

**Ambient Air Monitoring Work plan
For
National Core (NCore) Monitoring
Station**

**CBSA
Louisville-Jefferson County
KY-IN MSA**

**Louisville Metro Air Pollution Control
District
850 Barret Avenue
Louisville, KY 40204**



National Core (NCore) Multi-pollutant Monitoring Stations:

In October 2006 the United States Environmental Protection Agency (EPA) issued final amendments to the ambient air monitoring regulations for criteria pollutants. These amendments are codified in 40 CFR parts 53 and 58. The purpose of the amendments was to enhance ambient air quality monitoring to better serve current and future air quality needs. One of the most significant changes in the regulations was the requirement to establish National Core (NCore) multi-pollutant monitoring stations. These stations will provide data on several pollutants at lower detection limits and replace the National Air Monitoring Station (NAMS) networks that have existed for several years. The final network plan must be submitted to EPA by July 1, 2009 and the stations must be operational by January 1, 2011.

The NCore Network addresses the following monitoring objectives:

- timely reporting of data to the public through AIRNow, air quality forecasting, and other public reporting mechanisms
- support development of emission strategies through air quality model evaluation and other observational methods
- accountability of emission strategy progress through tracking long-term trends of criteria and non-criteria pollutants and their precursors
- support long-term health assessments that contribute to ongoing reviews of the National Ambient Air Quality Standards (NAAQS)
- compliance through establishing nonattainment/attainment areas by comparison with the NAAQS
- support multiple disciplines of scientific research, including; public health, atmospheric and ecological

In 2007, EPA provided funding to the Louisville Metro Air Pollution Control District (LMAPCD) to begin the process of establishing an NCore station in Jefferson County. In January 2008, the Kentucky Division for Air Quality delegated the responsibility for establishing and operating an NCore station to the District. After evaluating the existing network, historical data, census data, meteorology, and topography the District recommends the following changes to its air monitoring network to become effective January 1, 2009.

Recommended changes to Ambient Air Monitoring Network to accommodate NCore sampling strategy:

- 1) Establish an NCore multi-pollutant monitoring station in Eastern Jefferson County at 2730 Cannons Lane. The location meets the objective for an NCore site and meets urban scale criteria for PM_{2.5}, PM₁₀, Ozone, and NO_x. It meets neighborhood scale criteria for Carbon Monoxide.
- 2) Move carbon monoxide monitoring from NAMS Site 21-111-0046 at 3510 Goldsmith Lane to the NCore station. This site was established in 1987 as part of the legacy NAMS network and was designed to observe pollution trends for national data analysis. The NAAQS for carbon monoxide is 35 ppm for the 1-hour standard and 9 ppm for the 8-hour standard. Measured values at this site have not violated either standard and current maximum values are approximately 8% of the 1-hour and 35% of the 8-hour standard. The 2007 8-Hour Design Value for this site was 2.7 ppm. In 2007, 71% of the 1-hour values were below 0.50 ppm with only 0.09% above 2.0 ppm which indicates that most measurements are near the nominal detection limit of the current instrumentation. Integration of this site into the NCore station using trace level monitoring technologies will provide a more accurate assessment of neighborhood scale carbon monoxide levels within the Louisville Metro Area.
- 3) Move ozone and special purpose NO_x monitoring from NAMS site 21-111-1021 at 1019 Mellwood Avenue to the NCore station. This site was established in 1973 as a NAMS site for Ozone and includes a NO_x monitor. The NAAQS for ozone is 0.08 ppm and is based on a 3-year average of the 4th highest 8-hour averages. Measurements at the site indicate the site has not violated the ozone standard for the past 7 years. The NAAQS for NO₂ is 0.053 ppm and is based on an annual mean. Measurements at the site have not violated the NO₂ standard. The principal value of this site is the use of NO_x and ozone data for studying ozone formation and transport. Because the enhanced monitoring capabilities at the NCore station will better accomplish this task and will be located within the same air shed, continued operation of this site is no longer needed or cost effective.
- 4) Move the PM_{2.5} speciation sampler from Site 21-111-0043 (3621 Southern Avenue) to the NCore Station. The primary purpose of speciation sampling is to study transport and formation of the secondary aerosols which make up a substantial portion of PM_{2.5} mass. Sulfates and nitrates are the predominant species of concern. Integrating these measurements with trace level SO₂, trace level NO_y, PM_{2.5}/PM_{coarse}, and enhanced meteorological measurements will provide a more complete and accurate assessment of secondary aerosol formation in the Louisville Metro Area.
- 5) Move PM_{2.5} sampling from SLAMS site 21-111-0048 to the 2730 Cannons Lane. Due to safety concerns identified by Metro-OSHA and Metro-Facilities Management, the existing site must be terminated. Because the Cannons Lane site

meets urban scale monitoring for PM_{2.5}, measurements at the site will represent the same air shed as the existing Barret Avenue site.

