NARRATIVE PROPOSAL

A. PROJECT TITLE: Evaluations of Local- and Community-Scale Monitoring for the San Francisco Bay Area Community Air Risk Evaluation (CARE) Program

B. CATEGORY: Community-Scale Monitoring

C. APPLICANT INFORMATION:

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D. FUNDING REQUESTED: $749,758 for a period of two years.

E. TOTAL PROJECT COST: The total project cost is approximately $975,558. The Bay Area Air Quality Management District (BAAQMD) will contribute approximately $225,800 over the course of the monitoring project and $749,758 will be provided by the requested EPA grant. These costs exclude the substantial in-kind resources that have been committed for developing a gridded air toxics emissions inventory, the local-scale dispersion modeling conducted by the California Air Resources Board (CARB) for the Port of Oakland, and the regional modeling that will be conducted by the BAAQMD. These costs also exclude BAAQMD staff time to plan and conduct the study and incorporate study findings into our ongoing Community Air Risk Evaluation (CARE) program.

F. PROJECT PERIOD: The project is expected to start in July 2007 and conclude in 2 years.

G. PROJECT DESCRIPTION

1. Background Information

The BAAQMD has initiated a Community Air Risk Evaluation (CARE) program, with an annual budget of over $1 million, to estimate health risks associated with exposure to toxic air contaminants (TACs) within the nine counties of the San Francisco Bay Area. Its objectives are to identify high risk communities – those with high toxic emissions and sensitive populations – and to use the information to help the BAAQMD and other public and private entities to establish policies on incentive funding, regulation development, and other programs to reduce toxic emissions in high risk communities (BAAQMD, 2006).

The CARE program consists of three phases over a period of five years beginning in July 2004. A preliminary gridded (2x2 km) emissions inventory of TAC was developed for the year 2000 in Phase I, and demographic and health-statistics data were compiled to help identify high risk communities. Based upon toxicity-weightings of these emissions, diesel particulate matter (DPM) accounts for about 80% of the cancer risk from airborne toxics in the Bay Area and acrolein is the major contributor to both acute and chronic non-cancer health effects. Relative risks estimated from the inventory matched those estimated from measured ambient concentrations within the range of uncertainty of the measurements.

Phase II of the CARE program will include regional modeling by the BAAQMD to estimate the spatial and seasonal variations in ambient TAC concentrations throughout the Bay Area and local-scale modeling (using CALPUFF) by CARB and BAAQMD as part of a Health Risk Assessment (HRA) study of diesel emissions at and near the Port of Oakland. In Phase II, the BAAQMD will refine and update the year-2000 annual TAC emissions to 2005 and will begin regional modeling with the updated inventory to estimate concentrations of TAC. As part of the HRA study, an inventory of diesel emissions for the Port of Oakland, the Union Pacific (UP) rail yard, and surrounding West Oakland community is being developed. Figure 1 shows the source areas for DPM emissions used for modeling in the West Oakland HRA. The current schedule calls for completing the HRA by fall of 2007. In Phase III, the regional modeling of TAC concentrations will be refined and more detailed assessments of exposure will be made using measurements, surveys and modeling. The findings from these studies will be used to help develop mitigation measures to reduce exposure to toxic compounds, especially for sensitive populations.

Two previous pilot-scale studies conducted in West Oakland include aethalometer measurements of black carbon inside two West Oakland homes (Wu, 2003) and an EPA-funded pilot indoor-outdoor study of ten West Oakland homes (Palaniappan and Smorodinsky, 2006).

