TN Ambient Air Monitoring Plan

Tennessee Department of Environment and Conservation

Air Pollution Control Division

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Annual Air Monitoring Network Plan Acronym Glossary

AADT ..... Annual Average Daily Traffic
ANMP ..... Annual Network Monitoring Plan
AQI ..... Air Quality Index
AQS ..... Air Quality Subsystem
BAM ..... Beta Attenuation Monitor
CASTNET ..... Clean Air Status and Trends Network
CBSA ..... Core-Based Statistical Area
CFR ..... Code of Federal Regulations
CO ..... Carbon Monoxide
DAPC ..... Division of Air Pollution Control
DV ..... Design Value
EFO ..... Environmental Field Office
EPA ..... Environmental Protection Agency
FEM ..... Federal Equivalent Method
FRM ..... Federal Reference Method
µg/m3 ..... Micro Grams per Cubic Meters
MSA ..... Metropolitan Statistical Area
NAAQS ..... National Ambient Air Quality Standards
NCO ..... Nashville Central Office
NCORE ..... National Core Monitoring Station
NEI ..... National Emissions Inventory
NFO ..... Nashville Field Office
NPS ..... National Park Service
NO2 ..... Nitrogen Dioxide
NOx ..... Nitrogen Oxides
NOy ..... Reactive Oxides of Nitrogen
O3 ..... Ozone
PAMS ..... Photochemical Assessment Monitoring Station
Pb ..... Lead
PM2.5 ..... Particles with an average aerodynamic diameter of 2.5 microns or less
PM10 ..... Particles with an average aerodynamic diameter of 10 microns or less
PWEI ..... Population Weighted Emission Index
POC ..... Parameter Occurrence Code
ppb ..... Parts Per Billion
ppm ..... Parts Per Million
PQAO ..... Primary Quality Assurance Organization
PSD ..... Prevention of Significant Deterioration
SLAMS ..... State and Local Air Monitoring Stations
SO2 ..... Sulfur Dioxide
SPM ..... Special Purpose Monitor
TEOM ..... Tapered Element Oscillating Microbalance
TDEC ..... Tennessee Department of Environment and Conservation
Tpy ..... Tons per year
TVA ..... Tennessee Valley Authority

Introduction to the 2018/19 Ambient Air Monitoring Plan for Tennessee

The annual network monitoring plan (ANMP) that is presented in the following pages will address each of the requirements specified in the Code of Federal Regulations (CFR). An overview of the geography, general climate, wind patterns, and population trends are included to provide background information that will assist the reader in understanding the current air monitoring network and reasons for placement of the existing monitoring sites. The actual regulatory requirements that specify the number and placement of air monitoring sites are found in 40 CFR 58. The sections that provide this guidance are also included in the report as a reference to help better understand the actual monitoring needs in a given area.

In many instances, the areas for which monitoring is required are based on population criteria in which population must be considered to allow for monitoring in the areas where populations may be affected or exposed to the various criteria pollutants of concern. Additional monitoring sites are needed to address impacts to communities where source-related emission density might be elevated. Other considerations must also be addressed when selecting and operating air monitoring sites. The local influences of some types of sources (roadway dust or emissions) may be factors that require monitoring sites to be spaced certain distances from those sources. In the case of near-road or roadway monitoring activities, the monitors must be located very close to the potential sources of mobile emissions.

The principal areas in Tennessee with air monitoring sites are depicted with a graphic showing the locations for each of the monitoring sites. The sites are further identified with a site number, an Air Quality Site Identification (AQSID) and the types of pollutants being monitored at each location. Tables containing the relevant information for each site are also included. The tables are provided in two sections following the location graphic and have been condensed and combined from the previous year's format so that all relevant information can be found within each area's section of the report and relieves the reader from searching tables at the end of the report for information about a given site.

Each of the four local programs operating an air monitoring network in Tennessee provided a separate annual review. The local program's air monitoring network plan will be submitted at the same time as the State of Tennessee's annual ambient air monitoring plan. Where revisions were noted in the local networks, those revisions were added to the State's overall plan, see Table 1: Metropolitan Monitoring Configuration for 2018.

The recent changes in the National Ambient Air Quality Standards (NAAQS) have resulted in a need to evaluate additional air monitoring in order to comply with the new standards. In some cases (PM, O_3, SO_2 and NO_2), the revisions to the standard were augmented with revisions to the monitoring requirements. Some of the necessary changes to the monitoring networks have been completed while others are being planned for implementation. These changes appear in the QA Handbook Volume II January 2017.

The State of Tennessee is required to evaluate the ambient air monitoring network each year in accordance with requirements specified in 40 CFR Subpart B 58.10 and 40 CFR 58 Appendix D. All ambient air monitoring sites are meeting these regulatory requirements. Air monitoring evaluations can be found in Appendix G: Annual Site Evaluations & Documentation. The Jackson and Lawrence air monitors have approved Environmental Protection Agency (EPA) waivers and can be found in Appendix G: Annual Site Evaluations & Documentation.

The National Park Service (NPS) operates several air monitoring sites located within the Great Smoky Mountains National Park (GSMNP) and is responsible for the generation, review and validation of the data generated by these monitoring sites. The EPA has determined that these sites fall under the Primary Quality Assurance Organization (PQAO) oversight of the NPS and as such, are the responsibility of the NPS. TDEC has evaluated the current and historic monitoring data generated by these sites and confirms that all of the current ozone monitoring sites reported attaining ozone air quality data for the most recent evaluation periods including 2014 to 2016 and 2015 through 2017. Historically, Tennessee Dept. of Environment and Conservation Division of Air Pollution Control (TDEC DAPC) has assisted the NPS with limited support and a small amount of funding in cooperation with other partner agencies including EPA, NPS and Tennessee Valley Authority (TVA) in supporting the monitoring activities in the GSMNP and in processing air quality data for several of these sites.

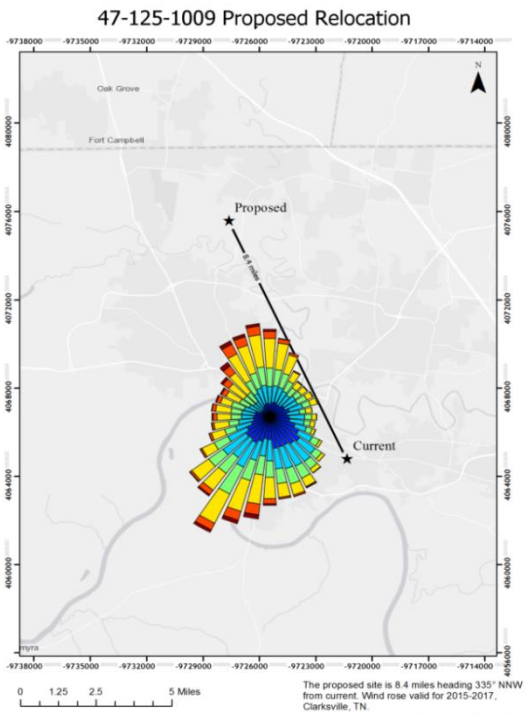
The NPS ozone monitoring sites have consistently demonstrated compliance with the ozone NAAQS in recent years and with this in mind, TDEC DAPC has determined that its funding for these sites is no longer possible or necessary. TDEC DAPC appreciates the opportunity to provide past assistance to the NPS, but must look to the future support and maintenance of the air monitoring network that TDEC is required to operate, ensuring that the necessary resources are available. NPS will continue to operate monitoring stations in GSMNP and report the data to AQS for the 2018 monitoring season.

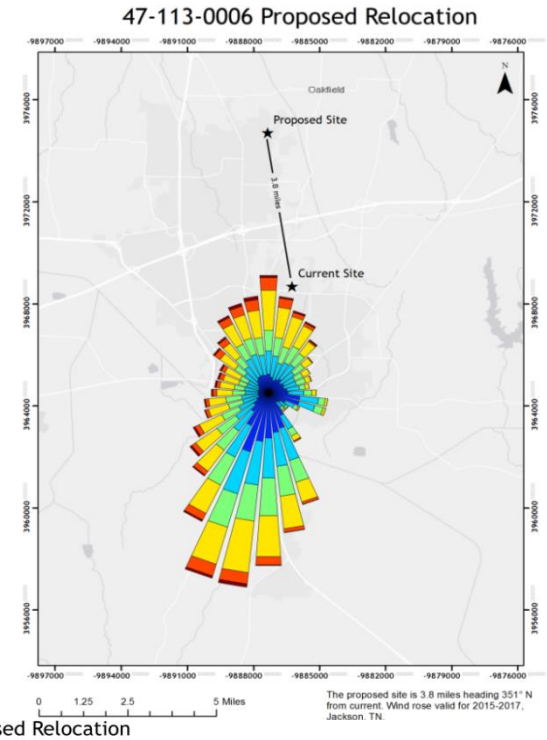
Proposed Revisions to Tennessee's Ambient Air Monitoring Network

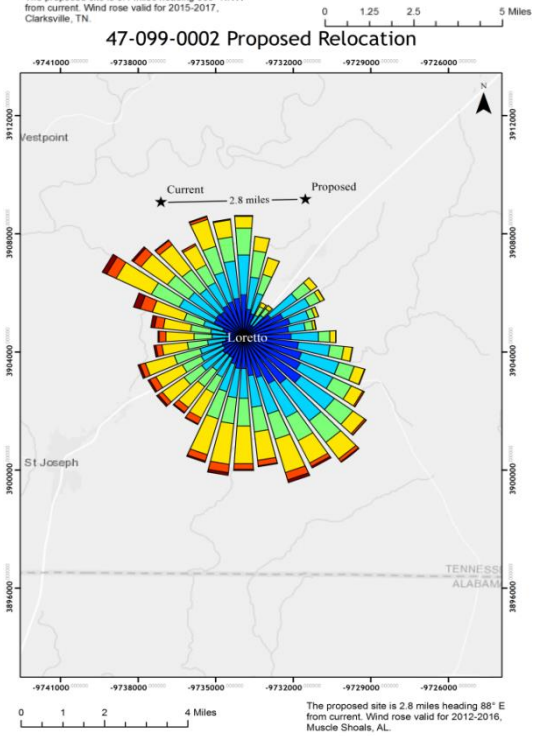
The following section details the planned revisions to TDEC DAPC's air monitoring network for 2018-19.

$PM_{2.5}$ Monitoring:

The State of Tennessee is proposing to relocate three $PM_{2.5}$ sites in order to comply with the siting requirements in 40 CFR Part 58 Appendix E. The three sites are Clarksville (47-125-1009), Jackson (47-113-0006), and Lawrence (47-099-0002). More information is in the attached proposals Appendix G: Annual Site Evaluations & Documentation. The graphics below summarize the proposed relocations with respect to the predominate wind patterns of the nearest populated area:







PM_{10} Monitoring:

The State of Tennessee does not operate any PM_{10} monitors as a part of the state network. The previous PM_{10} site, Luttrell, was shut down on December 31, 2015. Additional information on the monitoring requirements can be found in Appendix D: Monitoring Network Requirements.

Ozone Monitoring:

All eight of the State's ozone sites will receive new, upgraded shelters to house equipment. Due to the logistics of deploying new shelters, nearly all of the sites will move a short distance (5 meters). This change will also require a site reconfiguration proposal to be considered by the EPA. Information that is more detailed can be found in Appendix G: Annual Site Evaluations & Documentation.

Carbon Monoxide (CO) Monitoring:

The State of Tennessee does not operate any CO monitors as a part of the state network. Additional information on the monitoring requirements can be found in Appendix E: CO Monitoring Network Requirements.

Nitrogen Dioxide (NO_2) Monitoring:

The State of Tennessee does not operate any NO_2 monitors as a part of the state network. Additional information on the monitoring requirements can be found in Appendix E: NO_2 Monitoring Network Requirements.

Community Wide Monitors

A Nitrogen Dioxide (NO_2) monitoring site that meets the community wide monitoring requirement is already in operation in the Nashville core-based statistical area (CBSA). The NO_2 monitor AQSID 47-037-0011, located on Trinity Lane in Nashville, Tennessee is identified in the EPA's air quality subsystem (AQS) as a state and local air monitoring station (SLAMS). In the Memphis CBSA, the State of Arkansas currently operates an NO_2 monitor at its Marion site, (05-035-0005).

National Core Monitoring Station

In October 2006, the United States EPA established the National Core (NCore) multi-pollutant monitoring network in its final amendments to the ambient air monitoring regulations for criteria pollutants (codified in 40 CFR parts 53 and 58). It is the expectation that each state will have at least one NCore site. Nationwide, approximately 50 sites will be located in urban locations and 20 sites in rural areas. The multi-pollutant monitoring approach at NCore sites will benefit health assessments, emissions strategy development, and future monitoring efforts. By providing data users, such as researchers and policy makers, with a robust suite of collocated pollutant and meteorological data, NCore sites will better characterize the numerous chemical and physical interactions between pollutants than what is traditionally available at compliance oriented monitoring sites. Shelby County operates the only required NCORE site in Tennessee. This site is detailed in the Shelby County ANMP plan. The Look Rock rural NCORE site is an optional site operated by NPS.

Near-Road Monitors:

There are currently two near-road sites in Tennessee, both operated in local program counties (Davidson and Shelby). The near-road monitoring network was initiated as part of the 2010 NO2 NAAQS review and has become a multi-pollutant (CO, NO_2, NO, NO_x, $PM_{2.5}$) monitoring network. The EPA, in cooperation with state, local, and tribal air agencies, has tracked the installation of near-road NO2 monitoring stations across the country. As part of this effort, the EPA has created a list of sites and captured critical meta-data about the sites, their target roads and general operations. Additional information on near-road monitoring networks can be found at https://www3.epa.gov/ttnamti1/nearroad.html and in Appendix D: Monitoring Network Requirements.

Lead Monitoring:

The State operates a single lead monitoring site in Sullivan County, Tennessee near the currently shutdown Exide facility. This site is located within the boundary of the current Bristol lead maintenance area. There are no proposed changes to this site.

Prevention of Significant Deterioration (PSD) monitoring:

The Prevention of Significant Deterioration (PSD) permitting program is a Clean Air Act preconstruction review program for new and modified major stationary sources of air pollution (e.g., power plants, manufacturing facilities). The program requires that the area where the source is located be classified as either in attainment or unclassifiable with the National Ambient Air Quality Standards (NAAQS). The NAAQS establishes maximum pollution concentration levels to protect public health and welfare from harmful levels of nitrogen oxides, ozone, sulfur dioxide, particulates, carbon monoxide, and lead. A PSD increment is the maximum allowable increase in concentration towards the NAAQS from the baseline concentration for a pollutant. The baseline concentration is set for each existing pollutant at the time that the first complete PSD permit application affecting the area is submitted. PSD increments prevent the air quality in clean areas from completely consuming remaining air quality to the level set by the NAAQS. This monitoring requirement is triggered when there is insufficient ambient air quality data necessary to determine compliance with the NAAQS. Under these criteria, either pre or post construction monitoring may be required to be conducted in the area near the facility being constructed.

Currently, TDEC DAPC does not operate any PSD monitors.

Sulfur Dioxide (SO_2) Monitoring:

The State of Tennessee operates two SO_2 monitoring sites in the Kingsport, TN area named as nonattainment by EPA in Sullivan County, Tennessee. One is located on Skyland Drive (47-163-6002) and the other (Ross N Robinson) on Wilburn Drive (47-163-6001). These sites satisfy the population weighted emissions index (PWEI) requirements for the Kingsport CBSA. The State of Tennessee is proposing two additional locations in the nonattainment area for SO2 monitoring as requested by EPA to supplement the State's attainment plan. The State has determined the additional monitors are necessary to establish a network that will adequately characterize the nonattainment area and provide monitoring in closer proximity to the maximum receptor areas as indicated in the modeling included within the attainment plan.

The two new locations have been selected and a formal proposal is attached Appendix G: Annual Site Evaluations & Documentation.

The State of Tennessee also operates an SO_2 monitoring site at Freels Bend (47-001-0101), in Anderson County, Tennessee. This site was established to assess emission impacts from a nearby TVA fossil plant. This site shares a shelter with the ozone equipment and will undergo a reconfiguration upon EPA's approval of the shelter replacement described in Appendix G: Annual Site Evaluations & Documentation. This State is also planning to propose ending SO_2 monitoring at this location in 2018/19. The proposal to end monitoring is a result of a reduction in the population weighted emissions index (PWEI) value calculated using the most recent population and SO_2 emission estimates (Table 7). The most recent three-year design value for the Freels Bend SO_2 monitor is 6 parts per billion (ppb), or 8% of the federal SO_2 standard (75 ppb). Ending SO_2 monitoring at this location would free up valuable resources that could then be dedicated to the robust SO_2 monitoring network in the Kingsport nonattainment area.

The Purpose of Tennessee's Ambient Air Monitoring Network

There are several criteria used to determine the need for ambient air quality monitoring. These criteria are as follows:

- EPA National Ambient Air Quality Standards (NAAQS) criteria pollutant monitoring network requirements for the NCore, formally NAMS (National Air Monitoring Site); SLAMS (State and Local Air Monitoring Site); and SPM (Special Purpose Monitoring) monitoring networks can be found in 40 CFR Appendix D to Part 58.
- The CFR sets forth as regulations the requirements for air quality monitoring to be implemented by the states and EPA. These requirements are primarily organized around population and emission density in a given area with the number of required monitors and the distribution of the monitors within the networks specified by these regulations. Additionally 40 CFR, Part 58, Appendix D specifies criteria that must be followed in designing the NCore and SLAMS networks. The EPA must approve design and/or modifications to these networks.
- Additional federal regulations also specify requirements for Prevention of Significant Deterioration (PSD) monitoring networks. This monitoring requirement is triggered as part of a PSD permit application review where there is no representative contemporaneous ambient air quality data for the area near the proposed PSD source site. Under these criteria, either pre or post construction monitoring may be required to be conducted in the area near the facility likely to be impacted (as determined by modeling) by emissions.
- Air quality monitoring is required to be conducted to alert citizens in given areas to elevated levels of air pollutants in cities or communities of designated population levels that are required to provide Air Quality Index (AQI) reports to the general public.
- Air quality monitoring is conducted to address the need for background air quality data.
- Special air quality monitoring studies are conducted based on identified needs for monitoring data in a given area.
- Citizen complaints and enforcement investigations related to air quality are other reasons for air quality monitoring usually in or around a specific area related to the complaint or investigation.
- Where warranted, requests from citizens for special air monitoring studies are also a reason for air monitoring activities.
- The federal regulations also specify the frequency, method, location requirements, equipment, quality assurance procedures and reporting of data collected from the ambient air monitoring networks.

Table 1: Metropolitan Monitoring Configuration for 2018

Census Area Identification and Population			Monitoring Program	Lead		CO		SO_2		NO_2		Ozone			PM_{10}		$PM_{2.5}$				$PM_{2.5}$ Speciation		$PM_{2.5}$ Cont.	
CBSA Code	Census 2010 / 2017	CBSA Title (MS Areas)	State / PQAO	Operating	Required	Operating	Required	Operating	Required	Operating	Required	Operating	2015 2017 8 Hr DV (ppm)	Required	Operating	Required	Operating	2015 2017 Annual DV µg/m³	2015 2017 24 Hr DV µg/m³	Required	Operating	Required	Operating	Required
16860	528,143 556,548	Chattanooga, TN-GA	GA 0437	0	0	0	0	0	0	0	1(b)	0	0.067	2	0	1(d)	1	9.0(c)	18(c)	2	0	1(a)	0	1
			TN 0170	0		0		0		0		2			0(d)		3				0		1	
			TN 1025	0		0		0		0		0			0		0				0		0	
17300	260,625 285,042	Clarksville, TN-KY	KY 0584	0	0	0	0	0	0	0	0	1	0.061	1	0	0	0	8.6	19	1	0	0	0	1
			TN 1025	0		0		0		0		0			0		1				0		1	
17420	115,788 122,317	Cleveland, TN		0	0	0	0	0	0	0	0	0		0	0	0	0			0	0	0	0	0
27180	130,011 129,235	Jackson, TN	TN 1025	0	0	0	0	0	0	0	0	0		0	0	0	2	6.9	14	0	0	0	2	1
27740	198,716 202,053	Johnson City, TN		0	0	0	0	0	0	0	0	0		0	0	0	0			0	0	0	0	0
28700	309,544 306,659	Kingsport-Bristol-Bristol, TN-VA	TN 1025	3	1	0	0	4 (e)	1	0	0	2	0.066	1	0	0	1	7.6(c)	18(c)	0	0	0	1	0
			VA 1127	0		0		0		0		0			0		0				0		0	
28940	837,571 877,104	Knoxville, TN	TN 0581	3	1	0	0	0	1	0	1(b)	2	0.067	2	3	1	4	10.0(c)	34(c)	2	1	0	1	1
			NPS 0745	0		1		1		0		2			0		0				0		1	
			TN 1025	0		0		1		0		2			0		3				0		3	

Census Area Identification and Population			Monitoring Program	Lead		CO		SO_2		NO_2		Ozone			PM_{10}		$PM_{2.5}$				$PM_{2.5}$ Speciation		$PM_{2.5}$ Cont.	
CBSA Code	Census 2010 / 2017	CBSA Title (MS Areas)	State / PQAO	Operating	Required	Operating	Required	Operating	Required	Operating	Required	Operating	2015 2017 8 Hr DV (ppm)	Required	Operating	Required	Operating	2015 2017 Annual DV $\mu g/m^3$	2015 2017 24 Hr DV $\mu g/m^3$	Required	Operating	Required	Operating	Required
32820	1,324,829 1,342,260	Memphis, TN-MS-AR	AR 0055	0	1	0	1	0	1	1	2	1	0.067	2	0	2	0	8.5	17	2	0	1	0	1
			MS 073	0		0		0		0		1			0		0				0		0	
			TN 0673	1		3		1		1		3			2		2				1		1	
			TN 1025	0		0		0		0		0			0		0				0		0	
34100	113,951 118,081	Morristown, TN	TN 1025	0	0	0	0	0	0	0	0	1	0.067	1	0	0	0			0	0	0	0	0
34980	1,670,890 1,903.045	Nashville-Davidson—Murfreesboro	TN 0682	0	0	1	1	1	1	2	2	2	0.066	2	1(d)	2(d)	2	9.7	19	2	0	1(a)	1	1
			TN 1025	0		0		0		0		3			0		2				0		2	

(a) EPA has defunded the required speciation sampling in these areas. The CFR requirement has not been revised.

(b) This monitor is the near road site that may not be funded. The CFR requirement has not been revised.

(c) This data is subject to change upon EPA's concurrence of exceptional event requests.

(d) Monitoring agency receives a waiver from EPA Region 4.

(e) Two additional monitors are proposed to begin operation in late 2018, subject to site approval by the EPA.

Table 2: Micropolitan Monitoring Configuration for 2018

Census Area Identification and Population			Monitoring Program	Lead		CO		SO_2		NO_2		Ozone			PM_{10}		$PM_{2.5}$				$PM_{2.5}$ Speciation		$PM_{2.5}$ Cont.	
CBSA Code	Census 2010 / 2017	CBSA Title (Micro Areas)	State / PQAO	Operating	Required	Operating	Required	Operating	Required	Operating	Required	Operating	2015 2017 8 Hr DV (ppm)	Required	Operating	Required	Operating	2015 2017 Annual DV ug/m3	2015 2017 24 Hr DV ug/m3	Required	Operating	Required	Operating	Required
11940	52,266 52,877	Athens, TN	TN 1025	0	0	0	0	0	0	0	0	0		0	0	0	1	8.3(a)	20(a)	0	0	0	1	0
18260	106,042 111,363	Cookeville, TN	TN 1025	0	0	0	0	0	0	0	0	0		0	0	0	1	7.3	16	0	0	0	1	0
20540	31,809 32,691	Dyersburg, TN	TN 1025	0	0	0	0	0	0	0	0	0		0	0	0	0	14	6.9	0	0	0	1	0
29980	41,869 43,396	Lawrenceburg, TN	TN 1025	0	0	0	0	0	0	0	0	0		0	0	0	0	6.7	14	0	0	0	1	0

(a) This data is subject to change upon EPA's concurrence of exceptional event requests.

Clean Air Status and Trends Network (CASTNET)

The Clean Air Status and Trends Network (CASTNET) monitoring network is designed to measure air quality in rural areas year-round. CASTNET sites in Tennessee and the state's metropolitan statistical areas (MSAs) are managed by the EPA's Clean Air Markets Division and operated by an EPA contractor. The three CASTNET sites in rural areas of Tennessee and Kentucky are as follows:

Table 3: CASTNET Sites in Tennessee

Site	AQSID	County	Location	2015 2017 DV (ppm)
Cadiz (CDZ171)	21-221-9991	Trigg	5720 Old Dover Rd, Cadiz, KY 42211	0.061
Edgar Evins (ESP127)	47-041-9991	DeKalb	Edgar Evins State Park, Smithville, TN 37166	0.061
Speedwell (SPD111)	47-025-9991	Claiborne	718 Russell Hill Rd, Speedwell, TN 37870	0.062

Monitoring Sites and Discussion

All TDEC DAPC operated sites meet the siting criteria as found in appendix E to 40 CFR Part 58 for probe and monitoring path for $PM_{2.5}$, ozone (O_3), lead (Pb), and sulfur dioxide (SO_2). These sites will be reevaluated annually for compliance with this criterion. These sites are part of the State of Tennessee ambient air monitoring criteria pollutant monitoring network and operated to ensure continued compliance with appendix D to 40 CFR Part 58 network design requirements. These sites are summarized in Table 1 and Table 2. Current site evaluations with photographs, distance measurements and confirmation of meeting the siting criteria requirements are provided in Appendix G: Annual Site Evaluations to this plan.

The individual monitoring sites below have graphs included of their daily measured parameters, displayed according to their respective daily design value statistic when applicable. The reader will notice an anomalous spike in the $PM_{2.5}$ data during the months of November 2016 and December 2016. These spikes were caused by an outbreak of wildfires in eastern Tennessee and surrounding states. Additionally, sites that transitioned from one method of $PM_{2.5}$ monitoring to another are displayed according to their new and historical parameter occurrence code (POC). For federal reference monitors (FRMs), POCs 1 and 2 are used and for federal equivalent monitors (FEMs), POCs 3 and 4 are used.

The Jackson and Lawrence sites are currently operating under an EPA approved siting criteria waiver pursuant to appendix E to 40 CFR Part 58 for probe and monitoring paths for PM2.5. New sites are being evaluated during CY 2018 that will meet all of the siting criteria. Copies of the approval letters are found in Appendix F: EPA Request and Approval Letters. These sites are part of the State's $PM_{2.5}$ criteria pollutant monitoring network and operated to ensure continued compliance with appendix D to 40 CFR Part 58 network design requirements. A summary appears in Table 1 and Table 2.

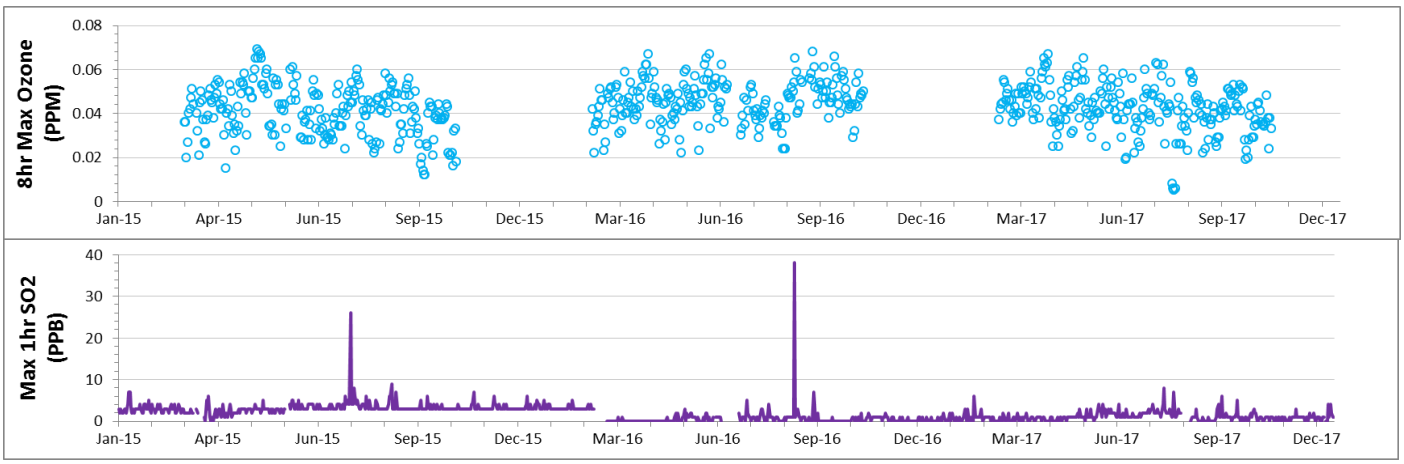
Freels Bend – Anderson County

Address	Freels Bend Study Area Melton Lake Oak Ridge	
AQSID	470010101	
CBSA	28940	
Lat, Lon	35.96522, -84.22316	
Parameter Code	42401	44201
Parameter Name	SO2	O3
Monitor Type	SLAMS	SLAMS
POC	1	1
Int	1	W
Collection Frequency	Hourly	Hourly
Method	100	87
FRM/FEM Instrument	TeledyneModel 100 E SO2 Analyzer	Model T400 Ozone Analyzer
Analysis	Ultraviolet Fluorescence	Ultra Violet Absorption
Ref Mtd ID	EQSA-0495-100	EQOA-0992-087
Monitor Objective	Population Exposure	Population Exposure
Dominant Source	Area	Area
Measurement Scale	Urban Scale	Urban Scale
Land Use Type	Forest	Forest
Location Setting	Rural	Rural

The Freels Bend site is located in Anderson County, Tennessee and currently supports monitoring for ozone and sulfur dioxide. The site was initially established in 1992 and is expected to operate during CY's 2018 and 2019. This site is located west of Knoxville and southeast of Oak Ridge, Tennessee. This site is an upwind site from the core Knoxville MSA. Sulfur dioxide monitoring began 03/01/2013 to assess emission impacts from the Bull Run FP. Because of the importance this site serves in assessing both the upwind ozone levels entering the Knoxville area and the ongoing need to continue to collect SO_2 data to assess area impacts near the TVA facility. This site was previously determined to remain in operation over 5 years (2015 through 2020), but due to changes in SO_2 monitoring requirements, TDEC DAPC will propose to shut it down before 2020. The Knoxville MSA has six ozone sites and is required to have only two. This site is also employed in the air quality index (AQI) forecasting program and currently is attaining the standards for both ozone and SO_2. See Appendix G: Annual Site Evaluations for further details.

In CY 2018, TDEC DAPC plans to replace the existing shelter with a new, upgraded shelter. Due to the logistics of shelter replacement, the site will undergo a reconfiguration. This reconfiguration will result in a new monitoring location approximately 22.4 meters from the existing site, heading 202° SW. This reconfiguration is subject to EPA approval; more details can be found Appendix G: Annual Site Evaluations & Documentation.

Freels Bend Daily Air Quality

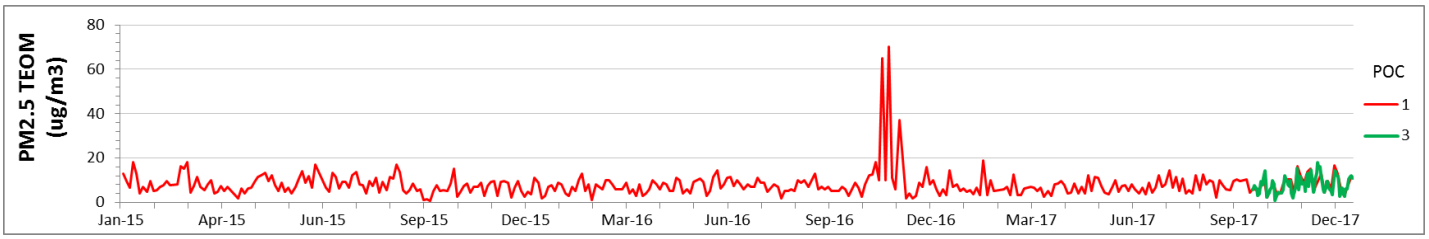


Maryville – Blount County

Address	2007 Sequoyah Avenue Maryville TN 37803
AQSID	470090011
CBSA	28940
Lat, Lon	35.768847, -83.942152
Parameter Code	88101
Parameter Name	$PM_{2.5}$ Continuous
Monitor Type	SPM
POC	3
Int	1
Collection Frequency	Hourly
Method	209
FRM/FEM Instrument	Met One BAM 1022 FEM
Analysis	Real Time Beta Attenuation Mass Monitor
Ref Mtd ID	EQPM-1013-209
Monitor Objective	Population Exposure
Dominant Source	Area
Measurement Scale	Neighborhood
Land Use Type	Residential
Location Setting	Suburban

The Maryville site is located in Blount County, Tennessee and currently supports monitoring for fine particulate matter. The site was initially established in 2000 and is expected to operate during CY's 2018 and 2019. This site is located south of Knoxville and northwest of the GSMNP. This site is an upwind site from the core Knoxville MSA. $PM_{2.5}$ monitoring began 05/01/2000 as a part of the original $PM_{2.5}$ state network. An FEM continuous $PM_{2.5}$ sampler replaced the FRM sampler on 01/01/2018. Because of the importance this site serves in assessing the upwind $PM_{2.5}$ levels entering the Knoxville area, this site was determined to remain in operation over 5 years (2015 through 2020). The Knoxville MSA has six PM2.5 FRM sites and is only required to have two to meet the minimum requirements. This site is also employed in the AQI forecasting program and is used to help assess impacts from precursor transport into Tennessee from Georgia and North Carolina. See Appendix G: Annual Site Evaluations for further details.

Maryville Daily Air Quality

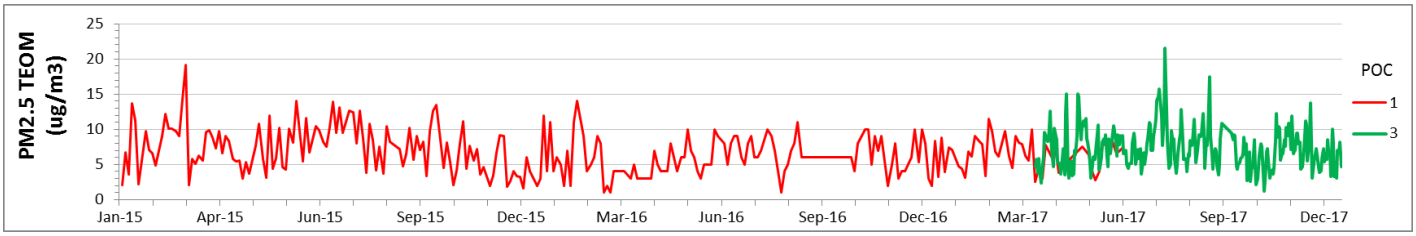


Dyersburg – Dyer County

Address	175-B Greenwood Street, Dyersburg TN 38024
AQSID	470450004
CBSA	20540
Lat, Lon	36.05266, -89.382157
Parameter Code	88101
Parameter Name	$PM_{2.5}$ Continuous
Monitor Type	SLAMS
POC	3
Int	1
Collection Frequency	Hourly
Method	209
FRM/FEM Instrument	Met One BAM 1022
Analysis	Real Time Beta Attenuation Mass Monitor
Ref Mtd ID	EQPM-1013-209
Monitor Objective	Population Exposure
Dominant Source	Area
Measurement Scale	Neighborhood
Land Use Type	Residential
Location Setting	Suburban

The Dyersburg site is located in Dyer County, Tennessee and currently supports monitoring for fine particulate matter. The site was initially established in 1998 and is expected to operate during CY's 2018 and 2019. This site is located northwest of Jackson and north-northeast of Memphis, Tennessee. This site is downwind from the core Memphis MSA. $PM_{2.5}$ monitoring began 08/22/1998 as a part of the original $PM_{2.5}$ state network. An FEM continuous $PM_{2.5}$ sampler replaced the FRM sampler on 04/01/2017. Because of the importance this site serves in assessing the area $PM_{2.5}$ levels outside of the Memphis area, this site was determined to remain in operation over 5 years (2015 through 2020). This site is also employed in the AQI forecasting program and is used to help assess impacts from precursor transport into Tennessee from adjacent states. See Appendix G: Annual Site Evaluations for further details.

Dyersburg Daily Air Quality



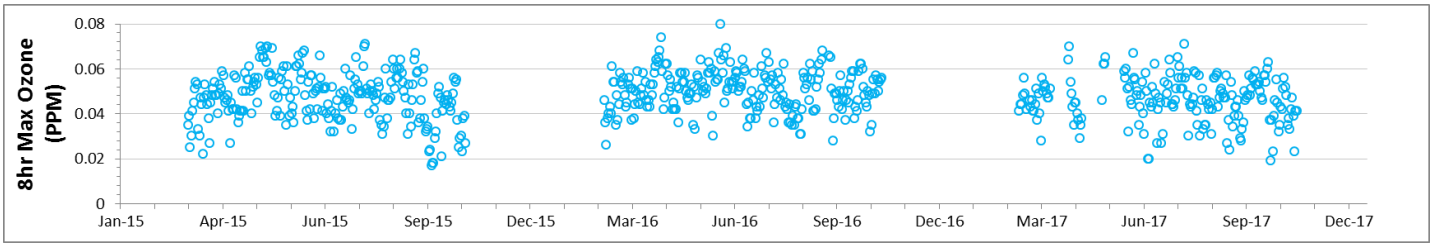
New Market – Jefferson County

Address	2393 Forester Rd, New Market, TN 37820
AQSID	470890002
CBSA	34100
Lat, Lon	36.105629, -83.602077
Parameter Code	44201
Parameter Name	O_3
Monitor Type	SLAMS
POC	1
Int	W
Collection Frequency	Hourly
Method	87
FRM/FEM Instrument	Model 400 Ozone Analyzer
Analysis	Ultra Violet Absorption
Ref Mtd ID	EQOA-0992-087
Monitor Objective	Max Ozone Concentration
Dominant Source	Area
Measurement Scale	Neighborhood
Land Use Type	Agricultural
Location Setting	Rural

The New Market site is located in Jefferson County, Tennessee and currently supports monitoring for ozone. The site was initially established in 1999 and is expected to operate during CY's 2018 and 2019. This site is located east-northeast of Knoxville and west southwest of Morristown, Tennessee. This site is downwind from the core Knoxville MSA. Ozone monitoring began 03/01/1999 and this site is used with the ozone AQI forecasting program for verification and to help address transport downwind of the Knoxville CBSA. This site is located in the Morristown MSA and is required to have 1 ozone site and this site meets that requirement. Because of the importance this site serves in assessing the area ozone levels outside and downwind of the Knoxville area, this site was determined to remain in operation over 5 years (2015 through 2020). See Appendix G: Annual Site Evaluations for further details.

In CY 2018, TDEC DAPC plans to replace the existing shelter with a new, upgraded shelter. Due to the logistics of shelter replacement, the site will undergo a reconfiguration. This reconfiguration will result in a new monitoring location approximately 5 meters from the existing site, heading 349° NW. This reconfiguration is subject to EPA approval; more details can be found Appendix G: Annual Site Evaluations & Documentation.

New Market Daily Air Quality



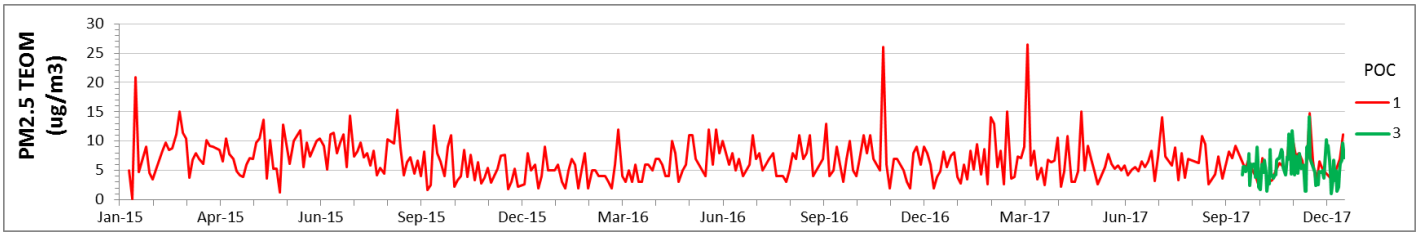
Lawrence – Lawrence County

Address	355 Busby Rd, Loretto, TN 38469
AQSID	470990002
CBSA	29980
Lat, Lon	35.115968, -87.469954
Parameter Code	88101
Parameter Name	$PM_{2.5}$ Continuous
Monitor Type	SLAMS
POC	3
Int	1
Collection Frequency	Hourly
Method	209
FRM/FEM Instrument	Met One BAM 1022
Analysis	Real Time Beta Attenuation Mass Monitor
Ref Mtd ID	EQPM-1013-209
Monitor Objective	Upwind background, population exposure
Dominant Source	Area
Measurement Scale	Regional Scale
Land Use Type	Agricultural
Location Setting	Rural

The Lawrence site is located in Lawrence County, Tennessee and currently supports monitoring for $PM_{2.5}$. This site is located on the southern border of Tennessee, north of Alabama. The site is southwest of Nashville and southeast of Jackson, Tennessee. This site is not located near any MSA in Tennessee. $PM_{2.5}$ monitoring began 12/24/1998 as a part of the original $PM_{2.5}$ state network. An FEM continuous $PM_{2.5}$ sampler replaced the FRM sampler on 01/01/2018. This site is also part of the $PM_{2.5}$ AQI forecasting program. This site supported a $PM_{2.5}$ Speciation and URG sampler from 12/03/2001 to 09/26/2014. Because this site serves as a background $PM_{2.5}$ site it was determined to remain in operation over 5 years (2015 through 2020). See Appendix G: Annual Site Evaluations for further details.

In CY 2018, TDEC DAPC will relocate to a new $PM_{2.5}$ monitoring location, approximately 2.85 miles from existing site heading 88° E. This site will continue to operate under an EPA site waiver until a new location is approved by the EPA and is operational. See Appendix F: EPA Request and Approval Letters for the siting waiver from the EPA. See Appendix G: Annual Site Evaluations & Documentation for the proposed $PM_{2.5}$ monitoring site.

Lawrence Daily Air Quality

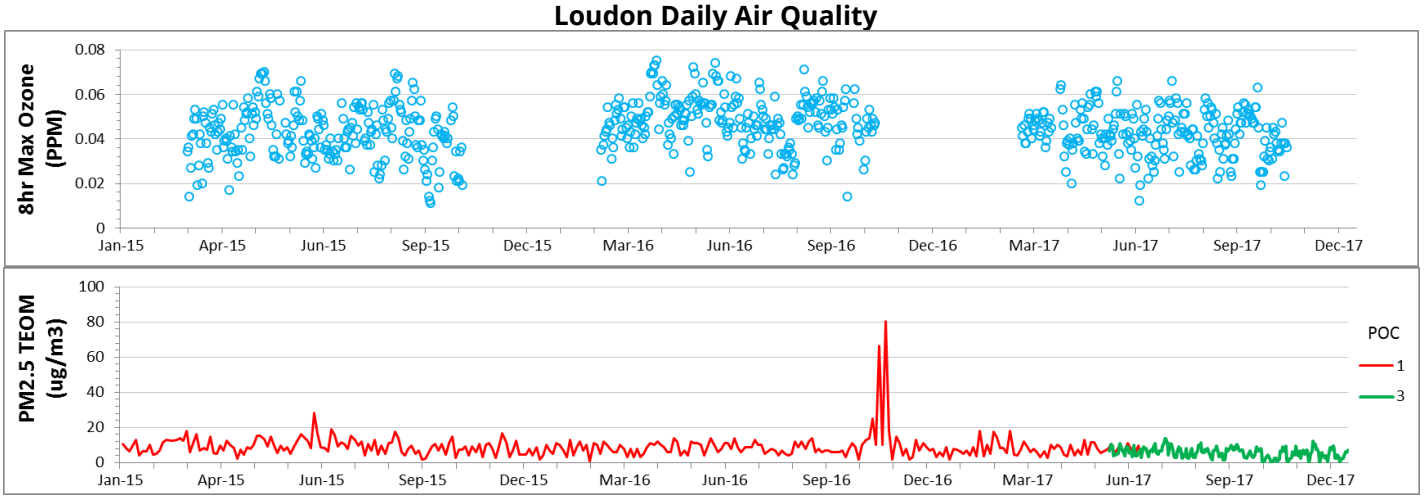


Loudon – Loudon County

Address	2175 Roberts Road, Loudon, TN 37774		
AQSID	471050109		
CBSA	28940		
Lat, Lon	35.721095, -84.343035		
Parameter Code	44201	88101	88101
Parameter Name	O3	PM2.5 Continuous	PM2.5 Continuous
Monitor Type	SLAMS	SLAMS	SLAMS
POC	1	3	4
Int	W	1	1
Year	2014	2017	2018
Collection Frequency	Hourly	Hourly	Hourly
Method	87	209	209
FRM/FEM Instrument	Model 400 Ozone Analyzer	Met One BAM 1022	Met One BAM 1022
Analysis	Ultra Violet Absorption	Real Time Beta Attenuation Mass Monitor	Real Time Beta Attenuation Mass Monitor
Ref Mtd ID	EQOA-0992-087	EQPM-1013-209	EQPM-1013-209
Monitor Objective	Population Exposure	Population Exposure	Population Exposure
Dominant Source	Area		
Measurement Scale	Neighborhood		
Land Use Type	Residential		
Location Setting	Suburban		

The Loudon site is located at 2175 Roberts Road, in Loudon County, TN 37774. The Loudon site supports monitoring for $PM_{2.5}$ and O_3. This site is located southwest of Knoxville and northeast of Chattanooga. This site is upwind of the Knoxville MSA and downwind from the Chattanooga MSA. FEM $PM_{2.5}$ monitoring began on 07/01/2017 as a part of the Loudon air quality study and complaint investigation. The FRM sampler located at 130 Webb Drive, Loudon, TN 37774 (AQS ID 471050108) was retired upon completion of routine correlation testing. A second, collocated FEM sampler was installed and began collecting data on 01/01/ 2018. The Loudon site is serving as the new $PM_{2.5}$ collocated site due to a higher 3-year design value than the previous Jackson collocated site. Monitoring at this site is used by the AQI forecasting program for verification for the Knoxville MSA. In CY 2018, TDEC DAPC plans to replace the existing shelter with a new, upgraded shelter. Due to the logistics of shelter replacement, the site will undergo a reconfiguration. This reconfiguration will result in a new monitoring location approximately 5 meters from the existing site, heading 93° E. This reconfiguration is subject to EPA approval; more details can be found Appendix G: Annual Site Evaluations & Documentation.