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Monitoring Objective:

Determine compliance with NAAQS; observe pollution trends for national data analysis, provide pollution levels for daily index reporting; and provide data for scientific studies.

Table 1 Monitors:

Monitor Type	Designation	Analysis Method	Frequency of Sampling
ARM Carbon Monoxide (CO)	NCore	Automated Reference Method utilizing trace level non-dispersive infrared analysis.	Continuously
ARM Nitrogen Oxide (NO _x)	NCore/AQI	Automated Reference Method utilizing chemiluminescence analysis.	Continuously
ARM Ozone (O ₃)	NCore/AQI	Automated Equivalent Method utilizing UV photometry analysis.	Continuously
ARM Sulfur Dioxide (SO ₂)	NCore	Automated Equivalent Method utilizing trace level UV fluorescence analysis	Continuously
FRM PM _{2.5}	NCore	Manual Reference Method utilizing gravimetric analysis.	1/3 days
PM _{2.5} TEOM	NCore/AQI	Automated Equivalent Method* utilizing Tapered Element Oscillating Microbalance/gravimetric analysis	Continuously
PM _{coarse}	NCore	Manual Reference Method PM ₁₀ utilizing differential gravimetric analysis.	1/6 days
PM _{2.5} Speciation	NCore	Multi-species manual collection method utilizing thermal optical, ion chromatography, gravimetric, and X-ray fluorescence analyses.	1/6 days
Total Reactive Nitrogen (NO _y)	NCore	Automated trace level chemiluminescence analysis.	Continuously
Meteorological	NCore	Air quality measurements approved instrumentation for wind speed, wind direction, humidity, barometric pressure temperature, rainfall, and solar radiation	Continuously
Lead	NCore	Manual Reference Method TSP or Manual Reference Method PM ₁₀	1/6
Radiation	RadNet	RadNet fixed station air monitor, manual and automated methods	Continuously + 2 weekly filters

* Pending

Quality Assurance Status:

All Quality Assurance procedures shall be implemented in accordance with 40 CFR 58, Appendix A. The District's current Quality Assurance Project Plan covers PM_{2.5}, Ozone, NO_x, Speciation, and meteorological measurements. For the trace level instruments, a Quality Assurance Project Plan will be developed and submitted prior to use of the trace level instruments and SOPs will be developed for each new instrument used in the project.

Area of Representativeness:

40 CFR Part 58 Appendix D provides design criteria for ambient air monitoring. The monitoring objective for the NCore site is to produce data that represents a fairly large area and therefore the spatial scale of the site is important. The spatial scale defines the physical dimensions of the air parcel nearest to a monitoring site throughout which actual pollutant concentrations are reasonably similar. It is determined by the characteristics of the area surrounding the air monitoring site and the site's distance from nearby air pollution sources such as roadways, factories, etc. In the case of urban NCore the spatial scales to be used are neighborhood and urban. Table 2 shows the area of representativeness for each pollutant for the Cannons Lane site.

