OMB Number: 4040-0004
Expiration Date: 01/31/2009

Application for Federal Assistance SF-424

Version 02

* 1. Type of Submission:	* 2. Type of Application:	* If Revision, select appropriate letter(s):
☐ Preapplication	☑ New	
☑ Application	☐ Continuation	* Other (Specify)
☐ Changed/Corrected Application	☐ Revision	

* 3. Date Received: Completed by Grants.gov upon submission.

4. Applicant Identifier:

5a. Federal Entity Identifier:

* 5b. Federal Award Identifier:

State Use Only:

6. Date Received by State:

7. State Application Identifier:

8. APPLICANT INFORMATION:

* a. Legal Name: Municipality of Anchorage

* b. Employer/Taxpayer Identification Number (EIN/TIN): 92-0059987

* c. Organizational DUNS: 07-666-7013

d. Address:

* Street1: PO Box 196650
Street2:
* City: Anchorage
County:
* State: Alaska
Province:
* Country: USA
* Zip / Postal Code: 99519-6650

e. Organizational Unit:

Department Name: Health and Human Services

Division Name: Environmental Services

f. Name and contact information of person to be contacted on matters involving this application:

Prefix: Mr.
* First Name: Stephen
Middle Name: Sean
* Last Name: Morris
Suffix: P.E.

Title: Air Quality Program Manager

Organizational Affiliation:

* Telephone Number: (907) 343-6976

Fax Number: (907) 279-7959

* Email: morrisss@muni.org

OMB Number: 4040-0004
Expiration Date: 01/31/2009

Application for Federal Assistance SF-424 Version 02

9. Type of Applicant 1: Select Applicant Type:

C. City or Township (Municipality)

Type of Applicant 2: Select Applicant Type:

Type of Applicant 3: Select Applicant Type:

* Other (specify):

*** 10. Name of Federal Agency:**

Environmental Protection Agency

11. Catalog of Federal Domestic Assistance Number:

66.034

CFDA Title:

Community-Scale Air Toxics Monitoring

*** 12. Funding Opportunity Number:**

EPA-OAR-OAQPS-07-01

* Title:

Community Scale Air Toxics Monitoring

13. Competition Identification Number:

Title:

14. Areas Affected by Project (Cities, Counties, States, etc.):

Municipality of Anchorage

*** 15. Descriptive Title of Applicant's Project:**

This monitoring study will assess the effectiveness of new EPA regulations reducing the amount benzene in gasoline on ambient concentrations of benzene and other air toxics.

Attach supporting documents as specified in agency instructions.

Add Attachments | Delete Attachments | View Attachments

Application for Federal Assistance SF-424

Version 02

16. Congressional Districts Of:

* a. Applicant: AK-all
* b. Program/Project: AK-all

Attach an additional list of Program/Project Congressional Districts if needed.

Add Attachment | Delete Attachment | View Attachment

17. Proposed Project:

* a. Start Date: 07/01/07
* b. End Date: 06/30/09

18. Estimated Funding ($):

* a. Federal	$166,350.00
* b. Applicant	
* c. State	
* d. Local	
* e. Other	
* f. Program Income	
* g. TOTAL	$166,350.00

*** 19. Is Application Subject to Review By State Under Executive Order 12372 Process?**

☐ a. This application was made available to the State under the Executive Order 12372 Process for review on ______.

☐ b. Program is subject to E.O. 12372 but has not been selected by the State for review.

☑ c. Program is not covered by E.O. 12372.

*** 20. Is the Applicant Delinquent On Any Federal Debt? (If "Yes", provide explanation.)**

☐ Yes ☑ No Explanation

21. *By signing this application, I certify (1) to the statements contained in the list of certifications and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances** and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 218, Section 1001)**

☑ **** I AGREE**

** The list of certifications and assurances, or an internet site where you may obtain this list, is contained in the announcement or agency specific instructions.

Authorized Representative:

Prefix: Mr. * First Name: Denis

Middle Name: C.

* Last Name: LeBlanc

Suffix:

* Title: Municipal Manager

* Telephone Number: (907) 343-7110 Fax Number: (907) 343-7140

* Email: leblancdc@muni.org

* Signature of Authorized Representative: [signature] * Date Signed: 4/11/07

BUDGET INFORMATION - Non-Construction Programs

OMB Approval No. 0348-0044

SECTION A - BUDGET SUMMARY

Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	Total (g)
1. Comm Air Toxics	66.034	$	$	$ 166,350.00	$ 0.00	$ 166,350.00
2.						0.00
3.						0.00
4.						0.00
5. Totals		$ 0.00	$ 0.00	$ 166,350.00	$ 0.00	$ 166,350.00

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	GRANT PROGRAM, FUNCTION OR ACTIVITY				Total
	(1) EPA	(2)	(3)	(4)	(5)
a. Personnel	$ 31,000.00	$	$	$	$ 31,000.00
b. Fringe Benefits	18,000.00				18,000.00
c. Travel	2,000.00				2,000.00
d. Equipment	21,400.00				21,400.00
e. Supplies	2,000.00				2,000.00
f. Contractual	58,950.00				58,950.00
g. Construction	0.00				0.00
h. Other	11,300.00				11,300.00
i. Total Direct Charges *(sum of 6a-6h)*	144,650.00	0.00	0.00	0.00	144,650.00
j. Indirect Charges	21,700.00	0.00			21,700.00
k. TOTALS *(sum of 6i and 6j)*	$ 166,350.00	$ 0.00	$ 0.00	$ 0.00	$ 166,350.00
7. Program Income	$	$	$	$	$ 0.00

