Version 7/03

APPLICATION FOR FEDERAL ASSISTANCE

2. DATE SUBMITTED **August 22, 2005**	Applicant Identifier **NATA_06**
3. DATE RECEIVED BY STATE	State Application Identifier
4. DATE RECEIVED BY FEDERAL AGENCY	Federal Identifier

1. TYPE OF SUBMISSION:

Application: [ ] Construction [X] Non-Construction

Pre-application: [ ] Construction [ ] Non-Construction

5. APPLICANT INFORMATION

Legal name: **State of Vermont Agency of Natural Resources**	Organizational Unit — Department: **Department of Environmental Conservation**
Organizational DUNS: **809800303**	Division: **Air Pollution Control**
Address — Street: **1 South Building, 103 South Main Street**	Name and telephone number of person to be contacted on matters involving this application (give area code) — Prefix: **Dr.** First Name: **Heidi**
City: **Waterbury**	Middle Name: **Colleen**
County: **Washington**	Last Name: **Hales**
State: **Vermont** Zip Code: **05671-0401**	Suffix:
Country: **USA**	Email: **Heidi.Hales@state.vt.us**
6. EMPLOYER IDENTIFICATION NUMBER (*EIN*): **03-6000274**	Phone Number (give area code): **(802) 241-3848** Fax Number (give area code): **(802) 241-2590**
8. TYPE OF APPLICATION: [X] New [ ] Continuation [ ] Revision. If Revision, enter appropriate letter(s) in box(es) [ ] [ ]. Other (specify):	**7. TYPE OF APPLICANT** (See back of form for Application Types): **A. State**. Other (specify):
	9. NAME OF FEDERAL AGENCY: **U.S. EPA - New England (Region I)**
10. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER: **66-034**. TITLE: **Surveys, Studies, Investigations....Relating to the CAA**	**11. DESCRIPTIVE TITLE OF APPLICANT'S PROJECT:** **National Air Toxics Assessment**
12. AREAS AFFECTED BY PROJECT (*Cities, Counties, States, etc.*): **State of Vermont**	
13. PROPOSED PROJECT — Start Date: **03/01/2006** Ending Date: **09/30/2007**	**14. CONGRESSIONAL DISTRICTS OF** — a. Applicant: **State of Vermont** b. Project: **Statewide**

15. ESTIMATED FUNDING:

a. Federal	$	499,975.00
b. Applicant	$	-
c. State	$	124,995.00
d. Local	$	-
e. Other	$	-
f. Program Income	$	-
g. TOTAL	$	624,970.00

16. IS APPLICATION SUBJECT TO REVIEW BY STATE EXECUTIVE ORDER 12372 PROCESS?

a. Yes. [ ] THIS PREAPPLICATION / APPLICATION WAS MADE AVAILABLE TO THE STATE EXECUTIVE ORDER 12372 PROCESS FOR REVIEW ON

DATE:

b. No. [ ] PROGRAM IS NOT COVERED BY E.O. 12372

[X] OR PROGRAM HAS NOT BEEN SELECTED BY STATE FOR REVIEW

17. IS THE APPLICANT DELINQUENT ON ANY FEDERAL DEBT?

[ ] Yes If "Yes", attach an explanation. [X] 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. Authorized Representative

Prefix: **Mr.**	First Name: **Jeffrey**	Middle Name:
Last Name: **Wennberg**		Suffix:
b. Title: **Commissioner**		c. Telephone Number (give area code): **(802) 241-3808**
d. Signature of Authorized Representative: [signature]		e. Date Signed: 8/22/05

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Standard Form 424 (Rev. 9-2003)
Prescribed by OMB Circular A-102

SPATIAL AND TEMPORAL CONCENTRATIONS OF BENZENE IN TWO NORTHERN NEW ENGLAND COMMUNITIES: A MODELING VALIDATION STUDY

Program Grant: Local-Scale Air Toxics Ambient Monitoring RFA OAR-EMAD-05-16

1. SF-424 APPLICATION FOR FEDERAL ASSISTANCE (Attached)

2. NARRATIVE WORKPLAN

a. PROJECT TITLE
Spatial and Temporal Concentrations of Benzene and in Two Northern New England Communities: A Modeling Validation Study

b. CATEGORY
Category 4: Community –Scale Monitoring

c. APPLICANT INFORMATION

Air Pollution Control Division
Vermont Department of Environmental Conservation
103 South Main St.
Building 3 South
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phone (802)241-3848; fax (802)241-2590; heidi.hales@state.vt.us

Project Partner:
New Hampshire Department of Environmental Services
Air Resources Division
29 Hazen Drive
P.O. Box 95
Concord, NH 03302-0095

Contact: Rick Rumba
Phone (603) 271-1987; fax (603) 271-7053; rrumba@des.state.nh.us

d. FUNDING REQUESTED **$499,975**

e. TOTAL PROJECT COST **$624,970**

f. PROJECT PERIOD
October 2005-July 2007

g. DESCRIPTION
1. DETAILED PROJECT SUMMARY

Introduction

Throughout Vermont, benzene concentrations in the ambient air have exceeded the health-based standard listed in the Vermont Air Pollution Control Regulations at all of VT's monitoring stations since we began air toxics monitoring in 1993. Benzene is a known carcinogen and a high priority hazardous air contaminant. Our monitoring results are supported by the 1996 National Air Toxics Assessment (NATA), which identifies high benzene concentrations throughout VT, with the highest predicted values in Chittenden County (median cancer risk 30 in one million). NATA also predicts that Chittenden County, VT is within 90-95% of the highest predicted inhalation exposure values in the US. Additionally, EPA Region 1 recently identified benzene as one of eight toxic pollutants of concern in the northeast with a need for more comprehensive emissions inventories.

