1. Information Summary

Project Title: Attribution of Near-Roadway Air Toxics in Detroit
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Amount Requested: $637,790. **Total Project Cost: $746,468**
Cost-sharing/in-kind: $108,678. Start Date: May 1, 2015; **End Date**: April 30, 2018
DUNS number. 92-932-7880 RFP Category: 2. Monitoring in a Near-Road Environment

Summary: Michigan Department of Environmental Quality (MDEQ) proposes to complete a near-road monitoring study to assess air toxics in communities next to the I-96 and I-275 freeways in Detroit, Michigan. The data collected will build on measurements taken in 2010-2011 during the FHWA-EPA Detroit National Near-Road Study, and during prior studies by EPA and MDEQ to evaluate decadal air toxics trends in Detroit. Three existing near-road air monitoring sites will be augmented for two years with long-term, continuous measurements of benzene, toluene, ethylbenzene, xylene (BTEX), and black carbon (BC[1]). An ultrafine particle (UFP[2]) monitor will be rotated among the sites during the two years, with about 6 to 12 months of data collected per site. In addition, during a three-month intensive study, (1) hourly metals will be collected for approximately one month at each site; (2) 24-hour averaged total suspended particulates (TSP) metals will be collected at all three sites on an every-other-day schedule; and (3) 24-hr samples will be collected for carbonyl analysis in conjunction with the TSP metals. This measurement suite will help us (1) quantify toxics concentrations and gradients in an environmental justice (EJ) area of Detroit next to I-96, at Eliza Howell Park (EH), and a non-EJ area (Livonia) eight miles away next to I-275; (2) compare near-road toxics to urban "background" and to health benchmarks and national-scale concentrations; and (3) evaluate concentrations under different traffic conditions: 138,000 daily vehicles at EH, 5,600 of which are commercial trucks, versus 200,000 at Livonia, 12,200 of which are commercial trucks. Our findings, paired with data collected previously, will also facilitate near-road model evaluations. The project supports EPA's 2014-2018 Strategic Plan Goal 1, "Addressing Climate Change and Improving Air Quality," by improving understanding of near-road toxics impacts. Improved understanding will motivate efforts to reduce exposure and health impacts in affected EJ and non-EJ communities. Our proposed measurements will establish baseline concentrations for later comparisons as vehicle fleet turnover occurs and point source emissions change. Lastly, community collaboration and outreach will be done in two ways, via a series of community meetings to share information on near-road air toxics and pollution, and establishment of a multi-agency stakeholder group to help bring scientific and policy perspectives to the project.

2. Work Plan

2.1 Basis and Rationale

This study will evaluate air toxics in an EJ area of Detroit (Eliza Howell Park [EH], in the Brightmoor community) next to I-96 and a non-EJ area (Livonia) eight miles away next to I-275. The proposed study offers unique opportunities to leverage prior work by state and federal agencies, to assess how varying traffic conditions contribute to air toxics in an area where

[1] BC is a marker for diesel particulate matter (DPM), which EPA has concluded that diesel exhaust ranks with the other substances that the national-scale assessment suggests pose the greatest relative risk; see http://www.epa.gov/ttnatw01/nata/perspect.html
[2] Mobile sources are a key source of exposure to ambient UFP emissions. Epidemiological studies have so far been inconclusive regarding UFP toxicity, but more data are needed, as discussed in detail in Health Effects Institute Perspectives 3 Understanding the Health Effects of Ambient Ultrafine Particles http://pubs.healtheffects.org/getfile.php?u=893

industrial sources are also significant contributors to local air toxics concentrations, and to assess toxics differences at the local level between EJ and non-EJ communities. It is well established that concentrations of selected pollutants, including key toxics, are higher adjacent to major roads.[3] From 2010 to 2011, FHWA and EPA measured mobile source air toxics (MSATs) adjacent to I-96 as part of their joint "National Near-Road Study;" our study will sample in the same location, five years after the FHWA-EPA effort. In addition, our work will build on past MDEQ efforts to assess toxics. The Detroit Air Toxics Initiative (DATI-1) measured toxics in 2001 and 2002, and MDEQ completed follow-up measurements in 2006 and 2007 (DATI-2).[4] By leveraging past state and federal work, our findings will document multi-year concentration trends and establish baseline data for future year comparisons. Such trends analyses will document control program impacts and allow EPA to demonstrate the effectiveness of new vehicle emissions requirements.

