APPLICATION FOR FEDERAL ASSISTANCE

2. Date Submitted 4/16/2007

Applicant Identifier: D-U-N-S Number 92-932-7880

1. TYPE OF SUBMISSION:

Application
- ☐ Construction
- ☐ Non-Construction

Preapplication
- ☐ Construction
- ☑ Non-Construction

3. Date Received By State

State Application Identifier

4. Date Received By Federal Agency

Federal Identifier

5. APPLICANT INFORMATION

Legal Name: **MI DEPT. OF ENVIRONMENTAL QUALITY**

Organizational Unit

Address *(give city, county, state and zip code)*
P.O. BOX 30473
LANSING, MI 48909
INGHAM COUNTY

Name and Telephone Number of the person to be contacted on matters involving this application *(give area code)*
PROGRAM:
FINANCIAL: Karen Jurgensen, 517-241-7991

6. EMPLOYER IDENTIFICATION NUMBER (EIN):
38-6000134

7. TYPE OF APPLICANT: *(enter appropriate letter in box)* **A.**

A. State	H. Independent School District
B. County	I. State Controlled Institution of Higher Learning
C. Municipal	J. Private University
D. Township	K. Indian Tribe
E. Interstate	L. Individual
F. Intermunicipal	M. Profit Organization
G. Special District	N. Other - Specify:

8. TYPE OF APPLICATION
☑ **New** ☐ **Continuation** ☐ **Revision**

If Revision, enter appropriate letter(s) in box(es) ☐ ☐

A. Increase Award B. Decrease Award
C. Increase Duration D. Decrease Duration
E. Other - specify:

9. NAME OF FEDERAL AGENCY
Environmental Protection Agency

10. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NO.:
TITLE: 66.034 Surveys, Studies, Investigations, Demonstrations and Special Purpose Activities Relating to the Clean Air Act

11. DESCRIPTIVE TITLE OF APPLICANT'S PROJECT:
Community Scale Air Toxics Ambient Monitoring- Data Analysis

12. AREAS AFFECTED BY PROJECT (Cities, Counties, States, etc.)
Grand Rapids and Detroit Michigan

13. PROPOSED PROJECT

Start Date	Ending Date
7/1/2007	6/30/2009

14. CONGRESSIONAL DISTRICT OF:

a. Applicant	b. Project
8th	

15. ESTIMATED FUNDING:

a. Federal	$250,000
b. Applicant	
c. State	
d. Local	
e. Other	
f. Program Income	
g. TOTAL	$250,000

16. IS APPLICATION SUBJECT TO REVIEW BY STATE EXECUTIVE ORDER 12372 PROCESS? *(check one)*

a. ☑ YES - THIS PREAPPLICATION/APPLICATION WAS MADE AVAILABLE TO THE STATE EXECUTIVE ORDER 12372 PROCESS FOR REVIEW.

IF YES, PROVIDE DATE OF REVIEW: 4/16/2007

b. ☐ NO - PROGRAM IS NOT COVERED BY EO 12372

☐ OR PROGRAM HAS NOT BEEN SELECTED BY STATE FOR REVIEW

17. IS THE APPLICANT DELINQUENT ON ANY FEDERAL DEBT? *(check one)*
☐ YES *(If "YES," attach explanation)* ☑ NO

18. To the best of my knowledge and belief, all data in this application/preapplication are true and correct. The document has been duly authorized by the governing body of the applicant and the applicant will comply with the attached assurances if the assistance is awarded.

a. Typed Name of Authorized Representative	b. Title	c. Telephone Number
Jim Sygo	Deputy Director	517-241-7394

d. Signature of Authorized Representative [signature]

e. Date Signed 4/16/07

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Standard Form 424 (REV. 4/92)
Prescribed by OMB Circular A-102

Standard Form 424A

OMB Approval No. 0348-0044

BUDGET INFORMATION - Non-Construction Programs

SECTION A - BUDGET SUMMARY

Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds: Federal (c)	Estimated Unobligated Funds: Non-Federal (d)	New or Revised Budget: Federal (e)	New or Revised Budget: Non-Federal (f)	New or Revised Budget: Total (g)
1. Community Scale Air Toxics Ambient Monitoring	66.034	$250,000				$250,000
2.						$0
3.						$0
4.						$0
5. TOTALS		$250,000	$0	$0	$0	$250,000

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	GRANT PROGRAM FUNCTION OR ACTIVITY (1)	(2)	(3)	(4)	Total (5)
a. Personnel	$73,477				$73,477
b. Fringe Benefits	$45,262				$45,262
c. Travel	$547				$547
d. Equipment	$0				$0
e. Supplies	$1,300				$1,300
f. Contractual	$110,000				$110,000
g. Construction	$0				$0
h. Other	$5,343				$5,343
i. Total Direct Changes (sum of 6a-6h)	$235,929	$0	$0	$0	$235,929
j. Indirect Charges	$14,071				$14,071
k. TOTALS (sum of 6i and 6j)	$250,000	$0	$0	$0	$250,000
7. Program Income					$0

STANDARD FORM 424A (cont'd.)