Burlington is Vermont's largest city, with 38,889 residents (U.S. Census Bureau, 2000). Long-term air quality monitoring of ambient air benzene concentrations has been conducted in the urban center of Burlington from 1993 to 2000 (S. Winooski & Bank St.) and from 2003 to present (S. Winooski & Main St.). In Burlington, for 1999 the monitoring data documents that ambient air concentrations of benzene exceeded the Vermont hazardous ambient air standard for benzene (0.12 $\mu g/m^3$ on an annual average basis) by roughly a factor of 20. Consequently, an urban-scale benzene modeling study was initiated in early 2003 to apply a state of the art air quality model (CALPUFF) to the Burlington area for a one-year time period (1999). The modeling study was designed to examine ambient air concentration gradients for benzene in the most urbanized portion of the state, the City of Burlington. The results of this modeling study will be used to spatially and temporally extend the data obtained in the monitoring program throughout Burlington, and to inform future decisions and policies regarding control and management of benzene (and other similarly emitted HACs) in the ambient air. Therefore, it is critically important that we evaluate and validate our benzene model for Burlington, in order to assess benzene exposure, conduct risk assessments and develop a strategy to reduce population exposure to benzene. Once the method has been validated for Burlington, VT, one of our objectives is to apply this model to predict ambient air benzene concentrations to other areas across northern New England and the US. To begin this model technology transfer, we have partnered with the State of NH and plan to conduct ambient air monitoring of benzene to run and validate the benzene model in Manchester, NH. Manchester, NH is the largest city in northern New England.

With tens of thousands of residents of New England exposed to an unacceptable risk of benzene exposure, it is crucial that we understand the spatial and temporal distribution of benzene in ambient air throughout a city or region, rather than at one monitoring location. The proposal is intended to add value to, and extend the applicability of, an air quality modeling platform which has been developed and implemented for the Burlington, Vermont area. The purpose of the air quality model is to estimate spatial concentration gradients over the region. Achieving the goal of better defining benzene concentration gradients would improve our ability to assess long-term exposure to benzene and other similarly emitted toxic compounds. Benzene has been measured in the ambient air of Burlington and other Vermont communities at levels exceeding 20 times the health-based state hazardous air contaminant standards.

This air toxics monitoring project will involve the collection of highly temporally and spatially refined measurements of benzene and other volatile hazardous air pollutants (HAPs) in the northern New England cities of Burlington, VT and Manchester NH. The data will supplement air toxics monitoring data that has been collected in these communities over the last 6-12 years. The major objective of the proposed project is to help characterize the degree and extent to which priority hazardous air pollutants (HAPs) - particularly benzene and other volatile compounds - impact populations in small to medium size urban communities in northern New England. The data obtained through this monitoring project will also be used to help evaluate and refine an air quality modeling platform being developed and implemented by the Vermont Department of Environmental Conservation (VTDEC) to estimate spatial concentration gradients and exposure estimates for benzene and other volatile HAPs in the City of Burlington, VT. Additional data will be collected in the City of Manchester, NH in order to help evaluate other potential exposure levels and concentration gradients in larger and more industrialized northern New England communities.

Burlington, VT and Manchester, NH are representative of many small to medium-sized communities in northern New England that have experienced rapid growth, changing demographics, and shifting economic bases in recent years. These changes can be attributed in part to a major shift from a business base of light manufacturing and textile production prior to the 1980s, to economies based primarily on technology development, medical and financial services, communications and other non-manufacturing businesses today. One result of these on-going changes has been a significant shift in the sources of and exposures to hazardous air pollutants. EPA's Toxic Release Inventory (TRI) data shows that industrial emissions of toxic chemicals to the atmosphere in both NH and VT have dropped by over 90% since 1987 [i]. In addition, EPA's most recent National Air Toxics Assessment (NATA) data indicates that today more than 70% of all priority HAPs in both states are emitted by "mobile" sources, while less than 5% are emitted by "major" industrial sources [ii]. The NATA data also indicate that benzene is the dominant HAP emitted in NH and VT, and is one of the primary air toxics risk drivers in both states. In fact, the NATA data suggest that benzene levels exceed the health risk screening benchmark of 0.12 ug/m3 in **all** census tracks in both NH and VT, with the estimated average annual concentration almost **10 times greater** than the benchmark concentration[iii].