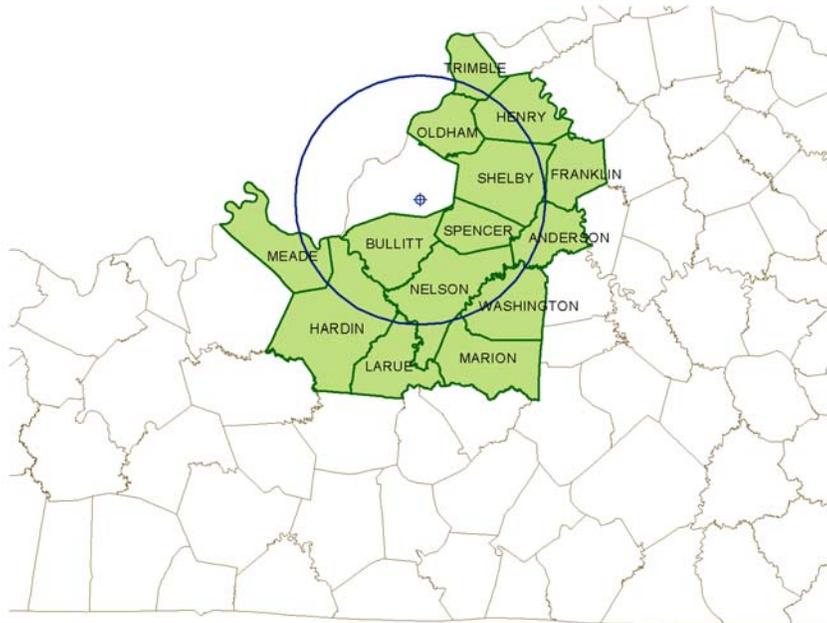
Table 2: Spatial Scales for Each Pollutant

Pollutant	Spatial Scale	Comments
Ozone	Neighborhood and Urban Scale	
NO _x	Neighborhood and Urban Scale	
Carbon Monoxide	Neighborhood Scale	There is no Urban scale for CO
SO ₂	Neighborhood Scale	There is no Urban scale for SO ₂
PM ₁₀ /PM _{2.5} /Lead	Urban	

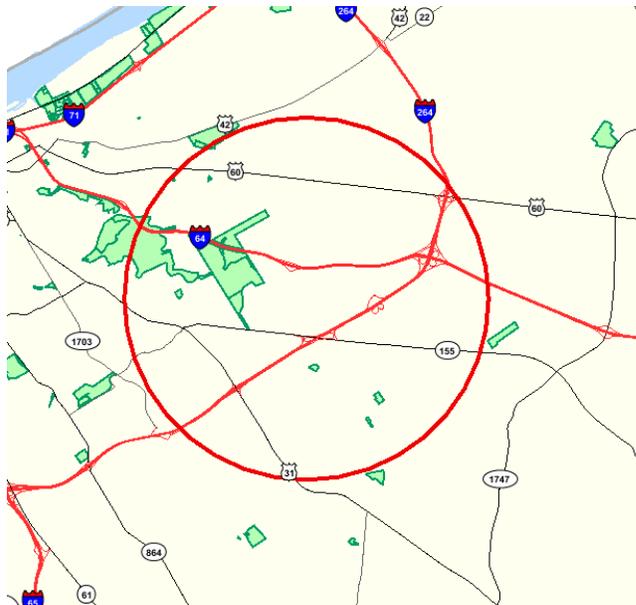
For neighborhood scale the area covered is up to a 4 km radius around the air monitoring site. This area is a mix of commercial, light industry and residential. In other words it is representative of most areas in Jefferson County. Approximately 20% of the total population for Jefferson County lives within a 4 km radius of the site. This scale also includes 36 schools, 3 hospitals, 6 parks and 3 large shopping venues.