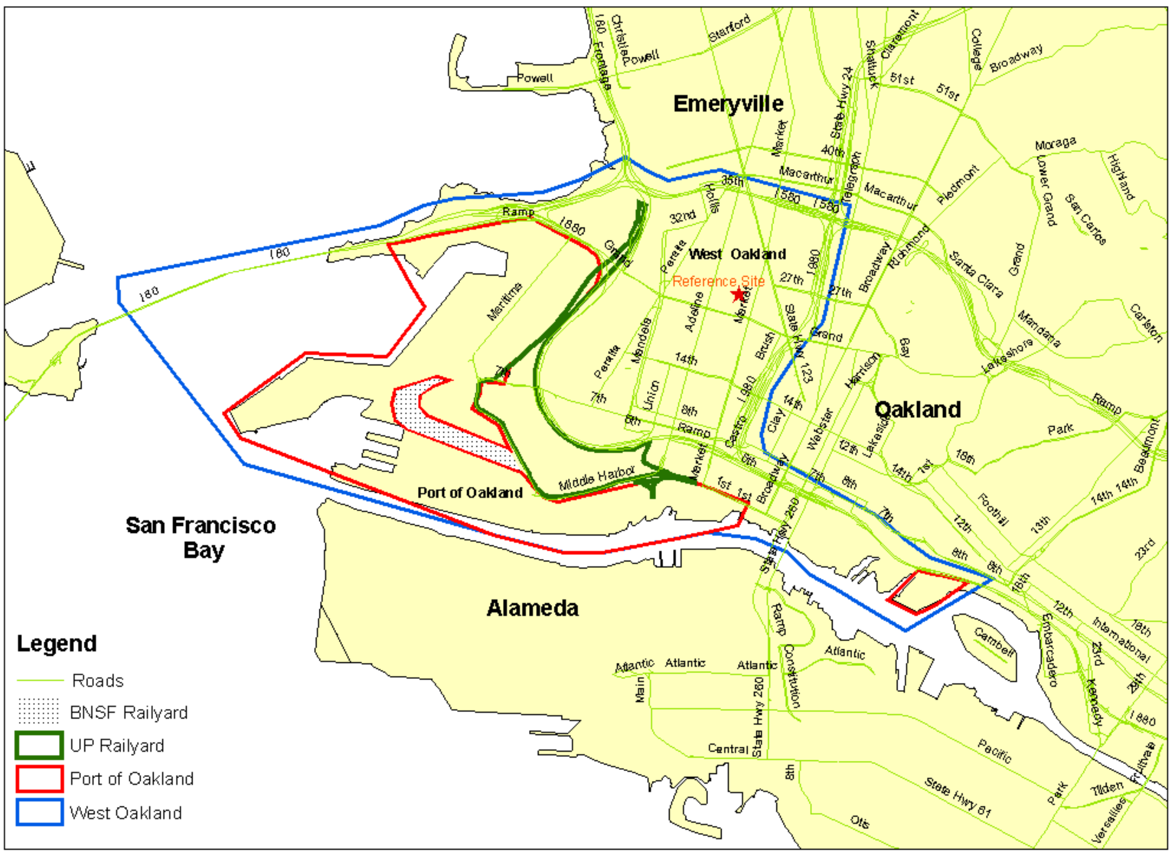

Figure 1. Bold colored lines demark boundaries of source areas for health risk assessment modeling of diesel PM in West Oakland. The red star indicates the Reference Site monitoring location.

2. Project Objectives

Both regional- and local-scale modeling have uncertainties that result from their formulation and inputs (i.e., emissions, source characteristics, upwind background concentrations, and meteorology). Ambient measurements are used to estimate annual average exposure concentrations and can be used to evaluate modeled air toxic concentrations. However, data from the BAAQMD's existing network of 23 air toxic monitoring stations are not sufficient to characterize the concentration gradients in proximity to emission hotspots or the ranges of peak exposure concentrations within various microenvironments. Furthermore, no method is available to directly measure ambient concentrations of DPM, and the uncertainties associated with estimates of DPM from surrogates, such as elemental carbon, have not been adequately characterized. Two other key TACs, 1,3-butadiene and acrolein, are difficult to measure due to sampling and/or analysis artifacts.

This proposal addresses the community-scale monitoring category of the RFP (EPA-OAR-OAQPS-07-01) by providing the supplemental air monitoring that will be required to support the objectives of the CARE program. The local- and micro-scale air toxics monitoring data described in this proposal will be used to evaluate and validate the local-scale dispersion modeling of diesel emissions for the area within and around the Port of Oakland and the regional-scale modeling of DPM and other TACs within the San Francisco Bay Area. Additionally, the supplemental monitoring data will be used to identify emission hotspots and evaluate pollutant levels in other microenvironments, including indoor, that are not accurately represented by the modeling. These measurements will also provide input into the CARE program Phase III assessment of population exposure.

3. Project Tasks

The monitoring program will consist of both saturation monitoring (multiple fixed ambient sampling locations) and mobile sampling with both time-integrated sampling and continuous monitors to obtain the spatial and temporal resolution necessary to identify potential air toxic hot spots and determine gradients of air toxic concentrations within West Oakland. Additionally, the measurements will include in-vehicle exposures and other potentially important microenvironments including indoor environments. Because there is no direct measure of DPM, the use of black carbon (BC) or elemental carbon (EC) as a surrogate for estimating DPM will be evaluated by relating BC and $PM_{2.5}$ concentrations along major roadway and near-road locations with traffic consisting of varying proportions of diesel and gasoline vehicles and in residential areas on nights with and without wood combustion. Finally, recently developed methods for measuring 1,3-butadiene and acrolein that address known sampling artifacts will be used and compared to methods that have been commonly used in air toxic monitoring programs.

The BAAQMD will seek assistance and input from active community groups in West Oakland to identify potential monitoring locations, develop recruitment materials, and conduct participatory research with follow-on community outreach.

<u>Task 1: Establish spatial gradients in annual-averaged ambient concentrations of TACs within the West Oakland Area.</u>

<u>Task 1a. Integrated sampling at Core Sites.</u> The core component of the supplemental monitoring program will consist of seven-day time-integrated sampling at up to 15 sites in West Oakland and nearby communities for four consecutive weeks in four seasons during 2008. This approach is proposed in order to maximize the number of sampling sites with the resources available while providing sufficient data to determine valid annual average ambient concentrations of TACs at each site. Most of the sampling sites will be private residences located throughout West Oakland at varying distances from the Port of Oakland to characterize the spatial variations in TAC concentrations within the community. Additional sampling sites will be located near sources (e.g., major roadways and adjacent to the Port) to reflect their higher exposure concentrations due to proximity to emission sources (see Tasks 4 and 5). One or two sites will be located outside the West Oakland area for reference. The annual averages from the local-scale supplemental monitoring will be compared to annual averages obtained by the BAAQMD at the 23 air toxics monitoring stations (every 12th day sampling) throughout the Bay Area.