Our study design includes measurement of toxic metals (e.g., nickel, manganese)[5] that originate from point sources, brake and tire wear, and re-entrained road dust. EPA's MOVES model forecasts that PM from brake and tire wear is rapidly becoming a larger fraction of on-road PM emissions, due to fleet turnover and exhaust PM emissions reductions. Our study will establish baseline conditions against which the future importance of toxic metal emissions can be weighed. Our work will also help distinguish the current importance of vehicle emissions in near-road settings, in an area historically subject to substantial stationary source pollution. For example, our proposed measurements along I-96 will take place approximately 6 to 10 miles downwind of automotive, steel, and manufacturing facilities along the Rouge River—facilities that the Clean Air Act has helped successfully control over the past 25 years. Thus, our study offers a unique opportunity to document the overall progress being made in reducing regional air pollution, while highlighting that residual problems are mobile source-dominated and persistent near major roads. Our study locations are within the broader Detroit area—a region beset by long-term economic contraction and home to a preponderance of EJ communities. Planned work, to be split between EJ and non-EJ settings, will improve understanding of air toxics exposures in multiple communities.

The proposed measurement campaign includes two monitoring sites near EH next to I-96. These sites at 10 m and 100 m from I-96 are locations used during the FHWA-EPA near-road study and are in the EJ Brightmoor community of Detroit. Poverty in census tracks around the site can be in excess of 70%, and excess cancer risk is relatively high (for the U.S.), at about 80-per-million.[6] Annual average daily traffic (AADT) is 138,000 vehicles, 5,400 of which are commercial trucks. Our second study area, 50 m from I-275 in Livonia, is one of the highest traffic count areas in Detroit where at-grade air pollution measurements can be made. AADT is nearly 200,000 vehicles, 12,200 of which are commercial trucks. This non-EJ area includes low-density suburban subdivisions, shopping malls, and other land uses (**Figure 1**).

Our overall program design will contribute to a robust understanding of near-road toxics and related pollutants in both EJ and non-EJ settings, and concentration trends that can inform

[3] See, for example, Karner et al. (2010) Near-roadway air quality: synthesizing the findings from real-world data. *Environ. Sci. Technol*., **44**, 14.
[4] See: http://www.michigan.gov/documents/deq/deq-aqd-dati-riskassessmentupdate_340942_7.pdf.
[5] See: Gasser et al., 2009, Toxic effects of brake wear particles on epithelial lung cells in vitro; Particle and Fiber Toxicology.
[6] See statistics from an EJ view: http://epamap14.epa.gov/ejmap/ejmap.aspx.

exposure assessments, source characterizations, and the effectiveness of control programs. The findings will update baseline data from 2001-2006, and can be used to support ongoing and future health analyses similar to those completed during DATI-2.

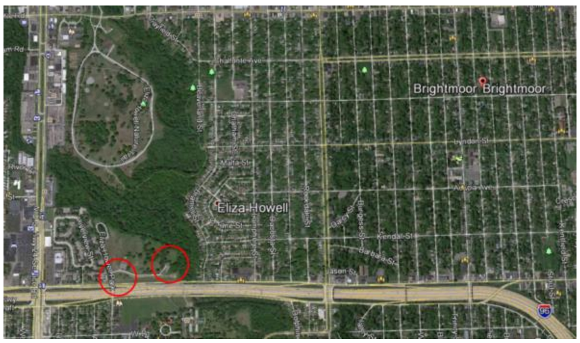

Figure 1. (Left) EH study area, next to I-96 in the Brightmoor community of Detroit. Figure scale is ~2 miles east-west. (Right) Livonia study area, next to I-275. Figure scale is ~1 mile east-west. The Livonia location offers representation of suburban areas east and west of the freeway. Red circles show approximate monitoring locations.