Authorized for Local Reproduction

SECTION C - NON-FEDERAL RESOURCES

(a) Grant Program	(b) Applicant	(c) State	(d) Other Sources	(e) TOTALS
8. Community Air Toxics (2nd year)	$	$	$	$ 0.00
9.				0.00
10.				0.00
11.				0.00
12. TOTAL *(sum of lines 8-11)*	$ 0.00	$ 0.00	$ 0.00	$ 0.00

SECTION D - FORECASTED CASH NEEDS

	Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
13. Federal	$ 120,000.00	$ 60,000.00	$ 20,000.00	$ 20,000.00	$ 20,000.00
14. Non-Federal	0.00				
15. TOTAL *(sum of lines 13 and 14)*	$ 120,000.00	$ 60,000.00	$ 20,000.00	$ 20,000.00	$ 20,000.00

SECTION E - BUDGET ESTIMATES OF FEDERAL FUNDS NEEDED FOR BALANCE OF THE PROJECT

(a) Grant Program	FUTURE FUNDING PERIODS (Years)			
	(b) First	(c) Second	(d) Third	(e) Fourth
16. Community Air Toxics (2nd year)	$ 46,350.00	$	$	$
17.				
18.				
19.				
20. TOTAL *(sum of lines 16-19)*	$ 46,350.00	$ 0.00	$ 0.00	$ 0.00

SECTION F - OTHER BUDGET INFORMATION

21. Direct Charges: $144,650	22. Indirect Charges: $21,700
23. Remarks:	

Assessment of the Effectiveness of New Mobile Source Air Toxics Regulations in Reducing Ambient Concentrations of Benzene and Other Air Toxics in Anchorage, Alaska

Submitted in response to EPA RFA NO: OAR-OAQPS-07-01
Community-Scale Air Toxics Monitoring
Category: Community-scale monitoring

Municipality of Anchorage Department of Health and Human Services
Anchorage Air Quality Program
Contact: Stephen S. Morris, PE
Tel: (907) 343-6976- Fax: (907) 249-7959, E-mail: MorrisSS@muni.org

Eligibility enabling legislation is appended.
Funding Requested and Total Project Cost: $166,350
Project Period: July 1, 2007 - June 30, 2009

1 Project Summary

In response to the U.S. Environmental Protection Agency solicitation for air toxics monitoring proposals (*Community-Scale Air Toxics Ambient Monitoring* - RFA NO: OAR-OAQPS-07-01), the Municipality of Anchorage, Department of Health and Human Services, Air Quality Program (AAQP) proposes to carry out a community-scale monitoring study to assess the effectiveness of a new EPA rule designed to reduce benzene emissions from gasoline, passenger vehicles and fuel storage containers.* The purpose of this project is to characterize concentrations of ambient benzene and other air toxics *before* the effects of rule implementation are realized in Anchorage. AAQP intends to seek grant funding for follow-up monitoring in 2011 or 2012 to measure benzene concentrations after rule implementation and determine whether ambient concentrations are reduced as a result of the rule.

Previous monitoring studies suggest that ambient benzene concentrations in Anchorage are among the highest in the U.S.[1, 2] These elevated ambient benzene concentrations have been attributed to three primary factors: (1) strong and persistent winter temperature inversions that trap air pollutants close to the ground; (2) the high benzene content of Alaska gasoline; and (3) increased hydrocarbon exhaust emissions from motor vehicles at cold temperatures. The new air toxics rule will directly address two of these three factors. By 2011 or 2012 the rule could reduce the benzene content in Alaska gasoline three to ten-fold from its current level of 3% to 5% to less than 0.62%.† It will also impose stricter cold temperature exhaust emissions standards for passenger vehicles, to be phased-in between 2011 and 2015.

Because Anchorage is currently supplied with gasoline with a high benzene content and has a sub-arctic climate conducive to elevated cold temperature hydrocarbon emissions, it provides an ideal venue for evaluating the effectiveness of this rule in reducing ambient benzene concentrations. This proposal outlines proposed methods for measuring benzene and other associated air toxics and describes how this data will be used to assess the effectiveness of the new air toxics rule in reducing ambient benzene.

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* The EPA published the new rules on February 26, 2007 (72 Fed. Reg. 8428).

† The rule subjects all refiners and importers to an annual average benzene content of 0.62% but allows trading to achieve this. The rule imposes a maximum content limit of 1.3%, without trading, beginning July 2012. There are also temporary relief provisions for small refiners. How this will all play out in Alaska is unclear.

Although we understand that this solicitation limits proposals to ambient monitoring, AAQP is very interested in evaluating the effect of the new rule on indoor benzene concentrations. AAQP has found the average benzene concentration inside homes was almost six times higher than ambient. The highest concentrations have been found in homes with attached garages.[3,4] We expect that the rule will also effect reductions in these indoor concentrations. AAQP is interested in performing a concurrent and complementary study that would assess effectiveness of the rule on indoor concentrations. Based on preliminary discussions with EPA, we are hopeful that we will be able to obtain a separate source of funding for this complementary study.‡ The results of indoor monitoring, combined with results of the outdoor monitoring would provide a more comprehensive estimation of the effect of the new rule on overall personal exposures to benzene in Anchorage.

2 Background

Anchorage is Alaska's largest city with a population of 260,283 (US Census 2000). The city is located at 61°N on a plain between the Chugach Mountain Range and the head of the Cook Inlet of the Gulf of Alaska. It serves as the regional center for health and other service industries as well as retail. The Ted Stevens Anchorage International Airport is the busiest cargo airport in the U.S. and accounts directly or indirectly for approximately 10% of the employment in Anchorage.

