

# **RFP (EPA-OAR-OAQPS-15-01)**

## **Project Title**

Determining local scale air toxics gradients near the I-25/I-70 interchange in environmental justice communities in Denver, Colorado

## **Applicant Information**

Colorado Department of Public Health and Environment  
Air Pollution Control Division  
4300 Cherry Creek Drive South  
Denver, CO 80246-1530

## **Primary Contact**

Gordon Pierce  
Phone#: 303-692-3238  
Fax#: 303-782-5493  
Email: [gordon.pierce@state.co.us](mailto:gordon.pierce@state.co.us)

## **Funding Requested**

\$399,111

## **Total Project Cost** (including cost share and leveraging)

\$649,438

## **Project Period**

July 1, 2015, to December 31, 2017

## **DUNS Number**

878208826

## **Overview**

The Colorado Department of Public Health and Environment (CDPHE) in partnership with the Denver Department of Environmental Health (DEH) proposes to conduct air toxics measurements in environmental justice (EJ) communities adjacent to the I-70/I-25 freeway interchange area in the Globeville, Elyria, and Swansea (GES) neighborhoods of Denver. These communities are disproportionately affected by emissions from the freeways, which have annual average daily traffic (AADT) in excess of 250,000 and 150,000 vehicles per day on I-25 and I-70 respectively. The GES neighborhoods also have relatively high rates of acute and chronic health outcomes as documented in a 2014 Health Impact Assessment (HIA) done for GES (by DEH). Interstate 70 cuts through the GES neighborhoods and is programmed for major expansion over the next five years. There is insufficient data about the toxics exposure in these communities and community members have many questions about the baseline, construction phase, and post construction emissions from I-70 which abuts numerous residences and an elementary school.

The objectives of this proposed project are to (1) determine the levels and gradients of air toxics in the community and provide a reference baseline to compare to future year concentrations after construction of the highway and supporting infrastructure, taking into account CAFÉ and Tier III standards; (2) quantify the impact of roadway emissions on air toxics in the community, especially adjacent to the highways; (3) evaluate how well measurements at the planned second near-road site for Denver represents concentrations in the community; (4) improve dispersion model validation related to near-road environments; and (5) educate the community about planned and potential improvements to mitigate the impacts of near-road air toxics. To do this, we will:

1. Conduct continuous air pollution monitoring for one year at the Swansea Elementary School, adjacent to I-70. Limited yet informative air toxics sampling was conducted in 2002 and 2005 by CDPHE and DEH.
2. Establish five additional sites (upwind and downwind) within a 300 m radius of the highway for two 1-month intensive periods of air toxics monitoring between the I-25 and I-70 near-road sites;
3. Augment the forthcoming second CDPHE near-road monitoring site adjacent to I-25 on the west side of the GES neighborhoods to include black carbon (BC) and benzene/toluene/ethylbenzene/xylenes (BTEX).
4. Conduct community outreach.

Continuous measurements at the near-road elementary school site will include BTEX and BC. This may be co-located with criteria pollutant measurements that CDPHE and DEH are working with the Colorado Department of Transportation (CDOT) to install (funded separately). During eight weeks of intensive monitoring at multiple community sites, a suite of gaseous air toxics via whole-air canisters, cartridges, and passive samplers, as well as BC, will be quantified. Results will be used to determine the current roadway contribution to air toxics, quantify the gradients in and exposure of the community to air toxics, and provide a reference baseline for understanding the eventual contribution of new/expanded roadways in the community.

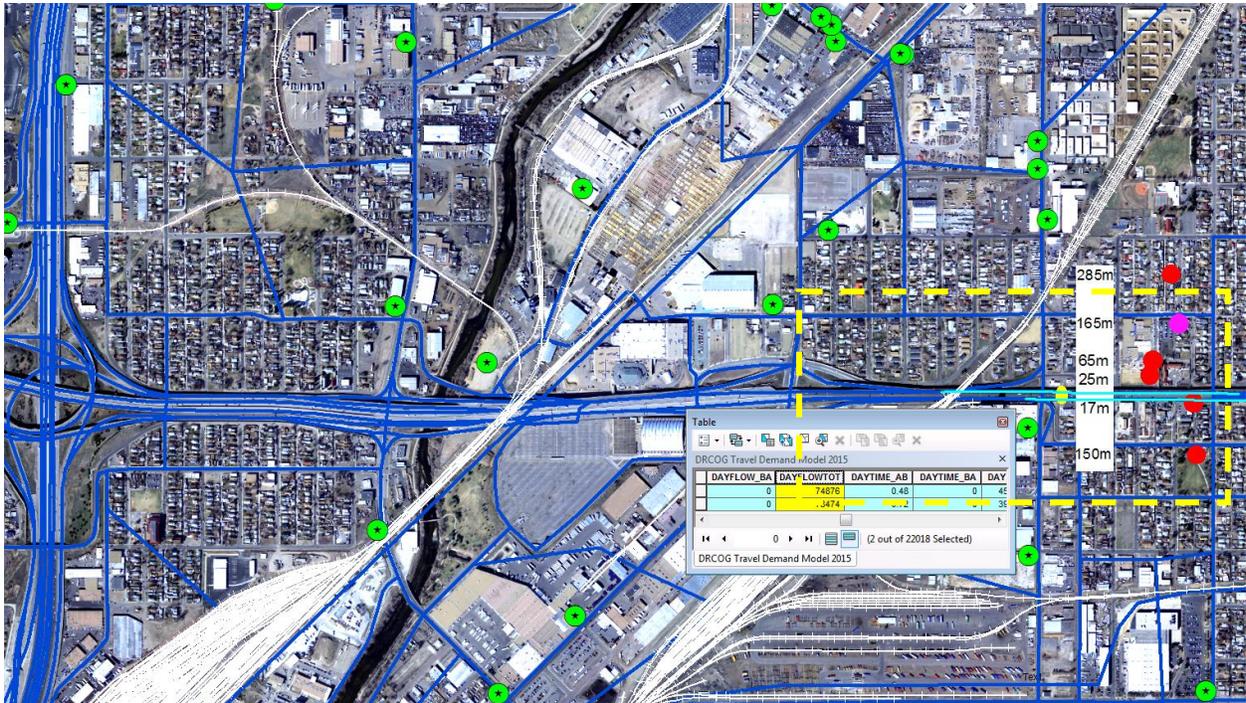
The project supports EPA's 2014-2018 Strategic Plan Goal 1, "Addressing Climate Change and Improving Air Quality," by improving understanding of near-road toxics impacts. Improved understanding will inform mitigation efforts to reduce exposures and health impacts of highways in affected EJ communities. Also, our proposed BC measurements will establish baseline concentrations for truck fleet turnover and emissions control evaluations—particularly as the truck fleet contains more vehicles meeting stringent model year 2010 and later PM emissions requirements. Heavy-duty diesel truck PM emissions contribute to atmospheric BC, an important climate forcing compound.