SECTION C - NON-FEDERAL RESOURCES				
(a) Grant Program	(b) Applicant	(c) State	(d) Other Sources	(e) TOTALS
8.				$0
9.				$0
10.				$0
11.				$0
12. TOTAL (Sum of Lines 8 - 11)	$0	$0	$0	$0

SECTION D - FORECASTED CASH NEEDS					
	Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
13. Federal	$250,000	$62,500	$62,500	$62,500	$62,500
14. Non-Federal					
15. TOTAL (sum of lines 13 and 14)	$250,000	$62,500	$62,500	$62,500	$62,500

SECTION E - BUDGET ESTIMATES OF FEDERAL FUNDS NEEDED FOR BALANCE OF THE PROJECT				
	FUTURE FUNDING PERIODS (Years)			
(a) Grant Program	(b) First	(c) Second	(d) Third	(e) Fourth
16.				
17.				
18.				
19.				
20. TOTAL (sum of lines 16 - 19)	$0	$0	$0	$0

SECTION F - OTHER BUDGET INFORMATION	
21. Direct Charges:	22. Indirect Charges:
23. Remarks:	

Narrative Proposal: FY '07 Community-Scale Air Toxics Ambient Monitoring

A. TITLE: Analysis of Air Toxics Data: Quality Assurance Implications, Source Apportionment Uncertainty Analysis and Updated Risk Assessment

B. CATEGORY: Analysis of Existing Data

C. APPLICANT INFORMATION: Air Quality Division, Michigan Department of Environmental Quality, 525 W Allegan St, Lansing MI 48909
Submitted by: Dr. Mary Ann Heindorf
Phone Number: (517) 373-2151
E-mail: heindorm@michigan.gov

D. FUNDING REQUESTED: $250,000

E. TOTAL PROJECT COST: $250,000

F. PROJECT PERIOD: 24 months from date of award

G. EXPLICIT DESCRIPTION:

Legislation establishing MDEQ as eligible: Public Act 451 of 1994 (as amended October 10, 2005) part 55 section 324.5503 See powers of department link at : http://www.legislature.mi.gov/(S(qqz3fuugkfap1aevmjlq4045))/mileg.aspx?page=getObject&objectName=mcl-451-1994-II-1-AIR-RESOURCES-PROTECTION-55

Background Information

The Detroit air shed is complex due to the micro and regional meteorology caused by the land/water interface and the plethora of point sources as supported by ambient data[1,2]. The busiest international border crossing in North America[3] is located in Detroit, and as a result, air quality issues are also created by mobile source emissions. Measurements of air toxics in ambient air have been investigated in Detroit for several years. As analysis methods have improved and changed, a more diverse set of measurements has been collected. These include measurements obtained by using conventional methods such as TO-11a, TO-15 integrated over a 24-hour period to passive techniques to near real-time techniques such as mobile monitoring platforms. As technology has improved, the various methods have become more sensitive. In addition, the implementation of the performance evaluation program for laboratories participating in the National Air Toxics Trend Site (NATTS) has improved inter-laboratory comparability and the accuracy of results for VOCs, carbonyls and trace metals. Another factor influencing accuracy of results for trace metals is the high background level of certain metals in the filter blanks, as discussed - but not resolved - in several national conference calls.

Due to the complex nature of many air sheds, budgetary limitations, and the need to identify and control point sources contributing to increased risk and reduced air quality, increased emphasis has been placed on modeling outputs. Source apportionment models have been used to explore some of these data sets, which have varied over time and span many categories of analytes. Thus, it is important to understand the limitations and biases inherent in these complex data sets before source apportionment exercises are performed. Issues such as data comparability across multiple laboratories, impact of alterations in laboratory sensitivity over time, techniques of handling non detected quantities, analytical methodology, sample integration times and accuracy in method detection limit (MDL) reporting are all critical in the performance of modeling projects. In the future, source apportionment models will become more widely used and important due to the need to develop attainment strategies and to improve the limited spatial coverage from a few monitoring stations to an entire air shed. It is critical that we better understand the uncertainties in the model output and the factors that influence these degrees of uncertainty.

Another important use of ambient monitoring data is the characterization of risk. As shown by **Figure 1**, there are many "hot spot" locations in the Detroit area that are characterized as having elevated levels of risk. The figure shows the top 30 census tracts in Wayne County with the highest cancer risk. The total cancer risk in these tracts ranges from about 100 – 200 in a million, and all 30 census tracts are in the top 5% nationally for total cancer risk. The figure also shows locations of selected point sources. The Detroit Air Toxics Initiative[4], a risk assessment and risk reduction project, was based on 2001-2002 air toxics monitoring data for the Detroit area. That assessment identified key drivers of human health inhalation risks and the locations which had relatively high risk estimates. MDEQ-AQD conducted the monitoring and risk assessment, in consultation with USEPA Region 5 and a stakeholder group. The findings are presented in a public summary, a technical summary, and a fully detailed report[5].

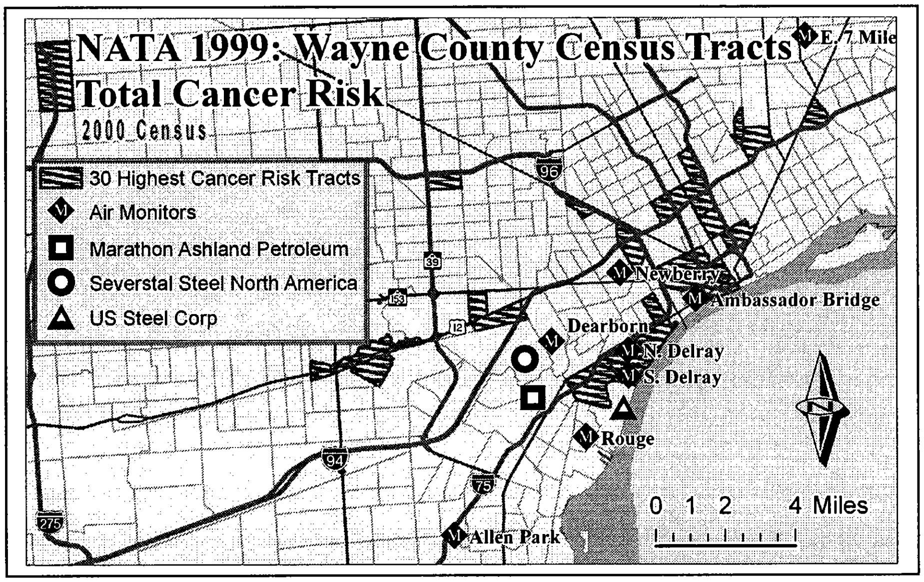

Figure 1: Comparison of Monitoring Locations with Major Point Sources and Tracts with Elevated levels of Risk According to NATA

Leveraging Previous Monitoring and Data Analysis Efforts

The air toxics data set for the Detroit area is very rich, both in spatial and temporal diversity, and offers an excellent opportunity to characterize both source apportionment results and risk estimates. In 2001- 2002 the Detroit Pilot Project measured volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), carbonyl compounds, trace metals and hexavalent chromium at 8 stations around SE Michigan. Daily and once every 3 day co-located sampling for VOCs and carbonyls occurred at Dearborn. Two thirds of the data pairs were used to assess intra laboratory precision while the final set were split between the two different labs performing analytical work for the project. Although all 8 stations are no longer operating, air toxics measurements for various suites of parameters have continued since the pilot project, generating spatial and temporal diversity. In more recent years, a variety of particulate measurements have been added to the network. **Table 1** summarizes the set of measurements.

