed study will be at 2ZM (Del Norte Mid School) and the satellite sites will be at 2ZH (North Valley) and 2ZV (South Valley).



4.1 Project coordination

In order to maximize efficiency, the project tasks are divided among the partners according to expertise (AQD: Air Quality Department; SLD: Scientific Laboratory Division and;

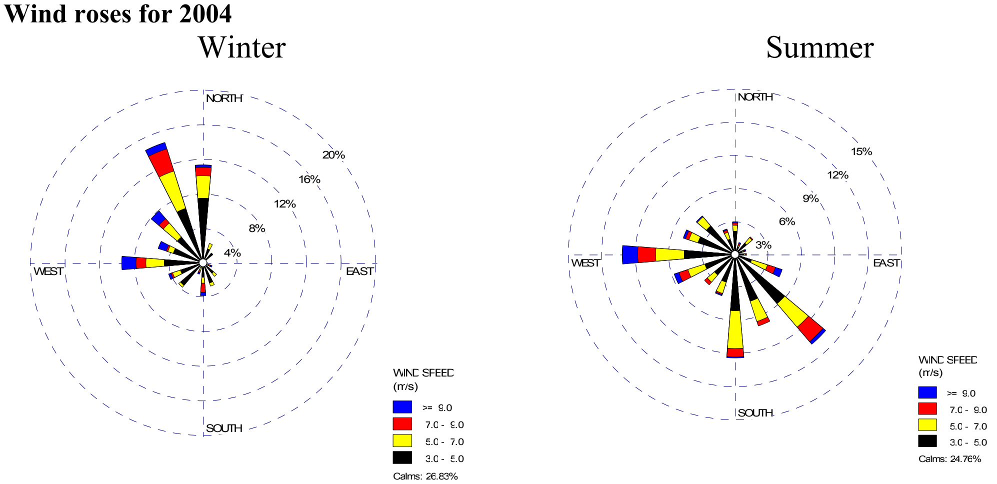
DRI: Desert Research Institute). The Project will be managed by AQD. During the “kick-off” meeting, a Project Committee (PC) will be formed; its members will be associated with the partners and other stakeholders who wish to participate including the State of New Mexico, EPA Region 6, and community groups. The PC will provide support by establishing and agreeing on management procedures, facilitating coordination, reviewing documents, ensuring that deadlines are met, and meeting on an as needed basis. General meetings will be held twice a year for the duration of the project. Between meetings, electronic mail will be the main communication medium.

4.2 Monitoring strategy

4.2.1 Sampling sites

Analysis of local meteorological data for 2004 from National Weather Service Climate Station (Eagle II METAR; Lat. 35° 9’ Lon: 106° 48’) indicated a strong seasonal wind pattern. North-northeasterly winds prevail during the winter time, while southerly/southeasterly and westerly winds are more common during the summer (Figure 2). Based on these wind patterns, one reference (C) and two satellite sites (S) are proposed for the study (See Figure 1).

Figure 2. Wind roses for 2004



<u>Reference site: (“C” in Figure 1):</u>

The reference site will be collocated with the existing 2ZM site (Del Norte High School; EPA Site ID: 350010023), northeast of the intersection of I-25 and I-40. This area contains more than 2 million square feet of retail stores and draws business to the city of Albuquerque and a number of industrial activities. O_3, PM_{10}, $PM_{2.5}$ CO, NOx and meteorological parameters are currently monitored at this site by AQD. In addition, this site has been used in a previous pilot-scale air toxics study (PCMP [2],[3]). A major source at this site is the high density traffic from the nearby intersection of San Mateo and Montgomery. There are also a number of area sources such as filling stations, dry cleaners and automotive repair shops.

<u>Satellite sites (“S” in Figure 1)</u>:

2ZH (North Valley; EPA Site ID: 350011013) is located northwest of the reference site, in the North Valley community. One of the major sources in the area is the Intel computer chip manufacturing plant which is about two miles to the northwest. Other area sources include filling stations and emissions from sand and gravel plants to the southeast. The area is also home to mixed agricultural use, though urban infill of open areas is starting to increase. O_3, CO, and PM_{10} and $PM_{2.5}$ (TEOM) are currently measured at 2ZH.

