

Project Title: Ambient Air Quality Monitoring at Mid-Stream Natural Gas Processing Facility

Applicant Information: Ohio Environmental Protection Agency (Ohio EPA), 50 West Town Street, Suite 700, PO Box 1049, Columbus, Ohio 43216-1049;

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Total Project Cost: \$142,117.00

Project Period: Anticipated beginning date: April 1, 2015
End no later than: March 30, 2018

DUNS #: 809172372

1. Basis and Rationale

Ohio EPA, Division of Air Pollution Control (DAPC) is proposing a Community-Scale Air Toxics monitoring project to characterize near-source concentrations from Ohio’s oil and gas industry in order to assess criteria and the toxic pollutant levels, which will assist Ohio EPA in assessing the need for emission reduction measures, and to characterize risk for the most highly impacted populations.

The oil and gas industry has been rapidly expanding in eastern Ohio. The natural gas that has been found in Ohio in the Utica formation is “wet gas,” that is, it contains natural gas liquids (NGL) along with the natural gas. The NGL are higher chain hydrocarbons that provide additional BTU value to the gas, but cannot be transported or shipped in natural gas lines a long distance or else the NGL would condense and cause both operational issues and potential safety issues to the end users. In order to clean up the raw gas and produce pipeline quality natural gas, “midstream” facilities are constructed between the well and pipeline to clean up the gas and recover the NGL. The NGL is a high BTU commodity that has much economic value. It is however, a liquid hydrocarbon mixture that has the potential for air emissions from several different source operations. Although these facilities are not categorized as major sources, Ohio EPA is finding that these midstream facilities can be significant sources of VOCs due to leaks, undersized equipment and equipment malfunctions. A typical midstream facility in Ohio is shown in Photo 1.

Ohio EPA has been evaluating the air quality impact of natural gas “upstream” operations that include fracturing and drilling in eastern Ohio. A recent analysis consisted of ambient air quality monitoring of a natural gas well site in Muskingum County. The site (Photo 2) was located to monitor air impacts from nearby gas well sources, however, the closest well site has not been active and recent ambient air quality values of significance have not been measured. Since the well is now in production phase, little if any additional emissions are anticipated.

Ohio EPA is proposing to relocate this trailer along with the existing equipment and operate these monitors at a location near one of the large natural gas processing plants in Ohio. This proposal includes six months to identify a site and relocate the monitors and includes operating the complete set of monitors for 2 ½ years. Ohio EPA has acquired all of the monitors and trailers and is willing to dedicate them to this project. This proposal is for the cost of relocation, site preparation and operation of the monitors including quality assurance, data handling, data input into AQS, along with data analysis and final report.



Photo 1: mid-stream processing plant



Photo 2: monitoring trailer

2. Technical Approach

The proposed monitoring project will be used to determine the concentrations of toxic air pollutants from a large natural gas processing plant during a 2 ½ year sampling period. The project consists of four components:

- Site selection and preparation
- Ambient Air Monitoring
- Data quality assurance and analysis
- Issuance of final report including a summary of the monitoring data and characterization of near-source concentrations for large mid-stream processing plants

Ohio EPA will locate a fully equipped air monitoring trailer at a site nearby one of the larger midstream processing plants in eastern Ohio. The sites under consideration include:

- Mark West Hopedale Fractionation Plant, Harrison County
- Pennant Midstream LLC - Hickory Bend Gas Processing Plant, Mahoning County
- Kensington Processing Plant, Columbiana County
- Harrison Hub Fractionation Plant, Harrison County
- Blue Racer Midstream Plant, Monroe County
- Mark West Seneca Complex, Noble County

The fixed location of the monitoring trailer will be downwind of the chosen facility. The exact location for this site will be dependent on the access to land close to one of these facilities. The trailer will be used to monitor for PM10, PM2.5, hydrocarbons using a gas chromatograph and canister sampling, carbon monoxide, hydrogen sulfide, and wind speed and direction. The monitors will include:

- SRI 8610C Gas Chromatograph
- Volatile Organic Compound Sampler
- Carbon monoxide monitor
- Hydrogen sulfide monitor
- Wind speed/wind direction sensors
- ESC data logger
- VOC stainless steel canisters and timers
- BGI 100 sampler PM10
- BGI 100 sampler PM2.5

The monitors will be operated in accordance with Ohio EPA's Quality Assurance Project Plan (QAPP). The data quality objectives are to be suitable for submission to EPA's AQS system and to be usable for emission estimates from similar sources.

The following is a list of the types of sources found at a mid-stream processing plant.