In addition to routine monitoring efforts, the MDEQ has focused on a variety of quality assurance related activities. To better understand the variability of the air toxics measurements, the MDEQ has continued to collect split samples for carbonyls and VOCs since 2001 at the NATTS site at Dearborn. Over this time period, a national performance evaluation program was implemented by the EPA to assess and improve the accuracy of laboratories participating in the NATTS program. In addition, through a cooperative effort among the Region 5 states and Region 5 EPA, round robin exchanges of VOC, carbonyl and trace metals samples have been conducted over the previous 5 years. As the only representative from the Midwest, the MDEQ is a regular participant in the Air Resources Board VOC sample exchange program. To address the issue of high background levels of some trace metals on filters, the MDEQ has been collecting monthly field blanks for trace metals at all of the air toxics monitoring sites since 2005.

Monitoring projects beginning in 2003 conducted by MDEQ and LADCO have supplemented the toxics data set with measurements of continuous EC/OC, carbon black measurements and speciated organic carbon. To supplement the LADCO studies and to help formulate attainment strategies for the Detroit PM2.5 non-attainment area, Sonoma Technology Inc has performed positive matrix factorization (PMF) modeling to identify sources using STN data sets collected at Allen Park (1/01-12/05), Dearborn (5/02 – 12/05) and Luna Pier (5/02 - 12/05).

From 2004 to 2007, EPA conducted the Detroit Exposure Aerosol Research Project (DEARS) where passive measurements of VOCs, PM, trace metals were made inside homes, outside homes and within personal air space. Passive measurements were also collected at the Allen Park ambient monitoring station. One goal of this project was to understand the relationship of data collected at an ambient monitoring station to what people are actually exposed to, and to validate the relationship of the ambient monitoring network to the NAAQS. A similar project was conducted by Environment Canada concurrently in Windsor Canada. Precision measurements comparing the American and Canadian techniques were collected at the Allen Park ambient monitoring site. DEARS will also perform source apportionment analysis of the results to identify sources.

Table 1: Toxics and Particulate Monitoring Databases in the Detroit Area

Site	VOCS	carbonyls	Trace Metals as TSP	Trace Metals as PM10	Cr+6	PAH's	Speciated Organic Carbon	Carbon Black	Continuous EC/OC	PM2.5 FRM	PM2.5 TEOM	PM2.5 Speciation	PM10 TEOM
Allen Park	01-02; '05	01-02; '05	01-'06		01-'02	01-'02	04-'06	03-'07		01-'07	01-'07	01-'07	
Allen Park Co-located						01-'02				01-'07			
Dearborn	01-06	01-06	01-'07	03-'07	01-'02; '04-'07	01-'02	04-'06	03-'07	07	01-'07	03-'07	02-'07	01-'07
Dearborn co-located	01-'02	01-'02	01-'07	03-'07									
Newberry							05-'06		05-'07	05-'07	05-'07		
Ambassador Bridge								05-'07		05-'07	05-'07		
River Rouge	01-'02	01-'07	01-'06		01-'02	01-'02		05-'07					
River Rouge co-located					01-'02								
SW HS	01-'07	01-'07	01-'06			01-'02				01-'07			
SW HS co-located			01-'02										
E 7 Mile	pams '01-'06	pams '01-'05	01-'06			01-'02				01-'07		01-'02	
Yellow Freight	01-02; '05	01-'02	01-'02			01-'02; '05							
Ypsilanti	01-'03; '05-'06	01-06	01-'06							01-'07	01-'07	03-'07	
Ypsilanti co-located										01-'07			
Houghton lake	01-'03; '05-'06	01-06	01-'06							01-'07	03-'07	02-'07	
696/Lodge	01-'02	01-'02	01-'02		01-'02	01-'02						01-'02	
Livonia										01-'07			
Linwood										01-'07			
Wyandotte										01-'07			
Port Huron										01-'07	'03-'07		
New Haven										01-'07			
Luna Pier										01-'07		03-'07	

A variety of spin-off projects were conducted concurrently with DEARS. The Detroit Children's Health study investigated the health of 4th and 5th grade children in Detroit. The Detroit Cardiovascular Health Study made physiological measurements of DEARS study participants.

A community monitoring project was conducted by the MDEQ in the Delray area of Detroit. Speciated organic carbon samples were collected at Newberry School and sent to Dr. Schauer's lab at University of Wisconsin for analysis. Continuous EC/OC, trace CO, BC and PM2.5 measurements were also collected at Newberry School. Trace CO, BC and PM2.5 measurements were collected near the Ambassador Bridge. This project is nearing completion. No funds were allocated for source apportionment of this data set. This data analysis project will do so.

As a result of severe vandalism to the Newberry site in 2005, a full year of speciated organic carbon measurements could not be collected. Instead, monthly composites for January to August 2005 and June to August 2006 were collected, providing the opportunity to understand how speciated organic carbon may change temporally. Archived filters from Allen Park and Dearborn from June to August 2005 and June to August 2006 were analyzed for speciated organic carbon. Combining this data with that generated at Newberry School will address spatial variability in speciated organic carbon. By using data from these three sites and applying the source apportionment techniques, we will be able to triangulate on sources.