While NATA is primarily intended to be used as a tool for estimating annual average concentrations of priority HAPs nationwide, it may not adequately reflect air toxics concentrations or exposures related to living and working in the changing local, mixed-use environments found in many northern New England urban communities. Consequently, VTDEC and NHDES have been interested in working to refine these estimates in order to better characterize the range and extent of benzene and other HAP concentrations and exposure levels that currently exist, and to use these data to prioritize reduction strategies in these and other similar communities. To this end, VTDEC has been working to develop an air-quality modeling platform for evaluating concentration gradients of benzene and other volatile HAPs in the urbanized portion of Chittenden County in Burlington, Vermont. Thus far, the modeled results compare well to measurements of benzene at the one location in the urban center of Burlington where air toxics monitoring data are currently collected, but results cannot yet be fully validated for other locations without the ability to collect additional monitoring data.

The objectives of the air toxics monitoring program proposed in this application are to:
1) evaluate and improve the air-quality model that has been implemented for the urbanized portion of Chittenden County in Burlington, Vermont;
2) obtain more spatially and temporally resolved air toxics monitoring data in the northern New England communities of Burlington, VT and Manchester, NH;
3) identify source signatures of major stationary and mobile emissions sources within these communities;
4) determine baseline concentration gradients with respect to these emissions sources in order to better assess actual population exposures;
5) provide information and develop tools to help address community concerns;
6) identify and facilitate appropriate risk and source reduction strategies;
7) provide information that can be applied for air toxics characterization and risk reduction strategies in other similar communities;
8) evaluate, refine and improve the air dispersion model developed by VTDEC to better assess long-term exposure to benzene and other similarly emitted toxic compounds in the greater Burlington area; and
9) obtain information necessary to allow transfer of the refined modeling tool for use in other, similar urban communities;

The proposed air toxics monitoring program will be conducted as a cooperative effort of the VTDEC, Air Pollution Control Division and the NHDES Air Resources Division. Vermont and New Hampshire are two small neighboring states in the northeast that share similar histories, climate, demographics and economies. Both VTDEC and NHDES have existing air toxics monitoring programs that employ EPA approved quality assurance project plans (QAPPs) and report data to the EPA Aerometric Information Retrieval System (AIRS), Air Quality System (AQS). VTDEC and NHDES have worked closely on a number of environmental issues in the past; work cooperatively on air toxics and air monitoring concerns through regional organizations such as NESCAUM, and have an existing relationship with routine analyses of air toxics samples through a memorandum of agreement between NHDES and the VTDEC Environmental Laboratory. By working cooperatively, we feel that the value of the project will be enhanced through the ability to make use of the combined resources and shared responsibilities of both agencies.

If the project is selected for funding, we expect to begin preparation immediately upon receipt of the award notice. It is expected that monitoring locations will be finalized, any subcontracts will be negotiated, a QAPP will be drafted, and equipment will be purchased and installed during the first six months of the period of performance. During this time we will also conduct our method development for sorbent tube analysis. We expect that actual air toxics monitoring will commence when preparation activities have been completed, and continue for one consecutive 12-month period as detailed in the Detailed Project Description section of this Scope of Work. VTDEC and NHDES will report quality-assured ambient monitoring data the EPA Air Quality System (AQS) Database quarterly within 120 days of completing each data collection quarter, and will prepare and submit quarterly progress reports. A final report will also be prepared and submitted to EPA at the conclusion of the period of performance. All work will be completed within 24 months of award notification.

<u>Methods</u>

Benzene CALPUFF Model Compared to Monitored Data

When results from this newly developed model are compared to monitored measurements of benzene conducted at <u>one location</u> in the urban center of Burlington, the modeled results predict the annual trends seen in the monitored data, but the mean predicted concentration is approximately 20% lower. Quarterly average benzene concentrations at this monitoring location are particularly well reproduced and 24-hour short term measurements are also reproduced reasonably well. Although the cause of over-predictions and under-predictions on 24-hour time periods is not well understood. By obtaining continuously monitored benzene measurements from several locations within Burlington, as well as an increased number of samples collected at additional sampling sites at the same frequency of our current monitoring location we will create a robust data set to evaluate model short-term performance at the existing downtown monitoring site and (with refinements to the model if necessary) increase our confidence in model performance on the entire domain. The measurement data itself will be very useful in directly defining the spatial benzene concentration gradients over the one-year monitoring period.

Study Design

In order to validate the benzene model, we are proposing to establish additional monitoring sites throughout the city to verify the temporal and spatial model predictions. For all samples, the primary compound of interest for analysis is benzene, but analysis for as many other compounds as the methods permit will also be conducted.