- Hot Oil Heater 1 (B001): 150 MMBtu/hr natural gas-fired, hot oil heater #1 (TMP172307)
Subject to 40 CFR Part 60, Subpart Db
- Railcar and Truck Loading System (Natural Gas Liquids Loading Rack) (J001): The railcar and truck loading system is a closed loop vapor balance system used to load propane, butane and natural gasoline product from the on-site storage tanks and production units into railcars. Potential emissions from loading hose blowdowns are routed to the Storage/Loading Flare with 95 percent destruction efficiency. The truck loading system is used only for propane and is a closed loop system.
- Emergency fire pump (P001): 460 Hp emergency fire pump
- Closed and Cold Drain Systems (P002): Drain systems for blow-down closed sample loops.
- Emergency Release Control Flare (P003): The flare is used to control potential VOC emissions from the closed and cold drain system, plus any emergency venting that could occur during a process upset. The flare normally operates with a heat input of less than 0.5 MMbtu/hr during non-upset conditions, but has a maximum capacity of 8029 MMbtu/hr.
- Storage and Loading Flare (P004): Potential emissions from rail car loading and truck unloading associated with natural gasoline product and condensate are vapor balanced back to the 750 bbl tanks and then controlled by the storage and loading flare. The flare has manufacturer guaranteed hydrocarbon destruction and removal efficiency (DRE) of 98%.
- Emergency Generator (P005): 150kW Generac Emergency Generator for LPG Flare Blower
- Fugitives (P801): Fugitive emission leaks from valves, pumps, flanges, relief valves, compressors, and other miscellaneous sources.
- Two Gasoline Product 60K Storage Tanks (T001-T002): 60 K bbl gasoline product storage tanks #1-2 bbl = 42 gallons
- Four Gasoline 750 Working Tank (T003-T006): 750 bbl gasoline product working tank #1-4
- Refrigerated Tank Storage Flare (T007): Emissions from the four refrigerated (propane and butane) atmospheric tanks during emergency process releases and streams resulting from maintenance, start-up and shutdown (MSS) activities. The flare has manufacturer guaranteed

hydrocarbon destruction and removal efficiency (DRE) of 98%. The only expected emissions associated with the refrigerated system during normal operation are those associated with products of combustion from the refrigerated storage flare.

- Process Wastewater Tanks (T008): Process Wastewater Tanks
- Pressurized propane and butane storage tanks (T009): 20 - 90,000 gallon pressurized propane and butane storage tanks, one 50,000 BBL butane sphere.
- Pressurized 30K BBL Propane Sphere (T010): Pressurized 30K BBL Propane Sphere
- Controlled Railcar Blowdown (Tmp182534): Controlled Railcar Blowdown

The air pollutants that will be evaluated for inclusion in this study include:

- Propane
- Butane
- Pentane
- Hexane
- Benzene
- Toluene
- Ethylbenzene
- m_p-Xylenes

More than 60 pollutants will be monitored through the canisters.

The estimated number of samples will be:

Sampler Type	Number of Samplers	Sampling Frequency	Sampling Duration	Number of Samples
Gas Chromatograph	1	1 analysis/hr	2.5 years	21,900
Carbon monoxide monitor	1	Hourly averages	2.5 years	21,900
Hydrogen sulfide monitor	1	Hourly averages	2.5 years	21,900
Wind speed/wind direction sensors	1 each	Hourly averages	2.5 years	21,900
VOC stainless steel canisters	1	1-in-12 days	2.5 years	76
BGI 100 sampler PM10	2	1-in-6 days	2.5 years	$(61+21)2.5=205$
BGI 100 sampler PM2.5	2	1-in-6-days	2.5 years	$(61+21)2.5=205$

Ohio EPA will evaluate the results of the hydrocarbon monitoring against various toxic compound databases to determine if the concentrations measured at the site are at a level of concern, utilizing the following resources:

- U.S. EPA's Integrated Risk Information System (IRIS)
- The Agency for Toxic Substances and Disease Registry (ATSDR) Minimal Risk Levels (MRLs) for Hazardous Substances and Toxicological Profiles
- The American Conference of Governmental and Industrial Hygienists (ACGIH)
- U.S. EPA's Accidental Release Prevention Program (112r)
- U.S. EPA's list of Hazardous Air Pollutants (HAPs) and Health Affects Notebook

- U.S. EPA's National Air Toxics Assessment (NATA)
- The International Agency for Research on Center (IARC)
- The National Toxicology Program (NTP) U.S. Department of Health and Human Services)
- U.S. EPA's Persistent Bioaccumulative and Toxics Pollutant Strategy (PBTs)
- U.S. Department of Health and Human Services Hazardous Substances Data Bank

3. Data Analysis

The three year project will involve a significant amount of data. The concentrations for each specific air compound of concern will be characterized using basic statistics (median, mean and max values). A time trend analysis will also be developed.