Loudon Daily Air Quality

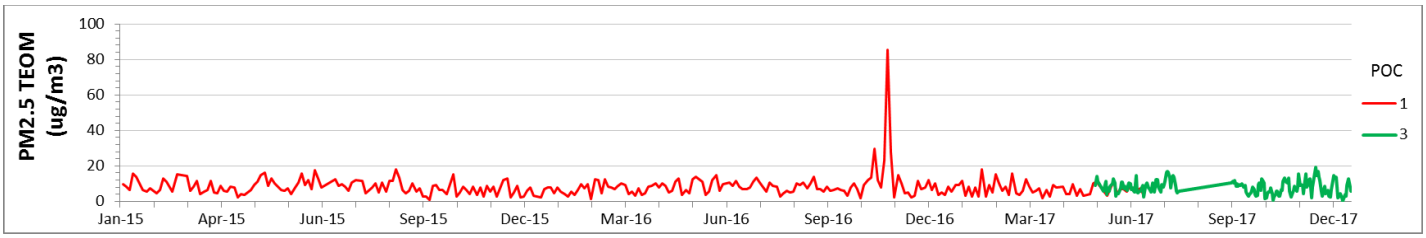


Athens – McMinn County

Address	Saint Mark AME Zion Church: 707 North Jackson St, Athens, TN 37303
AQSID	471071002
CBSA	11940
Lat, Lon	35.450115, -84.596195
Parameter Code	88101
Parameter Name	$PM_{2.5}$ Continuous
Monitor Type	SPM
POC	3
Int	1
Collection Frequency	Hourly
Method	209
FRM/FEM Instrument	Met One BAM 1022
Analysis	Real Time Beta Attenuation Mass Monitor
Ref Mtd ID	EQPM-1013-209
Monitor Objective	Population Exposure
Dominant Source	Area
Measurement Scale	Neighborhood
Land Use Type	Commercial
Location Setting	Urban And Center City

The Athens site is located in McMinn County, Tennessee and currently supports monitoring for $PM_{2.5}$. This site is located northeast of Chattanooga and southwest of Knoxville, Tennessee. This site is downwind from the Chattanooga MSA and located in the Athens micropolitan area. $PM_{2.5}$ monitoring began 02/03/2000 as a part of the original $PM_{2.5}$ state network. The FEM continuous $PM_{2.5}$ sampler replaced the FRM sampler on 07/01/2017. This site is also part of the $PM_{2.5}$ AQI forecasting program. This site was determined to remain in operation over 5 years (2015 through 2020). This site serves to help quantify air quality in this developing area of the state. See Appendix G: Annual Site Evaluations for further details.

Athens Daily Air Quality

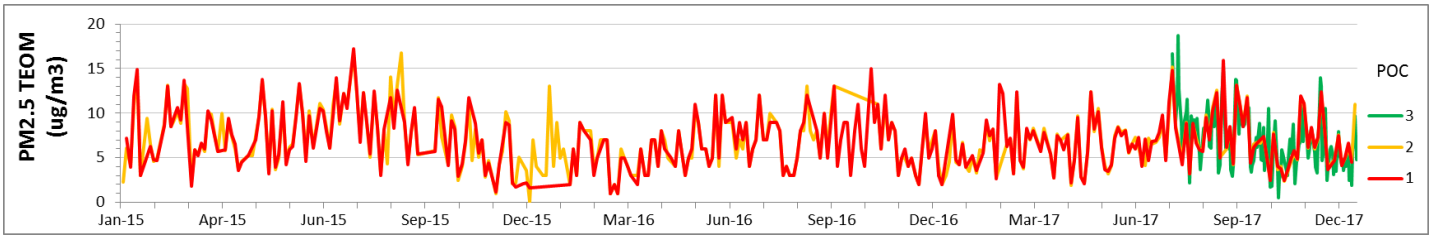


Jackson – Madison County

Address	1371-A North Parkway, Jackson, TN 38301
AQSID	471130006
CBSA	27180
Lat, Lon	35.651349, -88.809578
Parameter Code	88101
Parameter Name	$PM_{2.5}$ Continuous
Monitor Type	SLAMS
POC	3
Int	1
Collection Frequency	Hourly
Method	209
FRM/FEM Instrument	Met One BAM 1022
Analysis	Real Time Beta Attenuation Mass Monitor
Ref Mtd ID	EQPM-1013-209
Monitor Objective	Population Exposure
Dominant Source	Area
Measurement Scale	Neighborhood
Land Use Type	Residential
Location Setting	Suburban

The Jackson site is located in Madison County, Tennessee and currently supports monitoring for $PM_{2.5}$. This site is located northeast of Memphis and southeast of Dyersburg. This site is located in the Jackson MSA. $PM_{2.5}$ monitoring began 11/17/2004 as a part of the original $PM_{2.5}$ state network. An FEM continuous $PM_{2.5}$ sampler (POC 3) replaced the collocated FRM samplers (POCs 1 and 2) on 01/01/2018. The Jackson MSA has a single FEM continuous $PM_{2.5}$ sampler and is not required to operate any $PM_{2.5}$ sites. This site was determined to remain in operation over 5 years (2015 through 2020) primarily because it provides valuable upwind PM2.5 data for the Nashville AQI forecast. See Appendix G: Annual Site Evaluations for further details. In CY 2018, TDEC DAPC will relocate to a new $PM_{2.5}$ monitoring location, approximately 23.8 miles from existing site, heading 351° N. This site will continue to operate under an EPA site waiver until the new location is approved by EPA and is operational. See Appendix F: EPA Request and Approval Letters for the siting waiver from the EPA.

Jackson Daily Air Quality

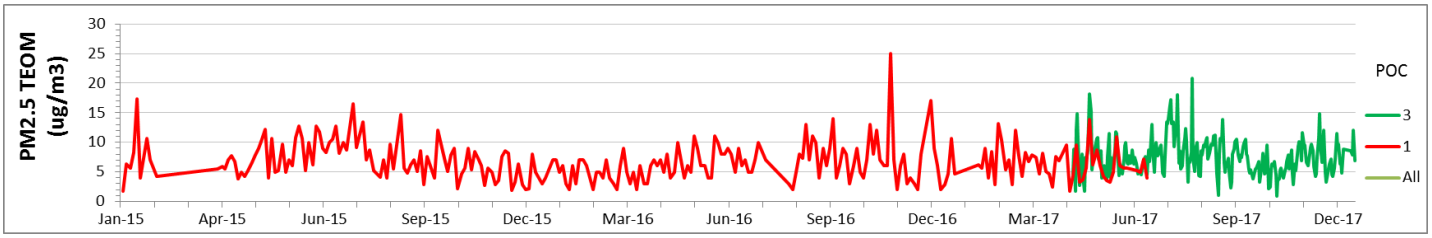


Columbia – Maury County

Address	1600 Nashville Hwy, Columbia, TN
AQSID	471192007
CBSA	34980
Lat, Lon	35.65188, -87.0096
Parameter Code	88101
Parameter Name	$PM_{2.5}$ Continuous
Monitor Type	SPM
POC	3
Int	1
Collection Frequency	Hourly
Method	209
FRM/FEM Instrument	Met One BAM 1022
Analysis	Real Time Beta Attenuation Mass Monitor
Ref Mtd ID	EQPM-1013-209
Monitor Objective	Population Exposure
Dominant Source	Area
Measurement Scale	Neighborhood
Land Use Type	Commercial
Location Setting	Urban And Center City

The Columbia site is located in Maury County, Tennessee and currently supports monitoring for $PM_{2.5}$. This site is located south-southwest of Nashville and northwest of Lewisburg, Tennessee. This site is located upwind within the Nashville MSA. $PM_{2.5}$ monitoring began 12/25/1998 as a part of the original $PM_{2.5}$ state network. The FEM continuous PM2.5 sampler replaced the FRM sampler on 07/01/2017. This site was determined to remain in operation over 5 years (2015 through 2020) primarily because it is the only $PM_{2.5}$ site in this region. See Appendix G: Annual Site Evaluations for further details.

Columbia Daily Air Quality



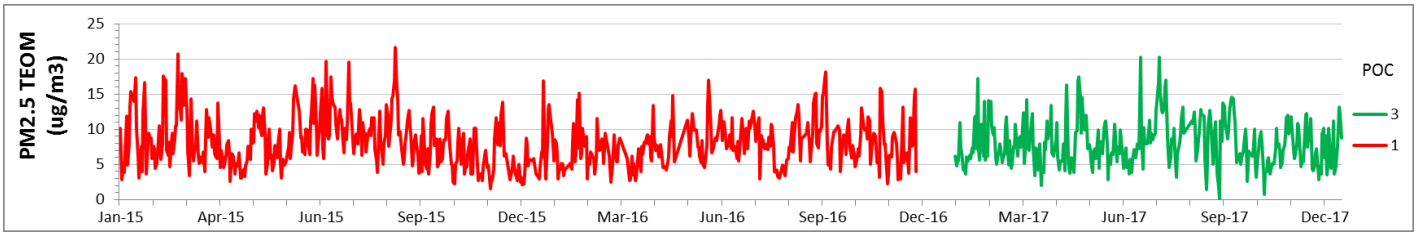
Clarksville – Montgomery County

Address	1514 E. Tompkins Ln, Clarksville, TN 37043
AQSID	471251009
CBSA	17300
Lat, Lon	36.514627, -87.328041
Parameter Code	88101
Parameter Name	$PM_{2.5}$ Continuous
Monitor Type	SLAMS
POC	3
Int	1
Collection Frequency	Hourly
Method	209
FRM/FEM Instrument	Met One BAM 1022
Analysis	Real Time Beta Attenuation Mass Monitor
Ref Mtd ID	EQPM-1013-209
Monitor Objective	Population Exposure
Dominant Source	Area
Measurement Scale	Neighborhood
Land Use Type	Residential
Location Setting	Suburban

The Clarksville site is located in Montgomery County, Tennessee and currently supports monitoring for $PM_{2.5}$. This site is located northwest of Nashville, Tennessee, located within the Clarksville, TN-KY MSA and is suitable for use in meeting the MSA monitoring requirement for $PM_{2.5}$ for both Tennessee and Kentucky. This site is within the Clarksville city limits. $PM_{2.5}$ monitoring began 01/01/1998 as a part of the original $PM_{2.5}$ state network. This site also assists with the PM fine AQI forecasting program. An FEM continuous PM2.5 sampler replaced the FRM sampler on 01/18/2017. The Clarksville MSA has a single FEM continuous $PM_{2.5}$ sampler and is not required to operate a $PM_{2.5}$ site for the MSA. This site will be moved to a new location within the city of Clarksville. The new site will remain in operation over 5 years (2018 through 2023) primarily because it is the only $PM_{2.5}$ site in the MSA. See Appendix G: Annual Site Evaluations for further details.

Tennessee has determined to relocate the site due to the difficulties related to the site's elevated platform and to ensure compliance with siting criteria. By January 1, 2019, TDEC DAPC will relocate to a new $PM_{2.5}$ monitoring location, approximately 8.4 miles from existing site, heading 335° NW. See Appendix G: Annual Site Evaluations & Documentation for documentation for new $PM_{2.5}$ monitoring site.

Clarksville Daily Air Quality

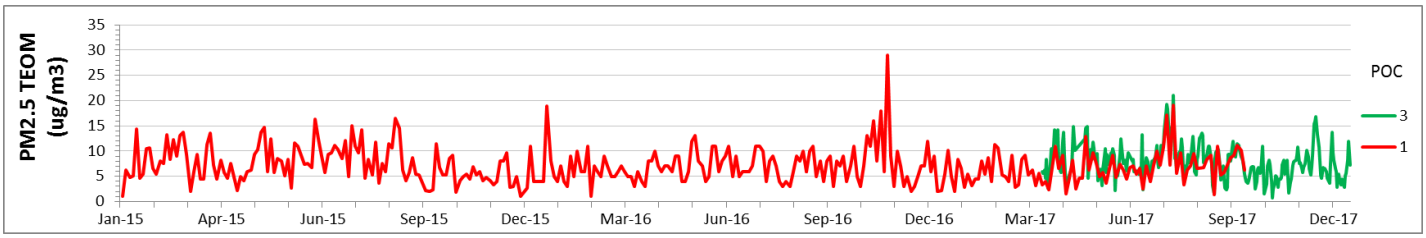


Cookeville – Putnam County

Address	630 East 20th Street, Cookeville TN 38501
AQSID	471410005
CBSA	18260
Lat, Lon	36.185702, -85.492107
Parameter Code	88101
Parameter Name	$PM_{2.5}$ Continuous
Monitor Type	SPM
POC	3
Int	1
Collection Frequency	Hourly
Method	209
FRM/FEM Instrument	Met One BAM 1022
Analysis	Real Time Beta Attenuation Mass Monitor
Ref Mtd ID	EQPM-1013-209
Monitor Objective	Population Exposure
Dominant Source	Area
Measurement Scale	Neighborhood
Land Use Type	Residential
Location Setting	Suburban

The Cookeville site is located in Putnam County, Tennessee and currently supports monitoring for $PM_{2.5}$. This site is located east of Nashville, on the Highland Rim, just west of the Cumberland Plateau. This site is not located in or near an MSA but is within the largest micropolitan statistical area in the state. $PM_{2.5}$ monitoring began 08/15/2006 after the site was relocated. An FEM continuous PM2.5 sampler replaced the FRM sampler on 04/01/2017. This site was determined to remain in operation over 5 years (2015 through 2020) primarily because it is the only $PM_{2.5}$ site in this region. See Appendix G: Annual Site Evaluations for further details.

Cookeville Daily Air Quality

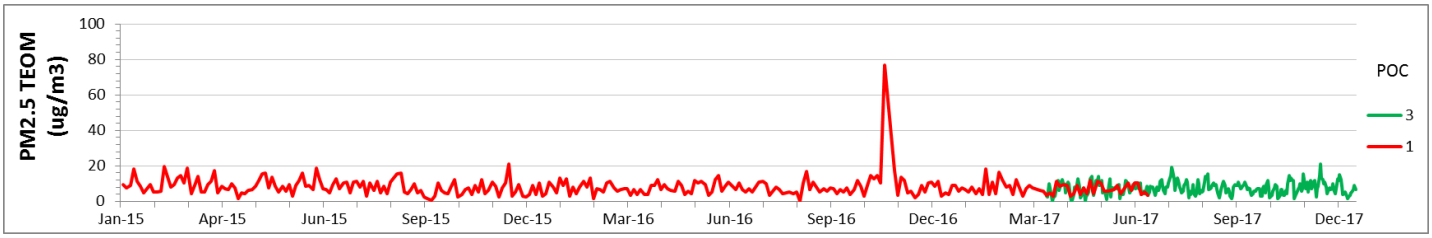


Harriman – Roane County

Address	Harriman High: 1002 N. Roane St., Harriman, TN 37748
AQSID	471450004
CBSA	28940
Lat, Lon	35.939078, -84.542802
Parameter Code	88101
Parameter Name	$PM_{2.5}$ Continuous
Monitor Type	SPM
POC	3
Int	1
Collection Frequency	Hourly
Method	209
FRM/FEM Instrument	Met One BAM 1022
Analysis	Real Time Beta Attenuation Mass Monitor
Ref Mtd ID	EQPM-1013-209
Monitor Objective	Population Exposure
Dominant Source	Area
Measurement Scale	Urban
Land Use Type	Industrial
Location Setting	Suburban

The Harriman site is located in Roane County, Tennessee and currently supports monitoring for $PM_{2.5}$. This site is located west of Knoxville and west-southwest of Oak Ridge, Tennessee. This site is upwind from the Knoxville MSA. $PM_{2.5}$ monitoring began on 01/01/1998 as a part of the original $PM_{2.5}$ state network. This site is also part of the $PM_{2.5}$ AQI forecasting program. An FEM continuous $PM_{2.5}$ sampler replaced the FRM sampler on 04/01/2017. This site was determined to remain in operation over 5 years (2015 through 2020). The Knoxville MSA has six operating $PM_{2.5}$ FRM sites and is required to have only two. See Appendix G: Annual Site Evaluations for further details.

Harriman Daily Air Quality

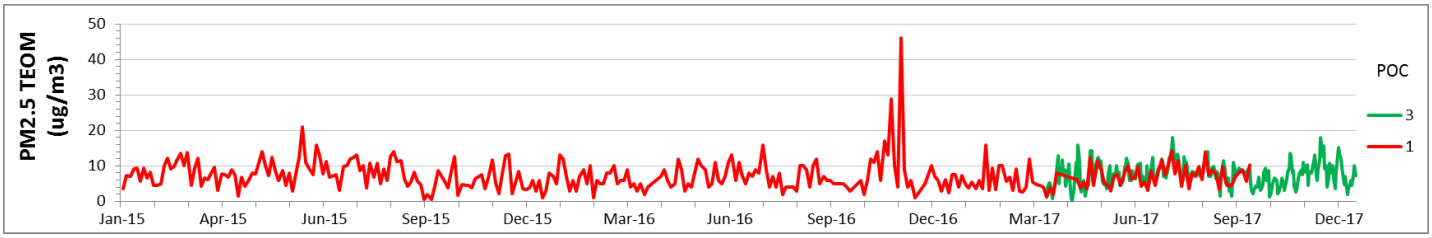


Kingsport ($PM_{2.5}$) – Sullivan County

Address	1649 D Street Kingsport TN 37664
AQSID	471631007
CBSA	28700
Lat, Lon	36.538761 , -82.521599
Parameter Code	88101
Parameter Name	$PM_{2.5}$ Continuous
Monitor Type	SLAMS
POC	3
Int	1
Collection Frequency	Hourly
Method	209
FRM/FEM Instrument	Met One BAM 1022
Analysis	Real Time Beta Attenuation Mass Monitor
Ref Mtd ID	EQPM-1013-209
Monitor Objective	Population Exposure
Dominant Source	Area
Measurement Scale	Urban Scale
Land Use Type	Residential
Location Setting	Suburban

The Kingsport site is located in Sullivan County, Tennessee and currently supports monitoring for $PM_{2.5}$. This site is located in the far northeast corner of the state and is south of the state of Virginia. This site is upwind of Gate City, VA and located within the Kingsport-Bristol-Bristol, Tennessee-Virginia MSA, in the Kingsport city limits. $PM_{2.5}$ monitoring began 10/01/1998 as a part of the original $PM_{2.5}$ state network. This site is also part of the $PM_{2.5}$ AQI forecasting program. An FEM continuous PM2.5 sampler replaced the FRM sampler on 04/01/2017. The Kingsport MSA has a single FEM continuous $PM_{2.5}$ sampler and is not required to operate a $PM_{2.5}$ site for the MSA. This site was determined to remain in operation over 5 years (2015 through 2020) primarily because it is the only $PM_{2.5}$ site in this region. See Appendix G: Annual Site Evaluations for further details.

Kingsport (PM2.5) Daily Air Quality



Blountville – Sullivan County

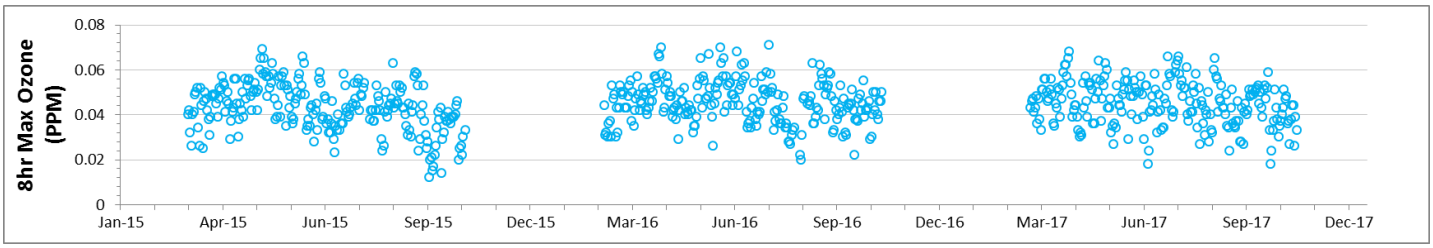
Address	Indian Springs School Shawnee Drive Blountville, TN 37664
AQSID	471632002
CBSA	28700
Lat, Lon	36.541365, -82.424555
Parameter Code	44201
Parameter Name	O_3
Monitor Type	SLAMS
POC	1
Int	W
Collection Frequency	Hourly
Method	87
FRM/FEM Instrument	Model 400 Ozone Analyzer
Analysis	Ultra Violet Absorption
Ref Mtd ID	EQOA-0992-087
Monitor Objective	Population Exposure
Dominant Source	Area
Measurement Scale	Neighborhood
Land Use Type	Residential
Location Setting	Rural

The Blountville site is located in Sullivan County, Tennessee and currently supports monitoring for ozone. This site is located east of Kingsport, near Blountville, TN. This site is downwind from the city of Kingsport.

Ozone monitoring began 01/01/1980 and this site is used with the ozone AQI forecasting program for verification and to help address the ozone impacts in the Kingsport-Bristol-Bristol Tennessee-Virginia and Johnson City MSAs. The Kingsport MSA has two ozone sites operating and is required to have only one ozone site. See Appendix G: Annual Site Evaluations for further details.

In CY 2018, TDEC DAPC plans to replace the existing shelter with a new, upgraded shelter. Due to the logistics of shelter replacement, the site will undergo a reconfiguration. This reconfiguration will result in a new monitoring location approximately 5 meters from the existing site, heading 186° S. This reconfiguration is subject to EPA approval; more details can be found Appendix G: Annual Site Evaluations & Documentation.

Blountville Daily Air Quality



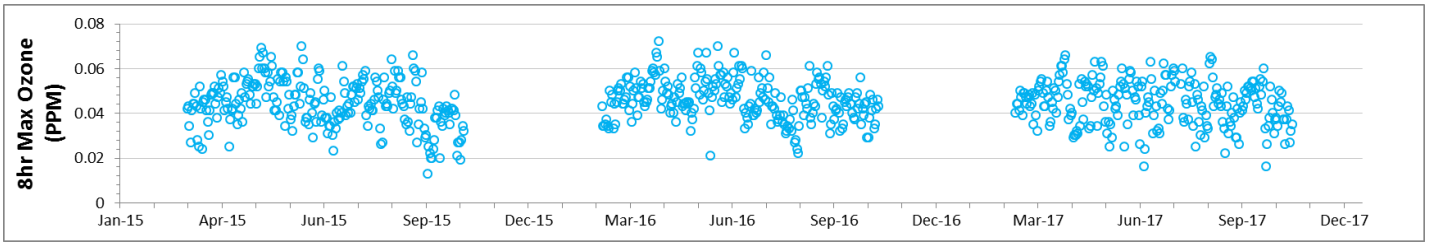
Kingsport O_3 – Sullivan County

Address	3301 Bloomingdale Rd. Kingsport TN 37660
AQSID	471632003
County Name	Sullivan
CBSA	28700
Lat, Lon	36.58211, -82.485742
Parameter Code	44201
Parameter Name	O_3
Monitor Type	SLAMS
POC	1
Int	W
Collection Frequency	Hourly
Method	87
FRM/FEM Instrument	Model 400 Ozone Analyzer
Analysis	Ultra Violet Absorption
Ref Mtd ID	EQOA-0992-087
Monitor Objective	Population Exposure
Dominant Source	Area
Measurement Scale	Neighborhood
Land Use Type	Residential
Location Setting	Suburban

The Kingsport site is located in Sullivan County, Tennessee and currently supports monitoring for ozone. This site is located in the far northeast corner of the state and is south of the State of Virginia near the Tennessee-Virginia line. This site is upwind of Gate City, VA and downwind of the Kingsport city limits. Kingsport is also a part of the Kingsport-Bristol-Bristol Tennessee-Virginia MSA and is conducted for the AQI forecasting program. Ozone monitoring began on 04/01/1995. The Kingsport MSA has two ozone sites operating and is required to have only one ozone site. This site was determined to remain in operation over 5 years (2015 through 2020) primarily because of its location within the Kingsport-Bristol-Bristol MSA. See Appendix G: Annual Site Evaluations for further details.

In CY 2018, TDEC DAPC plans to replace the existing shelter with a new, upgraded shelter. Due to the logistics of shelter replacement, the site will undergo a reconfiguration. This reconfiguration will result in a new monitoring location approximately 5 meters from the existing site, heading 87° E. This reconfiguration is subject to EPA approval; more details can be found in Appendix G: Annual Site Evaluations & Documentation.

Kingsport Daily Air Quality

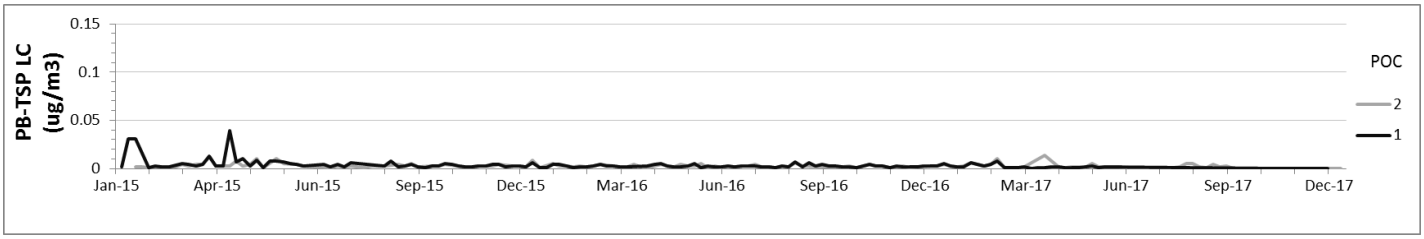


Exide – Sullivan County

Address	364 Exide Drive, Bristol TN 37620	
AQSID	471633004	
County Name	Sullivan	
CBSA	28700	
Lat, Lon	36.524433, -82.27261	
Parameter Code	14129	14129
Parameter Name	Pb	Pb
Monitor Type	SLAMS	SLAMS
POC	1	2
Int	7	7
Collection Frequency	1 In 6	1 In 6
Method	192	192
FRM/FEM Instrument	Pb-TSP/ICP Spectra (ICP-MS)	Pb-TSP/ICP Spectra (ICP-MS)
Analysis	Inductively Coupled Plasma-Mass Spectrometry Acid Filter Extract With Hot Nitric Acid	Inductively Coupled Plasma-Mass Spectrometry Acid Filter Extract With Hot Nitric Acid
Ref Mtd ID	EQL-0710-192	EQL-0710-192
Monitor Objective	Source Oriented	
Dominant Source	Point	
Measurement Scale	Urban Scale	
Land Use Type	Industrial	
Location Setting	Urban And Center City	

The Exide site is located in Sullivan County, Tennessee and currently supports monitoring for lead. This site is located east of Kingsport and northeast of Blountville on the Tennessee Virginia state lines. This site is downwind from Johnson City and Blountville and is located in the Kingsport Bristol MSA. Lead monitoring began on 01/01/2010 to verify lead NAAQS compliance at a lead battery plant that is now shutdown. The POC 2 monitor serves as the site's collocated monitor. This area is now classified as an attainment area for lead. The former lead source has surrendered its air permits and shut down. See Appendix G: Annual Site Evaluations for further details.

Exide Daily Air Quality

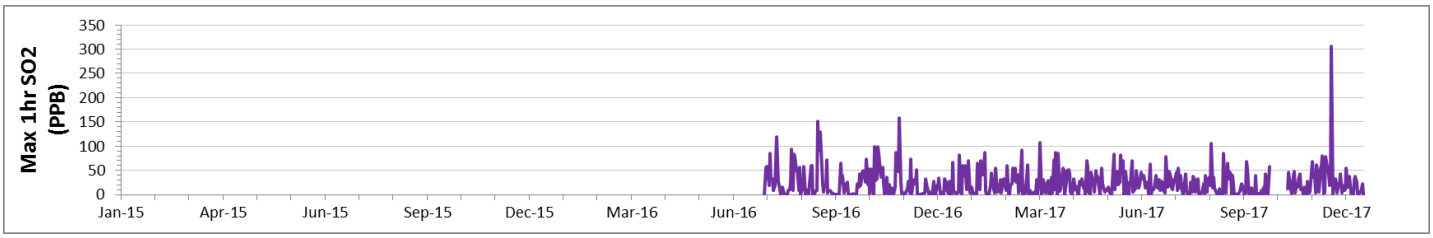


Ross N Robinson – Sullivan County

Address	Wilburn Drive, Kingsport, TN 37664
AQSID	471636001
County Name	Sullivan
CBSA	28700
Lat, Lon	36.532616, -82.516306
Parameter Code	42401
Parameter Name	SO_2
Monitor Type	SLAMS
POC	1
Int	1
Collection Frequency	Hourly
Method	100
FRM/FEM Instrument	Teledyne T100 SO2 Analyzer
Analysis	Ultraviolet Fluorescence
Ref Mtd ID	EQSA-0495-100
Monitor Objective	Source Oriented
Dominant Source	Point
Measurement Scale	Urban Scale
Land Use Type	Residential
Location Setting	Suburban

The Ross N Robinson site is located in Sullivan County, Tennessee and currently supports monitoring for SO_2. The Ross N Robinson monitor is located within the 3-km SO_2 nonattainment area surrounding the Tennessee Eastman Chemical Plant and became operational in July 2016. This monitor is one of two monitors that satisfy PWEI requirements for the Kingsport, TN CBSA and secondly, to characterize the maximum expected concentrations in the nonattainment area.

Ross N Robinson Daily Air Quality

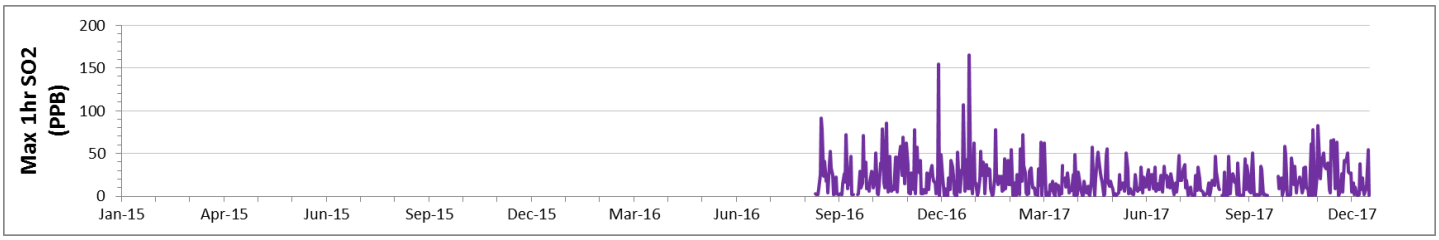


Skyland Dr. – Sullivan County

Address	Skyland Drive at Bagwell St., Kingsport, TN
AQSID	471636002
County Name	Sullivan
CBSA	28700
Lat, Lon	36.521066, -82.502454
Parameter Code	42401
Parameter Name	SO_2
Monitor Type	SLAMS
POC	1
Int	1
Collection Frequency	Hourly
Method	100
FRM/FEM Instrument	Api Model 100 E SO2 Analyzer
Analysis	Ultraviolet Fluorescence
Ref Mtd ID	EQSA-0495-100
Monitor Objective	Population Exposure
Dominant Source	Point
Measurement Scale	Urban Scale
Land Use Type	Residential
Location Setting	Suburban

The Skyland Drive ambient air monitoring site is located in Sullivan County, Tennessee and currently supports monitoring for SO_2. The site is located within the 3-km SO_2 nonattainment area surrounding the Tennessee Eastman Chemical Plant and became operational in September 2016. The monitor was established in order to characterize the maximum expected concentrations in the nonattainment area. This monitor is one of two monitors that satisfy PWEI requirements for the Kingsport, TN CBSA and secondly, to characterize the maximum expected concentrations in the nonattainment area.

Skyland Dr. Daily Air Quality



Andrew Johnson Elementary School – Sullivan County

Address	1001 Ormond Drive, Kingsport, TN
AQSID	471636003
County Name	Sullivan
CBSA	28700
Lat, Lon	To be supplied
Parameter Code	42401
Parameter Name	SO_2
Monitor Type	SLAMS
POC	1
Int	1
Collection Frequency	Hourly
Method	To be supplied
FRM/FEM Instrument	To be supplied
Analysis	To be supplied
Ref Mtd ID	To be supplied
Monitor Objective	Population Exposure
Dominant Source	Point
Measurement Scale	Urban Scale
Land Use Type	Residential
Location Setting	Suburban

The Andrew Johnson Elementary School ambient air monitoring site is located in Sullivan County, Tennessee and currently supports monitoring for SO_2. The site is located within the 3-km SO_2 nonattainment area surrounding the Tennessee Eastman Chemical Plant and will become operational in late 2018. The monitor will be established in order to characterize the maximum expected concentrations in the nonattainment area.

Happy Hill Road – Sullivan County

Address	2105 Happy Hill Road, Kingsport, TN
AQSID	471636004
County Name	Sullivan
CBSA	28700
Lat, Lon	To be supplied
Parameter Code	42401
Parameter Name	SO_2
Monitor Type	SLAMS
POC	1
Int	1
Collection Frequency	Hourly
Method	To be supplied
FRM/FEM Instrument	To be supplied
Analysis	To be supplied
Ref Mtd ID	To be supplied
Monitor Objective	Population Exposure
Dominant Source	Point
Measurement Scale	Urban Scale
Land Use Type	Residential
Location Setting	Suburban

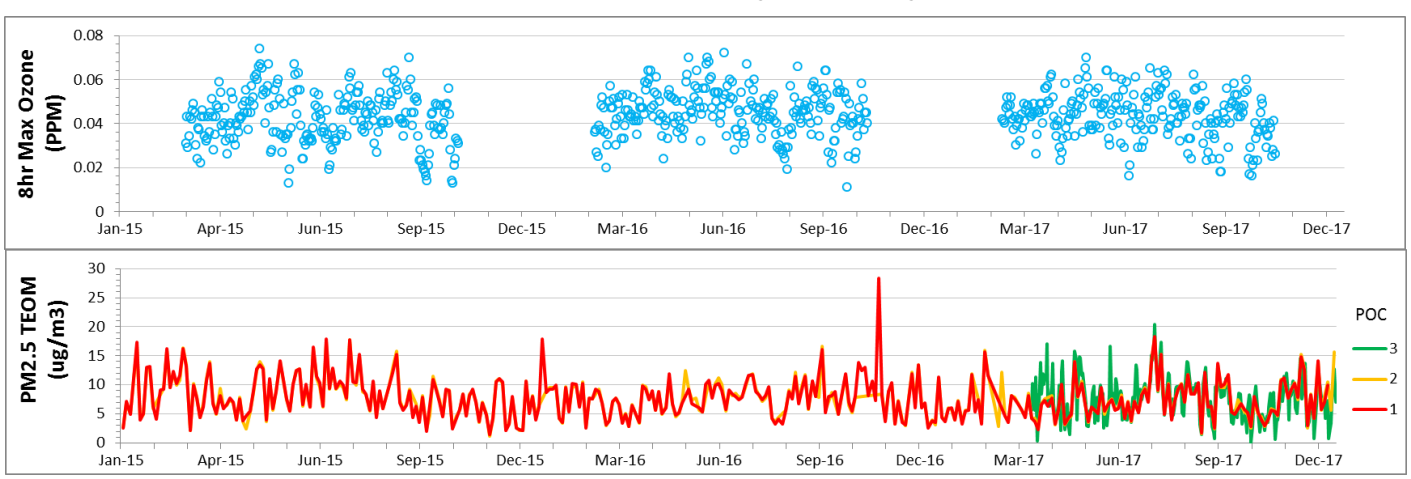
The Happy Hill Road ambient air monitoring site is located in Sullivan County, Tennessee and currently supports monitoring for SO_2. The site is located within the 3-km SO_2 nonattainment area surrounding the Tennessee Eastman Chemical Plant and will become operational in late 2018. The monitor will be established in order to characterize the maximum expected concentrations in the nonattainment area.

Hendersonville - Sumner County

Address	Rockland Recreational Area, Old Hickory Dam, Hendersonville, TN		
AQSID	471650007		
CBSA	34980		
Lat	36.29756, -86.653137		
Parameter Code	44201	88101	88101
Parameter Name	O_3	$PM_{2.5}$	$PM_{2.5}$ Continuous
Monitor Type	SLAMS	SLAMS	SLAMS
POC	1	1	3
Int	W	7	1
Collection Frequency	Hourly	1 in 3	Hourly
Method	047	118	209
FRM/FEM Instrument	Thermo Electron 49	R&P Co Plus Model 2025	Met One BAM 1022
Analysis	Ultra violet	Gravimetric	Real Time Beta Attenuation Mass Monitor
Ref Mtd ID	EQOA-0880-047	RFPS-0498-118	EQPM-1013-209
Monitor Objective	Highest Conc	Population Exposure	
Dominant Source	Area	Area	
Measurement Scale	Neighborhood	Neighborhood	
Land Use Type	Industrial	Industrial	
Location Setting	Rural	Rural	

The Hendersonville site is located in Sumner County, Tennessee and currently supports monitoring for ozone and PM2.5. This site is located northeast of Nashville and west southwest of Gallatin, Tennessee. This site is downwind from Nashville and is considered part of the Nashville MSA. Ozone monitoring began 01/01/1973 and is conducted for the ozone AQI forecasting program for verification and to help address NAAQS compliance in the Nashville MSA. $PM_{2.5}$ monitoring began 10/01/1998 as a part of the original $PM_{2.5}$ state network. This site is also part of the PM fine AQI forecasting program. An FEM continuous $PM_{2.5}$ sampler replaced the collocated FRM sampler on 01/01/2018. This site was determined to remain in operation over 5 years (2015 through 2020) primarily because it is the ozone DV site for the Nashville MSA and is downwind from the Nashville fine particulate precursor sources. The Nashville MSA has 5 ozone monitors operating and is only required to have 2. See Appendix G: Annual Site Evaluations for further details. In CY 2018, TDEC DAPC plans to replace the existing shelter with a new, upgraded shelter. The new shelter will be placed in the same location as the existing shelter.

Hendersonville Daily Air Quality



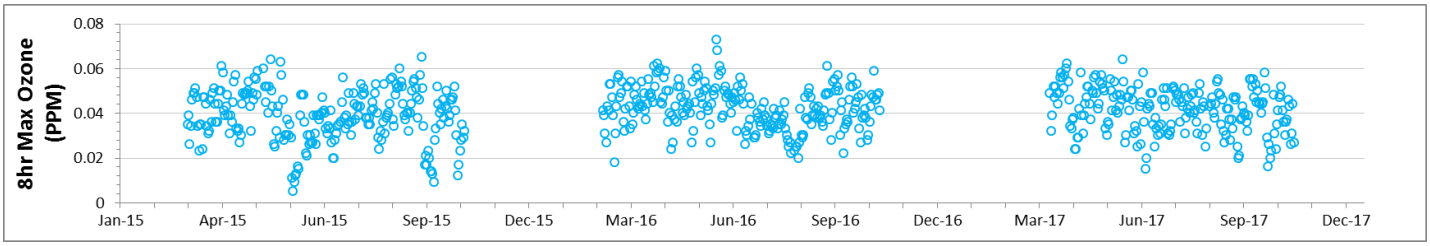
Fairview –Williamson County

Address	Fairview Middle School: 7200 Cumberland Dr, Fairview, TN
AQSID	471870106
CBSA	34980
Lat, Lon	35.949765, -87.138246
Parameter Code	44201
Parameter Name	O_3
Monitor Type	SLAMS
POC	1
Int	W
Collection Frequency	Hourly
Method	47
FRM/FEM Instrument	Thermo Electron 49
Analysis	Ultra Violet
Ref Mtd ID	EQOA-0880-047
Monitor Objective	Population Exposure
Dominant Source	Area
Measurement Scale	Urban Scale
Land Use Type	Agricultural
Location Setting	Rural

The Fairview site is located in Williamson County, Tennessee and currently supports monitoring for ozone. This site is located southwest of Nashville and northwest of Franklin, Tennessee. This site is upwind from the core Nashville MSA. Ozone monitoring began on 10/30/2001 is conducted for the ozone AQI forecasting program for verification and to help address upwind ozone concentrations entering the Nashville MSA. The Nashville MSA has 5 ozone sites operating and is only required to have 2. Due to this site's importance in assessing the area ozone levels outside and upwind of the Nashville area, it was determined to remain in operation over 5 years (2015 through 2020). See Appendix G: Annual Site Evaluations for further details.

In CY 2018, TDEC DAPC plans to replace the existing shelter with a new, upgraded shelter. Due to the logistics of shelter replacement, the site will undergo a reconfiguration. This reconfiguration will result in a new monitoring location approximately 5 meters from the existing site, heading 311° W. This reconfiguration is subject to EPA approval; more details can be found in Appendix G: Annual Site Evaluations & Documentation.

Fairview Daily Air Quality



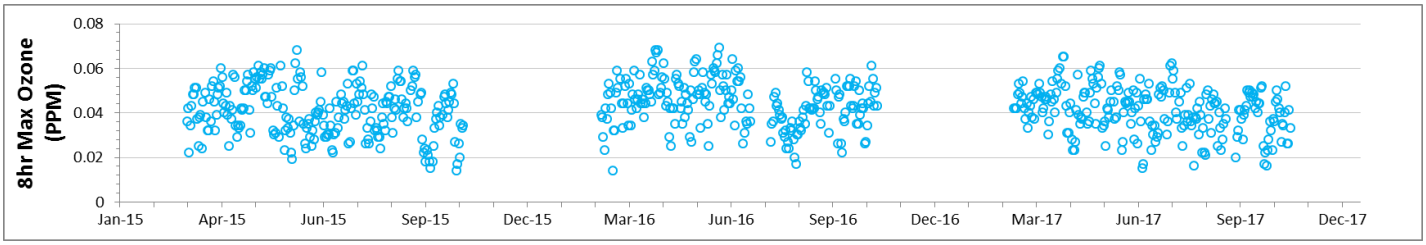
Cedars of Lebanon – Wilson County

Address	Cedar Forest Rd., Lebanon, TN
AQSID	471890103
CBSA	34980
Lat, Lon	36.060833, -86.286261
Parameter Code	44201
Parameter Name	O_3
Monitor Type	SLAMS
POC	1
Int	W
Collection Frequency	Hourly
Method	47
FRM/FEM Instrument	Thermo Electron 49
Analysis	Ultra Violet
Ref Mtd ID	EQOA-0880-047
Monitor Objective	Highest Concentration
Dominant Source	Area
Measurement Scale	Urban Scale
Land Use Type	Forest
Location Setting	Rural

The Cedars site is located in Wilson County, Tennessee and currently supports monitoring for ozone. This site is located east of Nashville and north of Murfreesboro, Tennessee. This site is downwind from Franklin, Tennessee and is located within the Nashville MSA. Ozone monitoring began 05/01/1988 and is conducted for the ozone AQI forecasting program for verification and to help address downwind ozone levels in the Nashville MSA. The Nashville MSA has five ozone sites operating and is only required to have two. Because of the importance that this site serves in assessing the area ozone levels outside and downwind of the Nashville area, this site was determined to remain in operation over 5 years (2015 through 2020). See Appendix G: Annual Site Evaluations for further details.

In CY 2018, TDEC DAPC plans to replace the existing shelter with a new, upgraded shelter. Due to the logistics of shelter replacement, the site will undergo a reconfiguration. This reconfiguration will result in a new monitoring location approximately 5 meters from the existing site, heading 352° N. This reconfiguration is subject to EPA approval; more details can be found in Appendix G: Annual Site Evaluations & Documentation.

Cedars Daily Air Quality



National Park Service Monitors

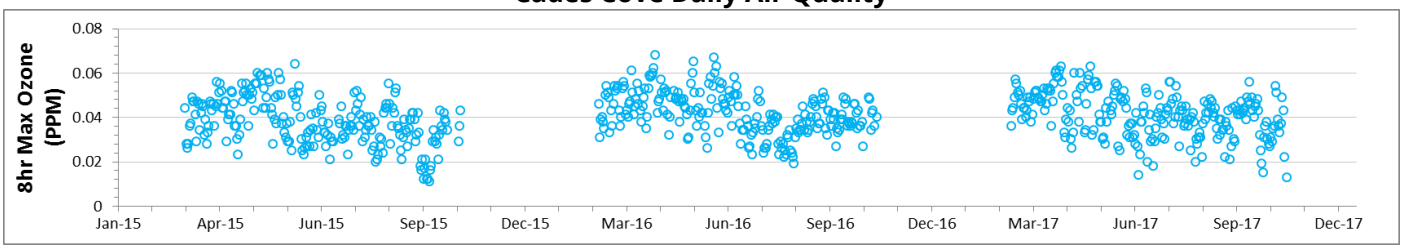
The NPS air monitoring sites are included as a courtesy to the readers of the TDEC DAPC 2018 ANMP. These sites are included because they are collecting and reporting data previously used for attainment decisions in Tennessee and that can be used for future determinations. The NPS sites are not a part of the TDEC DAPC air monitoring networks and TDEC DAPC does not report their data to the EPA AQS data systems; however, these data may continue to be used to support air quality forecasting by TDEC in the area.

Cades Cove – Blount County (GSM NP)

Address	Great Smoky Mountains NP - Cades Cove
AQSID	470090102
CBSA	28940
Lat, Lon	35.603056, -83.783611
Parameter Code	44201
Parameter Name	O_3
Monitor Type	Non-EPA Federal
POC	1
Int	W
Collection Frequency	Hourly
Method	53
FRM/FEM Instrument	Monitor Labs 8810
Analysis	Ultra Violet
Ref Mtd ID	EQOA-0881-053
Monitor Objective	Highest Concentration
Dominant Source	0
Measurement Scale	Regional Scale
Land Use Type	Forest
Location Setting	Rural

The Cades Cove site is located in Blount County, Tennessee and currently supports monitoring for ozone and meteorological parameters. The site was initially established in 05/01/1994. This site is located within the Tennessee portion of the Great Smoky Mountains National Park. This site is within and southeast of the Knoxville MSA. This site is used with the ozone AQI forecasting program for verification and to help address ozone levels found in the GSMNP. It is the responsibility of the NPS to operate, maintain, and conduct all QA/QC activities at this site in accordance with 40 CFR Part 58. The National Park Service is responsible for verifying, validating and certifying the ozone data collected.

