

Vermont Lead (Pb) NAAQS Monitoring Plan 2009



Vermont Department of Environmental Conservation
Air Pollution Control Division
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Acronyms and Abbreviations

AMTIC - Ambient Monitoring Technical Information Center
APCD - (Vermont) Air Pollution Control Division
AQI - Air Quality Index
BTEX - Benzene, Toluene, Ethylbenzene, Xylene
CAA - Clean Air Act
CARB - California Air Resources Board
CFR - Code of Federal Regulations
CO - Carbon Monoxide
CSA - combined statistical area
EPA - Environmental Protection Agency
ESC - Environmental Systems Corporation
FDMS - Filter Dynamic Measurement System
FEM - Federal Equivalent Method
FRM - Federal Reference Method
GIS - geographical information systems
HAP - hazardous air pollutants
HAAS - Hazardous Ambient Air Standard
IC - Ion Chromatography
IO - inorganic
MQOs - measurement quality objectives
MPA - monitoring planning area
MSA - metropolitan statistical area
NAAQS - National Ambient Air Quality Standards
NAMS - national air monitoring station
NATTS - National Air Toxic Trends Stations network
NCore - National Core Monitoring Sites
NECMSA - New England county metropolitan statistical area
NOX - Oxides of Nitrogen
OAQPS - Office of Air Quality Planning and Standards
Pb - Elemental Lead
PESA - Proton-Elastic Scattering Analysis
PIXE - Proton Induced X-ray Emission
PMSA - primary metropolitan statistical area
PM₁₀ - Particulate ≤ 10 micron aerodynamic particle size
PM_{2.5} - Particulate ≤ 2.5 micron aerodynamic particle size
QA - quality assurance
QA/QC - quality assurance/quality control
QAPP - quality assurance project plan
SLAMS - state and local monitoring stations
SO₂ - Sulfur Dioxide
SOP - standard operating procedure
SPMS - special purpose monitoring stations
TEOM - Tapered Element Oscillating Microbalance
TL - trace level
TOR - Total Organic Reduction
TSP - total suspended particulate
TSS - Technical Services Section (Monitoring Section) of the APCD
VOC - volatile organic compound
XRF - X-Ray fluorescence

Introduction

Lead (Pb) is a metal found naturally in the environment and some manufactured products. The major sources of lead air emissions was primarily motor vehicles, but those emissions have been significantly reduced with the phase-out of leaded gasoline. Lead is still used as an additive in general aviation gasoline used in piston-engine aircraft and remains a trace contaminant in other fuels. There are also some industries sources that also emit lead. These industrial sources are regulated to control lead emissions as necessary.

Health studies with regard to Pb have been numerous since EPA issued the first NAAQS standard of $1.5 \mu\text{g}/\text{m}^3$ in October of 1978. Results from the health studies show that detrimental effects occur at significantly lower levels of Pb in blood than was previously thought. Children are particularly susceptible to the effects of Pb. Exposures to low levels of Pb early in life have been linked to effects on IQ, learning, memory, and behavior.

EPA Regulation

On October 5, 1978 the EPA promulgated primary and secondary NAAQS for Pb under section 109 of the Act (43 FR 46246). Both primary and secondary standards were set at a level of $1.5 \mu\text{g}/\text{m}^3$ as a quarterly average (maximum arithmetic mean averaged over a calendar quarter). This standard was based on the 1977 Pb AQCD (USEPA, 1977).

In 1986, the first periodic review of the Pb air quality criteria and standards was undertaken with the development of the 1986 AQCD (USEPA, 1986a) and Addendum to the 1986 AQCD (USEPA, 1986b). In 1990 a supplement to the 1986 AQCD/Addendum was published (USEPA, 1990). Based on information contained in the AQCD documents, Exposure Assessment (USEPA, 1989) and OAQPS Staff Paper (USEPA, 1990) and were prepared.

On October 15th, 2008, the U.S. EPA adopted the new lead (Pb) National Ambient Air Quality Standard (NAAQS). The NAAQS standard was changed from $1.5 \mu\text{g}/\text{m}^3$ (quarterly calendar average) to $0.15 \mu\text{g}/\text{m}^3$ (rolling three-month average) over a three year period. This was a substantial change to the Pb NAAQS to strengthen the standard to a level that protects both human health and the environment. More background on ambient air lead regulatory information can be found at <http://www.epa.gov/oar/lead/actions.html>.

EPA issued a final rule (effective date January 12, 2009) that revised the NAAQS for Pb and associated Pb monitoring requirements. As part of the Pb monitoring requirements, monitoring agencies *are required to develop a plan for establishing Pb monitoring sites in accordance with the requirements of 40 CFR Part 58, Appendix D*¹. Contained in appendix D, EPA identifies two lead network design conditions that would require mandatory monitoring of ambient air lead levels for State and local air monitoring organizations.

¹ [Federal Register November 12, 2008 Vol 73 No 213](#)

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- “...4.5 Lead (Pb) Design Criteria. (a) State and, where appropriate, local agencies are required to conduct ambient air Pb monitoring taking into account Pb sources which are expected to or have been shown to contribute to a maximum Pb concentration in ambient air in excess of the NAAQS, the potential for population exposure, and logistics. At a minimum, there must be one source-oriented SLAMS site located to measure the maximum Pb concentration in ambient air resulting from each Pb source which emits 1.0 or more tons per year based on either the most recent National Emission Inventory (<http://www.epa.gov/ttn/chief/eiinformation.html>) or other scientifically justifiable methods and data (such as improved emissions factors or site-specific data) taking into account logistics and the potential for population exposure.”
 - “ b) State and, where appropriate, local agencies are required to conduct Pb monitoring in each CBSA with a population equal to or greater than 500,000 people as determined by the latest available census figures. “

State and local agencies that fulfill one or both these conditions are required to set up a approved monitoring station(s) utilizing a Federal Reference Method (FRM) or Federal Equivalent Method (FEM) for collection and analysis or apply for a waiver to the Regional Administrator based on supporting information.

Vermont Lead (Pb) Monitoring Plan Overview

Vermont is required to provide a monitoring plan providing a demonstration as to why or why not the State needs to establish mandatory ambient air monitoring Pb network, based on the lead network design criteria provided in 40 CFR Part 58 Appendix D. In order to demonstrate that a specific Pb air monitoring network utilizing FRM / FEM monitoring methods is not required, Vermont must provide information that shows:

1. There are no stationary sources within the State of Vermont, which emit lead (Pb) levels that exceed ≥ 1 ton per year (TPY), requiring fence line or population exposure monitoring.
2. The State of Vermont does not have any urban metropolitan CBSA's $\geq 500K$ that would require the need to provide an FRM/FEM ambient lead monitoring network.

Vermont's Lead Emissions Inventory

EPA requires source-oriented monitoring for each source emitting one ton per year (TPY) or more of lead. Vermont recently collaborated with EPA Region I to review various datasets to identify lead emission levels. These datasets included facility annual emissions statements, permitted emissions, site inspection reports, National Emissions Inventory (NEI) estimates and Toxic Release Inventory (TRI) estimates. The review confirmed that Vermont currently lacks the industrial source types that typically emit substantial quantities of lead. Stationary source emissions of lead in Vermont originate from several small facilities having Pb-emitting manufacturing processes ([see Table 1](#)). Additional Pb is emitted from stationary source fuel combustion; but estimates using annual emission statement data and EPA emission factors

indicate that combined stationary source combustion emissions of Pb are roughly 0.25 tons statewide.