There are two distinct approaches to the analysis of the data that will be obtained from the monitors. For the criteria monitors, the data will be compared to the NAAQS. Since there are no NAAQS for hydrocarbons, Ohio EPA will conduct a toxics review of the hydrocarbon components that are monitored. The individual hydrocarbon component concentrations will be evaluated individually against toxicity benchmarks as listed in the technical approach.

4. Environmental Justice Impacts

The Utica shale natural gas and oil development has largely occurred in counties that are officially designated as part of Appalachia. Communities in this geographic region face numerous challenges and potential environmental risks which align with Environmental Justice concerns. Residents in Appalachia deserve the same degree of protection from environmental hazards and this grant will move us towards this goal. By identifying and evaluating potential increases in exposure to air toxics, HAPs and criteria pollutants associated with this type of operation, we will be better suited to identify toxic emissions impacts in numerous local-scale Appalachian communities located near existing, new and expanding facilities.

The Health Policy Institute of Ohio (hpio) notes that Ohioans living in one of the Appalachian counties see a greater health disparity because of the socioeconomic factors specific to their region. Individuals in this region are more likely to not have health insurance and not seek medical care as often. These individuals have a greater risk of having adverse health outcomes, and they consider themselves in poor health. The Appalachian region has a higher percentage of uninsured individuals than other regions of the state (Metropolitan, Rural and Suburban). This region also shows a higher percentage of poor quality of healthcare and unmet health needs, as well as a greater incidence of individuals enrolled in Medicaid. Health risk factors such as smoking, obesity and high blood pressure affect a greater percentage of individuals in the Appalachian region than the other regions in Ohio. People living in an Appalachian county are more likely to have diabetes and/or suffered a heart attack. Overall, hpio ranked Ohio 47th in the nation on the Health Value Dashboard. Two additional factors to note: Ohio ranked 34th in the Physical Environment category and 51st in Public Health and Prevention.

Belmont, Carroll, Harrison, Monroe, and Noble counties (with some of these midstream facilities) clearly have socioeconomic and healthcare/environmental factors that put them at a greater risk for adverse

health effects than the general population in Ohio. Better identification of potential air toxics, HAPS and criteria pollutants from natural gas midstream operations will provide Ohio EPA, citizens and local organizations with the knowledge necessary to properly evaluate health risks and optimize resources to maximize their impact on protection of local communities.

5. Community Collaboration / Outreach

Community collaboration and outreach for this proposed project are dependent on the undefined specific ambient monitoring location and similar mid-stream source locations across the state. The proposed project monitoring will characterize concentrations of select air toxics, criteria pollutants and HAPs downwind from the emissions source. A final report of this proposed midstream monitoring project will be developed and issued similar to the upstream report summarizing the well site air quality impact. A copy of the upstream report can be found at:

http://epa.ohio.gov/Portals/27/ams/HydraulicFracturingWellAirMonitoringAssessment_%202013DataUpdateFeb2014.pdf

Communication of these findings to surrounding citizens and community will be disseminated through press releases and electronic posting of data via Ohio EPA's website. These outreach measures will use Ohio EPA's previous investigative air toxics sampling as a guide. As discussed earlier, characterization and evaluation of natural gas fracturing and drilling impact on ambient air quality has been completed. Outreach including public meetings, collaboration with local community leaders and citizens will be initiated if measured results and analysis establish ambient concentrations predicted to impact human health. Previous monitoring of natural gas fracturing and drilling did not measure air contaminants that presented a health impact, so additional outreach was not conducted.

Air toxics, HAPs and criteria pollutant monitoring made possible by this grant and the acquired ambient concentration profile downwind from a representative mid-stream natural-gas processing facility will be used as a baseline reference for evaluation of similar facilities across Ohio. Measured ambient conditions down-wind from this facility type are invaluable to permit writers as they evaluate permit applications for new or expanding mid-stream processors across Appalachia. Many of these permits necessitate general community outreach and public hearings where citizens and communities have local health concerns associated with air toxics and HAPs emissions impacts. In addition, inspectors will use downwind air toxic characterizations when responding to citizen and/or community-based concerns and complaints. Applying these results to other midstream natural gas processing operations provides a valuable educational tool to proactively discuss community-scale impacts from proposed expansions, location of new facilities, and associated environmental justice impacts with citizens, community groups and/or local elected officials.