## **1.0 Basis and Rationale**

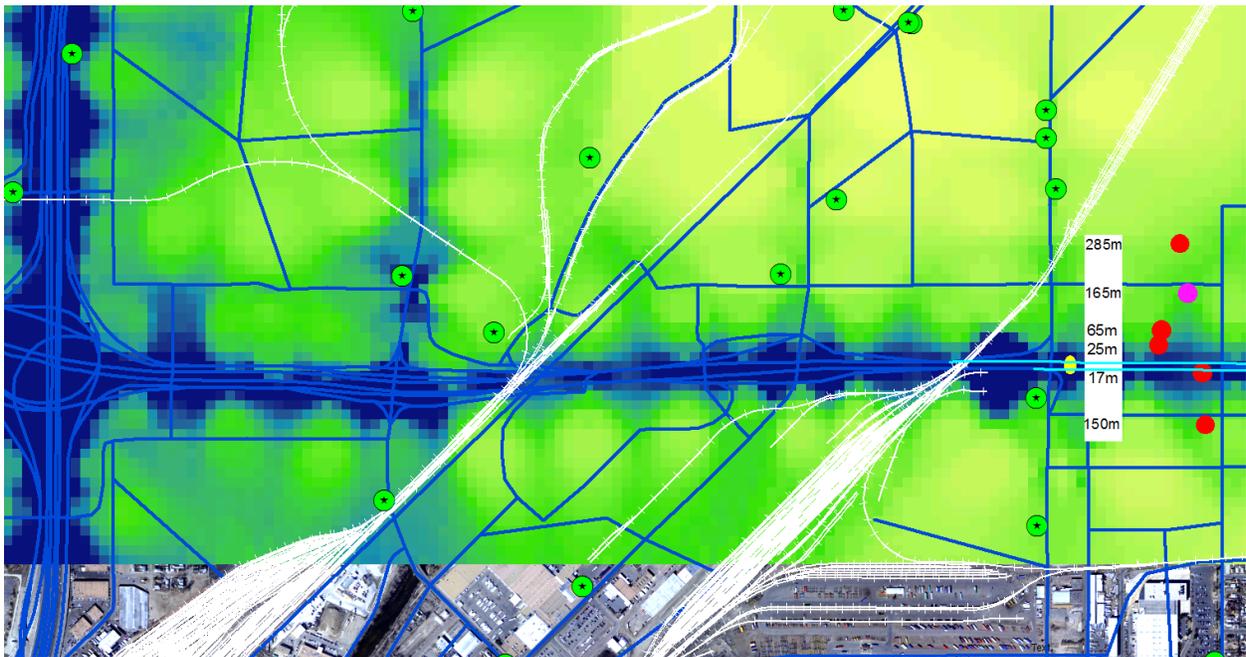
EPA has mandated near-road air quality monitoring stations across the U.S., focused on NO<sub>2</sub>, yet there is little characterization of air toxics being conducted at these sites, and the overall body of knowledge of mobile source air toxics (MSATs) in the near-road environment is still limited. This study will assess gradients of air toxics in the near-highway environment, helping to assess whether and to what extent air toxics measurements at near-road sites are warranted. Moreover, environmental justice (EJ) communities are disproportionately located next to major roadways, so this study aims to understand air toxics concentrations and gradients in EJ areas. Specifically, monitoring will occur in the Globeville/Elyria/Swansea (GES) neighborhoods of Denver adjacent to the I-70 and I-25 freeways.