This project fulfills all RFP requirements listed by EPA under Section 2, "Monitoring in the Near-road Environment." We will leverage current/future near-road monitoring stations operated by MDEQ and assess local-scale toxics concentrations, gradients, and sources in EJ and non-EJ communities (RFP Section 2a). Measurements will help MDEQ and EPA understand pollutant levels, behavior, and interaction in the near-road environment, and evaluate 2001-2016 trends as fleet turnover deploys emission controls (RFP Section 2b). Data collected will support future and ongoing health analysis projects by other researchers (Section 2c). Our long-term measurements will extend by several years the existing baseline of available concentration data, and facilitate future studies to assess emissions and control program impacts (RFP Section 2d). Data collected will also support near-road dispersion model evaluations, including current work such as RLINE model development by EPA and near-road dispersion modeling in the area done by MDEQ, University of Michigan, and others (RFP Section 2e). Given the history of toxics measurement work completed in Detroit, including at EH, our study offers an opportunity to document the evolution of air pollution problems; to assess current effectiveness of onroad vehicle controls relative to stationary-source controls; and to improve characterization of future conditions.

2.2 Technical Approach

To meet our objectives, we will complete air toxics monitoring at near-road sites (described here), analyze data (described in Section 2.3), and conduct outreach to affected communities (Section 2.5).

Monitoring will occur 10 m and 100 m from I-96 at the EH sites used by FHWA and EPA[7] and 50 m from I-275 in Livonia (Figure 1). Prior Detroit studies[8] have shown that diesel particulate matter (DPM), benzene, formaldehyde, acetaldehyde, and trace metals such as arsenic and cadmium are leading risk drivers. In addition, there are few continuous, multi-year near-road measurements of MSATs, which this project would provide. Thus, our focus is on measurement of MSATs plus trace metals that have historically been important risk drivers in Detroit, and which may, in the future, contribute an increasingly larger fraction of roadway sources such as brake and tire wear and re-entrained road dust, as other source contributions are reduced.

We will take a comprehensive set of measurements during two years, approximately fall 2015 through fall 2017. **Table 1** details measurements by site; **Table 2** summarizes the project schedule. Hourly BC via an Aethalometer and benzene, toluene, ethylbenzene, xylenes (BTEX) via an auto-GC will be collected for two years at each site. Our long-term continuous measurements will augment existing measurements of CO, $NO/NO_2/NO_x$, and $PM_{2.5}$ at these sites, and provide a robust dataset with which to understand sources and levels of air toxics. A UFP monitor (e.g., Teledyne 651 UFP) will be rotated among the sites during the two years, collecting about 6 to 12 months of data per site. In addition, during a three-month intensive study: (1) hourly PM_{10} metals will be collected for approximately one month at each site via a Cooper Environmental Services XACT continuous particulate metals instrument to support source apportionment and upwind/downwind analyses;[9] (2) 24-hour averaged total suspended particulates (TSP) metals via filter analysis will be collected at all three sites, for three months per site, on an every-other-day schedule to inform long-term seasonal assessments; and (3) 24-hr cartridge samples will be collected to support carbonyl analysis.

MDEQ air monitoring staff will set up instruments and conduct monitoring. Site infrastructure (e.g., power, communications) will be established by early 2015. MDEQ already has protocols and standard operating procedures (SOPs) for all proposed instrumentation except for the XACT 625 instrument, which will be loaned to the research team by EPA Region 5. We will use Region 5's existing SOP or work with Region 5 to develop an SOP. We anticipate four days of time will be needed to transfer the XACT between sites; thus, during each 14-week period, we will collect approximately four weeks of data per site. Continuous data will be collected via datalogger systems and stored in a central repository at MDEQ. Filter and cartridge data will be assembled into a central database, and all data will be made publically available via EPA's Air Quality System (AQS). Site visits will occur at least weekly during the two years, and will include through-the-probe audits for carbonyls. During the three-month intensive, MDEQ staff will visit sites multiple times weekly to change filters and cartridges. About 10% of site measurements will be duplicates of filters and cartridges; we will establish a rotating schedule to evaluate uncertainties and perform quality assure (QA) on duplicates.

[7] See: http://www.fhwa.dot.gov/environment/air_quality/air_toxics/research_and_analysis/near_road_study/detroit_michigan/detroit06112013.pdf.