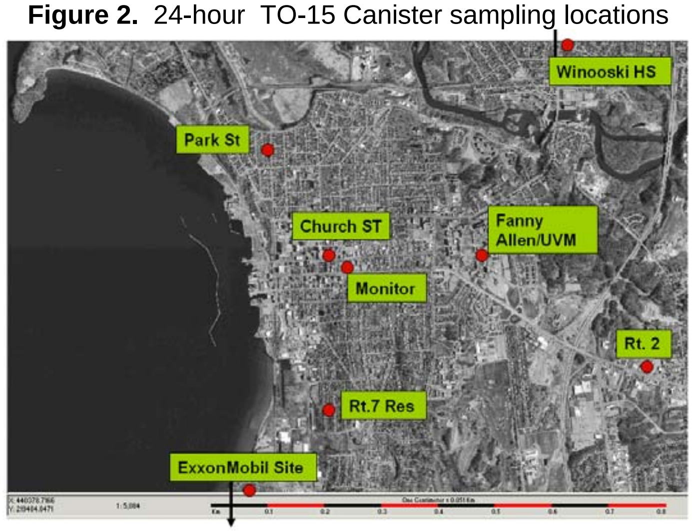
- High Spatial and Temporal Resolution Monitoring- Burlington downtown core

Intensive week long sequential 6-hr sampling periods. We are proposing to establish 8 monitoring sites in close proximity (within approximately 50 meters) of the current air toxics monitoring site in Burlington (see Figure 1). These 8 additional sites, with one duplicate, would run active sorbent tube samplers (using battery powered flow controlled sample pumps) for 6-hour time periods sequentially from Sunday to Saturday during the weeks of March 12-18, 2006, June 11-17, 2006, September 17-23, 2006, and December 10-16, 2006 in accordance with established EPA methods. This would yield 1008 6-hour tube samples over the duration of the project, and 252 during each quarter, not including QA/QC samples. Three sorbent tube samplers would be located at three distances from the center of Main Street on the property of the Edmonds Elementary School (roughly 60 meters across the street from the current air toxics monitoring site) to allow evaluation of the model's performance in re-producing the gradient of benzene experienced at distances in a direction perpendicular to this main urban roadway (5 meters, 15 meters, and 25 meters). One additional sorbent tube sampler would be located 2 to 5 meters from the curb on the south side of Main Street and within 20 meters east of the gasoline service station pumps located at the intersection of Main Street and South Winooski Avenue. Two additional sorbent tube sampling sites would be located to allow one of them to sample ambient air outside a building and the other to be sample indoor air within a building. The location of both samplers should be in/near a building that is next to a primary urban road and relatively free of known indoor sources of benzene. The intent of the indoor sampling site is to confirm the relative exposure to benzene indoors and outdoors in this type of urban setting. One sorbent tube sampling location is proposed to be at the information kiosk on the Church Street Marketplace, or any nearby location that is available.

Figure 1. 6-hour sorbent tube sampling locations

EXPANDED MONITORING SITES- BURLINGTON. In addition to the existing air toxics monitoring site and sampling schedule, which collects ambient air samples for 24-hours on every 12th day in evacuated 6L SUMMA® canisters, in accordance with the EPA TO-15 method, we are proposing to collect 24-hour ambient air samples in 6L canisters in additional sampling locations in Burlington. These canisters will be spatially distributed throughout the modeling domain and within a 2-mile radius of the current monitoring location (Figure 2). This will result in a total of 196 24-hour canister samples (49 per quarter) from this enhancement of the network during the project. The sampling dates will be chosen to correspond with the existing Air Toxics monitoring collection schedule published by the EPA (every 12th day). Samples will be analyzed at the VT DEC Laboratory using the well established TO-15 method. A continuous BTX (benzene, toluene, xylene) sampling/analysis system (manufacturer to be determined) would also be placed at the current air toxics monitoring site and operated for the entire year of the project. It will be configured to collect 1-hour average BTX concentration values. The proposed monitoring sites would be in the vicinity of: 1) Winooski High School; 2) Fletcher Allen Hospital/UVM Campus (i.e. Fanny Allen); 3) Commercial area along Rt. 2 just east of the I-89 interchange; 4) Rt. 7 oriented site in the range of 300 to 600 meters south of Main Street; 5) Church Street Marketplace; 6) a residence on Park Street NW of the current air toxics monitoring site or another residential neighborhood in the north end; and 7) a residence NW of the Exxon/Mobil Terminal, which would also serve as a site on the lake shore boundary between lake to west and urban area land use to east. All ambient air collection inlet heights will meet the guidelines established by the EPA for monitoring site design criteria determination.

Figure 2. 24-hour TO-15 Canister sampling locations



- ADDITIONAL DATA

MET DATA: For model validation, it is necessary to have a meteorological station for continuous surface wind speed, direction, pressure and temperature (later converted to hourly averages). These measurements would be made at the current downtown Burlington long-term air quality sampling site with an existing met station, from a tripod attached to the roof of the trailer. A second meteorological station may be installed and maintained prior to this study period (funded by private sources) at the Leahy Center. If this station is installed, the met data collected will be used for the model validation.

TRAFFIC DATA: Traffic counts, including the number of vehicles, mix of vehicles (if possible) and average speed of vehicles, for each hour as a composite of both directions of traffic flow during each week long intensive sampling period conducted on each leg of the four-way intersection at Main Street and S. Winooski Avenue.

GASOLINE STATION ACTIVITY: It will be necessary to collect specific information about gasoline throughput on an hourly basis for the single gasoline service station located across Main St. from the current long-term monitoring location. This could be achieved either by: 1) agreement with the owner of the station to keep records of the amount of gasoline sold per hour; 2) observation by a technician to conduct counts of the use of gasoline station pumps by vehicles and recording hourly activity; or 3) use of a surveillance camera on the air toxics monitoring trailer.