2ZV (South Valley, EPA Site ID: 350010029) is located south-southwest of the reference site, in the South Valley community, which represents a diversity in land use characterized by a mix of urban and rural population densities as well as industrial and commercial expansion. Urban growth began spreading into the South Valley from the north and along its major streets. Industrial activities include a power station, the City sewage treatment plant, asphalt plants and tanks farms, auto dismantlers, brick manufacturing, a chicken farm, and a meat packing plant. Complaints about poor air quality, roads and street lighting, ground water pollution and growth pressures are frequently expressed by community groups to local authorities. O_3, PM_{10}, and meteorological parameters are monitored continuously at 2ZV, which has been used in prior pilot-scale air toxics studies (PCMP [2],[3]).

4.2.2 Sampling duration and frequency

The following sampling scheme is proposed:

- Year-long sampling at the three fixed sites with a collection frequency of 1 in 6 days starting on March 1, 2005 (6-th project month)
- Two one-week intensive monitoring periods (IMPs) with continuous monitoring of ground level HAPs and vertical profiling of VOCs, commonly associated pollutants, and meteorological parameters

4.2.3 Measurement methods

a. Volatile Organic Compounds (VOCs)

Method TO-15[6] will be used to measure 12-hr and 24-hr integrated VOCs. Ambient samples will be collected using CS1200 samplers equipped with TM1000 Start/stop timers and 6-L SUMMA canisters. The State Laboratory Division (SLD) will perform the sample analyses using an Entech 7100 Preconcentrator and a Carlo Erba GC-8060 equipped with a Fisons MD-800 mass spectrometer. 1-hr measurements of VOCs during the IMPs will be carried out using a compact gas chromatograph equipped with a sample dryer and ozone scrubber, a dual trap TO-14 air concentrator placed in a cryo-cooled Peltier trap, PID and a combination FID/ECD detectors, vacuum pump and control interface, temperature programmable column oven, built-in "whisper quiet" air compressor, and 60-meter capillary column and an on-column injector. To eliminate the need for gas cylinders, a hydrogen generator for both carrier and FID combustion gases will be used. Concentrations of the following VOCs will be measured (Target HAPs are in bold letters): **Vinyl chloride, 1,3-Butadiene, 1,1,-Dichloroethene, Methylene chloride, Chloroform, Benzene, Acrylonitrile, Carbon tetrachloride, Trichloroethene, 1,1,2,2-tetrachlroethane, *cis*-1,3-Dichloropropene,** Trichlorofluormethane**,** m-Xylene, 1,2-Dichloroethane, o-Xylene, Bromomethane, p-Xylene Chloroethane, Dichloro-difluoromethane, 1,2-Dichloropropane, Styrene, 1,1-Dichloroethane**,** 1,3,5-trimethylbenzene, cis-1,2-Dichloroethene**,** 1,2,4-trimethylbenzene**,** 1,1,2-Trichloroethane, 1,3-Dichlorobenzene Toluene, 1,4- Dichlorobenzene 1,2-Dibromoethane, 1,2-Dichlorobenzene**,** Tetrachloroethene, 1,2,4-Trichlorobenzene, Chlorobenzene, Hexachloro-1,3-butadiene, Ethyl-benzene, Trichlorotrifluoroethane, Chloromethane, Dichlorotetrafluoroethane

b. Carbonyls

Carbonyl samples will be collected using an active dinitrophenylhydrazine (DNPH) cartridge (6 mm OD X 140 mm Length). Formaldehyde and other aldehydes react with DNPH to form stable hydrazones, which are extracted from the silica gel and analyzed by liquid chromatography with fluorescent detector by SLD according to TO-11A[7]. A programmable pump with flowrate of 200 ml/min will be used to draw ambient air through the DNPH cartridge. The following carbonyls will be measured: **Formaldehyde, Acetaldehyde,** Acetone.

c. Heavy metals

PM_{10} samples will be collected using a medium flow air sampler consisting of an inlet, a PM_{10} impactor for size separation of airborne particles and a final filter. The system also includes a blower, blower speed control, and instrumentation for flow measurement. A seven-day solid-state timer allows up to 14 programmable starts and stops of the system. All filters will be analyzed for particle mass and elemental composition by the Environmental Analysis Facility (EAF, DRI, Reno, NV) by energy dispersive X-ray fluorescence[8]. Standard operating procedures, quality control performance tests, and inter-laboratory comparisons have been established for these routine analyses. The following metals will be measured: **Be, Hg, Ni, Mn, Cr, Pb, Ar,** Si, Cl, Cu, Sn, Al, Mg, Zn, Sb, K, Br, Se, Ba, Fe, V, Rb, Ca, S, Sr, Ti, P, Mo, Na, Co, Cd,

d. Polycyclic Aromatic Hydrocarbons (PAHs), elemental (EC) and organic carbon(OC)