In 2007, the Lake Michigan Air Directors Consortium (LADCO) will be conducting two intensive studies to characterize the day-to-day and spatial variability of the speciated organic carbon in the summer and in the winter in the Detroit air shed. The results will be fed into source apportionment models. This is an opportunity to leverage the LADCO data analysis project by comparing the source apportionment results generated from the shorter term monitoring data with the monthly composite data in the historical data set.

Data Analysis Projects- Historical Results
Detailed analysis of the 2001-2002 Pilot Project data set has been conducted both through the national data analysis contract for the pilot projects[6,7] and through DATI.

Lessons learned from these previous efforts include:

- The spatial distribution of some air toxics compounds is heterogeneous in Detroit but homogeneous in other Pilot cities.
- The primary risk driver differs for each site in Detroit.
- Levels of naphthalene, benzene and methylene chloride were within the top 99th percentile nationally.
- The cancer risk drivers for Detroit were: naphthalene, methylene chloride, benzene, acrylonitrile, formaldehyde, 1,4 dichlorobenzene, arsenic, carbon tetrachloride, 1,3-burtadiene, acetaldehyde, cadmium and nickel.
- Diesel particulate mater was identified as a compound of concern and potential carcinogen by DATI.
- Manganese levels were 2 to 5 times higher than the health reference level depending on the site according to DATI. Manganese levels continue to be problematic in the Detroit area.
- Benzene was the main risk driver in the national NATA 1999 data set.
- The regional risk drivers in the NATA 1999 data set were: arsenic, benzidine, 1,3-butadiene, chromium 6, coke oven emissions, carbon tetrachloride, cadmium, ethylene oxide, hydrazine, and naphthalene.
- The inter laboratory precision data set indicated that laboratory selection could be a major factor influencing data comparability nationwide.
- Comparability between laboratories is improving as a result of the performance evaluation program.

Data Analysis Needs/ Future Goals
The more recent data sets, however, have not been analyzed in great detail. These data sets offer a unique opportunity to address a host of issues.

Many source apportionment exercises have been performed using the Detroit data set. These projects have had diverse goals and have relied on various subsets of data. For example, source apportionment of PM2.5 species focused on PM state implementation plan (SIP) support but several of the identified sources of PM also emit air toxics. These studies need to be reviewed in an air toxics context and the outputs compared. Extraction of common themes may promote better control of source emissions. It is critical that we better understand the uncertainties in the model output and the factors that influence these degrees of uncertainty. One goal of this project is to determine the impact issues in the data have on the variability of the output from the source apportionment models. Novel technologies are being developed that allow the near real-time capture of measurements of air toxics and particulate measurements. This opportunity poses several key questions. How would the source apportionment results differ if these novel inputs were used instead of more conventional measurements? What is the sensitivity of source apportionment results to reflect the impact of changes in temporal or seasonal changes in air quality? Can the use of near real-time measurements improve the application of source apportionment models in heterogeneous air sheds?

Another goal of the proposed project is to better understand factors that influence data quality of air toxics data on a national scale. Elements of the data set may be analyzed to address inter laboratory data comparability and characterize how it has changed over time. Determining the impact of alterations in the sensitivity of analytical techniques on the bias of the data set as well as accuracy of reporting MDLs also has national applicability. Understanding the degree of contamination of filter blanks by various trace metals and how this varies over time is another critical issue. Once we better understand the contamination problem, recommendations can be developed for the national network examining ways to correct the data.

The final component of the proposed data analysis project is to follow up on the detailed analysis of risk, which was conducted in the DATI project using 2001-2002 data. This would determine if the risk levels, risk drivers or spatial differences have changed appreciably since 2002. Additionally, existing air toxics monitoring data for the Grand Rapids area will be used to assess potential risks. This will allow comparison of the risks between the two largest urban areas in Michigan.

1. Project Objectives

Objective #1: Create a comprehensive, quality assured database to support subsequent data analysis projects. Improve understanding of inter laboratory data comparability issues. Determine the impact of changes in MDLs and assess the accuracy of reported MDLs. Make recommendations about how to correct filter contamination by trace metals.

Objective #2: Place more recent air toxics measurements into historical and national perspective.

Objective #3: Quantify the impact of loss of sources or emission reductions on ambient air concentrations (i.e., accountability).

Objective #4: Determine how the levels of risk have changed in the Detroit area and compare to the Grand Rapids area.

Objective #5: Understand comparability and certainty in source apportionment model results.

Objective #6: Effectively communicate these findings to populations at risk, to other members of the monitoring community and to stakeholders.

2. Project Tasks

Objective #1: Data base & QA related activities

A comprehensive air toxics database will be compiled and validated in a stepwise manner building on the EPA's air toxics archive (currently housed at STI). Outliers will be identified by looking for data that are inconsistent spatially, temporally and physically. Routine quality checks will be made (e.g., concentrations below remote background). Testing will be performed to check for internal consistency by creation of time series and scatter plots.

Laboratory comparability and data handling procedures on the introduction of artificial bias will be determined by relying on split samples. A subset of the data set contains carbonyl and VOC samples that were split between two laboratories from 2002 through 2006 to investigate intra-laboratory precision. In addition, the laboratories analyzed a single sample multiple times to determine method precision. These data will be investigated as part of the quality assurance process. Time will be spent unraveling the current POC coding convention to readily identify replicates and duplicates and to simplify data analysis activities.

The accuracy of reporting the MDLS for two laboratories will be determined by using the detection frequency and the reported MDLs. The detection frequency of the analytes will be compared with the reported MDLs for each laboratory to determine the accuracy of the laboratories assessment of their sensitivity. By using the aforementioned split samples, the data points will be paired both in time and space, minimizing any bias due to concentration differences. Therefore, any differences in detection frequencies should be a function of reported sensitivity. The goal is to establish CONSISTENT techniques for determining and reporting MDLS and create buy-in to the technique.