OTHER: Upgrade of benzene emission inventories within the modeling domain to be consistent with the sampling period (2007).

Laboratory Analysis and Quality Assurance

Sorbent tubes will be analyzed using thermal desorption followed by GC/PID analysis following established EPA methods. After a period of method development, we plan to develop the expertise within the VT DEC laboratory to analyze sorbent tube samples. We may collaborate with the University of Vermont. The BTX continuous sampler analysis will also involve a period of method development and potential collaboration with a graduate student at the University of Vermont (discussions in progress).

VOC Collection. VOCs will be collected in 6 L canisters. All sampling and analysis, performed by the VT DEC, will follow the established TO-15 SOPs in the EPA-approved QAAP. The VT DEC laboratory has demonstrated proficiency in the TO-15 method. The volume of additional canisters for TO-15 analyses associated with this project will require an upgrade of the capabilities of the DEC laboratory to include an additional laboratory technician during the project duration.

Schedule

The 6-hr sorbent tube sampling represents the intensive (essentially continuous) aspect of the sampling effort at locations distinct from the downtown monitoring site (see Figure 1). The every 12th day 24-hr sampling at 7 additional urban area locations with canisters for the entire year of the project represents a significant spatial enhancement of the normal single site benzene sampling conducted each year (see Figure 2). The canister sampling enhancement would produce 24-hour average benzene measurements that could be compared to model predictions for approximately 240 space-time pairings over the year time period, a significantly dense data set for use in model validation. During each week time period of intensive 6-hr sorbent tube sampling (March, April, July, and October) the individual sorbent tube samplers would be set to collect samples at the designated times. During each weekly sampling period met data, traffic data, and gasoline service station activity data would recorded. The additional 24-hour canister sampling would require technician visits to change the canisters at 7 locations other than the downtown monitoring site every 12 days.

Model Validation & Anticipated Outcomes

Activity data collected (traffic flows and estimated benzene emissions from these traffic volumes, benzene emissions estimated from gasoline service station activity and various year-specific meteorological inputs) would be incorporated into the CALPUFF model previously developed.

Meteorological data necessary to create 3-D wind fields for the time period of intensive sampling would be augmented by the on-site surface measurements collected during each week. CALMET 3-D met fields would be created to drive the CALPUFF model for the entire 2006-2007 time period of sampling. The week-long periods sampled intensively would be modeled on the existing platform with the **specific local road and gasoline station inputs gathered (those portions of Main Street and S. Winooski Ave for which specific data is collected & the specific gasoline station throughputs recorded) during the intensive VOC sampling** substituted for the currently available year 1999 model inputs while all other benzene emissions previously modeled would be adjusted to the specific week time periods in 2006 through estimation techniques used to create the original 1999 input source data sets (averages of monthly data and typical diurnal patterns for instance). The location of the intensive sampling sites and the detail of the traffic data will be important limitations on how well the model may represent the short-term impacts from these nearest sources of benzene (on-road traffic and the one gasoline service station). Average data for on-road and other emission categories specific to 2006 will be developed for running the CALPUFF model for the entire year. Predicted 24-hour modeled results will be compared to ambient concentrations of benzene measured for 24-hour time periods at the 8 locations with every twelfth day canister measurements for the one-year monitoring period.

Cooperative Aspects

We plan to collaborate with the State of New Hampshire to enhance the applicability of the data collected in Burlington by conducting additional canister sampling in an urbanized setting that is slightly more commercial and industrial than Burlington. We plan to monitor at 3 sampling sites, in addition to the current monitoring station. One site is near a school near major highways in Manchester, NH, another one in the rapidly developing growth area around the Manchester airport, and a 3rd site in a more traditional residential setting of Manchester. Sampling would be on the same every 12th day schedule and would be in addition to the existing canister sampling currently conducted in Manchester. The TO-15 analysis of all the NH canister samples generated by the added 3 samplers as well as the TO-15 analyses of existing canister samplers (3) in New Hampshire would be conducted by the Vermont DEC laboratory under this proposal.

Technology Transfer

As part of this project, we will transfer of the CALPUFF modeling approach to a Manchester centered domain, although this would not be accomplished under this grant proposal. It would be the next step and State resource contribution. Meteorological and benzene emission inventories, similar to what was developed for Burlington, would also be developed for the Manchester area. The final ability to transfer a reasonably working model to this second study area would also require traffic and other activity data sufficient to produce the basic region-wide on-road vehicle emission patterns and to estimate all other region-wide sources of benzene in the second study area. 3-D meteorological data specific to the sampling location and time period of the sampling in the second study area would also be conducted for modeling in that area.