12-h and 24-h gas-phase and particle-bound polyaromatic hydrocarbons will be collected using a high volume sampler based on TO-13A[9]. A 8" x 11" quartz fiber filter (QFF) will be used to collect particles prior to collection of organic vapors by a 7" x 6" polyurethane foam (PUF) cartridge at a flowrate of up to 1.1. m^3/hour. QFFs and PUFs will be analyzed separately using a high resolution Varian 3380 gas chromatograph equipped with a Saturn 2200 tandem ion-trap mass spectrometer in electron ionization mode. Analysis will be carried out by SLD laboratory using the EPA Methods 8279C protocol[10]. A portion of the pre-fired QFF will be analyzed for elemental and organic carbon content (EC/OC) using the thermal optical reflectance method. EC/OC analysis will be conducted at DRI's EAF lab. The following PAHs will be measured: **Benzo[a]anthracene, Benzo[b]fluoranthene, Benzo[k]fluoranthene, Benzo[a]pyrene, Chrysene/Triphenylene, Dibenz[a,h]anthracene, Indeno[1,2,3-cd]pyrene,** Naphthalene, Phenanthrene, Acenaphthene, Pyrene, Acenaphthylene, Benzoic acid, Anthacene, Benzyl alcohol, Fluoranthene, 2-Chloronaphthalene, Fluorene, 4-Chloroaniline and Methyl-Naphthalenes.

4.2.4 Vertical profiles of Meteorological parameters, VOCs, NO_x, O_3 and PM_{10}

A Vaisala DigiCORA Tethersonde system with a Tethered Balloon will be used during the IMPs to obtain information about the vertical profile of HAPs, associated air pollutants, and the boundary layer. The balloon system can be equipped with a combination of instruments. Those available for the study include three tethersondes (continuous measurements of wind speed, direction, temperature, relative humidity, barometric pressure), three tethered ozonesondes (continuous measurements of ozone), a nephelometer (TSI, Model 8520), ppbRAE plus (total VOCs measurements) and a tethered NO_xsonde (NO_x measurements). In addition to vertical profile measurements, HAPs integrated samples may be collected aloft using a light-weight sampling device. These data along with on-line ground-level measurements will provide useful insights and details about the coupling among HAPs levels, sources and meteorology. In addition, vertical profile data will be used to "ground-truth" dispersion model results (See 4.4.2) and assess the contribution of regional-transported HAPs.

4.3 Quality assurance/quality control

If this proposal is awarded, a detailed Quality Management Plan (QMP) and Quality Assurance Project Plan (QAPP) will be prepared and forwarded to the US EPA Region 6 before monitoring begins (EPA-454/R-01-007). The project partners will develop and submit a Data Quality Objectives to EPA Region 6 (EPA/600/R-96-055), which will include a sampling frequency of 1 in 6 days, at least 5% field blanks and 10% collocated duplicates. Standard operating procedures will be developed and submitted to EPA Region 6 for all the ambient air measurements proposed, including those where non-standard technologies are slated for use.

4.4 Data management and analysis

A detailed central database (CD) will be developed by DRI and maintained at AQD. Data from the study along with supplemental NAAQS and meteorological data will be uploaded and archived at the CD. Data analysis will be carried out using a combination of tools including statistical analysis, air mass backward trajectories analysis, and geospatial analysis. Statistical analysis will include analysis-of-variance, cluster analysis, single linear regression and mixed linear models to evaluate the effect of sites, seasons and other area-specific parameters on air toxics concentrations. Data obtained during the two IMPs will be used to determine temporal (diurnal scale) and vertical variations in HAPS concentrations.

4.4.1 Receptor modeling

The Positive Matrix factorization (PMF) receptor model will be used in this proposed project to identify the major sources of PM_{10} in the study area and to estimate the contributions of major sources and source types to the PM_{10} mass. PMF is a recently developed least squares formulation of factor analysis with built-in non-negativity constraints[11]. The fundamental principle of PMF modeling is that a mass balance analysis can be used to identify and apportion sources of airborne particulate matter in the atmosphere[11.12] based on chemical speciation of ambient samples. In order to achieve statistically meaningful results using the PMF source appointment model, a relatively large number of samples is needed. In this study, the measured PM_{10} chemical speciation data from 60 samples collected at each of the three sites will serve as the PMF inputs. PMF source appointment results will be compared with the air toxics data to investigate the relationship between the aerosol sources and ambient concentrations of the toxic components. Initially, PMF will be attempted using all of the chemical data collected as part of the study including HAPS concentrations. However, we expect that due to their reactive nature, using PMF directly (or any statistical source apportionment model) on air toxics concentrations is not likely to yield useful results. Therefore, we also propose to use only the traditional aerosol chemical characterizations (metals, ions, EC/OC) to perform the brunt of the source apportionment. Results of the source apportionment would then be combined with ambient air toxics concentration information to determine relationships between source contributions and air toxics measured at the receptor sites. The strength of this latter type of analysis is the combined investigation of PMF outcomes, local meteorology, and HAPs measurements in order to extract useful relationships among these parameters and assess source impacts.