Cades Cove Daily Air Quality

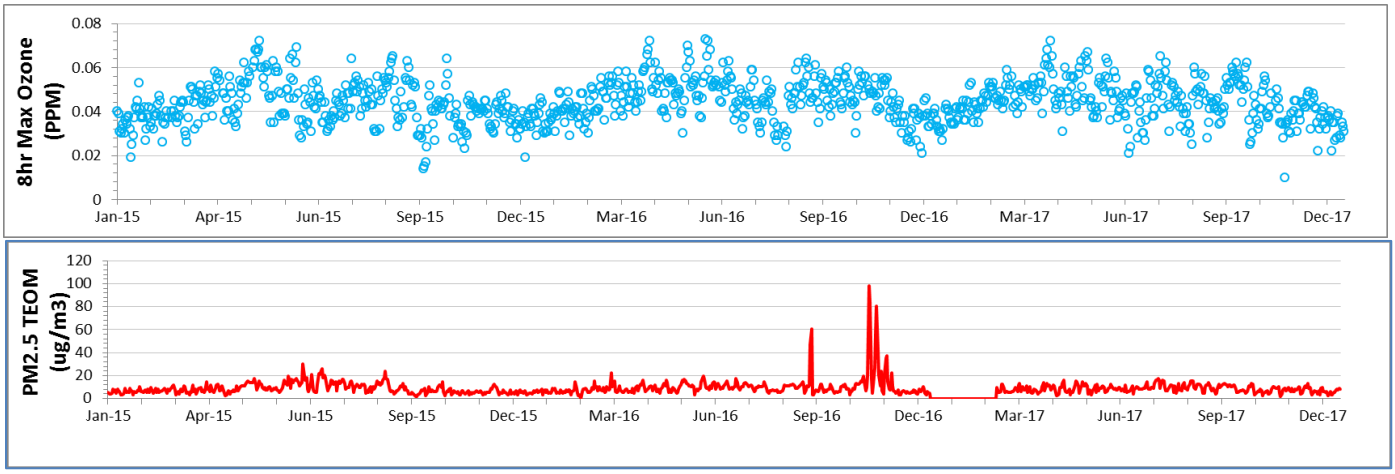


Look Rock – Blount County (GSM NP)

Address	Great Smoky Mountains NP Look Rock	
AQSID	470090101	
CBSA	28940	
Lat, Lon	35.6334799, -83.941605999999993	
Parameter Code	44201	88501
Parameter Name	O_3	$PM_{2.5}$ Continuous
Monitor Type	SLAMS	SPM
POC	1	3
Int	W	1
Collection Frequency	Hourly	Hourly
Method	053	716
FRM/FEM Instrument	Monitor Labs 8810	None
Analysis	Ultra Violet	TEOM Gravimetric 50 deg C
Ref Mtd ID	EQOA-0881-053	None
Monitor Objective	General Background	
Dominant Source	0	
Measurement Scale	0	
Land Use Type	Forest	
Location Setting	Rural	

The Look Rock site is located in Blount County, Tennessee and currently supports monitoring for ozone and other pollutants. The site was initially established in 1980. This site is located within the Tennessee portion of the Great Smoky Mountains National Park. This site is within and southeast of the Knoxville MSA. Ozone monitoring began on 07/23/1998 and $PM_{2.5}$ monitoring began on 05/01/2002. The Look Rock site is used with the PM Fine AQI forecasting program for verification and to help address fine particulate levels found in the GSMNP area. This site is operated and maintained by the NPS. The NPS is responsible for verifying, validating and certifying the ozone data collected.

Look Rock Daily Air Quality

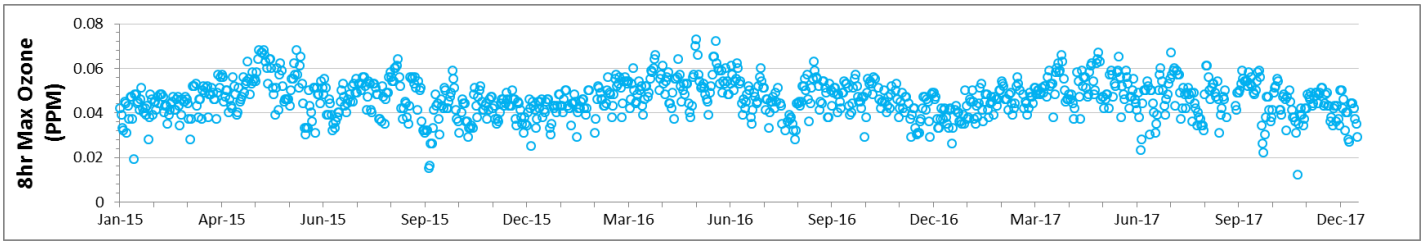


Cove Mountain – Sevier Country (GSM NP)

Address	Great Smoky Mountain NP- Cove Mountain
AQSID	471550101
CBSA	42940
Lat, Lon	35.6966669999999, -83.609722
Parameter Code	44201
Parameter Name	O_3
Monitor Type	NON-EPA FEDERAL
POC	1
Int	W
Collection Frequency	Hourly
Method	47
FRM/FEM Instrument	Thermo Electron 49
Analysis	Ultra Violet
Ref Mtd ID	EQOA-0880-047
Monitor Objective	General/Background
Dominant Source	Area
Measurement Scale	Neighborhood
Land Use Type	Forest
Location Setting	Rural

The Cove Mt. site is located in Sevier County, Tennessee and currently supports monitoring for ozone and meteorological parameters. This site is located within the Tennessee portion of the Great Smoky Mountains National Park. This site is outside and southeast of the Knoxville MSA. Ozone monitoring began on 07/01/1988. This site is used with the ozone AQI forecasting program for verification and to help address ozone levels found in the GSMNP area. This site is operated and maintained by the NPS. The NPS is responsible for verifying, validating and certifying the ozone data collected.

Cove Mountain Daily Air Quality

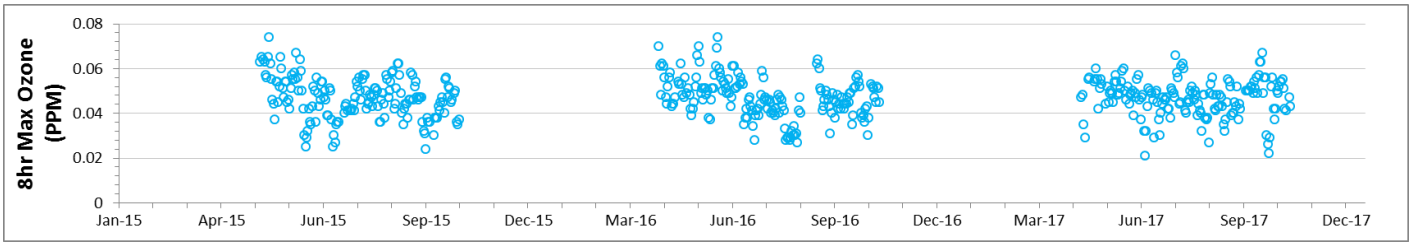


Clingman's Dome – Sevier County (GSM NP)

Address	Great Smoky Mountain Np Clingman's Dome
AQSID	471550102
CBSA	42940
Lat, Lon	35.562778, -83.4981
Parameter Code	44201
Parameter Name	O_3
Monitor Type	NON-EPA FEDERAL
POC	1
Int	W
Year	2014
Collection Frequency	Hourly
Method	47
FRM/FEM Instrument	Thermo Electron 49
Analysis	Ultra Violet
Ref Mtd ID	EQOA-0880-47
Monitor Objective	Highest Concentration
Dominant Source	Area
Measurement Scale	Regional Scale
Land Use Type	Forest
Location Setting	Rural

The Clingman's Dome site is located in Sevier County, Tennessee and currently supports monitoring for ozone and meteorological parameters. This site is located within the Tennessee portion of the Great Smoky Mountains National Park. This site is outside and southeast of the Knoxville MSA. Ozone monitoring began 04/01/1993. This site is used with the ozone AQI forecasting program for verification and to help address ozone levels found in the GSMNP area. This site is located at the highest point inside of Tennessee and is on the border of Tennessee and North Carolina. The elevation of the site poses challenges in maintenance and access as the site is often impacted in the late fall and through-out the winter and spring by excessive snow fall and icing events that prevent access to the site. The ozone data collection season at this site is truncated due to the site access issues in March and April and in some years in October due to early snowfall events. This site is operated and maintained by the NPS. The NPS is responsible for verifying, validating and certifying the ozone data collected.

Clingman's Dome Daily Air Quality



Tennessee Geographic Regions, Descriptions and Climate

Topographic Features - The topography of Tennessee is quite varied, stretching from the lowlands of the Mississippi Valley to the mountain peaks in the east. The westernmost part of the state, between the bluffs overlooking the Mississippi River and western valley of the Tennessee River, is a region of gently rolling plains sloping gradually from 200 to 250 feet in the west to about 600 feet above sea level in the hills overlooking the Tennessee River. The hilly Highland Rim, in a wide circle touching the Tennessee River Valley in the west and the Cumberland Plateau in the east, together with the enclosed Central Basin make up the whole of Middle Tennessee. The Highland Rim ranges from about 600 feet in elevation along the Tennessee River to 1,000 feet in the east and rises 300 to 400 feet above the Central Basin which is a rolling plain of about 600 feet average elevation, but with a crescent of hills reaching to over 1,000 feet south of Nashville. The Cumberland Plateau, with an average elevation of 2,000 feet extends roughly northeast-southwest across the state in a belt 30 to 50 miles wide, being bounded on the west by the Highland Rim and overlooking the Great Valley of East Tennessee on the east. The Great Valley, paralleling the Plateau to the west and the Great Smoky Mountains to the east, is a funnel shaped valley varying in width from about 30 miles in the south to about 90 miles in the north. Within the valley, which slopes from 1,500 feet in the north to 700 feet in the south, is a series of northeast-southwest ridges. Along the Tennessee-North Carolina border lie the Great Smoky Mountains, the most rugged and elevated portion of Tennessee, with numerous peaks from 4,000 to 6,000 feet.

Tennessee, except for a small area east of Chattanooga, lies entirely within the drainage of the Mississippi River system. The extreme western section of the state is drained through several relatively small rivers directly into the Mississippi River. Otherwise, drainage is into either the Cumberland or Tennessee Rivers, both of which flow northward near the end of their courses to join the Ohio River along the Kentucky-Illinois border. The Cumberland River, which drains north-central portions of Tennessee rises in the Cumberland Mountains in Kentucky, flows southwestward, then south into Tennessee reaching the Nashville area before tuning northward to re-enter Kentucky. The Tennessee River is formed by the juncture of the Holston and French Broad rivers at Knoxville. It flows southwesterly along the Alabama-Mississippi line, and then flows northward across the state into Kentucky. Besides the headwater streams, other important tributaries include the: Clinch, Little Tennessee, Hiawassee, Elk and Duck Rivers.

Temperature - Most aspects of the state's climate are related to the widely varying topography within its borders. The decrease of temperature with elevation is quite apparent, amounting to, on the average, three degrees Fahrenheit (°F) per 1,000 feet increase in elevation. Thus higher portions of the state, such as the Cumberland Plateau and the mountains of the east, have lower average temperature than the Great Valley of East Tennessee, which they flank, and other lower parts of the state. In the Great Valley temperature increases from north to south, reaching a value at the south end comparable to that of Middle and West Tennessee where elevation variations are a generally minor consideration. Across the state, the average annual temperature varies from over 62° F in the extreme southwest to near 45 degrees atop the highest peaks of the east. It is of interest to note that average January temperature atop a 6,000 foot peak in the Great Smoky Mountains is equivalent to that in Central Ohio, while average July temperature is duplicated along the southern edge of the Hudson Bay in Canada. While most of the state can be described as having warm, humid summers and mild winters, this must be qualified to include variations with elevation. Thus with increasing elevation, summers become cooler and more pleasant while winters become colder and more blustery.

This dependence of temperature on elevation is of considerable importance to a variety of interests. Temperature, together with precipitation, plays an important role in determination what plant and animal life are adaptable to the area. In the Great Smoky Mountains, for example, the variations in elevation from 1,000 to 6,000 feet with attendant variations in temperature contribute to a remarkable variety of plant life. The relative coolness of the mountains also contributes to the popularity of that area during the warmer part of the year.

Length of growing season is linked to topography in a way similar to temperature, varying from an average of 237 days at low-lying Memphis to a near 130 days on the highest mountains in the east. Most of the state is included in the range of 180 to 220 days. Shorter growing seasons than this are confined to the mountains forming the state's eastern border and to the northern part of the Cumberland Plateau. Longer growing seasons are found in counties bordering the Mississippi River, parts of the Central Basin of the Middle Tennessee, and the southern end of the Great Valley of East Tennessee.

Precipitation - Since the principal source of moist air for this area is the Gulf of Mexico, there exists a gradual decrease of average precipitation from south to north. This effect is largely obscured however, by the overruling influence of topography. Air forced to ascend, cools and condenses out a portion of its moisture. Thus, average precipitation ranges from 46 to 54 inches, increasing from Mississippi bottomlands to the slight hills farther east. In Middle Tennessee the variation is from a minimum of 45 inches in the Central Basin to 50 to 55 inches in the surrounding hilly Highland Rim. Over the elevated Cumberland Plateau average annual precipitation is generally from 50 to 55 inches. In contrast, average annual precipitation in the Great Valley of East Tennessee increases from near 40 inches in northern portions to over 50 inches in the south. The northern minimum, lowest for the entire state, results from the shielding influence of the Great Smoky Mountains to the southeast and the Cumberland Plateau to the northwest. The mountainous eastern border of the state is the wettest, having average annual precipitation ranging up to 80 inches on the higher, and well-exposed peaks of the Great Smoky Mountains.

Over most of the state, the greatest precipitation occurs during the winter and early spring due to the more frequent passage of large-scale storms over and near the state during those months. A secondary maximum of precipitation occurs in midsummer in response to thunderstorm activity. This is especially pronounced in the mountains of the east where July rainfall exceeds the precipitation of any other month. Lightest precipitation, observed in the fall, is brought about by the maximum occurrence of slow moving, rain suppressing high pressure areas. Although all parts of Tennessee are generally well supplied with precipitation, there occurs on the average one or more prolonged dry spells each year during summer and fall. Studies illustrate the beneficial effects of supplemental irrigation of crops, despite usually bountiful annual precipitation.

Average annual snowfall varies from four to six inches in the southern and western parts of the state and in most of the Great Valley of East Tennessee to more than 10 inches over the northern Cumberland Plateau and the mountains of the east. Over most of the state, due to relatively mild winter temperatures, snow cover rarely persists for more than a few days.

The most important flood season is during the winter and early spring when the frequent migratory storms bring general rains of high intensity. During this period both widespread flooding and local flash floods can occur. During the summer, heavy thunderstorm rainfalls frequently result in local flash flooding. In the fall, while flood producing rains are rare, a decadent tropical system on occasion causes serious floods. The numerous dams constructed along the Tennessee and Cumberland rivers are major features in the control of flood waters in the state.

The dams of the Tennessee and Cumberland River systems and the lakes so formed, in addition to vastly reducing flood damage have: facilitated water transportation, provided abundant low cost hydroelectric power and created extensive recreation areas. Fishing, boating, swimming and camping along the many lakes, together with the several state and national parks, have made tourism one of the major industries in the state.

Climate and the Economy - Water resources of Tennessee have been a major factor in the state's industrial growth. The bountiful and good quality water supply has influenced the location of industry, especially chemical processing plants. Three major waterways, the Mississippi, Cumberland and Tennessee Rivers, are suitable for commercial traffic. Finally, the availability of low cost hydroelectric power from the multipurpose dams of the

Cumberland and Tennessee rivers and tributaries has been stimulus to industry of all types. The principal types of manufacturing products are: textile mill products, primary metals, fabricated metals and lumber products.

Although surpassed in monetary value by industrial activity, agriculture remains a vital feature of Tennessee's economic life. The wide range of climates in Tennessee, from river bottom to mountaintop, coupled with a wide range of soils, has resulted in a large number of crops which thrive in the state.

Forests represent an additional important segment of Tennessee's natural resources related to the climate of the state. Timberland, containing principally hardwood types, covers approximately one-half of the total area of Tennessee. This has led to a highly diversified woodworking industry and made the area around Memphis the center of production for wood flooring. The temperate climate of the state is very favorable for logging operations, allowing full-scale activity during nine months of the year and to a lesser extent during the winter months.

Climate descriptions of Tennessee - Generally, Tennessee has a temperate climate, with warm summers and mild winters. However, the state's varied topography leads to a wide range of climatic conditions.

The warmest parts of the state, with the longest growing season, are the Gulf Coastal Plain, the Central Basin, and the Sequatchie Valley. In the Memphis area in the southwest, the average date of the last killing frost is 20 March, and the growing season is about 235 days. Memphis has an annual mean temperature of 62°F (17°C), 40°F (4°C) in January, and 83°F (28°C) in July. In the Nashville area, the growing season lasts about 225 days. Nashville has an annual mean of 59°F (15°C), ranging from 36°F (2°C) in January to 79°F (26°C) in July. The Knoxville area has a growing season of 220 days. The city's annual mean temperature is 60°F (16°C), with averages of 41°F (5°C) in January and 78°F (26°C) in July. In some parts of the mountainous east, where the temperatures are considerably lower, the growing season is as short as 130 days. The record high temperature for the state is 113°F (45°C), set at Perryville on 9 August 1930; the record low, –32°F (–36°C), was registered at Mountain City on 30 December 1917.

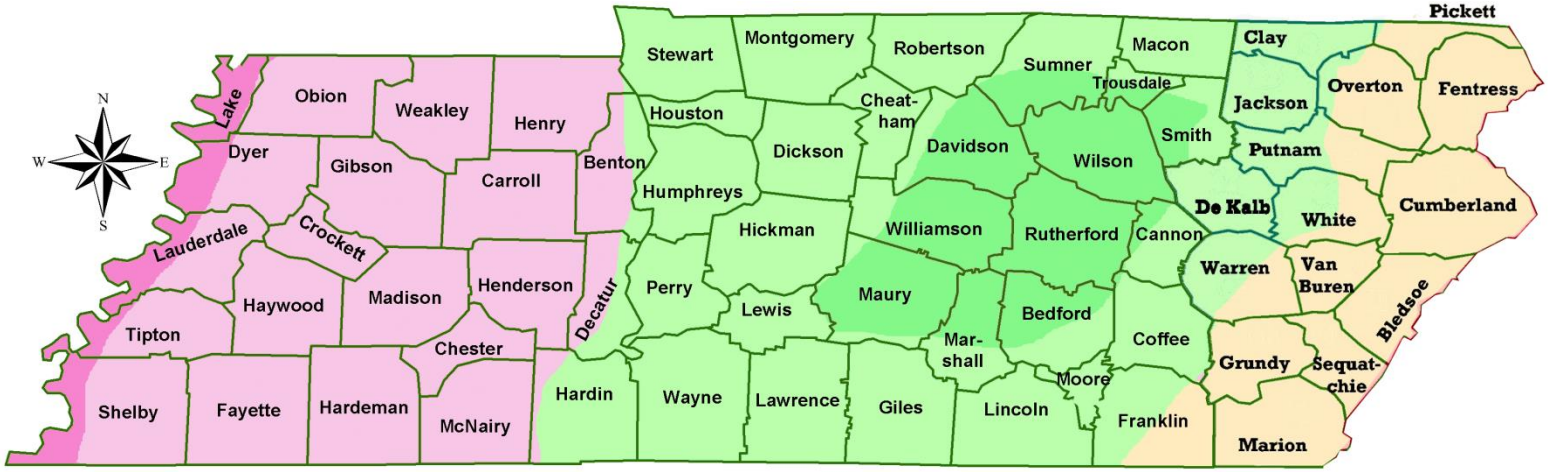
Severe storms occur infrequently. The greatest rainfall occurs in the winter and early spring, especially March; the early fall months, particularly September and October, are the driest. Average annual precipitation (1971–2000) was 54.7 in (138.9 cm) in Memphis and 48 in (122 cm) in Nashville. Snowfall varies and is more prevalent in East Tennessee than in the western section; Nashville gets about 10 in (25.4 cm) a year, Memphis only 5 in (12.7 cm).

Source:

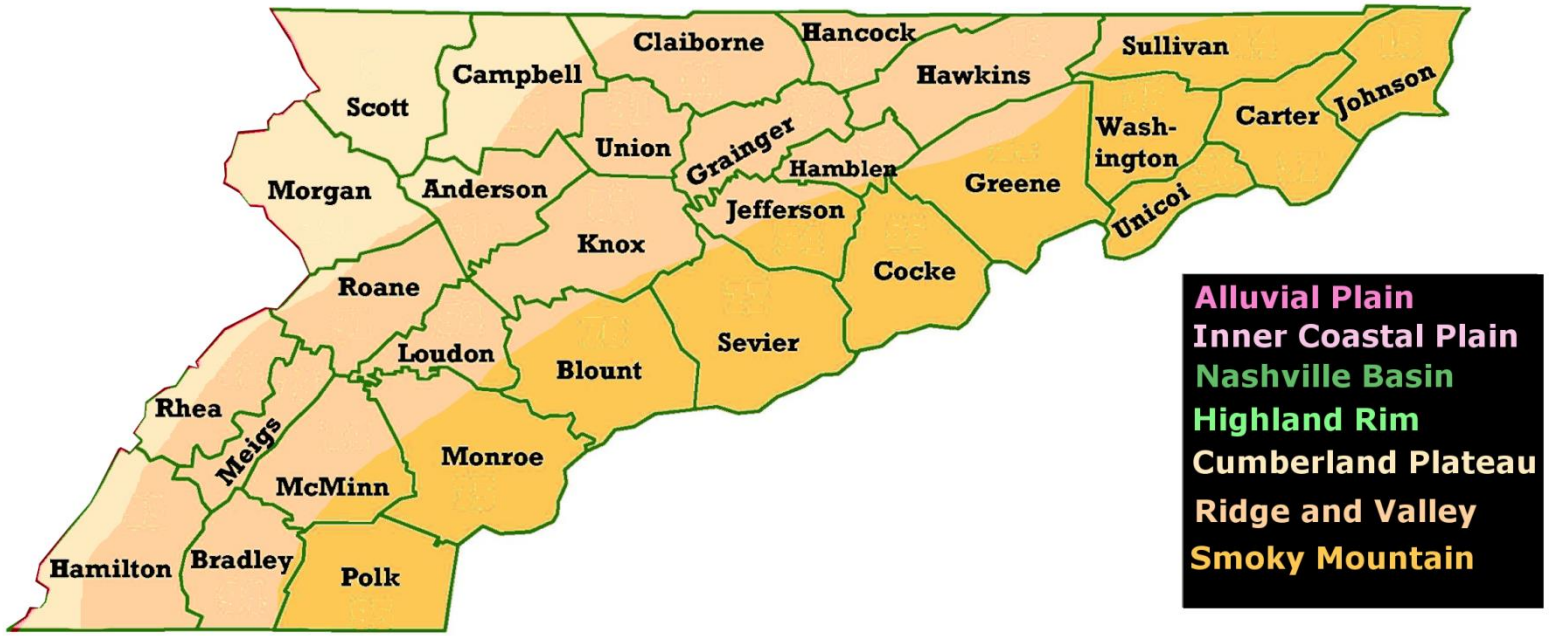
UT Institute of Agriculture > Tennessee Climatological Service > Climate Data for Tennessee

Map of Tennessee Geographic Regions

Central Time Zone Regions (CST UTC-6:00, CDT UTC-5:00)



Eastern Time Zone Regions (CST UTC-5:00, CDT UTC-4:00)



Climate Synopsis for Tennessee

The highly varied topography of Tennessee has a significant impact on the state's climate. The landscape varies generally from west to east, starting with the gently rolling lowlands (200-600' above sea level) in the west, rising to the Highland Rim (600-1000') enclosing the Central Basin, and on up to the Cumberland Plateau (~2000') which trends northeast-southwest across the state in a belt 30-50 miles wide. East of the Plateau is the Great Valley of East Tennessee (elevations ranging from 1500' in the north down to 700' in the south) containing a series of northeast-southwest ridges. The eastern border of the state is dominated by the Great Smoky Mountains, with numerous peaks rising 4000' to 6000' above sea level.

Average annual temperatures across the state range from around 57°F to 60°F (1981-2010). Winter mean temperatures are near 39°F (1981-2010) over most of the state, while summer temperatures average between 74°F and 78°F (1981-2010). Of course, these general patterns are affected by topography: the higher mountain areas tend to have milder summers as well as colder, more blustery winters. The length of the growing season is also linked to topography: most of the state has a growing season between 180 and 220 days, but this stretches to over 235 days in the lowlands around Memphis and drops to near 130 days in the highest mountains to the east.

The principal source of moisture for the state is the Gulf of Mexico to the south, which results in a gradual decrease of precipitation from south to north. This gradient is largely obscured, however, by orographic effects. In West Tennessee, annual precipitation amounts range from 46 inches to 54 inches, increasing from the Mississippi bottomlands to the slight hills farther east. In Middle Tennessee, the variation is from around 45 inches in the Central Basin to 50-55 inches in the surrounding Highland Rim. The Cumberland Plateau also averages 50-55 inches per year. In the Great Valley of Eastern Tennessee, annual precipitation rises from a minimum of 40 inches in the north (the driest part of the state due to the rain shadow effect of the Great Smoky Mountains and the Cumberland Plateau) to over 50 inches in the south. The mountainous eastern border of the state is the wettest part, with annual totals of up to 80 inches in the higher, well-exposed peaks.

Over most of the state, the greatest precipitation occurs in winter and early spring owing to the more frequent passage of large-scale (frontal) storms over the region. A secondary maximum of precipitation occurs in midsummer in response to shower and thunderstorm activity, especially in July in the mountains of the east. Fall tends to be the dry season for the state, due to the higher frequency of slow-moving high pressure areas during this season. Average annual snowfall ranges from 4-6 inches in the south and west to over 10 inches in the east. Due to the relatively mild winter conditions over most of the state, snow cover rarely persists for more than a few days.

Severe storms are relatively infrequent in the state, being east of the center of tornado activity, south of most blizzard conditions, and too far inland to be often affected by hurricanes. Averages of 26 (1991-2011) tornadoes are observed in the state each year, mostly confined to areas west of the Cumberland Plateau. Hailstorms (>1”) at a given location are observed 3 to 6 (2003-2012) times a year, and damaging glaze storms occur in the state every 3 or 4 years (1996-2013). Thunderstorms are frequent in the warm season, and severe thunderstorms with damaging winds are experienced at scattered locations throughout the state each year.

Adapted from: Climatography of the United States, No. 60, National Climatic Data Center

Updated 2/26/2014 by TDAPC using data from NCDC

3-Yr (2015-2017) Wind Rose Data for 10 TN Area ASOS Stations

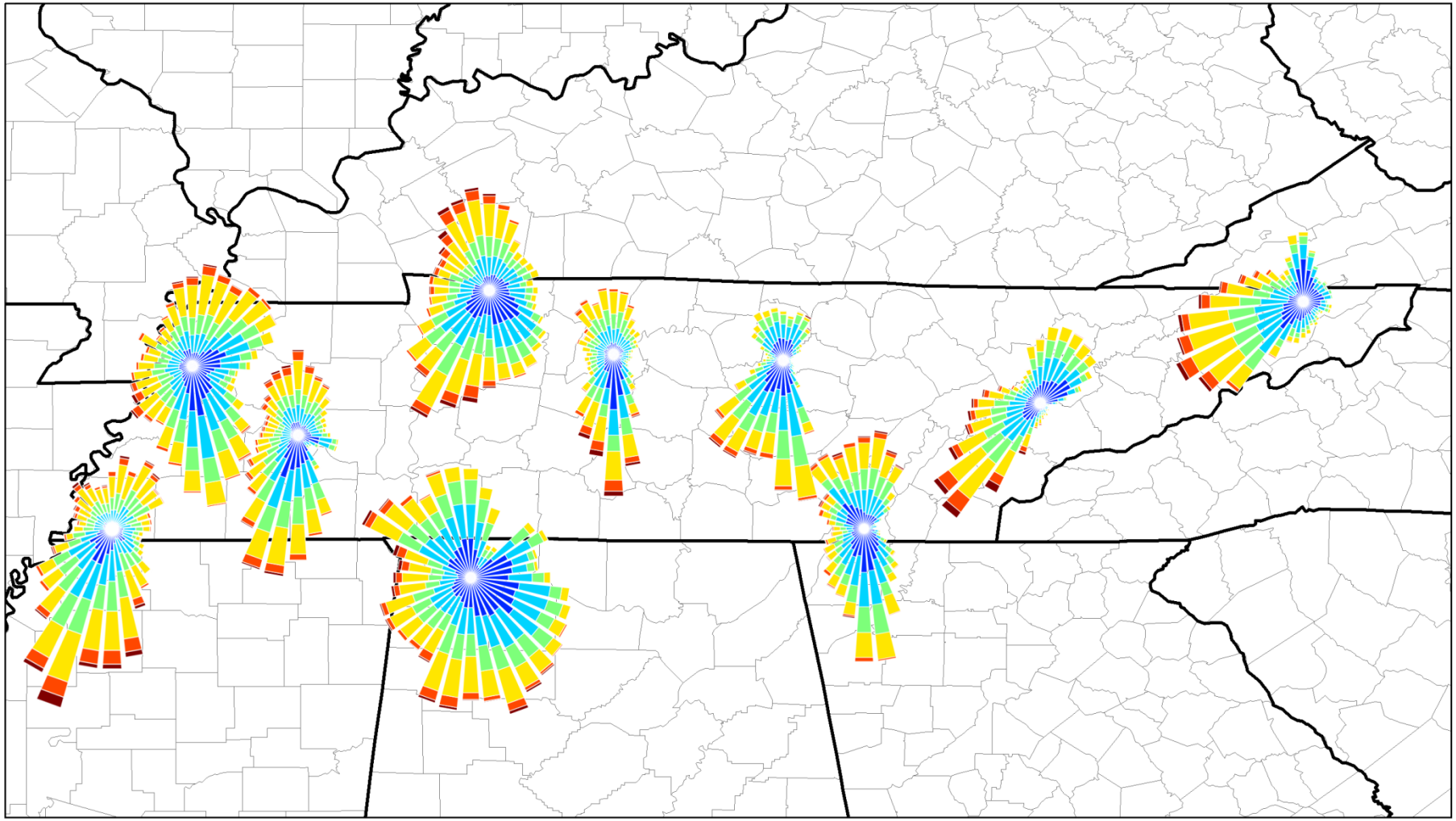


Table 4: Tennessee Metropolitan Statistical Areas and Population Estimates

CBSA	STCOU	NAME	LSAD	CENSUS 2010 POP	POP EST 2017
16860		**Chattanooga, TN-GA**	**Metropolitan Statistical Area**	**528143**	**556548**
16860	13047	Catoosa County, GA	County or equivalent	63942	66550
16860	13083	Dade County, GA	County or equivalent	16633	16285
16860	13295	Walker County, GA	County or equivalent	68756	68939
16860	47065	Hamilton County, TN	County or equivalent	336463	361613
16860	47115	Marion County, TN	County or equivalent	28237	28425
16860	47153	Sequatchie County, TN	County or equivalent	14112	14736
17300		**Clarksville, TN-KY**	**Metropolitan Statistical Area**	**260625**	**285042**
17300	21047	Christian County, KY	County or equivalent	73955	70416
17300	21221	Trigg County, KY	County or equivalent	14339	14444
17300	47125	Montgomery County, TN	County or equivalent	172331	200182
17420		**Cleveland, TN**	**Metropolitan Statistical Area**	**115788**	**122317**
17420	47011	Bradley County, TN	County or equivalent	98963	105560
17420	47139	Polk County, TN	County or equivalent	16825	16757
27180		**Jackson, TN**	**Metropolitan Statistical Area**	**130011**	**129235**
27180	47023	Chester County, TN	County or equivalent	17131	17119
27180	47033	Crockett County, TN	County or equivalent	14586	14473
27180	47113	Madison County, TN	County or equivalent	98294	97643
27740		**Johnson City, TN**	**Metropolitan Statistical Area**	**198716**	**202053**
27740	47019	Carter County, TN	County or equivalent	57424	56488
27740	47171	Unicoi County, TN	County or equivalent	18313	17759
27740	47179	Washington County, TN	County or equivalent	122979	127806
28700		**Kingsport-Bristol-Bristol, TN-VA**	**Metropolitan Statistical Area**	**309544**	**306659**
28700	47073	Hawkins County, TN	County or equivalent	56833	56459
28700	47163	Sullivan County, TN	County or equivalent	156823	157158
28700	51169	Scott County, VA	County or equivalent	23177	21865
28700	51191	Washington County, VA	County or equivalent	54876	54387
28700	51520	Bristol city, VA	County or equivalent	17835	16790
28940		**Knoxville, TN**	**Metropolitan Statistical Area**	**837571**	**877104**
28940	47001	Anderson County, TN	County or equivalent	75129	76257
28940	47009	Blount County, TN	County or equivalent	123010	129929
28940	47013	Campbell County, TN	County or equivalent	40716	39648
28940	47057	Grainger County, TN	County or equivalent	22657	23144
28940	47093	Knox County, TN	County or equivalent	432226	461860
28940	47105	Loudon County, TN	County or equivalent	48556	52152
28940	47129	Morgan County, TN	County or equivalent	21987	21636
28940	47145	Roane County, TN	County or equivalent	54181	53036
28940	47173	Union County, TN	County or equivalent	19109	19442
32820		**Memphis, TN-MS-AR**	**Metropolitan Statistical Area**	**1324829**	**1348260**
32820	5035	Crittenden County, AR	County or equivalent	50902	48750

CBSA	STCOU	NAME	LSAD	CENSUS 2010 POP	POP EST 2017
32820	28009	Benton County, MS	County or equivalent	8729	8312
32820	28033	DeSoto County, MS	County or equivalent	161252	178751
32820	28093	Marshall County, MS	County or equivalent	37144	35619
32820	28137	Tate County, MS	County or equivalent	28886	28441
32820	28143	Tunica County, MS	County or equivalent	10778	10024
32820	47047	Fayette County, TN	County or equivalent	38413	40036
32820	47157	Shelby County, TN	County or equivalent	927644	936961
32820	47167	Tipton County, TN	County or equivalent	61081	61366
34100		**Morristown, TN**	**Metropolitan Statistical Area**	**113951**	**118081**
34100	47063	Hamblen County, TN	County or equivalent	62544	64277
34100	47089	Jefferson County, TN	County or equivalent	51407	53804
34980		**Nashville-Davidson--Murfreesboro--Franklin, TN**	**Metropolitan Statistical Area**	**1670890**	**1903045**
34980	47015	Cannon County, TN	County or equivalent	13801	14216
34980	47021	Cheatham County, TN	County or equivalent	39105	40330
34980	47037	Davidson County, TN	County or equivalent	626681	691243
34980	47043	Dickson County, TN	County or equivalent	49666	52853
34980	47081	Hickman County, TN	County or equivalent	24690	24864
34980	47111	Macon County, TN	County or equivalent	22248	24079
34980	47119	Maury County, TN	County or equivalent	80956	92163
34980	47147	Robertson County, TN	County or equivalent	66283	70177
34980	47149	Rutherford County, TN	County or equivalent	262604	317157
34980	47159	Smith County, TN	County or equivalent	19166	19636
34980	47165	Sumner County, TN	County or equivalent	160645	183545
34980	47169	Trousdale County, TN	County or equivalent	7870	10083
34980	47187	Williamson County, TN	County or equivalent	183182	226257
34980	47189	Wilson County, TN	County or equivalent	113993	136442

Table 5: Tennessee Micropolitan Statistical Areas and Population Estimates

CBSA	STCOU	NAME	LSAD	CENSUS 2010 POP	POP EST 2017
11940		**Athens, TN**	**Micropolitan Statistical Area**	**52266**	**52877**
11940	47107	McMinn County, TN	County or equivalent	52266	52850
18260		**Cookeville, TN**	**Micropolitan Statistical Area**	**106042**	**111363**
18260	47087	Jackson County, TN	County or equivalent	11638	11677
18260	47133	Overton County, TN	County or equivalent	22083	22012
18260	47141	Putnam County, TN	County or equivalent	72321	77674
18900		**Crossville, TN**	**Micropolitan Statistical Area**	**56053**	**59078**
18900	47035	Cumberland County, TN	County or equivalent	56053	59078
19420		**Dayton, TN**	**Micropolitan Statistical Area**	**31809**	**32691**
19420	47143	Rhea County, TN	County or equivalent	31809	32691
20540		**Dyersburg, TN**	**Micropolitan Statistical Area**	**38335**	**37463**
20540	47045	Dyer County, TN	County or equivalent	38335	37463
24620		**Greeneville, TN**	**Micropolitan Statistical Area**	**68831**	**68808**
24620	47059	Greene County, TN	County or equivalent	68831	68808
29980		**Lawrenceburg, TN**	**Micropolitan Statistical Area**	**41869**	**43396**
29980	47099	Lawrence County, TN	County or equivalent	41869	43396
30280		**Lewisburg, TN**	**Micropolitan Statistical Area**	**30617**	**32931**
30280	47117	Marshall County, TN	County or equivalent	30617	32931
32280		**Martin, TN**	**Micropolitan Statistical Area**	**35021**	**33337**
32280	47183	Weakley County, TN	County or equivalent	35021	33337
32660		**McMinnville, TN**	**Micropolitan Statistical Area**	**39839**	**40651**
32660	47177	Warren County, TN	County or equivalent	39839	40651
35460		**Newport, TN**	**Micropolitan Statistical Area**	**35662**	**35556**
35460	47029	Cocke County, TN	County or equivalent	35662	35556
37540		**Paris, TN**	**Micropolitan Statistical Area**	**32330**	**32450**
37540	47079	Henry County, TN	County or equivalent	32330	32450
42940		**Sevierville, TN**	**Micropolitan Statistical Area**	**89889**	**97638**
42940	47155	Sevier County, TN	County or equivalent	89889	97638
43180		**Shelbyville, TN**	**Micropolitan Statistical Area**	**45058**	**48117**
43180	47003	Bedford County, TN	County or equivalent	45058	48117
46100		**Tullahoma-Manchester, TN**	**Micropolitan Statistical Area**	**100210**	**103070**
46100	47031	Coffee County, TN	County or equivalent	52796	55034
46100	47051	Franklin County, TN	County or equivalent	41052	41652
46100	47127	Moore County, TN	County or equivalent	6362	6384
46460		**Union City, TN-KY**	**Micropolitan Statistical Area**	**38620**	**36577**
46460	21075	Fulton County, KY	County or equivalent	6813	6192
46460	47131	Obion County, TN	County or equivalent	31807	30385

https://www.census.gov/data/datasets/2016/demo/popest/total-metro-and-micro-statistical-areas.html

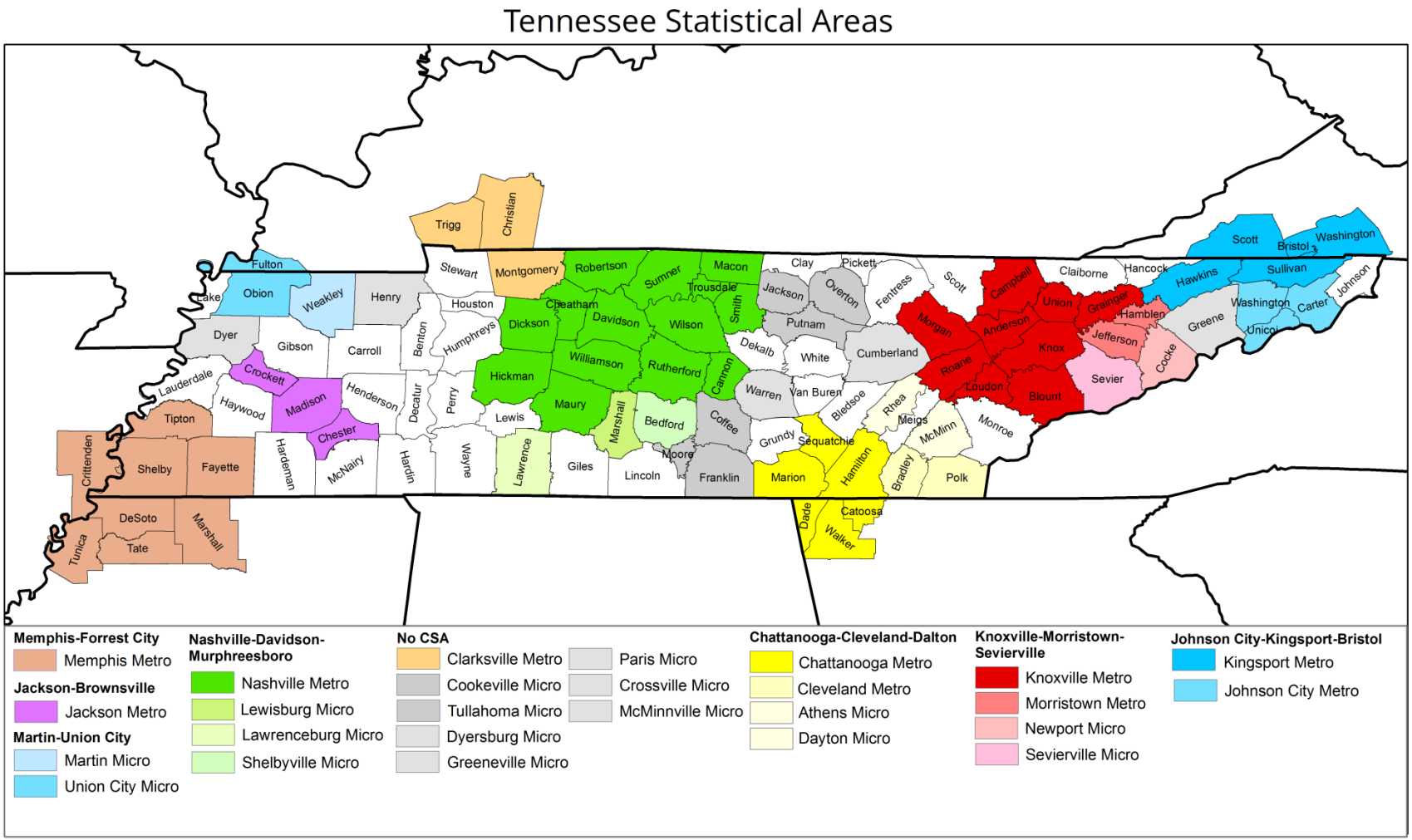
Table 6: Tennessee County Population Data Trends

(2010 Census and Estimates to 2017 by US Census Bureau)

Geography	April 1, 2010		Population Estimate (as of July 1, 2017)							
	Census	Est.	2010	2011	2012	2013	2014	2015	2016	2017
Anderson	75,129	75,094	75,126	75,179	75,326	75,420	75,347	75,698	75,936	76,257
Bedford	45,058	45,056	45,100	45,271	45,307	45,638	46,284	46,940	47,484	48,117
Benton	16,489	16,491	16,493	16,423	16,354	16,280	16,109	16,107	16,014	15,986
Bledsoe	12,876	12,872	12,874	12,847	12,791	13,785	14,535	14,580	14,675	14,717
Blount	123,010	123,100	123,241	123,704	124,069	124,985	126,092	127,142	128,670	129,929
Bradley	98,963	98,932	99,126	99,883	101,101	101,881	102,921	103,907	104,490	105,560
Campbell	40,716	40,723	40,722	40,579	40,460	40,229	39,909	39,728	39,714	39,648
Cannon	13,801	13,816	13,814	13,764	13,868	13,800	13,725	13,854	14,027	14,216
Carroll	28,522	28,480	28,445	28,533	28,707	28,685	28,471	28,131	28,092	27,860
Carter	57,424	57,375	57,313	57,434	57,309	56,982	56,312	56,430	56,502	56,488
Cheatham	39,105	39,103	39,115	38,986	39,245	39,387	39,674	39,690	39,880	40,330
Chester	17,131	17,143	17,184	17,222	17,213	17,340	17,358	17,413	17,453	17,119
Claiborne	32,213	32,212	32,234	32,088	31,770	31,661	31,630	31,687	31,757	31,609
Clay	7,861	7,860	7,843	7,827	7,801	7,784	7,733	7,773	7,752	7,703
Cocke	35,662	35,642	35,644	35,372	35,450	35,287	35,230	35,096	35,219	35,556
Coffee	52,796	52,800	52,783	52,882	53,132	53,324	53,623	54,279	54,682	55,034
Crockett	14,586	14,576	14,574	14,550	14,607	14,590	14,614	14,566	14,411	14,473
Cumberland	56,053	56,062	56,210	56,620	57,073	57,513	57,958	58,278	58,655	59,078
Davidson	626,681	626,580	628,077	635,503	649,004	658,990	668,699	678,323	684,410	691,243
Decatur	11,757	11,750	11,729	11,684	11,660	11,697	11,733	11,657	11,769	11,751
DeKalb	18,723	18,720	18,716	18,794	18,911	19,108	19,211	19,205	19,361	19,852
Dickson	49,666	49,658	49,701	49,946	50,177	50,211	50,609	51,461	52,170	52,853
Dyer	38,335	38,330	38,313	38,148	38,246	38,148	37,868	37,878	37,708	37,463
Fayette	38,413	38,439	38,435	38,569	38,662	38,810	39,072	39,220	39,590	40,036
Fentress	17,959	17,960	17,928	18,026	17,924	17,937	17,867	17,917	18,033	18,136
Franklin	41,052	41,064	40,970	40,862	40,786	41,313	41,428	41,514	41,700	41,652
Gibson	49,683	49,691	49,732	49,873	49,689	49,483	49,541	49,442	49,401	49,111
Giles	29,485	29,489	29,401	29,337	29,006	28,859	28,917	29,079	29,307	29,401
Grainger	22,657	22,656	22,714	22,733	22,649	22,681	22,830	22,835	23,072	23,144
Greene	68,831	68,825	68,826	68,996	68,654	68,272	68,416	68,551	68,615	68,808
Grundy	13,703	13,726	13,738	13,657	13,653	13,509	13,464	13,456	13,389	13,361
Hamblen	62,544	62,533	62,550	62,816	62,712	63,082	63,022	63,414	63,785	64,277
Hamilton	336,463	336,484	337,332	340,939	345,783	348,853	350,545	353,604	357,738	361,613
Hancock	6,819	6,815	6,808	6,711	6,675	6,638	6,602	6,554	6,577	6,600
Hardeman	27,253	27,247	27,154	26,851	26,528	26,251	25,927	25,732	25,435	25,447
Hardin	26,026	26,012	26,039	25,868	26,005	25,981	25,810	25,718	25,679	25,846
Hawkins	56,833	56,829	56,867	56,617	56,561	56,740	56,529	56,443	56,563	56,459
Haywood	18,787	18,807	18,787	18,568	18,281	18,256	18,226	18,028	17,853	17,573
Henderson	27,769	27,782	27,786	28,020	28,006	27,958	27,991	27,984	27,822	27,751
Henry	32,330	32,354	32,404	32,379	32,373	32,253	32,315	32,205	32,310	32,450
Hickman	24,690	24,689	24,648	24,344	24,132	24,153	24,360	24,315	24,295	24,864
Houston	8,426	8,425	8,443	8,338	8,408	8,275	8,220	8,131	8,134	8,213
Humphreys	18,538	18,535	18,569	18,396	18,271	18,230	18,109	18,122	18,347	18,484
Jackson	11,638	11,632	11,596	11,514	11,524	11,533	11,492	11,517	11,566	11,677
Jefferson	51,407	51,660	51,697	52,008	52,428	52,352	52,651	53,288	53,535	53,804
Johnson	18,244	18,244	18,285	18,210	18,121	17,998	17,919	17,821	17,754	17,691