Figure 1 shows a map of the area, including monitoring sites to be operated as part of this project (see Section 2.0 for details). Previous National Air Toxics Assessment (NATA) results for the GES neighborhoods show that chronic and cancer risks are higher than the county average. This has been corroborated with specialized dispersion modeling work conducted by DEH in the past. Two heavily traveled freeways in the vicinity with a combined annual average daily traffic (AADT) of over 400,000 vehicles per day, coupled with a mix of medium and heavy industrial sources nearby, results in relatively high air toxics concentrations in the communities. Over the next 5-10 years, I-70 will be expanded from 6 to 10 lanes. The residents of these neighborhoods are concerned that this will result in increased emissions of air toxics in the area, yet there is currently no data on existing toxics levels and exposure in these communities, and therefore no way to evaluate the potential future air toxics impact of the expanded roadways except through modeling. A potential benefit to the community is that these data can help inform mitigation efforts that may be necessary during construction when the project plan is developed.

This proposal meets many of the requirements specified in Section I, Part B, of the Community-Scale Air Toxics Ambient Monitoring RFP. We will determine local-scale air toxics concentration gradients, assess exposure, and determine sources of air toxics in EJ communities near the I-25/I-70 freeways and interchange (RFP category 2a). Specifically, the contribution from mobile sources to air toxics next to the roadway and in the community will be determined (RFP category 2b). While no health study is specifically linked to this proposed study, air toxics data in the area are very limited, and this project will help to increase understanding of overall exposure in the Denver area (RFP category 2c). This proposed study will initiate, together with other leveraged funds, a new near-road EJ monitoring site at Swansea Elementary School, laying the groundwork for ongoing longer-term measurements and characterizing changes in air toxics concentrations with anticipated expansion of roadways in the community (RFP category 2d). Lastly, local-scale AERMOD modeling and emissions data will be evaluated and improved using ambient measurements of multiple air toxics in the community next to the roadway (RFP category 2e). Figure 2 shows previous near highway gradient modeling conducted by DEH.



**Figure 1.** I-70 expansion area (yellow box), proposed monitoring locations (red dots), distances from I-70, and I-70 traffic volumes (152,000 vehicles per day). I-25 runs north-south and is 1.5 miles west of the Swansea Elementary School. Facilities with air pollution permits are shown in green.



**Figure 2.** Predicted near-road benzene gradients generated by AERMOD and conducted by DEH (2002 emissions).

## 2.0 Technical Approach

A combination of air quality monitoring, data analysis, and outreach will be done to meet the project objectives: (1) determine the levels and gradients of air toxics in the community and provide a baseline to compare to future year concentrations during and after construction of roadways in the area, (2) quantify the impact of roadway emissions on air toxics in the community, (3) evaluate how well measurements at the near-road sites represent concentrations in the community, (4) improve dispersion model evaluation and conduct outreach with the community on the project

results, and (5) educate the community about planned and potential improvements to mitigate the impacts of near-road air toxics..

Monitoring will be a combination of 1) one year of continuous measurements at a fixed site at Swansea Elementary in the EJ community adjacent to I-70, 2) at the forthcoming second CDPHE near-road site next to I-25 (“I-25 Globe” to be operational by June 2015), and 3) during two intensive monitoring periods of approximately four weeks each at five other sites within the community (in addition to the continuous site). Table 1 summarizes these proposed measurements.

At the continuous fixed site at Swansea Elementary, we will collect a year of hourly C6-C12 volatile organic compounds (VOCs) and BC measurements. With the prevailing meteorology, Swansea Elementary is typically downwind of I-70 during the overnight and morning hours (times of day with the highest pollution), and upwind in the afternoon. Benzene is an MSAT that is a leading contributor to health risk, and has been quantified with an automated gas chromatograph (auto-GC). BC is representative of diesel emissions, which include numerous air toxics. At the near-road I-25 Globe site, existing measurements of NO<sub>2</sub>, PM<sub>10</sub>, and PM<sub>2.5</sub> will be augmented by collecting a year of BC data. The I-25 Globe site is typically downwind of I-25 but can be upwind occasionally in the afternoon hours in the summer season. These long-term, continuous measurements will help determine upwind/downwind concentration differences, contributions from I-25 and I-70 to downwind communities, diurnal and temporal patterns of BC and BTEX, and the relationships of BC or particulate matter (PM) with specific toxics such as benzene.

Two four-week-long intensive monitoring periods will take place at six community sites, likely during July/August and November. Collecting samples in the summer season is important to understand ozone precursor concentrations and November is usually a high pollution month (low winds, strong temperature inversions). Three of the identified sites are on the elementary school property that abuts the highway and extend 200m to the north. One site is at a city park and the other two will be on private property.

Private property sites will be recruited through existing channels with I-70 EIS outreach and with the aid of community groups like Groundwork Denver, Live well GES, Focus Points Community Resource Center, and Denver Public Schools. The goal is to select sites that represent community exposure, have access to power and security for air monitoring, and preferably are in varying distances upwind and downwind from I-70. A full suite of 24-hour averaged gaseous air toxics will be collected at both the near-road and Swansea Elementary sites and at five community sites via canister/cartridge collection methods used in National Air Toxics Trends Stations (NATTS); chemical analysis will be performed using EPA TO-11A and TO-15 methods. In addition, eight week-long passive samples will be collected at each of the six community and two near-road sites to quantify benzene, 1,3-butadiene, formaldehyde, and acetaldehyde, via EPA method 325. The combination of gaseous toxics measurements will allow for assessments of potential exposure, determination of average gradients in the communities, the contribution of toxics from mobile sources, comparison to established methods, and finally to evaluate dispersion model results. Lastly, mini-Aethalometers will be used at the community sites during the intensives, to understand the gradient of BC and infer the gradient of toxics on a higher time resolution basis than the 24-hr or week-long samples can provide. Optimally, we would like to have hourly VOCs available at the I-25 Globe site, and a larger suite of hourly VOCs at the Swansea site, but costs would be much higher to purchase and operate two auto-GCs with full suites of VOCs, so instead we opted to have a combination of VOC and BC measurements in the community as well as other long-term measurements at the fixed sites.