2. ASSOCIATED WORK PRODUCTS TO BE DEVELOPED

Measurement data will be used to validate a local-scale comprehensive source dispersion model for ambient benzene concentrations in Burlington, VT. This measurement data will assist in the characterization of the spatial distribution of and exposure to ambient benzene within Burlington, VT. The model output data will extend spatial and temporal resolution of measured benzene concentrations and benzene exposure in Burlington, VT. Work that will extend beyond the scope of this project will produce the necessary model emission and meteorological field inputs for Manchester, NH, and technology transfer of the model to NH to predict benzene concentrations and exposure within Manchester, NH—NH's largest city.

3. EXPLANATION OF PROJECT BENEFITS TO PUBLIC

Project benefits will include the identification of health hazards due to benzene exposure and the identification of high risk locations in typical small northern N.E. urban areas. Additionally, we will gain the ability to determine strategies to reduce exposure to benzene and gain an improved capability to predict benzene exposure for VT and NH residents. Community residents of Burlington, VT have expressed concern over benzene exposure in two district regions of the city.

4. EXPLANATION OF PROJECT OUTCOMES

This project will use an outcome-based evaluation process to measure program effectiveness in achieving its ultimate goals, as well as to provide continuous feedback for adapting to unanticipated events and implementing program improvements during the period of performance. The evaluation process will include the evaluation of both short-term and long-term outcomes. Project milestones are summarized in Table 1, below. Measurements included in the outputs/goals in Table 1 below, as well as timely completion of project deliverables (see Section 3 – Program Implementation, above) will be evaluated as activities are completed in order to evaluate success and take corrective actions if necessary. All evaluation results, including comparisons of the output goals vs. actual outputs, as well as completion of project deliverables will be provided in the Quarterly Progress Reports and Summarized in the Final Report.

Sampling for benzene will be carried out for one year at spatially representative sites in Burlington VT and in Manchester NH. Model validation will be accomplished by comparing Burlington VT short time period benzene measurements taken during the one year time period with modeled short time period benzene predicted for the same time periods. The model will be run for entire one year time period to produce long term (annual) predicted benzene concentration gradients for the entire urban area of Burlington VT. If data is available to transfer the model to Manchester NH, this would occur after the end of the grant period.

5. PLAN FOR TRACKING AND MEASURING PROGRESS

Table 1 - Summary of Program Evaluation Activities and Measures

Task	Start Date	Duration	Outcome
Grant Submittal	August 22, 2005		
Grant Awarded	October 2005*		Commence project
Submit QAAP to EPA	October 2005	1 month	Approved plan
Coordinate Traffic and Met data sampling	November 2006	1 month	Established plan for MET data and traffic counts
Purchase Equipment	November 2006	1 month	
Method Development	December 2005	3 months	Proficiency in methods
Establish Sites	January 2006	1 month	
Sampling	March 2006**	1 per 12 days	Begin Sample Collection every 12 days
Laboratory Analysis-canisters	March 2006	12 months	
Sampling	March 2006	7 days	
Laboratory Analysis-tubes	March 2006	1 month	
1st quarterly report	March 2006	2 weeks	Project tracking
Sampling	June 2006	7 days	
Laboratory Analysis-tubes	June 2006	1 month	
2nd quarterly report	June 2006	2 weeks	Project tracking
Sampling	September 2006	7 days	
Laboratory Analysis-tubes	September 2006	1 month	
3rd quarterly report	September 2006	2 weeks	Project tracking
Model Validation	October 2006	7*** months	
Sampling	December 2006	7 days	
Laboratory Analysis-tubes	December 2006	1 month	
4th quarterly report	December 2006	2 weeks	Project tracking
Technical Assessments	March 2007	13 months	
5th quarterly report	March 2007	2 weeks	Project tracking
Final Report	May 2007	2 months	

*Tentative

**Canister sampling will be conducted every 12th day (EPA schedule) and analyzed within 2 weeks of sampling.

*** Model validation will require actual surface and upper air MET data that may not be immediately available.

6. EXPLANATION OF HOW PROJECT SUCCESS WILL BE EVALUATED

Monitored benzene concentrations in Burlington will be compared with modeled concentrations. Based on comparative statistics, project will identify additional areas for model refinement. Success of the project will be judged at several levels:

a. Characterization of the risk and exposure to ambient benzene in Burlington will be considered successful if the program produces more than 75% of possible valid 24-hr benzene samples during the field measurement phase.
b. Model validation through comparison of approximately 240 24-hr ambient benzene model/measurement values paired in space and time will produce a confidence level in the model's representation of spatial gradients across the urban area of Burlington VT. Success of the model platform will be relative to the results of validation seen.
c. Confirmation of a successful modeling platform would enhance the success of the project in determining exposure to ambient benzene in Burlington VT.
d. Ability to transfer the modeling platform to another location (Manchester, NH) would be judged for success based on comparative statistics between the Manchester NH benzene sampling data and any modeled predictions for the same time period in Manchester that might be conducted in the future.

7. DESCRIPTION OF ROLES OF APPLICANTS AND PARTNERS

Vermont Department of Environmental Conservation, Air Pollution Control Division

The Air Pollution Control Division has assembled a qualified group of individuals with expertise in air sampling and design, modeling, risk assessment, data analysis and laboratory analysis.