Geography	April 1, 2010		Population Estimate (as of July 1, 2017)							
	Census	Est.	2010	2011	2012	2013	2014	2015	2016	2017
Knox	432,226	432,266	433,056	436,551	440,793	444,325	448,125	451,444	456,132	461,860
Lake	7,832	7,832	7,821	7,778	7,710	7,711	7,662	7,572	7,560	7,468
Lauderdale	27,815	27,822	27,742	27,697	27,676	27,559	27,340	26,959	26,773	25,274
Lawrence	41,869	41,851	41,988	42,059	42,133	41,990	42,297	42,531	43,081	43,396
Lewis	12,161	12,171	12,162	12,152	11,918	11,969	11,878	11,866	11,904	12,035
Lincoln	33,361	33,350	33,411	33,416	33,442	33,574	33,556	33,695	33,645	33,751
Loudon	48,556	48,548	48,738	49,073	49,732	50,374	50,646	50,978	51,454	52,152
McMinn	52,266	52,278	52,197	52,356	52,429	52,405	52,710	52,636	52,850	52,877
McNairy	26,075	26,077	26,056	26,050	26,160	26,078	26,114	25,997	25,935	26,004
Macon	22,248	22,227	22,245	22,462	22,501	22,619	22,942	23,108	23,450	24,079
Madison	98,294	98,299	98,258	98,022	98,523	98,715	98,130	97,609	97,663	97,643
Marion	28,237	28,222	28,224	28,075	28,218	28,316	28,373	28,462	28,446	28,425
Marshall	30,617	30,606	30,678	30,885	30,928	31,082	31,233	31,518	31,915	32,931
Maury	80,956	80,930	81,188	81,415	81,969	83,611	85,541	87,735	89,981	92,163
Meigs	11,753	11,768	11,795	11,684	11,701	11,696	11,744	11,872	12,005	12,068
Monroe	44,519	44,505	44,618	44,930	45,150	45,223	45,390	45,677	45,970	46,240
Montgomery	172,331	172,362	173,218	176,655	185,225	184,637	189,655	193,294	195,734	200,182
Moore	6,362	6,345	6,340	6,401	6,336	6,302	6,317	6,290	6,323	6,384
Morgan	21,987	21,986	21,999	22,058	21,947	21,707	21,742	21,492	21,554	21,636
Obion	31,807	31,807	31,815	31,683	31,346	31,068	30,875	30,633	30,578	30,385
Overton	22,083	22,084	22,096	22,193	22,222	22,021	22,002	22,156	22,051	22,012
Perry	7,915	7,928	7,944	7,863	7,854	7,878	7,845	7,914	7,964	7,975
Pickett	5,077	5,077	5,072	5,132	5,070	5,044	5,081	5,142	5,142	5,073
Polk	16,825	16,826	16,810	16,737	16,606	16,640	16,722	16,744	16,772	16,757
Putnam	72,321	72,347	72,580	72,981	73,487	73,992	74,878	74,974	75,931	77,674
Rhea	31,809	31,802	31,859	32,051	32,338	32,526	32,607	32,392	32,442	32,691
Roane	54,181	54,193	54,159	53,856	53,506	53,035	52,773	52,726	52,874	53,036
Robertson	66,283	66,349	66,391	66,693	66,743	67,244	67,923	68,452	69,165	70,177
Rutherford	262,604	262,592	263,776	269,136	274,386	281,289	289,095	298,423	308,251	317,157
Scott	22,228	22,232	22,240	22,121	22,175	22,024	22,026	21,974	21,947	21,989
Sequatchie	14,112	14,121	14,137	14,280	14,426	14,663	14,773	14,789	14,897	14,736
Sevier	89,889	89,725	89,977	91,123	92,299	93,356	94,696	95,661	96,673	97,638
Shelby	927,644	927,684	928,652	933,011	938,965	938,091	937,162	936,131	934,603	936,961
Smith	19,166	19,149	19,124	19,145	19,114	19,050	19,014	19,253	19,447	19,636
Stewart	13,324	13,313	13,337	13,228	13,311	13,308	13,243	13,240	13,182	13,355
Sullivan	156,823	156,806	156,820	156,929	156,547	156,562	156,784	156,661	156,667	157,158
Sumner	160,645	160,617	161,249	163,882	166,101	169,110	172,790	175,866	180,063	183,545
Tipton	61,081	61,006	61,077	61,282	61,609	61,599	61,672	61,605	61,303	61,366
Trousdale	7,870	7,864	7,862	7,800	7,774	7,782	7,990	8,035	8,271	10,083
Unicoi	18,313	18,315	18,277	18,285	18,227	18,047	17,914	17,820	17,719	17,759
Union	19,109	19,109	19,102	19,213	19,120	19,055	18,964	19,126	19,140	19,442
Van Buren	5,548	5,558	5,557	5,540	5,635	5,570	5,625	5,686	5,689	5,742
Warren	39,839	39,824	39,851	39,869	39,745	39,893	40,003	40,338	40,516	40,651
Washington	122,979	123,065	123,423	123,920	124,907	125,516	125,999	126,357	127,440	127,806
Wayne	17,021	17,027	16,985	17,012	16,996	16,918	16,846	16,738	16,713	16,583
Weakley	35,021	35,015	35,027	34,907	34,594	34,186	34,001	33,831	33,507	33,337
White	25,841	25,836	25,838	26,050	26,096	26,273	26,346	26,495	26,653	26,753
Williamson	183,182	183,252	184,143	188,342	193,095	199,032	205,317	211,674	219,107	226,257
Wilson	113,993	114,057	114,671	116,780	119,109	122,014	125,404	128,772	132,781	136,442

2010 Combined/Metropolitan/Micropolitan Statistical Areas of Tennessee



Appendix A: DAPC Monitoring Equipment Evaluation 2018

PHYSICAL LOCATION	EQUIPMENT DETAILS		CONDITION
Nashville Field Office	Multi-gas calibrator	Portable Calibrator T750U	Good
Nashville Field Office	Multi-gas calibrator	Portable Calibrator T750U	Good
Bristol	HiVol variable orifice	Kit #9	Good
Athens	PM 2.5 Continuous	BAM 1022, FEM PM 2.5	Good
Athens	TEOM shelter	Ekto	Good
Blountville	Data logger	Agilaire 8872	Good
Blountville	Data logger	ESC 8832	Good
Blountville	Data logger	ESC 8832	Good
Blountville	Ozone analyzers	API 400A	Good
Blountville	Trailer	T&R 8X20	Poor
Loudon Elementary School	Ozone Calibrator	703E Ozone Calibrator	Good
Blountville	Teledyne 400A	Teledyne 400A	Good
Chattanooga	Flow Check Device	Streamline Pro	Good
Bristol	HiVol TSP/Lead	Tisch Housing	Good
Bristol	HiVol TSP/Lead	Tisch Housing	Good
Columbia	Flow Check Device	Streamline Pro	Good
Cedars of Lebanon	Data logger	Agilaire 8872	Good
Cedars of Lebanon	Data logger	ESC 8832	Good
Cedars of Lebanon	Data logger	ESC 8832	Good
Cedars of Lebanon	TEI49C	TEI49C	Good
Cedars of Lebanon	Ozone Calibrator	703E Ozone Calibrator	Good
Cookeville	Flow Check Device	Streamline Pro	Good
Cedars of Lebanon	Ozone analyzers	T400	Good
NFO Storage	Ozone Calibrator	703E Ozone Calibrator	Good
Centerhill	Trailer	Ozone shelter 820	Poor
Central Office	Data logger	Agilaire 8872	Good
Central Office	Data logger	Agilaire 8872	Good
JCFO	Flow Check Device	Streamline Pro	Good
Clarksville	PM 2.5 Continuous	BAM 1022, FEM PM 2.5	Good
Clarksville	TEOM shelter	Ekto	Good
Columbia	PM 2.5 Continuous	BAM 1022, FEM PM 2.5	Good
JFO	Flow Check Device	Streamline Pro	Good
Cookeville	PM 2.5 Continuous	BAM 1022, FEM PM 2.5	Good
KFO	Flow Check Device	Streamline Pro	Good
Dyersburg	PM 2.5 Continuous	BAM 1022, FEM PM 2.5	Good

PHYSICAL LOCATION	EQUIPMENT DETAILS		CONDITION
Dyersburg	TEOM shelter	Ekto	Good
Fairview	Data logger	Agilaire 8872	Good
Fairview	Data logger	ESC 8832	Good
Fairview	Data logger	ESC 8832	Good
Blountville	Ozone Calibrator	703E Ozone Calibrator	Good
Fairview	TEI49C	TEI49C	Good
Freel's Bend	Data logger	Agilaire 8872	Good
Freel's Bend	Data logger	ESC 8832	Good
Freel's Bend	Data logger	ESC 8832	Good
Loudon Elementary School	Ozone analyzers	T400	Good
Fairview	Ozone Calibrator	T703 Ozone Calibrator	Good
Nashville Field Office	Air Compressor (1 of 2)	0.5 HP	Good
Freel's Bend	SO2 analyzers	Teledyne M100E	Good
Freel's Bend	SO2 Calibrator	T700 SO2 Calibrator	Good
Harriman	PM 2.5 Continuous	BAM 1022, FEM PM 2.5	Good
Nashville Field Office	Air Compressor (2 of 2)	0.5 HP	Good
Harriman	TEOM shelter	Ekto	Good
Hendersonville	Data logger	Agilaire 8872	Good
Hendersonville	PM 2.5 Continuous	BAM 1022, FEM PM 2.5	Good
Hendersonville	Data logger	ESC 8832	Good
Hendersonville	Data logger	ESC 8832	Good
Hendersonville	PM 2.5 filter sampler	R&P 2025, FRM	Good
Hendersonville	TEI49C	TEI49C	Good
Freel's Bend	Ozone Calibrator	T703 Ozone Calibrator	Good
Plan to purchase*	Zero air supply	Purchase additional T701 Zero Air Supplies	Good
Jackson	PM 2.5 filter sampler	R&P 2025, FRM	Good
Jackson	PM 2.5 filter sampler	R&P 2025, FRM	Good
Jackson	TEOM shelter	Ekto	Good
Blountville	Trailer	Ozone shelter 820	Poor
JCFO	Trailer	Ozone shelter 820	Poor
Cedars of Lebanon	Trailer	Ozone shelter 820	Poor
Freel's Bend	Trailer	Ozone shelter 820	Poor
Kingsport	Data logger	Agilaire 8872	Good
Kingsport	PM 2.5 Continuous	BAM 1022, FEM PM 2.5	Good
Kingsport	Data logger	ESC 8832	Good
Kingsport	Data logger	ESC 8832	Good

PHYSICAL LOCATION	EQUIPMENT DETAILS		CONDITION
Kingsport	Data logger	ESC 8832	Good
Kingsport	Ozone Calibrator	T703 Ozone Calibrator	Good
Kingsport	Teledyne T400	Teledyne T400	Good
Kingsport	TEOM shelter	Ekto	Good
Harriman	TEOM shelter	Ekto	Poor
Lawrence	TEOM shelter	Ekto	Good
Loretto County Site	BAM 1020 Enclosure	432SP	Good
Loudon Elementary School	Data logger	Agilaire 8872	Good
Loudon Elementary School	Data logger	ESC 8832	Good
Loudon Elementary School	Data logger	ESC 8832	Good
New Market	Ozone Calibrator	T703 Ozone Calibrator	Good
Blountville	Ozone Calibrator	T703 Ozone Calibrator	Good
NFO Storage and QA	Ozone analyzers	T400	Good
Hendersonville	Trailer	Ozone shelter 820	Poor
Maryville	TEOM shelter	Ekto	Good
Kingsport	Trailer	Ozone shelter 820	Poor
Loudon Elementary School	Trailer	O D I, Model 818	Poor
Nashville Field Office	Equinox, SUV	Quality Assurance Audit Vehicle	Good
Nashville Field Office	HiVol calibration	Orifice, variable; plan to be replaced	Good
New Market	Data logger	Agilaire 8872	Good
NFO Storage	Ozone Calibrator	T703 Ozone Calibrator	Good
New Market	Trailer	Ozone shelter 820	Poor
New Market	Data logger	ESC 8832	Good
New Market	Ozone analyzers	API 400E	Good
NFO	Flow Check Device	Streamline Pro	Good
NFO -Quality Assurance	Flow Check Device	Streamline Pro	Good
NFO -Quality Assurance	Flow Check Device	Streamline Pro	Good
NFO -Quality Assurance	Flow Check Device	Streamline Pro	Good
NFO -Quality control	Flow Check Device	Streamline Pro	Good
NFO Storage	Flow Check Device	Streamline Pro	Good
NFO Storage	Flow Check Device	Streamline Pro	Good
NFO Storage	Flow Check Device	Streamline Pro	Good
NFO Storage and QA	Data logger	Agilaire 8872	Good
NFO Storage and QA	Data logger	Agilaire 8872	Good
NFO Storage and QA	Data logger	Agilaire 8872	Good
NFO Storage and QA	Aircheck 224-PCXR7	Aircheck 224-PCXR7	Poor

PHYSICAL LOCATION	EQUIPMENT DETAILS		CONDITION
NFO Storage and QA	Aircheck 224-PCXR7	Aircheck 224-PCXR7	Poor
NFO Storage and QA	Aircheck 224-PCXR7	Aircheck 224-PCXR7	Poor
NFO Storage and QA	PM 2.5 Continuous	BAM 1020, FEM PM 2.5	Good
NFO Storage and QA	PM 2.5 Continuous	BAM 1020, FEM PM 2.5	Good
NFO Storage and QA	PM 2.5 Continuous	BAM 1020, FEM PM 2.5	Good
NFO Storage and QA	PM 2.5 Continuous	BAM 1020, FEM PM 2.5	Good
NFO Storage and QA	PM 2.5 Continuous	BAM 1020, FEM PM 2.5	Good
NFO Storage and QA	PM 2.5 Continuous	BAM 1020, FEM PM 2.5	Good
NFO Storage and QA	PM 2.5 Continuous	BAM 1020, FEM PM 2.5	Good
NFO Storage and QA	PM 2.5 Continuous	BAM 1022, FEM PM 2.5	Good
NFO Storage and QA	PM 2.5 Continuous	BAM 1022, FEM PM 2.5	Good
NFO Storage and QA	PM 2.5 Continuous	BAM 1022, FEM PM 2.5	Good
NFO Storage and QA	PM 2.5 Continuous	BAM 1022, FEM PM 2.5	Good
NFO Storage and QA	Dasisbi 1008PC	Ozone calibrator, replace with newer versions	Poor
NFO Storage and QA	Dasisbi 1008PC	Ozone calibrator, replace with newer versions	Poor
NFO Storage and QA	Dasisbi 1008PC	Ozone calibrator, replace with newer versions	Poor
NFO Storage and QA	Dasisbi 1008PC	Ozone calibrator, replace with newer versions	Poor
NFO Storage and QA	Dasisbi 1008PC	Ozone calibrator, replace with newer versions	Poor
NFO Storage and QA	Dasisbi 1008PC	Ozone calibrator	Poor
NFO Storage and QA	Dasisbi 1008PC	Ozone calibrator	Poor
NFO Storage and QA	Dasisbi 1008PC	Ozone calibrator	Poor
NFO Storage and QA	Dasisbi 1008PC	Ozone calibrator	Poor
NFO Storage and QA	Dasisbi 1008PC	Ozone calibrator	Poor
NFO Storage and QA	Dasisbi 1008PC	Ozone calibrator	Poor
NFO Storage and QA	Dasisbi 1008PC	Ozone calibrator	Poor
NFO Storage and QA	Dasisbi 1008PC	Ozone calibrator	Poor
NFO Storage and QA	Dasisbi 1008PC	Ozone calibrator	Poor
NFO Storage and QA	Dasisbi 1008PC	Ozone calibrator	Poor
NFO Storage and QA	Dasisbi 1008PC	Ozone calibrator	Poor
NFO Storage and QA	Dasisbi 1008PC	Ozone calibrator	Poor
NFO Storage and QA	Data logger	ESC 8816	Good
NFO Storage and QA	Data logger	ESC 8816	Good
NFO Storage and QA	Data logger	ESC 8816	Good
NFO Storage and QA	Data logger	ESC 8816	Good
NFO Storage and QA	Data logger	ESC 8816	Poor
NFO Storage and QA	Data logger	ESC 8816	Good

PHYSICAL LOCATION	EQUIPMENT DETAILS		CONDITION
NFO Storage and QA	Data logger	ESC 8816	Good
NFO Storage and QA	Data logger	ESC 8816	Poor
NFO Storage and QA	Data logger	ESC 8816	Poor
NFO Storage and QA	Data logger	ESC 8816	Poor
NFO Storage and QA	Data logger	ESC 8816	Good
NFO Storage and QA	Data logger	ESC 8816	Good
NFO Storage and QA	Data logger	ESC 8816	Poor
NFO Storage and QA	Data logger	ESC 8816	Poor
NFO Storage and QA	Data logger	ESC 8832	Good
NFO Storage and QA	Data logger	ESC 8832	Good
NFO Storage and QA	Data logger	ESC 8832	Good
NFO Storage and QA	Data logger	ESC 8832	Good
NFO Storage and QA	Data logger	ESC 8832	Good
NFO Storage and QA	Flow bench standard, multi gas standard QA	Mesa Labs Drycal	Good
NFO Storage and QA	Flow bench standard, multi gas standard QA	Seirra Cal Bench	Poor
NFO Storage and QA	Flow Check Device	BGI Challenger	Good
NFO Storage and QA	Flow Check Device	BGI TetraCal	Good
NFO Storage and QA	HiVol TSP/Lead	GMW 2000	Good
NFO Storage and QA	HiVol TSP/Lead	GMW 76-100	Good
NFO Storage and QA	HiVol TSP/Lead	GMW 76-100	Good
NFO Storage and QA	HiVol TSP/Lead	GMW 76-100	Good
NFO Storage and QA	HiVol TSP/Lead	GMW 76-100	Good
NFO Storage and QA	HiVol TSP/Lead	GMW 76-100	Good
NFO Storage and QA	HiVol TSP/Lead	GMW 76-100	Good
NFO Storage and QA	HiVol TSP/Lead	GMW 76-100	Good
NFO Storage and QA	HiVol TSP/Lead	GMW Housing	Good
NFO Storage and QA	HiVol TSP/Lead	GMW Housing	Good
NFO Storage and QA	HiVol TSP/Lead	GMW Housing	Good
NFO Storage and QA	HiVol TSP/Lead	GMW Housing	Good
NFO Storage and QA	HiVol TSP/Lead	Anderson 2000	Good
NFO Storage and QA	HiVol TSP/Lead	Tisch Housing	Good
NFO Storage and QA	HiVol TSP/Lead	Tisch Housing	Good
NFO Storage and QA	HiVol TSP/Lead	Tisch Housing	Good
NFO Storage and QA	Multi-gas calibrator	Environics 6100	Good
NFO Storage and QA	Multi-gas calibrator	Environics Calibrator 6103	Good
NFO Storage and QA	Multi-gas calibrator	Environics Calibrator 6103	Poor

PHYSICAL LOCATION	EQUIPMENT DETAILS		CONDITION
NFO Storage and QA	Multi-gas calibrator	Environics Calibrator 6103	Poor
NFO Storage and QA	Ozone analyzers	API 400A	Poor
NFO Storage and QA	Ozone analyzers	API 400A	Poor
NFO Storage and QA	Ozone analyzers	API 400A	Good
NFO Storage and QA	Ozone analyzers	API 400A	Poor
NFO Storage and QA	Ozone analyzers	API 400E	Good
NFO Storage and QA	Ozone analyzers	API 400E	Good
NFO Storage and QA	Ozone analyzers	API 400E	Poor
NFO Storage and QA	Ozone analyzers	API 400E	Poor
NFO Storage and QA	Ozone analyzers	T400	Good
Blountville	Ozone analyzers	T400	Good
Freel's Bend	Ozone analyzers	T400	Good
NFO Storage and QA	Ozone analyzers	TEI 49C, plan to replace with T400	Good
NFO Storage and QA	Ozone analyzers	TEI 49C, plan to replace with T400	Good
Hendersonville	Ozone Calibrator	T703 Ozone Calibrator	Good
NFO Storage and QA	Ozone analyzers	TEI 49i (ref photometer)	Good
NFO Storage and QA	Ozone analyzers	TEI 49i (ref photometer)	Good
NFO Storage and QA	PM 2.5 Speciation	MetOne SASS	Good
NFO Storage and QA	PM 2.5 Speciation	MetOne SASS	Good
NFO Storage and QA	PM 2.5 Speciation	MetOne SASS	Good
NFO Storage and QA	PM 2.5 Speciation	MetOne SASS	Poor
NFO Storage and QA	PM 2.5 Speciation	MetOne SASS	Good
NFO Storage and QA	PM10 inlet	Graseby	Good
NFO Storage and QA	PM10 inlet	Graseby	Good
NFO Storage and QA	PM 2.5 filter sampler	R&P 2025, FRM	Good
NFO Storage and QA	Orifice certification HiVol	Roots meter	Good
NFO Storage and QA	Orifice certification HiVol	Roots meter 5M125TC	Good
NFO Storage and QA	Flow Check Device	BGI TetraCal	Good
NFO Storage and QA	T100 SO2 Analyzer	gas monitor	Good
NFO Storage and QA	T100 SO2 Analyzer	gas monitor	Good
NFO Storage and QA	SO2 Calibrator	T700 SO2 Calibrator	Good
NFO Storage and QA	SO2 Calibrator	T700 SO2 Calibrator	Good
Ross N Robinson	Portable zero air	T701 Zero Air Supply	Good
Ross N Robinson	Data logger	Agilaire 8872	Good
NFO Storage and QA	Multi-gas calibrator	TEI 146	Poor
NFO Storage and QA	TEI49C	TEI49C	Good

PHYSICAL LOCATION	EQUIPMENT DETAILS		CONDITION
NFO Storage and QA	TEI49C	TEI49C	Good
NFO Storage and QA	Ozone analyzers	TEI 49i	Good
NFO Storage and QA	Ozone analyzers	Teledyne API 400E	Good
NFO Storage and QA	Ozone analyzers	Teledyne API 400E	Good
NFO Storage and QA	Ozone analyzers	Teledyne API 400E	Good
NFO Storage and QA	Ozone analyzers	Teledyne API T400	Good
NFO Storage and QA	Ozone analyzers	Teledyne API T400	Good
NFO Storage and QA	Ozone analyzers	Teledyne API T400	Good
NFO Storage and QA	Ozone analyzers	Teledyne API T400	Good
NFO Storage and QA	SO2 analyzers	Teledyne M100E	Good
NFO Storage and QA	SO2 analyzers	Teledyne M100E	Good
NFO Storage and QA	SO2 analyzers	Teledyne T100	Good
NFO Storage and QA	SO2 Calibrator	T700 SO2 Calibrator	Good
NFO Storage and QA	Multi-gas calibrator	Teledyne T750U, plan to order two additional units	Good
NFO Storage and QA	Multi-gas calibrator	Teledyne T750U	Good
NFO Storage and QA	PM 2.5/10 filter sampler	TEOM 1400a, PM 10 FEM	Good
NFO Storage and QA	PM 2.5/10 filter sampler	TEOM 1400a, PM 10 FEM	Good
NFO Storage and QA	PM 2.5/10 filter sampler	TEOM 1400a, PM 10 FEM	Good
NFO Storage and QA	PM 2.5/10 filter sampler	TEOM 1400a, PM 10 FEM	Good
NFO Storage and QA	PM 2.5/10 filter sampler	TEOM 1400a, PM 10 FEM	Good
NFO Storage and QA	PM 2.5/10 filter sampler	TEOM 1400a, PM 10 FEM	Poor
NFO Storage and QA	TEOM shelter	Ekto	Good
NFO Storage and QA	Flow Check Device	Tetracal, for TEOM	Good
NFO Storage and QA	Flow Check Device	Tetracal, for TEOM	Good
NFO Storage and QA	Trailer	Ozone shelter 820	Poor
NFO Storage and QA	Trailer	Ozone shelter 820	Poor
NFO Storage and QA	Carbon speciation PM 2.5	URG3000N	Good
NFO Storage and QA	Carbon speciation PM 2.5	URG3000N	Good
NFO Storage and QA	Weather	Climatronics Sonic	Good
NFO Storage and QA	SO2 analyzers	Teledyne M100E	Good
Pope	Trailer	Ozone shelter 820	Poor
Ross N Robinson	Data logger	ESC 8832	Good
Ross N Robinson	SO2 analyzers	Teledyne T100	Good
Ross N Robinson	SO2 Calibrator	T700 SO2 Calibrator	Good
Skyland Drive	34 foot tower	Met Tower Sample Manifold	Good

PHYSICAL LOCATION	EQUIPMENT DETAILS		CONDITION
Skyland Drive	Portable zero air	T700 SO2 Calibrator	Good
Skyland Drive	Data logger	Agilaire 8872	Good
Skyland Drive	Data logger	ESC 8832	Good
Skyland Drive	SO2 Calibrator	T700 SO2 Calibrator	Good

Appendix B: Tennessee Monitoring Site Agreement Letters

Kentucky

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION

Division of Air Pollution Control
William R. Snodgrass TN Tower
312 Rosa L. Parks Ave., 15th Floor
Nashville, Tennessee 37243

July 2, 2014

Sean Alteri, Director
Kentucky Division for Air Quality
Kentucky Department for Environmental Protection
200 Fair Oaks Lane
Frankfort, KY 40601

Dear Mr. Alteri:

The United States Environmental Protection Agency (EPA) revised monitoring regulations found in 40 CFR Part 58, Appendix D states in part: "The EPA recognizes that there may be situations where the EPA Regional Administrator and the affected State or local agencies may need to augment or to divide the overall MSA/CSA monitoring responsibilities and requirements among these various agencies to achieve an effective network design. Full monitoring requirements apply separately to each affected State or local agency in the absence of an agreement between the affected agencies and the EPA Regional Administrator." This revision of the CFR also describes the minimum monitoring requirements for the NAAQS pollutants, including continuous PM 2.5 as it applies to MSA areas where the population is sufficient to warrant monitoring for that pollutant. Tennessee and Kentucky share the Clarksville, TN-KY MSA, which is comprised of Trigg and Christian counties in Kentucky and Montgomery county in Tennessee. The US Census Bureau lists this area as containing a population in excess of 260,000.

CBSA Code	Geographic area	Legal/statistical Area description	July 1, 2013 Estimate	2010 Census
17300	Clarksville, TN-KY	Metropolitan Statistical Area	272,579	260,625

The Tennessee Division of Air Pollution Control (TDAPC) currently operates one (1) PM 2.5 FRM monitor and one (1) continuous PM 2.5 monitor in this area. The TDAPC believes the operation of the existing PM 2.5 monitors; (FRM and continuous), are sufficient to properly characterize the particulate air quality in the entire Clarksville, TN-KY MSA and comply with the requirements for both population and concentration based monitoring identified in the revised monitoring regulations as found at 40 CFR58,AppD. The TDAPC would like to invite the

Kentucky Division for Air Quality to participate in Tennessee's annual ambient air monitoring network review. Tennessee commits to sharing with Kentucky any and all quality assured ambient air monitoring data collected in the Tennessee portion of the Clarksville, TN-KY MSA. Tennessee also will notify Kentucky in advance of the intent to relocate or shutdown any of the PM 2.5 monitors referenced above so that adequate monitoring arrangements can be made to meet the entire MSA monitoring requirements for PM 2.5.

Sincerely,

Barry R. Stephens, PE
Director, Air Pollution Control Division

BRS/lb
Cc: Heather McTeer-Toney, US EPA Region IV

Steven L. Beshear
Governor

Leonard K. Peters
Secretary

Energy and Environment Cabinet
Department for Environmental Protection
Division for Air Quality
200 Fair Oaks Lane, 1st Floor
Frankfort, Kentucky 40601-1403
Web site: air.ky.gov

May 15, 2015

Mr. Barry R. Stephens, PE
Director
Tennessee Division of Air Pollution Control
312 Rosa L. Parks Avenue, 15th Floor
Nashville, TN 37243

Dear Mr. Stephens:

In a letter from your office dated July 1, 2014, the Tennessee Division of Air Pollution Control (TDAPC) agreed to operate a continuous $PM_{2.5}$ monitor and an intermittent FRM $PM_{2.5}$ sampler, to meet the minimum network design requirements stated in 40 CFR 58, Appendix D for the Clarksville, TN-KY metropolitan statistical area (MSA). The Kentucky Division for Air Quality (Division) appreciates TDAPC's cooperation and looks forward to participating in TDAPC's annual air monitoring network review.

The Division currently operates one (1) intermittent FRM $PM_{2.5}$ sampler and one (1) continuous ozone monitor at the Hopkinsville site (21-047-0006) in Christian County. In accordance with Table D-2 of 40 CFR 58, Appendix D, one (1) ozone monitor is required to be operated in the Clarksville, TN-KY MSA, based upon the most current population estimates from the US Census Bureau, as well as 2012-2014 ozone design values.

Geographic Area	Area Description	2014 USCB Population Estimate	2014 Three-Year Ozone DV (ppm)
Christian County, KY	County	74,250	0.067
Trigg County, KY	County	14,142	0.069 (CASTNET)
Montgomery County, TN	County	189,961	N/A
Clarksville, TN-KY	**MSA**	**278,353**	**0.069**

To satisfy the regulatory requirement, the Division agrees to operate one ozone monitor at the Hopkinsville site. Also, the Division agrees to notify TDAPC in the event that shutdown or relocation of the ozone monitor is necessary.

Despite the fact that 2012-2014 design values show that no FRM $PM_{2.5}$ samplers are required in the Clarksville MSA, the Division will continue to operate the $PM_{2.5}$ sampler at

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Mr. Barry Stephens
May 15, 2015
Page 2

Hopkinsville. The Division also agrees to notify TDAPC in the event that the Hopkinsville FRM $PM_{2.5}$ sampler must be shutdown or relocated, as it is the design value monitor for the MSA.

The Division commits to sharing with TDAPC any and all quality-assured ambient monitoring data collected in the Kentucky portion of the Clarksville, TN-KY MSA. The Division also welcomes TDAPC participation in Kentucky's annual network review process. If you have any questions or concerns, please contact me at 502-564-3999.

Sincerely,

Sean Alteri

Sean Alteri,
Director

SA/jfm
c: -Heather McTeer Toney, USEPA Region IV
-Daniel Garver, USEPA Region IV

Virginia

Department of Environment & Conservation

May 13, 2016

Michael Dowd
Director of Air Division
Virginia Department of Environmental Quality
P.O. Box 1105
Richmond, VA 23218

Dear Mr. Dowd,

This letter is in regard to ambient air monitoring in the MSA/CSA that our two states share.

The United States Environmental Protection Agency's (EPA) revised monitoring regulations found in 40 CFR Part 58, Appendix D state in part: "The EPA recognizes that there may situations where the EPA Regional Administrator and the affected State or local agencies may need to augment or divide the overall MSA/CSA monitoring responsibilities and requirements among these various agencies to achieve an effective network design. Full monitoring requirements apply separately to each affected State or local agency in the absence of an agreement between the affected agencies and the EPA Regional Administrator." This revision of the CFR also describes the minimum monitoring requirements for the NAAQS pollutants.

Tennessee and Virginia share the Kingsport-Bristol-Bristol, TN-VA MSA, which is comprised of Scott and Washington counties in Virginia, and Hawkins and Sullivan counties in Tennessee. The US Census Bureau estimates the 2015 population under 309,000; however in 2010 the census population was 309,544.

CBSA Code	Geographic Area	Legal/Statistical Area Description	2015 Estimate	2010 Census
28700	Kingsport-Bristol-Bristol, TN-VA MSA	Metropolitan Statistical Area	307,120	309,544

The Tennessee Division of Air Pollution Control (DAPC) currently operates a $PM_{2.5}$, TEOM continuous monitor at site 47-163-1007, two ozone monitors at sites 47-163-2002 and 47-163-2003, and a lead monitor at site 47-163-3004, all in Sullivan County. In addition, we are establishing two SO_2 monitoring sites in the Kingsport, Sullivan County nonattainment area.

Upon a 3 year data review, the records show the ozone concentrations recorded by the two ozone monitors are similar. DAPC will propose that the ozone monitor site 47-163-2002 be shut down in 2017 or at the conclusion of the 2016 ozone monitoring season. The other sites with

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existing monitors in operation: (ozone, $PM_{2.5}$ FRM, and $PM_{2.5}$ continuous TEOM), are sufficient to properly characterize the air quality in the entire Kingsport-Bristol-Bristol, TN-VA MSA and comply with the requirements for both population and concentration-based monitoring, identified in the revised monitoring regulations found in 40 CFR Part 58, Appendix D. The TEOM monitor is used for air quality forecasting.

TDAPC would like to invite the Virginia Department of Environmental Quality Air Division to participate in Tennessee's annual ambient air monitoring network review. Tennessee commits to notifying the Virginia Department of Environmental Quality Air Division in advance of any proposed relocation or shut down of ozone or $PM_{2.5}$ monitors referenced above so that adequate monitoring arrangements can be made to meet the entire MSA monitoring requirements.

If you have technical questions contact Jason Stephens at 615-532-0584/ jason.stephens@tn.gov. I may be contacted at 615-532-9668/michelle.b.walker@tn.gov.

Sincerely,

Michelle W. Owenby

Michelle Walker Owenby
Director
Department of Environment and Conservation
Division of Air Pollution Control

Cc: Heather McTeer-Toney, US EPA Region IV

Appendix C: Sections of the CFR Referred to in the 2018/19 ANMP

§ 58.10 Annual monitoring network plan and periodic network assessment.

(a)(1) Beginning July 1, 2007, the state, or where applicable local, agency shall submit to the Regional Administrator an annual monitoring network plan which shall provide for the documentation of the establishment and maintenance of an air quality surveillance system that consists of a network of SLAMS monitoring stations that can include FRM, FEM, and [Approved Regional Method] monitors that are part of SLAMS, NCore, [Chemical Speciation Networks], PAMS, and SPM stations. The plan shall include a statement of whether the operation of each monitor meets the requirements of appendices A, B, C, D, and E of this part, where applicable. The Regional Administrator may require additional information in support of this statement. The annual monitoring network plan must be made available for public inspection and comment for at least 30 days prior to submission to the EPA and the submitted plan shall include and address, as appropriate, any received comments.

(2) Any annual monitoring network plan that proposes network modifications (including new or discontinued monitoring sites, new determinations that data are not of sufficient quality to be compared to the NAAQS, and changes in identification of monitors as suitable or not suitable for comparison against the annual $PM_{2.5}$ NAAQS) to SLAMS networks is subject to the approval of the EPA Regional Administrator, who shall approve or disapprove the plan within 120 days of submission of a complete plan to the EPA.

(3) The plan for establishing required NCore multipollutant stations shall be submitted to the Administrator not later than July 1, 2009. The plan shall provide for all required stations to be operational by January 1, 2011.

(4) A plan for establishing source-oriented Pb monitoring sites in accordance with the requirements of appendix D to this part for Pb sources emitting 1.0 tpy or greater shall be submitted to the EPA Regional Administrator no later than July 1, 2009, as part of the annual network plan required in paragraph (a)(1) of this section. The plan shall provide for the required source-oriented Pb monitoring sites for Pb sources emitting 1.0 tpy or greater to be operational by January 1, 2010. A plan for establishing source-oriented Pb monitoring sites in accordance with the requirements of appendix D to this part for Pb sources emitting equal to or greater than 0.50 tpy but less than 1.0 tpy shall be submitted to the EPA Regional Administrator no later than July 1, 2011. The plan shall provide for the required source-oriented Pb monitoring sites for Pb sources emitting equal to or greater than 0.50 tpy but less than 1.0 tpy to be operational by December 27, 2011.

(5)(i) A plan for establishing or identifying an area-wide NO_2 monitor, in accordance with the requirements of Appendix D, section 4.3.3 to this part, shall be submitted as part of the Annual Monitoring Network Plan to the EPA Regional Administrator by July 1, 2012. The plan shall provide for these required monitors to be operational by January 1, 2013.

(ii) A plan for establishing or identifying any NO_2 monitor intended to characterize vulnerable and susceptible populations, as required in Appendix D, section 4.3.4 to this part, shall be submitted as part of the Annual Monitoring Network Plan to the EPA Regional Administrator by July 1, 2012. The plan shall provide for these required monitors to be operational by January 1, 2013.

(iii) A plan for establishing a single near-road NO_2 monitor in CBSAs having 1,000,000 or more persons, in accordance with the requirements of Appendix D, section 4.3.2 to this part, shall be submitted as part of the Annual Monitoring Network Plan to the EPA Regional Administrator by July 1, 2013. The plan shall provide for these required monitors to be operational by January 1, 2014.

(iv) A plan for establishing a second near-road NO2 monitor in any CBSA with a population of 2,500,000 persons or more, or a second monitor in any CBSA with a population of 1,000,000 or more persons that has one or more roadway segments with 250,000 or greater AADT counts, in accordance with the requirements of appendix D, section 4.3.2 to this part, shall be submitted as part of the Annual Monitoring Network Plan to the EPA Regional Administrator by July 1, 2014. The plan shall provide for these required monitors to be operational by January 1, 2015.

(6) A plan for establishing SO_2 monitoring sites in accordance with the requirements of Appendix D to this part shall be submitted to the EPA Regional Administrator by July 1, 2011 as part of the annual network plan required in paragraph (a) (1). The plan shall provide for all required SO_2 monitoring sites to be operational by January 1, 2013.

(7) A plan for establishing CO monitoring sites in accordance with the requirements of Appendix D to this part shall be submitted to the EPA Regional Administrator. Plans for required CO monitors shall be submitted at least six months prior to the date such monitors must be established as required by section 58.13.

(8)(i) A plan for establishing near-road $PM_{2.5}$ monitoring sites in CBSAs having 2.5 million or more persons, in accordance with the requirements of Appendix D to this part, shall be submitted as part of the annual monitoring network plan to the EPA Regional Administrator by July 1, 2014. The plan shall provide for these required monitoring stations to be operational by January 1, 2015.

(ii) A plan for establishing near-road $PM_{2.5}$ monitoring sites in CBSAs having 1 million or more persons, but less than 2.5 million persons, in accordance with the requirements of Appendix D to this part, shall be submitted as part of the annual monitoring network plan to the EPA Regional Administrator by July 1, 2016. The plan shall provide for these required monitoring stations to be operational by January 1, 2017.

(9) The annual monitoring network plan shall provide for the required O_3 sites to be operating on the first day of the applicable required O_3 monitoring season in effect on January 1, 2017 as listed in Table D-3 of Appendix D of this part.

(10) A plan for making Photochemical Assessment Monitoring Stations (PAMS) measurements, if applicable, in accordance with the requirements of Appendix D paragraph 5(a) of this part shall be submitted to the EPA Regional Administrator no later than July 1, 2018. The plan shall provide for the required PAMS measurements to begin by June 1, 2019.

(11) An Enhanced Monitoring Plan for O_3, if applicable, in accordance with the requirements of Appendix D paragraph 5(h) of this part shall be submitted to the EPA Regional Administrator no later than October 1, 2019 or two years following the effective date of a designation to a classification of Moderate or above O_3 nonattainment, whichever is later.

(12) A detailed description of the PAMS network being operated in accordance with the requirements of Appendix D to this part shall be submitted as part of the annual monitoring network plan for review by the EPA Administrator. The PAMS Network Description described in section 5 of Appendix D may be used to meet this requirement.

(b) The annual monitoring network plan must contain the following information for each existing and proposed site:

(1) The AQS site identification number.

(2) The location, including street address and geographical coordinates.

(3) The sampling and analysis method(s) for each measured parameter.

(4) The operating schedules for each monitor.

(5) Any proposals to remove or move a monitoring station within a period of 18 months following plan submittal.

(6) The monitoring objective and spatial scale of representativeness for each monitor as defined in Appendix D to this part.

(7) The identification of any sites that are suitable and sites that are not suitable for comparison against the annual $PM_{2.5}$ NAAQS as described in §58.30.

(8) The MSA, CBSA, CSA or other area represented by the monitor.

(9) The designation of any Pb monitors as either source-oriented or non-source-oriented according to Appendix D to 40 CFR part 58.

(10) Any source-oriented monitors for which a waiver has been requested or granted by the EPA Regional Administrator as allowed for under paragraph 4.5(a)(ii) of Appendix D to 40 CFR part 58.

(11) Any source-oriented or non-source-oriented site for which a waiver has been requested or granted by the EPA Regional Administrator for the use of Pb-PM_{10} monitoring in lieu of Pb-TSP monitoring as allowed for under paragraph 2.10 of Appendix C to 40 CFR part 58.

(12) The identification of required NO_2 monitors as near-road, area-wide, or vulnerable and susceptible population monitors in accordance with Appendix D, section 4.3 of this part.

(13) The identification of any $PM_{2.5}$ FEMs and/or ARMs used in the monitoring agency's network where the data are not of sufficient quality such that data are not to be compared to the NAAQS. For required SLAMS where the agency identifies that the $PM_{2.5}$ Class III FEM or ARM does not produce data of sufficient quality for comparison to the NAAQS, the monitoring agency must ensure that an operating FRM or filter-based FEM meeting the sample frequency requirements described in §58.12 or other Class III $PM_{2.5}$ FEM or ARM with data of sufficient quality is operating and reporting data to meet the network design criteria described in Appendix D to this part.

(c) The annual monitoring network plan must document how state and local agencies provide for the review of changes to a $PM_{2.5}$ monitoring network that impact the location of a violating $PM_{2.5}$ monitor. The affected state or local agency must document the process for obtaining public comment and include any comments received through the public notification process within their submitted plan.

(d) The state, or where applicable local, agency shall perform and submit to the EPA Regional Administrator an assessment of the air quality surveillance system every 5 years to determine, at a minimum, if the network meets the monitoring objectives defined in Appendix D to this part, whether new sites are needed, whether existing sites are no longer needed and can be terminated, and whether new technologies are appropriate for incorporation into the ambient air monitoring network. The network assessment must consider the ability of existing and proposed sites to support air quality characterization for areas with relatively high populations of susceptible individuals (e.g., children with asthma), and, for any sites that are being proposed for discontinuance, the effect on data users other than the agency itself, such as nearby states and tribes or health effects studies. The state, or

where applicable local, agency must submit a copy of this 5-year assessment, along with a revised annual network plan, to the Regional Administrator. The assessments are due every five years beginning July 1, 2010.

(e) All proposed additions and discontinuations of SLAMS monitors in annual monitoring network plans and periodic network assessments are subject to approval according to §58.14.

[71 FR 61298, Oct. 17, 2006, as amended at 72 FR 32210, June 12, 2007; 73 FR 67059, Nov. 12, 2008; 73 FR 77517, Dec. 19, 2008; 75 FR 6534, Feb. 9, 2010; 75 FR 35601, June 22, 2010; 75 FR 81137, Dec. 27, 2010; 76 FR 54341, Aug. 31, 2011; 78 FR 16188, Mar. 14, 2013; 78 FR 3282, Jan. 15, 2013; 80 FR 65466, Oct. 26, 2015; 81 FR 17279, Mar. 28, 2016]

Appendix D: Monitoring Network Requirements

Ozone Monitoring Network Requirements

40 CFR 58 Subpart G, Appendix D to Part 58 revised on December 30, 2016

4.1 Ozone (O_3) Design Criteria. (a) State, and where appropriate, local agencies must operate O_3 sites for various locations depending upon area size (in terms of population and geographic characteristics) and typical peak concentrations (expressed in percentages below or near the O_3 NAAQS). Specific SLAMS O_3 site minimum requirements are included in Table D-2 of this appendix. The NCore sites are expected to complement the O_3 data collection that takes place at single-pollutant SLAMS sites, and both types of sites can be used to meet the network minimum requirements. The total number of O_3 sites needed to support the basic monitoring objectives of public data reporting, air quality mapping, compliance, and understanding O_3-related atmospheric processes will include more sites than these minimum numbers required in Table D-2 of this appendix. The EPA Regional Administrator and the responsible State or local air monitoring agency must work together to design and/or maintain the most appropriate O_3 network to service the variety of data needs in an area.

TABLE D–2 OF APPENDIX D TO PART 58 SLAMS MINIMUM O_3 MONITORING REQUIREMENTS

MSA population[1, 2]	**Most recent 3-year design value concentrations ≥85% of any O_3 NAAQS[3]**	**Most recent 3-year design value concentrations <85% of any O_3 NAAQS[3,4]**
>10 million	4	2
4–10 million	3	1
350,000–<4 million	2	1
50,000–<350,000 [5]	1	0

1. Minimum monitoring requirements apply to the Metropolitan statistical area (MSA).

2. Population based on latest available census figures.

3. The ozone (O_3) National Ambient Air Quality Standards (NAAQS) levels and forms are defined in 40 CFR part 50.

4. These minimum monitoring requirements apply in the absence of a design value.

5. Metropolitan statistical areas (MSA) must contain an urbanized area of 50,000 or more population.

(b) Within an O_3 network, at least one O_3 site for each MSA, or CSA if multiple MSAs are involved, must be designed to record the maximum concentration for that particular metropolitan area. More than one maximum concentration site may be necessary in some areas. Table D-2 of this appendix does not account for the full breadth of additional factors that would be considered in designing a complete O_3 monitoring program for an area. Some of these additional factors include geographic size, population density, complexity of terrain and meteorology, adjacent O_3 monitoring programs, air pollution transport from neighboring areas, and measured air quality in comparison to all forms of the O_3 NAAQS (i.e., 8-hour and 1-hour forms). Networks must be designed to account for all of these area characteristics. Network designs must be re-examined in periodic network assessments. Deviations from the above O_3 requirements are allowed if approved by the EPA Regional Administrator.