Table 1 - Manufacturing Process - Pb Emissions from Stationary Sources 2008²

Industry Description	Facility	CAS	Pollutant	Annual Emissions (lbs)
Electric Induction Foundry	Vermont Castings- A Division of M.H.S.C. - Foundry Division	7439921	Pb Compounds	0.55
Aircraft Turbine Part Manufacturing	GE Co. (Rutland-Windcrest Rd)	7439921	Pb Compounds	0.06
Aircraft Turbine Part Manufacturing	GE Co. (Rutland-Columbian Ave)	7439921	Pb Compounds	0.16
Rubber Processing and Manufacturing Facility	Fulflex of Vermont, Inc.	7439921	Pb Compounds	0.01

Aviation gasoline use was another source of Pb emissions we reviewed. Estimates developed by EPA indicate that no Vermont airports have Pb emissions that exceed the monitoring threshold; and only two airports had estimated Pb emissions of 200 lbs or greater (Burlington International airport, and the Middlebury State airport).

Vermont's CBSA Inventory

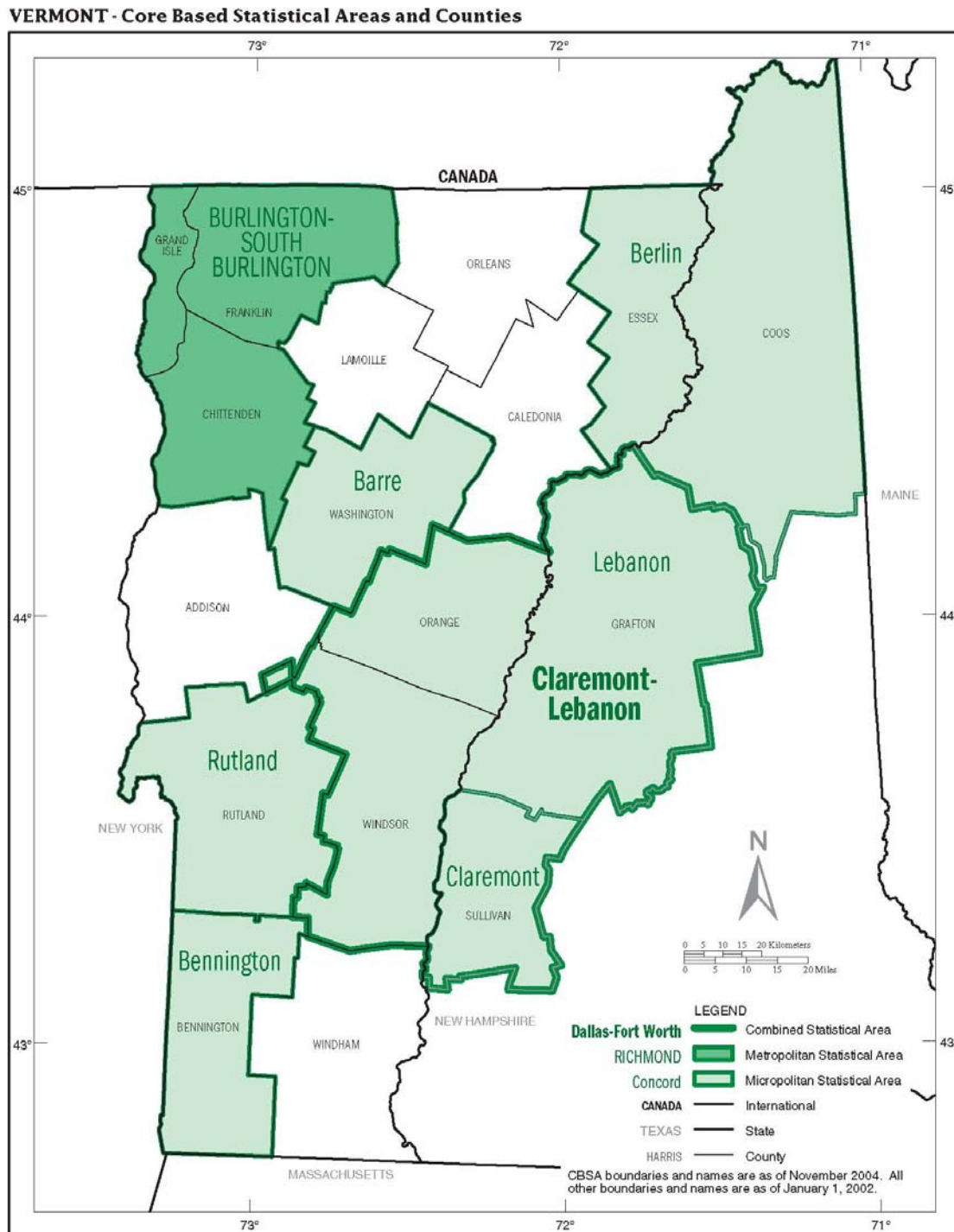
Metropolitan and micropolitan statistical areas, as defined by the U.S. Office of Management and Budget (OMB), are collectively known as core based statistical areas (CBSAs). Also called metro areas and micro areas, these geographical areas consist of one or more counties or county equivalents. Metro areas contain at least one Census-Bureau-defined urbanized area of 50,000 or more people, while micro areas contain at least one urban cluster of 10,000 to 49,000 people. Territory not included in either a metro or a micro area is referred to as "outside CBSAs."

According to the US Census Bureau³, the population of the State of Vermont is estimated to be 621,270 people as of 2008. The only urban Statistical Area listed for Vermont is Burlington – South Burlington which as shown in the [Figure 1](#) with a 2008 estimated population of 208,460. The State of Vermont does not meet the mandatory urban CBSA monitoring requirement necessary of "a population equal to or greater than 500,000 people as determined by the latest available census figures", to establish a Pb monitoring network.

² 2008 Lead Emissions From Stationary Sources - Compiled by Jeffery Merrell, Vermont APCD, May 2009

³ US Census Bureau Population Estimates (see <http://www.census.gov/popest/metro/CBSA-est2008-annual.html>)

Figure 1 Vermont Core Base Statistical Area



Current Pb Monitoring in Vermont

There are three on-going air monitoring efforts to assess ambient air levels of elemental metals including lead (Pb), in the State of Vermont.