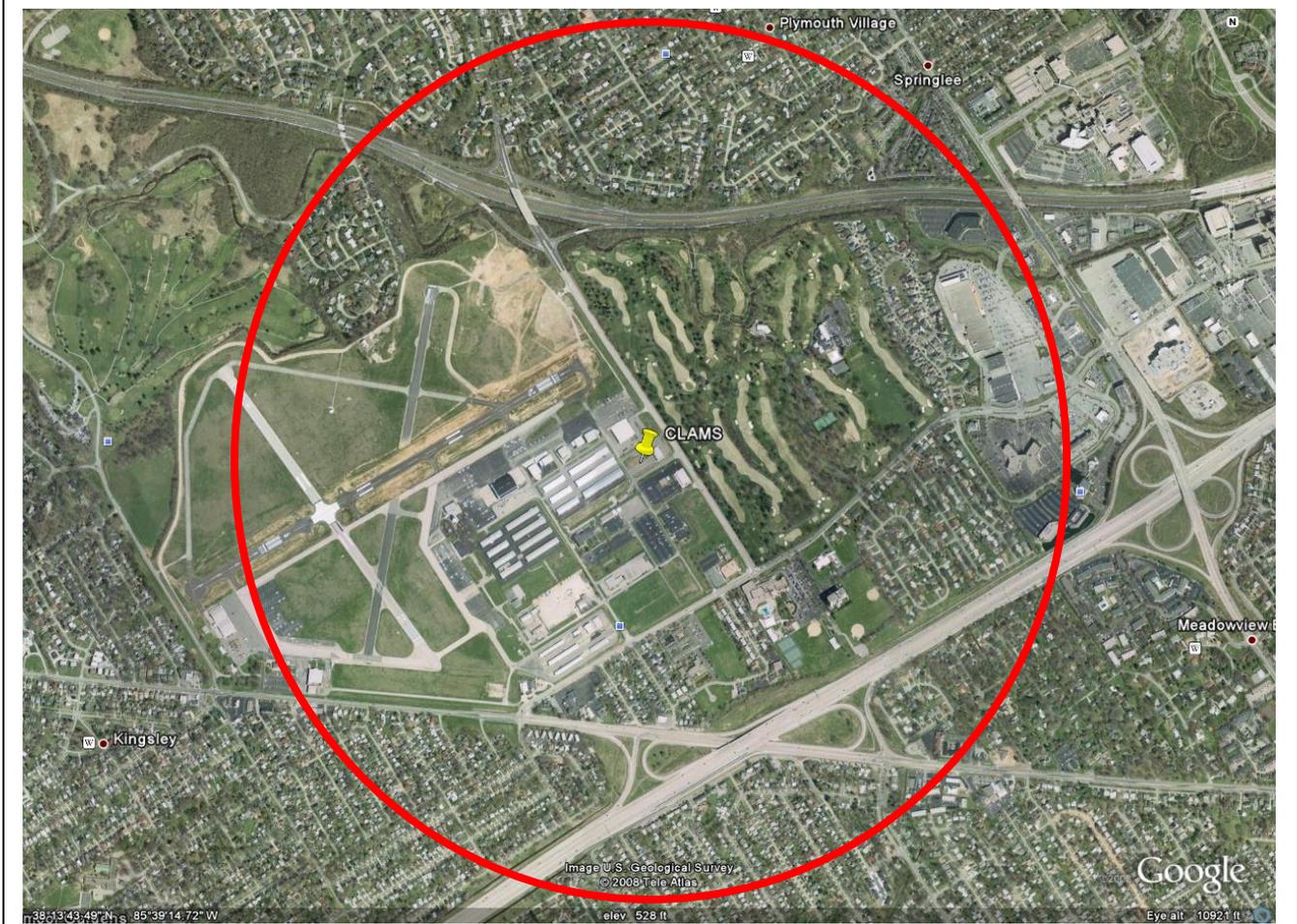
Urban scale is 4 km up to 50 km. 50 km would cover the entire MSA and overlap the current monitoring network. Dropping the scale down to 10 km covers most of the urban core and a portion of the MSA currently not covered by air monitoring. On a 10 km scale the land use varies from light to heavy industry, commercial, and dense residential. Approximately 50% of the total population for Jefferson County lives within 10 km of the site. It also includes 85 schools and many of Metro's parks and hospitals.

Ozone, PM_{2.5}, PM₁₀, and NO_x urban scale (50 km)