Measurements at these Core Sites will include seven-day NO_2, NO_x, SO_2, VOC (benzene, toluene, ethylbenzene, xylenes (BTEX) and 1,3-butadiene), carbonyl compounds (formaldehyde, acetaldehyde and acrolein) using passive diffusive samplers. The following four types of passive samplers[1] are proposed for this study, each with a unique adsorbent and method of analysis.

Manufacturer	Target Pollutant	Analysis Method
Ogawa	NO_2/NO_x	Colorimetry for nitrite
Ogawa	SO_2	Ion Chromatography
Radiello	BTEX, 1,3-butadiene	Thermal Desorption/GC/MS
Radiello	Aldehydes	HPLC/UV

In addition to the passive sampling, measurements at the Core Sites will also include seven-day integrated particle measurements with portable Airmetric MiniVol samplers. Particles will be collected on both Teflon, for gravimetric mass, and pre-fired quartz filters, for organic and elemental carbon (OC and EC). In order to evaluate differences due to the methods and protocol of analysis, OC and EC will be measured by thermal optical reflectance (TOR) method using the IMPROVE (Interagency Monitoring of Protected Visual Environments) temperature/oxygen cycle (IMPROVE-TOR) and also according to the Speciation Trends Network (STN) protocol using a thermal/optical transmittance (TOT) instrument (STN-TOT).

The same set of measurements collected at the Core Sites will also be collected at an existing BAAQMD air toxics monitoring station at the East Bay Municipal Utility District facility on Grand Street, which will serve as a Reference Site (Figure 1) for the purposes outlined in Tasks 1b and 1c below.

Task 1b. Assess the validity of the annual averages of TAC concentrations measured at the Core Sites. All seven-day integrated samples will be collected year-round at the Reference Site to provide comparisons of the annual averages of TAC concentrations derived from all 52 weeks with averages based on a subset of the 16 weeks (four consecutive weeks in four seasons) of sampling at the Core Sites. These averages will also be compared with the corresponding averages from the District's existing 1-day-in-12 air toxic monitoring at this site.

Task 1c. Assess measurement precision and quality of the assembled database. Two additional replicate passive samples will be collected at the Reference Site during the summer and winter sampling seasons to establish the precision of the passive measurements. This site will also be used to compare the various time-integrated and continuous measurements. Daily, 24-hour samples for VOC and carbonyl compounds will be collected during one four-week seasonal sampling period by more standard methods (i.e., canisters and DNPH cartridges) and the seven-day composite averages compared with the corresponding passive samples. The core measurements will be compared with the District continuous NO_x, SO_2, and BAM $PM_{2.5}$ mass and aethalometer BC concentration data. Meteorological data will be provided by the BAAQMD at the Reference Site. Additionally, the various continuous instruments that will be used in Task 2 (outdoor/indoor sampling) and Task 3 (mobile monitoring) will be compared side by side with District monitors for two weeks prior to and two weeks after each seasonal sampling period.

[1] DRI is currently using these passive samplers in the Harbor Community Monitoring Study (HCMS) in the Los Angeles area (http://www.arb.ca.gov/research/mobile/hcm/sat-mon/sat-mon.htm). As part of HCMS, DRI has evaluated the precision and accuracy of these measurements in the laboratory using a flow-through chamber and under field conditions and found they generally have replicate precisions between 5-10% and agreed well with more standard methods (Fujita et al., 2006).

Task 2. Characterize the differences in outdoor and indoor sampling.

Task 2a. Simultaneous seven-day integrated indoor measurements. Simultaneous seven-day integrated indoor measurements will be made at up to ten of the community-scale Core Sites during the four seasonal sampling periods in order to determine the outdoor/indoor differences in annual average TAC concentrations. The indoor measurements will include seven-day NO_x, VOC (BTEX and 1,3-butadiene), carbonyl compounds (formaldehyde, acetaldehyde and acrolein) using passive diffusive samplers and seven-day integrated Teflon and quartz filters for gravimetric mass and OC and EC, respectively. For each structure, a blower door measurement will be made for use in estimating the range of expected air exchange rates. Volunteer homeowners will be requested to maintain a diary of specific activities associated with higher indoor TAC concentrations (e.g., use of wood-burning fireplace), as well as any activities that will change the natural ventilation of the structure (e.g., open windows or use of exhaust fans).

Task 2b. Indoor/outdoor continuous measurements. Simultaneous outdoor and indoor measurements will be made using continuous monitors to examine temporal and day-of-week variations that may be associated with emission sources outside and inside the home. The continuous measurements will be made at a subset of four of the Core Sites (three in West Oakland and one outside of the area) during the summer and winter sampling periods. The continuous measurements will include CO/CO_2, an estimate of VOC, particularly aromatic compounds using a portable photoionization detector monitor, $PM_{2.5}$ BC mass concentrations inferred from light scattering and light absorption measurements, respectively. The two sets of the four continuous instruments will be operated at each home for two consecutive weeks during both summer and winter sampling period with time resolutions of five minutes. Four sets of instruments will be acquired so that two homes can be monitored simultaneously. At these homes continuous measurements of air exchange rates will be calculated by measuring the decay of an inert tracer released within the home. As mentioned in Task 1c, all instruments will be operated for two weeks prior to and two weeks after each seasonal sampling period at the Reference Site.