Standard operating procedures (SOPs) have previously been developed by CDHPE and DEH for most of the instrumentation proposed, including the Airmo auto-GC; SOPs will be developed for the passive samplers and mini-Aethalometers. Prior to field work, a project plan and field plan will be developed, included in an overall Quality Assurance Project Plan (QAPP). At the beginning of the study, collocated measurements of the Aethalometers will be done for approximately five days, and collocated measurements at one near-road site of the mini-Aethalometers with a full Aethalometer will also be done before the intensive periods. This will ensure that any observed gradients or differences among sites are real, and not caused by instrument bias. Approximately 10% of the total canister, cartridge, and passive samplers will be collocated, duplicate samples. Analysis of the duplicate samples will help determine the precision of the VOC measurements and whether there is any bias among measurements. Continuous data will be quality controlled (QC'd) weekly during operations; VOC data from laboratories will be QC'd upon receipt of the data, to ensure no systematic biases are evident after the first intensive period.

Analysis of data is detailed in Section 3, and will include a suite of analyses employed in prior near-road and air toxics studies. Outreach is detailed in Section 5, and builds upon ongoing efforts by the DEH and CDPHE in the

targeted communities. Table 2 summarizes the project plan and schedule. Performance measures include quarterly data review, delivery of quality data, and an analysis report.

**Table 1.** Summary of proposed measurements. *Italics* indicate measurements that will be taken as part of other projects but can be leveraged in this proposed study.

| <b>Pollutants</b>                                                                                              | <b>Measurement</b>                                | <b>I-25 Near-Road Site</b>                     | <b>I-70 Swansea Site</b>                       | <b>6 Community Sites</b>                       |
|----------------------------------------------------------------------------------------------------------------|---------------------------------------------------|------------------------------------------------|------------------------------------------------|------------------------------------------------|
| Hourly C6-C12 VOCs                                                                                             | Chromatotec Airmo C6-C12 auto-GC                  | -                                              | 1 year                                         | -                                              |
| Hourly BC                                                                                                      | Aethalometer                                      | 1 year                                         | 1 year                                         | -                                              |
| Hourly BC                                                                                                      | Mini-Aethalometers                                | -                                              | -                                              | 8 weeks                                        |
| 24-hr gaseous air toxics (including formaldehyde, acetaldehyde, acrolein, benzene, 1,3-butadiene, naphthalene) | Cartridge, canister; EPA methods TO-11A and TO-15 | ~ 18 samples each during two 4-week intensives | ~ 18 samples each during two 4-week intensives | ~ 18 samples each during two 4-week intensives |
| Weekly average benzene, 1,3-butadiene, formaldehyde, acetaldehyde                                              | Passive samplers; EPA method 325                  | 8 samples during two 4-week intensives         | 8 samples during two 4-week intensives         | 8 samples during two 4-week intensives         |
| <i>5-min meteorology</i>                                                                                       | <i>Wind speed, direction, temperature</i>         | <i>&gt; 1 year</i>                             | <i>&gt; 1 year</i>                             | -                                              |
| <i>Hourly NO<sub>2</sub></i>                                                                                   | <i>Teledyne-API</i>                               | <i>&gt; 1 year</i>                             | -                                              | -                                              |
| <i>Hourly PM<sub>2.5</sub></i>                                                                                 | <i>GRIMM or TEOM</i>                              | <i>&gt; 1 year</i>                             | <i>&gt; 1 year</i>                             | -                                              |

**Table 2.** Project schedule.

| <b>Schedule</b> | <b>Monitoring</b>                              | <b>Outreach</b>                                 | <b>Analysis</b>              | <b>Reporting</b>                                 |
|-----------------|------------------------------------------------|-------------------------------------------------|------------------------------|--------------------------------------------------|
| Summer 2015     | Obtain mini-Aeths; prepare Airmo, Aeth         | Discuss project with community                  | ---                          | Project plan; SOPs; field plan                   |
| Fall 2015       | Set up instruments, begin monitoring           | Identify potential sites                        | Weekly QC                    | Progress reports                                 |
| Jan–June 2016   | Continue continuous monitoring                 | Finalize community sites                        | Assess first six months data | Progress reports                                 |
| July–Aug 2016   | 4-week intensive monitoring                    | Coordinate with community groups                | Weekly QC                    | Progress reports                                 |
| Sep–Oct 2016    | Continue continuous monitoring                 | Assess viability of sites after first intensive | Assess data from intensive   | Progress reports; adjust sampling plan if needed |
| Nov-Dec 2016    | 4 week intensive monitoring; finish monitoring | Coordinate with community groups                | Weekly QC                    | Progress reports                                 |
| Jan–Apr 2017    | ---                                            | Community updates                               | Finish QC                    | Progress reports; present at conference          |
| May–Aug 2017    | ---                                            | Community updates                               | Finish draft analyses        | Draft report; present at conference              |
| Sep–Dec 2017    | ---                                            | Share findings with community                   | Complete analysis            | Final report                                     |

### 3.0 Data Analysis

The data analysis objectives of the project are to:

- Quantify spatial and temporal variability in air toxics concentrations originating from the roadways;
- Quantify the contribution of air toxics from the roadway and compare pollution/exposure gradients to health benchmarks;
- Assess transport of pollutants into the Globeville/Elyria/Swansea communities;

- Establish a “baseline” of existing air toxics concentrations at the monitoring sites prior to construction of additional roadways in the area; and
- Use ambient measurements and observed relationships between air toxics concentrations and meteorology to constrain local-scale emission inventories and validate previous modeling results.