- Commencing in 2004 the designated National Air Toxics Trends Station (NATTS) in Underhill, Vermont commenced collecting high-volume PM₁₀ quartz filters for elemental analysis (including Pb) via ICP/MS. Filters collected in 2008 to the present are currently being analyzed and reported by EPA's contract lab ERG. The APCD is planning on having the filters collected during 2004-2007 to be analyzed by the DEC laboratory utilizing ICP/MS following EPA IO Method 3.5. For further information concerning the NATTS monitoring program contact Robert Lacaillade at robert.lacaillade@state.vt.us or 802-241-3852 and/or visit <http://www.epa.gov/ttn/amtic/airtox.html>.
- Since 2004 the State of Vermont air toxics program has also operated high-volume PM₁₀ samplers at monitoring sites in Burlington (collocation), Brattleboro (2004-Nov., 2008), and Rutland. The purpose of this monitoring effort was to provide elemental analysis in urban areas that are consistent with the sample collection method and analysis currently being operated at the NATTS site Underhill, VT. For further information concerning these monitoring efforts contact Robert Lacaillade at robert.lacaillade@state.vt.us or 802-241-3861.
- Speciation sampling programs in both Burlington (Speciation Trends Network -STN) and Underhill (Interagency Monitoring of Protected Visual Environments-IMPROVE) collect PM_{2.5} samples that are subsequently analyzed for elemental metals including lead (Pb). In addition, there is an IMPROVE station in Manchester, VT on Mount Equinox in the Lye Brook Wilderness, which is operated and maintained by the National Park Service. For more information concerning these monitoring programs visit:

STN - <http://www.epa.gov/ttn/amtic/specgen.html>

IMPROVE - <http://vista.cira.colostate.edu/improve/>

Based on results reported from these Pb monitoring programs identified above, the current Vermont ambient air Pb concentrations are well below the NAAQS level of 0.15 ug/m³. Vermont APCD will continue to monitor ambient air Pb concentrations through the NATTS, STN, IMPROVE and State of Vermont Air Toxics programs. The Vermont APCD program firmly believes that the current monitoring and analytical efforts are sufficient to demonstrate the State of Vermont complies with the newly adopted Pb NAAQS and will be sufficient to show overall long range trends for Pb in the ambient air.

Presented below are historical data summary graphs and tables that clearly demonstrate Pb levels to be one to two order(s) of magnitude below the current NAAQS level of 0.15 ug/m³. Vermont APCD has not established a three-year demonstration utilizing Federal Reference Method or Federal Equivalent Methods. However, to utilize extra resources to demonstrate that Vermont

complies with the Pb NAAQS, when there is no need to do so both from a regulatory or data demonstration standpoint is not necessary.

VT APCD will continue to operate the NATTS, IMPROVE, STN, and Air Toxics sampling programs to quantify elemental metals including Pb. If there are any questions or concerns regarding these monitoring programs please feel free to contact:

Benjamin Whitney
State of Vermont APCD
Building 3 South
103 South Main Street
Waterbury, VT 05676-0402
Or
E-mail: ben.whitney@state.vt.us
Phone: 802-241-3861

1996 Historical Pb TSP Data:

In 1996, Vermont air monitoring program operated a TSP monitoring network throughout the state. There were five monitoring sites in the TSP network which included Burlington, Brattleboro, Rutland, Winooski, and Underhill. Selected filters that were collected during that year were analyzed for elemental metals including lead (Pb). These results presented below indicate that ambient Pb concentrations from the five sites did not approach the current NAAQS of 0.15 ug/m^3 . Even the limited data set for 1996 indicates that a three month rolling average was not going to present an ambient air concern for Pb. ([Figures 2-6](#)).

2003-2008 STN & 2003-2006 IMPROVE

Both the STN – Burlington, VT sampling program and the IMPROVE sampling program- Underhill, VT collect $\text{PM}_{2.5}$ samples which are analyzed for elemental metals including lead (Pb). The AQS Quick Look ([Table 2](#)) report is provided below showing summaries for these sites.

Based on Burlington STN reported data from 2006-2008 ([Figure 7](#)) and utilizing a very general estimation technique where $\text{PM}_{2.5}$ Pb concentration represents two-thirds of the PM_{10} Pb concentration, the Pb concentrations in Burlington are shown to be well below the NAAQS level of 0.15 ug/m^3 .

2008 NATTS - Underhill PM_{10} Data

The NATTS site in Underhill, VT collects Hi-Volume PM_{10} samples every six days. Elemental analysis has been conducted on 2008 filters. The results shown here in ([Figure 8](#)) are lot-blank corrected to eliminated filter matrix contributions. As can be seen from the graph, these data indicate similar results as the TSP analysis completed in 1996.