There is little heavy industry in Anchorage. Natural gas serves as the primary energy source for electrical generation and space heating. Because natural gas costs are still relatively low in Anchorage, wood heating is minimal. Motor vehicles account for an estimated 77% of all carbon monoxide (CO) emissions.[5] Although AAQP has not performed a comprehensive inventory of benzene emissions, motor vehicles are presumed to be the main source of these emissions.

Because of its location in the sub-arctic, Anchorage experiences frequent and persistent winter temperature inversions that trap exhaust emissions near the ground where people are susceptible to exposure. Anchorage is currently classified as a maintenance area for CO. It is an attainment area for other criteria pollutants.

2.1 Previous Anchorage Air Toxics Monitoring Studies

Over the past 15 years, the AAQP has conducted a number of air toxics monitoring studies. Although these studies have been short-term, they suggest that outdoor and indoor benzene concentrations in Anchorage are among the highest in the U.S. These studies are summarized briefly below.

2.1.1 1993-94 Ambient Volatile Organic Compound Monitoring Study

The primary purpose of this study was to address concerns about volatile organic compound (VOC) exposures among residents of the Government Hill neighborhood just north of downtown Anchorage. This neighborhood is located adjacent to a large petroleum storage facility or tank farm and residents frequently complained about petroleum odors coming from this facility. VOC sampling was conducted at three sites in Government Hill and at eight other locations in Anchorage for comparison.

Twenty-four hour samples were collected every 12 days during the 14-month study using the TO-14 Summa canister method. Canisters were analyzed by gas chromatography for 37 possible VOCs. Quantifiable levels of seven VOCs were regularly observed in the samples. Benzene, toluene, ethyl benzene, m, p & o-xylene, and 1,3,5 & 1,2,4 trimethylbenzene were all found in reportable quantities. Because of its known carcinogenicity, benzene was of the greatest interest. Benzene data are summarized in Table 1.

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‡ In 2004 AAQP received $1.98M in congressional earmark funds, administered through EPA Region 10, which expire in December 2008. With EPA Region 10 approval, some of this funding could be re-programmed to support the complementary indoor evaluation.

Table 1
14-Month Mean and 24-Hour Maximum Benzene Concentrations
1993-94 Anchorage Ambient VOC Monitoring Study

Location	Land Use*	[benzene] μg/m³ Mean	Max	Min
Downtown	C	8.1	28.6	1.3
Government Hill (fence line with tank farm)	I/R	12.0	28.3	2.0
Government Hill (Delaney St.)	R	7.5	22.8	3.3
Government Hill School	R	5.9	25.4	1.3
Benson / Spenard Blvd.	C	17.6	67.6	3.3
Airport Post Office	C	6.5	22.8	1.0
Tanaina Drive	R	3.9	10.7	0.7
Sand Lake	R	7.8	33.8	1.3
Lower Hillside	R	4.6	12.0	1.0
Garden	R	11.7	45.5	1.6
Muldoon	R	7.2	35.8	1.3

* C – Commercial
I – Industrial
R – Residential
I/R – Industrial / Residential fence line

Surprisingly, the highest concentrations of benzene were not found in Government Hill. Mean benzene concentrations measured near the intersection of Spenard Road and Benson Boulevard were approximately 50% higher than the highest site in Government Hill. Benzene concentrations in a number of other Anchorage residential areas (i.e., Garden, Sand Lake) were as high as or higher than Government Hill even though they were far removed from the influence of the tank farm.

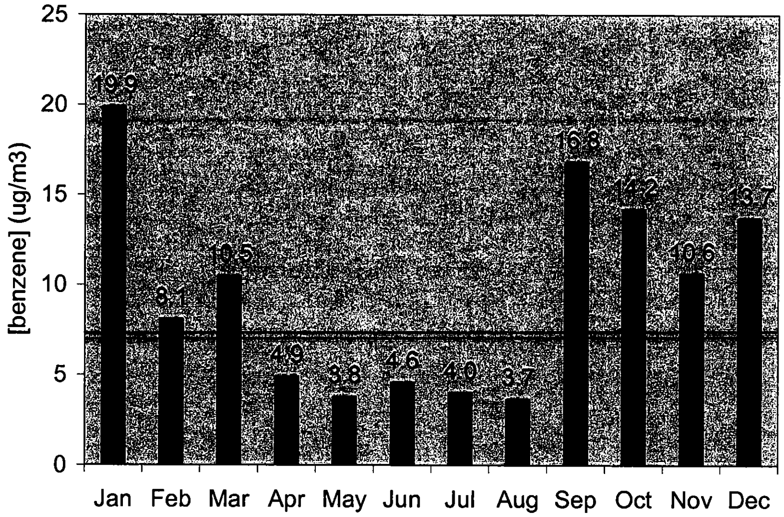
The study strongly suggested that motor vehicle exhaust emissions were the primary source of benzene and other VOCs in most of Anchorage. A very strong association was observed between CO concentrations and VOCs. The Pearson correlation coefficient (R^2) between CO and benzene was greater than 0.95 at all three sites where collocated VOC and CO measurements were taken. The study also suggested that ambient benzene concentrations in Anchorage were higher than other cities. An EPA study published in 1990 reported mean benzene concentrations for Boston, Houston, Chicago and Seattle; Anchorage concentrations were two to three times higher than those cities.[6, 7]

2.1.2 1994-96 Indoor and Outdoor VOC Assessment

The purpose of this air quality monitoring study was to measure and assess indoor and outdoor concentrations of volatile organic compounds while ethanol-blended gasoline was being used in Anchorage. This study was conceived to help address concerns about possible health impacts of using ethanol-blended gasoline in a sub-arctic climate and to gather baseline information on indoor VOC exposures and sources within the home.