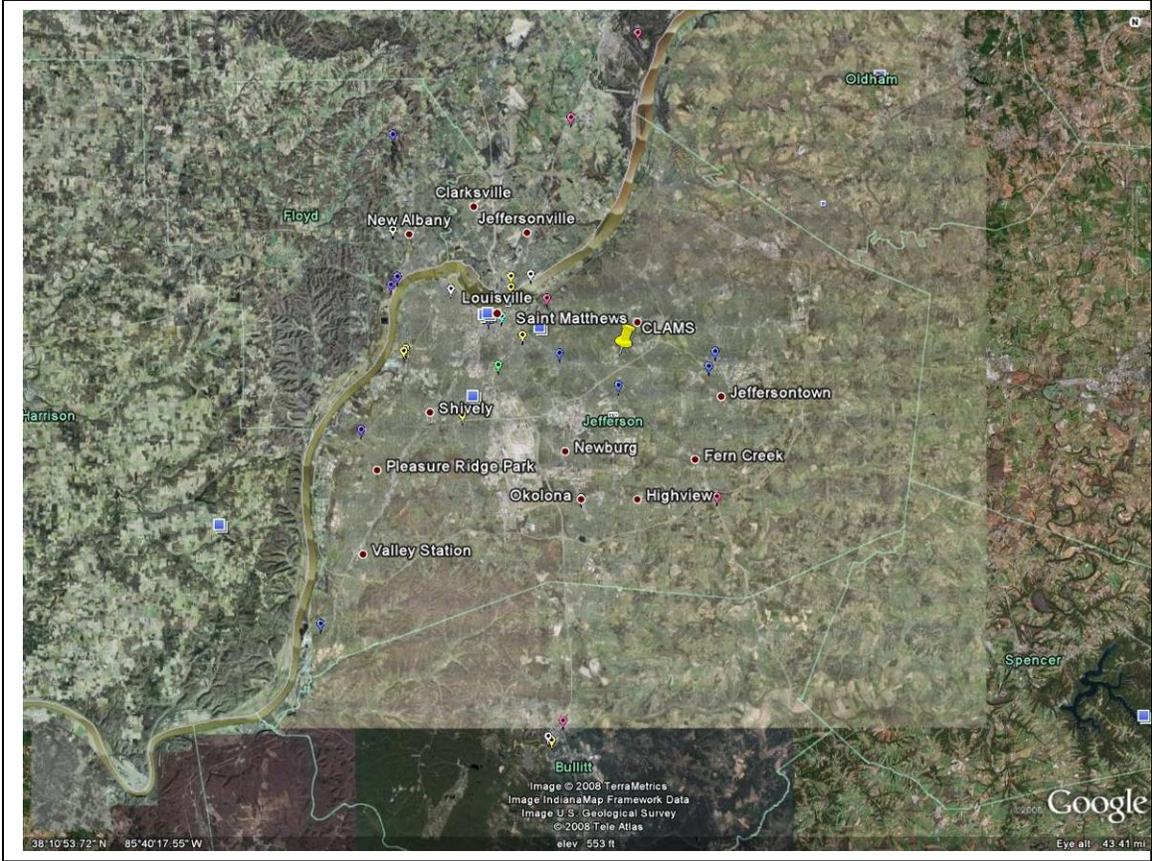


CO neighborhood scale (4 km)



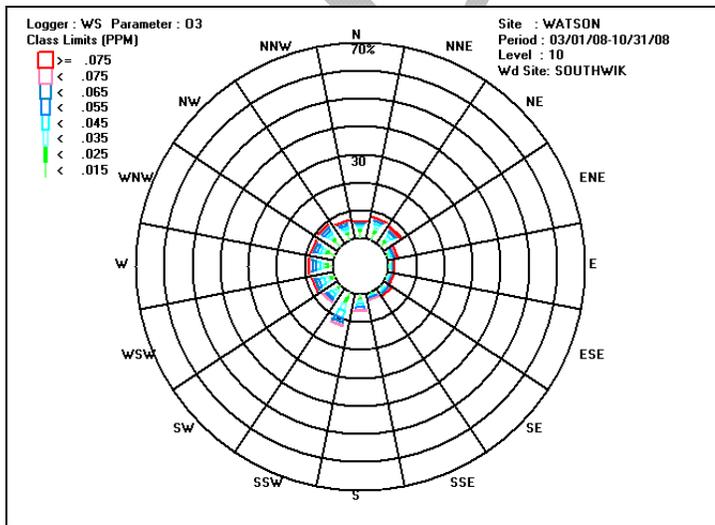
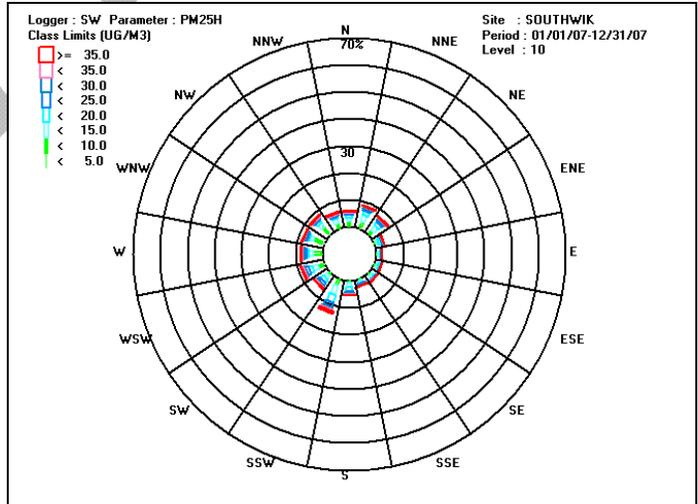
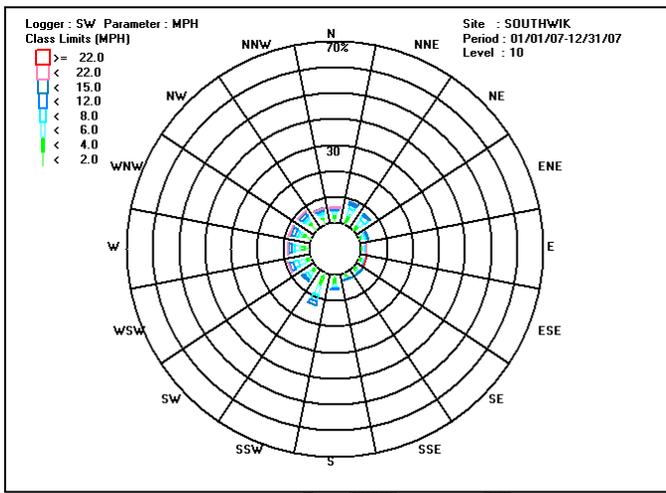