CO Monitoring Network Requirements

40 CFR 58 Subpart G, Appendix D to Part 58 revised on December 30, 2016

4.2.1 General Requirements. (a) Except as provided in subsection (b), one CO monitor is required to operate collocated with one required near-road NO_2 monitor, as required in Section 4.3.2 of this part, in CBSAs having a population of 1,000,000 or more persons. If a CBSA has more than one required near-road NO_2 monitor, only one CO monitor is required to be collocated with a near-road NO_2 monitor within that CBSA.

(b) If a state provides quantitative evidence demonstrating that peak ambient CO concentrations would occur in a near-road location which meets microscale siting criteria in Appendix E of this part but is not a near-road NO_2 monitoring site, then the EPA Regional Administrator may approve a request by a state to use such an alternate near-road location for a CO monitor in place of collocating a monitor at near-road NO_2 monitoring site.

NO_2 Monitoring Network Requirements

40 CFR 58 Subpart G, Appendix D to Part 58 revised on December 30, 2016

4.3.2 Requirement for Near-road NO_2 Monitors

(a) Within the NO_2 network, there must be one microscale near-road NO_2 monitoring station in each CBSA with a population of 1,000,000 or more persons to monitor a location of expected maximum hourly concentrations sited near a major road with high annual average daily traffic (AADT) counts as specified in paragraph 4.3.2(a)(1) of this appendix. An additional near-road NO2 monitoring station is required for any CBSA with a population of 2,500,000 persons or more, or in any CBSA with a population of 1,000,000 or more persons that has one or more roadway segments with 250,000 or greater AADT counts to monitor a second location of expected maximum hourly concentrations. CBSA populations shall be based on the latest available census figures.

(1) The near-road NO_2 monitoring sites shall be selected by ranking all road segments within a CBSA by AADT and then identifying a location or locations adjacent to those highest ranked road segments, considering fleet mix, roadway design, congestion patterns, terrain, and meteorology, where maximum hourly NO_2 concentrations are expected to occur and siting criteria can be met in accordance with appendix E of this part. Where a state or local air monitoring agency identifies multiple acceptable candidate sites where maximum hourly NO_2 concentrations are expected to occur, the monitoring agency shall consider the potential for population exposure in the criteria utilized to select the final site location. Where one CBSA is required to have two near-road NO_2 monitoring stations, the sites shall be differentiated from each other by one or more of the following factors: fleet mix; congestion patterns; terrain; geographic area within the CBSA; or different route, interstate, or freeway designation.

(b) Measurements at required near-road NO_2 monitor sites utilizing chemiluminescence FRMs must include at a minimum: NO, NO_2, and NO_X.

SO_2 Monitoring Network Requirements

40 CFR 58 Subpart G, Appendix D to Part 58 revised on December 30, 2016

4.4 Sulfur Dioxide (SO_2) Design Criteria.

4.4.1 General Requirements. (a) State and, where appropriate, local agencies must operate a minimum number of required SO2 monitoring sites as described below.

4.4.2 Requirement for Monitoring by the Population Weighted Emissions Index. (a) The population weighted emissions index (PWEI) shall be calculated by States for each core based statistical area (CBSA) they contain or share with another State or States for use in the implementation of or adjustment to the SO2 monitoring network. The PWEI shall be calculated by multiplying the population of each CBSA, using the most current census data or estimates, and the total amount of SO2 in tons per year emitted within the CBSA area, using an aggregate of the most recent county level emissions data available in the National Emissions Inventory for each county in each CBSA. The resulting product shall be divided by one million, providing a PWEI value, the units of which are million persons-tons per year. For any CBSA with a calculated PWEI value equal to or greater than 1,000,000, a minimum of three SO2 monitors are required within that CBSA. For any CBSA with a calculated PWEI value equal to or greater than 100,000, but less than 1,000,000, a minimum of two SO2 monitors are required within that CBSA. For any CBSA with a calculated PWEI value equal to or greater than 5,000, but less than 100,000, a minimum of one SO2 monitor is required within that CBSA.

(1) The SO2 monitoring site(s) required as a result of the calculated PWEI in each CBSA shall satisfy minimum monitoring requirements if the monitor is sited within the boundaries of the parent CBSA and is one of the following site types (as defined in section 1.1.1 of this appendix): population exposure, highest concentration, source impacts, general background, or regional transport. SO2 monitors at NCore stations may satisfy minimum monitoring requirements if that monitor is located within a CBSA with minimally required monitors under this part. Any monitor that is sited outside of a CBSA with minimum monitoring requirements to assess the highest concentration resulting from the impact of significant sources or source categories existing within that CBSA shall be allowed to count towards minimum monitoring requirements for that CBSA.

Table 7: TDEC DAPC Interpretation of the PWEI SO_2 Monitoring Requirements

CBSA AREA NAME	POP ESTIMATE 2017	2011 NEI SO_2 Tons	2011 NEI Data (03/23/2016)							2014 V2 NEI Data (4/12/18)			
			PWEI 2010	PWEI 2011	PWEI 2012	PWEI 2013	PWEI 2014	PWEI 2015	SO_2 Monitors Required	2014 SO_2 NEI Tons*	PWEI 2016	PWEI 2017	SO_2 Monitors Required
Chattanooga, TN-Ga	556,548	953	503	508	512	516	219	525	-	260	2,187	144	-
Clarksville, TN-KY	285,042	431	112	114	119	118	120	122	-	567	196	162	-
Cleveland, TN	122,317	5	1	1	1	1	1	1	-	151	21	18	-
Jackson, TN	129,235	154	20	20	20	20	20	20	-	190	27	25	-
Johnson City, TN	202,053	4	1	1	1	1	1	1	-	100	25	20	-
Kingsport-Bristol-Bristol, TN-VA	306,659	39,082	12,098	12,080	12,071	12,051	12,040	11,972	1	22,164	6,808	6,797	1
Knoxville, TN	877,104	28,722	24,057	24,207	24,351	24,470	24,632	14,947	1	4,726	4,297	4,145	-
Memphis, TN-MS-AR	1,348,260	15,025	19,905	20,025	20,144	20,159	20,182	20,176	1	14,245	19,643	19,207	1
Morristown, TN	118,081	21	2	2	2	2	2	3	-	41	8	5	-
Nashville-Davidson-Murfreesboro-Franklin, TN	1,903,045	24,560	41,038	41,710	42,419	43,191	44,028	45,812	1	20,981	3,982	39,927	1

*NEI data not including mobile sources of SO2

4.4.3 *Regional Administrator Required Monitoring.* (a) The Regional Administrator may require additional SO_2 monitoring stations above the minimum number of monitors required in 4.4.2 of this part, where the minimum monitoring requirements are not sufficient to meet monitoring objectives. The Regional Administrator may require, at his/her discretion, additional monitors in situations where an area has the potential to have concentrations that may violate or contribute to the violation of the NAAQS, in areas impacted by sources which are not conducive to modeling, or in locations with susceptible and vulnerable populations, which are not monitored under the minimum monitoring provisions described above. The Regional Administrator and the responsible State or local air monitoring agency shall work together to design and/or maintain the most appropriate SO_2 network to provide sufficient data to meet monitoring objectives.

4.4.5 *NCore Monitoring.* (a) SO_2 measurements are included within the NCore multipollutant site requirements as described in paragraph (3)(b) of this appendix. NCore-based SO_2 measurements are primarily used to characterize SO_2 trends and assist in understanding SO_2 transport across representative areas in urban or rural locations and are also used for comparison with the SO_2 NAAQS. SO_2 monitors at NCore sites that exist in CBSAs with minimum monitoring requirements per section 4.4.2 above shall be allowed to count towards those minimum monitoring requirements.

Lead Monitoring Network Requirements

40 CFR 58 Subpart G, Appendix D to Part 58 revised on December 30, 2016

4.5 *Lead (Pb) Design Criteria.* (a) State and, where appropriate, local agencies are required to conduct ambient air Pb monitoring near 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, taking into account the logistics and potential for population exposure. At a minimum, there must be one source-oriented SLAMS site located to measure the maximum Pb concentration in ambient air resulting from each non-airport Pb source which emits 0.50 or more tons per year and from each airport 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.

(i) One monitor may be used to meet the requirement in paragraph 4.5(a) for all sources involved when the location of the maximum Pb concentration due to one Pb source is expected to also be impacted by Pb emissions from a nearby source (or multiple sources). This monitor must be sited, taking into account logistics and the potential for population exposure, where the Pb concentration from all sources combined is expected to be at its maximum.

(ii) The Regional Administrator may waive the requirement in paragraph 4.5(a) for monitoring near Pb sources if the State or, where appropriate, local agency can demonstrate the Pb source will not contribute to a maximum Pb concentration in ambient air in excess of 50 percent of the NAAQS (based on historical monitoring data, modeling, or other means). The waiver must be renewed once every 5 years as part of the network assessment required under §58.10(d).

(iii) State and, where appropriate, local agencies are required to conduct ambient air Pb monitoring near each of the airports listed in Table D-3A for a period of 12 consecutive months commencing no later than December 27, 2011. Monitors shall be sited to measure the maximum Pb concentration in ambient air, taking into account logistics and the potential for population exposure, and shall use an approved Pb-TSP Federal Reference Method or Federal Equivalent Method. Any monitor that exceeds 50 percent of the Pb NAAQS on a rolling 3-month average (as determined according to 40 CFR part 50, Appendix R) shall become a required monitor under paragraph 4.5(c) of this Appendix, and shall continue to monitor for Pb unless a waiver is granted allowing it to stop operating as allowed by the provisions in paragraph 4.5(a)(ii) of this appendix. Data collected shall be submitted to the Air Quality System database according to the requirements of 40 CFR part 58.16.

$PM_{2.5}$ Monitoring Network Requirements

40 CFR 58 Subpart G, Appendix D to Part 58 revised on December 30, 2016

4.7.1 General Requirements. (a) State, and where applicable local, agencies must operate the minimum number of required $PM_{2.5}$ SLAMS sites listed in Table D-5 of this appendix. The NCore sites are expected to complement the $PM_{2.5}$ data collection that takes place at non-NCore SLAMS sites, and both types of sites can be used to meet the minimum $PM_{2.5}$ network requirements. Deviations from these $PM_{2.5}$ monitoring requirements must be approved by the EPA Regional Administrator.

Table D-5 of Appendix D to Part 58—$PM_{2.5}$ Minimum Monitoring Requirements

MSA population[1 2]	Most recent 3-year design value ≥85% of any $PM_{2.5}$ NAAQS[3]	Most recent 3-year design value <85% of any $PM_{2.5}$ NAAQS[3 4]
>1,000,000	3	2
500,000-1,000,000	2	1
50,000-<500,000[5]	1	0

[1]Minimum monitoring requirements apply to the Metropolitan statistical area (MSA).

[2]Population based on latest available census figures.

[3]The $PM_{2.5}$ National Ambient Air Quality Standards (NAAQS) levels and forms are defined in 40 CFR part 50.

[4]These minimum monitoring requirements apply in the absence of a design value.

[5]Metropolitan statistical areas (MSA) must contain an urbanized area of 50,000 or more population.

(b) Specific Design Criteria for $PM_{2.5}$. The required monitoring stations or sites must be sited to represent area-wide air quality. These sites can include sites collocated at PAMS. These monitoring stations will typically be at neighborhood or urban-scale; however, micro-or middle-scale $PM_{2.5}$ monitoring sites that represent many such locations throughout a metropolitan area are considered to represent area-wide air quality.

(1) At least one monitoring station is to be sited at neighborhood or larger scale in an area of expected maximum concentration.

(2) For CBSAs with a population of 1,000,000 or more persons, at least one $PM_{2.5}$ monitor is to be collocated at a near-road NO_2 station required in section 4.3.2(a) of this appendix.

(3) For areas with additional required SLAMS, a monitoring station is to be sited in an area of poor air quality.

(4) Additional technical guidance for siting $PM_{2.5}$ monitors is provided in references 6 and 7 of this appendix.

(c) The most important spatial scale to effectively characterize the emissions of particulate matter from both mobile and stationary sources is the neighborhood scale for $PM_{2.5}$. For purposes of establishing monitoring sites to represent large homogenous areas other than the above scales of representativeness and to characterize regional transport, urban or regional scale sites would also be needed. Most $PM_{2.5}$ monitoring in urban areas should be representative of a neighborhood scale.

(1) *Micro-scale.* This scale would typify areas such as downtown street canyons and traffic corridors where the general public would be exposed to maximum concentrations from mobile sources. In some circumstances, the micro-scale is appropriate for particulate sites. SLAMS sites measured at the micro-scale level should, however, be limited to urban sites that are representative of long-term human exposure and of many such microenvironments in the area. In general, micro-scale particulate matter sites should be located near inhabited buildings or locations where the general public can be expected to be exposed to the concentration measured. Emissions from stationary sources such as primary and secondary smelters, power plants, and other large industrial processes may, under certain plume conditions, likewise result in high ground level concentrations at the micro-scale. In the latter case, the micro-scale would represent an area impacted by the plume with dimensions extending up to approximately 100 meters. Data collected at micro-scale sites provide information for evaluating and developing hot spot control measures.

(2) *Middle scale*—People moving through downtown areas, or living near major roadways, encounter particle concentrations that would be adequately characterized by this spatial scale. Thus, measurements of this type would be appropriate for the evaluation of possible short-term exposure public health effects of particulate matter pollution. In many situations, monitoring sites that are representative of microscale or middle-scale

impacts are not unique and are representative of many similar situations. This can occur along traffic corridors or other locations in a residential district. In this case, one location is representative of a number of small scale sites and is appropriate for evaluation of long-term or chronic effects. This scale also includes the characteristic concentrations for other areas with dimensions of a few hundred meters such as the parking lot and feeder streets associated with shopping centers, stadia, and office buildings.

(3) *Neighborhood scale*—Measurements in this category would represent conditions throughout some reasonably homogeneous urban sub-region with dimensions of a few kilometers and of generally more regular shape than the middle scale. Homogeneity refers to the particulate matter concentrations, as well as the land use and land surface characteristics. Much of the $PM_{2.5}$ exposures are expected to be associated with this scale of measurement. In some cases, a location carefully chosen to provide neighborhood scale data would represent the immediate neighborhood as well as neighborhoods of the same type in other parts of the city. $PM_{2.5}$ sites of this kind provide good information about trends and compliance with standards because they often represent conditions in areas where people commonly live and work for periods comparable to those specified in the NAAQS. In general, most $PM_{2.5}$ monitoring in urban areas should have this scale.

(4) *Urban scale*—This class of measurement would be used to characterize the particulate matter concentration over an entire metropolitan or rural area ranging in size from 4 to 50 kilometers. Such measurements would be useful for assessing trends in area-wide air quality, and hence, the effectiveness of large scale air pollution control strategies. Community-oriented $PM_{2.5}$ sites may have this scale.

(5) *Regional scale*—These measurements would characterize conditions over areas with dimensions of as much as hundreds of kilometers. As noted earlier, using representative conditions for an area implies some degree of homogeneity in that area. For this reason, regional scale measurements would be most applicable to sparsely populated areas. Data characteristics of this scale would provide information about larger scale processes of particulate matter emissions, losses and transport. $PM_{2.5}$ transport contributes to elevated particulate concentrations and may affect multiple urban and State entities with large populations such as in the eastern United States. Development of effective pollution control strategies requires an understanding at regional geographical scales of the emission sources and atmospheric processes that are responsible for elevated $PM_{2.5}$ levels and may also be associated with elevated O_3 and regional haze.

4.7.2 Requirement for Continuous $PM_{2.5}$ Monitoring. The State, or where appropriate, local agencies must operate continuous $PM_{2.5}$ analyzers equal to at least one-half (round up) the minimum required sites listed in Table D-5 of this appendix. At least one required continuous analyzer in each MSA must be collocated with one of the required FRM/FEM/ARM monitors, unless at least one of the required FRM/FEM/ARM monitors is itself a continuous FEM or ARM monitor in which case no collocation requirement applies. State and local air monitoring agencies must use methodologies and quality assurance/quality control (QA/QC) procedures approved by the EPA Regional Administrator for these required continuous analyzers.

4.7.3 Requirement for $PM_{2.5}$ Background and Transport Sites. Each State shall install and operate at least one $PM_{2.5}$ site to monitor for regional background and at least one $PM_{2.5}$ site to monitor regional transport. These monitoring sites may be at community-oriented sites and this requirement may be satisfied by a corresponding monitor in an area having similar air quality in another State. State and local air monitoring agencies must use methodologies and QA/QC procedures approved by the EPA Regional Administrator for these sites. Methods used at these sites may include non-federal reference method samplers such as IMPROVE or continuous $PM_{2.5}$ monitors.

4.7.4 $PM_{2.5}$ Chemical Speciation Site Requirements. Each State shall continue to conduct chemical speciation monitoring and analyses at sites designated to be part of the $PM_{2.5}$ Speciation Trends Network (STN). The selection and modification of these STN sites must be approved by the Administrator. The $PM_{2.5}$ chemical speciation urban trends sites shall include analysis for elements, selected anions and cations, and carbon. Samples must be collected using the monitoring methods and the sampling schedules approved by the

Administrator. Chemical speciation is encouraged at additional sites where the chemically resolved data would be useful in developing State implementation plans and supporting atmospheric or health effects related studies.

Index reporting requirements

40 CFR 58 Subpart G, 58.50 Revised as of October 26, 2015.

58.50 Index reporting.

(a) The state or where applicable, local agency shall report to the general public on a daily basis through prominent notice an air quality index that complies with the requirements of Appendix G: Annual Site Evaluations to this part.

(b) Reporting is required for all individual MSA with a population exceeding 350,000.

(c) The population of a MSA for purposes of index reporting is the most recent decennial U.S. census population.

Geographic area	**2010 Census**	**2017 Census Est.**	**Required to Have AQI Reporting**	**Daily AQI/Air Quality Forecasts Provided**
Chattanooga, TN-GA	528143	**556548**	**Yes**	**Yes**
Clarksville, TN-KY	260625	285042	No	Yes
Cleveland, TN	115788	122317	No	No
Jackson, TN	130011	129235	No	No
Johnson City, TN	198716	202053	No	Yes Based on the combined population of both areas.
Kingsport-Bristol-Bristol, TN-VA	309544	306659	No	
Knoxville, TN	837571	877104	**Yes**	Yes In addition, the GSMNP has a separate AQI/Forecast provided.
Memphis, TN-MS-AR	1324829	**1348260**	**Yes**	Yes
Morristown, TN	113951	118081	No	No
Nashville-Davidson--Murfreesboro, TN	1670890	**1903045**	**Yes**	**Yes**

NCore Monitoring Network Requirements and PM $_{10-2.5}$

40 CFR 58 Subpart G, Appendix D to Part 58 Revised as of December 30, 2016

(a) Each State (i.e. the fifty States, District of Columbia, Puerto Rico, and the Virgin Islands) is required to operate at least one NCore site. States may delegate this requirement to a local agency. States with many MSAs often also have multiple air sheds with unique characteristics and, often, elevated air pollution. These States include, at a minimum, California, Florida, Illinois, Michigan, New York, North Carolina, Ohio, Pennsylvania, and Texas. These States are required to identify one to two additional NCore sites in order to account for their unique situations. These additional sites shall be located to avoid proximity to large emission sources. Any State or local agency can propose additional candidate NCore sites or modifications to these requirements for approval by the Administrator. The NCore locations should be leveraged with other multipollutant air monitoring sites including PAMS sites, National Air Toxics Trends Stations (NATTS) sites, CASTNET sites, and STN sites. Site leveraging includes using the same monitoring platform and equipment to meet the objectives of the variety of programs where possible and advantageous.

(b) The NCore sites must measure, at a minimum, PM2.5 particle mass using continuous and integrated/filter-based samplers, speciated PM2.5, PM10-2.5 particle mass, O3, SO2, CO, NO/NOY, wind speed, wind direction, relative humidity, and ambient temperature.

(1) Although the measurement of reactive nitrogen compounds (NOy) is required in support of a number of monitoring objectives, available commercial instruments may indicate little difference in their measurement of NOy compared to the conventional measurement of nitrogen oxides (NOx), particularly in areas with relatively fresh sources of nitrogen emissions. Therefore, in areas with negligible expected difference between NOy and NOx measured concentrations, the Administrator may allow for waivers that permit NOX monitoring to be substituted for the required NOy monitoring at applicable NCore sites.

(2) The EPA recognizes that, in some cases, the physical location of the NCore site may not be suitable for representative meteorological measurements due to the site's physical surroundings. It is also possible that nearby meteorological measurements may be able to fulfill this data need. In these cases, the requirement for meteorological monitoring can be waived by the Administrator.

40 CFR 58 Subpart G, Appendix D to Part 58 revised as of December 30, 2016

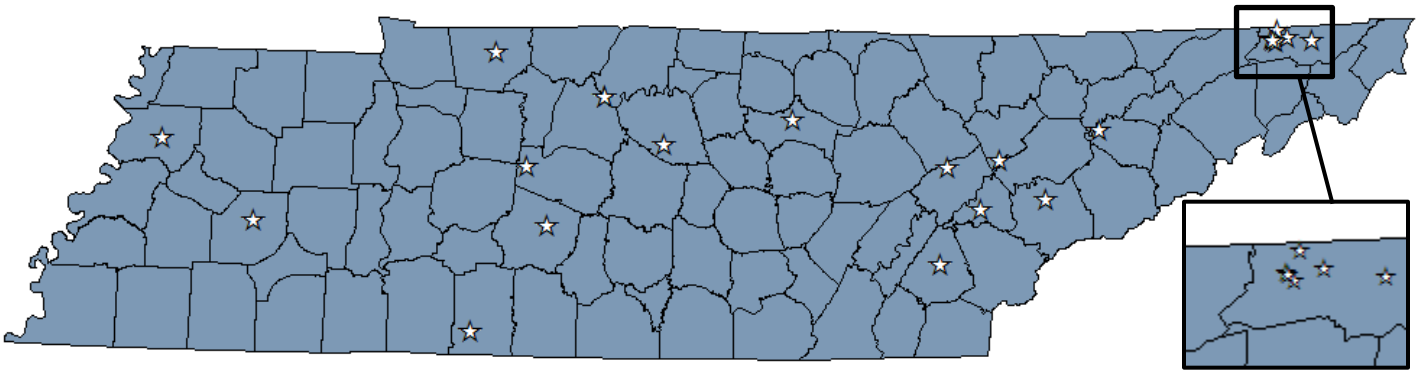
Coarse Particulate Matter (PM10-2.5) Design Criteria.

4.8.1 General Monitoring Requirements. (a) The only required monitors for $PM_{10-2.5}$ are those required at NCore Stations.

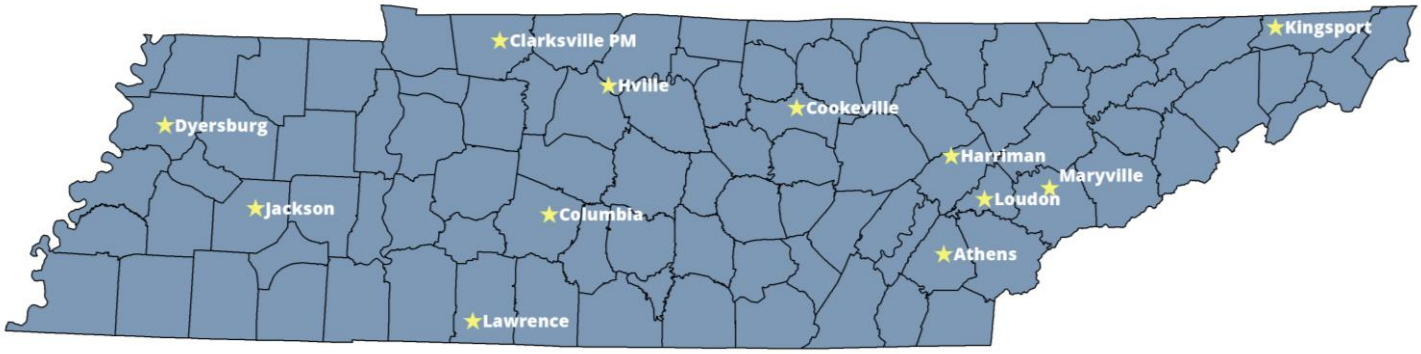
(b) Although microscale monitoring may be appropriate in some circumstances, middle and neighborhood scale measurements are the most important station classifications for $PM_{10-2.5}$ to assess the variation in coarse particle concentrations that would be expected across populated areas that are in proximity to large emissions sources.

Appendix E: TDEC DAPC Monitor Maps

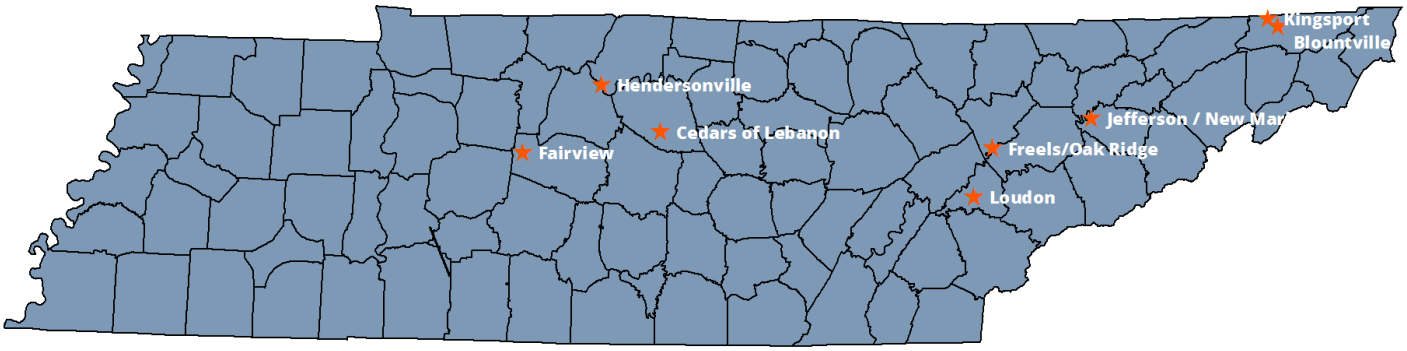
All Monitoring Sites Operated by TDEC DAPC



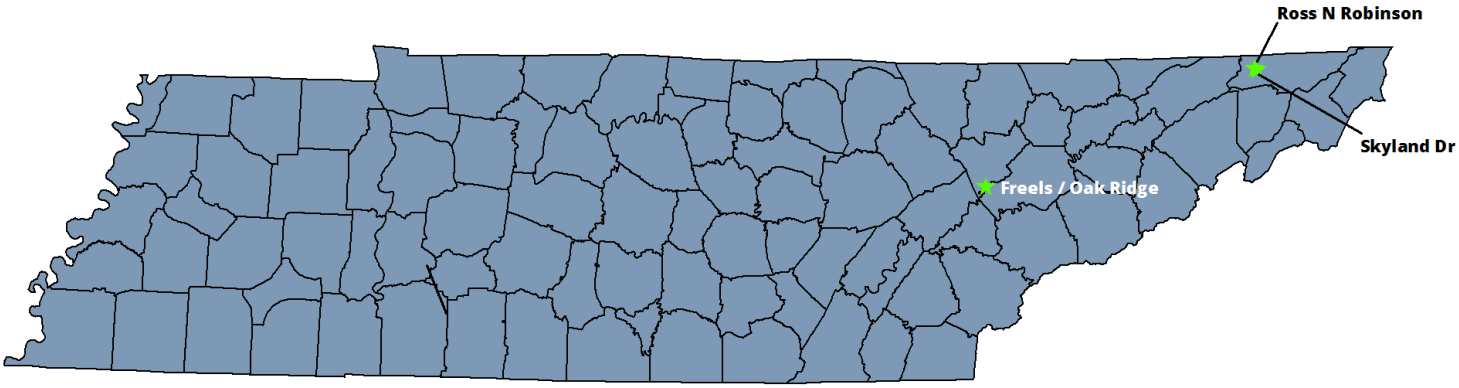
$PM_{2.5}$ Monitor Locations



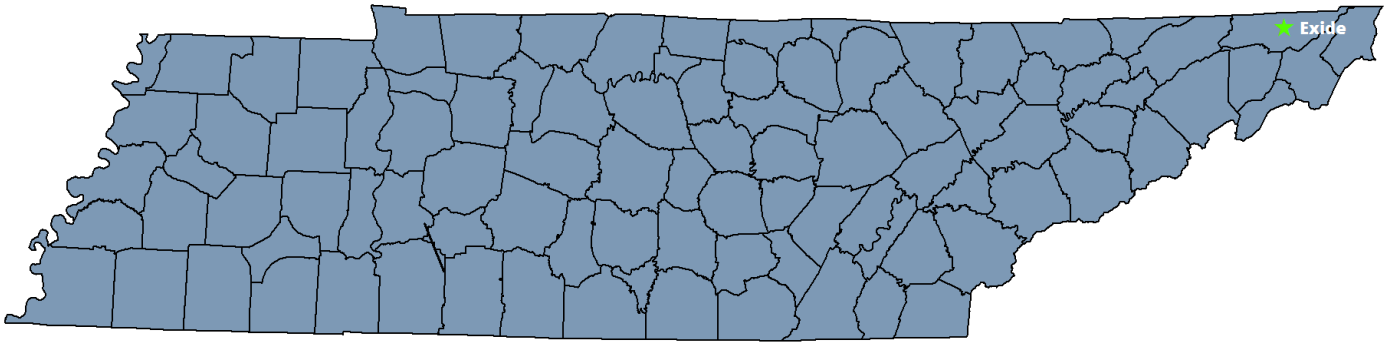
Ozone Monitor Locations



SO_2 Monitor Locations



Lead Monitor Locations



Appendix F: EPA Request and Approval Letters

Jackson and Lawrence Site Waiver

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

MAR 14 2017

Ms. Michelle Walker Owenby
Director
Division of Air Pollution Control
Tennessee Department of Environment and Conservation
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 15th Floor
Nashville, Tennessee 37243

Dear Ms. Owenby:

Thank you for your March 6, 2017, letter requesting waivers to the 40 CFR Part 58, Appendix E siting requirements for the Jackson monitoring site (Air Quality System (AQS) # 47-113-0006) Jackson, TN and the Lawrence monitoring site (AQS # 47-099-0002) located in Loretto, TN. Based on the information provided in your request, the U.S. Environmental Protection Agency Region 4 has determined that the Tennessee Department of Environment and Conservation (TDEC) has met the requirements for waiving the monitor siting requirements for both sites and is approving the waiver requests through December 31, 2017. Below is a more detailed explanation for our approval.

The basis for your request references 40 CFR Part 58, Appendix E, Section 10, which states a waiver can be granted if "the monitor or probe cannot reasonably be located so as to meet the siting criteria because of physical constraints (e.g., inability to locate the required type of site the necessary distance from roadways or obstructions)." The TDEC noted existing trees are encroaching on the monitoring sites and the property owners will not allow the trees to be trimmed or removed. The TDEC is in the process of investigating new sites to relocate both the Jackson and Lawrence $PM_{2.5}$ monitoring sites. The new sites will be proposed in the TDEC's 2017 Annual Network Plan, and the sites will begin collecting data by January 1, 2018.

The EPA reviewed the information submitted by the TDEC and determined both sites meet the waiver requirement in 40 CFR Part 58, Appendix E, Section 10.2. The EPA also reviewed the 2015 design values (DV) and the preliminary 2016 DVs for the two sites. The Jackson site recorded a 2015 DV of 8.3 ug/m^3 and a preliminary 2016 DV of 7.7 ug/m^3. The Lawrence site recorded a 2015 DV of 7.7 ug/m^3 and a preliminary 2016 DV of 7.4 ug/m^3. These DVs are below the national ambient air quality standard (NAAQS) of 12 ug/m^3.

The EPA has determined that the TDEC's request for a waiver of the siting requirements is justified because: 1) the Jackson and Lawrence sites meet the waiver request requirement, 2) the DVs are below the NAAQS, and 3) the TDEC will propose new locations that meet siting requirements in the 2017 Annual Network Plan (with relocation to occur by December 31, 2017). The EPA approves the waiver requests through December 31, 2017. If the sites are not relocated and operating by January 1, 2018, the TDEC will be required to submit a new waiver request.

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The EPA agrees with the TDEC that the $PM_{2.5}$ data collected at the existing sites must be flagged with an "SX" qualifier in AQS during the time the siting issues remain. If you have any questions or concerns about this matter, please contact me or have your staff contact Ms. Sara Waterson at (404) 562-9061 or waterson.sara@epa.gov.

Sincerely,

Beverly H. Banister
Director
Air, Pesticides and Toxics Management Division

cc: Dr. Jason Stephens, Environmental Manager 3
Division of Air Pollution Control

Blountville Monitoring Site

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

FEB 23 2017

Ms. Michelle Walker Owenby
Director
Division of Air Pollution Control
Tennessee Department of Environment and Conservation
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 15th Floor
Nashville, Tennessee 37243

Dear Ms. Owenby:

Thank you for submitting a request to relocate the Blountville monitoring site (AQS # 47-163-2002), dated February 10, 2017. In order to meet 40 CFR Part 58 Appendix E siting requirements, the Tennessee Department of Environment and Conservation stated the site would be moved approximately 25 meters southwest of the current site to address drip line obstructions. Due to the proximity to the current site, the U.S. Environmental Protection Agency Region 4 considers this a reconfiguration of the site rather than a relocation; therefore, public inspection and comment are not required. The EPA approves the reconfiguration of the ozone monitor at the Blountville monitoring site. The new location will continue to report data to AQS # 47-163-2002.

Thank you for working with us to monitor air pollution and promote healthy air quality in Tennessee and the nation. If you have any questions or concerns, please contact Gregg Worley at (404) 562-9141 or Sara Waterson at (404) 562-9061.

Sincerely,

Beverly H. Banister
Director
Air, Pesticides and Toxics Management Division

cc: Mr. Jason Stephens
Manager 3, Tennessee Department
of Environment and Conservation

Internet Address (URL) • http://www.epa.gov
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Fairview Relocation Request

TN Environment & Conservation

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT & CONSERVATION
DIVISION OF AIR POLLUTION CONTROL
WILLIAM R. SNODGRASS TENNESSEE TOWER
312 ROSA L. PARKS AVENUE, 15TH FLOOR
NASHVILLE, TENNESSEE 37243

February 1, 2017

Beverly H. Banister, Director
Air, Pesticides, & Toxics Management Division
US EPA Region 4
Sam Nunn Atlanta Federal Center
61 Forsyth St, SW
Atlanta, GA 30303-8960

Dear Ms. Banister:

The State of Tennessee (TDEC DAPC) would like to request that the EPA approve the relocation of the Fairview ozone monitoring site located in Williamson County, Tennessee. This proposal is described in more detail in the enclosed document. The Fairview site contains one ozone monitor (AQS # 47- 187- 0106). Under the proposal, the site would be moved approximately 221.8 meters southwest of the current site to address drip line obscuration issues and render the site compliant with 40 CFR part 58 Appendix E. This monitor would cease operation and reporting data to the AQS database after the new site has begun to collect data. If approved, the State of Tennessee will start reporting data to the AQS database once the new site is fully functional. The estimated shutdown/startup would take place on or before June 2016.

The current site no longer meets EPA siting criteria. The Williamson Board of Education has agreed to allow TDEC DAPC to relocate the site. The proposed location will comply with EPA 40 CFR part 58 Appendix E requirements.

This proposal is in response to the technical systems audit (TSA) conducted on June 13-17, 2016 for the operational period from January 2013 through December 2015. The audit was conducted by EPA Region 4's Science and Ecosystem Support Division (SESD). The TSA team included Douglas Jager and Richard Guillot.

As a result of the TSA, SESD recommended that TDEC DAPC prioritize our corrective actions according to the findings detailed in Sections 4.1.1 of the TSA report:

Division of Air Pollution Control
William R. Snodgrass Tennessee Tower •15th Floor
312 Rosa L. Parks Avenue • Nashville, TN 37243
Tel: 615-532-0554 • Fax: 615-532-0614
Air.Pollution.Control@tn.gov

TN Environment & Conservation

Nine out of eleven air monitoring stations did not meet established regulatory requirements for distance and spacing (40 CFR part 58 Appendix E).

DAPC must address these siting issues as quickly as possible. Because SESD only inspected a subset of the monitoring stations in the air monitoring network, DAPC must evaluate the remaining sites to ensure compliance with EPA siting requirements. Corrective action measures for nonconforming sites must be completed prior to the start of the 2017 ozone season. The trees may be removed or trimmed, the probe line location(s) may be adjusted, or the sites may be relocated away from these obstacles. For some locations, however, DAPC may need to submit to EPA Region 4 APTMD a request for a waiver, in accordance with the provisions stated in 40 CFR Part 58 Appendix E §10.

With regards to the data collected in the DAPC network, SESD recommends data associated with the violating sites (samplers/analyzers) be flagged in the AQS database. Because the length of time the sites have been out of compliance with the regulations cannot be precisely defined, data must be flagged from January 1, 2016, and continue to be flagged until evidence is provided to EPA demonstrating these siting issues have been corrected. Measurement results impacted by these siting issues must be flagged with the AQS "SX" quality assurance qualifier code (i.e., Does Not Meet Siting Criteria).

TDEC is committed to acting upon the EPA SESD recommendations. Thank you for working with us to monitor air pollution and promote healthy air quality in Tennessee. If you have any questions or concerns, please contact Jason Stephens at (615) 532-0584.

Sincerely,

Quinas N. Stupe III

for Michelle Walker Owenby, Director
Department of Environment and Conservation
Division of Air Pollution

Copy via Email to: Todd Rinck – rinck.todd@epa.gov, Sara Waterson – waterson.sara@epa.gov
Attachment: Fairview Site Information 47- 187- 0106

Division of Air Pollution Control
William R. Snodgrass Tennessee Tower • 15th Floor
312 Rosa L. Parks Avenue • Nashville, TN 37243
Tel: 615-532-0554 • Fax: 615-532-0614
Air.Pollution.Control@tn.gov

Appendix G: Annual Site Evaluations & Documentation

Annual site evaluation, relocation, reconfiguration, and new site documentation can be found at TDEC DAPC's Air Quality Monitoring & Forecasting website:

https://www.tn.gov/environment/program-areas/apc-air-pollution-control-home/-air-quality-forecasting.html.

Tennessee Environment and Conservation
Division of Air Pollution Control

William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 15th Floor
Nashville, Tennessee 37243

Air Monitoring Site Evaluations
TDEC APC

Date: 3/27/18 **Location:** Kingsport, TN
AQS Number: 47-163-6003
Site Name: Eastman Andrew Johnson **Pollutants:** SO2
(Proposed New Site)
Project Leader:

Print Name / Signature / Initials / Duties

1: (Team Lead) Evelyn Haskin EMH Site Specialst

2:

3:

Air Monitoring Site Evaluation Summary

Local Site Name: Eastman Andrew Johnson **Initials:** EMH **Date:** 3/27/18

Additional Comments:

The proposed site will be located at the Andrew Johnson Elementary School, 1001 Ormond Drive, Kingsport, TN 37664 (Lat: 36.526416, Long: -87.528679)
Owner of the property is the Kingsport City Schools.

Since this a site evaluation for a proposed new site, all information concerning equipment, operator, and shelter does not apply.

Distance between school fence and track is 18 feet for the proposed area.

Closest road to proposed site (Montrose Ave- E of site) is 8.2 meters from proposed probe. Other roads near proposed site are Bruce Street (22.6 meters SE of site), Ormond Drive (282 meters N of site), and East Sevier Ave. (146 meters w of site). Closest traffic count stations to proposed site (Konnarock Road- 396.0 meters S of site) had a 2016 count of 3811 ADT and (Sherwood Road – 341 meters SE of site) had a 2016 count of 1528 ADT.

MONITORING SITE EVALUATION FORM (MSEF)

Local Site Name: _Eastman Andrew Johnson__ **Initials:** __EMH_____ **Date:** _3/27/18_____

APC auditor should document in the Site Logbook – the time / date / purpose of visit / APC representatives present **[N] Completed**

Arrival Time: _9:15 am___ **Departure Time:** _11:00 am__ **Primary Operator:** _____

Observer(s): _____

SITE

[Y/N]-**Security Fence** [Y/N]-**Razor/Barb Wire** [Y / N / NA] **Grass/Shrubs Cut** [Y / N / NA] **Bare Soil Area**

[Y/N] **Vandalism** – [□**Inside** / □**Outside**] **Date:** _____ [Y/N] **Police Report Filed**

Issues: _____

SHELTER - Interior

Arrival Temperature: _____**°C** (from data logger) **Operator Site Visits:** _____ per [week | month | _____]

[Y/N] **Leaking Roof** **[Damaged: □Ceiling / □Floor / □Walls]** [Y/N] **Clean / Neat** [Y/N] **Fire Extinguisher**

[Y/N] **Insect / Wildlife Issues** [Y/N] **Thermometer** (min/max) [Y/N] **Gasoline** (inside shelter)

Issues: _____

MONITOR(s): **Location:** Exterior Samplers **[□Roof / □Ground / x Not Present]**

Monitor(s)	Manufacturer	Model	Serial Number

CALIBRATOR(s): **x Not Present** [Y/N] **Are QA/QC Check Gases Vented Outside Shelter?**

QA/QC	Make	Model	Serial Number	Certification Date	Expiration Date

Is any analyzer sampling shelter air through its calibration line? [Y/N] If yes, photo, document and notify agency mgr.

MSEF (Page 2/5): Local Site Name: Eastman Andrew Johnson_____ **Initials:** __EMH_____ **Date:** _3/27/18____

All Gas Standards Pass thru all Filters during: [Y/N] **Calibrations** (Not Required) [Y/N] **Precision Checks** (Required) [Y/N] **Audits** (Required)

Issues: _____

CYLINDER GAS STANDARDS: **x Not Present**

VENDOR: **(PSI Reading < 200, tank is empty and should not be in service)**

QA /QC	Gas Standard	PSI Reading	Expiration Date	Standard Concentration	Serial Number

Issues: _____

SUPPORTING INSTRUMENTATION: **Internal**

[Y/N] **Temperature Sensor** [Y/N] **Uninterruptable Power Supply**

Zero Air System: **Commercial System** (Make / Model): _____

Cartridge System: [□Silica Gel □Pink / □Blue] / □Charcoal / □Purafil / □Hopcalite / Other: _____]

[Y/N] **Needs Service** **Last Service Date:** _____ **Condition:** _____

Issues: _____

Probe Line(s): [□Replaced / □Cleaned] – Frequency: _____ **Last Service Date:** _____

[Y/N] **Clean** [Y/N] **Heated** [Y/N] **Insulated** [Y/N] **Moisture** [Y/N] **Retractable** [Y/N] **Old / Unused Lines**

[Y/N] **Lo Flo Manifold -> [Y/N] Any Open Ports? –> How many analyzers using manifold?** _____

Issues: _____

MSEF (Page 3/5): Local Site Name: Eastman Andrew Johnson_____ **Initials:** __EMH_____ **Date:** _3/27/18____

SHELTER – Exterior **x Not Present**

Type: [□Freezer / □Wood Building / □Brick-Block / Other: _____]

[Y/N] **Needs Maintenance** (specify) [Y/N] **Tied Down** [Y/N] **Electrically Grounded** [Y/N] **Roof Railing**

Roof Access: [Stairs [Interior/Exterior] / Ladder [attached/removable] / □ Not Present] [Y/N] **Loose Decking** (Trip Hazard)

Issues: _____

Height of Roof: _____meters **Roofing Material**: _____

Issues: _____

OUTDOOR SAMPLERS **x Not Present**

[Y/N] **Locked** [Y/N] **Electrically Grounded** [Y/N] **Stabilized** [Y/N] **Clean Inside** [Y/N] **Head/Separator Clean**

Operator / Log: VSCC/WINS Clean Schedule: _____ PM_{10} Head Clean Schedule: _____

Issue(s): _____

COLLOCATED SAMPLERS: **x Not Present** (39.4 inches = 1 meter)

Pollutant	Flow (Hi / Lo)	*Separation Distance (meters)

*Collocated monitors **must be within 4 meters of each other** and at least **2 meters apart** for flow rates **greater than 200 liters/min** or at **least 1 meter apart** for samplers having flow rates **less than 200 liters/min** to preclude airflow interference, unless a waiver is in place as approved by the Regional Administrator pursuant to section 3 of Appendix A.

PROBE SYSTEM(s): External **□ Not Present**

Inlet Type: [□Single Line / □Dual Line / □Bell Type (CAS design)]

Funnel(s): [□Rain Shield / □Part of Probe] **Funnel Material**: [□Teflon® / □Glass / □Stainless Steel / Other: _____]

Probe Line(s): [□Teflon® / Other: _____] **Probe Fitting(s)**: [□Teflon® / Other: _____ / □ Not Present]

Residence Time: (20 sec. max) (Refer to chart for maximum line lengths)

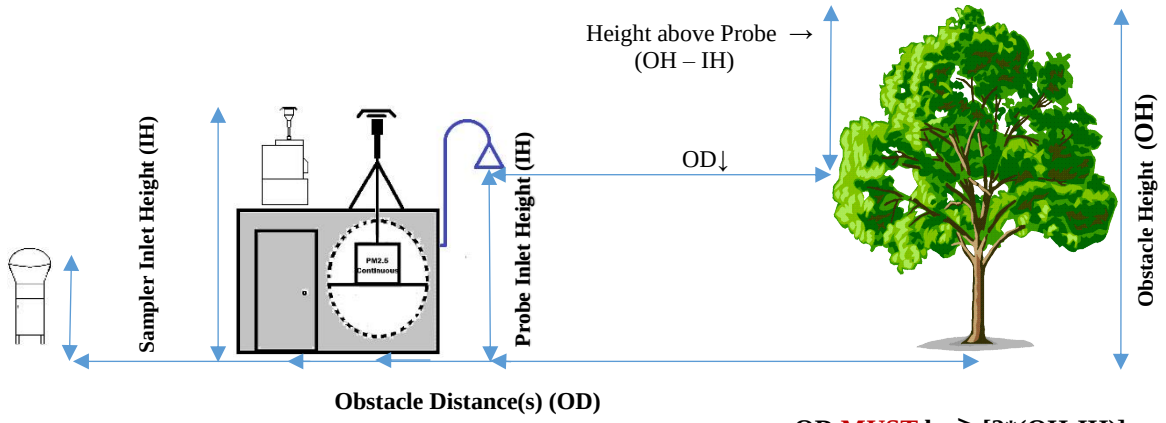
Issue(s): _____

Pollutant(s)	Inlet Height (meters)	Inlet Location (Side of Shelter, Ground, Roof)	*Horizontal Distance (meters) If Applicable	*Vertical Distance (meters) If Applicable	Monitoring SCALE	
					AQS	Annual Network Plan
SO2	> 3.0				Neighborhood	Neighborhood

FOR Horizontal and Vertical Distances: Separation Distance = (1 meter for O_3, SO_2,) & (2 meters for PM, Pb)
When probe is located on a rooftop, this separation distance is in reference to walls, parapets, or penthouses located on roof.