[8] MDEQ (2005) Detroit air toxics initiative, risk assessment report; MDEQ (2010) Detroit air toxics initiative: risk assessment update. December 22. Available at http://www.michigan.gov/documents/deq/deq-aqd-dati-riskassessmentupdate_340942_7.pdf.

[9] See: http://www.epa.gov/ttnamti1/files/2012conference/3BCaudill.pdf or http://www.epa.gov/ttnamti1/files/2014conference/wedcsnpeltier.pdf.

Table 1. List of measurements for each site. CO, NO/NO_2/NOx, and traffic at three sites and PM at two sites are monitored as part of other operations; 24-hr and hourly metals measurements will be done with in-kind support.

Measurement	Duration	Purpose
Hourly BC[1]	2 years	Characterize diesel PM
Hourly BTEX	2 years	Characterize benzene and mobile source indicators
Hourly PM	2 years	Mandated near-road measurement
Hourly NO/NO_2/NOx	2 years	Mandated near-road measurement
Hourly CO	2 years	Mandated near-road measurement
Hourly UFP[2]	6-12 months	Determine UFP levels, which have acute and likely chronic health affects
Hourly PM_{10} toxic metals via XACT 625	1 month	Use high–time-resolution measurements to apportion roadway influence, upwind versus downwind, and variations with traffic
Every other day 24-hour TSP toxic metals	3 months	Obtain full suite of toxics metals, for comparison among near-road and urban sites, apportion roadway influence
Every other day 24-hour carbonyls via cartridge and TO-11 chemical analysis	3 months	Obtain toxics formaldehyde, acetaldehyde, acrolein to best determine risk from these air toxics
Meteorology	2 years	Provide capability to differentiate upwind from downwind
Traffic counts	2 years	Provide data on traffic patterns to link traffic mix and speed to air toxics concentrations

[1]BC is a marker for diesel particulate matter (DPM), which EPA has concluded that diesel exhaust ranks with the other substances that the national-scale assessment suggests pose the greatest relative risk; see http://www.epa.gov/ttnatw01/nata/perspect.html

[2]Mobile sources are a key source of exposure to ambient UFP emissions. Epidemiological studies have so far been inconclusive regarding UFP toxicity, but more data are needed, as discussed in detail in Health Effects Institute Perspectives 3 Understanding the Health Effects of Ambient Ultrafine Particles http://pubs.healtheffects.org/getfile.php?u=893

Table 2. Project Schedule.

Period	Monitoring	Analysis	Outreach
May-Jul 2015	Acquire instrumentation	Develop work plan	Establish stakeholder group
Aug-Sep 2015	Finalize SOPs; install instrumentation; begin monitoring	Finalize work plan	Community meetings
Oct-Dec 2015	Continue monitoring and quality control (QC)	Progress report	Quarterly updates to stakeholders
Jan-Mar 2016	Continue monitoring and QC; draft plan for intensive		Quarterly updates to stakeholders
Apr-Jun 2016	Continue monitoring and QC; finalize plan for intensive	Review first months of data	Quarterly stakeholder and one community update
Jul-Sep 2016	Continue monitoring and QC; conduct three-month intensive	Review XACT data weekly	Quarterly updates to stakeholders
Oct-Dec 2016	Continue monitoring and QC; lab analyses of filters & cartridges	QC XACT data; progress report	Quarterly updates to stakeholders
Jan-Jun 2017	Continue monitoring and QC	Finalize QC on first year of data; QC filter & cartridge data; conduct analysis of first year of data + three-month intensive	Quarterly stakeholder and one community update
Jul-Dec 2017	Complete funded monitoring and QC	Continue analysis with full two years of data; progress report	Quarterly stakeholder and one community update
Jan-Apr 2018		Finish analyses; complete reports; submit journal articles	Quarterly updates to stakeholders; community update; uploads to AQS