Eighteen different VOCs were measured in this study using method TO-14. Ambient monitoring was performed for 24 hours every twelve days at three outdoor sites from December 1994 through February 1996. These three outdoor sites were located at three of the permanent CO stations (Garden, Benson, and Sand Lake) to investigate the relationship between VOC concentrations and CO. The 18 VOCs measured in this study included carbonyls and the BETX (benzene, ethyl benzene, toluene, and xylene) compounds. Monthly average benzene concentrations measured at the Benson site near the intersection of Benson Boulevard and Spenard Road site are plotted in Figure 1. Similar seasonal patterns were observed at other sites.

Figure 1
Mean Benzene Concentrations by Month at Benson Site
1994-96 Anchorage VOC Assessment



Data from the study suggested that motor vehicle emissions were a major contributor to ambient BETX as well as other VOC compounds such as formaldehyde and acetaldehyde. Concentrations of these compounds were highest in the winter months of the study and were strongly correlated with CO measurements. The strong associations observed between VOCs and CO implicated motor vehicle emissions as a major contributor to ambient VOCs in Anchorage. The R^2 between CO and benzene was greater than 0.90 at all sites where CO and benzene data were collected.

During the same period of time that ambient VOC monitoring was being conducted, indoor VOCs were sampled in Anchorage homes following an identical one-in-twelve day schedule. Samples were collected from 137 homes in Anchorage during the course of the study. Depending on the type of VOC compared, indoor concentrations of VOCs were 2 to 50 times higher than those measured outside. The average concentration of benzene measured inside homes was nearly six times higher (51 $\mu g/m^3$ vs. 6.2 $\mu g/m^3$) than measured outside. Homes with attached garages had an average benzene concentration that was over eight times higher (72 $\mu g/m^3$ vs.8.8 $\mu g/m^3$) than homes without attached garages and over an order of magnitude higher than outside.[8]

2.1.3 Ted Stevens Anchorage International Airport Air Toxics Monitoring Study - 2002

The purpose of this ambient monitoring study was to address concerns about toxic air pollution and associated odors in parklands and neighborhoods adjacent to the Ted Stevens Anchorage International Airport. It was prompted by odor complaints and concerns from residents living near the airport and users of Kincaid Park adjacent to the airport. Complaints were most common during the winter.

Method TO-15 sampling was performed utilizing Summa canisters to collect 24-hour samples from each of the ten study sites. Sampling was conducted during fourteen separate 24-hour periods between January 19, 2002 and February 28, 2002. Six of the ten sites were located either on or in close proximity to airport property. Four "non-airport" sites were selected for comparison. Three of these sites, the Seward Highway, Garden and Turnagain sites were long-standing CO monitoring stations where VOC sampling had been conducted previously.

Summa canister samples were analyzed for a total of 33 different VOC compounds. Only five of these were found at levels consistently above the detection limit. These compounds were benzene, toluene, ethylbenzene, m,p-xylene, and o-xylene, the BETX compounds. In addition to being correlated with

CO, there were strong correlations between all BETX compounds, suggesting a common source. BETX concentrations at the six sites nearest the airport were lower than the four "non-airport" sites. Canister sites located in areas with the most motor vehicle activity had the highest BETX concentrations. For example, the highest average BETX concentration (9.0 $\mu g/m^3$) was measured at the Seward Highway site, located at the busiest intersection in Anchorage was almost three times higher than the highest average concentration at the airport (3.6 $\mu g/m^3$). The average benzene concentration measured at the Garden site, in an east Anchorage residential area was 7.4 $\mu g/m^3$.[9]

2.2 Ambient Benzene Concentrations in Anchorage Compared with Other Cities

It is difficult to compare benzene data collected in Anchorage to other cities because of lack of recent data. The last time "long-term" VOC data were collected in Anchorage was during the *1994-96 Indoor and Outdoor VOC Assessment* described earlier. Data from this study are compared to data from other cities selected from the EPA's on-line AirData database in Table 2.

Table 2
Comparison of 1995 Ambient Benzene Concentrations in Selected U.S. Metropolitan Areas **

City	Number of Samples	Mean ($\mu g/m^3$)	Max ($\mu g/m^3$)
Anchorage, AK	**40**	**9.6**	**34.7**
Los Angeles, CA	44	6.8	16.9
El Paso, TX	55	5.2	16.3
Houston, TX	46	4.9	11.7
Chicago, IL	139	3.9	10.7
Minneapolis, MN	53	2.6	7.2
Bellingham, WA	11	2.6	6.5
San Diego, CA	48	2.6	14.6
Sacramento, CA	109	2.3	14.0
Duluth, MN	39	2.0	4.6
Vancouver, WA	10	2.0	4.9

** The benzene data presented in EPA AirData are expressed in units of ppbC. These data were converted to $\mu g/m^3$ for presentation in this table.

This comparison suggests that ambient benzene concentrations in Anchorage were among the highest in the country in 1995. It should be noted that concentrations measured at any one site are not necessarily representative of the average concentration in each city. Concentrations are highly dependent on proximity to major traffic arterials, industrial areas, and other sources. The Anchorage data presented in Table 2 are from the Benson station, located near the intersection of two busy traffic arterials. However, benzene concentrations were also high in Anchorage residential areas with lower much traffic volumes. Mean (7.2 $\mu g/m^3$) and maximum (33.5 $\mu g/m^3$) concentrations measured at the Garden site, in a residential area in east Anchorage, were higher than any of the cities presented in Table 2.