The impact of alterations in MDLs over time on the introduction of artificial bias into the data set will be assessed with the help of Dr. Peter Scheff, University of Chicago. Dr. Scheff has an interest in this area and a strong background in statistical techniques. He will determine how changes in MDLs over time may bias the data set and develop suggestions on how to handle analytes reported as below the detection limit as a function of changes in analytical sensitivity without introducing excessive artificial bias.

We will also investigate the impact of the performance evaluation program on laboratory comparability and determine the impact this has on the ability to differentiate spatial gradients when multiple laboratories are involved.

The MDEQ has collected monthly field blanks for trace metals at all of the toxics monitoring sites since 2005. The blank data will be analyzed to identify trends in contamination over time and between batches. Various techniques to perform blank correction on the trace metals data will be investigated. Since it is not cost effective to gather a field blank every time a sample is collected, it is important to determine how the blank data should be compiled before subtraction from the sample occurs. This will be readily applicable to other toxics sites in the nation.

<u>Objective #2</u>: Temporal & Spatial Trends
The more recent air toxics data set will be compared with the 2001-2002 data to determine changes in temporal trends and spatial gradients. In this task exploratory data analysis identifying spatial and temporal variability in the concentrations of air toxics will be performed. Compounds most frequently detected will be identified and compared with the historical data set. Differences and similarities in the spatial and temporal distributions of analytes will be determined. Common trends will be identified. This will put the concentrations in Detroit into perspective nationally and regionally, and also determine what urban-scale gradients in concentrations are evident in the ambient data. This is key for modeling and exposure analysis. Also, gradients will help in identifying hot spot areas where there are likely local sources, which the MDEQ can use to develop regulations.

The data set will be examined to identify the compounds that have shown the greatest level of change in ambient concentrations. This will be tied in with Objective #1 to insure that this change in concentration is not due to artificial bias introduced by other factors.

<u>Objective #3</u>: Understand Impact of Changes in Source Emission Profiles
Accountability analyses are an important part of an agency's work to understand and quantify the impact and effectiveness of regulations. Starting with a known control or change in emissions, what pollutants are expected to be effected, and the spatial scale on which they will be affected need to be investigated, but the expected magnitude of the emission change also needs to be large enough to be evident above the variability of the ambient pollutant concentrations due to meteorology, etc. Alternatively, if a significant trend in ambient concentrations is observed, the spatial extent and magnitude of the trend can be quantified, and then related to known or suspected controls/changes in emissions.

This analysis will focus on compounds identified in Objective #2 showing the greatest level of change in ambient concentrations. An example may include using total VOCs as well as benzene and butadiene to better understand the impact of regulations on ambient levels. If no regulation was implemented, we would expect to see an average reduction of around 4% a year in mobile source emissions due to fleet turnover. We will quantify the trends of total VOCs, VOC/NOx, benzene and other VOCs to ascertain if the reduction has been greater than this. Also, fuel and maintenance programs have been implemented, and we will investigate if a significant impact or trend due to these programs is evident. Next, we will perform source apportionment with the receptor model PMF to separate and better quantify the trend in mobile source emissions. The historical record will provide sufficient data to assess robust trends and understand sources of VOCs and air toxics. In addition to quantifying the impact of sources to total VOC, this will also apportion the contribution from sources to specific air toxics including benzene and butadiene.

Other possible analysis could include: 1) the quantification of the reduction in methylene chloride at Allen Park by comparing ambient monitoring data with more recent data collected by CRUISER and DEARS in 2006; 2) at the heavily industrialized site of Dearborn, changes in the operation of major point sources in the area were compared to PM2.5 concentrations as a function of wind direction. The dates and sources identified in this study will serve as markers so that air toxics data can be examined to identify any changes. 3) The impact of the shut-down of the Honeywell plant on the ambient data collected in the Del Ray area will be investigated. By combining ambient monitoring data collected in 2005 with CRUISER data collected in 2006, levels of naphthalene will be compared to those from 2001- 2002. The outcome of this accountability task will be a quantification of the reduction of air toxics due to control measures (such as benzene reductions due to fuel changes) or changes in emissions (such as naphthalene reductions due to plant shut-downs). This will provide the EPA and MDEQ an example showing the effectiveness of control measures, and provide an understanding of what affects ambient concentrations and trends in air pollutants.

Objective #4: *Analysis of Risk*
This portion of the project will focus on determining how the risk drivers have changed from the 2001-2002 DATI report. Additionally, utilizing existing air toxics monitoring data from Grand Rapids, comparison of risks will be made between Detroit and Grand Rapids, the two largest urban areas in Michigan. The national risk drivers will be compared to those for Michigan and for Detroit as identified by NATA data. In turn, these will be compared to the results from the ambient monitoring data determining the top risk drivers for the Detroit area and the top risk drivers for each site. If levels of risk have changed appreciably, the possible sources and changes in their emissions will be identified. This assessment of risk will also use acrolein data collected by DEARS. Up until this time, acrolein hasn't been measured in Michigan except for at Dearborn NATTS and only recently.

The monitoring data will serve as a surrogate for the inhalation exposure component of the risk assessment, consistent with the prior DATI study. Human health risks associated with these levels will be characterized and will be compared to the findings of the DATI risk assessment.

Another component of this analysis will be to determine the extent that the use of more sensitive analytical methodology impacts the analysis of risk. Sources and possible risk reduction strategies will also be identified.

Objective #5: *Source Apportionment Models - Characterization of Uncertainty*
The goal of receptor modeling (i.e., source apportionment) is to quantify sources impacting ambient concentrations by using the ambient data and source profiles. This differs from source or chemical modeling, where the impact of sources on, and the magnitude of, ambient pollutant concentrations are predicted based on assumed emissions, chemical transformations and meteorology. In the latter analysis, a large source of uncertainty is the magnitude and temporal variability of the emissions, so predicted concentrations may not actually reflect what is observed in the ambient data. This is especially true for complicated species such as air toxics. Thus, it is vital to utilize the ambient data to help quantify the sources of air toxics, improve model prediction, and understand the spatiotemporal variability of sources and concentrations for exposure analyses.