4.4.2 Air transport characterization

A combination of transport models and analysis of the existing meteorological monitoring data will be applied in order to understand the transport of pollutants in the Albuquerque area. A wind rose analysis of the existing surface meteorological network will be completed to help understand inter- and intra-valley differences in wind flow patterns. The analysis will look at up- and down valley as well as up- and down-slope winds from the mountains in the context of diurnal and seasonal cycles. The CALMET diagnostic meteorological model will be used to generate local-scale wind fields within the greater Albuquerque area. CALMET will be run with hourly data from the existing City of Albuquerque meteorological monitoring network and airport radiosondes. CALMET may also be run in a mode that uses meteorological model calculations from the EDAS, RUC or MM5 models. Tethersonde data collected during the IMP will be used to supplement the upper air measurements taken at the airport and as input to CALMET. The CALMET model output will be necessary for running a local dispersion model such as CALPUFF. To obtain a regional perspective (and identify regional transport of HAPS), HYSPLIT will be employed to calculate multi-day back-trajectories. The inputs for HYSPLIT are provided by either the 40-km or 12-km EDAS model data from NOAA's Atmospheric Research Laboratory. Since comprehensive toxics emission inventory is neither part of this proposed work nor available for the Albuquerque area from prior studies, a reasonably accurate cumulative source dispersion modeling analysis will not be possible. Dispersion modeling will be employed in some specific cases for hypothesis testing, assessing the impacts of major, identifiable sources of air toxics, and estimating concentrations far away from the three fixed monitoring sites. In such cases we propose to use the Industrial Source Complex Short Term model (ISCST3) which is recommended in EPA guidance on urban scale toxics modeling (U.S. Environmental Protection Agency, 1999a) or CALPUFF for point and area sources and CALINE for mobile sources or a combination of all three.

4.4.3 Exposure and risk evaluation

The EPA-approved model HAPEM5 will be used to estimate personal exposure based on collected data, modeled ambient concentration, activity patterns and, micro-environmental factors (penetration and proximity factors). The HAPEM5 requires annual-averaged, diurnally distributed air quality data in the ISCLT format. Activity pattern data will be acquired from EPA's Consolidated Human Activity Database (CHAD). The U.S. Census Bureau is the primary source of most population demographic data divided into a set of cohorts based on age and gender. In addition, the inhalation tool, TRIM.expo module, will be employed to predict exposures of population to HAPs. A screening risk assessment tool will be initially used to assess the health risk because of long-term exposure to HAPs. In particular, the EPA's prioritized Chronic Dose-Response Values for non-cancer and cancer will be used to estimate the Cancer Risk and Hazard Index for target HAPs. In addition, the TRIM.Risk, module will be used to join the information on exposure (HAPEM5/TRIM.Expo) with a dose-response model. This will provide a first-order estimate of inhalation cancer risks and non-cancer hazard indices at both the individual and population level.

5 Schedule

The study is divided into eight subtasks as shown in Table 2.

Table 2. Schedule and milestomes

Task/month	1	6	12	18	24
Project management					
Air toxics sampling					
Intensive monitoring					
Chemical analysis					
Modeling					
Health risk assessment					
Meetings					
Reports					

6 Budget Information

The budget is divided as follows:

Category	Estimated Cost	Comment
Personnel	$ 0	
Fringe benefits	$ 0	
Partnership costs	$ 328,165	Desert Research Institute (See DRI budget breakdown below)
Travel	$ 15,000	
Equipment	$ 55,000	4 sets of high-volume (for PAHs), med-volume (for heavy metals and EC/OC), Canisters and DNPH samplers
Supplies	$ 11,200	Canisters, DNPH cartridges, filters and PUF plugs
Other	$ 90,450	For chemical analysis of VOCs carbonyls, and PAHs by Scientific Laboratory Division (SLD)
Total Direct Costs	$ 499,815	
Total Indirect Costs	$ 0	
Total Cost	$ 499,815	