MSEF (Page 4/5): Local Site Name: Eastman Andrew Johnson_____ **Initials:** __EMH_____ **Date:** _3/27/18____

OBSTRUCTION(s): **Distance from** sampler, **probe** to obstacle, such as a building, **must be at least twice the height the obstacle protrudes above the sampler and probe**. Sites not meeting this criterion may be classified as middle scale.



All distances in meters **OD MUST be ≥ [2*(OH-IH)]**

Obstacle(s)	Obstacle Height (OH)	Sampler/Probe Inlet Height (IH)	[2*(OH-IH)]	Obstacle Distance (OD)
Tree 1	23.6	3	41.2	17.4

Please identify each of these obstacles in the SITE DRAWING (next page)

TREE DRIPLINE(s): _____inches = _____**meters** (nearest inlet to dripline) ☐ **No Trees Present**

(39.4 inches = 1 meter) _____inches = _____**meters** (nearest inlet to dripline) ☐ Not Present

_____inches = _____**meters** (nearest inlet to dripline) ☐ Not Present

Should be greater than **20 meters** from the dripline of tree(s) and **must be 10 meters** from the dripline when the tree(s) act as an obstruction.

Issues: _The school has given permission to remove these two trees when the shelter is installed on site. Measurements recorded in "Additional Information" on page 9._____

Minor Sources:

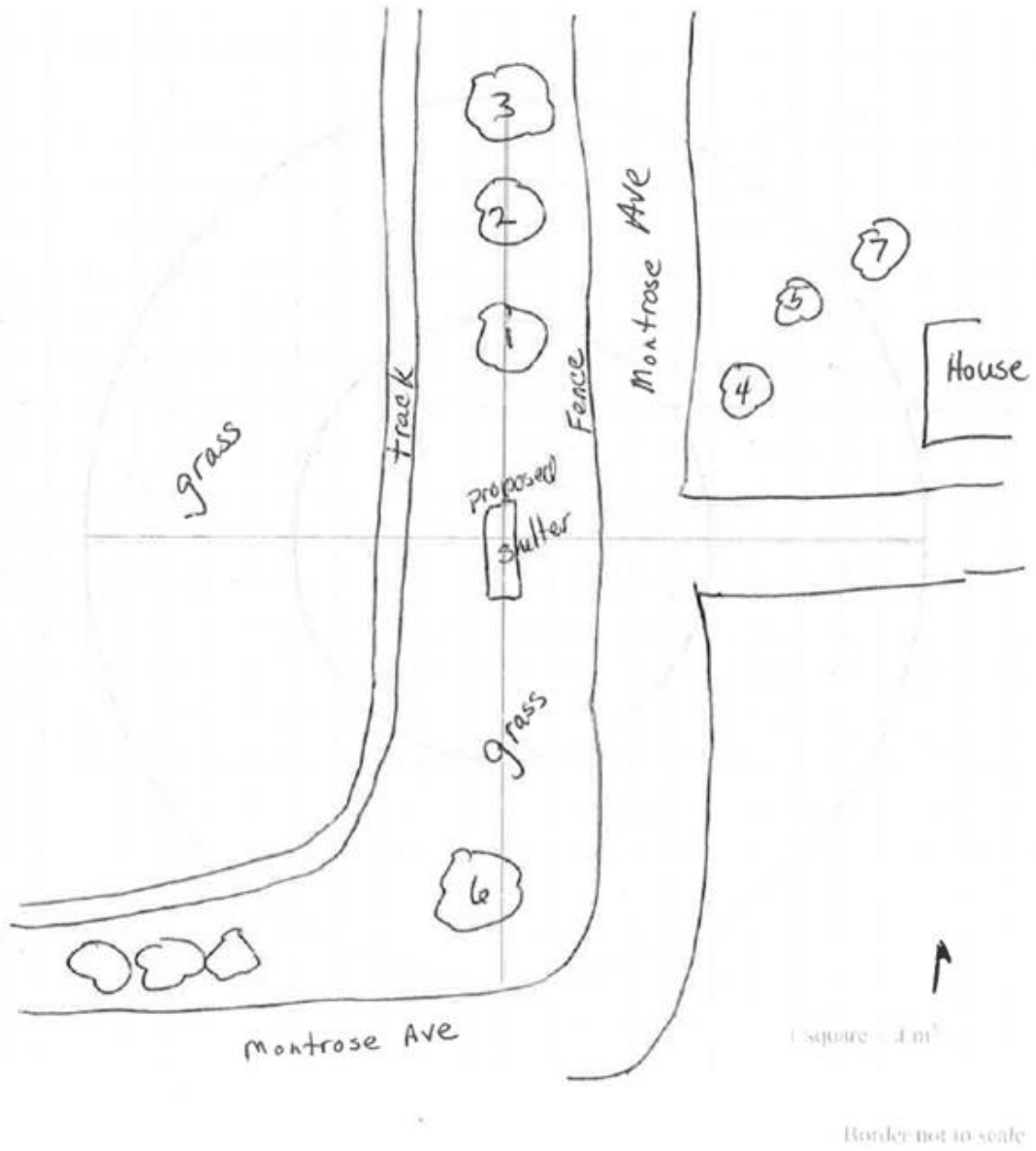
- Groundcover, grass, etc present? (especially for PM samplers)
- Excessive number of chimnies, smoke stacks, fireplaces, diesel heating
- Off road diesel generators near NO_2 or SO_2 analyzers

Issues: _None____

MSEF (Page 5/5): Local Site Name: Eastman Andrew Johnson_____ **Initials:** __EMH_____ **Date:** _3/27/18____

SITE DRAWING - Please Indicate: (relevant distance / height measurements)

Direction NORTH	Monitoring Shelter	Nearby Trees/Shrubs	Possible Sources
Primary Wind Dir	Probe Position(s)	Roadways	Paved / Unpaved Areas
Security Issues	Exterior Samplers	Buildings	Nearby Construction
Sloping Areas	Met Tower	Walls	Flues, Vents, Boilers
	Security Fencing	Other Obstructions	Meat Cooking



UNRESTRICTED AIR FLOW: _> 270_____° **Estimated Degrees of Clearance**

Must have unrestricted airflow **270 degrees** around the probe or sampler; **180 degrees** if the probe is on the **side of a building** or a wall.

Additional Information:

Object	Object Height(OH)	[2*(OH- IH)]	Object Distance
Tree #1	23.6 m	41.2 m	17.4 m
Tree #2	23.6 m	41.2 m	27.4 m
Tree #3	23.6 m	41.2 m	51.0 m
Tree #4	5.8 m	5.6 m	15.4 m
Tree #5	8.4 m	10.8 m	26.4 m
Tree #6	20.0 m	34.0 m	35.4 m
Tree #7	16.8 m	27.6 m	39.0 m

IH is inlet height (3.0 meters is the minimum allowable probe height according to 40 CFR Part 58)

Probe will be > 3 meters and placed on north side of shelter

Tree #1 will be remove during site set up.

Aerial Photo with Wind Rose

PHOTO LOG: **Local Site Name:** Eastman Andrew Johnson_____ **Initials:** __EMH_____ **Date:** _3/27/18____

Camera [x APC / □ Personal – Owner: _____] Make/Model: __Nikon Coolpix_____

Filename: __001_____ **Date:** _3/27/18_____ **Time:** __10:30 am____ **Photographer:** ___EMH_____

Description: __North directional_____

Filename: __002_____ **Date:** _3/27/18_____ **Time:** __10:30 am____ **Photographer:** ___EMH_____

Description: __Northeast directional_____

Filename: __003_____ **Date:** _3/27/18_____ **Time:** __10:30 am____ **Photographer:** ___EMH_____

Description: __East directional_____

Filename: __004_____ **Date:** _3/27/18_____ **Time:** __10:30 am____ **Photographer:** ___EMH_____

Description: __Southeast directional_____

Filename: __005_____ **Date:** _3/27/18_____ **Time:** __10:30 am____ **Photographer:** ___EMH_____

Description: __South directional_____

Filename: __006_____ **Date:** _3/27/18_____ **Time:** __10:30 am____ **Photographer:** ___EMH_____

Description: __Southwest directional_____

Filename: __007_____ **Date:** _3/27/18_____ **Time:** __10:30 am____ **Photographer:** ___EMH_____

Description: __West directional_____

Filename: __008_____ **Date:** _3/27/18_____ **Time:** __10:30 am____ **Photographer:** ___EMH_____

Description: __Northwest directional_____

Filename: _____ **Date:** _____ **Time:** _____**Photographer:** _____

Description: __ _____

Filename: _____ **Date:** _____ **Time:** _____ **Photographer:** _____

Description: _____

Filename: _____ **Date:** _____ **Time:** _____ **Photographer:** _____

Description: _____

Filename: _____ **Date:** _____ **Time:** _____ **Photographer:** _____

Description: _____

Eastman (Proposed site – Andrew Johnson Elementary): Photo Log (2018)

001 North

002 Northeast

003 East

004 Southeast

005 South

006 Southwest

007 West

008 Northwest

CFR Part 58, Appendix E, Tables and Figures

Roadway average daily traffic, vehicles per day	Minimum distance[1] (meters)	Minimum distance[1 2] (meters)
≤1,000	10	10
10,000	10	20
15,000	20	30
20,000	30	40
40,000	50	60
70,000	100	100
≥110,000	250	250

TABLE E-1 OF APPENDIX E TO PART 58—MINIMUM SEPARATION DISTANCE BETWEEN ROADWAYS AND PROBES FOR MONITORING NEIGHBORHOOD AND URBAN SCALE **OZONE (O_3)**

[1]Distance from the edge of the nearest traffic lane. The distance for intermediate traffic counts should be interpolated from the table values based on the actual traffic count.

[2]Applicable for ozone monitors whose placement has not already been approved as of December 18, 2006.

Required Pollutant Probe Height (meters) vs Monitoring Scale:

Pollutant	Micro	Middle	Neighborhood	Urban	Regional
O_3	--	2-15	2-15	2-15	2-15
SO_2	--	2-15	2-15	2-15	2-15
PM, Pb	2-7	2-7	2-15	2-15	2-15

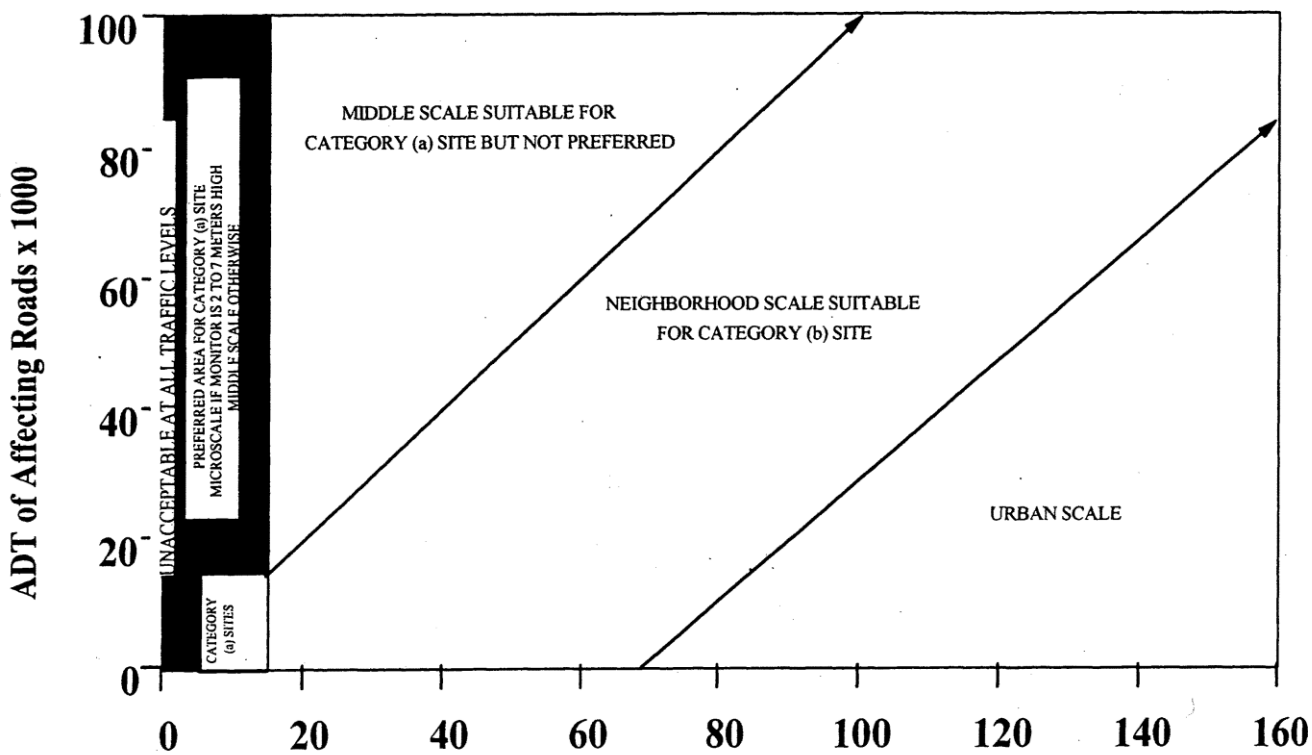


Figure E-1. Distance of PM samplers to nearest traffic lane (meters)

Residence Time: The chart provides the maximum probe line length (in feet) of ¼" OD tubing at given flow rate - using a 20 second residence time. The ID's shown are for thick (1/8"), intermediate (5/32") and thin (3/16") wall Teflon® tubing. The line lengths shown **do not** account for any lo-flo manifold volumes as part of the probe system.

1/4" Line OD / 20 Sec Residence Time			
Flow Rate	**1/8" ID**	**5/32" ID**	**3/16" ID**
(liters/min)	**feet**	**feet**	**feet**
0.1	13.8	8.8	6.1
0.2	27.6	17.7	12.3
0.3	41.4	26.5	18.4
0.4	55.3	35.4	24.6
0.5	69.1	44.2	30.7
0.6	82.9	53.0	36.8
0.7	96.7	61.9	43.0
0.8	110.5	70.7	49.1
0.9	124.3	79.6	55.3
1	138.1	88.4	61.4
1.1	151.9	97.2	67.5
1.2	165.8	106.1	73.7
1.3	179.6	114.9	79.8
1.4	193.4	123.8	85.9
1.5	207.2	132.6	92.1
1.6	221.0	141.4	98.2
1.7	234.8	150.3	104.4
1.8	248.6	159.1	110.5
1.9	262.4	168.0	116.6
2	276.3	176.8	122.8

SUPPORTING INSTRUMENTATION

Temperature Sensor: the shelter must have a temperature sensor inside connected to the data logger. The sensor is not directly required in the regulation, but is needed to demonstrate the operational conditions of the analyzer meet the FRM/FEM requirements.

Uninterruptable Power Supply – not required, but a UPS can offer additional protection to the expensive equipment in the monitoring shelter.

On-Site Computer: not required, can act as a data backup device, can have electronic strip chart information for QC/QA purposes. The operator may utilize a laptop pc instead of one on-site.

Zero Air System:
For a Commercial System: give the make and model
For a home built Cartridge System: identify the cartridges present, if any need service, date of last service, and condition of system. Identify any issues with either system.

Data Logger: Identify system at site
Identify how the analyzers are connected the data logger.

Strip Chart: Is the operator proficient at retrieving and viewing the strip chart?
Does the operator know what it means?
Is the time-scale of the strip chart accurate with the actual or standard time?
Probe Lines:
Frequency – how often are they cleaned or serviced, ask operator or check the logbook for the last service date.

Was any dirt and contamination observed in the probe lines, including condensation? **Y / N**
Are the probe lines heated and insulated? **Y / N**
Are the probe lines retractable – a retractable line is a single line system which can be "retracted" inside the shelter from its sampling position? **Y / N**
Comment and identify on any issues about the probe lines or attached additional sheets.

_____

_____

_____

_____

RECORDS – at site
Documents available (QAPPs, SOPs)?

_____

Are these electronic or hardcopy?

_____

Are logbooks at the site?

_____

Charts / Papers on Walls: What do they Track, Up-to-date?

_____

SHELTER
Is the shelter tied down – physically tied with hurricane straps?
Is the shelter grounded - look for rod in the ground and lead wire connection?

Type of Shelter(s) located on site:

1. **Enclosure: Y**
2. **Trailer: N**
3. **None: N**
4. **Other: Y**

What are the shelter(s) made of?

1. _____
2. _____
3. _____
4. _____

Are any of the shelter(s) in need of maintenance (painting, cleaning, mold removal, repair)? **Y / N**
With roof top samplers or inlets – is a roof railing present? **Y / N** (May not be required in accordance with local ordinances)
Roof Access: Stairs or Ladder? **Y / N**
Stairs can be inside or outside – Ladders are usually permanently attached or removable? **Y / N**
Are any of the shelter(s) in need of maintenance (painting, cleaning, mold removal, repair)? **Y / N**
Write additional comments on the shelters below:

_____

_____

_____

_____

INDEX

Local Site Name: prefer name used by agency monitoring staff for this site, this field should be completed for each page of the evaluation form, if a sheet ever separates from the logbook it can be returned to the proper place.

Initials: Initials of auditor completing form.

Date: current date site is entered by auditor

Reminder: If present, the auditor should add comment to the Site Logbook including: time, date, purpose of visit, auditors present.

Arrival Time: time auditors arrive at site

Departure Time: time auditors depart site

Primary Operator: the sites main operator, include parameters responsible for

Observers: person(s) at site, attending agency staff, site operators, other EPA, State auditors present

Networks: check all that apply, indicates type / purpose of monitoring conducted at site

SITE (Questions to ask yourself)
Security Fence: present or not? Security fencing can help with sample integrity. Is there more than one lock on gate, who has access other than monitoring staff?

Razor/Barb Wire - present or not? Note condition if damaged or aging – rusted? Is wire hanging down out of proper place?

Grass/Shrubs Cut: Is the grass and/or shrubs at the monitoring site cut and trimmed? Who is responsible for grass/shrub/tree maintenance? Is it regularly maintained?

Bare Soil: Does the site area consist of bare soil? Could be a local source for PM samplers (40 CFR Part 58 Appendix E, §3)

Vandalism – Any vandalism history at Site? Inside or Outside / check both if necessary? Date of last occurrence. Were police notified? If vandalism is current/ how serious/ gunfire into shelter?, loss of equipment/records?

SHELTER – Interior note condition/age of shelter, roof issues, water damage, and t, mold - insect issues, any electrical issues, is it clean, are the instruments securely mounted, loud pumps, is the lock secure

Arrival Temperature: Ask operator to provide current reading from data logging system if available. Values should be 20-30 °C generally, can depend on instrumentation present – FRM-FEM designations, and is specified in TDEC DAPC's QAPP. Some agencies keep the shelters near the upper limit in winter to help poorly insulated shelters maintain temperature overnight. May become too warm during mid-day hours. Conversely, an agency may keep the shelter cool in summer to help with high temperatures. Teledyne analyzers are designated FEM for a range of 5-40 °C. Therefore, TDEC DAPC keeps shelters with these monitors within this range (still keeping in mind the 2 deg SD requirement). Shelters are generally kept about 25-26 °C in the warmest months to reduce condensation in sample lines and analyzer.

Operator Site Visits: how many times per week or month, what is the schedule? Does logbook confirm?

Leaking Roof: Does roof leak, evidence may be apparent, question operator?

Damage: Ceiling, Wall, Floor: document damage if present – how long did leak exist before repair?

Clean / Neat: Is interior of shelter maintained, are the floors/counters/walls clean, well-organized, neat in appearance?

Fire Extinguisher: not required by EPA, good idea.

Insect/Wildlife Issues: Termites? Ants? Wasps/Bees? / Larger wildlife causing problems (such as nesting in the undercarriage or walls or digging dens near the foundation/supports)?

Thermometer (min/max): not required, but good insurance measure should temperature probe fail. Operator should document reading at site visit and reset.

Gasoline: Gasoline for weed trimmers, etc. is dangerous to have inside the shelter and can impact concentration values. Gasoline should not be stored in same environment as sample equipment, away from pumps and other electrical equipment as well.

Monitors: document the instrumentation present – monitor / manufacturer / model / serial #, look at the age and/or condition of the instrumentation, clean/dirty, and examine lines for moisture, cleanliness, and kinks/cracks. Moisture in the sample line can scrub pollutant concentrations – data will have to be invalidated if moisture found – determine how long the moisture has been present.
Exterior Samplers – roof or ground.
Met: define the met instrumentation present or not.

Calibrators: can be ozone, gas blenders, audit calibrators, note condition, clean/dirty, and examine lines for moisture, cleanliness, kinks/cracks, examine line from calibrator to analyzer – it should be capped or connected to a solenoid or the calibrator – if the end is open the analyzer may be sampling shelter air – photograph, document, show operator – correct problem, note in site log. For each calibrator present at the site, if the site contains no standards, mark the not present selection and move to the next section.

QA/QC Vented? – Gases should be vented, it's unhealthy for operators to breathe these pollutant concentrations.

Is analyzer sampling Shelter Air? - if the analyzer is sampling shelter air, even partially, all of the data impacted must be invalidated. Some examples of items that can cause this problem are a leaking filter holder or fitting and an uncapped TTP system or sample line tee.

FILTERS: For precision checks and audits, all gas standards (including Ozone) MUST pass through the sample line filter at the back of or internal to the instrument. Check the plumbing, interview the operator and qa auditor on this point. Calibrations may or may not pass through the filter, if it does it should be a clean filter and the records – logbook should indicate an ending precision check, then the filter change, then the calibration. If the calibration gas does not pass through the filter, there should be a probe line integrity check after the calibration – demonstrating the probe line has not impacted the pollutant concentration during the calibration.

Cylinder Gas Standards: complete the table as noted: QA/QC how is the standard used for QA or QC operations?, Gas Standard meaning CO, SO2, NO, NO2, the PSI reading - a low reading (<=200) is a warning that the tank should be considered empty – the gas regulator cannot reliably control lower than this reading. Note the expiration date, standard concentration and tank serial number from the certification information with the tank.

Site Information

Proposed Site 47-163-6003

The following proposed siting information supplements the supporting documentation section immediately following this table. Where applicable, the section from 40 CFR parts 58 is included.

§58.10 (a)(1)	A statement of purposes for each monitor	The proposed Eastman Andrew Johnson Elementary site (1001 Ormond Drive) is located in Sullivan County. This site is located within the 3-km SO2 nonattainment area surrounding the Tennessee Eastman Chemical Plant and is located downwind from the plant. The site will characterize the maximum expected concentration in the nonattainment area.
	Site photos facing from the site in each direction (N, S, E, W)	See photographs for general site information in the next sections. Photographs for the proposed site are included.
	Applicable measurements to any obstructions or trees	See measurement graphic provided in the next sections. The tree (17.4 meters) north of the proposed site will be removed during site set-up. The nearest roadway is (Montrose Ave.) 8.2 meters away.
	Estimated PM2.5 inlets height for the site.	The SO2 probe height will be > 3 meters.
§58.10 (b)	(1) The AQS site identification number.	The AQS ID for proposed site is: 47-163-6003. The proposed site is located at 1001 Ormond Drive, Kingsport, TN 37664.
	(2) The location, including street address and geographical coordinates.	The proposed site is located at 1001 Ormond Drive, Kingsport, TN 37664, Lat. 36.526416, Lon. -82.528679, Elev. 1266 ft.
	(3) The sampling and analysis method(s) for each measured parameter.	Teledyne T100 SO_2 analyzer (EQSA-0495-100)
	(4) The operating schedules for each monitor.	The SO2 monitor will operate continuously, collecting hourly data.

	(5) Any proposals to remove or move a monitoring station within a period of 18 months following plan submittal.	The proposed site is planned to operate for at least 5 years if approved.
	(6) The monitoring objective and spatial scale of representativeness for each monitor as defined in appendix D to this part.	Monitoring objective: Source Oriented Spatial Scale: Neighborhood scale—Defines concentrations within some extended area of the city that has relatively uniform land use with dimensions in the 0.5 to 4.0 kilometers range. Site type: population exposure.
	(7) The identification of any sites that are suitable and sites that is not suitable for comparison against the "Ozone and PM2.5 NAAQS".	The proposed site will be suitable for comparison to the SO2 NAAQS. This site will be a SLAMs site.
	(8) The MSA, CBSA, CSA or other area represented by the monitor.	The site is located in the Kingsport-Bristol-Bristol, TN-VA CBSA #28700.

§58.10 (a)(1) Site Photos Facing from the Site in each Direction (N,NE, E, SE, S, SW, W, NW)

Proposed site location at 1001 Ormond Drive, Kingsport, TN. Photos taken by Evelyn Haskin on 3/27/18 with a Nikon Coolpix.

North directional

Northeast directional

East directional

Southeast directional

South directional

Southwest directional

West directional

Northwest directional

§58.10 (a)(1) Applicable Measurements to any Obstructions or Trees

Figure 1: No Obstructions within the 15.4 m Radius of the Proposed Site

Figure 2: No Obstructions within the 15.4 m Radius of the Proposed Site

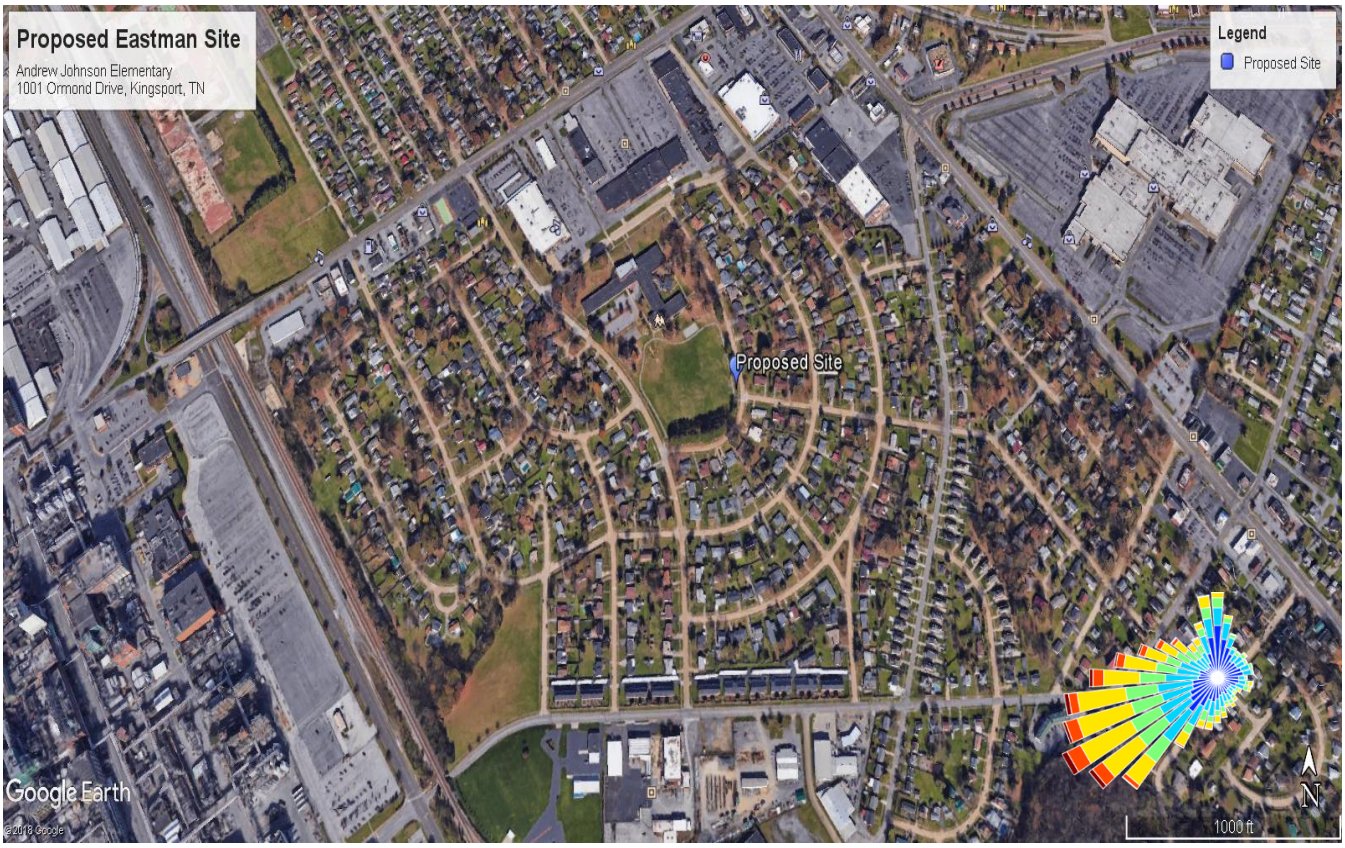
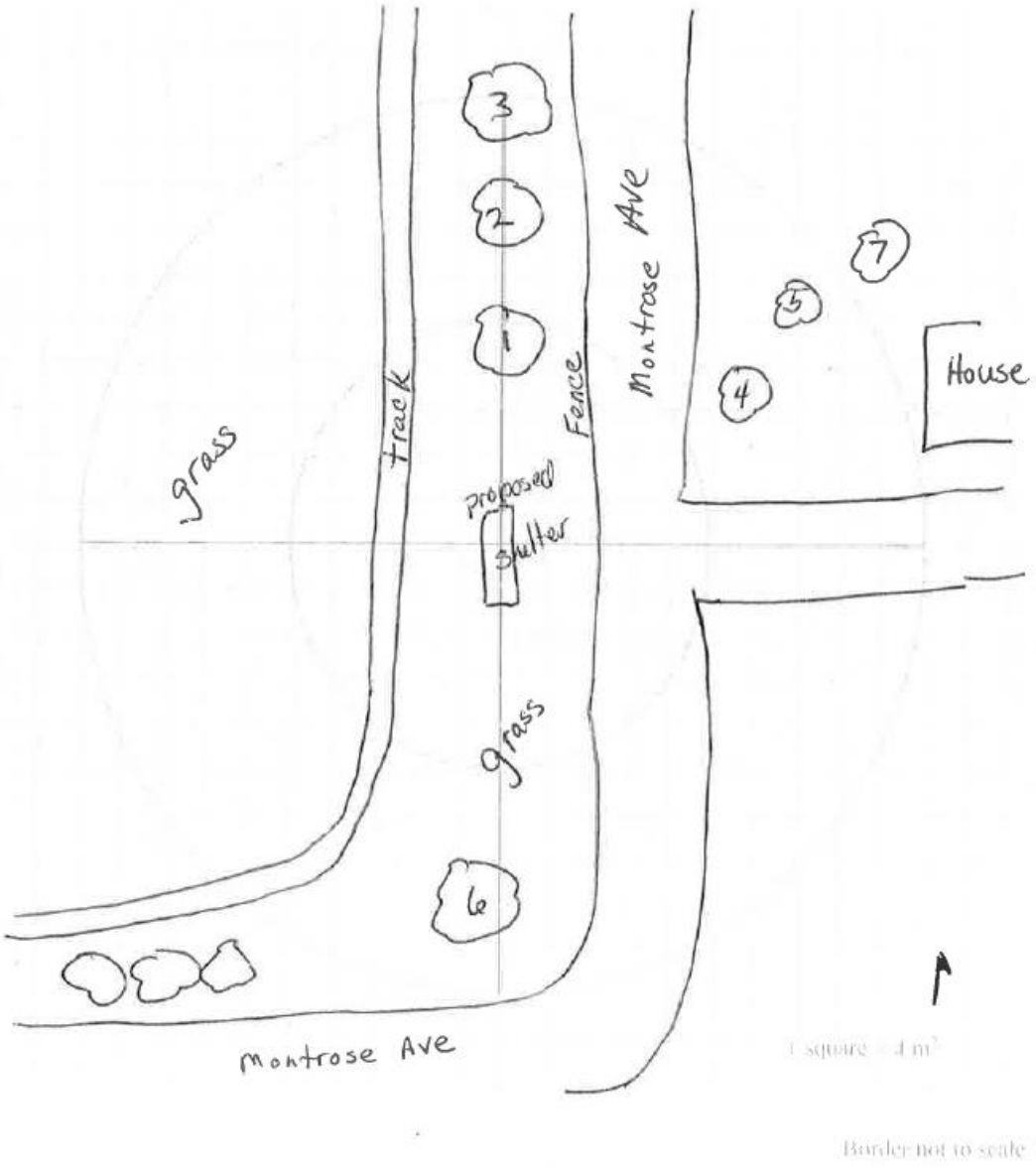


Figure 3: Site Drawing and Measurements of Proposed Site

SITE DRAWING - Please Indicate: (relevant distance / height measurements)

Direction NORTH	Monitoring Shelter	Nearby Trees/Shrubs	Possible Sources
Primary Wind Dir	Probe Position(s)	Roadways	Paved / Unpaved Areas
Security Issues	Exterior Samplers	Buildings	Nearby Construction
Sloping Areas	Met Tower	Walls	Flues, Vents, Boilers
	Security Fencing	Other Obstructions	Meat Cooking



Measurements:

Object	Object Height (OH)	[2*OH-IH (3.0)]	Object Distance
#1 Tree	23.6 m	41.2 m	17.4 m
# 2 Tree	23.6 m	41.2 m	27.4 m
# 3 Tree	23.6 m	41.2 m	51.0 m
# 4 Tree	5.8 m	5.6 m	15.4 m
# 5 Tree	8.4 m	10.8 m	26.4 m
# 6 Tree	20.0 m	34.0 m	35.4 m
# 7 Tree	16.8 m	27.6 m	39.0 m

IH is inlet probe height (used the minimum allowable probe height as stated in §58.10 (a)(1).)

Closest road (Montrose Ave) is 8.2 meters from the proposed probe inlet. Closest traffic count station (Sherwood Road) had a 2016 traffic count 1528 ADT. Montrose Ave. has less traffic than Sherwood Road.

Distance between school fence line and track is 18 feet.

Tree #1 will be removed during the set-up of the site.

The probe will be placed on the north side of the shelter and be greater than 3 meters.

Proposed Site Location Discussion

The following wind rose is presented to establish the representative wind directions based upon the meteorological data collected at the nearby Bristol/Tri-City Airport (Figure 4 and Figure 5). Winds predominately blow from southwest to northeast in the Kingsport area. The proposed site would remain downwind of the Tennessee Eastman Chemical Plant (Figure 6).

Figure 4: 5-Year Wind Frequencies

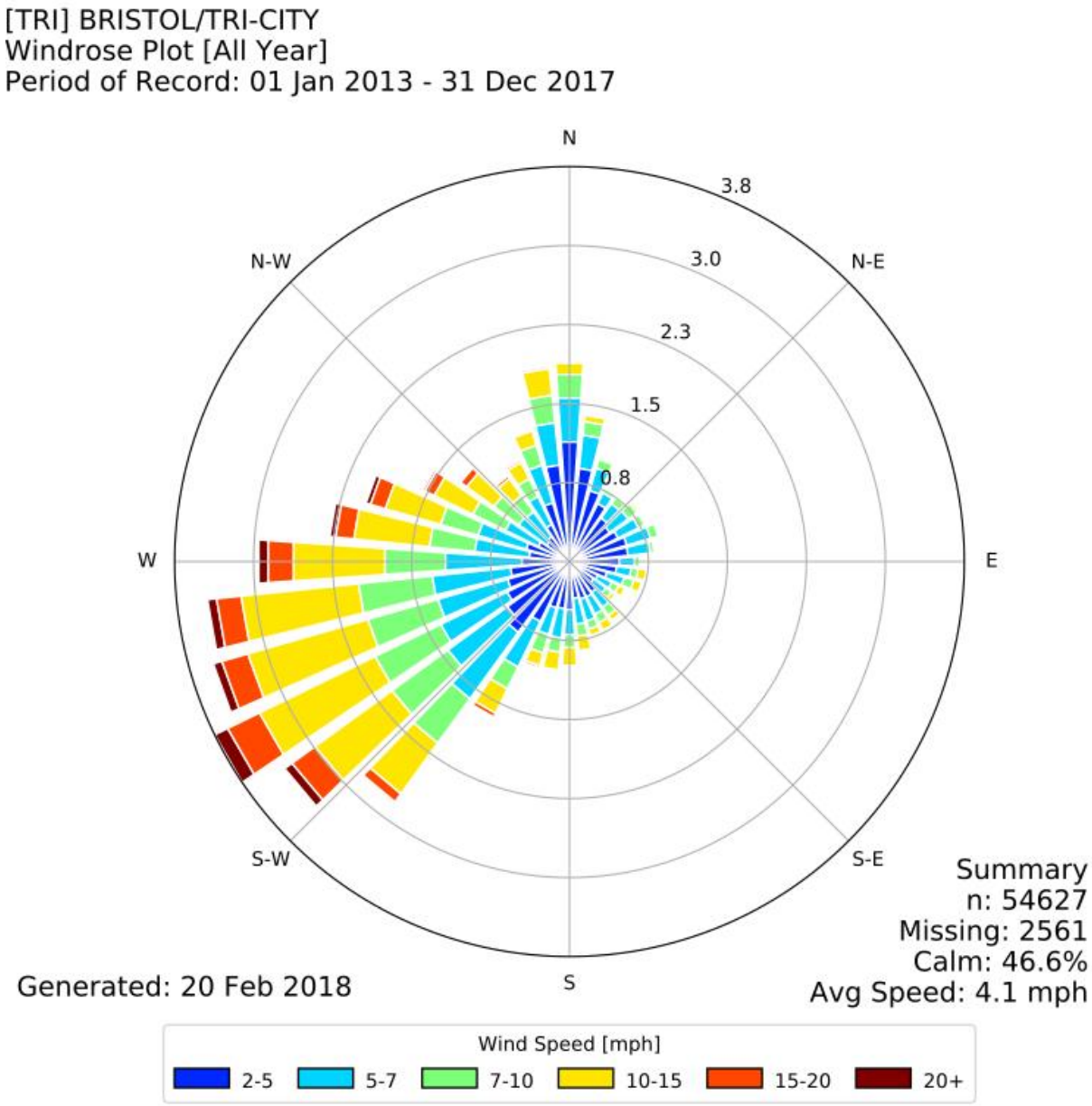
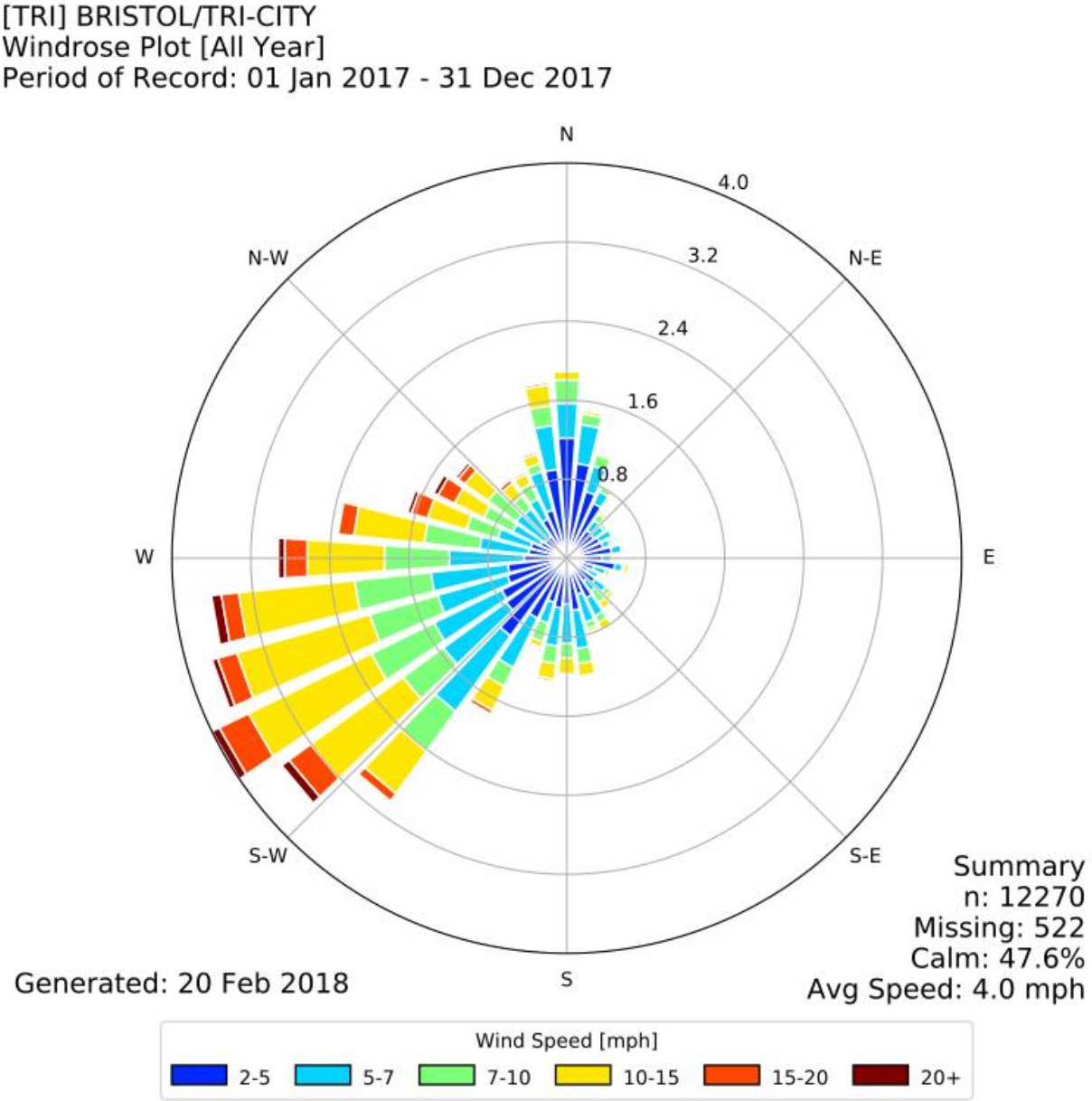


Figure 5 - **1 Year Wind Frequencies (Most recent)**



Tennessee Environment and Conservation
Division of Air Pollution Control

William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 15th Floor
Nashville, Tennessee 37243

Air Monitoring Site Evaluations
TDEC APC

Date: 5/23/18 **Location:** Kingsport, TN
AQS Number: 47-163-6004
Site Name: Eastman Happy Hill **Pollutants:** SO2
(Proposed New Site)
Project Leader:

Print Name / Signature / Initials / Duties

1: (Team Lead) Evelyn Haskin EMH Site Specialst

2: Jason Stephens JMS Project Leader

3:

Air Monitoring Site Evaluation Summary

Local Site Name: Eastman Happy Hill **Initials:** EMH **Date:** 5/23/18

Additional Comments:

The proposed site will be located at 2105 Happy Hill Road, Kingsport, TN 37660
(Lat: 36.513052, Long: -82.550459)

Since this a site evaluation for a proposed new site, all information concerning equipment, operator, and shelter does not apply.

A 10 meter tower will be used at site.

Closest road to proposed site (Happy Hill Road- E of site) is 21.0 meters from proposed probe. Closest traffic count stations to proposed site (South Eastman Road) had a 2016 count of 547 ADT Happy Hill Road has the same amount or less daily traffic.

The property owner has granted permission to remove any necessary vegetation on property needed to meet siting criteria.

MONITORING SITE EVALUATION FORM (MSEF)

Local Site Name: _Eastman Happy Hill_____ **Initials:** __EMH_____ **Date:** _5/23/18_____

APC auditor should document in the Site Logbook – the time / date / purpose of visit / APC representatives present **[N] Completed**

Arrival Time: _10:00 am___ **Departure Time:** _11:00 am__ **Primary Operator:** _____

Observer(s): _____

SITE

[Y/N]-**Security Fence** [Y/N]-**Razor/Barb Wire** [Y / N / NA] **Grass/Shrubs Cut** [Y / N / NA] **Bare Soil Area**

[Y/N] **Vandalism** – [□**Inside** / □**Outside**] **Date:** _____ [Y/N] **Police Report Filed**

Issues: _____

SHELTER - Interior

Arrival Temperature: _____**°C** (from data logger) **Operator Site Visits:** _____ per [week | month | _____]

[Y/N] **Leaking Roof** **[Damaged: □Ceiling / □Floor / □Walls]** [Y/N] **Clean / Neat** [Y/N] **Fire Extinguisher**

[Y/N] **Insect / Wildlife Issues** [Y/N] **Thermometer** (min/max) [Y/N] **Gasoline** (inside shelter)

Issues: _____

MONITOR(s): **Location:** Exterior Samplers **[□Roof / □Ground / x Not Present]**

Monitor(s)	Manufacturer	Model	Serial Number

CALIBRATOR(s): **x Not Present** [Y/N] **Are QA/QC Check Gases Vented Outside Shelter?**

QA/QC	Make	Model	Serial Number	Certification Date	Expiration Date

Is any analyzer sampling shelter air through its calibration line? [Y/N] If yes, photo, document and notify agency mgr.

MSEF (Page 2/5): Local Site Name: _Eastman Happy Hill_____ **Initials:** __EMH_____ **Date:** _5/23/18_____

All Gas Standards Pass thru all Filters during: [Y/N] **Calibrations** (Not Required) [Y/N] **Precision Checks** (Required) [Y/N] **Audits** (Required)

Issues: _____

CYLINDER GAS STANDARDS: **x Not Present**

VENDOR: **(PSI Reading < 200, tank is empty and should not be in service)**

QA /QC	Gas Standard	PSI Reading	Expiration Date	Standard Concentration	Serial Number

Issues: _____

SUPPORTING INSTRUMENTATION: **Internal**

[Y/N] **Temperature Sensor** [Y/N] **Uninterruptable Power Supply**

Zero Air System: **Commercial System** (Make / Model): _____

Cartridge System: [□Silica Gel □Pink / □Blue] / □Charcoal / □Purafil / □Hopcalite / Other: _____]

[Y/N] **Needs Service Last Service Date:** _____ **Condition:** _____

Issues: _____

Probe Line(s): [□Replaced / □Cleaned] – Frequency: _____ **Last Service Date:** _____

[Y/N] **Clean** [Y/N] **Heated** [Y/N] **Insulated** [Y/N] **Moisture** [Y/N] **Retractable** [Y/N] **Old / Unused Lines**

[Y/N] **Lo Flo Manifold -> [Y/N] Any Open Ports? –> How many analyzers using manifold?** _____

Issues: _____

MSEF (Page 3/5): Local Site Name: Eastman Happy Hill **Initials:** EMH **Date:** 5/23/18

SHELTER – Exterior **x Not Present**

Type: [□Freezer / □Wood Building / □Brick-Block / Other: _____]

[Y/N] **Needs Maintenance** (specify) [Y/N] **Tied Down** [Y/N] **Electrically Grounded** [Y/N] **Roof Railing**

Roof Access: [Stairs [Interior/Exterior] / Ladder [attached/removable] / □ Not Present] [Y/N] **Loose Decking** (Trip Hazard)

Issues: _____

Height of Roof: _____meters **Roofing Material**: _____

Issues: _____

OUTDOOR SAMPLERS **x Not Present**

[Y/N] **Locked** [Y/N] **Electrically Grounded** [Y/N] **Stabilized** [Y/N] **Clean Inside** [Y/N] **Head/Separator Clean**

Operator / Log: VSCC/WINS Clean Schedule: _____ PM_{10} Head Clean Schedule: _____

Issue(s): _____

COLLOCATED SAMPLERS: **x Not Present** (39.4 inches = 1 meter)

Pollutant	Flow (Hi / Lo)	*Separation Distance (meters)

*Collocated monitors **must be within 4 meters of each other** and at least **2 meters apart** for flow rates **greater than 200 liters/min** or at **least 1 meter apart** for samplers having flow rates **less than 200 liters/min** to preclude airflow interference, unless a waiver is in place as approved by the Regional Administrator pursuant to section 3 of Appendix A.