2.3 Data Analysis

This comprehensive data set will be assembled (including meta data), quality assured, and quality controlled. Summary statistics and exploratory spatial and temporal analyses will be conducted for each site and comparisons made among sites. Our key focus will be on MSATs including continuous BC and benzene. A key objective is to quantify and characterize BC and benzene at each site. For example, we will assess how concentrations vary by distance from road, time of day, traffic conditions (volumes, speeds, fleet mix), weekday/weekend, upwind/ downwind, and compared to other pollutants (CO, NO_2, UFP). Similar analyses will be done for hourly toxics metals data. For all pollutants, we plan to compare concentrations at the near-road sites to other Detroit sites, in order to apportion concentration increments due to the freeways. We will also place concentrations in context with health benchmarks plus national and historical data by comparing our findings to other near-road studies in comparable urban environments, the 2010-2011 FHWA-EPA study, upcoming 2011 NATA results, and Detroit toxics studies completed in the past 15 years. Our evaluations will employ statistical analysis methods commonly used in near-road studies and will identify trends in air toxics over time.[10] Data from the two EH sites (10 m and 100 m distances from I-96) will be compared to assess near-road BC and BTEX concentration gradients. Data from the EH and Livonia sites will be compared to understand how concentrations vary with traffic and wind direction changes. BC and BTEX values will be compared with collocated values for UFP, CO, NO_2, and PM, and to conceptual models of near-road pollutant gradients.[11]

Three-month intensive data will be used to assess how carbonyl and toxic metal concentrations vary with traffic, meteorology, and distance from road, and other pollutants. Pollutant concentrations are a combination of urban-scale concentrations plus an additional increment due to emissions on the roadway. Near-road data will be compared to co-temporal measurements made at other sites in Detroit, to see if there is a clear increase in concentrations by the roadway above urban “background.” Data will be segregated by wind speed, direction, and other factors to try to determine the urban and near-road influences. With hourly metals data available at each site, receptor modeling with positive matrix factorization (PMF) or chemical mass balance (CMB) will be performed, to isolate roadway influence from other sources. Source apportionment will be carried out on various combinations of the continuous data, PM metals alone, gaseous species alone, etc. To the extent that comparable historical data is readily available, we will establish broad trends in the evolution of the relative importance of stationary and mobile sources to pollution levels and exposure.

2.4 Environmental Justice Impacts

Our study design specifically includes EJ and non-EJ settings to enable comparisons and facilitate outreach to multiple stakeholders. An important consideration when addressing near-road pollution is the ability to help affected communities plan for meaningful mitigation in settings where concentrations and risk are unacceptably high. Near-road pollution mitigation is a rapidly evolving field, and EPA and others are working to quantify the effectiveness of options such as use of near-road barriers (sound walls and vegetative screens), in-building filtration, truck re-routing, and improved setbacks and site designs that provide important buffer distances between sources and receptors.[12] Our work will provide the technical foundation to present long-term trends, explain how/if local impacts vary by EJ and non-EJ settings, forecast changes, and motivate mitigation.

The MDEQ will engage the local communities near the sites of interest in order to create a working relationship with them and to build trust in the community. The MDEQ will work to

[10] See: Polidori and Fine (2012) Ambient concentrations of criteria and air toxic pollutants in close proximity to a freeway with heavy-duty diesel traffic, South Coast Air Quality Management District; Baldauf et al. (2008) Traffic and meteorological impacts on near-road air quality: summary of methods and trends from the Raleigh near-road study. *J. Air Waste Manage*., 58, 865-878; Brown et al. (2014) Changes in air quality at near-roadway schools after a major freeway expansion in Las Vegas, Nevada. *J. Air Waste Manage*., 64(9), 1002-1012.

[11] See, e.g.: Karner et al., (2010) *Environ. Sci. Technol.,* **44**. Clements et al. (2009) Air pollutant concentrations near three Texas roadways, part II: chemical characterization and transformation of pollutants. *Atmos. Environ.*, 43, 4523-45347.

[12] See: Karner et al. (2009) Mitigating diesel truck impacts in environmental justice communities. *Transportation Research Record,* **2125**. Karner et al. (2010) Near-roadway air quality: synthesizing the findings from real-world data. Baldauf et al. (2011) The role of vegetation in mitigating air quality impacts from traffic emissions; *EM.* McCarthy et al. (2013) Filtration effectiveness of HVAC systems at near-roadway schools. *Indoor Air,* **23**. Russell et al. (2014) Best practices for reducing emissions exposure near larger roadways; *TRB 93rd annual meeting*, STI, EPA, and Arup.

educate the local communities about air toxics and the impacts to their health. A plan for addresses community concerns will be developed (see next section).