New Hampshire Department of Environmental Services

The Air Resources Division, Technical Services Bureau at NH DES includes staff familiar with all aspects of ambient air monitoring, including the measurement of benzene and other hazardous air pollutants, and will be responsible for air toxics sample collection for this program in NH. In addition, the NH Air Toxics Control Program, managed by Rick Rumba, will be responsible for all oversight of air toxics monitoring, modeling, risk assessment and data analysis activities conducted by NH DES. Collected data will be shared with VT DEC in order to assist with model development and validation. All laboratory analyses for air samples collected at NH locations as part of this program will be analyzed at the VT DEC laboratory.

8. BIOGRAPHICAL INFORMATION OF KEY PERSONNEL

A. Vermont Department of Environmental Conservation, Air Pollution Control

Heidi Hales, Ph.D., Air Toxics Program Coordinator

Heidi Hales is the Air Toxics Program Coordinator for the VT Department of Environmental Conservation. She is responsible for coordinating and implementing the State's Air Toxics program. She is also the NESCAUM Air Toxics and Public Health Committee Coordinator. Dr. Hales received a B.A. in Biology with a Chemistry minor and an M.A. in Conservation Biology from the University of Pennsylvania. She has earned a Ph.D. in Plant & Soil Science from the University of Vermont. Prior to working with the VT DEC Dr. Hales worked as a Chemistry Research Editor for Ashgate Publishing and as an Environmental Scientist for the NJ Pinelands Commission.

Paul Wishinski, **B.S.E., M.Sc.**, Air Division Planning Section Chief

Paul Wishinski has worked for the VT DEC since November 1976, for about 5 years initially as a federal Region 1 EPA employee analyst/scientist assigned to VT and subsequently as a State of VT employee. He has been Planning Section Chief of the VT DEC's Air Division for the past 20 years. He is responsible for management of the Planning Section, modeling and analysis of priority air quality issues and submittal of SIP revisions as required by the Clean Air Act. His major technical responsibility is conducting regional scale air quality modeling as part of studies to determine transport of air pollutants for sources in the eastern US into VT and other areas of the Northeast. For a number of years he has collaborated on the development and improvement of air parcel back-trajectory receptor modeling techniques not commonly used to identify most probably source regions for transported air pollutants. Most recently he has directly the development of a computer modeling approach intended to model ambient benzene concentrations in VT's largest urban area. Mr. Wishinski received a B.S.E. in Aeronautical Engineering from Princeton University in 1965 and an M.Sc. in Aerospace and mechanical Sciences from the University of California at Berkeley in 1967. Prior to working for the State of VT, Mr. Wishinski spent seven years (1968-1975) working in science education and as program manager for rural development engineering projects for the US Peace Corps in Nepal.

George Apgar, B.S., Air Division Monitoring Section Chief
George Apgar has worked for the Air Pollution Control Division of the Vermont DEC since 1976 first as QA Officer, then Special Studies Engineer and for the last 10 years as Chief of the Monitoring Section. He is responsible for the supervision of the Monitoring Section. Mr. Apgar graduated from Rutgers University in 1973 and has taken many post graduate classes and EPA training programs.

Robert Lacaillaide, **M.S,** Air Toxics Monitoring Program Project Manager
Robert Lacaillade has worked for the DEC since 1990 and has been the Project Manager for the VT APCD's Air Toxics VOC and Carbonyl Monitoring Network for the past 10 years. As Project Manager, he is responsible for overall technical operation of the day-to-day program, coordinating with the analytical and field staff for scheduling, equipment and procedures, validating and quality assuring the VT APCD's Air Toxics data and for developing the EPA-approved Quality Assurance Project Plan (QAAP) for Air Toxics monitoring program. Mr. Lacaillade received a B.S. in Biology from Northeastern University and an M.S. in Environmental Quality Science from the University of Alaska, at Anchorage. Prior to coming to the Department in 1990, Mr. Lacaillade worked as an Environmental Engineer for the Air Pollution Control Department for the Municipality of Anchorage and as an Air Quality Scientist with an Environmental Consulting Company.

<u>Laboratory Services</u>
Gerald DiVincenzo, Ph.D., Laboratory Director
Dr. DiVincenzo is the Laboratory Director for the Vermont Environmental Laboratory. He has been Laboratory Director for 35 years and he directs the analysis of air and water samples according to EPA established methods. Dr. DiVincenzo received his Ph.D. in Chemistry from the University of Vermont.

B. New Hampshire Department of Environmental Services, Air Resources Division
Richard Rumba, **MPH**, Air Toxics Program Manager
Richard Rumba is the Air Toxics Program Manager for the New Hampshire Department of Environmental Services (NH DES). He is responsible for the implementation of both federal and state air toxics control programs in New Hampshire, the New Hampshire air toxics monitoring program, and all issues involving air quality and public health for the Department. Mr. Rumba has earned a B.S. in environmental science, and a Master of Public Health (MPH) degree in Environmental Health at the University of New Hampshire. His past experience includes more than 20 years in the environmental consulting field, primarily in the area of toxic air pollutant characterization and control. He is the principal author of the *New Hampshire Dioxin Reduction Strategy*, currently serves as a member of the New Hampshire Commission to Study the Relationship between Public Health and the Environment, and represents NH DES on the New England Asthma Regional Coordination Council. Over the past seven years, Mr. Rumba researched, developed and established a long-term ambient air monitoring program for NH DES to complement existing state air monitoring network for criteria pollutants. The program currently consists of routine integrated sample collection and analysis for 30 volatile organic compounds, carbonyls, and five toxic metals at three monitoring locations throughout the state. Monitoring data is used to estimate population exposures and related health risks for target toxic air pollutants in urban and rural areas of the state.