Cannons Lane (CLAMS)
1 km Radius



Cannons Lane (CLAMS) County View

As can be seen from the county wide view above, the proposed NCore site is located East of the urban core and North East of the heavier industrialized areas of the metro area. The wind rose indicates the prevailing wind directions while the pollution roses show the distributions of PM_{2.5} and ozone readings within the 16 quadrants. The placement of the NCore site east of the urban core provides the best location for measuring transport and secondary pollutant formation from that area. The placement of the NCore site downwind of the more industrialized areas compliments the existing network which is primarily designed to measure maximum concentration on a neighborhood scale. An added bonus would be measurement of transport from the NNE and NE quadrants which although monitored by sites in Southern Indiana are not effectively addressed by sites located in Kentucky.



Site Description and Spacing:

401 KAR 50:20 Air Quality Control Region: Louisville Interstate (078)

CBSA: Louisville-Jefferson County, KY-IN MSA

Site Name: Cannons Lane

AQS ID: 21-111-0067

Location: 2730 Cannons Lane

County: Jefferson

GPS Coordinates: 38.24012, -85.73256

Date Established: July 1, 2009

Inspection Date: April 17, 2008 (Initial site inspection)

Inspection By: Andrea P. Keatley, Kentucky Division for Air Quality

Site Approval Status: Pending



The station is located on the grounds of the Cannons Lane air monitoring building. The location is in the NEE quadrant of Jefferson County and is approximately 9 km from the urban core of Metro Louisville.

NCore and PM_{2.5} SLAMS Siting Criteria

Appendix E to 40 CFR Part 58-*Probe and Monitoring Path Siting Criteria for Ambient Air Quality Monitoring* contains specific location criteria applicable to NCore and SLAMS siting. The following measurements and data were obtained for evaluation of compliance with the criteria.

1. **Horizontal Placement of Sampling Probes:**

The gaseous instruments will be placed in a 10'w x 16' l x 8'h air monitoring shelter to be located approximately 40 meters behind the building to the West with the sample probe inlets being approximately 4 meters above the ground. A 10 meter "nested" meteorological tower will be placed next to the air monitoring

shelter to allow for extension of the sampling inlet for the NO_y monitor to reach up to 10 meters.

The manual particulate samplers will be placed on a wooden deck behind the sampling shelter. The height of the inlets of the particulate samplers will vary between 2-3 meters. The inlets for the continuous particulate samplers will be placed on the roof of the air monitoring shelter with the sample inlets being 2 meters above the roof (4 meters above ground). The control units will be located inside the temperature controlled shelter.

2. Spacing from Obstructions:

- VET Office/garage (h=7.5 meters): 40 meters
- Large Pine to the North West (estimated h=8 meters): from drip line 18 meters
- Small Pine to the North West (estimated h=5 meters): from drip line 12 meters.
- Deciduous tree to the West (estimated h=5 meters): from drip line 30 meters
- Deciduous tree to the East (estimated h=7 meters): from drip line 16 meters
- Sampling platform from air monitoring shelter (h=2.4 meters): 5.5 meters
- T-Hanger (estimated h=10 meters): 67 meters
- Army Reserve Center (estimated h=10 meters): 68 meters
- National Guard Complex (estimated h= 10 meters): 76 meters

3. Spacing from Roadways:

Tables E-1, E-2, and Figure E-1 of 40 CFR Part 58 Appendix E list the minimum distances from roadways a monitoring probe needs to be based on the average daily traffic (ADT) counts. Table 3 summarizes the findings and includes the minimum separation distance from roadways for each pollutant. ADT counts were obtained from a traffic count map generated from the Kentucky Transportation Cabinet's website.