PROBE SYSTEM(s): External **□ Not Present**

Inlet Type: [□Single Line / □Dual Line / □Bell Type (CAS design)]

Funnel(s): [□Rain Shield / □Part of Probe] **Funnel Material**: [□Teflon® / □Glass / □Stainless Steel / Other: _____]

Probe Line(s): [□Teflon® / Other: _____] **Probe Fitting(s)**: [□Teflon® / Other: _____ / □ Not Present]

Residence Time: (20 sec. max) (Refer to chart for maximum line lengths)

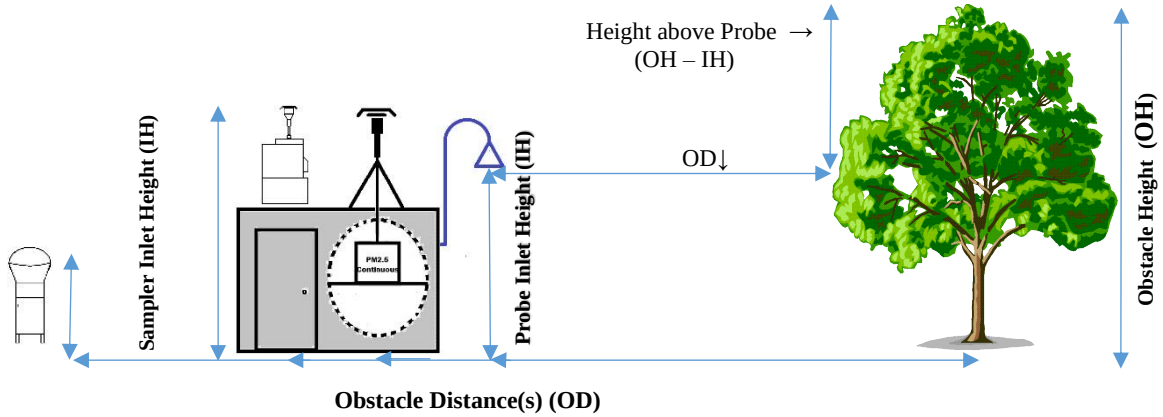
Issue(s): _____

Pollutant(s)	Inlet Height (meters)	Inlet Location (Side of Shelter, Ground, Roof)	*Horizontal Distance (meters) If Applicable	*Vertical Distance (meters) If Applicable	Monitoring SCALE	
					AQS	Annual Network Plan
SO2	10.0	Ground			Neighborhood	Neighborhood

FOR Horizontal and Vertical Distances: Separation Distance = (1 meter for O_3, SO_2,) & (2 meters for PM, Pb)
When probe is located on a rooftop, this separation distance is in reference to walls, parapets, or penthouses located on roof.

MSEF (Page 4/5): Local Site Name: Eastman Happy Hill **Initials:** EMH **Date:** 5/23/18

OBSTRUCTION(s): **Distance from** sampler, **probe** to obstacle, such as a building, **must be at least twice the height the obstacle protrudes above the sampler and probe**. Sites not meeting this criterion may be classified as middle scale.



All distances in meters **OD MUST be ≥ [2*(OH-IH)]**

Obstacle(s)	Obstacle Height (OH)	Sampler/Probe Inlet Height (IH)	[2*(OH-IH)]	Obstacle Distance (OD)

Please identify each of these obstacles in the SITE DRAWING (next page)

TREE DRIPLINE(s): _____inches = _____**meters** (nearest inlet to dripline) ☐ **No Trees Present**

(39.4 inches = 1 meter) _____inches = _____**meters** (nearest inlet to dripline) ☐ Not Present

_____inches = _____**meters** (nearest inlet to dripline) ☐ Not Present

Should be greater than **20 meters** from the dripline of tree(s) and **must be 10 meters** from the dripline when the tree(s) act as an obstruction.

Issues: No dripline or obstacle issues. Measurements recorded in "Additional Information" on page 9.

Minor Sources:

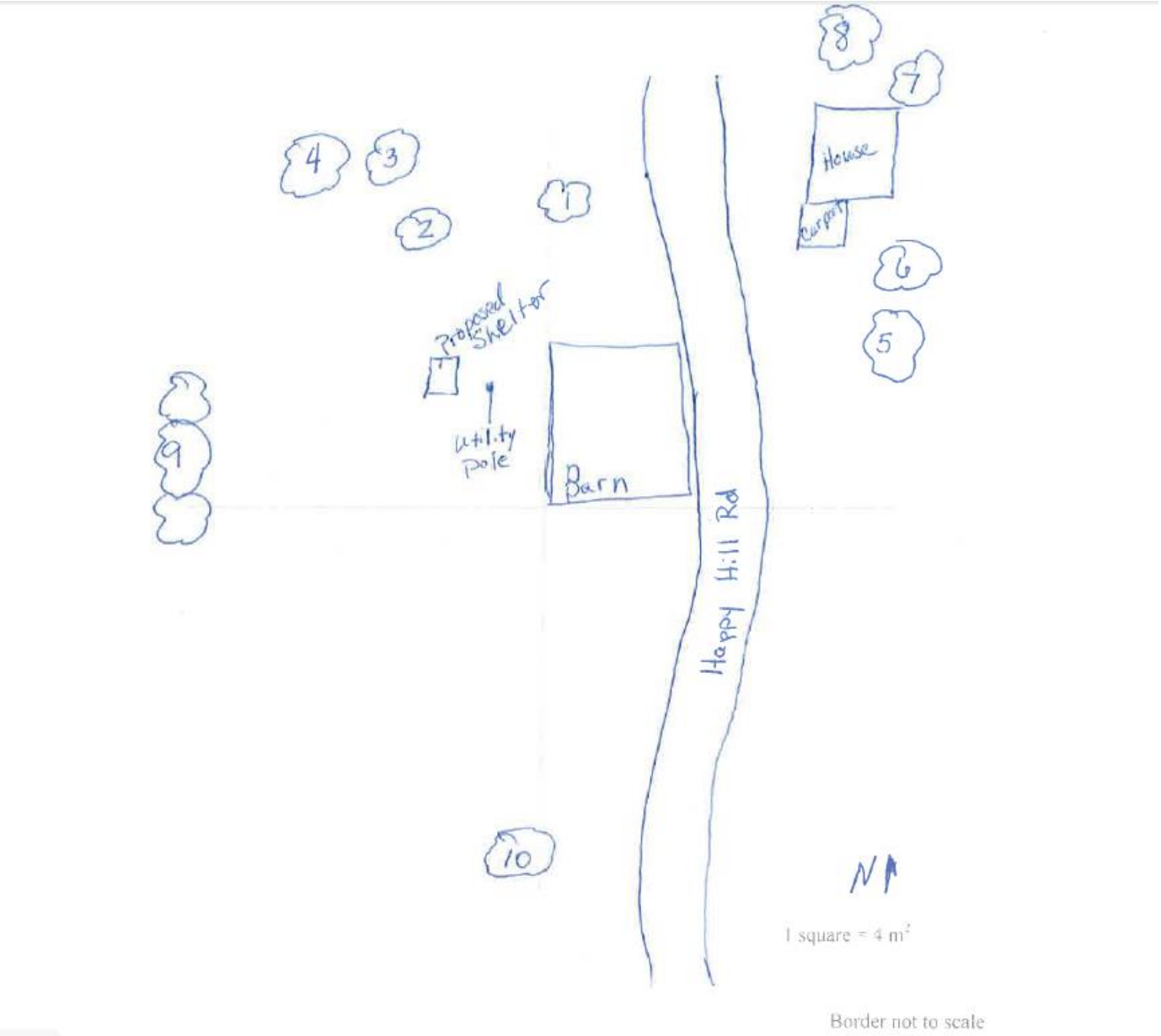
- Groundcover, grass, etc present? (especially for PM samplers)
- Excessive number of chimnies, smoke stacks, fireplaces, diesel heating
- Off road diesel generators near NO_2 or SO_2 analyzers

Issues: None

MSEF (Page 5/5): Local Site Name: _Eastman Happy Hill_____ **Initials:** __EMH_____ **Date:** _5/23/18_____

SITE DRAWING - Please Indicate: (relevant distance / height measurements)

Direction NORTH	Monitoring Shelter	Nearby Trees/Shrubs	Possible Sources
Primary Wind Dir	Probe Position(s)	Roadways	Paved / Unpaved Areas
Security Issues	Exterior Samplers	Buildings	Nearby Construction
Sloping Areas	Met Tower	Walls	Flues, Vents, Boilers
	Security Fencing	Other Obstructions	Meat Cooking



UNRESTRICTED AIR FLOW: _> 270_____° **Estimated Degrees of Clearance**

Must have unrestricted airflow **270 degrees** around the probe or sampler; **180 degrees** if the probe is on the **side of a building** or a wall.

Additional Information:

Object	Object Height (OH)	[2*OH-IH (10.0)]	Object Distance
#1 Tree	11.2 m	2.4 m	26.4 m
# 2 Tree	9.8 m	NA	15.8 m
# 3 Tree	19.6 m	19.2 m	25.8 m
# 4 Tree	18.0 m	16.0 m	21.0 m
# 5 Tree	9.0 m	NA	34.8 m
# 6 Tree	17.8 m	15.6 m	40.0 m
# 7 Tree	19.8 m	19.6 m	63.2 m
# 8 Tree	16.6 m	13.2 m	58.8 m
# 10 Tree	18.2 m	16.4 m	39.0 m
Barn	6.4 m	NA	10.5 m

IH is inlet probe height (using a 10 meter tower)

Aerial Photo with Wind Rose

PHOTO LOG: **Local Site Name:** Eastman Happy Hill **Initials:** EMH **Date:** 5/23/18

Camera [x APC / □ Personal – Owner: _____] Make/Model: Nikon Coolpix

Filename: 001 **Date:** 5/23/18 **Time:** 10:30 am **Photographer:** EMH

Description: North directional

Filename: 002 **Date:** 5/23/18 **Time:** 10:30 am **Photographer:** EMH

Description: Northeast directional

Filename: 003 **Date:** 5/23/18 **Time:** 10:30 am **Photographer:** EMH

Description: East directional

Filename: 004 **Date:** 5/23/18 **Time:** 10:30 am **Photographer:** EMH

Description: Southeast directional

Filename: 005 **Date:** 5/23/18 **Time:** 10:30 am **Photographer:** EMH

Description: South directional

Filename: 006 **Date:** 5/23/18 **Time:** 10:30 am **Photographer:** EMH

Description: Southwest directional

Filename: 007 **Date:** 5/23/18 **Time:** 10:30 am **Photographer:** EMH

Description: West directional

Filename: 008 **Date:** 5/23/18 **Time:** 10:30 am **Photographer:** EMH

Description: Northwest directional

Filename: _____ **Date:** _____ **Time:** _____ **Photographer:** _____

Description: _____

Filename: _____ **Date:** _____ **Time:** _____ **Photographer:** _____

Description: _____

Filename: _____ **Date:** _____ **Time:** _____ **Photographer:** _____

Description: _____

Filename: _____ **Date:** _____ **Time:** _____ **Photographer:** _____

Description: _____

Eastman (Proposed site – Happy Hill Road): Photo Log (2018)

001 North

002 Northeast

003 East

004 Southeast

005 South

006 Southwest

007 West

008 Northwest

CFR Part 58, Appendix E, Tables and Figures

Roadway average daily traffic, vehicles per day	Minimum distance[1] (meters)	Minimum distance[1 2] (meters)
≤1,000	10	10
10,000	10	20
15,000	20	30
20,000	30	40
40,000	50	60
70,000	100	100
≥110,000	250	250

TABLE E-1 OF APPENDIX E TO PART 58—MINIMUM SEPARATION DISTANCE BETWEEN ROADWAYS AND PROBES FOR MONITORING NEIGHBORHOOD AND URBAN SCALE **OZONE (O_3)**

[1]Distance from the edge of the nearest traffic lane. The distance for intermediate traffic counts should be interpolated from the table values based on the actual traffic count.

[2]Applicable for ozone monitors whose placement has not already been approved as of December 18, 2006.

Required Pollutant Probe Height (meters) vs Monitoring Scale:

Pollutant	Micro	Middle	Neighborhood	Urban	Regional
O_3	--	2-15	2-15	2-15	2-15
SO_2	--	2-15	2-15	2-15	2-15
PM, Pb	2-7	2-7	2-15	2-15	2-15

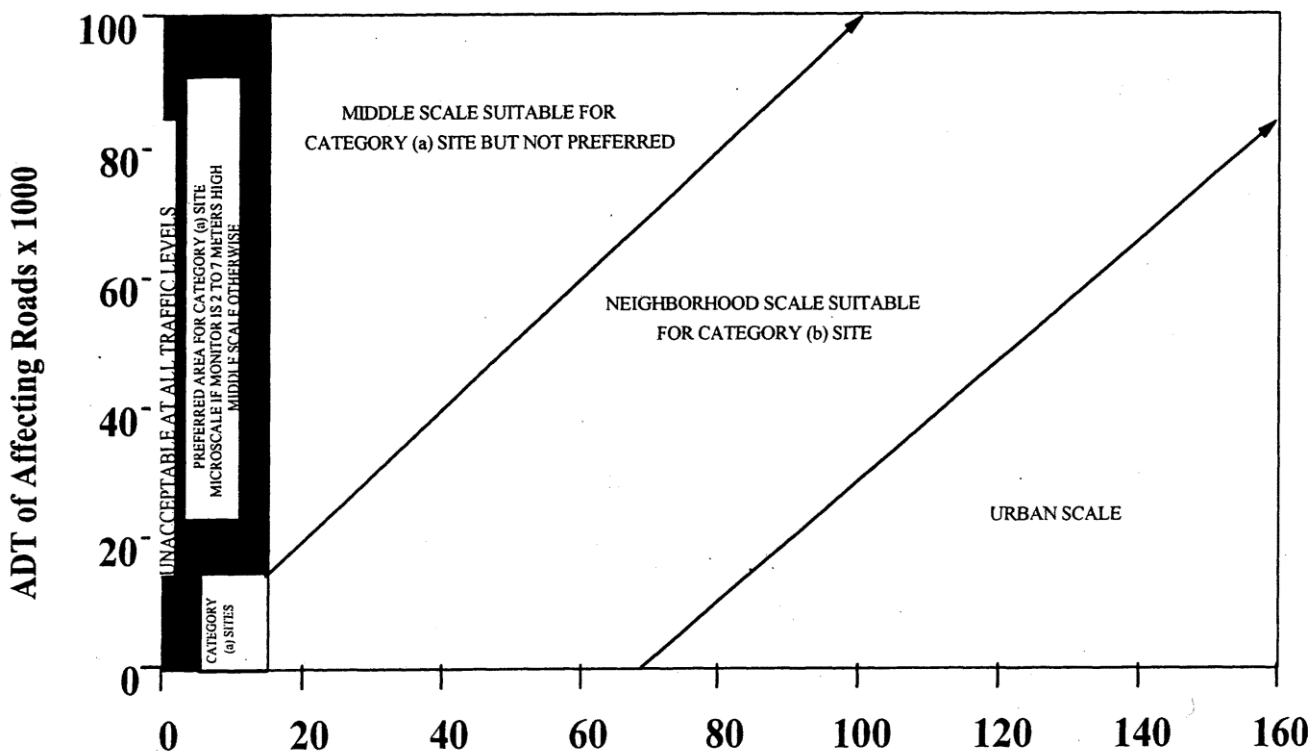


Figure E-1. Distance of PM samplers to nearest traffic lane (meters)

Residence Time: The chart provides the maximum probe line length (in feet) of ¼" OD tubing at given flow rate - using a 20 second residence time. The ID's shown are for thick (1/8"), intermediate (5/32") and thin (3/16") wall Teflon® tubing. The line lengths shown **do not** account for any lo-flo manifold volumes as part of the probe system.

1/4" Line OD / 20 Sec Residence Time			
Flow Rate	**1/8" ID**	**5/32" ID**	**3/16" ID**
(liters/min)	**feet**	**feet**	**feet**
0.1	13.8	8.8	6.1
0.2	27.6	17.7	12.3
0.3	41.4	26.5	18.4
0.4	55.3	35.4	24.6
0.5	69.1	44.2	30.7
0.6	82.9	53.0	36.8
0.7	96.7	61.9	43.0
0.8	110.5	70.7	49.1
0.9	124.3	79.6	55.3
1	138.1	88.4	61.4
1.1	151.9	97.2	67.5
1.2	165.8	106.1	73.7
1.3	179.6	114.9	79.8
1.4	193.4	123.8	85.9
1.5	207.2	132.6	92.1
1.6	221.0	141.4	98.2
1.7	234.8	150.3	104.4
1.8	248.6	159.1	110.5
1.9	262.4	168.0	116.6
2	276.3	176.8	122.8

SUPPORTING INSTRUMENTATION

Temperature Sensor: the shelter must have a temperature sensor inside connected to the data logger. The sensor is not directly required in the regulation, but is needed to demonstrate the operational conditions of the analyzer meet the FRM/FEM requirements.

Uninterruptable Power Supply – not required, but a UPS can offer additional protection to the expensive equipment in the monitoring shelter.

On-Site Computer: not required, can act as a data backup device, can have electronic strip chart information for QC/QA purposes. The operator may utilize a laptop pc instead of one on-site.

Zero Air System:
For a Commercial System: give the make and model
For a home built Cartridge System: identify the cartridges present, if any need service, date of last service, and condition of system. Identify any issues with either system.

Data Logger: Identify system at site
Identify how the analyzers are connected the data logger.

Strip Chart: Is the operator proficient at retrieving and viewing the strip chart?
Does the operator know what it means?
Is the time-scale of the strip chart accurate with the actual or standard time?
Probe Lines:
Frequency – how often are they cleaned or serviced, ask operator or check the logbook for the last service date.

Was any dirt and contamination observed in the probe lines, including condensation? **Y / N**
Are the probe lines heated and insulated? **Y / N**
Are the probe lines retractable – a retractable line is a single line system which can be "retracted" inside the shelter from its sampling position? **Y / N**
Comment and identify on any issues about the probe lines or attached additional sheets.

_____

_____

_____

_____

RECORDS – at site
Documents available (QAPPs, SOPs)?

_____

Are these electronic or hardcopy?

_____

Are logbooks at the site?

_____

Charts / Papers on Walls: What do they Track, Up-to-date?

_____

SHELTER
Is the shelter tied down – physically tied with hurricane straps?
Is the shelter grounded - look for rod in the ground and lead wire connection?

Type of Shelter(s) located on site:

1. **Enclosure: Y**
2. **Trailer: N**
3. **None: N**
4. **Other: Y**

What are the shelter(s) made of?

1. _____
2. _____
3. _____
4. _____

Are any of the shelter(s) in need of maintenance (painting, cleaning, mold removal, repair)? **Y / N**
With roof top samplers or inlets – is a roof railing present? **Y / N** (May not be required in accordance with local ordinances)
Roof Access: Stairs or Ladder? **Y / N**
Stairs can be inside or outside – Ladders are usually permanently attached or removable? **Y / N**
Are any of the shelter(s) in need of maintenance (painting, cleaning, mold removal, repair)? **Y / N**
Write additional comments on the shelters below:

_____

_____

_____

_____

INDEX

Local Site Name: prefer name used by agency monitoring staff for this site, this field should be completed for each page of the evaluation form, if a sheet ever separates from the logbook it can be returned to the proper place.

Initials: Initials of auditor completing form.

Date: current date site is entered by auditor

Reminder: If present, the auditor should add comment to the Site Logbook including: time, date, purpose of visit, auditors present.

Arrival Time: time auditors arrive at site

Departure Time: time auditors depart site

Primary Operator: the sites main operator, include parameters responsible for

Observers: person(s) at site, attending agency staff, site operators, other EPA, State auditors present

Networks: check all that apply, indicates type / purpose of monitoring conducted at site

SITE (Questions to ask yourself)
Security Fence: present or not? Security fencing can help with sample integrity. Is there more than one lock on gate, who has access other than monitoring staff?

Razor/Barb Wire - present or not? Note condition if damaged or aging – rusted? Is wire hanging down out of proper place?

Grass/Shrubs Cut: Is the grass and/or shrubs at the monitoring site cut and trimmed? Who is responsible for grass/shrub/tree maintenance? Is it regularly maintained?

Bare Soil: Does the site area consist of bare soil? Could be a local source for PM samplers (40 CFR Part 58 Appendix E, §3)

Vandalism – Any vandalism history at Site? Inside or Outside / check both if necessary? Date of last occurrence. Were police notified? If vandalism is current/ how serious/ gunfire into shelter?, loss of equipment/records?

SHELTER – Interior note condition/age of shelter, roof issues, water damage, and t, mold - insect issues, any electrical issues, is it clean, are the instruments securely mounted, loud pumps, is the lock secure

Arrival Temperature: Ask operator to provide current reading from data logging system if available. Values should be 20-30 °C generally, can depend on instrumentation present – FRM-FEM designations, and is specified in TDEC DAPC's QAPP. Some agencies keep the shelters near the upper limit in winter to help poorly insulated shelters maintain temperature overnight. May become too warm during mid-day hours. Conversely, an agency may keep the shelter cool in summer to help with high temperatures. Teledyne analyzers are designated FEM for a range of 5-40 °C. Therefore, TDEC DAPC keeps shelters with these monitors within this range (still keeping in mind the 2 deg SD requirement). Shelters are generally kept about 25-26 °C in the warmest months to reduce condensation in sample lines and analyzer.

Operator Site Visits: how many times per week or month, what is the schedule? Does logbook confirm?

Leaking Roof: Does roof leak, evidence may be apparent, question operator?

Damage: Ceiling, Wall, Floor: document damage if present – how long did leak exist before repair?

Clean / Neat: Is interior of shelter maintained, are the floors/counters/walls clean, well-organized, neat in appearance?

Fire Extinguisher: not required by EPA, good idea.

Insect/Wildlife Issues: Termites? Ants? Wasps/Bees? / Larger wildlife causing problems (such as nesting in the undercarriage or walls or digging dens near the foundation/supports)?

Thermometer (min/max): not required, but good insurance measure should temperature probe fail. Operator should document reading at site visit and reset.

Gasoline: Gasoline for weed trimmers, etc. is dangerous to have inside the shelter and can impact concentration values. Gasoline should not be stored in same environment as sample equipment, away from pumps and other electrical equipment as well.

Monitors: document the instrumentation present – monitor / manufacturer / model / serial #, look at the age and/or condition of the instrumentation, clean/dirty, and examine lines for moisture, cleanliness, and kinks/cracks. Moisture in the sample line can scrub pollutant concentrations – data will have to be invalidated if moisture found – determine how long the moisture has been present.
Exterior Samplers – roof or ground.
Met: define the met instrumentation present or not.

Calibrators: can be ozone, gas blenders, audit calibrators, note condition, clean/dirty, and examine lines for moisture, cleanliness, kinks/cracks, examine line from calibrator to analyzer – it should be capped or connected to a solenoid or the calibrator – if the end is open the analyzer may be sampling shelter air – photograph, document, show operator – correct problem, note in site log. For each calibrator present at the site, if the site contains no standards, mark the not present selection and move to the next section.

QA/QC Vented? – Gases should be vented, it's unhealthy for operators to breathe these pollutant concentrations.

Is analyzer sampling Shelter Air? - if the analyzer is sampling shelter air, even partially, all of the data impacted must be invalidated. Some examples of items that can cause this problem are a leaking filter holder or fitting and an uncapped TTP system or sample line tee.

FILTERS: For precision checks and audits, all gas standards (including Ozone) MUST pass through the sample line filter at the back of or internal to the instrument. Check the plumbing, interview the operator and qa auditor on this point. Calibrations may or may not pass through the filter, if it does it should be a clean filter and the records – logbook should indicate an ending precision check, then the filter change, then the calibration. If the calibration gas does not pass through the filter, there should be a probe line integrity check after the calibration – demonstrating the probe line has not impacted the pollutant concentration during the calibration.

Cylinder Gas Standards: complete the table as noted: QA/QC how is the standard used for QA or QC operations?, Gas Standard meaning CO, SO2, NO, NO2, the PSI reading - a low reading (<=200) is a warning that the tank should be considered empty – the gas regulator cannot reliably control lower than this reading. Note the expiration date, standard concentration and tank serial number from the certification information with the tank.

Site Information

Proposed Site 47-163-6004

The following proposed siting information supplements the supporting documentation section immediately following this table. Where applicable, the section from 40 CFR parts 58 is included.

§58.10 (a)(1)	A statement of purposes for each monitor	The proposed Eastman Happy Hill site (2105 Happy Hill Road) is located in Sullivan County. This site is located within the 3-km SO2 nonattainment area surrounding the Tennessee Eastman Chemical Plant and is located upwind from the plant. The site will characterize the maximum expected concentration in the nonattainment area.
	Site photos facing from the site in each direction (N, S, E, W)	See photographs for general site information in the next sections. Photographs for the proposed site are included.
	Applicable measurements to any obstructions or trees	See measurement graphic provided in the next sections. The closest tree is 15.8 meters northwest of the proposed site. The closest object is the barn 10.5 meters east of the proposed site. The nearest roadway is (Happy Hill Road) 21.0 meters away.
	Estimated PM2.5 inlets height for the site.	The SO2 probe height will be > 10 meters, but less than 15 meters.
§58.10 (b)	(1) The AQS site identification number.	The AQS ID for proposed site is: 47-163-6004. The proposed site is located at 2105 Happy Hill Road, Kingsport, TN 37660.
	(2) The location, including street address and geographical coordinates.	The proposed site is located at 2105 Happy Hill Road, Kingsport, TN 37660, Lat. 36.513052, Lon. -82.550459, Elev. 1301 ft.
	(3) The sampling and analysis method(s) for each measured parameter.	Teledyne T100 SO_2 analyzer (EQSA-0495-100)
	(4) The operating schedules for each monitor.	The SO2 monitor will operate continuously, collecting hourly data.

	(5) Any proposals to remove or move a monitoring station within a period of 18 months following plan submittal.	The proposed site is planned to operate for at least 5 years if approved.
	(6) The monitoring objective and spatial scale of representativeness for each monitor as defined in appendix D to this part.	Monitoring objective: Source Oriented Spatial Scale: Neighborhood scale—Defines concentrations within some extended area of the city that has relatively uniform land use with dimensions in the 0.5 to 4.0 kilometers range. Site type: population exposure.
	(7) The identification of any sites that are suitable and sites that is not suitable for comparison against the "Ozone and PM2.5 NAAQS".	The proposed site will be suitable for comparison to the SO2 NAAQS. This site will be a SLAMs site.
	(8) The MSA, CBSA, CSA or other area represented by the monitor.	The site is located in the Kingsport-Bristol-Bristol, TN-VA CBSA #28700.

§58.10 (a)(1) Site Photos Facing from the Site in each Direction (N,NE, E, SE, S, SW, W, NW)

Proposed site location at 2105 Happy Hill Road, Kingsport, TN. Photos taken by Evelyn Haskin on 5/23/18 with a Nikon Coolpix.

North directional

Northeast directional

East directional

Southeast directional

South directional

Southwest directional

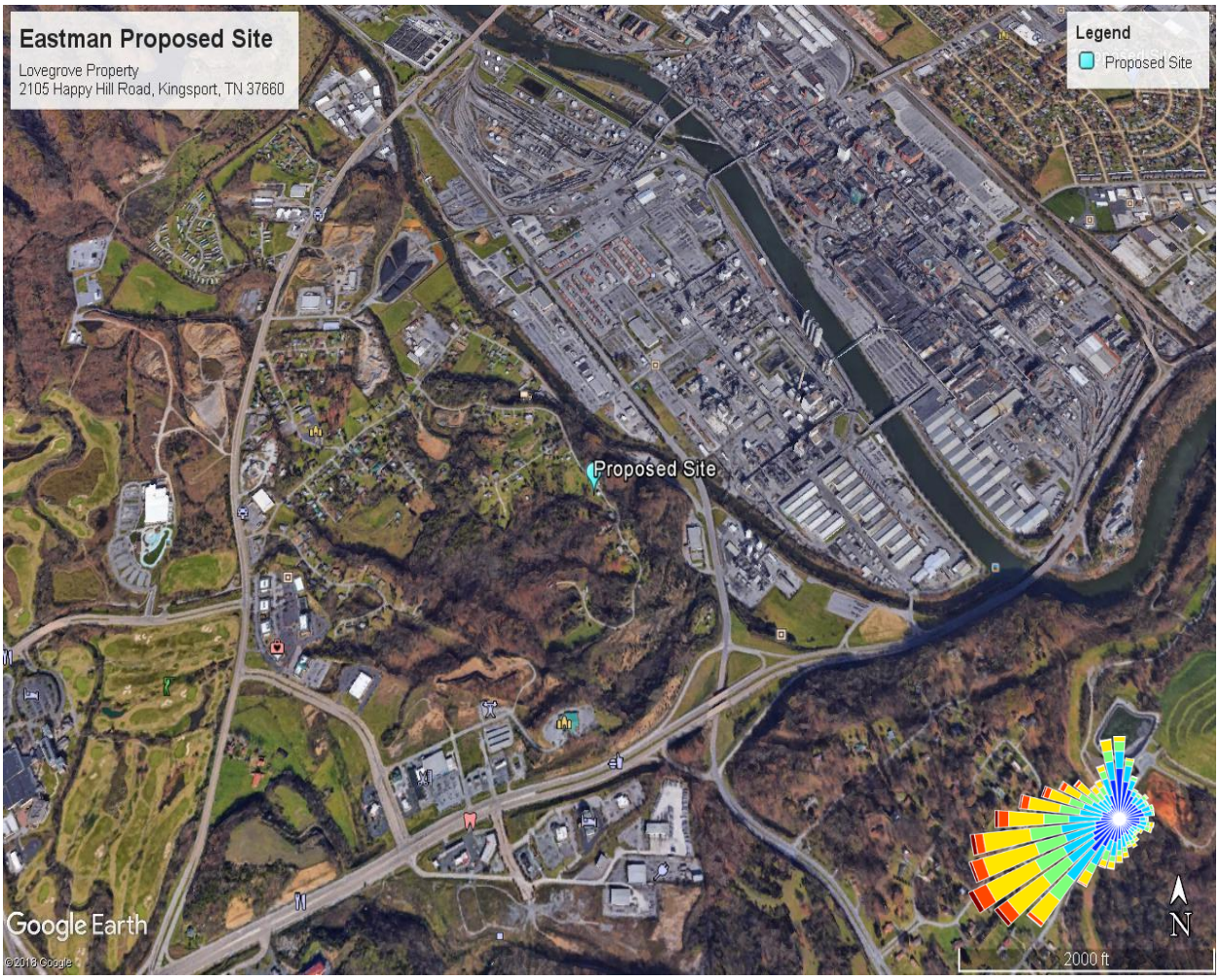
West directional

Northwest directional

§58.10 (a)(1) Applicable Measurements to any Obstructions or Trees

Figure 1: No Obstructions within the 15.8 m Radius of the Proposed Site

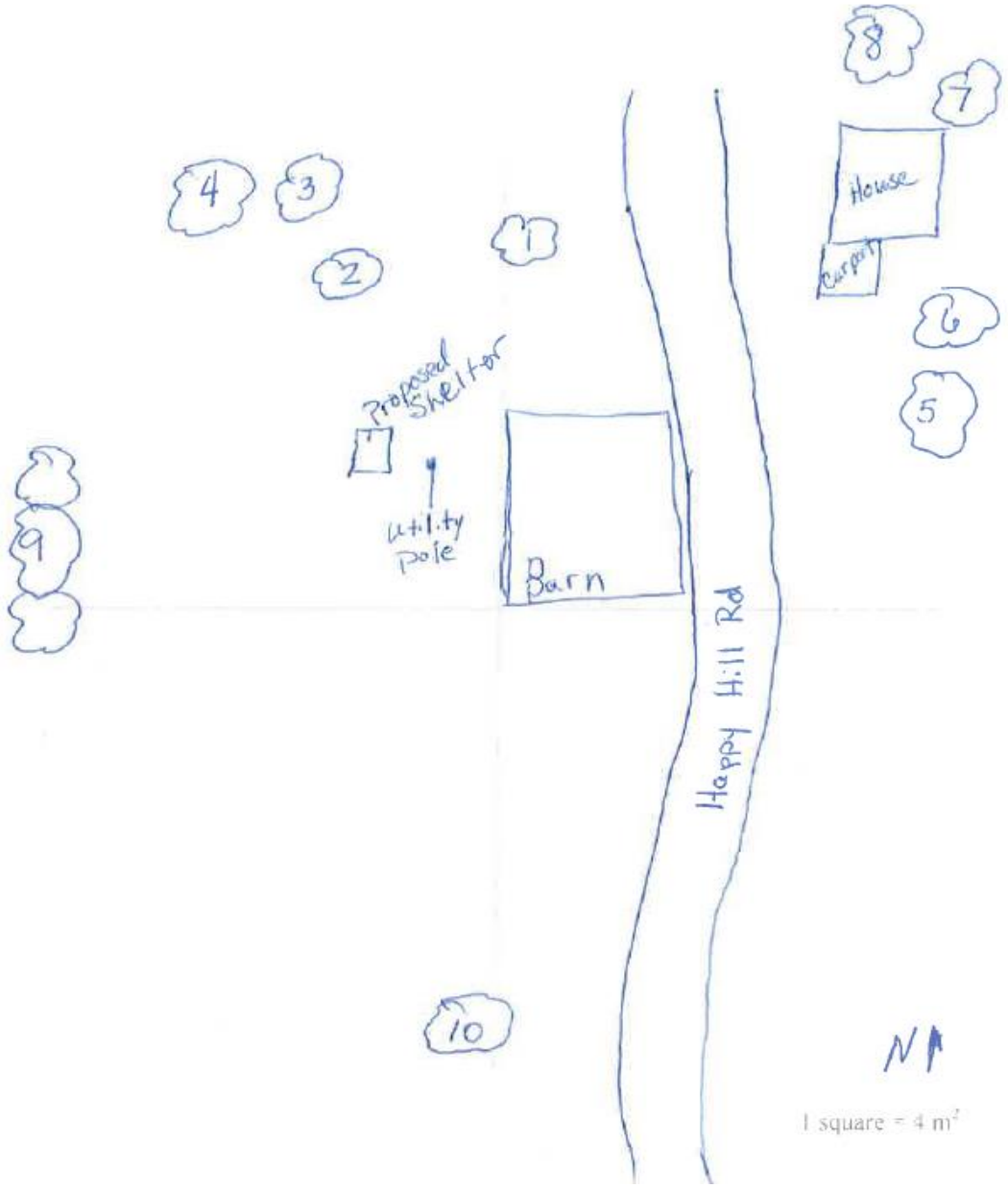
Figure 2: No Obstructions within the 15.8 m Radius of the Proposed Site



igure 3: Site Drawing and Measurements of Proposed Site

SITE DRAWING - Please Indicate: (relevant distance / height measurements)

Direction NORTH	Monitoring Shelter	Nearby Trees/Shrubs	Possible Sources
Primary Wind Dir	Probe Position(s)	Roadways	Paved / Unpaved Areas
Security Issues	Exterior Samplers	Buildings	Nearby Construction
Sloping Areas	Met Tower	Walls	Flues, Vents, Boilers
	Security Fencing	Other Obstructions	Meat Cooking



Measurements:

Object	Object Height (OH)	[2*OH-IH (10.0)]	Object Distance
#1 Tree	11.2 m	2.4 m	26.4 m
# 2 Tree	9.8 m	NA	15.8 m
# 3 Tree	19.6 m	19.2 m	25.8 m
# 4 Tree	18.0 m	16.0 m	21.0 m
# 5 Tree	9.0 m	NA	34.8 m
# 6 Tree	17.8 m	15.6 m	40.0 m
# 7 Tree	19.8 m	19.6 m	63.2 m
# 8 Tree	16.6 m	13.2 m	58.8 m
# 9 Trees	9.0 m	NA	23.8 m
# 10 Tree	18.2 m	16.4 m	39.0 m
Barn	6.4 m	NA	10.5 m

IH is inlet probe height (using a 10 meter tower)

Closest road (Happy Hill Road) is 21.0 m east from the proposed site. Closest traffic count station (South Eastman Road) had a 2016 traffic count of 547 ADT. Happy Hill Road has the same amount of traffic or less per day.

There will be 270 degrees of unrestricted air flow around the probe by using a 10 meter tower.

Proposed Site Location Discussion

The following wind rose is presented to establish the representative wind directions based upon the meteorological data collected at the nearby Bristol/Tri-City Airport (Figure 4 and Figure 5). Winds predominately blow from southwest to northeast in the Kingsport area. The proposed site would remain upwind of the Tennessee Eastman Chemical Plant (Figure 6).

Figure 4: 5-Year Wind Frequencies

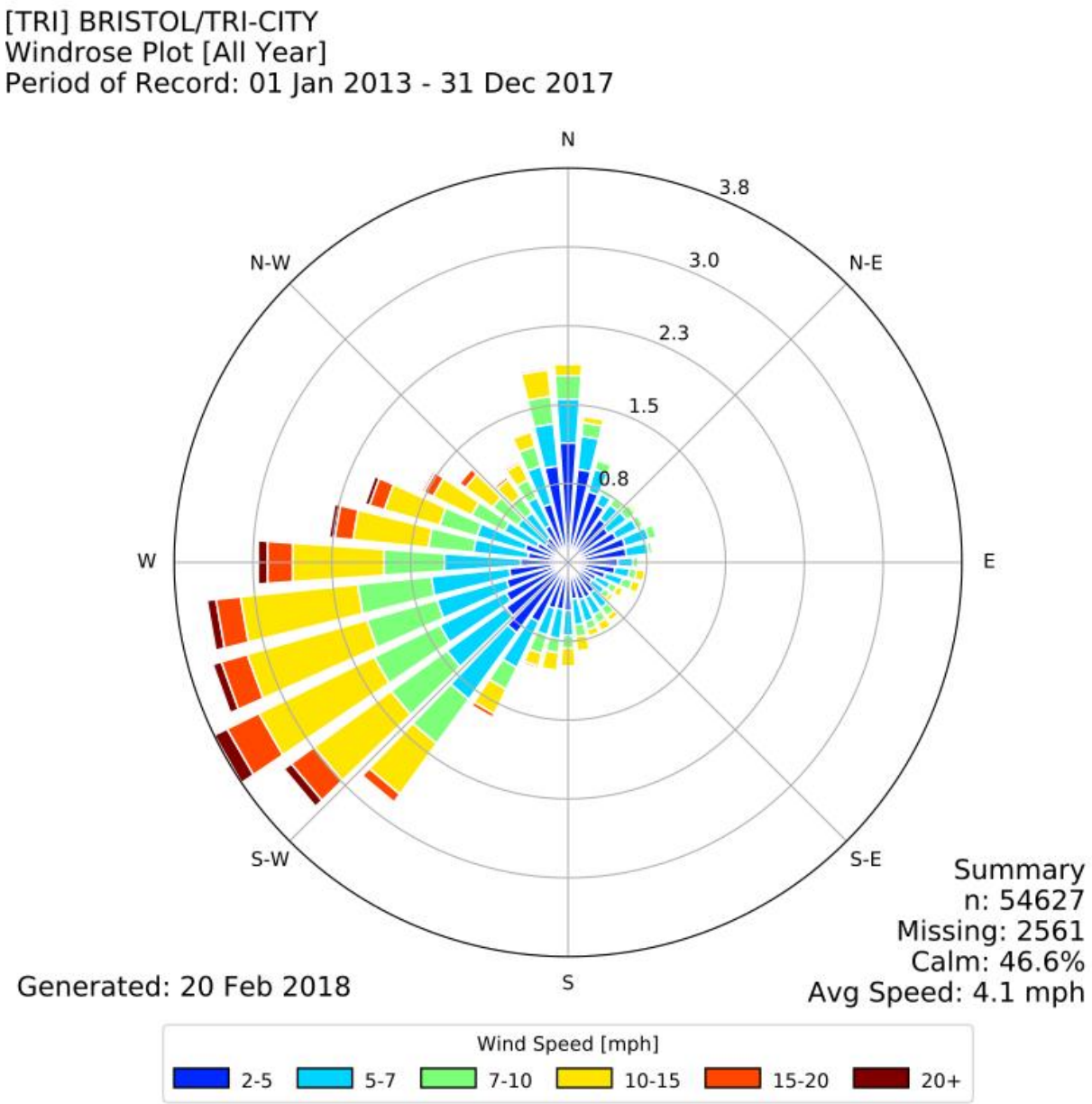
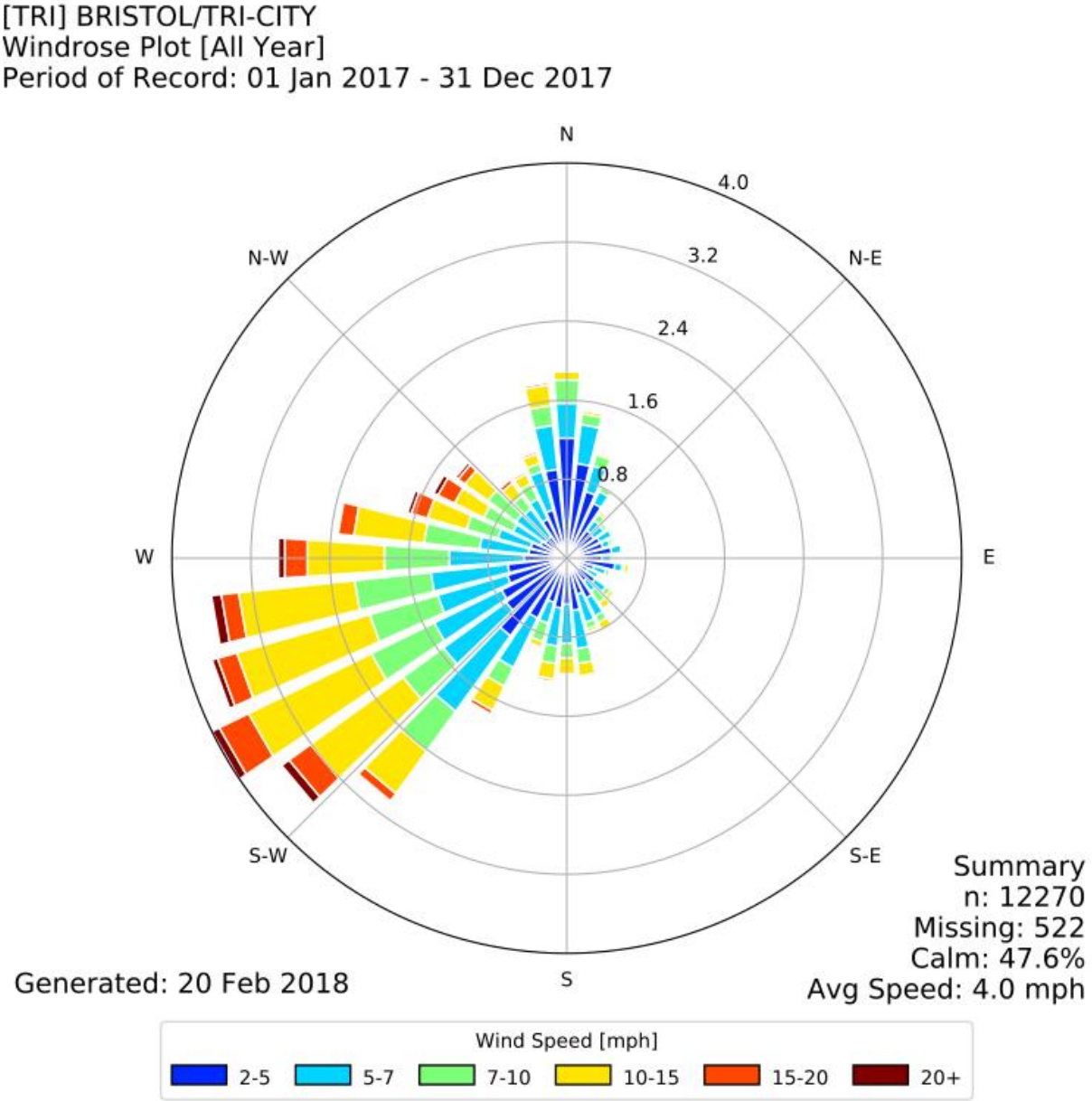


Figure 5 - **1 Year Wind Frequencies (Most recent)**



Kingsport SO_2 Monitor Site Selection

The two sites discussed in this proposal were selected based on Tennessee's most recent attainment modeling demonstration for the Eastman Chemical Company's SO_2 sources. An analysis of the predicted highest fourth high SO_2 concentrations as well as a ranking system for the daily maximum receptor concentration were utilized according to the EPA's draft SO_2 NAAQs Designations Source-Oriented Monitoring Technical Assistance Document located on the EPA's website:

https://www.epa.gov/sites/production/files/2016-06/documents/so2monitoringtad.pdf

The highest fourth high concentrations in Figure A show a maximum impact area (orange contours) downwind of the Eastman facility (red outline) where the proposed Andrew Johnson monitor is located. Another maximum impact area can be found upwind of the plant, on the hilly area to the southwest of the Eastman fence line. The Happy Hill site was located as close as possible to this area. The two existing monitors are also shown as maroon markers on the map for reference (Ross N Robinson and Skyland).