Task 3. Identify emission hotspots and characterize the peak TAC concentrations and gradients in proximity to the sources.

Measurements will be made using a mobile sampling vehicle to characterize the spatial variations in pollutant concentrations within and surrounding the Port of Oakland to identify hotspots of TAC emissions and to characterize concentration gradients near sources. These measurements will be used to estimate ratios of pollutant concentrations in the higher exposure locations to the corresponding measurements at nearby fixed monitoring locations during the summer and winter sampling periods. BAAQMD funds will be used to acquire a mobile sampling van, make any necessary modifications, and purchase the required equipment and instruments. In addition to GPS, CO/CO_2, NO_x instruments, mobile measurements will include estimates of VOC, using a portable photoionization detector (PID) monitor, $PM_{2.5}$ mass and black carbon concentrations inferred from light scattering and light absorption measurements[2], respectively. Additionally, a condensation particle counter (CPC) and an optical particle counter (OPC) will be used to simultaneously measure ultrafine particle (< 0.2 µm) and fine particle (0.2 to 2.0 µm) counts. Fresh motor vehicle exhaust emissions are predominantly in the ultrafine particle fraction. The ratios of particle counts in the two size ranges will be used to assess the spatial influence of motor vehicle PM emissions from roadways. When the instruments are not used for mobile sampling, they will be deployed at a roadside location to complement the saturation monitoring network. They will also be operated at the Reference Site for a limited time for quality assurance purposes.

[2] A photoacoustic instrument (Arnott et al., 1999) is preferable to the aethalometer for mobile measurements of BC due to frequent tape advances of the aethalometer when encountering high BC concentrations (e.g., following a diesel truck), causing 15 minutes of downtime as the instrument goes through its calibration cycle, and due to sensitivity of the aethalometer measurement to PM loading on the quartz filter (Arnott et al., 2005).

The mobile platform will also be used to determine variations in TAC concentrations on various roadways throughout the Bay Area during commute periods and other times and locations with greater fractions of diesel truck traffic. Time-integrated canister[3] and DNPH[4] samples will be collected and related to the corresponding time-averaged continuous CO or PID data. Such correlations can be used to reconstruct the time series of specific air toxic concentrations (e.g., benzene). The ranges in concentrations for these TACs along with those for $PM_{2.5}$ and BC and NO_x data will used to evaluate the incremental contributions of on-road exposures to the annual average exposure concentrations based on ambient TAC concentrations at nearby air monitoring stations.

Task 4. Determine the temporal variations in TAC concentration near emission hotspots.

As a complement to Task 3, one upwind and one downwind monitoring station will be established within 250 meters on each side of Interstate 80 in West Oakland. One additional monitoring station will be established adjacent to a major truck route within the Port of Oakland. These three sites will be among the 15 Core Sites identified in Task 1, whose measurements will consist of seven-day NO_2, NO_x, SO_2, VOC (BTEX and 1,3-butadiene), carbonyl compounds (formaldehyde, acetaldehyde and acrolein) passive samples and seven-day Teflon filter for $PM_{2.5}$ mass and quartz filters of OC and EC. The annual average TAC concentrations from these three roadside sites will be compared to the other Core Sites located throughout West Oakland. The same set of continuous instruments used in the mobile monitoring in Task 3 will be deployed at the three sites during the same summer and winter sampling periods as in Task 1, 2 and 3. Meteorological data (WS, WD, T and RH) will be collected at the downwind I-80 site and the Port of Oakland site. Available data for total vehicle and truck traffic volumes will be obtained for the specific segment of I-80 where the sampling sites are located and supplemented with surveys based on videotape logs of traffic passing the sampling location.

Task 5. Estimate DPM using EC or BC based upon correlations between PM and EC or BC in microenvironments where the predominant sources of BC are reasonably known.

No measurement method currently available can measure diesel PM (DPM) directly. Ambient source apportionment studies and vehicle testing data show that diesel exhaust is the predominant source of BC (measured by optical methods) or EC (thermal optical methods) in urban areas (Fujita et al., 2007b). Surrogate calculations of DPM have been based on the fraction of EC measured in a sample that is attributable to diesel engine exhaust and the fraction of the diesel particle mass accounted for by the EC. Because BC or EC measurements may depend on the method and instrument, these are operationally defined parameters. These factors need to be considered when using BC and EC as surrogates of DPM.

The relationship between ambient $PM_{2.5}$ and BC or EC will be established in four source dominated locations with varying contributions of diesel exhaust, gasoline exhaust and residential wood combustion: 1) Port of Oakland near diesel traffic (Task 3); 2) on-road mobile sampling in varying mix of traffic (Task 3); 3) I-80 roadside sampling (Task 4); and 4) residential sampling during winter with evidence of wood burning (Task 2). First, a correlation of $PM_{2.5}$ mass with BC or EC mass will be

[3] 1,3-butadiene is known to react with NO and NO_2 in the canister. The rate of this decay is concentration dependent with loss rate of few percent in three days for NO_x concentrations typically measured near roadways (Fujita et al., 2007a). The NO_x will be removed from the sample using a cobalt oxide denuder that was recently developed for motor vehicle emissions testing (Fujita et al., 2004).