To meet the objectives, we will use a weight-of-evidence approach to construct a conceptual model. Initial hypotheses are that air toxics will have differing gradients across the community, and some will be predominantly from roadway emissions while others will be influenced from other local and urban sources. The local sources in the community, including emissions on the roadway, are all in addition to a relatively large, urban background of air toxics concentrations. One of the goals is to differentiate the contribution of the adjacent roadways from the concentration of the urban signal. Data analysis will move from “big picture” overall views to detailed case study analyses. First, we will determine basic statistical characteristics of each species by site, weekday and weekend, time of day, and meteorological conditions such as wind speed and direction, to determine the range of concentrations found. With the continuous measurements, we will determine the increase in air toxics such as benzene under upwind/downwind conditions, parsed by important factors such as season, traffic volume, and fraction of heavy duty trucks, weekday/weekend, and meteorology. This basic information will provide a solid basis for understanding the spatial and temporal variations, assessing conceptually if the variations make sense, and providing us guidance on how to adjust or add analyses to best understand the data.

We will then examine the spatial and temporal variability of air toxics concentrations by developing a variety of analysis visualizations, including gradient plots of concentration as a function of distance from the road, inter-pollutant spearman correlations, cumulative distribution functions, and wind and pollution roses. Gradient plots will show how roadway emissions drop off with distance from roadway by pollutant, and how exposure varies within the communities. Inter-pollutant spearman correlations will indicate which pollutants are co-emitted, such as benzene and BC, from vehicle exhaust. Other pollutants, such as formaldehyde, may be influenced by a mix of primary sources and secondary formation. During wintertime, air toxics may also be influenced by residential wood smoke; dual-wavelength Aethalometer BC data will be used to assess if wood burning or diesel PM is contributing to BC.

Pollution roses provide valuable information regarding frequency of winds from the roadway toward the receptors and help verify the frequency of high concentrations related to roadway emissions. These analysis methods will be used to understand relationships among pollutants and how much roadway emissions impact ambient concentrations at varying distances from the roadways in the communities, and have been used in previous studies to examine near-road impacts on the concentrations of air toxics downwind of roadways<sup>1</sup>. Concentrations at the community sites will be normalized to observed near-road concentrations to help understand the contribution of roadway emissions to community exposure. Gradients of gaseous air toxics and BC will be evaluated by pollutant and by weeklong versus nominally every-other-day 24-hr samples. Case studies of high-concentration days found in the 24-hour samples will be performed, by examining local traffic patterns, meteorology, source activity, and continuous measurements at the near-road and community sites and other sites in the Denver area, as warranted. Receptor modeling with Chemical Mass Balance and principal component analysis-based techniques will be performed on canister/cartridge and auto-GC data, to understand the contribution of roadway emissions to individual air toxics by site location, and for understanding gradients in pollutants. Lastly, ambient concentrations will be put in context of other concentrations at other near-road communities, with other air toxics measurements in Denver, and concentration ranges nationally. Air toxics measurements will be compiled into continuous integrated spatial surfaces in GIS, allowing for estimates of toxics throughout the community. These surfaces will be compared with census tract NATA emission estimates. Understanding nearby emissions will potentially help explain outliers and anomalies in the data. In addition, DEH has developed detailed AERMOD modeling of several MSATs in the area. Recent year spatial surfaces of AERMOD modeling will be compared with ambient point observations and surfaces developed with ambient data. The observed relationships between air toxics and meteorology will be used to constrain model predictions.

---

<sup>1</sup> e.g., Baldauf R., Watkins N., Heist D., Bailey C., Rowley P., and Shores R. (2009) Near-road air quality monitoring: factors affecting network design and interpretation of data. *Air Quality, Atmosphere, and Health*, 2(1), 1-9, doi: 10.1007/s11869-009-0028-0. Available at <http://www.daham.org/bin/Near-road%20air%20quality%20monitoring%20Factors%20affecting%20network.pdf>.

Hagler G.S.W., Lin M.-Y., Khlystov A., Baldauf R.W., Isakov V., Faircloth J., and Jackson L.E. (2012) Field investigation of roadside vegetative and structural barrier impact on near-road ultrafine particle concentrations under a variety of wind conditions. *Science of the Total Environment*, 419, 7-15, doi: 10.1016/j.scitotenv.2011.12.002, March 1.

Polidori A. and Fine P.M. (2012) Ambient concentrations of criteria and air toxic pollutants in close proximity to a freeway with heavy-duty diesel traffic. Final report prepared by the South Coast Air Quality Management District, April.