2.5 Community Collaboration/Outreach

Community collaboration and outreach will be done in two ways: (1) community meetings and (2) establishment of a stakeholder group. Prior to and at the beginning of air monitoring in 2015, MDEQ will conduct community meetings in the communities where monitoring will occur. The goals of these meetings will be to provide information on air toxics, near-road air pollution and an overview of this study, plus to obtain feedback from and understand concerns of the community regarding near-road pollution. In 2016 and 2017, we will hold two community meetings each year, sharing updates on the project and general information on air toxics and near-road air pollution. In 2018, once the study is complete, we will share an overview of study results, including how concentrations compare to elsewhere in Detroit and the U.S., and the next steps for MDEQ. A stakeholder group will be established that includes MDEQ, MDEQ's contractor Sonoma Technology, Inc. (STI), the Lake Michigan Air Directors Consortium (LADCO), EPA Region 5, the Southeast Michigan Council of Governments (SEMCOG), and the Michigan Department of Transportation. MDEQ will hold quarterly meetings with this stakeholder group to share results and solicit feedback, ensuring a diverse range of views is included. Once the project is finished, MDEQ anticipates continued air monitoring at these sites, and will continue to perform outreach and engagement with the stakeholder group as warranted. For scientific outreach, we will present findings at a conference such as the National Air Quality Conference sponsored by EPA.

2.6 Environmental Results: Outcomes, Outputs, Performance Measures

This project supports EPA's 2014-2018 Strategic Plan Goal 1, "Addressing Climate Change and Improving Air Quality," by improving scientific and public understanding of air toxics impacts. Improved understanding will motivate actions to reduce exposure to near-road toxics. Resulting actions that modify commercial vehicle use (e.g., smoothed traffic flow, reduced high-speed travel) will also contribute to BC emissions reductions; BC is an important climate forcing compound that contributes to climate change. Furthermore, our proposed educational materials and outreach efforts can reduce toxics exposure in EJ and non-EJ communities throughout the Detroit region, and can inform and motivate actions outside Detroit.

Outputs: The project will produce numerous outputs, including:

- Near-road toxics measurements in EJ and non-EJ areas of Detroit;
- A public repository (EPA's AQS database) of toxics data for future studies;
- Time series and spatial analyses to relate traffic activity and long-term pollutant concentrations, based on state and federal studies completed throughout the 2000s;
- Educational materials such as presentations describing near-road pollution problems and trends and available actions to reduce exposure; and
- Progress reports and a final report that document study methods and findings.

Outcomes: The project will achieve short-, mid-, and long-term outcomes, including:

- Identification of near-road toxics concentrations and how they have changed over time (*short-term*);
- Improved communication of near-road and air toxics problems (*short-term and beyond*);

- Increased community awareness of near-road issues and air toxics health effects (*mid-term*);
- Reduced health impacts from exposure in EJ and non-EJ areas, where local residents are motivated to take corrective action (e.g., filtration) (*mid-term and beyond*); and
- Improved understanding and reduced public exposure to toxics in other U.S. communities via the sharing of findings (*long-term*).

Performance Measures: Success will be tracked using the following performance measures:

- Reductions in air toxics concentrations observed over the various study periods;
- Improved understanding of near-road pollution issues in EJ and non-EJ areas;
- Identified relationships between vehicle use and concentrations;
- Improved ability to forecast expected air toxics concentrations;
- Improved understanding of the role of stationary versus motor vehicle emissions sources and the corresponding control strategy implications for future air quality improvement.

2.7 Programmatic Capability and Past Performance

- National Air Toxics Trends Stations (NATTS) Grant – The MDEQ has a long history of implementing the NATTS Grant at our Dearborn (26-163-0033) site. All semi-annual and final programmatic reports have been submitted for this grant.
- $PM_{2.5}$ (103) Grant – The MDEQ has a long history of implementing the $PM_{2.5}$ (103) Grant at roughly 25 monitoring sites throughout the state. All semi-annual and final programmatic reports have been submitted for this grant.
- Near-Road grants – The MDEQ has managed two separate near-road grants. One grant was used to take over operation of the EH near-road sites from ORD. All semi-annual and final programmatic reports have been submitted for this grant. The second grant to establish the Livonia near-road site is currently open. All semi-annual reports for this grant have been established.