Figure 2 - 1996 TSP Lead (Pb) Rutland, VT

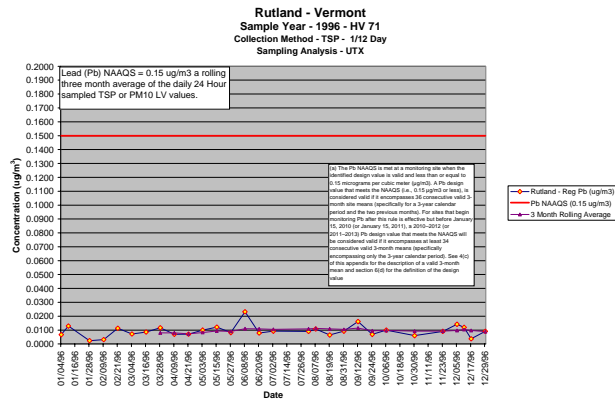


Figure 5 1996 TSP Lead (Pb) Brattleboro, VT

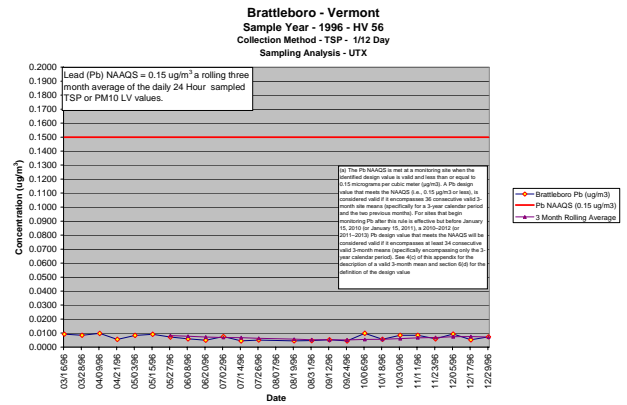


Figure 3 1996 TSP Lead (Pb) Burlington, VT

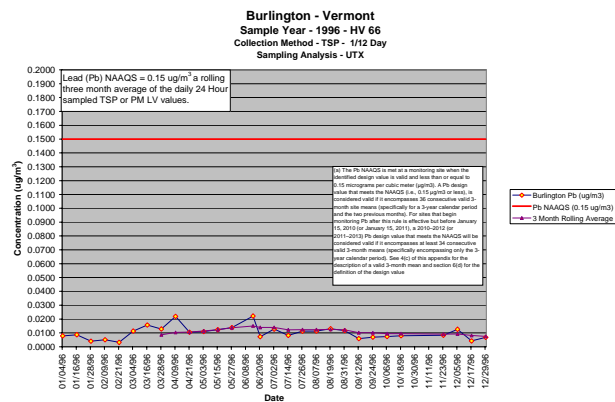


Figure 6 1996 TSP Lead (Pb) Winooski, VT

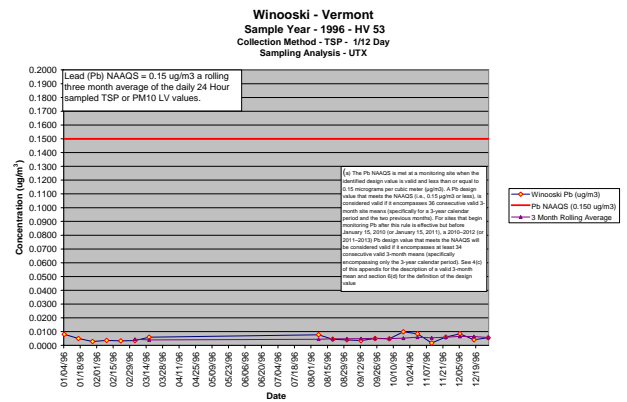


Figure 4 1996 TSP Lead (Pb) Underhill, VT

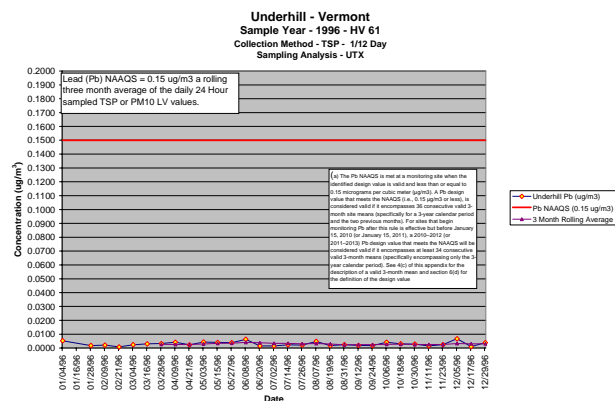


Table 2 - AQS 2003 - 2008 Quick Look Vermont STN & IMROVE

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY AIR QUALITY SYSTEM														
QUICKLOOK ALL PARAMETERS														
Jun. 1, 2009														
Parameter	Unit	P O C	FQAO	Year	Meth	# Obs	1st Max Value	2nd Max Value	3rd Max Value	4th Max Value	Arith. Mean	Duration	EDT	
Site ID: 50-007-0007			City: Underhill (Town of)			County: Chittenden			Address: 59 HARVEY ROAD					
88128 Lead PM2.5 LC	Micrograms/cubic meter (LC)	1	0745	2003	802	118	.005	.005	.004	.004	.0015	24 HOURS	0	
88128 Lead PM2.5 LC	Micrograms/cubic meter (LC)	1	0745	2004	802	118	.008	.006	.005	.005	.0019	24 HOURS	0	
88128 Lead PM2.5 LC	Micrograms/cubic meter (LC)	1	0745	2005	800	122	.006	.005	.005	.004	.0017	24 HOURS	0	
88128 Lead PM2.5 LC	Micrograms/cubic meter (LC)	1	0745	2006	800	119	.022	.005	.004	.003	.0017	24 HOURS	0	
88128 Lead PM2.5 LC	Micrograms/cubic meter (LC)	2	0745	2003	802	34	.005	.003	.003	.003	.0014*	24 HOURS	0	
88128 Lead PM2.5 LC	Micrograms/cubic meter (LC)	2	0745	2004	802	112	.007	.005	.004	.004	.0019	24 HOURS	0	
88128 Lead PM2.5 LC	Micrograms/cubic meter (LC)	2	0745	2005	800	119	.005	.005	.005	.004	.0017	24 HOURS	0	
88128 Lead PM2.5 LC	Micrograms/cubic meter (LC)	2	0745	2006	800	115	.024	.004	.004	.003	.0017	24 HOURS	0	
Site ID: 50-007-0012			City: Burlington			County: Chittenden			Address: 108 CHERRY STREET, BURLINGTON					
88128 Lead PM2.5 LC	Micrograms/cubic meter (LC)	5	1217	2003	811	116	.011	.008	.008	.008	.0032	24 HOURS	0	
88128 Lead PM2.5 LC	Micrograms/cubic meter (LC)	5	1217	2004	811	108	.008	.008	.007	.007	.0036	24 HOURS	0	
88128 Lead PM2.5 LC	Micrograms/cubic meter (LC)	5	1217	2005	811	111	.010	.009	.009	.009	.0032	24 HOURS	0	
88128 Lead PM2.5 LC	Micrograms/cubic meter (LC)	5	1217	2006	811	115	.015	.012	.012	.012	.0031	24 HOURS	0	
88128 Lead PM2.5 LC	Micrograms/cubic meter (LC)	5	1217	2007	811	121	.010	.006	.005	.004	.0022	24 HOURS	0	
88128 Lead PM2.5 LC	Micrograms/cubic meter (LC)	5	1217	2008	811	117	.007	.006	.006	.005	.0021	24 HOURS	0	