Patton, A. P., Collins, C., Naumova, E. N., Zamore, W., Brugge, D., and Durant, J. L.: An hourly regression model for ultrafine particles in a near-highway urban area, *Environ. Sci. Technol.*, 2014

Results from the data analyses will be documented in a study report. Concentration values reported in the final report can then be used as a “baseline” prior to additional roadway construction. Additionally, a journal article will likely be prepared and submitted to a peer-reviewed journal, and results will be presented at one or more conferences, such as the National Air Quality Conference or the American Geophysical Union (AGU) Fall Meeting.

#### **4.0 Environmental Justice Impacts**

This project will be conducted in the north Denver neighborhoods of Globeville and Elyria-Swansea. The neighborhoods include 10,160 residents living in 2652 households. According to the 2010 Census, 26% of the residents lived below the federal poverty level, almost twice the rate as Denver as a whole. In 2009, 93% of the children attending Denver Public Schools from these neighborhoods were eligible for the free lunch program, as compared to 87% in 2001.

Both Globeville and Elyria-Swansea have populations that are predominantly Hispanic in ethnicity. In fact, Elyria-Swansea has one of the highest Hispanic populations of any neighborhood in Denver at 84%, compared with Denver at about 32%. Globeville’s population is about 68% Hispanic. Both neighborhoods also have a much younger population, and more families with children (43% in Globeville, 55% in Elyria-Swansea) than in Denver (25% overall). The average household income in Elyria-Swansea is \$44,700, and in Globeville is \$39,200, both significantly lower than Denver’s average of \$73,100.

The entire Globeville and Elyria-Swansea neighborhoods are included in two EPA Superfund sites (Globeville ASARCO and VB/I-70) for soils contaminated with heavy metals including lead, arsenic and cadmium due to smelting operations. Medium and heavy industry are also within or adjacent to these neighborhoods.

The construction of I-25 and I-70 in the 1950-60s cut these neighborhoods into four quadrants, causing neighborhood cohesion problems and increased public health risk. Highway access brought additional industrial activity making the neighborhoods two islands of residences surrounded by industry and highways.

#### **5.0 Community Collaboration and Outreach**

The development of this project is the result of extensive community input over the last several years. Improving air quality was identified by community residents as a priority in three recently-completed planning processes (the Globeville Neighborhood Plan, the Elyria-Swansea Neighborhood Plan, and the Globeville, Elyria, Swansea Health Impact Assessment). Each of these planning processes included extensive community outreach and engagement. Additionally, in October 2014, several community-based organizations submitted extensive comments on air quality monitoring and the need for baseline air quality data in response to the I-70 expansion Draft Environmental Impact Statement. Recent surveys collected by Groundwork Denver (GWD), a local community-based organization, indicated that 80% of the surveyed residents in Globeville felt that the air quality was negatively impacting their lives. Based on these ongoing community concerns, DEH and CDPHE have developed this aspect of the proposal in collaboration with GWD.

Throughout the project, GWD will partner with DEH and CDPHE to assist with the community engagement and outreach strategies essential for the project. GWD has been involved with the affected communities for twelve years, since its inception as a non-profit organization in 2002. Since its inception, GWD has worked with the affected community on issues ranging from indoor air quality, lead poisoning, green space improvements, built environment improvements and energy efficiency, typically getting involved at the request of residents, partner organizations or the City of Denver. GWD was awarded an EPA Community Problem Solving (CPS) grant in 2004 and an EPA CARE-Level II grant from 2005-2008, both which focused on air quality issues in these neighborhoods. In 2010, leaders of the local civic association requested GWD’s assistance to address air quality issues and odors which resulted in a successful request to EPA for an Environmental Small Grant. The work completed under that grant included health surveys and some air monitoring. This proposed project builds upon all of this community-based work. GWD will also ensure that project status updates and the technical communications are culturally and linguistically appropriate, that they are broadly distributed, and that resident concerns are collected and responded to in a timely and appropriate manner.

Methods of engagement will include making presentations to community groups including neighborhood associations, faith-based organizations, civic organizations, and parent groups; distribution of information via local

newsletters (Groundwork Denver “El Contacto Verde”, City Council newsletters, church bulletins); and announcements/tabling at local neighborhood events. Communications will be conducted in Spanish and English.

## 6.0 Environmental Results

Table 3 identifies expected quantitative and qualitative outcomes and outputs of the project. These support EPA’s 2014-2018 Strategic Plan Goal 1, “Addressing Climate Change and Improving Air Quality,” by improving understanding of near-road toxics impacts.