2.3 Trends in Anchorage Benzene Concentrations

It is very difficult to analyze trends in Anchorage benzene because of sporadic data collection. Extended benzene monitoring (i.e. ≥ one year) has not been conducted since 1994-96. Two pieces of evidence, however, suggest that ambient benzene concentrations in Anchorage have likely declined over the past decade. Because CO and benzene are highly correlated, the fact that mean CO concentrations have dropped by about 25% since 1996 suggests that benzene concentrations have also declined. Moreover, there has been a change in the slope of the regression relationship between CO and benzene observed in the 1994-96 study and the 2002 airport study. As explained in the footnote below,[§] this change in slope implies that the benzene content in gasoline may have dropped over the past decade, contributing to additional reductions in ambient benzene. Nevertheless, benzene concentrations in Anchorage today are still likely to be among the highest in the country.

3 Objectives

The primary goal of the study is to characterize baseline or pre-rule implementation concentrations of toxic air pollutants, especially benzene, so that these concentrations can be later compared with those after rule implementation. In addition to measuring benzene, AAQP proposes to measure a number of other air toxics and CO as part of the study. The specific objectives of the study are:

1. Measure baseline ambient benzene concentrations *before* the benzene content in gasoline changes as a result of the new mobile source air toxics rule.
2. Measure baseline ambient concentrations of other VOCs besides benzene found in Anchorage gasoline. The required benzene reduction in 2011 may affect gasoline octane rating and other key fuel attributes, necessitating a reformulation to meet fuel performance requirements. Measuring baseline concentrations of other air toxics will help determine whether reformulation affects ambient concentrations of other air toxics besides benzene.[**]
3. Perform gasoline fuel sampling and analysis to characterize the baseline composition of gasoline during the one-year study period sampling. Major constituents to be quantified include benzene, toluene, ethyl benzene, and xylenes.
4. Measure baseline ambient concentrations of polycyclic aromatic hydrocarbons (PAHs). Anchorage may have elevated ambient PAHs because studies show that PAHs emissions increase when vehicles operate at cold temperatures.[10] To our knowledge, this will be the first time that PAHs data will have been collected in Anchorage. The follow-up study in 2011 will help determine whether ambient PAHs are affected by changes in gasoline composition.
5. Measure baseline ambient CO concentrations. As discussed earlier, CO and benzene concentrations are highly correlated. The slope of this regression relationship is likely influenced by the amount of benzene in the gasoline. Lowering the benzene content should result in a change in the slope of this regression relationship (i.e. the ambient concentration of benzene relative to CO should fall). This would provide good evidence of rule effectiveness.

If AAQP is successful in obtaining separate grant funding for a complementary indoor air monitoring project, the primary objective for the indoor study would be to characterize baseline benzene concentrations in a representative sample of Anchorage homes before and after the benzene content of gasoline is reduced in 2011.

[§] The slope of the regression relationship between CO and ambient benzene concentrations dropped significantly between the 1993-94 study and the Airport Study in 2002. The linear regression relationship (intercept set to equal zero) for the 1993-94 study was [benzene] = 9.54 x [CO]; the slope fell in the 2002 Airport Study to [benzene] = 5.07 x [CO], where [benzene] is expressed as $\mu g/m^3$ and [CO] as ppm. This suggests that the benzene content in gasoline may have declined between the two studies.

[**] These VOCs could serve as "markers" to distinguish the effect that changes in benzene content may have on ambient concentrations from other unrelated factors. If, for example, the toluene content in gasoline remained unchanged between 2008 and 2011, any reductions observed in ambient toluene concentrations would in theory be attributed to something other than changes in gasoline composition. Measuring ambient concentrations of other gasoline constituents like toluene may provide a means to distinguish the effect of changes resulting from lowering the gasoline benzene content from other unrelated factors that could also affect ambient concentrations.

4 Study Design

This section discusses the monitoring site selection, sampling frequency and methods, analytical methods and quality assurance procedures.

4.1 Monitoring Site Selection

AAQP is proposing to use the Garden site (Trinity Christian Reformed Church, 3000 East 16th Avenue, Anchorage, 99508) for monitoring of VOCs, PAHs and CO. Garden is located in a residential area predominantly comprised of single family homes without attached garages, typical of many Anchorage residential areas. Garden currently serves as a PM-10, PM-2.5 and CO monitoring site and was used in all three of previously described air toxics studies (1993-94, 1994-96, and 2002). Using this existing monitoring site will reduce travel time and result in other efficiencies that will reduce the amount of AAQP staff time required to perform VOC, PAH, and CO monitoring for the study.