The suite of instruments purchased under this proposal will enhance MDEQ's ability to quantify air toxics concentrations and trends in communities over time. We anticipate that MDEQ will operate the EH and Livonia near-road sites for additional years beyond this study's timeframe, so that trends in benzene, for example, can be related to trends in emissions and control measures. The instruments could also be used at other MDEQ sites. For example, the N. Delray (26-163-0015) site is located near a new proposed international bridge crossing in Detroit. If the current plans are implemented, all traffic from this bridge will have to pass by the N. Delray site. MDEQ could relocate some of these instruments to the N. Delray site after this study is completed to assess air quality impacts of the new bridge crossing.

2.8 Detailed Budget Narrative

Itemized costs for this project are shown in **Table 3**. The total requested funding is $637,790, and the total budget, including in-kind funds, is $746,468. In-kind funds from MDEQ include operation of monitoring sites, TSP and some carbonyl samplers, and ICP-MS laboratory analysis for metals. Field plan support, data quality control, and data analysis and reporting, as described in Section 1.3 Data Analysis, will be performed by Sonoma Technology, Inc. (STI), a consultant experienced with data analysis, data QC, air toxics analysis, and near-road research. STI will also participate in stakeholder meetings and reporting.

Table 3. Project budget.

Personnel -Total	#	Annual Salary	FTE Fraction*	Federal Funds	Non-Federal Funds
Project Manager	1	$70,553	0.6	$42,331	$0
Air Quality Monitoring Technician	2	$48,316	0.3	$28,989	$0
Financial Analyst	1	$73,434	0.3	$22,030	$0
Communications/Outreach Personnel	1	$77,089	0.3	$0.00	$23,126
*Total FTEs over the three year study period			1.5	**$93,350**	**$23,126**
Fringe Benefits 52% of wages to cover retirement, health benefits, FICA, SUI				**$48,542**	**$12,025**
Travel (vehicle cost based on 25 miles per day per technician)					**$5,070**
Equipment – 3 TSP samplers ($5000 per); 50 filters * 3 sites = 150 filters ($5 per); ICP/MS analysis for 150 filters ($171 per); 1 carbonyl samplers ($15,000); meteorological sensors ($2000 per); XACT ($667 per) rental for 3 months				**0**	**$60,400**
Equipment – 2 carbonyl samplers ($15,000 per); 3 Aethalometers ($20k per); 3 CAS auto-GC ($60k per); 1 Teledyne/API UFP 651 ($28k)				**$298,000**	
Supplies – Aethalometer tape; XACT Tape				**$500**	**0**
Contractual Total	**Procurement**				
Lab analysis of 50 samples at 3 sites=150 analysis of cartridges @ $100/samples, including cartridge rental	Competitive			$15,000	
BAM monitor rental ($300 per month), 2 years	Sole Source			$3,600	$3,600
Field plan support; data QC; data analysis; reporting – Sonoma Technology Inc.	Sole Source			$160,807	
Indirect Charges Federal Negotiated Indirect Cost rate = 12.68%				**$17,991**	**$4,457**
TOTAL FUNDING				**$637,790**	**$108,678**
TOTAL PROJECT COST (federal and non-federal)				**$746,468**	

Commented [SGB1]: Amy I see in the RFP that "communications and outreach funding must be reflected in the detailed itemized budget" – here seemed like a good place

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2.9 Leveraging

The MDEQ will leverage the funds EPA granted for the near-road sites to provide the infrastructure needed at both of the EH sites and the Livonia near-road site. This includes shelters, electricity, communications, a data acquisition system, and routine visits by MDEQ staff. In addition, some of the technician time for data collection will be leveraged as in-kind support. In addition, the $PM_{2.5}$ data at the original Livonia (26-163-0025) site will be leveraged to compare to the $PM_{2.5}$ data from the near-road environment. These sites are within 500 ft of each other and they will both have $PM_{2.5}$ Federal Reference Method monitors (FRMs), therefore providing a very interesting and unique data set. The XACT monitor that EPA Region 5 has will also be leveraged for this study. MDEQ will provide consumable supplies for this instrument, which can be used by EPA Region 5 after this study is completed.