**Table 3.** Environmental results.

| OUTPUTS                                                                     | OUTCOMES/ LINKAGE TO STRATEGIC PLAN                                                                                                                                                                                                                                                                                                                                                                                    | PERFORMANCE MEASURES                                                        |
|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| Concentration gradients of HAPs in the near-road environment                | <i>Short Term:</i> Advance understanding of impacts to air quality from a major roadway that bisects an environmental justice neighborhood by characterizing emissions of HAPs at different setbacks.<br><i>Mid Term:</i> Provide inputs for source apportionment models.<br><i>Long Term:</i> Identify long term monitoring goals.                                                                                    | QAPP per EPA requirement, summary reports, final report                     |
| Development of baseline air quality concentrations                          | <i>Short Term:</i> Quantify levels of pollutants in a near-road environment prior to significant roadway construction.<br><i>Mid Term:</i> Inform the EJ community of concentrations and use results to develop or assess mitigation proposals.<br><i>Long Term:</i> Implement mitigation measures to reduce air toxics concentrations in the EJ community.                                                            | QAPP per EPA requirement, summary reports, upload data to AQS, final report |
| Community-specific assessments of air toxics related to near-road exposures | <i>Short Term:</i> Advance understanding of air toxics by determining extent of dispersion from roadways.<br><i>Mid-Term:</i> Provide insight for developing health protective strategies.<br><i>Long-Term:</i> Reduce human exposure and adverse health effects from air toxics.                                                                                                                                      | Upload data to AQS, final report                                            |
| Evaluation of air quality models                                            | <i>Short Term:</i> Advance understanding of air toxics science by building and evaluating a model to predict extent of air toxics dispersion in a near-road environment for use in exposure assessments.<br><i>Mid-Term:</i> Provide insight for developing health protective strategies through reducing air toxics emissions.<br><i>Long-Term:</i> Reduce human exposure and adverse health effects from air toxics. | Model Results, final report                                                 |

## 7.0 Programmatic Capability and Past Performance

### 7.1 Colorado Department of Public Health and Environment:

(1) *National Air Toxics Trends Sites (NATTS) – EPA funding:* Since 2004, CDPHE has been a part of the EPA NATTS program by operating a site in Grand Junction, Colorado. Originally sampling for VOCs, carbonyls and metals, semi-volatile organic sampling has been added, as well hexavalent chromium sampling for a few years. Many of the analyses are on the national contract with Eastern Research Group. Filter weighing is currently performed by the CDPHE laboratory. Data are uploaded to the EPA Air Quality System (AQS). CDPHE provides updates to EPA staff as needed on progress, works toward ensuring samples are collected according to NATTS guidelines and requirements, and participates in proficiency sample analyses and technical systems audits.

(2) *PM<sub>2.5</sub> monitoring – EPA funding:* CDPHE has performed PM<sub>2.5</sub> monitoring under EPA 103 funding since its inception in 1997. This monitoring includes both filter-based reference sampling as well as speciation sampling as part of the Speciation Trends Network. Data are uploaded to AQS and an annual grant summary is provided to EPA. CDPHE ensures that all data are collected according to reference requirements and meet all quality assurance as set forth in 40CFR58 Appendix A. CDPHE participates in EPA technical system audits and the Performance Evaluation Program to ensure accuracy of results.

(3) *3-State Study Pilot Project – Federal funding from BLM, NPS, USFS, EPA:* CDPHE, along with Wyoming and Utah, were the original proposers of a pilot data warehouse and modeling platform for the

northwest CO, southwest WY and northeastern UT area. Funding is provided by Federal partners who look at this project as a way to significantly streamline the NEPA/EIS process through validated, refined and pre-processed emissions inventories. CDPHE has provided inventory data and has installed additional monitoring sites with designated funding, with data being uploaded to AQS. CDPHE also works with Federal partners to review the inventories and modeling, and recommend changes to monitoring networks. CDPHE participates on Technical and Steering Committees, and is a Governing Board member.

**7.2 City and County of Denver:**

Gregg Thomas, Division Director and past air quality programs manager at DEH has been involved with numerous EPA and DOE grants over the past 10 years. A listing of EPA grants includes:

- (1) *EPA Brownfield grants:* DEH has received and successfully implemented several Brownfields grants over the past five years.
- (2) *2004 EPA Community Based Air Toxics Monitoring grant:* Evaluated temporal and spatial relationships and biases at four sites throughout Denver, including the Swansea Elementary School site included in this project.
- (3) *EPA Diesel Emissions Reduction Act grants:* Successful implementation of two DERA projects from 2008-2010.
- (4) *EPA Climate Showcase Communities:* Successful implementation 2009-2011.

**8.0 Budget Narrative**

The CDPHE will administrate the award and provide QA oversight for the project. CDPHE will contract with our partner, DEH, to perform the bulk of the project. Table 4 provides a detailed breakdown of the proposed project budget, including staff costs and contractual costs for the major project activities. The total requested funding is **\$399,111**. These funds will be combined with **\$162,327** of non-federal funds in addition to the **\$88,000** of leveraged funds discussed in the following section for an overall total of **\$649,438**.