Figure 4

Garden Site is Located in Northeast Portion of the Anchorage Bowl

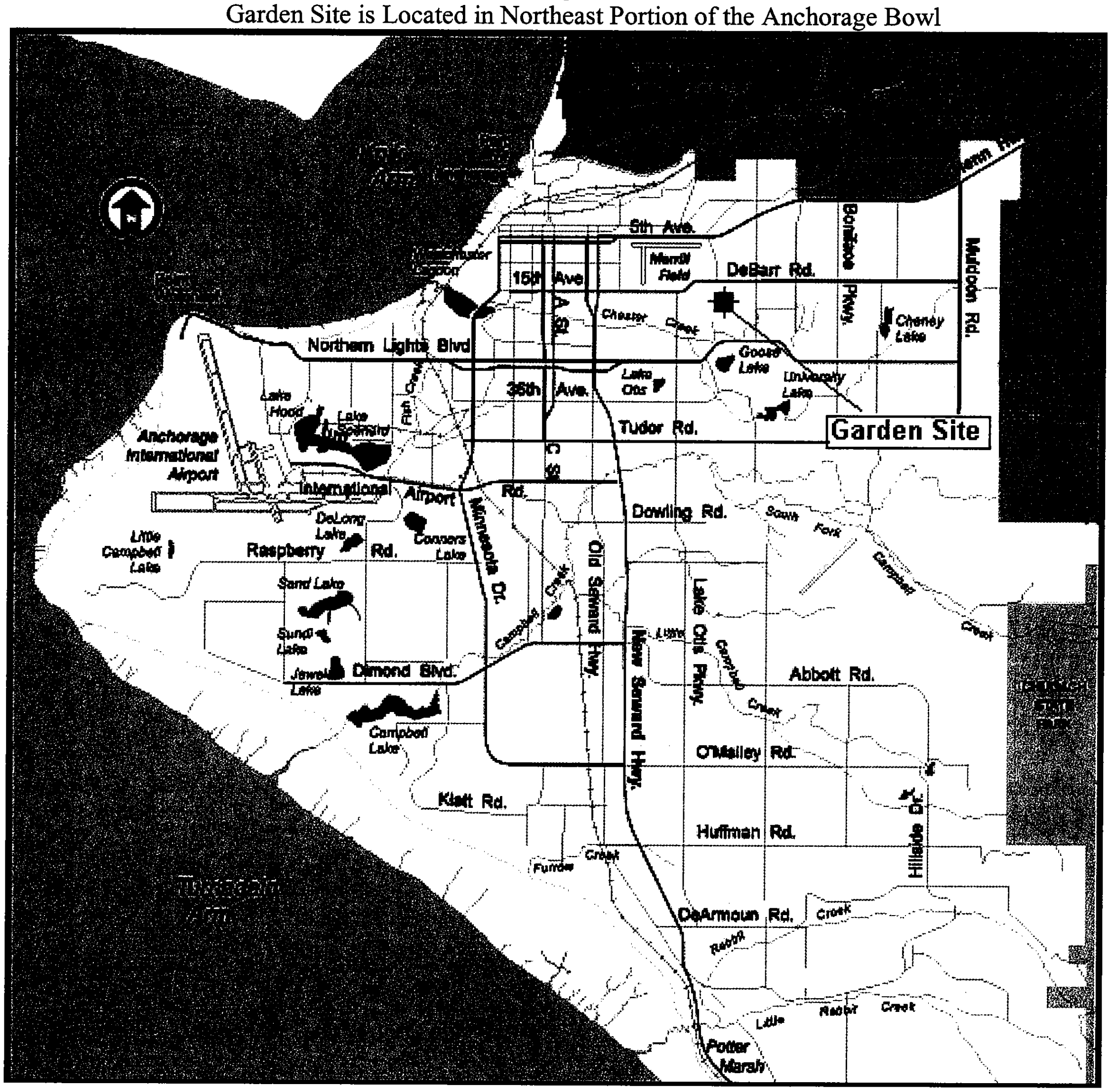


Figure 3
Views from Proposed Garden Air Toxics Monitoring Site

View North

View South

4.2 Sampling and Analytical Methods

AAQP is proposing the following methods for measuring VOCs, PAHs, and CO, and for speciation of gasoline constituents.

4.2.1 VOCs

Method TO-15 [11] will be used to measure 24-hour integrated VOCs on a one-in-six day schedule for one year. Ambient samples will be collected using MCS-1 Portable Canister Samplers, or equivalent, equipped with start/stop timers and 6-liter Summa canisters. A qualified contract laboratory will perform the sample analyses by GC/MS in accordance with Method TO-15. The following 39 VOCs have been tentatively selected for analysis in the canister samples.[††] Eleven of these are considered hazardous air pollutants (HAPs) by EPA. HAPs are noted in bold:

Benzene, Vinyl chloride, 1,3-Butadiene, 1,1,-Dichloroethene, Methylene chloride, Chloroform, Acrylonitrile, Carbon tetrachloride, Trichloroethene, 1,1,2,2- Tetrachloroethane, *cis*-1,3-Dichloropropene, m-Xylene, o-Xylene, p-Xylene, Toluene, Ethyl-benzene, Trichlorofluormethane, 1,2-Dichloroethane, Bromomethane, Chloroethane, Dichloro-difluoromethane, 1,2-Dichloropropane, Styrene, 1,1-Dichloroethane, 1,3,5-trimethylbenzene, cis-1,2- Dichloroethene, 1,2,4-trimethylbenzene, 1,1,2-Trichloroethane, 1,3-Dichlorobenzene, 1,4- Dichlorobenzene 1,2-Dibromoethane, 1,2-Dichlorobenzene, Tetrachloroethene, 1,2,4- Trichlorobenzene, Chlorobenzene, Hexachloro-1,3-butadiene, Trichlorotrifluoroethane, Chloromethane, and Dichlorotetrafluoroethane

4.2.2 PAHs

24-hour gas-phase and particle-bound polyaromatic hydrocarbons will be collected using a high volume sampler in accordance with Method TO-13A [12] . An 8" x 11" quartz fiber filter (QFF) will be used to collect particles prior to collection of organic vapors by a 7" x 6" polyurethane foam (PUF) cartridge at a flow rate of up to 1.1 m^3/hour. The following PAHs have been tentatively selected for analysis in the QFF and PUF samples. HAPs are noted in bold:

[††] This list is based on information received from one major contract analytical laboratory. The VOCs included on this list are part of their "standard package" of TO-15 analytes. This list may vary slightly if a different contractor is selected. Regardless of the contractor selected, we will require that VOCs commonly found in gasoline or as a product of gasoline combustion (e.g., BTEX, 1,3-butadiene) be included in the list of analytes.