[4] Acrolein is known to rearrange on 2-4 dinitrophenylhydrazine (DNPH) cartridges to an unknown degradation product (acrolein-x) (Tejada, 1986). The rearrangement of acrolein occurs over time periods of days. The sum of acrolein and acrolein-x provides an estimate of total acrolein that was originally present in the samples. However, the UV spectra from the photodiode array detector show that there is substantial overlap in the chromatographic retention time of acrolein-x with butyraldehyde. Thus the sum of acrolein and the sum of acrolein and butyraldehyde represent the lower and upper limits, respectively, of the true acrolein values. A correction method that was developed for a recent project for the Health Effects Institute (Fujita et al., 2007a) will be used to obtain a more accurate quantification of acrolein.

established for the diesel-dominated Port of Oakland site. The slope of the regression indicates the average ratio of DPM to BC or EC. The y-intercept represents the average background PM at this site that is unrelated to diesel emissions. The DPM/BC ratios from this site will be compared to the range of ratios measured in the mobile sampling van and at the roadside sampling sites with a varying mix of traffic. Lastly, the relationship of PM to BC will be examined with the mobile monitoring van in residential areas during the winter with evidence of substantial wood burning to assess the contributions of this source to ambient BC and PM. Additionally, we will compare the time-averaged BC measurements with the corresponding time-integrated EC measurements by IMPROVE-TOR and STN-TNT methods to quantify potential biases among the three measurements and the affect of these biases on the estimation of DPM by the surrogate method.

Task 6. Compile and validate the data, derive descriptive statistics of the temporal and spatial variations in TAC concentrations, compare measured and modeled annual average TAC concentrations and estimate cumulative TAC exposures for sensitive populations.

Data validation for the study will include assessment of overall measurement precision based upon replicate measurements of the passive samplers and collocated measurements of the continuous instruments used in Tasks 2, 3 and 4. Measurement accuracy will be assessed by either performance audits for measurement of gases such as NO_x or consistency with other standard methods used in the routine air toxics monitoring program for hydrocarbons and carbonyl compounds, and the Federal Reference Methods sampler for $PM_{2.5}$ mass. Data from Tasks 1b and 1c will be used for these purposes. We will also evaluate the spatial and temporal consistency of each data set and identify invalid data and outliers. These checks include comparison of time-averaged data with time-integrated measurements and correlations among co-pollutants emitted by major sources of TACs.

After the assembled data have been validated, they will be used to address the various objectives described in Tasks 1 through 5. These analyses include evaluation of BC or EC as surrogate of DPM; identification of emission hotspots and analysis of concentration gradients; estimation of annual TAC concentrations from four-season measurements and full-year reference site measurements; comparisons of 2008 data with previous years and other BAAQMD sites; comparisons of measurements with modeled TAC concentrations; comparisons of outdoor and indoor concentrations and identification of the impact of specific outdoor and indoor sources; analysis of indoor observations by time of day, day of week, season, and in comparison with results of other indoor/outdoor studies; relating microenvironmental to reference site concentrations; and determining the incremental increase in annual average TAC exposures based on allocation of time in microenvironments using existing exposure models versus simple annual average of ambient concentrations measured at air toxics monitoring station.

4. Environmental Outputs/Outcomes

a. *Short- and Mid-Term Products*

Short-term products that will be generated during the project include:

- Increased community involvement in identifying important sources of TAC in West Oakland through a community participatory research effort;
- Measurement dataset for evaluating local-scale and regional-scale modeling;
- Characterization of spatial gradients of toxic compounds, including identification of potential hotspots and characterization of specific microenvironments;
- Ratios of TAC concentrations in various microenvironments versus Reference Site measurements and Core Sites;
- Comparisons between outdoor and indoor TAC concentrations;
- Determination of incremental changes in annual average TAC exposures based on allocation of time in

microenvironments (using existing exposure models such as HAPEM or REHEX) versus simple annual average of ambient concentrations measured at air toxics monitoring station;

- Local correlation for DPM and BC, DPM and EC, and comparison to previous studies;
- Comparisons of annual averages based on seasonal averages of measurement data versus annual averages based on all data.