Figure 7 Burlington STN Data 2006-2008

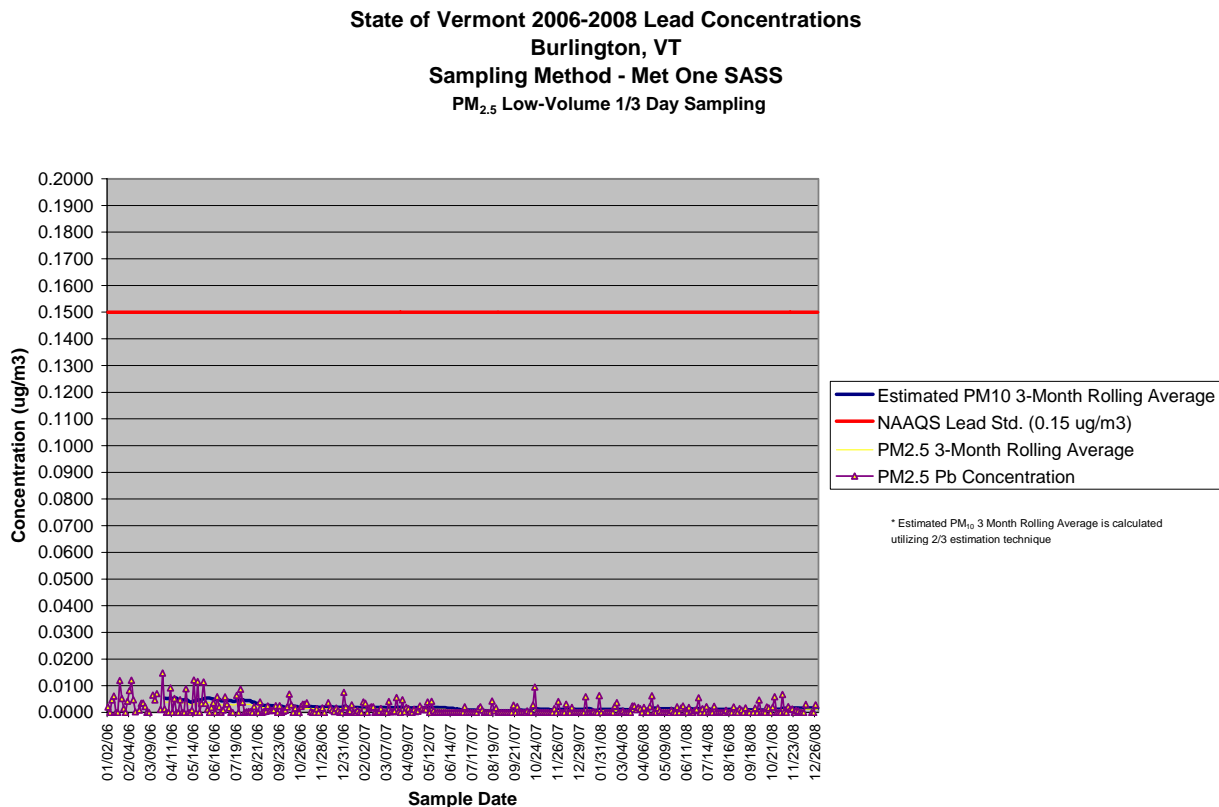


Figure 8 - 2008 Underhill NATTS Data

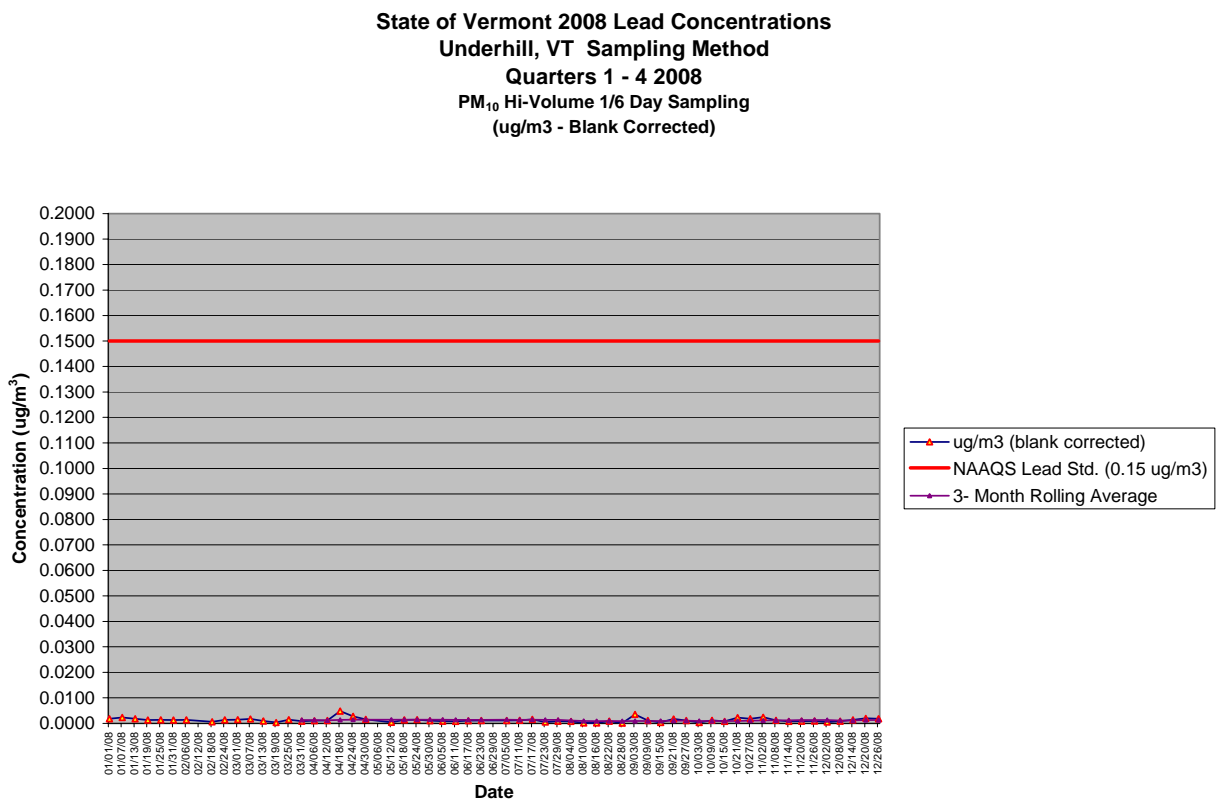
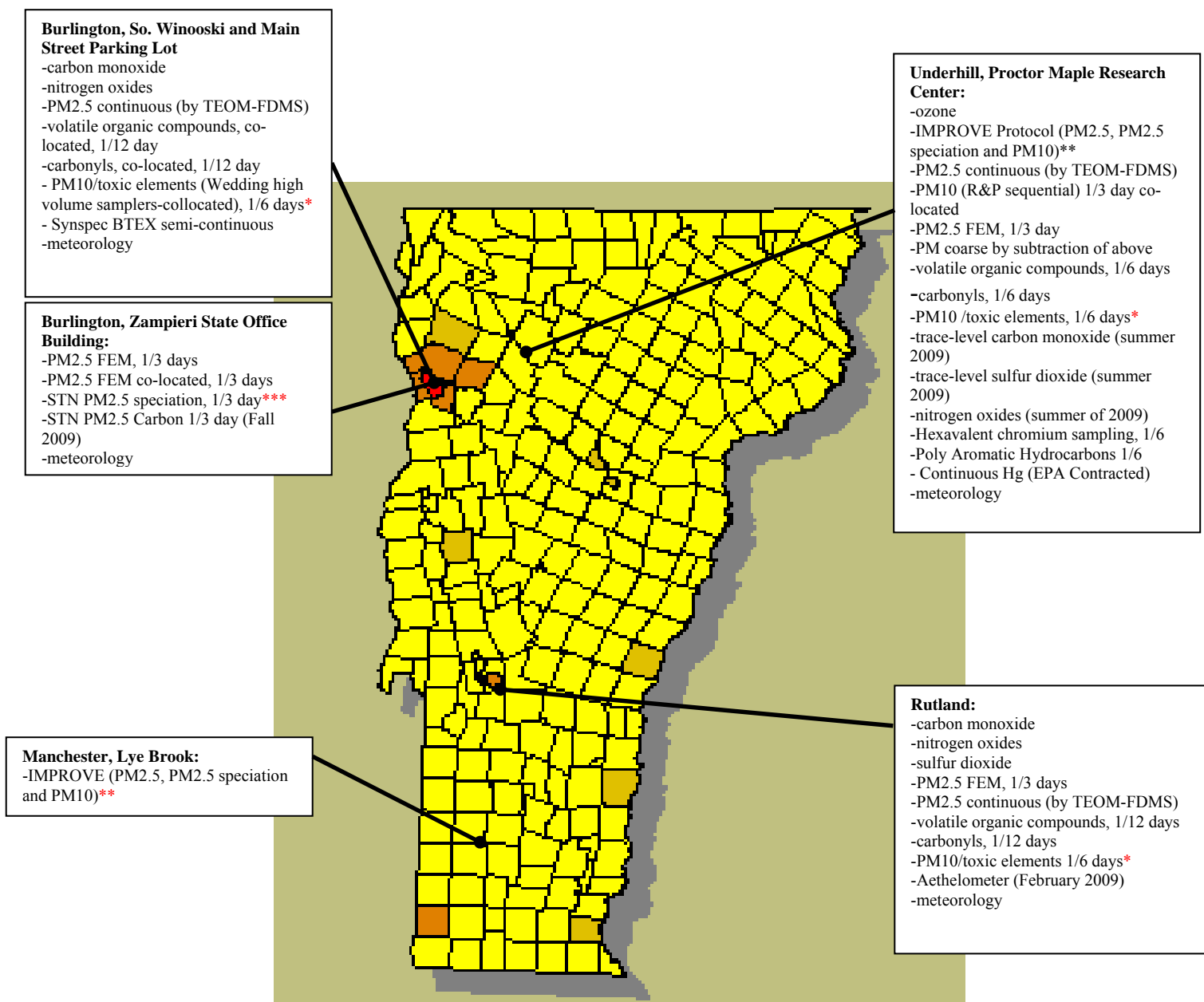