Benzo[a]anthracene, Benzo[b]fluoranthene, Benzo[k]fluoranthene, Benzo[a]pyrene, Chrysene/Triphenylene, Dibenz[a,h]anthracene, Indeno[1,2,3-cd]pyrene, Naphthalene, Phenanthrene, Acenaphthene, Pyrene, Acenaphthylene, Benzoic acid, Anthacene, Benzyl alcohol, Fluoranthene, 2-Chloronaphthalene, Fluorene, 4-Chloroaniline, and Methyl-Naphthalenes.

4.2.3 CO

CO will be monitored continuously during the one-year study period. The Garden site has served as a CO monitoring site for nearly 30 years. Monitoring is performed in accordance with the Federal Reference Method and is audited quarterly by the Alaska Department of Environmental Conservation. The Garden site is designated as one of the EPA State and Local Air Monitoring Stations (SLAMS). Although monitoring is normally conducted only during the CO season, October 1 – March 31, during this study CO monitoring at the Garden site will be conducted year-round.

4.2.3 Gasoline Composition

Because the composition of gasoline varies by season, AAQP plans to collect samples every two months throughout the one-year study period. Although there are at least eight gasoline retailers in Anchorage, these retailers are supplied by just two refineries. AAQP expects that it will be necessary to collect approximately twelve separate gasoline samples every two months to develop a reasonable characterization of the average content of benzene and other constituents. Before the study begins, AAQP will investigate which refiners supply which distributors to obtain a more precise estimate of the required sample size.

At the outset of the study, AAQP plans to have the selected contract laboratory determine and quantify all gasoline constituents present at a level of 0.5% or higher. The level of these constituents will be monitored in subsequent bi-monthly testing using ASTM Method D6729-04, *Standard Test Method for Determination of Individual Components in Spark Ignition Engine Fuels by 100 Meter Capillary High Resolution Gas Chromatography.*

4.2 Quality Assurance/Quality Control

A detailed Quality Management Plan (QMP) and Quality Assurance Project Plan (QAPP) will be prepared and forwarded to the US EPA Region 10 before monitoring begins (EPA-454/R-01-007). AAQP will develop and submit Data Quality Objectives (DQO) to EPA Region 10 (EPA/600/R-96-055). The quality assurance program will include protocols for evaluating method precision (e.g., replicate sampling), accuracy (e.g., third-party instrument audits, laboratory proficiency testing) and ensuring proper record keeping, chain of custody, and data validation. AAQP staff will submit validated data to EPA quarterly for inclusion in the AQS database.

5 Schedule

Submit grant application to EPA	04/17/07
EPA award	07/15/07
Grant approval / appropriation by Anchorage Assembly	09/15/07
Procure sampling equipment / select laboratory contractor (competitive bid)	12/01/07
Develop QMP, QAPP, DQO, gain EPA approval	01/15/08
Begin sampling	02/01/08
End sampling	01/31/09
Prepare draft report, submit to EPA	04/15/09
Final report	05/15/09
Prepare presentation and attend conference	TBD

6 Programmatic Capability

AAQP has received annual EPA Section 105 grants for over 30 years. Over the past three years, the annual amount of this Section 105 grant was $135,195 which was matched with $323,000 in local funding. This funding supported regular AAQP operations including CO and PM monitoring, planning and modeling required for local State Implementation Planning, complaint response and enforcement. AAQP met all program requirements and submitted annual performance reports to EPA describing accomplishments and progress on the objectives identified in the annual work plan.

In 2005 the AAQP received $1.98M in congressional earmark funding for air quality projects in Anchorage. This funding is being administered by EPA Region 10. AAQP prepared a work plan that was approved by EPA that includes projects that will (1) provide real time air quality data to the public over the web; (2) develop best management practices for the control of PM-10 emissions; (3) investigate the association between asthma and indoor benzene and other VOCs; and (4) conduct and report pollen and mold counts to the public. Contract work is underway on three of the four projects above and an intergovernmental agreement between the State of Washington, Alaska and the Municipality of Anchorage is in the process of being signed to begin implementation of the web-based air data reporting system. The congressional earmark grant funding period ends December 2008.

In addition, over the past three years the AAQP received over $1M in Congestion Mitigation / Air Quality (CMAQ) funding. This funding supports a very successful public awareness program called *Plug@20* which encourages the public to use of engine block heaters below 20°F to reduce CO and air toxics emissions from vehicles during cold starts. This program was recently selected as a finalist (among over 200 cities) for the City Livability Award from the U.S. Conference of Mayors. Award winners will be announced in May.

CMAQ funding also supported an evaluation of the effectiveness of the Anchorage I/M Program. In order to complete this study AAQP was responsible for managing two contracts with a combined value of over $500,000. Over 200 vehicles were subjected to extensive drive-cycle testing to determine how effective repairs were at reducing emissions of CO, hydrocarbons and oxides of nitrogen. The final report for the study was completed early in 2007.

In 2003 AAQP received $135,000 in competitive grant funding from EPA Region 10 to investigate the factors responsible for elevated benzene levels in Anchorage homes with attached garages. AAQP collaborated with the University of Washington (UW) to measure the garage-to-house infiltration rates, quantify the contribution of benzene originating from the garage on concentrations inside the home, and determine the main factors responsible for benzene infiltration. AAQP staff presented preliminary study results at the annual conference of the Pacific Northwest International Section of the Air & Waste Management Association in 2004.[13] AAQP is working with Dr. Sally Liu of UW on a submission for journal publication this year.