The Desert Research Institute budget of $ 328,165 is detailed as follows:

- $ 81,565 for professional salaries
- $ 31,158 for fringe benefits
- $ 20,300 for travel for meetings and intensive field studies
- $ 38,000 for capital equipment
- $ 38,672 for expenses related to chemical analysis by EAF
- $118,470 for Indirect Cost Recovery

7 Personnel

Mr. Louis Jaramillo is a supervisor in the Albuquerque Air Quality Division. He was previously the supervisor of the Remote Sensing Section of the Vehicle Pollution Management Division. He has 18 years experience in environmental Health, the last six of those in Air Quality. Mr. Jaramillo's duties include coordinating public health initiatives with community groups and neighborhood associations. He was responsible for conducting community meetings and coordinating grant applications for special monitoring projects. Mr. Jaramillo has also collaborated on community projects with the NM Department of health, the NM Environment Department, Masters of Public Health program and the Bernalillo county office of environmental health. Mr. Jaramillo has an MS from NM state university and a Masters in Public Health from UNM.

Dr. Ilias Kavouras will be the study lead investigator and principal contact for the Desert Research Institute. He will be assisted by Dr. Vic Etyemezian, Dr. David DuBois, and Dr. Jin Xu. Dr. Kavouras is an air quality scientist with the Division of Atmospheric Sciences, in Las Vegas, Nevada. His research background includes atmospheric chemistry, methods development, exposure measurement and assessment, and health risk assessment. As a post-doctoral researcher at Harvard School of Public Health, he was involved in development of aerosol sampling methods including personal and high-volume monitors, receptor modeling, and air quality monitoring. During his affiliation with the National Observatory of Athens as a Research Assistant Professor, he conducted studies on measurements of ambient (indoor/outdoor) and personal exposure to PM, VOCs, O_3 and NO_2, ambient monitoring and source emissions (stationary sources) of HAPs (VOCs, PAHs, PCBs, and PCDD/Fs), and evaluation of occupational exposure to HAPs using biological markers.

Dr. Etyemezian currently holds the position of Associate Research Professor in the Division of Atmospheric Sciences of the Desert Research Institute, where he conducts research and air quality studies. Dr. Etyemezian has served as PI and Co-PI on numerous past and ongoing studies. His research interests and specialties include direct measurement and quantification of fugitive dust emissions, source apportionment, design of field sampling campaigns for air quality studies, data management, data analysis, and use of GIS systems in air quality engineering. Dr. Etyemezian will provide technical assistance in analyzing data and compiling reports during this study.

Dr. Jin Xu is an Assistant Research Professor in the Division of Atmospheric Sciences of the Desert Research Institute. Dr. Xu's general research interests and specialties include formation, transport and deposition of atmospheric aerosols, influence of aerosols on regional haze and climate change, and atmospheric chemistry and radiative transfer modeling. In his present position, Dr. Xu is PI or Co-PI in several ongoing research projects including WRAP Causes of Haze Assessment, Columbia River Gorge National Scenic Area Air Quality Study, Upper Air Wind Measurements in Clark County, NV, and Aerosol Light Absorption and Climate: Quantification by the Photoacoustic Method. Dr. Xu is expert at using the PMF and other source apportionment models and is in the process of completing a PMF study for every IMPROVE site in the western US.

Dr. Dave DuBois currently holds the position of Assistant Research Air Quality Scientist in the Division of Atmospheric Sciences at DRI. Dave's research interests and specialties include the design and evaluation of air quality networks, applications of GIS to air quality problems, atmospheric dispersion modeling and remote sensing. Prior to DRI, Dr. DuBois managed the dispersion modeling and emission inventory section at the New Mexico Environment Department. During that time he oversaw and reviewed dispersion modeling demonstrations for hundreds of air quality permits. He also participated in regulation and state implementation plan development, permit enforcement, fugitive dust control strategies, prescribed fire permitting, and monitoring network design and evaluations.

8 References

[1]. Data were obtained from http://www.epa.gov/ttn/atw/nata/maprisk.html

[2]. Corrales Environmental health Evaluation Community Process Summary Report. The New Mexico Environment Department, June 2004

[3]. (http://www.nmenv.state.nm.us/aqb/projects/Corrales/report/Summary-Project-Report.pdf)

[4]. Air Toxics Pilot Study Laboratory Intercomparison, Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, EPA-454/R-02-004, April 2002

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