6. Environmental Results: Outcomes, Outputs, Performance Measures

The major outcome of this project will be the determination of the overall ambient impact from midstream natural gas fractionation plants. The project will support PA's Strategic Plan Goal 1, Objectives 1.1 and 1.2

Strategic Goal: 1 – Taking Action on Climate Change and Improving Air Quality

Objective 1.1: Address Climate Change. Reduce the threats posed by climate change by reducing greenhouse gas emissions and taking actions that help communities and ecosystems become more resilient to the effects of climate change.

Objective 1.2: Improve Air Quality. Achieve and maintain health-based air pollution standards and reduce risk from toxic air pollutants and indoor air contaminants.

The outcomes from the proposed project include a more robust understanding of air contaminants released from midstream natural gas processing. This new data will assist Ohio EPA as permit applications are submitted, evaluated and associated permits are issued for midstream natural gas operations. This new data will provide Ohio EPA with an enhanced understanding of the emissions from midstream gas processing plans, and assist Ohio EPA in identifying and assessing the impact of emission reduction measures, as well as characterizing risk for the most highly impacted populations.

Outputs

Outputs from the proposed project include:

- Identification of the levels of air toxics over time near mid-stream natural gas processing plants
- Identification of emissions from midstream natural gas operations.
- Identification of emission and risk reduction opportunities
- Identification of public awareness opportunities.
- Identification of probable risk due exposure to air toxics for the most highly impacted population
- Publication that summarizes the project, findings, and conclusions

Outcomes

Short-term

- As early as six months into the monitoring, Ohio EPA will start to evaluate the monitoring data to evaluate whether there are concentrations of health-based concerns.

Mid-term

- Once the ambient data is being collected, Ohio EPA will make an evaluation of whether these types of facilities should be permitted in a different manner, whether additional control measures are needed at existing and future installations and whether these facilities should be modifying the monitoring of sources to more accurately reflect actual emissions.

Long-term

- The characterization of both air toxic emissions and natural gas hydrocarbons will assist Ohio EPA in determining the extent that emissions from these types of facilities require additional

control measures. Any additional controls are likely to have multiple benefits in that not only will hydrocarbon emissions be reduced, but methane, a potent greenhouse gas would also be reduced thereby reducing the impact of these facilities on climate change.

Performance Measures

The performance measures are associated with data quantity and quality, data analysis, and reporting. The data quality and quantity measures are the Ohio EPA/DAPC measures identified in the QAPP. For reporting, all documentation will be developed to meet the objectives and timeframes associated with this grant.

7. Programmatic Capability and Past Performance

Ohio EPA manages millions of dollars in federal grant funds each year. Ohio EPA Office of Fiscal Administration includes budget analysts to oversee the use of grant funds. Ohio EPA DAPC includes two fiscal officers who oversee the fiscal management of air pollution control grants, as well as the management of state specific funds. Ohio EPA, DAPC senior management actively oversee both the fiscal administration of the grants and the technical work associated with the grants. Ohio EPA, DAPC has demonstrated organizational capability to manage a vast array of environmental programs and projects, with a proven record of timely reporting, project completion, and performance.

Three recent grants are describes of similar nature:

Example 1: EPA Performance Partnership Grant: (Grant Period 10/1/13-9/30/15). DAPC manages the EPA Section 105 portion of this grant. Work is underway to manage the projects of this grant and document its outputs and outcomes. Ohio EPA/DAPC is successfully meeting the expectations of this grant and reporting results to EPA within the applicable deadlines. The Section 105 grants include a variety of activities including permitting, monitoring, and State Implementation plan development. Each activity has distinct methods of reporting which may include quarterly reporting or monthly conference calls. Ohio EPA DAPC staff work with US EPA in order to meet each reporting requirement, and communicate the progress towards achieving expected outputs and outcomes.

Example 2: EPA PM2.5 Monitoring Network FY 2014 Allocation Grant Period April 2014 to March 2016)- Ohio EPA/DAPC manages this Section 103 grant for conducting PM2.5 monitoring. This grant funds monitoring and analysis activities associated with the fine particulate standards. Ohio EPA/DAPC continues to meet all project reporting deadlines.

Example 3: EPA Near-Road Monitoring Grant: Ohio EPA-DAPC manages the Near-Road monitoring grant, which provided funding to establish NOx monitoring sites in Columbus and Cleveland Ohio. Ohio EPA successfully met the expectations of this grant, and reported the results to EPA within the applicable deadlines.