Figure 9 Vermont Air Monitoring Network Plan Map
2009 Vermont Elemental Metals Monitoring Sites



Notes:

- * PM10 sampling for quantification of toxic elements is by the Wedding high volume sampling method.
- ** PM2.5 IMPROVE Elemental Metals Analysis
- *** PM2.5 STM Elemental Metals Analysis

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Monitoring Site Parameter Information

Below in [Table 3](#) is a list of all of the monitoring sites currently operating in Vermont utilizing sampling methods that assess the ambient air elemental metals including lead (Pb) concentrations. The monitoring sites are operated by the State of Vermont or National Forest Service and analysis is completed by EPA Contract laboratories, State of VT DEC laboratory, or UC Davis Laboratory.

Table 3 - Overview of Pb Monitoring Stations in Vermont

		Carbon Monoxide	Nitrogen Dioxide	Ozone	Sulfur Dioxide	Speciation (STN / IMPROVE)	BTEX	PM _{2.5} FRM	PM _{2.5} TEOM	PM ₁₀ FRM	PM ₁₀ Low Volume	VOC	Carbonyl	Black Carbon	Wind Speed	Wind Direction	Temperature	Relative Humidity	Solar Radiation	Rain Fall	Pressure	PAH
Burlington	150 So Winooski Ave	✓	✓				✓		✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	
Burlington	108 Cherry Street					✓		✓							✓	✓	✓	✓	✓	✓	✓	
Manchester	Lye Brook					✓																
Rutland	Merchants Row	✓	✓		✓			✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Underhill	Harvey Road	PT	PT	✓	PT	✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓

P=Proposed T=Trace Level

[illegible]

This site is located in a municipal parking lot of downtown Burlington, VT, located 1 km east of Lake Champlain, 1.5 km south west of McNeil Generating Station, 2 km west of I-89, and 8 km west of the Essex IBM plant. This site is designated to represent middle and neighborhood-scale. The monitoring location meets all siting requirements and criteria and has been approved by VTAPCD and EPA Region 1.

The Burlington monitoring site objective for the CO & NO₂ measurements is compliance and trends purposes. Historically, CO and NO₂ measurements at this site are well below the NAAQS. Monitoring for CO and NO₂ at this site continues to be operated into the future primarily for trends analysis. The objective of the PM₁₀ monitoring is collect PM₁₀ for trends analysis. The PM₁₀ filters will be analyzed for elemental metals for comparison to the Vermont HAAS and Federal standards and trends assessment. The monitoring objective for the VOC and Carbonyl sample collection and analysis is to assess long-term population exposure on a neighborhood scale, comparison to applicable state standards and trend assessment. Continuous PM_{2.5} is used for AQI determination and air quality forecasting. WS/WD & Temp/RH data is collected from a 3.0 meter tower.

- Site established in 2003

Figure 10 Ariel View Burlington

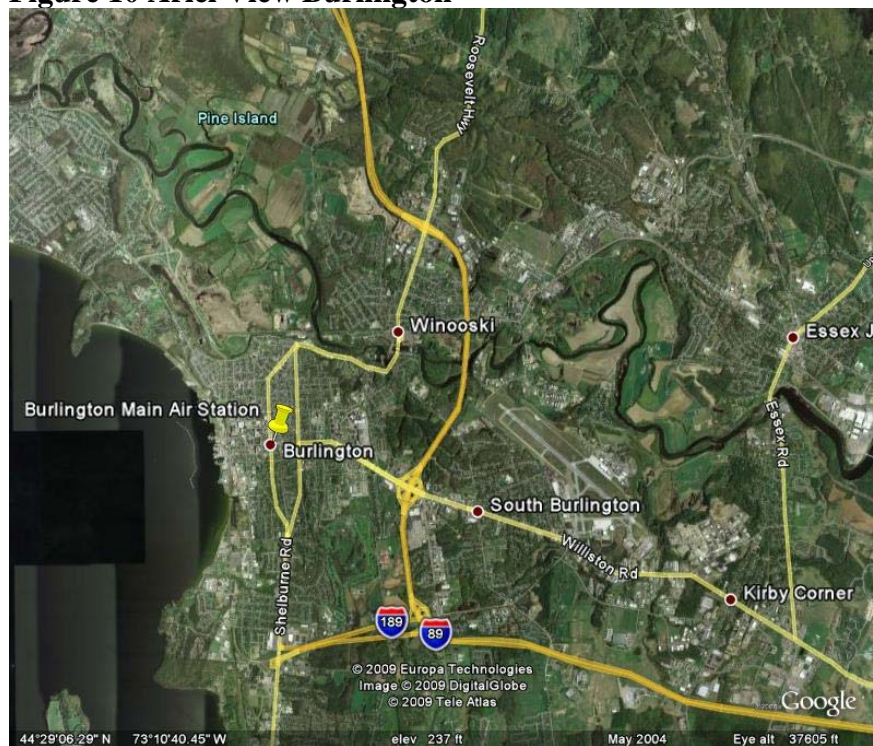


Figure 11 Burlington Trailer



Site Description: Burlington – 108 Cherry Street

Town – Site **Burlington – Zampieri State Office Building**
County: **Chittenden** Latitude: **+44.480278**
Address: **108 Cherry St.** Longitude: **-73.214444**
AQS Site ID: **50-007-0012** Elevation: **81.4 m**
Spatial Scale: **Urban & Center City** Year Established: **1999**
Statistical Area: **Burlington-South Burlington, VT Metropolitan**
Burlington-South Burlington, VT Metropolitan NECTA

Location	Site	Carbon Monoxide	Nitrogen Dioxide	Ozone	Sulfur Dioxide	Speciation (STN)	Speciation (IMPROVE)	PM _{2.5} FRM	PM _{2.5} TEOM	PM ₁₀ FRM	PM ₁₀ Low Volume	VOC	Carbonyl	Black Carbon	Wind Speed	Wind Direction	Temperature	Relative Humidity	Solar Radiation	Rain Fall	Pressure
Burlington	108 Cherry St.					✓		✓							✓	✓	✓	✓	✓	✓	✓

Site Description:

This site is located on the roof of the Zampieri State Office Building in Burlington. The monitoring site is located 15 meters above street level, .25 km from Lake Champlain, 1.2 km south west of McNeil Generating Station, 2.5 km west of I-89, and 8.5 km west of the Essex IBM plant. The site represents a neighborhood scale. This monitoring location meets all siting requirements and criteria and has been approved by VTAPCD and EPA Region 1

General Monitoring Description & Objectives:

The monitoring objective for PM_{2.5}, is for compliance and trends analysis. Speciation monitoring objective is PM_{2.5} trends analysis and complimentary data for PM_{2.5} FRM data. The speciation sampling is conducted as part of the EPA Speciation Trends Network (STN). WS/WD & Temp/RH data is collected from a 3.0 meter tower.