**Table 4. Budget**

| <b><u>CDPHE</u></b>                                                                                                                                                         | <b>EPA Funding</b> | <b>Cost Share</b> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------------------|
| <b><i>Personnel, Travel, Equipment, Supplies</i></b>                                                                                                                        |                    |                   |
| (See Leveraging section)                                                                                                                                                    |                    |                   |
| <b><i>Indirect</i></b>                                                                                                                                                      |                    |                   |
| Federal negotiated indirect cost rate = 1.0% for flow-thru                                                                                                                  | \$3,952            | \$0               |
| <b>Total Funding for CDPHE:</b>                                                                                                                                             | <b>\$3,952</b>     | <b>\$0</b>        |
| <b><u>DEH</u></b>                                                                                                                                                           |                    |                   |
|                                                                                                                                                                             | <b>EPA Funding</b> | <b>Cost Share</b> |
| <b><i>Personnel</i></b>                                                                                                                                                     |                    |                   |
| Air Quality Analyst: 0.4 total FTE @ \$75,000/yr                                                                                                                            | \$0                | \$30,000          |
| Supervisor(s)/Past Subject Matter Experts: 0.2 total FTE @ \$100,000/yr                                                                                                     | \$0                | \$20,000          |
| <b><i>Fringe Benefits</i></b>                                                                                                                                               |                    |                   |
| Fringe Benefits @32.8% of salary and wages (Retirement, Health, FICA, SUI, holiday, vacation)                                                                               | \$0                | \$16,400          |
| <b><i>Subcontracts</i></b>                                                                                                                                                  |                    |                   |
| Field study support; auto-GC database and QC; analysis                                                                                                                      | \$109,135          | \$0               |
| Aethalometer rental, 1-year @ \$1,000/mo                                                                                                                                    | \$6,000            | \$6,000           |
| Electrical installation                                                                                                                                                     | \$5,000            | \$0               |
| Laboratory analysis of whole-air canister samples for VOCs (216 @ \$450/sample), including canisters and shipping (2 periods * 6 sites * 15 samples/period + 36 QA samples) | \$96,552           | \$0               |
| Laboratory analysis of cartridge samples for carbonyls (216 @ \$155/sample), including cartridges and shipping (2 periods * 6 sites * 15 samples/period + 36 QA samples)    | \$33,048           | \$0               |

|                                                                                                                                                                                      |                        |                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-----------------------|
| Laboratory analysis of BTEX and carbonyl passive samples (88 @ \$400/sample set), including sampling equipment and shipping (2 periods * 10 sites * 4 samples/period + 8 QA samples) | \$35,200               | \$0                   |
| Community Outreach – Groundwork Denver                                                                                                                                               | \$30,000               | \$0                   |
| <b>Travel</b>                                                                                                                                                                        |                        |                       |
| City-owned vehicle mileage                                                                                                                                                           | \$0                    | \$500                 |
| <b>Equipment</b>                                                                                                                                                                     |                        |                       |
| 5 AethLabs microAeth samplers @ \$6,000 ea                                                                                                                                           | \$30,000               | \$0                   |
| 1 Chromatotech airmoVOC gas chromatograph (unit is on loan from EPA Region 8; needs calibration, internal standard replacement, and hydrogen generator/gases)                        | \$10,000               | \$65,000              |
| <b>Supplies</b>                                                                                                                                                                      |                        |                       |
| Aethalometer tape                                                                                                                                                                    | \$300                  | \$0                   |
| Field sampling supplies                                                                                                                                                              | \$1,000                | \$0                   |
| <b>Other</b>                                                                                                                                                                         |                        |                       |
| Electrical/power @ \$150/mo * 12 mo                                                                                                                                                  | \$1,800                | \$0                   |
| Communications @ \$100/mo * 12 mo                                                                                                                                                    | \$1,200                | \$0                   |
| <b>Indirect</b>                                                                                                                                                                      |                        |                       |
| Citywide indirect Cost rate = 26.02% of salaries + fringe; 10% of services and contracts                                                                                             | \$35,924               | \$24,427              |
| <b>Total Funding for DEH:</b>                                                                                                                                                        | <b>\$395,159</b>       | <b>\$162,327</b>      |
|                                                                                                                                                                                      | <b>EPA<br/>Funding</b> | <b>Cost<br/>Share</b> |
| <b>TOTAL PROJECT FUNDING (EPA + Cost Share)</b>                                                                                                                                      | <b>\$399,111</b>       | <b>\$162,327</b>      |

## 9.0 Leveraging

The proposed project leverages past, current and future funding resources, including air monitoring equipment, monitoring site infrastructure, community outreach, state and local government staff time, and computer systems. The investigators at the CDPHE and DEH bring extensive experience in air sampling and analysis, QA/QC, evaluation of air data, human health risk assessment, exposure assessment, and community outreach to the proposed project. The combination of available resources to leverage, the prospect of future resources, and the proposed project provide an excellent opportunity to determine a detailed understanding of community exposure to air toxics in the I-70/I-25 freeway EJ areas. Leveraging totals are estimated at **\$88,000**, detailed in Table 5.

**Table 5.** Summary of leveraged funds and resources

| Resource                                          | Leveraged funds (est.) | Source of resources/funds | Project benefit                                                    |
|---------------------------------------------------|------------------------|---------------------------|--------------------------------------------------------------------|
| Personnel time and fringe                         | \$30,000               | CDPHE                     | Administrative oversight, monitoring support, field monitoring, QA |
| 6 canister samplers                               | \$30,000               | CDPHE                     | Critical monitors for field portion                                |
| 6 carbonyl samplers                               | \$6,000                | CDPHE                     | Critical monitors for field portion                                |
| Shelter, 8'x14', temperature controlled           | \$10,000               | CDPHE                     | Required for Swansea air monitoring site                           |
| Fields sampling supplies                          | \$500                  | CDPHE                     | Critical supplies for field portion                                |
| Vehicle costs, mileage                            | \$500                  | CDPHE                     | Required for air monitoring                                        |
| Monitoring infrastructure at Swansea site         | \$3,000                | CDPHE, DEH                | Required for air monitoring                                        |
| Monitoring infrastructure at CDPHE near-road site | \$3,000                | CDPHE                     | Required for air monitoring                                        |
| Outreach support                                  | \$5,000                | DEH                       | Ongoing community outreach                                         |
| <b>TOTAL Leveraging (est.)</b>                    | <b>\$88,000</b>        |                           |                                                                    |