Mid-term products will include:

- Informed and targeted local regulations to reduce TAC, especially in areas such as West Oakland which are dominated by DPM related to goods movement;
- Updated guidance for local land use planning and development, as well as environmental review pursuant to the California Environmental Quality Act (CEQA) guidelines for use by cities and counties in planning and siting new development projects in regions with a high TAC burden, incorporating information on spatial gradients and the importance of local hotspots.

b. Link Between Short-, Mid-, and Long-Term Products

The planned long-term outcomes of this project are reduced TAC emissions, concentrations, and exposures to TAC, specifically in West Oakland, but also in other parts of the Bay Area, such as areas near the Ports of Richmond and San Francisco. Detailed local and regional TAC emissions inventories and modeling efforts are currently underway. The short- and mid-term products described above are designed to evaluate the emissions and modeling and to relate their products, as well as measurements from the Reference Site, to concentrations and, ultimately, exposures within local-scale and micro-scale environments to ensure that TAC mitigation measures are effective in reducing community exposures.

c. Progress Tracking

Stage	Milestone/Time Period	Activities
Project Planning	Two months after grant is awarded	Weekly team meetings, QAPPs development, finalize contracts, and purchase instruments for mobile sampling van.
Procurement and Testing	Fall 2007	Install and test mobile van instrumentation, purchase instrumentation, begin quarterly reports.
Site Selection/Installation	Fall 2007- Winter 2008	Contact residents, establish sites, and install calibrated equipment.
Monitoring	Winter 2008 - Winter 2009	Monitoring for Tasks 1 – 6; quarterly reports to EPA.
QA/QC & Reporting	Spring – Summer 2009	Prepare and submit final report to EPA.

During the project planning stage we will conduct weekly meetings. Once the Quality Assurance Project Plans (QAPPs) are completed, reports to EPA will be prepared on a quarterly basis. Project success will be evaluated based on the following four criteria: (1) data quality, (2) ability of the data to meet the objectives of the BAAQMD's CARE program, (3) project schedule, and (4) budget control.

d. *Transferability*

The proposed study has several elements that can be transferred to other similar communities within the BAAQMD and potentially other communities in other regions:

- Correlation of DPM with BC and EC at various locations and times of year;
- Evaluation of an advanced local-scale model (CALPUFF) against a spatially dense network of measurements to provide a benchmark for other comparisons;

- Importance of local- and micro-scale environments, including the modification of outdoor TAC concentrations in the indoor environment;
- Representation of local-scale concentrations by regional monitors;
- The influence of DPM from port activities on surrounding communities, building on previous studies.

5. Description of Roles and of the Applicant and Proposed Partners

BAAQMD. Dr. Phil Martien, project co-lead, will be responsible for the successful execution of this contract and will ensure that the link is made between the short- and mid-term outcomes of the project and the long-term goals to reduce TAC exposures in areas with high exposures and sensitive populations. He will also ensure that current modeling efforts benefit from the results of this study. He will be the contact with members of the West Oakland community and the Port of Oakland during the study. Mr. Eric Stevenson, project co-lead, will provide agency technical oversight for instrumentation and site selection. He will regularly coordinate with the EPA Contract Administrator to ensure that the project adheres to the approved schedule and budget. Dr. David Fairley, data QA/QC manager, will conduct regular statistical inter-comparisons of the data as they become available to maintain high data integrity and usefulness throughout the project. He will also be responsible for mid-term outcomes related to assessments of exposure and statistical comparisons to modeling results

DRI. Dr. Eric Fujita, technical manager, will be responsible for the planning and execution of project activities and coordinate sample collection in the field and arrange for analysis of the samples at DRI's two laboratories, the Organic Analytical Laboratory (Dr. Barbara Zielinska, Director) and the Environmental Analysis Facility (Dr. Judith Chow, Director). He will oversee and coordinate the activities of other DRI staff and students and maintain close communications with the BAAQMD throughout the project. Mr. David Campbell, will have responsibility for field operations and maintenance and quality assurance of instruments and samplers. Full resumes are available at http://www.dri.edu.

6. Biographical Information and Qualifications of Key Personnel.

Dr. Philip Martien, Senior Advanced Projects Advisor and manager of the Community Air Risk Evaluation (CARE) program at the Bay Area Air Quality Management District, coordinates the development of local- and regional-scale emissions of toxic air contaminants, plans modeling and measurement programs, and develops mitigation measures to reduce toxic emissions. He has over 15 years of experience as an atmospheric modeler, applying chemical transport models and evaluating modeling results against observations. He has authored a number of journal articles on sensitivity analysis of air quality models in Central and Southern California. He holds a Ph.D. in Civil & Environmental Engineering from U.C. Berkeley.

Mr. Eric Stevenson, Air Monitoring Manager at the BAAQMD, has more than 15 years of experience in the air quality measurement field. He has developed measurement methodologies and has worked with equipment manufactures to refine instrumentation to meet specific ambient air quality needs. He is responsible for operation and maintenance of the BAAQMD's air monitoring network that consists of 30 stations, and has participated in numerous special studies. He has also participated in numerous State and national air monitoring strategy groups to develop monitoring goals, objectives, and regulations.

Dr. David Fairley has been District Statistician with the BAAQMD since 1987. He has written a number of journal articles whose topics include the relationship of mortality and air pollution, the form of air quality standards, air quality trends, and statistical methods for air quality data. His current interests include spatial allocation of air toxics derived from mobile sampling data, and estimation of community-level exposure. He received his Ph.D. in Probability & Statistics from Stanford University in 1982.