The stand-alone version of the receptor model PMF will be used for these analyses, EPA PMF. This is a powerful tool that exploits covariance of species in the ambient air quality data to reduce the dimensionality of the data into a series of factors. An alternative approach is to use a model such as CMB. CMB requires *a priori* identification of all source categories that significantly contribute to PM2.5 mass. Representative source profiles are needed and the methodology is most powerful when unique markers are available for each source. For example, speciated OC data are well suited for this type of analysis, if appropriate profiles are available, because the profiles from different sources are typically distinct, and in some cases, there are species that can be considered source tracers (e.g., levoglucosan for wood combustion). Speciated VOC, PM2.5 and air toxics data are not as specific, and representative source profiles are currently not available for all the major sources categories impacting the sites of interest in this work. We believe PMF provides a superior analysis in light of the available ambient data and source profile information. However, there remain several challenges in applying the conventional apportionment results to relatively new data such as air toxics, where rather than using parts of a whole to apportion total mass (i.e., using PM2.5 species to apportion PM2.5 mass), we may only have a combination of species without a total mass to judge the apportionment by. Thus, additional source apportionment work focusing on apportioning air toxics only, rather than total PM2.5 or VOC mass, is needed.

A number of source apportionment analyses have already been conducted in the Detroit area, though the focus has typically been on $PM_{2.5}$ apportionment and not on air toxics. In addition to the proposed work quantifying sources and long term trends of air toxics at SWHS/RR in the accountability task (above), we propose to perform source apportionment analysis on VOC and PM data at other sites. For example, the Dearborn site is at the heart of the industrial and shipping area, and has VOC, carbonyl, PM_{10} metals and PM2.5 speciation for 2003-2006. This site is not only the highest concentration site and out of attainment for PM2.5, but also has some of the highest concentrations of air toxics in Detroit. We will conduct a number of iterative investigations using the various data available with PMF to quantify sources of and trends in ambient air toxics. Supporting wind direction and trajectory analyses will also be performed to help in source identification. Additional sites also have a similar variety of data, and could also be investigated to better understand the "typical" sources in urban Detroit, including Houghton Lake, River Rouge, and Ypsilanti.

The results for EPA and MDEQ will be quantification of sources of air toxics in Detroit, but specifically at a site of extremely high toxics and PM2.5 concentrations relative to the rest of the area. This will help in multipollutant SIP development, risk assessment efforts, air toxics emission inventory development, and eventual accountability analyses. A key part of these analyses will be leveraging the many different and previous efforts previously conducted by MDEQ, LADCO, EPA, STI and others, where data analysis and source apportionment of $PM_{2.5}$ and other have been done. This additional work will therefore effectively add to our understanding of community-scale air toxics, their trends and their sources.

Objective #6: Develop a communication strategy to communicate findings to populations at risk, to other members of the monitoring community and to stakeholders.

Results need to be communicated to a number of different audiences: 1) the public and residents of Detroit, 2) within MDEQ and Region 5 EPA, 3) national EPA and other state and local agencies. It is important for the public to be informed of the important work being conducted by the MDEQ with EPA grant funds. For policy makers at the MDEQ, Region 5, national EPA and other agencies, it is important to communicate the results and the processes used, so that the successful completion of this project can be used as a model for future work by the MDEQ and others. Lastly, other monitoring, modeling and analysis groups need to be informed so they can build off of the analyses and findings of these results, so EPA funding is effective at producing robust and copious results. The MDEQ's Communication Outreach Coordinator will be involved in these processes.

Results will be reported at: 1) regional EPA and RPO meetings as appropriate; 2) conference calls where national and regional EPA personnel are involved; 3.) a national conference and 4) at EPA if needed.

3. Linkage to Strategic Plan

This data analysis project supports EPA Strategic Plan Goal 1 Objective 1.1 Healthier Outdoor Air and Sub-Objective 1.1.2 Reducing Risk from Toxic Air Pollutants. The risk analysis will identify risk drivers. The source apportionment project will identify potential sources so that effective control strategies can be promoted. Once the risk drivers are identified, the MDEQ will work with its stakeholders to identify sources emitting those compounds and to suggest control strategies.

4. Environmental Outputs/Outcomes

a. Short Term: The MDEQ will build the capacity to perform source apportionment modeling and more advanced statistical analysis. The project will document near-term improvements in air quality or reductions in risk due to ambient air toxics pollutant levels since DATI.

The MDEQ will also build on a database of existing monitoring site information by developing and implementing an update procedure to provide information useful for future trends / accountability analysis.

Mid-term: A communication strategy will be developed to address results from the analysis of trends (objective #2) and from the analysis of risk (objective # 4) to be implemented in public outreach. We anticipate involving stakeholder groups in this process.

Lessons learned about inter laboratory data comparability and MDL issues will be shared with the NATTS community through the ongoing monthly conference calls and at a data analysis conference.

Long-term: A final report will be posted on the MDEQ website and electronically delivered by our list serve and to stakeholder groups.

Findings from the source apportionment synthesis will be used to develop control strategies for further reductions in air toxics emissions. These more comprehensive source apportionment results will provide justification for implementation of control strategies.

Findings will be communicated to the air quality community using presentations at appropriate conferences and through journal article(s).

Recommendations useful to national level programs will be made. Possible examples include a discussion about the impact of accuracy in the determination of MDLs, the creation of artificial bias by substitution for non-detected quantities, blank correction of trace metals data, accessibility of results from other studies, etc.

b. Explicit links between short/mid/long term outcomes

Improvements in air quality and reductions in levels of risk will be presented in a clear and concise manner that will be communicated to the community, stakeholders and to the EPA. This will promote a better understanding of data comparability between toxics sites across the nation.