Plans/History:

- Site established 1999

Figure 12 Ariel View Burlington Zampieri

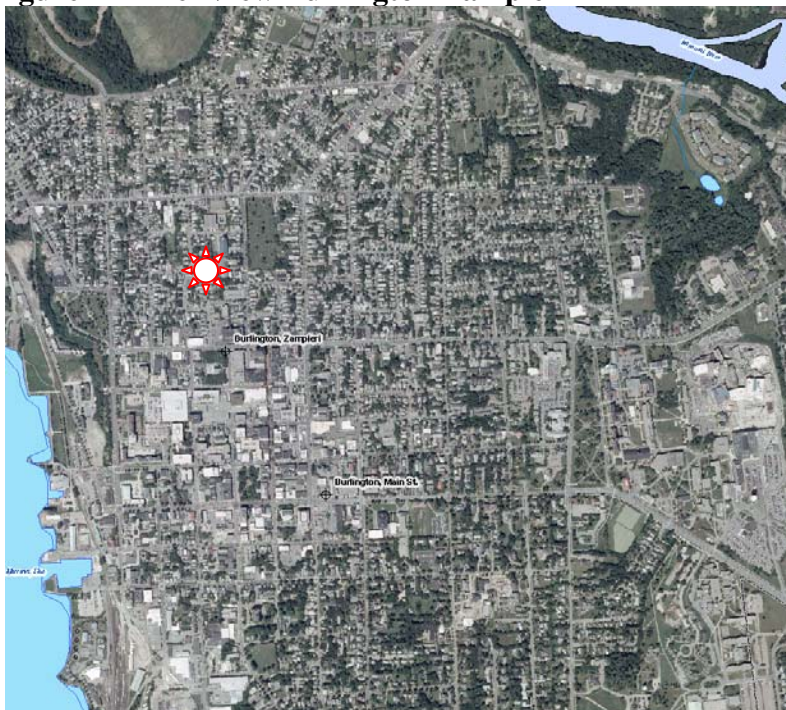


Figure 13 Burlington Zampieri Platform



Site Description: Manchester – Lye Brook Wilderness

Town – Site **Manchester – Lye Brook**
County: **Bennington** Latitude: **+43.1482**
Address: **Lye Brook Wilderness** Longitude: **-73.1268**
Site ID: **LYBR1** Elevation: **1015 m**
Spatial Scale: **Rural** Year Established: **1991**
Statistical Area: **Bennington, VT Micropolitan Area**

Location	Site	Carbon Monoxide	Nitrogen Dioxide	Ozone	Sulfur Dioxide	Speciation (STN)	Speciation (IMPROVE)	PM _{2.5} FRM	PM _{2.5} TEOM	PM ₁₀ FRM	PM ₁₀ Low Volume	VOC	Carbonyl	Black Carbon	Wind Speed	Wind Direction	Temperature	Relative Humidity	Solar Radiation	Rain Fall	Pressure
Manchester	Mountain Rd.						✓														

Site Description:

This monitoring location is not part of the Vermont APCD monitoring network. The NFS site participates in the IMPROVE network and is included here because it represents a permanent monitoring station within Vermont.

This site is located at the eastern slope of Mount Equinox. This site is operated and maintained by the National Forest Service. Further information about the Lye Brook site can be seen at <http://vista.cira.colostate.edu/views/Web/SiteBrowser/SiteBrowser.aspx>. The site is identified in the data search as LYBR1. The current data from this site is not accessible from the EPA AQS system.

General Monitoring Description & Objectives:

This site was established to monitor pollutants that contribute to regional haze impact on the visual environment within the Class 1 Area - Lye Brook Wilderness.

Plans/History:

- Site established 1991

Figure 14 Ariel View of Lye Brook Site

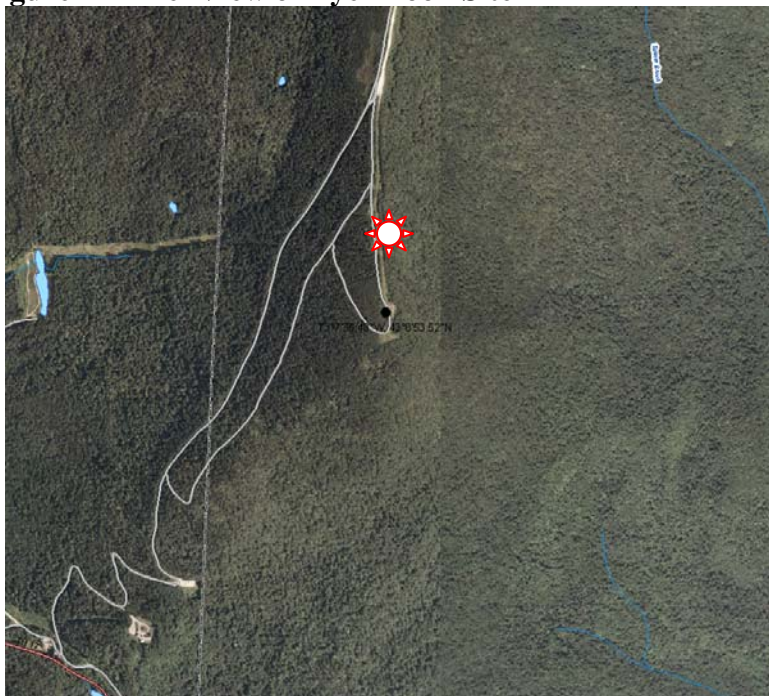


Figure 15 Lye Brook IMPROVE Site



Site Description: Underhill – 58 Harvey Road

Town – Site	Underhill – Proctor Maple Research Center		
County:	Chittenden	Latitude:	+44.528390
Address:	58 Harvey Rd.	Longitude:	-72.868840
AQS Site ID:	50-007-0007	Elevation:	392 m
Spatial Scale:	Rural	Year Established:	1988
Statistical Area:	Burlington-South Burlington, VT Metropolitan Area		
	Burlington-South Burlington, VT Metropolitan NECTA		

Location	Site	Carbon Monoxide	Nitrogen Dioxide	Ozone	Sulfur Dioxide	Speciation (STN)	Speciation (IMPROVE)	PM _{2.5} FRM	PM _{2.5} TEOM	PM ₁₀ FRM	PM ₁₀ Low Volume	VOC	Carbonyl	PAH	Wind Speed	Wind Direction	Temperature	Relative Humidity	Solar Radiation	Rain Fall	Pressure
Underhill	56 Harvey Rd.	PT	PT	✓	PT		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Site Description:

This site is located at the western slope of Mount Mansfield at the north end Underhill, VT. The site is rural in nature and located 5 km south west of the summit of Mount Mansfield, 6 km south of Route 15, and 26 km east of Burlington. This monitoring location meets all siting requirements and criteria and has been approved by VTAPCD and EPA Region 1

General Monitoring Description & Objectives:

The monitoring objective for ozone, PM_{2.5}, PM₁₀, PM speciation and future trace-level monitoring is regional scale background levels. The monitoring objectives for the VOC, Carbonyl, PAH, metals and CR⁺⁶ sample collection and analysis are to assess background levels on a regional scale for short and long-term trends, comparison to applicable state standards and federal guidelines and assessment of contribution of transported pollutants. WS/WD & Temp/RH data is collected from a 10.0 meter tower.