Dr. Eric Fujita is a Research Professor in the Division of Atmospheric Sciences of the Desert Research Institute and will be the study lead investigator and principal contact for DRI. Dr. Fujita has over 26 years of experience in managing and conducting air quality studies. Dr. Fujita has 47 peer-reviewed publications, 80 contracts and final reports. He is the principal author of the field study plans for the 2000 Central California Ozone Study and 1997 Southern California Ozone Study (SCOS97-NARSTO). His research interests include chemical characterization of emission sources, reconciliation of emission inventory estimates with ambient measurements, and measurement and characterization of exposure to toxic air contaminants. Exposure studies include a survey of the spatial and temporal variations of BC and PM concentrations at the Roseville Railyard, exposures to mobile source air toxics in high-end microenvironments in Houston, Atlanta, and Chicago, and on-road and near-road exposure to PM and air toxics in Southern California. He holds a doctorate in Environmental Science & Engineering from UCLA.

Mr. David E. Campbell is an Assistant Research Scientist in the Division of Atmospheric Sciences at DRI. He has participated in several large scale programs designed to measure emissions from on-road mobile sources for DOE, EPA, CARB, and the CRC. Mr. Campbell is experienced in the validation and analysis of large data sets using database, spreadsheet, and GIS. He is also familiar with all commonly used methods for collection and characterization of ambient aerosols. For 13 years Mr. Campbell worked for the primary contractor responsible for IMPROVE program sample collection and data analysis.

References

Arnott WP, Moosmüller H, Rogers CF, Jin T, Bruch R. (1999). Photoacoustic spectrometer for measuring light absorption by aerosols: Instrument description. Atmos Environ 33:2845-2852.

Arnott, W. P., K. Hamasha, H. Moosmüller, P.J. Sheridan and J.A. Ogren (2005). "Towards Aerosol Light Absorption Measurements with a 7-Wavelength Aethalometer: Evaluation with a Photoacoustic Instrument and 3-Wavelength Nephelometer." Aerosol Sci. and Technol. 39:17-29.

Bay Area Air Quality Management District. (2006). "Community Air Risk Evaluation Program: Phase I Findings and Policy Recommendations Related to Toxic Air Contaminants in the San Francisco Bay Area." Available on-line at http://www.baaqmd.gov/CARE/care_documents.htm.

Fujita E.M., B. Zielinska, J. Sagebiel and D.E. Campbell (2004) Kansas City PM Characterization Study Pilot Study Testing Report – Addendum: Effect of Sampling Temperature on Chemical Speciation 1,3-Butadiene Stability Experiments. Prepared for U.S. Environmental Protection Agency, Ann Arbor, MI and U.S. Department of Energy National Renewable Energy Laboratory, Golden, CO, October 27, 2004.

Fujita, E.M., B. Mason, D.E. Campbell and B. Zielinska (2006). Harbor Community Monitoring Study – Saturation Monitoring of Selected Pollutants: Laboratory Evaluation Update and Initial Results of Pilot Study. Attachment to Progress Report #2 submitted to CARB, Sacramento, CA, December 15, 2006.

Fujita, E.M., D.E. Campbell, B. Zielinska, W.P. Arnott and J.C.Chow, (2007a). Exposure to Air Toxics in Mobile Source Dominated Microenvironments. Draft report submitted to the Health Effects Institute, Contract 4704-RFA03-1/03-16, February 7, 2007.

Fujita, E. M., D. E. Campbell, W. P. Arnott, B. Zielinska (2007b). Evaluations of Source Apportionment Methods for Determining Contributions of Gasoline and Diesel Exhaust to Ambient Carbonaceous Aerosols. *J. Air Waste Manage. Assoc.* In press (June, 2007).

Palaniappan, M. and S. Smorodinsky (2006) Final Report: Evaluating Indoor Air Interventions to Reduce Diesel Particulate Matter in West Oakland, California: EPA Agreement CH-83225801-0.

Tejada SB. (1986). Evaluation of silica gel cartridges coated in situ with acidified 1,4-dinitrophenylhydrazine for sampling aldehydes and ketones. Air Intern J Environ Anal Chem 26:167-185.

Wu, D.P. 2003. West Oakland Diesel Emissions Inventory and Air Quality Monitoring Study (2003). Final report prepared by the Pacific Institute, Oakland, CA, November 14, 2003. Report available at www.pacinst.org.

H. BUDGET

Budget allocations for this collaborative effort are presented in the table below. Note that a significant portion of the CARE program budget (more than $1 million annually) will be assigned to this project for in-kind contributions in addition to the costs shown.