6.1 AAQP Staff

Stephen S. Morris, P.E. has served as AAQP Manager for 17 years and has 28 years experience in environmental science and monitoring. He has a BS in Environmental Science, University of California, Berkeley and a BS Civil Engineering, University of Alaska Anchorage.

Larry Taylor, Jr., QEP has served for 15 years as Environmental Engineer and one year as an Air Quality Specialist for the AAQP and has a total of 32 years professional experience in environmental science, analytical chemistry or industrial process engineering. He has a BS in Chemistry and Biology from the University of Alaska, Fairbanks and a BA in Sociology from Haverford College.

Anne Schlapia is a Project Manager with AAQP. She has 12 years experience in indoor and ambient air studies as well as air quality community outreach. She has a BA in Microbiology, Texas, State

University, San Marcos and an MS in Environmental Quality Science, University of Alaska, Anchorage.

Christopher Salerno has served as an Air Quality Specialist for the AAQP for 13 years. He has a BS in Biology, University of Nebraska and a Masters of Environmental Science, University of Alaska, Anchorage.

Matthew Stichick has four years experience as an Air Quality Specialist for the AAQP and has a total of 11 years professional experience in environmental science, analytical chemistry and data quality management. He has a BS in Chemistry from the University of Alaska, Fairbanks.

Stacey Cooper has served as an Air Quality Specialist for the AAQP since 2005. Her previous experience includes work as researcher investigating the desorption kinetics of PAHs and as an environmental consultant performing field investigations related to contaminated site clean-up and redevelopment. She has an AB Geology, Princeton University (cum laude) and MS Environmental Science, Policy and Management, University of California, Berkeley.

7 Budget Information

	Direct Cost	Indirect Cost (15%)	Total Cost	Budget Detail
Personnel	$31,000	$4,650	$35,650	AAQP staff time to plan and develop study, prepare quality control and assurance plan, perform TO-15, TO-13A sampling on one-in-6 day schedule, conduct CO monitoring, and collect gasoline samples, prepare study report and presentation.
Fringe Benefits	$18,000	$2,700	$20,700	
Travel	$2,000	$300	$2,300	Airfare, lodging, per diem costs for one person from AAQP staff to attend conference to present study results.
Equipment	$21,400	$3,210	$24,610	Two PUF samplers for PAHs sampling, full system with calibration equipment = $5,500 x 2 = $11,000 Two portable TO-15 sampling systems = $5,200 x 2 = $10,400
Supplies	$2,000	$300	$2,300	Sample bottles for gasoline sampling, motor repairs for PUF sampler, miscellaneous
Contractual	$58,950	$8,840	$67,790	TO-15 Analysis + Rental cost per canister = $227 75 samples x $227 = $17,025 TO-13A Analysis + PUF/XAD cartridge = $199 $199 x 75 samples = $14,925 Gasoline analysis –cost per analysis = $375 $375 x 72 samples = $27,000
Other	$11,300	$1,700	$13,000	Sample shipping costs (second day, FedEx) – Canisters $7,200 PUF and QFF samples $2,900 Gasoline samples $1,200
TOTAL	**$144,650**	**$21,700**	**$166,350**	

8 References

[1] "Final Report on the Operations and Findings of the Anchorage VOC Monitoring Project," L. Taylor, S. Morris, Document # 95-RA110.04, presented at the 88th Annual Meeting of the Air & Waste Management Association (San Antonio, TX) June 1995.

[2] "Assessment of Indoor and Outdoor Concentrations of BETX and Carbonyl Compounds in Anchorage, Alaska," Municipality of Anchorage Air Quality Program, September 1996.

[3] Ibid.

[4] A. Schlapia, S. Morris, "Architectural, Behavioral and Environmental Factors Associated with VOCs in Anchorage Homes," 98-MP9B.04 (A504) presented at the Air & Waste Management Association's 91st Annual Meeting & Exhibition, June 14-18, 1998, San Diego, California.

[5] Alaska State Implementation Plan, Vol II: Analysis of Problems, Control Actions, Section IIIB: Anchorage Transportation Control Program, adopted by Alaska Department of Environmental Conservation, January 2, 2004.

[6] Gary F. Evans, "Final Report on the Operations and Findings of the Toxic Air Monitoring System," Atmospheric Research and Exposure Assessment Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711, 1990.

[7] Taylor, Morris, . "Final Report on the Operations and Findings of the Anchorage VOC Monitoring Project"

[8] "Assessment of Indoor and Outdoor Concentrations of BETX and Carbonyl Compounds in Anchorage, Alaska.

[9] "Ted Stevens Anchorage International Airport Air Toxics Monitoring Study," Municipality of Anchorage Air Quality Program, April 21, 2003Ibid.

[10] Laurtikko J., Erlandsson L. and Abrahamsson R.: "Exhaust Emissions in Cold Ambient Conditions: Considerations for a European Test Procedure", SAE paper 950929, 1995.

[11] Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air: Method TO-15 "Determination of Volatile Organic Compounds in Air Collected In Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry, Second Edition, U. S. Environmental Protection Agency, Research Triangle Park, NC, EPA 600/625/R-96/010b, January 1999.

[12] Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air: Method TO-13A "Determination of Polycyclic Aromatic Hydrocarbons (PAHs) in Ambient Air Using Gas Chromatography/Mass Spectrometry, Second Edition, U. S. Environmental Protection Agency, Research Triangle Park, NC, EPA 600/625/R-96/010b, January 1999.

[13] "Influence of Attached Garages on Indoor VOC Concentrations in Anchorage Homes," Annual Conference of the Pacific Northwest International Section, Air & Waste Management Association, Portland, Oregon, November 4, 2004, http://www.pnwis.org/PNWIS2004/Presentations/Technical%20session.htm