9. INFORMATION TO ADDRESS THE RANKING FACTORS LISTED IN SECTION V
Within proposal.

3. DETAILED ITEMIZED BUDGET

If this grant is awarded, the State of Vermont will provide existing staff, programs, monitoring equipment, supplies and laboratory equipment toward this monitoring project. We are also planning to incorporate overhead and travel for sample collection into our existing budgets. The estimated VT provided expenses will be $124,995.

a. <u>Personnel</u>

Funds are requested to support one graduate student for the first year of the project ($33,592). This person will be responsible for running the BTX continuous sampler and for conducting the tube sampler analysis on a gas chromatograph. Funding is also requested to cover the salary of 1 temporary full-time monitoring technician for the first 1 ½ year of the project. The technician will be responsible for assisting senior staff with sample collection and equipment maintenance. The Laboratory Scientist will assist with the canister analysis in the VT DEC Laboratory.

Item	**Quantity**	**Unit cost**	**Estimated Cost**
Graduate Student	1 (17 mo)	$50,388	$50,388
Monitoring Technician	1 (17 mo)	$33,756	$33,756
Laboratory Scientist	1 (17 mo)	$58,874	$58,874
Subtotal			*$143,018*

b. <u>Fringe benefits</u>

Rate 34,502%	$26,750

c. <u>Contractual Costs</u>

Item	**Quantity**	**Unit cost**	**Estimated Cost**
Data Analysis	1	$25,000	$25,000

NH Portion

Personnel	**Hourly Salary**	**Hours**	**Estimated Cost**
Program Manager	$25.67	156	$4,005
Technician	$14.98	240	$3,595
Engineer	$19.88	200	$3,976
Fringe Benefits			$5,750
Equipment & Other	**Quantity**	**Unit Cost**	**Estimated Cost**
Canister Flow Meters/Automated Timer	6	$2000	$12,000
Monitoring Shelter			$15,000
Administration			$912
Indirect Costs			$516
Subtotal			*$45,754*

d. <u>Travel</u>

Out-of-State Travel	$2,250

e. <u>Equipment</u>

This project involves an extensive network of air sampling during the first year of the project. Canister TO-15 analysis will occur at the VT DEC Laboratory using methods and equipment currently in use. The major expenses include:

Item	**Quantity**	**Unit Cost**	**Estimated Cost**
BTX Continuous Sampler	2	$40,000	$80,000
Sorbent Tube samplers	10	$675	$6,750
Sequential Sorbent Tube Sampler	1	$10,000	$10,000

Canister Flow Meters/Automated Timer	16	$2000	$32,000
SUMMA Canisters	33	$700	$23,100
Sub-Total			*$151,850*

f. Supplies

Item	Quantity	Unit Cost	Estimated Cost
Sample Pump Battery Pack	20	$125	$2500
Shelter	7	1500	$10,500
Sample Pump Battery Charger	1	$125	$125
Sorbent Tube Sample Pump Software	1	$200	$200
Sorbent Tubes	125	$50	$6250
Subtotal			*$19,575*

g. Other

Item	Quantity	Unit Cost	Estimated Cost
Laboratory Analysis			
VT- Canister analysis (T0-15)	250	$100	$25,000
NH- Canister analysis (T0-15)	125	$100	$12,500
Tube GC analysis	1008	$10	$10,080
GC Tube method development	1	$2,000	$2,000
Subtotal			*$49,580*

h. (Total Direct Costs) $463,777

i. (Total Indirect Costs) $36,198

j. Total Costs

Category	Total Estimated Cost
a. Personnel	$143,018
b. Fringe Benefits	$26,750
c. Contractual Costs	$70,754
d. Travel	$2,250
e. Equipment	$151,850
f. Supplies	$19,575
g. Other	$49,580
h. Direct Costs	$463,777
i. Indirect Costs	$36,198
j. Total Costs	**$499,975**

4. QUALITY ASSURANCE NARRATIVE

VT DEC will submit quality assured data within 90 days after the end of the quarter to the Air Quality System (AQS). A final report will be submitted to the EPA within 90 days of the end of the project period. The VT DEC has an approved Air Toxics Quality Assurance Plan (QAPP) on file with the EPA. We plan to submit a QAPP to the EPA for this project prior to monitoring commencement. This plan will include field blanks (if necessary for sorbent tube analysis) (10%), duplicates from collocated samplers (10%) and control samples (10%).

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[i] Toxics Release Inventory (TRI)
[ii] TRI and NATA (1996)
[iii] NATA (1996)