	DRI		BAAQMD (1)		
Budget	Hrs	Amount	Hrs	Amount	TOTAL
Professional					
Eric Fujita	672	$ 47,792			
Barbara Zielinska	40	$ 2,792			
Pat Arnott	120	$ 6,757			
Larry Sheetz	168	$ 5,332			
Dave Campbell	896	$ 36,890			
Grad Student	936	$ 16,489			
Community Outreach (2)			640	$ 20,000	
Hourly	560	$ 11,126	640		
Total Salary	3392	$ 127,179	640	$ 20,000	$ 147,179
Fringe Benefits					
Professional		$ 39,626		$ 5,800	
Graduate Student		$ 1,896			
Hourly		$ 790			
Total Fringe Benefits		$ 42,312			
Total Salary and Fringe Benefits		$ 169,491		$ 25,800	$ 195,291
Total Travel Expenses (3)		$ 31,000		$ -	$ 31,000
Other Direct Costs					
Sampling Supplies		$ -		$ 5,040	$ 5,040
Media		$ 17,739		$ 23,947	$ 41,685
Analysis		$ 187,822			$ 187,822
Equipment Prep		$ 19,387			$ 19,387
Misc. Supplies		$ 2,000		$ 4,200	$ 6,200
Total Other Direct Costs		$ 226,947		$ 33,187	$ 260,134
Total Direct Costs		$ 427,439		$ 58,987	$ 486,425
DRI Indirect Costs (4)		$ 294,933			$ 294,933
Equipment (5)		$ -		$ 194,200	$ 194,200
Total Costs		$ 722,371		$ 247,387	$ 975,558
Cost Share by BAAQMD					$ 225,800
Grant Requested					$ 749,758

(1). Budget does not include substantial in-kind costs for BAAQMD participation and incorporating results in CARE program.

(2). BAAQMD will fund outreach by West Oakland community groups.

(3). Travel costs for DRI personnel from Reno, NV to the Bay Area, lodging, per diem, rental car, and fuel.

(4). DRI, a division of the Nevada System of Higher Education, uses the modified total direct cost method. DRI's methods are subject to audit by the U.S. Department of Health and Human Services (DHHS). DRI must comply with A-122 cost principles, A-110 grant and contract regulations, and A-133 audit regulations. The current approved ICR rate is 74%. However, DRI has elected to use 69% for this proposal.

(5). Following equiment or equivalent: TSI Dustrak (1); Met station (2); Magee Aethalometer (5); TSI CPC (4); TSI Q-Trak (5); and ppbRAE PID (5). Also includes mobile sampling van and modifications.

I. ENVIRONMENTAL RESULTS OF PAST PERFORMANCE

Between 1999 and 2006, the BAAQMD has been awarded an EPA program 103 grant each year to collect measurements of $PM_{2.5}$ mass and $PM_{2.5}$ chemical speciation. Measurements of $PM_{2.5}$ were collected using the EPA's Federal Reference Method instrumentation and one site within the network is now established as part of the EPA's Speciation Trends Network (STN). This successful program has supplied high quality $PM_{2.5}$ data to characterize fine PM levels at nine sites in the Bay Area. The BAAQMD regularly reports these data to EPA through the Air Quality System (AQS). These measurements help the BAAQMD track trends and progress toward attainment of National and State $PM_{2.5}$ standards and will supplement the special-purpose monitoring data used to evaluate PM modeling and inventories in modeling studies currently underway.

Since 2002, the BAAQMD has been awarded an EPA program 103 grant in the amount of $122,000 annually to collect measurements to support the National Air Toxic Trends Stations (NATTS) program. This program supports both sampling and laboratory analysis of toxic air contaminant data, which are regularly reported through the AQS. The BAAQMD's past performance demonstrates an ability to successfully complete and manage federally-funded assistance agreements and to meet reporting requirements of these agreements to ensure sponsors of reliable progress toward meeting project goals.

J. PROGRAMMATIC CAPABILITY

BAAQMD Projects

- Community Air Risk Evaluation (CARE) program has developed a gridded TAC emissions inventory for regional modeling and applied existing TAC measurements, including VOC and EC/OC data provided by the BAAQMD laboratory, to evaluate them. BAAQMD, in conjunction with CARB, has developed a detailed inventory of DPM in West Oakland for health risk assessment modeling. The CARE program has developed good working relations with both community groups and industry.

- Central California Air Quality Study (CCOS) was planned and implemented through a consortium that included the BAAQMD. BAAQMD expert staff conducted modeling, analysis of air quality concentrations, trends, source apportionment, emissions inventory comparisons, model validation, and instrument comparisons to support CCOS. Such analyses have been integral to the air quality planning process.

DRI Projects

- Roseville Railyard Air Monitoring Project sponsored by the Placer County Air Pollution Control District through federally funded assistance agreement (RFA No. OAR-EMAD-05-16), and in cooperation with the Union Pacific Railroad (UPRR), Sacramento Metro AQMD, and USEPA Region IX. The purpose of the project is to monitor PM and air toxics attributable to diesel locomotive emissions at the UPRR, located in Roseville, CA, using upwind/downwind monitoring. DRI conducted surveys of the spatial variations in pollutant concentrations around the Rail Yard in the April 2005 (Final Report (submitted by DRI on 5/6/05).
- Exposure to Air Toxics in Mobile Source Dominated Microenvironments sponsored by the Health Effects Institute (1/04 to 12/06). HEI is a nonprofit corporation and an independent research organization, which receives half of its core funds from the US EPA. The study focuses on on-road exposure of commuters and residents living near roadways in California's South Coast Air Basin. DRI both summer and winter phases of the measurement program in 2004. Measurements included VOC, including aldehydes, and speciated particles and semi-volatile organic aerosols. Continuous measurements of PM, BC, CO, CO_2, NO_x, VOC, and particle size distributions were made in a mobile sampling van to characterize spatial gradients in air pollutant concentrations.