Characterization of the accuracy of the determination and reporting of MDLs will hopefully generate greater compliance with MDL determination guidelines.

The data analysis will provide justification for control of emissions from sources.

c. Plan for tracking and measuring progress and explanation of how project success

The participants plan to conduct monthly conference calls to track and measure progress on the grant. STI will also come to Michigan to conduct a training session on the source apportionment software and the statistical software that will be used in the data analysis process.

Quarterly reports will be sent to Region 5 Quarterly to document progress. From what we learn about the sources of air toxics, the use of various controls can be proposed to help reduce emission of air toxics. Information will be organized in a fashion that will aid future analysis of the impact of control strategies.

d. Transfer to other like scenarios in different locations

The study results will be communicated in a straightforward manner in presentations and journal article format documents. The questions being investigated have national implications and applicability (e.g. comparability if air toxics data among laboratories, the effect of changes in MDLs over time on deducing trends). Recommendations regarding control strategies are pertinent to other cities, especially those with similar industrial sources since many of the risk drivers in Detroit are also on the National list of risk drivers. Presentation of the results in a clear and concise manner will benefit EPA, stakeholders and the community.

The accuracy of MDLs as related to the detection frequency will be characterized so that greater emphasis can be applied to issue for the national network, ensuring better conformity to method used to determine MDLs.

Recommendations about handling filter contamination issues and possible data correction techniques will benefit the nation, promoting greater consistency and improving the usefulness of the data.

Developing fingerprints of source profiles by using the unique set of measurements collected in the Detroit air shed will benefit other state and local agencies, as well as the EPA.

5. Roles & Qualifications of Partners

The MDEQ will lead and coordinate the efforts in this project. MDEQ staff will prepare the data to be used in later tasks, including performing preliminary QA with a particular focus on reviewing the inter-laboratory results and MDL reporting. Dr. Scheff will lead the investigation of the impacts of changes in MDLS on trend analysis. Synthesis of previous source apportionment results and apportionment of newer data will be performed by STI. STI will also train MDEQ staff on the use of PMF and statistical software use in pre- and post-analysis of the data. LADCO will assist in the final report preparation and act as a liaison with other work currently in progress.

6. Biographical Information for Key Personnel

Mary Ann Heindorf will serve as the principle investigator for the project. Dr. Heindorf has Ph.Ds in analytical chemistry and environmental toxicology (1992) from Michigan State University. Prior to being employed by the air monitoring unit of MDEQ, she was the laboratory director for an environmental testing company and then was the director of the analytical chemistry laboratory. Her pervious work experience provides laboratory-driven insights into the toxics data set. Her current interests are data comparability issues, artificial bias, design and implementation of field studies. She is also interested in the creation and operation of successful cross-agency/cross-specialty teams. She worked with the team that designed the Detroit Pilot Project 2001-2002, which collected air toxics measurements at 8 stations in the Detroit area, leveraging another project planned by the Wayne County department of the Environment. She also worked with the team that created the Detroit Air Toxics Initiative data analysis project in 2003. Dr. Heindorf has been actively involved with the monitoring steering committee.

Steven G. Brown is Manager of STI's Environmental Data Analysis Group and will lead the source apportionment tasks in this effort. During the past five years at STI, Mr. Brown has managed several data analysis and source apportionment projects for LADCO, the Central Regional Air Planning Association (CENRAP), British Columbia Ministry of Water, Land and Air Protection, Environment Canada, and EPA. Mr. Brown led source apportionment efforts using air toxics data from multiple measurement techniques; speciated PM2.5 data from the STN and IMPROVE networks as well as from special studies; hourly VOC data from the PAMS program; and continuous PM data. These efforts included validating data, developing unique and novel approaches to apply source apportionment models to different data sets, applying incremental probability transport analyses to determine wind-direction dependence of identified factors, and analyzing spatial trends in source apportionment factors from different sites within a city and region. Mr. Brown led STI's portion of the Upper Midwest Urban Organics Study in support of LADCO's work and has also worked with CENRAP and EPA to apply PMF to PM2.5 and other data collected in the Midwest.

Hilary R. Hafner is Vice President and manages the Air Quality Data Analysis Division at STI. Ms. Hafner will serve as the senior advisor to STI's efforts and to the PI. Her Division's primary research responsibilities entail air quality data validation, data analyses, and training covering hydrocarbon, hazardous air pollutant (HAP), and particulate matter data. Ms. Hafner is currently leading 1) a national-scale HAP data analysis project and 2) efforts to document trends in ozone, PM2.5 and HAPs, and to link ambient concentration changes over time to emissions controls. Ms. Hafner's data analysis projects involve developing, managing, and validating air quality data sets; developing innovative graphical methods to display data; performing statistical analyses including multivariate, regression, and trend analyses; interpreting the data relative to current chemical models; and documenting and presenting analysis results.

Mary Lee Hultin is a senior Toxicologist with the MDEQ. Mary Lee serves as a statewide technical specialist on children's environmental health as specialty in air quality and asthma for the state's air toxics program. She has 24 years of experience in the field of environmental toxicology and risk assessment. Mary Lee has a Master of Science degree from Michigan State University and is a registered Sanitarian (R.S.) in Michigan.

Peter Scheff has a Ph.D in Environmental and Occupational Health Science and is currently a full professor at University of Chicago. He specializes in the interpretation of environmental data and the application of statistical techniques, as well as receptor modeling. Dr. Scheff will lead the investigation of MDL trends over time portion of this project.