8. Budget **Narrative** (see Appendix B, Budget Sample)

	<i>EPA Funding</i>	<i>**Cost Share</i>
Personnel		
(1) Project Manager: Environmental Manager Randy Hock @ \$72,847/yr x .1 work year	\$8,142	\$0
(2) Project Staff: Environmental Specialists @ \$72,847/yr x .52 work year	\$37,880	\$0
Division Fiscal & Administrative Assistance: \$71,832/yr x 0.05 work year	\$3,593	
TOTAL PERSONNEL	\$49,615	
Fringe Benefits		
41.3% of salary	\$20,491	\$0
TOTAL FRINGE BENEFITS	\$20,491	
Travel	\$0	
Travel for Project Manager and Staff	\$0	\$0
TOTAL TRAVEL		
Equipment		
Volatile Organic Compounds Sampler	\$6,500	\$0
Gas Chromatograph Calibration mixture tank	\$2,500	\$0
TOTAL EQUIPMENT	\$9,000	\$0
Supplies		
PM10 filters for 2.5 years	\$1000	\$0
PM2.5 filters for 2.5 years	\$1000	\$0
Hydrogen Tanks	\$550	\$0
Helium Tanks	\$1150	\$0
Carbon Monoxide Tanks	\$800	\$0
TOTAL SUPPLIES	\$4500	
Contractual		
TOTAL CONTRACTUAL	\$0	\$0
Other		
Monitor Site Prep	\$4,900	
VOC Sample Analysis TO15 1/12 x 2.5 years@\$350/sample	\$26,615	
Vehicle Usage Expense for site work and 2 visits per week	\$9,750	
TOTAL OTHER	\$41,265	
<i>Indirect Charges</i>		<i>\$0</i>
<i>Federal Negotiated Indirect Cost Rate = 24.6%</i>	<i>\$17,246</i>	<i>\$0</i>
TOTAL INDIRECT	\$17,246	\$0
TOTAL FUNDING	\$142,117	\$0
TOTAL PROJECT COST (federal and non-federal)	\$142,117	

9. **Leveraging**

For this Air Monitoring Project to be conducted near a Midstream Natural Gas Processing Facility, Ohio EPA will leverage existing equipment and resources already used to assess the natural gas upstream

impacts at a Utica shale natural gas well. The equipment employed at the natural gas deep well was intended to detect and measure any compounds near a newly drilled well that had been drilled using deep horizontal drilling technology in conjunction with hydraulic fracturing of the shale layer of rock.

At the deep natural gas well and air sampling site Ohio EPA DAPC utilized equipment supplied by US EPA to measure air toxics for a previous US EPA program to measure for School Air Toxics (SAT). That program intended to measure potential air toxic compounds near schools determined to be at risk from various compounds by nearby industrial sources. Equipment employed in the SAT monitoring program was also employed at the first natural gas sampling site in Ohio and will be used again at this new location. The original equipment used included four BGI 100 samplers for sampling for PM10 and also for sampling for PM2.5. Other equipment used for the SAT program that will now be deployed at the second Ohio sampling site includes stainless steel canister sampling timers and stainless steel canisters to collect and measure volatile organic compounds via Method TO15. Also used for SAT sampling and at the first and second natural gas site will be the meteorological wind speed and wind direction sensors.

In addition to the SAT equipment Ohio EPA plans to utilize several items from the original Utica shale sampling site at the new natural gas processing facility. A new sampling trailer/shelter will contain a new gas chromatograph that was developed and calibrated specifically to detect and measure products from natural gas sources. In addition Ohio EPA will redeploy a carbon monoxide monitor and a hydrogen sulfide monitor. Costs for these items when new are estimated as: shelter/trailer - \$6,500, trailer stairs and railing - \$500, volatile organic sampling timer and canisters - \$5,500, four BGI 100 samplers - \$22,000, wind speed/wind direction sensors and mast - \$1,500, hydrogen sulfide monitor - \$11,500, carbon monoxide monitor - \$9,500, ESC datalogger - \$8,000, SRI 8610C Gas Chromatograph - \$24,000. Total value new - \$89,000.

10. Expenditure of Awarded Grant Funds

If awarded funding, Ohio EPA will initiate proven procedures and controls, as described above, to ensure funds will be allocated and used as proposed herein. Ohio EPA will immediately begin the Site selection and Preparation Phase. In addition, personnel and resources will be aligned such that monitoring will begin promptly to provide ample data for subsequent analysis and evaluation and preparation of reports to U.S. EPA.