Plans/History:

- Site Established 1988

P = Planned startup 2008 T = Trace Level

Figure 16 Ariel View of Underhill Site

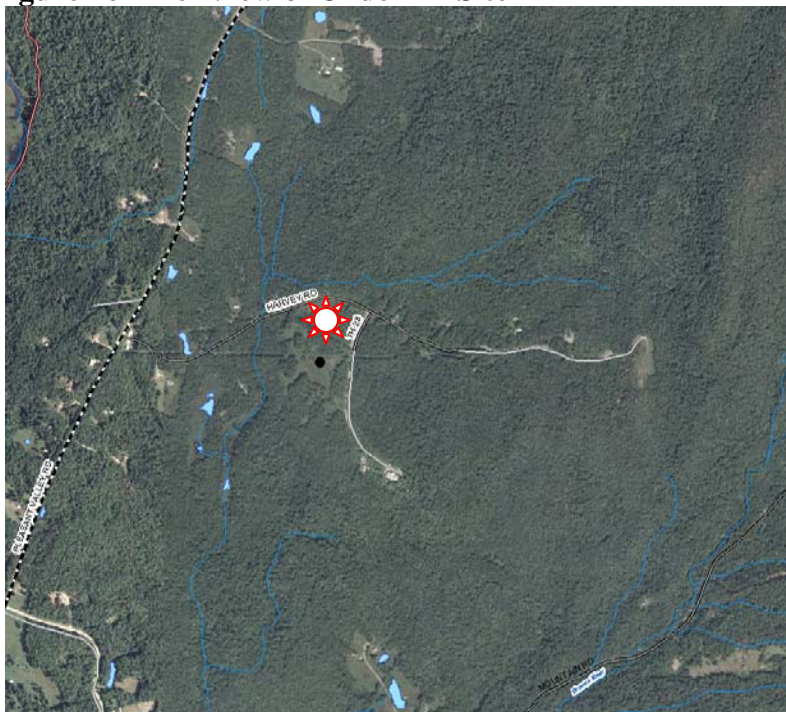


Figure 17 Underhill Site



Site Description: Rutland – 96 State Street

Town – Site	Rutland – State St.	Latitude:	+43.608056
County:	Rutland	Longitude:	-72.982778
Address:	96 State St.	Elevation:	165 m
AQS Site ID:	50-021-0002	Year Established:	1971
Spatial Scale:	Urban and Center City		
Statistical Area:	Rutland, VT Micropolitan Area		
	Rutland, VT Micropolitan NECTA		

Location	Site	Carbon Monoxide	Nitrogen Dioxide	Ozone	Sulfur Dioxide	Speciation (STN)	Speciation (IMPROVE)	PM _{2.5} FRM	PM _{2.5} TEOM	PM ₁₀ FRM	PM ₁₀ Low Volume	VOC	Carbonyl	Black Carbon	Wind Speed	Wind Direction	Temperature	Relative Humidity	Solar Radiation	Rain Fall	Pressure
Rutland	96 State Street	✓	✓		✓					✓		✓	✓	P	✓	✓	✓	✓	✓	✓	✓

Site Description:

This site is located in a court house parking lot in the downtown area of Rutland, 1 km from north junction of Route 7 & Route 4, 3.5 km from south junction of Route 7 & Route 4, 4 km NW of GE plant. The site is adjacent to a postal center distribution center which serves as the parking area for mail service vehicles. This monitoring location meets all siting requirements and criteria and has been approved by VTAPCD and EPA Region 1

General Monitoring Description & Objectives:

The monitoring objective for CO, NOX, PM_{2.5}, PM₁₀ and SO₂ is for compliance purposes and trends analysis. The monitoring objective for the VOC and Carbonyl sample collection and analysis is to assess long-term population exposure on a neighborhood scale, comparison to applicable state standards and trend assessment. WS/WD & Temp/RH data is collected from a 10.0 meter tower.

Plans/History:

- Site Established 1971
- A two channel Aethalometer will be deployed at this site in 2008

Figure 18 Ariel View Rutland Site

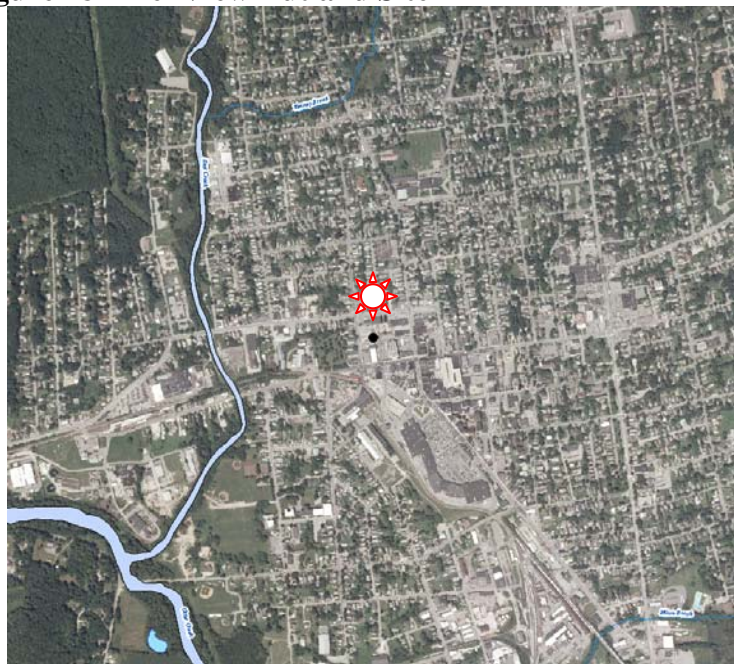


Figure 19 Rutland Site



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General References

1. United States Environmental Protection Agency Air and Radiation - National Ambient Air Quality Standards (NAAQS) March 2, 2007 <http://epa.gov/air/criteria.html>
2. State of Vermont, Agency of Natural Resources, *Air Pollution Control Regulation; Appendix C*, December 31, 2003
3. Electronic Code of Federal Regulations (e-CFR) Part 58 Subpart B § 58.10
<http://www.gpoaccess.gov/cfr/index.html>
4. United States Environmental Protection Agency, Technology Transfer Network, Ambient Monitoring Technology Information Center – *List of Designated EPA Reference and Equivalent Methods* May 16, 2007 <http://www.epa.gov/ttn/amtic/criteria.html>
5. [Code of Federal Regulation, \(e-CFR\) 40 CFR Part 50, Protection of Environment, May 29, 2009.](#)
6. [Code of Federal Regulation, \(e-CFR\) 40 CFR Part 53, Protection of Environment, May 29, 2009.](#)
7. [Code of Federal Regulation, \(e-CFR\) 40 CFR Part 58, Protection of Environment, May 29, 2009.](#)
8. *2008 Pb NAAQS -Evaluation of Ambient Monitoring Needs to Meet EPA Requirements*, Connecticut Department of Environmental Protection, Bureau of Air Management.