Donna Kenski was awarded a Ph.D. in Environmental and Occupational Health Sciences (1997) and an M.S. in Public Health (1992) from the University of Illinois at Chicago. Dr. Kenski will serve as an advisor and as liaison with other projects that LADCO is currently conducting. Her current professional affiliations are: Data Analysis Director for LADCO, and Adjunct Associate Professor, University of Illinois at Chicago. Dr. Kenski's areas of expertise and research activities include source-receptor modeling and other observation-based models for source attribution of PM2.5 and haze; ensemble trajectory analysis; conceptual model development integrating ambient data with theoretical and laboratory observations; visual display of quantitative data; and the development and field testing of advanced monitoring technologies. Her position at LADCO involves daily interaction with state, local, and tribal monitoring personnel, so she is intimately acquainted with their perspective on monitoring issues. Dr. Kenski chairs a Midwestern state data analysis workgroup and participates in the national RPO data analysis workgroup. She is a reviewer for numerous technical journals and is frequently an invited speaker at regional and national air quality meetings.

Amy Robinson has a B.S. in Molecular Biology and performed graduate work in analytical chemistry designing and testing solid sampling instrumentation. She has 7 years of air monitoring experience, focusing primarily on validation and analysis of PAMS data. Her other air monitoring responsibilities include operating and field testing more complex instrumentation and performing data analysis.

H. DETAILED ITEMIZED BUDGET

Table 2: Detailed Proposed Budget

PERSONNEL: Position Title				**Number in Position Class**	**Annual Salary Rate**	**Work Years**	**Personnel Cost**
Toxicologist				1	71,943	0.40	28,777
Environmental Quality Specialist 13				1	70,242	0.30	21,073
Laboratory Scientist-A				1	64,251	0.32	20,560
Financial Analyst 12				1	61,339	0.05	3,067
PERSONNEL CATEGORY TOTAL							**73,477**
FRINGE BENEFITS:							
Retirement 35%							25,717
Insurances 25%							18,369
Terminal-leave 1%							1,176
FRINGE BENEFITS TOTAL							**45,262**
TRAVEL: Location	**Number of FTEs**	**Number of Trips**	**Cost per Mile**	**Miles (round trip)**	**Sub Total**	**Lodging and/ or Meals**	**TOTAL TRAVEL**
Annual Conference	1	1	0.328	600	197	350	547
TOTAL TRAVEL							**547**
SUPPLIES:							
Software - statistical - Systat							1,300
SUPPLIES TOTAL							**1,300**
CONTRACTUAL:							
Sonoma Technology Inc							100,000
Peter Scheff, University of Illinois							10,000
CONTRACTUAL TOTAL							**110,000**
OTHER:							
Information Technology Services (DIT) 4.5%							5,343
OTHER TOTAL							**5,343**
DIRECT CHARGES							235,929
INDIRECT CHARGES: 11.85%							14,071
TOTAL BUDGET							**250,000**

I. ENVIRONMENTAL RESULTS PAST PERFORMANCE

Detroit Air Toxics Initiative Program (XA96515301-2) The primary focus of this grant was to perform a risk assessment using air toxics data in the greater Detroit area, develop risk reduction strategies and fund projects to reduce these risks. The MDEQ has and continues to submit timely technical progress reports. A final financial status report and final technical reports are due no later than 90 days after the end of the budget and project periods. The MDEQ plans to submit the final financial status report and final technical report on time when the grant ends in November 2007.

Initially, the grant project period was October 1, 2003 through March 31, 2005. Extensions were requested and granted due to complexity of issues that arose preparing the draft technical risk assessment report and due to the potentially controversial findings in the draft report. Preparation of the public release draft took longer than anticipated, as did the release of the draft to the stakeholder group. Concurrently, a supplemental environmental project for a major enforcement case was developing that would have overlapped with the DATI project. DATI was modified to eliminate the overlap. The MDEQ communicated the changes to the grant milestones to the EPA. The team selected a risk reduction project that involved retrofitting a switch engine to reduce diesel emissions. The railroad company agreed to track actual hours of operation in the Detroit area so an estimate of the reduction in emissions could be calculated. Impact of these changes on ambient air quality is currently being assessed. The grant extension was needed to allow for the collection of the data for the year after installation of the equipment.

Section 105 Air Grant (A005711-05) Progress in implementing air and radiation programs are tracked through the monitoring, data reporting, and information systems currently utilized by OAR, Regions, and state and local agencies. Programs are also tracked and discussed using oral and written communications by conference calls, face-to-face meetings, and the exchange of written information.

A final financial status report and final technical reports are submitted no later than 90 days after the end of the budget and project periods. Although the 105 grant is a two-year grant, the final financial status and technical reports are due each year. The MDEQ has met this requirement in the past and plans to submit the final financial status report and final technical report on time in the future.

J. PROGRAMMATIC CAPABILITY

The MDEQ was awarded a Community Monitoring Grant in 2004 for $94,231, leveraging reprogrammed funds and NATTS funds. Two new sites were established with monitoring beginning in 2005. Unfortunately, one site was severely vandalized before 1 year of sampling was completed. The damage was reported to the EPA. The site currently has enhanced security features and monitoring resumed in 2006. However, due to the break-in, the sampling design had to be reconfigured. Instead of focusing on 12 months of speciated OC data, 8 months were captured in 2005 and an overlapping 3 months in 2006 supporting an assessment of temporal variability. Laboratory results have not yet been received from the subcontractor. The status of the project continues to be reported to EPA in quarterly progress reports.

Also, the continuous formaldehyde samplers were extremely susceptible to breakage during shipping. They have been received from the manufacturer and are under going performance testing. The vendor provided new software January 2007 to aid operation. Inadequate documentation in the manual has created a steep learning curve. However, staff are still working with the units to learn how to diagnose and repair problems. Continuous formaldehyde measurements aid both the monitoring and toxics programs immensely, so efforts are still continuing to keep the units operational. Staff are developing recommendations for design changes to simplify operation. Region 5 EPA is regularly updated on the status of the continuous formaldehyde samplers through the quarterly reports, e-mails and conference calls.

The remainder of the data for the community monitoring grant has been successfully collected and uploaded into AQS. Quarterly reports have been submitted to the regional office. The submission of the final report is pending the delivery of the organic carbon results and completion of the performance testing, field deployment of the formaldehyde monitors and the development of recommendations for improvements in design.