Table 3
Spacing from Roadways Analysis

Roadway	ADT	Distance from site (meters)	Minimum Distance Required (meters)			
			Ozone Table E-1	NO/NO _y Table E-1	CO Table E-2	PM Figure E-1
Cannons Lane	18,709 (2006)	104	40	30	45	80
Dutchmans Lane	16,605 (2007)	441	40	30	45	80
I-64	79,332 (2008)	732	100	100	150	160
I-264	153,890 (2007)	833	250	250	150	160
Sidney Park Drive	<1000 (estimated)	32	10	10	10	10
Dargue Blvd	<1000 (estimated)	45	10	10	10	10

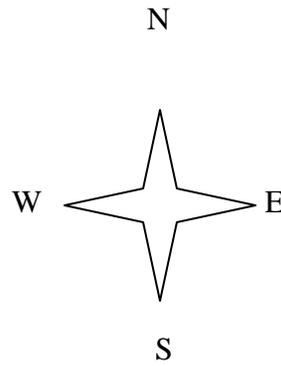
4. Spacing from Minor Sources:

The closest source to the site is the Bowman Field Airport. The airport is a general aviation field with the majority of the air traffic being privately owned small aircraft. For FY 2008 the average take off and landings were reported as 52,712 or approximately 145 per day.

The main runway is approximately 854 meters from the site.

The main terminal is approximately 1372 meters from the site.

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Direction	Description	Distance from Site
North	Army Reserve Center (offices, storage, hangers)	68 meters
North East	Parking lot for VET station. (25 spaces)	20 meters
East	Cannons Lane Air Monitoring Building (office and storage)	40 meters
South East	National Guard Complex & Sidney Park Drive	76 meters
South	Intersection of Sydney Park Drive and Dargue Blvd	76 meters
South west	View toward Dargue Blvd (paved area was VET stacking lanes)	45 meters
West	Airport rental T-Hangers	67 meters
North West	Airport rental T-Hangers	72 meters



Site Details:

The picture above was taken looking toward the NEE and shows the sampling platform which is 8'w x 14'l and 18"h. The sample inlets are just over 2 meters above the ground. The platform will support the PM_{2.5} FRM, the PM₁₀, PM_{2.5} Speciation, URG Carbon, and the RadNet sampler. It also has room for future hi-volume lead sampling if needed and room for the PEP audit equipment. Electrical service to the platform is 100 amps with 5 (20 amp GFCI) outlets strategically placed on the platform to provide power to the instruments.

The air monitoring shelter will be located in the area where the Jeep is parked (approximately 5 meters from the sampling platform) or in the grassy area in front of the site and approximately 6 meters from the sampling platform. The shelter will be 10' w x 16'l x 8' h. The roof of the shelter will be flat to support the sample inlets for the continuous particulate samplers and has additional room for other samplers if the need arises. The 10 meter meteorological tower will be next to the shelter and will be of the "nested" type to insure that the NO_y convertor is kept vertical and to ease servicing and calibration of the meteorological instruments. The shelter will be wired for 200 amp service and have internet and telephone connections. To maintain temperatures between 30-40 ° C the shelter will have a 24,000 BTU heat pump with a digital thermostat. The shelter insulation will be a minimum R-18.

The building in the background is a former Vehicle Emissions Testing center and is the property of the Air Pollution Control District. Long term use of the site should not be an issue. Plans are to renovate the building for office space. The large paved area is the "stacking lane" used for VET testing. Some of the paved surface nearest to the building will be marked for parking



Cannons Lane Air Monitoring Site

The picture above provides an aerial view of the location of the site in relationship to the airport. The view would be looking west from the site in the direction of the airport and downtown Louisville which can be seen in the distance. The airport terminal is the cluster of buildings located in the center of the picture. The buildings near the bottom of the picture are T-Hangers used to store private small engine aircraft. The area between the airport and the downtown Louisville can be characterized as an urban/residential mix. Unfortunately the picture does not show the site but it would be located in the general vicinity of the arrow.