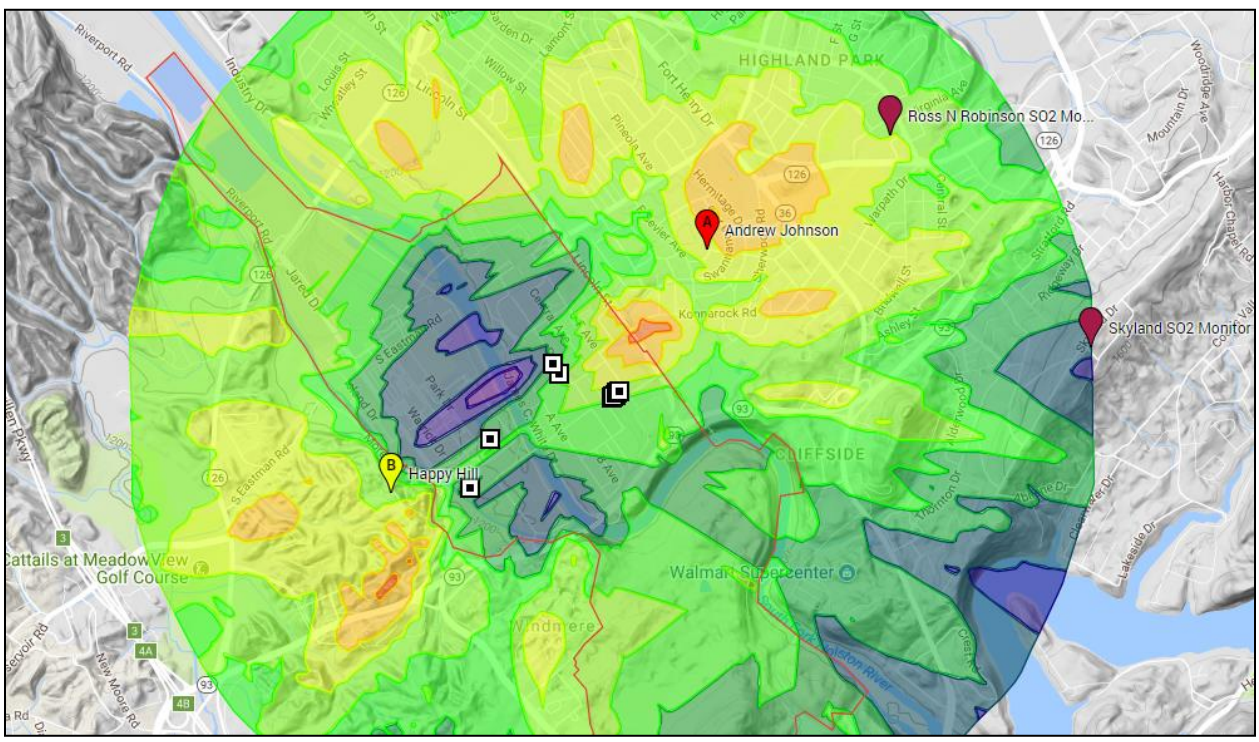


Figure A: TN SO2 Attainment Modeling Demonstration (Highest 4th High Concentrations)

A ranking system that combined the ranks of each receptor according to the number of days that the receptor had the highest predicted SO_2 concentration among all the receptors with the rank of each receptor's overall highest concentration. The resulting receptor ranks confirm that these two areas would be the most probable locations for capturing the maximum SO_2 concentrations at a monitor in the non-attainment area surrounding the Eastman facility.

Figure B shows the top 400 ranked receptors, where red receptors are ranked higher, more likely to see highest SO_2 impacts, and blue receptors are ranked lower, less likely to the highest SO_2 impacts.

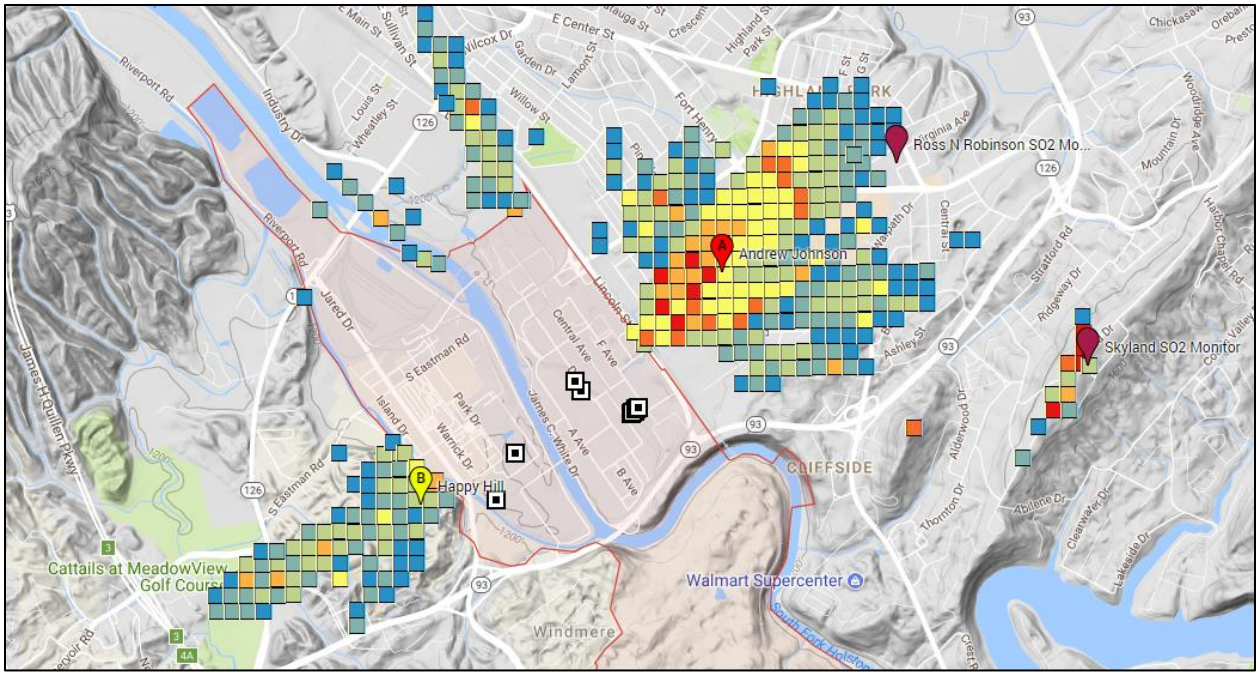


Figure B: Top 400 Receptor Ranks

The Happy Hill site is located within the path of receptors having a rank within the top 50 receptors (orange receptors) and is near two receptors with ranks of 30 and 36 (Figure C):

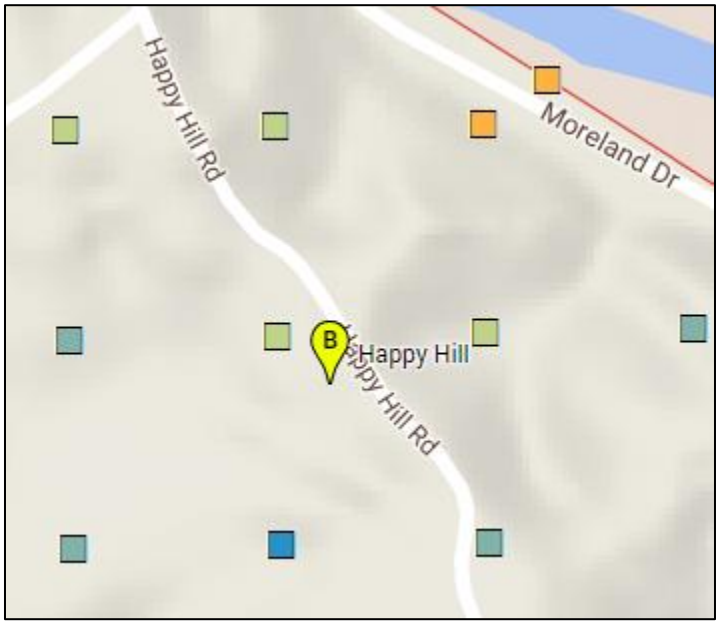


Figure C: Happy Hill Receptor Ranks

The Andrew Johnson site is located in an area containing the highest ranked receptors among all the receptors in the 3 km modeling domain. Figure D shows the Andrew Johnson proposed location with nearby receptors ranked in the top 10 (red receptors):

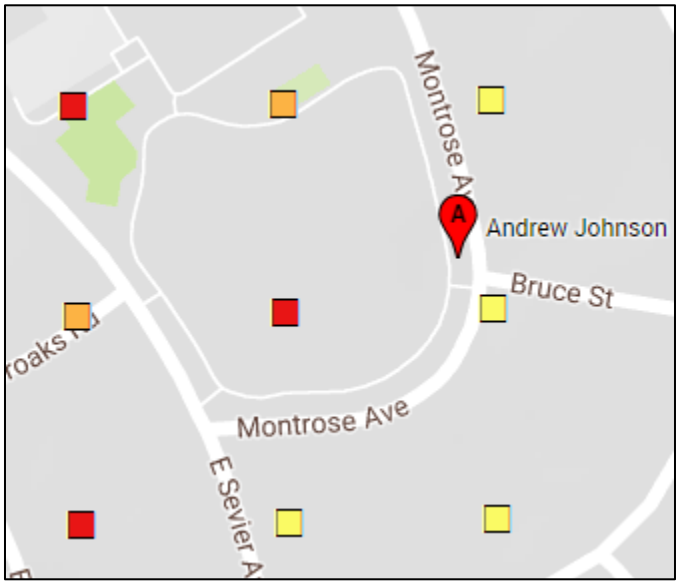


Figure D: Andrew Johnson Receptor Ranks

The two new monitor locations, along with the existing monitors in the nonattainment area will provide an adequate dataset for characterizing the air quality, with respect to SO_2 emissions, under typical meteorological conditions for the Kingsport area.

Many locations in the nonattainment area were investigated as potential monitoring sites but due to the maximum impact areas being in densely developed residential areas, most were not suitable for selection. Table A below summarizes sites that were investigated but were not selected.

Property Location	Reason for Non-selection	Type of Ownership
Konnarock/Brookwood Road	Not allowed access by property owners	Private Business
Lincoln Street/N.Wilcox	Not allowed access by property owners	Private Business
Sullivan County Regional Health Department	Low ranking receptors	Government
Konnarock Road	Not allowed access by property owners	Private Business
City of Kingsport Waste Water Treatment Plant	Low ranking receptors	Government
2164 Happy Hill Road	Not allowed access by property owners	Private Business
2145 Happy Hill Road	Does not meet siting criteria	Private Residence
2005 Happy Hill road	Not allowed access by property owners	Private Residence
2020 McKinney Street	Not allowed access by property owners	Private Residence
Fellowship Place	Does not meet siting criteria	Church
Meadowview Parkway	Does not meet siting criteria	Private Business
Lincoln Street	Not allowed access by property owners	Private Business

Table A: List of Sites Not Selected

Public Hearing
Tennessee Division of Air Pollution Control
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 15th Floor
Nashville, Tennessee 37243
9:30 A.M.

June 25, 2018

Opening Statement for Hearing

I would like to call this hearing to order. It is 9:52 a.m. June 25, 2018. We are in Conference Room A, 15th Floor William R. Snodgrass Tennessee Tower, 312 Rosa L. Parks Avenue, Nashville, Tn. My name is Paul LaRock, I'm an Environmental Manager with the Division of Air Pollution Control and I'm the Hearing Officer for this meeting. This hearing is being held under the authority of the Tennessee Air Pollution Control Board.

This public hearing has been called to consider the following:

Revisions to the Tennessee Division of Air Pollution Control's Ambient Air Monitoring Plans as detailed in the *State of Tennessee 2018/2019 Annual Air Monitoring Network Plan*. An annual evaluation of this plan is required by federal regulations. The hearing will be conducted in the manner prescribed by the Uniform Administrative Procedures Act, Tennessee Code Annotated, Section 4-5-201 et. seq.:

This hearing is a requirement of the Uniform Administrative Procedures Act, and the Federal Clean Air Act.

I want to emphasize (1) that we are not here to debate any testimony presented, but to listen and only ask questions for clarification and (2) that written statements or transcripts of comments are requested and will be considered as a part of this record if received in the office of the Technical Secretary, Tennessee Air Pollution Control Division, 15th Floor William R. Snodgrass Tennessee Tower, 312 Rosa L. Parks Avenue, Nashville, Tennessee 37243 by close of business Tuesday, July 3, 2018.

Materials concerning the proposed actions were available at http://tn.gov/environment/topic/ppo-air and also for public inspection during normal working hours at, the office of the Technical Secretary.

A copy of these notices will be made a permanent part of the record.

The proceedings of this hearing are being recorded and copies of the hearing record will be available for the cost of reproduction. Requests for such copies should be sent to the Technical Secretary at the previously mentioned address.

Compilers of the testimony presented at this hearing reserve the right to include extensive or bulky testimony by reference only.

Verbal or written testimony, either for or against matters under discussion, may be presented at this hearing.

Is there any one here who would like to make an oral comment?
Comments **No Commenters at hearing**

Is there anyone else here who would like to make an oral comment for the hearing record? I declare a recess until 10:15 a.m.

It is 10:15 a.m., the recess is ended. The public hearing will come to order.

Is there anyone else here who would like to make an oral comment for the hearing record? **No Commenters at hearing**

Written statements not presented at the hearings will only be considered part of the records if received by 4:30 p.m. today Tuesday, July 3, 2018, at the office of the Technical Secretary, Tennessee Air Pollution Control Board, 15th Floor William R. Snodgrass Tennessee Tower, 312 Rosa L. Parks Avenue, Nashville, TN 37243.

Since there is no one else here desiring to make an oral comment for the hearing record, the hearing is adjourned.

Winword\mhb\ohs63.doc

NOTICE
OF PUBLIC HEARING
TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF AIR POLLUTION CONTROL

There will be a public hearing before the Technical Secretary of the Tennessee Air Pollution Control Board to consider revisions to the Tennessee Division of Air Pollution Control's Ambient Air Monitoring Plan. An annual evaluation of this plan is required by federal regulations. The hearing will be conducted in the manner prescribed by the Uniform Administrative Procedures Act, Tennessee Code Annotated, Section 4-5-201 et. seq. and will take place in the 15th Floor Conference Room B of William R. Snodgrass Tennessee Tower, 312 Rosa L. Parks Avenue, Nashville, Tennessee, 37243 at 9:30 a.m. on the 25th day of June, 2018.

Written comments will be included in the hearing records if received by the close of business 3rd day of July, 2018, at the office of the Technical Secretary, Tennessee Air Pollution Control Board, William R. Snodgrass Tennessee Tower 15th Floor, 312 Rosa L. Parks Avenue, Nashville, Tennessee 37243-1531.

Any individuals with disabilities who wish to participate in these proceedings (or to review these filings) should contact the Tennessee Department of Environment and Conservation to discuss any auxiliary aids or services needed to facilitate such participation. Such initial contact may be in person, by writing, telephone, or other means, and should be made no less than ten (10) days prior to the 25th day of June, 2018, or the date such party intends to review such filings, to allow time to provide such aid or service. Contact the Tennessee Department of Environment and Conservation ADA Coordinator, 2nd Floor, William R. Snodgrass Tennessee Tower, 312 Rosa L. Parks Avenue, Nashville, Tennessee 37243. Hearing impaired callers may use the Tennessee Relay Service (1-800-848-0298).

If you have any questions about the origination of these revisions, you may contact Dr. Jason Stephens at (615) 532-0584. Copies of documents concerning this matter are available for review at the office of the Technical Secretary and at certain public depositories. For information about reviewing these documents, please contact Mr. Malcolm Butler, 15th Floor, William R. Snodgrass Tennessee Tower, 312 Rosa L. Parks Avenue, Nashville, Tennessee 37243, telephone (615) 532-0600.

The document may also be viewed/down-loaded from the TDEC public participation web site:
https://www.tn.gov/environment/ppo-public-participation/ppo-public-participation/ppo-air.html

[Public Notice, Draft TN Ambient Air Monitoring Plan 2018 and Draft Local Programs Ambient Air Monitoring Plan 2018]

Summary of Proposed Revisions

The Tennessee Division of Air Pollution Control's ambient air monitoring plan specifies the number and type of ambient air stations that will be operate in Tennessee. An evaluation of the Division's plan is required by federal regulation at Code of Federal Regulations, Title 40, Chapter 1, Subchapter C, Part 58, Subpart B, and Paragraph 58.10. These regulations also specify the minimum number and types of ambient air monitors to be operated in the state.

Revisions considered at this hearing will be submitted to the U.S. Environmental Protection Agency Region 4 Administrator.

All persons interested in Ambient Air Monitoring Plan in the State of Tennessee are urged to attend and will be afforded the opportunity to present testimony to the hearing officer regarding the revisions to the States Ambient Air Monitoring Plan. Any person desiring to present lengthy comments should be prepared at the hearing to offer a written statement to be incorporated into the record. Written statements not presented at the hearings will only be considered part of the records if received by 4:30 p.m. 3rd day of July, 2018, at the office of the Technical Secretary, Tennessee Air Pollution Control Board, 15th Floor, William R. Snodgrass Tennessee Tower, 312 Rosa L. Parks Avenue, Nashville, Tennessee, 37243.

For the The Chattanooga Times – Chattanooga, The Commercial Appeal – Memphis, The Knoxville News-Sentinel – Knoxville, The Kingsport Times-News – Kingsport,The Tennessean – Nashville – once on or before June 1, 2018

Public Hearing

Division of Air Pollution Control
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 15th Floor
Nashville, Tennessee 37243

9:30 AM.
June. 25, 2017

Hearing Officer:	Paul LaRock
Division of Air Pollution Control Representatives:	Linda Bilbrey (Recording Secretary) APC Bradley King (APC) Jason Stephens (APC) Michelle Oakes (APC)
Other Divisions: Resources Management Bureau	None
Public	None

Comment Summary

This public hearing has been called to consider the proposed Draft Ambient Air Monitoring Plan for 2018 and the Draft Local Programs Ambient Air Monitoring Plan 2018 pursuant to Tennessee Code Annotated, Section 68-201-105.

No Public comments were received at the public hearing.

Commentor	Comments taken at the public hearing	Response
None.	None	None

Commentor	Comments received by email or letter	Response
Sara Waterson EPA, Region 4 email comments received 06/25/2018	1. Loudon site - The 2018 ANP states the O3 monitor at the Loudon site is an SPM. Since this was a relocation of a SLAMS O3 monitor, this monitor should be categorized as SLAMS in the ANP. Additionally, I reviewed the relocation package that was submitted to EPA on March 7, 2016. That package says "The proposed site will be suitable for comparison to the ozone NAAQS and the PM2.5 NAAQS. This will be a SLAMS or SLAMS equivalent site."	The typo on page 22 of the ANMP was corrected to reflect the Loudon Ozone site as a SLAMS site and removed the SPM designation.
	2. TDEC included a statement regarding monitoring at National Park Service monitors. It would be appropriate to include the statement that the National Park Service is continuing to run these monitors and report the data to AQS so that the public is aware that monitoring will continue.	A statement on page 8 of the plan that states "NPS will continue to operate monitoring stations in GSMNP and report the data to AQS for the 2018 monitoring season."

	3. The reconfiguration packages request combined DVs. Because these monitoring sites will be maintaining the same AQS number, there is no need to combine DVs.	Siting Documentation Package language requesting combined DVs for the 8 ozone site reconfigurations since they will maintain the same AQS IDs were removed.
	4. Local programs - Appendix E, table E-4, footnote 4 states "Distance from sampler, probe, or 90 percent of monitoring path to obstacle, such as a building, must be at least twice the height the obstacle protrudes above the sampler, probe, or monitoring path. Sites not meeting this criterion may be classified as middle scale." TDEC APC provided these calculations to the nearest obstructions, but not all of the local programs provided the calculations.	Both Memphis and Chattanooga local programs were contacted and both indicated this comment has been addressed by providing the requested measurements to Ms. Waterson.

Phc60.doc

2018 Chattanooga Annual Network Plan

CHATTANOOGA-HAMILTON COUNTY AIR POLLUTION CONTROL NETWORK REVIEW 2018

Kathy Jones
mkjones@chattanooga.gov

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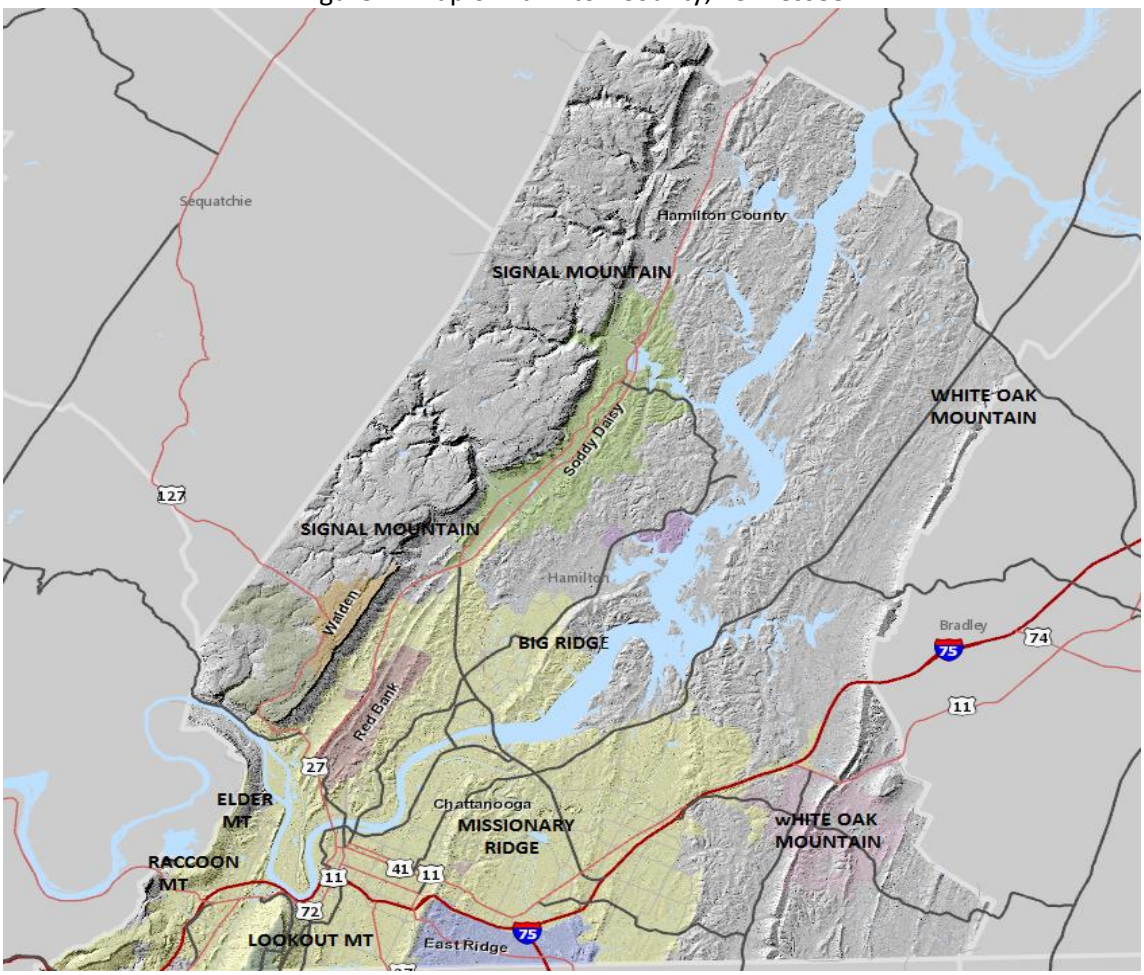
Introduction

Hamilton County, Tennessee, contains the City of Chattanooga and the municipalities of Collegedale, Soddy Daisy, Signal Mountain, Red Bank, East Ridge, Walden, Lakesite, Ridgeside, and Lookout Mountain, Tennessee. It is on the Tennessee, Georgia, Alabama border which means that pollution reduction is a cooperative effort between states. Designation areas for both ozone and particulate contain counties from Tennessee and Georgia.

Geography

Hamilton County is a picturesque Tennessee River valley between White Oak Mountain on the east of the county and Mowbray, Signal, Elder, Raccoon, and Lookout Mountains on the west of the county. The county is divided vertically by Big Ridge and Missionary Ridge, part of the same ridge chain. The Tennessee River flows through the ridge horizontally (where the ridge name changes) and through downtown Chattanooga. The valley, therefore, is shaped similarly to an "A". The topography is a liability for pollution prevention and reduction as frequent temperature inversions trap smoke in the valley.

Figure 1- Map of Hamilton County, Tennessee



Downtown Chattanooga is about 680 feet above sea level. There were at least four floods of downtown Chattanooga in the late 1800s and early 1900s, the most devastating one in 1867. To attempt to remedy the flooding, downtown was filled in from 3 to 15 feet after 1917 or an average of about one story. The

fill area started with four central downtown streets and eventually covered about 40 blocks. Begun in 1933, the Tennessee Valley Authority's system of dams and control of the waterways not only provided electricity to the masses, but it improved Chattanooga's flooding plight considerably.

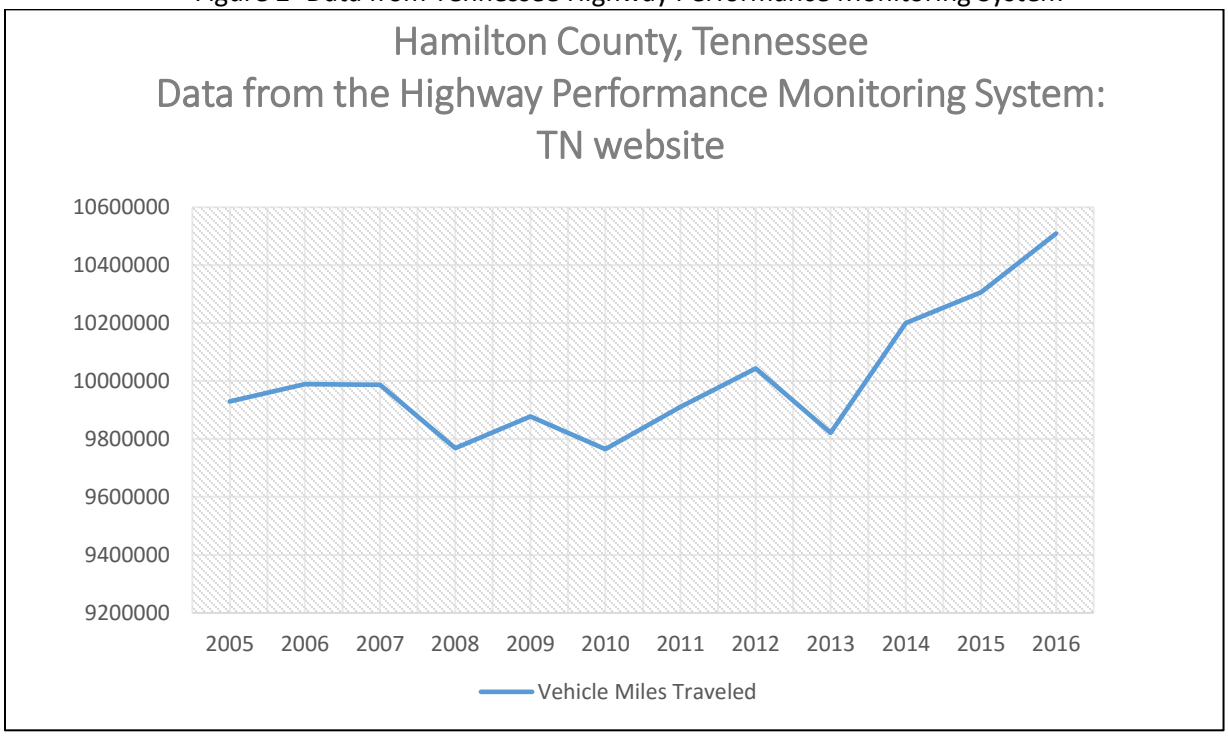
Traffic Patterns

About 1988 the then largest mall in Tennessee, Hamilton Place, was built in East Brainerd accessible by I-75. This spurred commercial and residential growth around the mall. In one year vehicle miles traveled (VMT) per year increased from about 6 million vehicles to about 10 million VMT. It has stayed in the 9.7 to 10.5 million range since. There has, however, been an increase since 2013.

The Interstate 75 corridor, a major north-south route for commercial transport, runs through Chattanooga and connects with Interstate 24 near East Ridge. On either side of the I-75/I-24 split are the highest traffic counts in Hamilton County. The split is scheduled for a major rework by the state in order to ease some of the traffic congestion as the split is a traffic bottleneck. Easing congestion should reduce vehicle pollution in that area.

Vehicle Miles Traveled

Figure 2- Data from Tennessee Highway Performance Monitoring System



Population

The U.S. Census Bureau population estimate (from the website) for July 1, 2016 for Hamilton County is 361,613 and for July 1, 2016 (2017 not available) for the City of Chattanooga is 177,571.

The two areas of the highest population density in Hamilton County are in the municipality of East Ridge and downtown in the University of Tennessee area. Both areas of the highest density contain particulate monitoring sites for $PM_{2.5}$. The University density is seasonal as the density decreases in the summer months. The population density of East Ridge is (2010 census) 2,534 persons per square mile whereas the City of Chattanooga has a population density of 1,223 (2010) persons per square mile. East Ridge,

therefore, is more than twice as dense as the City of Chattanooga. The population density of Hamilton County is 620.3 (2010) persons per square mile.

The Hamilton County racial demographics for predominant ethnicities for 2016 (most current available from US Census Bureau) of Hamilton County are White only (not Hispanic or Latino) 71.3%; Black only 19.7%; Asian only 2.1%; and Hispanic/Latino only 5.4% (source: Vintage 2016 Population Estimates Program). The racial demographics of the City of Chattanooga for predominant ethnicities are White only (not Hispanic or Latino) 57.1%; Black only 33.7%; Asian only 2.1%; and Hispanic/Latino only 5.2% (Source: 2016 Community Survey (ACS)- 5-Year Estimates).

The 2016 Small Area Income and Poverty Estimates (SAIPE) on the US Census Bureau website estimates the poverty in Hamilton County for 2016 as 13.5%. The poverty estimate for the City of Chattanooga is 21.1% based on the 2016 American Community Survey 5-year estimates. Neither estimation of poverty is comparable to other geographic levels of poverty estimates according to the US Census website.

The Chattanooga-Hamilton County CMSA is composed of Hamilton, Marion, and Sequatchie counties in Tennessee and Catoosa, Dade, and Walker Counties in Georgia. The US Census Bureau's 2017 population estimate for the MSA is 556,548 with an estimated increase of 4,916 over the estimate for 2016. Hamilton is the most urbanized county in the CMSA. The other counties are more rural.

Weather

Hamilton County tends to have frequent temperature inversions.

Figure 3- Thirty Year Averages
National Weather Service website
('Normals' are thirty year averages based on the period 1981-2010)

Chattanooga Annual Averages	
Precipitation.....52.48 inches	Days with 0.01" or more of precipitation.....119.6
Snowfall.....3.9 inches	Days with 1.0" or more of snowfall.....1
Days with thunderstorms.....54.8	Days at or above 90 F.....47.7
Days with dense fog.....27.3	Days at or below 32 F.....58.3
Average first freeze.....November 4	Average last freeze.....April 1
Average first frost.....October 20	Average last frost.....April 14

Network Review 2018

PM_{10} Site Requirement Waiver

The Chattanooga-Hamilton County Air Pollution Control Bureau (the Bureau) petitioned EPA on August 28, 2014, to delete the collocated PM_{10} site operating on a 6-day monitoring schedule at 3300 South Broad Street (470650006). EPA approved the site deletion in the approval letter for the 2014 State Air Monitoring Plan dated January 13, 2015. The monitors were shut down after the January 12, 2015, run date. EPA considers the deletion of this site the granting of a waiver of *40 CFR* requirements.

Data Comparison to the NAAQS

40 CFR Part 58 requires the Annual Monitoring Network Review to identify sites that are suitable and sites that are not suitable for comparison against the annual $PM_{2.5}$ NAAQS. All four Chattanooga-Hamilton County monitoring sites produce data that are suitable to compare against the National Ambient Air Quality Standards. All sites meet the siting requirements, and all data are produced by Federal Equivalent or Federal Reference Methods except for $PM_{2.5}$ continuous monitoring by the TEOM that is used for AQI only. All sites' data meet data completion requirements and quality control requirements. Ozone and $PM_{2.5}$ particulate data are meeting the NAAQS.

Purchase of T640 for $PM_{2.5}$ AQI

The Bureau purchased a Teledyne T640 light scattering instrument in December 2016 for continuous $PM_{2.5}$ monitoring. It is operated as a Special Purpose Monitor for $PM_{2.5}$. It monitors PM_{10} as well, but the data is not Federal Reference or Federal Equivalent. It is being run in conjunction with a 1400 AB TEOM. The TEOM is to be decommissioned as the site is reworked.

Figure 4- Active Sites

Chattanooga-Hamilton County Active Sites	Pollutant	Monitor	AQS #
911 Siskin Drive	*$PM_{2.5}$ Collocated* (3-day): TEI R & P FRM filter-based *$PM_{2.5}$ Continuous*: TEOM *$PM_{2.5}$ Continuous* (FRM) and *PM_{10}* (not FRM): T640	(2) TEI R & P 2025 Seq. TEOM 1400AB Teledyne T640	470654002 CORE $PM_{2.5}$
1517 Tombras Avenue Behind East Ridge City Hall	*$PM_{2.5}$* (Daily collocation from1/1/2009-1/17/2010) 3-day monitoring began 1/20/2010)	TEI R & P 2025 Seq.	470650031
618 Sequoyah Road Soddy-Daisy H.S.	Ozone Continuous Ozone Calibrator	TEI 49i TEI 49iPS	470651011
3018 Hickory Valley Road Eastside Utility District	Ozone Continuous Ozone Calibrator	TEI 49i TEI 49iPS	470654003

Figure 5- Equipment Evaluation 2018

Equipment	Location	Serial Number	Condition
PM_{10-} Stored	0006	1847- decommissioned 1/2015	Good
PM_{10-} Stored	0006	1845-decommissioned 1/2015	Good
$PM_{2.5}$	4002	20781 with VSCC	Good
$PM_{2.5}$	4002	20775 with VSCC	Good
$PM_{2.5}$	0031	20772 with VSCC	Good
$PM_{2.5}$	Spare	20774-decommissioned 12/31/2015	Good
$PM_{2.5}$	Spare	90709	Poor:parts only
$PM_{2.5}$ TEOM	Spare	1400A 24452: Eq Unit SES1B 203940211 Sensor Unit 140AB 244520302	Good
$PM_{2.5}$ TEOM	4002	1400 AB 244530302 :Sensor Unit 24454	Good
$PM_{2.5}$ T640	4002	070600000:83	Excellent
Met One Speciation	4002	a5924/a5910-decommissioned 1/2015	Good
URG 3000	4002	3N-B0768- decommissioned 1/2015	Good
Ozone	1011	49i-143566748-installed 2/2015	Excellent
Ozone	4003	49i-143566747-installed 2/2015	Excellent
Ozone-Spare	1011	49C-58192-316	Good
Ozone-Spare	4003	49C-57404-313	Good
Ozone Calibrator-Spare	1011	49CPS-66337-352	Good
Ozone Calibrator-Spare	4003	49CPS-66338-352	Good
Ozone Calibrator	1011	49iPS- installed 2/2016	Excellent
Ozone Calibrator	4003	49iPS- installed 2/2016	Excellent
Data logger	1011	ESC 8816-1904	Good
Data logger	4003	ESC 8816-1905	Good
Data logger	Spare/parts	ESC 8816-1906	Parts only
Data logger	4002	ESC 8832 AO994	Good
Data logger	1011	ESC 8832 A 4010 K	Good
Data logger	4003	ESC/Agilaire 8872 installed Aug 2017- 642	Excellent
Data logger	1011	ESC/Agilaire 8872: new April 2018: to be installed in May 2018-799	Excellent
Ozone Audit Monitor	1011 or 4003	49i-0607415796	Good
Chart Recorder	1011	1001685- decommissioned 2/2017	Good
Chart Recorder	4003	1001686- decommissioned 2/2017	Good
Chart Recorder	Spare	Leeds/Northrup Speedomax 165 82-31986-1-1	Good
8 X 14 Shelter	1011	Shelter One 8148 SN21051	Good
8 X 14 Shelter	4003	EKTO 8814 SN 3473-1	Good
8 X 14 Shelter	4002	EKTO 8814 SN 3473-2	Poor: to be auctioned

Changes to Established Sites

The Bureau plans to remove the shelter from the Siskin Drive 470654002 (downtown) site because of its poor condition and replace the shelter with a platform. This project is expected to be completed in mid-2018, postponed from 2017 because a technician had three military leaves in 2017. When the equipment is installed on the deck, the TEOM will be taken out of service. The new T640 continuous $PM_{2.5}$ monitor will report to AirNow for the Air Quality Index in place of the TEOM.

A temporary particulate site for the filter-based Federal Reference Monitors is proposed to be just behind the permanent site enclosure. The site is expected to be temporary for no more than two months in order to prevent losing data while the deck is built. The expectation is that the deck building and electrical work will require at least five business days under optimum conditions. Monitors will be moved from the roof of the building to ground level at the temporary site and begin monitoring before the deck building begins. The large bush southwest of the site near the street will be cut back. The continuous T640 may be temporarily shut down until the project is completed. The T640 cabinet is too heavy to move around without assistance.

The proposed location is indicated by two red dots on Figure 7 northwest of the fenced enclosure.

Figure 6- Proposed temporary site for $PM_{2.5}$ at 911 Siskin Drive.

The Bureau plans to replace the shelter at Eastside Utility before the end of 2019. The expectation is that the new shelter will be installed when the ozone monitors are not in operation.

Cost estimates to place the ozone sites on fiber optics were higher than anticipated so that project was not done.

The chart recorders at the ozone sites have been taken out of service entirely. In their place is an additional data logger at each site, spare Agilaire 8816s. Both loggers are being polled. Both sites also have AV Trends software that captures data from the primary logger on a local PC. AV Trends enables

the operator to view previously recorded data during a site visit. Data at the site can be manipulated into graphs using the software.

The Bureau began using Very Sharp Cut Cyclones (VSCCs) for all $PM_{2.5}$ FRMs on January 1, 2017. The Bureau is no longer using WINs Impactors.

Possible Site Changes for 2018

The Bureau is still searching for an appropriate location for a new Eastside Utility site within a mile radius of the current site. No appropriate sites have been found. Chattanooga-Hamilton County will submit a proposal for EPA approval if an appropriate location is found.

Memorandum of Agreement with the State of Georgia

The Memorandum of Agreement with the State of Georgia was renewed in 2018. A copy is included in Appendix A.

SODDY DAISY HIGH SCHOOL

REP ORG NAME	CHATTANOOGA-HAMILTON COUNTY AIR POLLUTION CONTROL BUREAU	The Soddy Daisy High School site is located in the municipality of Soddy-Daisy in North Hamilton County. The site was initially established as an ozone site August 1, 1978, at 9527 West Ridge Trail Road behind the Head Start Building using a chemi-luminescence method. June 1, 1979, the method was changed to UV. The ozone site was moved February 1, 2002, within a mile radius, to a new shelter on a hill behind Soddy Daisy High School. The $PM_{2.5}$ monitor was originally located on the roof of the Sheriff's Annex at 6233 Dayton Boulevard (AQS 470650032) as a Special Purpose Monitor (established 6/5/1999). The monitor was moved to the roof of the new shelter at 470651011 in mid-January 2002- first monitoring date was 1/26/02. In June 2008 the monitor was changed from a WINS Impactor to a Very Sharp Cut Cyclone model while retaining the same method code to designate it FRM. May 20, 2009, the shelter and monitors were moved approximately 100 feet east on the same property to accommodate the building of a girls' softball field. The Bureau shut down the $PM_{2.5}$ SPM at the end of December 2015. The last run date was 12/27/2015.
PQAO	0170	
ADDRESS	SODDY DAISY HIGH SCHOOL 618 SEQUOYAH ACCESS ROAD	
AQS ID	470651011 (FORMERLY 0032 for $PM_{2.5}$)	
COUNTY NAME	HAMILTON	
CBSA	CHATTANOOGA/ NORTH GEORGIA	
LAT	35.233562	
LONG	-85.181591	
PARAMETER CODE	44201	
PARAMETER	OZONE	
MONITOR TYPE	SLAMS	
POC	1	
INTERVAL	1	
YEAR	2018	
COLL. FREQ.	HOURLY	
METHOD	047	
FRM/FEM	THERMO ENVIRON. 49i	
ANALYSIS	UV PHOTOMETRIC	
REF MTD ID	EQOA-0880-047	
MONITOR TYPE	047	
OBJECTIVE	BACKGROUND	
DOM. SOURCE	AREA	
MEAS. SCALE	NEIGHBORHOOD	
LAND USE	COMMERCIAL	
LOCATION	RURAL	
ELEVATION	930 FT ABOVE SEA LEVEL	
CLOSEST MET STATION	CHATTANOOGA METROPOLITAN AIRPORT 1001 AIRPORT RD	
ESTABLISHED	8/01/1978 MOVED TO SDHS 2/1/2002, $PM_{2.5}$ deleted 12/31/15	

Site Evaluation 2018

Soddy Daisy High School, 618 Sequoyah Road 470651011		
Street Name	**Average Daily Traffic Counts: TDOT website**	**Distance**
Sequoyah Road- in front of the school	12,565 2016	.28 miles, 446 meters
Hyatte Road- behind the site	2,166 (Lovell Road- intersects with Hyatte) 2016	.02 mile, 39.74 meters

Direction	Predominant Land Use (Industry, Residential, Commercial or Agricultural)
North	School property- boys ball fields
South	Beyond Hyatte Road is residential, rural, agricultural
East	Soddy Daisy High School and Daisy Elementary, 620 Sequoyah Road
West	Girls softball field, beyond the field is Hyatte Road, beyond Hyatte Road is residential, rural, agricultural

Directions	Obstructions	Height (m)	Distance (m)
North	Tree, Tree	9.1m, 11 m	25.9 m, 46.3 m
South	Tree Row	16.5 m	27.1 m (on downhill slope)
East	Tree Row	16.5 m	73.04 m
West	Field House	2 story	74.2 m

Directions	Topographic Features (hills, valleys, rivers)	General Terrain (flat, rolling, rough)
North	Site is on hill	hill
South	Residential, farms	
East	Student parking lot below site	
West	Two story field house/concessions, parking lot and girls ball field on hill above site	Site is between an upper parking lot and a lower parking lot

Soddy Daisy High School 470651011 Images were taken April 12, 2018

North

Northeast

Soddy Daisy High School-470651011

East

Southeast

Soddy Daisy High School- 470651011
South

Southwest

Soddy Daisy High School-470651011
West

Northwest

EASTSIDE UTILITY

REP ORG NAME	CHATTANOOGA-HAMILTON COUNTY AIR POLLUTION CONTROL BUREAU	This ozone site was originally established June 13, 1979, using a UV method on Volunteer Army Ammunition Plant (VAAP) property as site 470650028. According to notes in AQS, the ozone monitor was moved to the Laboratory Building on Patrol Road from 100-200 feet away about 1979. About 1982 the ozone monitor was moved to a trailer across the street and northwest of the lab in a wooded area. It was moved to Eastside Utility, a high security area, on the top of a hill on VAAP property in February, 2004, because of a road widening project which utilized the property on which the monitoring module sat. The site was moved more than two (2) miles which required changing the AQS identifying number from 470650028 to a new number, 470654003.
PQAO	0170	
ADDRESS	RESERVOIR RD (PRIVATE DRIVE), UTILITY OFFICE ADDRESS: 3018 HICKORY VALLEY ROAD	
AQS ID	470654003, FORMERLY 0028	
COUNTY NAME	HAMILTON COUNTY	
CBSA	CHATTANOOGA/ NORTH GA	
LAT	35.102862	
LON	-85.162243	
PARAMETER CODE	44201	
PARAMETER	OZONE	
MONITOR TYPE	SLAMS	
POC	1	
INTERVAL	1	
YEAR	2018	
COLL. FREQ.	HOURLY	
METHOD	047	
FRM/FEM	THERMO ENVIRON. 49i	
ANALYSIS	UV PHOTOMETRIC	
REF MTD ID	EQOA-0880-047	
OBJECTIVE	TYPICAL CONCENTRATIONS	
DOM. SOURCE	AREA	
MEAS. SCALE	URBAN	
LAND USE TYPE	INDUSTRIAL	
LOCATION	URBAN AND CENTER CITY	
ELEVATION	940 FT ABOVE SEA LEVEL	
CLOSEST MET STATION	CHATTANOOGA METROPOLITAN AIRPORT, 1001 AIRPORT ROAD	
ESTABLISHED	6/13/1979 Moved from 0028-2/2004 for 3/1/2004 season	

Site Evaluation 2018

3018 Hickory Valley Road, Eastside Utility 470654003	
Street Name	**Traffic Counts: Average Per Day TDOT webpage**
Highway 58	29,172 2016
Hickory Valley Road	535 2016
Reservoir Road – private drive to Eastside Water Utility	3 or 4 vehicles a day and a few trucks as the county is dumping dirt in a hole on the hill
Interstate 75	74,906 (Station 616); 74,979 (Station 166) 2016
Highway 153	72,968 2016

Direction	Predominant Land Use (Industry, Residential, Commercial or Agricultural)
North	Commercial along Highway 58, residential beyond Highway 58
South	Undeveloped forest and Commercial/Industrial area
East	Forest
West	Forest to Highway 58, Commercial on Highway 58, then residential beyond

Directions	Obstructions	Height (m)	Distance (m)
North	None		
South	Building- One story	1 story: 3.7 m	12.6 m
East	None		
West	SW- Building Tree behind building	2 story: top of gable: 7.3 m 13 m	20.7 m 30.4 m

Directions	Topographic Features (hills, valleys, rivers)	General Terrain (flat, rolling, rough)
North	Site is on top of a hill at about 900 feet. It is a wilderness area as the entire hill is a gated high-security area. A drive to the site is through a beautiful forest and past a lake. One encounters deer, wild turkeys, hawks, and buzzards. Site is on the north edge of the hill- almost hanging over Highway 58. To the north is looking down the hill.	7,000 acres were a TNT plant (closed in mid 70s) controlled by the military that once housed nitric acid and sulfuric acid plants. About 1,000 acres are developed to the southeast of this monitoring site as a commercial/ industrial area around and including the Volkswagen Plant. The Highway 58 area at the bottom of the hill to the North is Commercial. Highway 58 is a major highway running east/west.
South	One story building- Commercial	Flat on top of hill
East	Looking downhill	
West	Looking downhill	

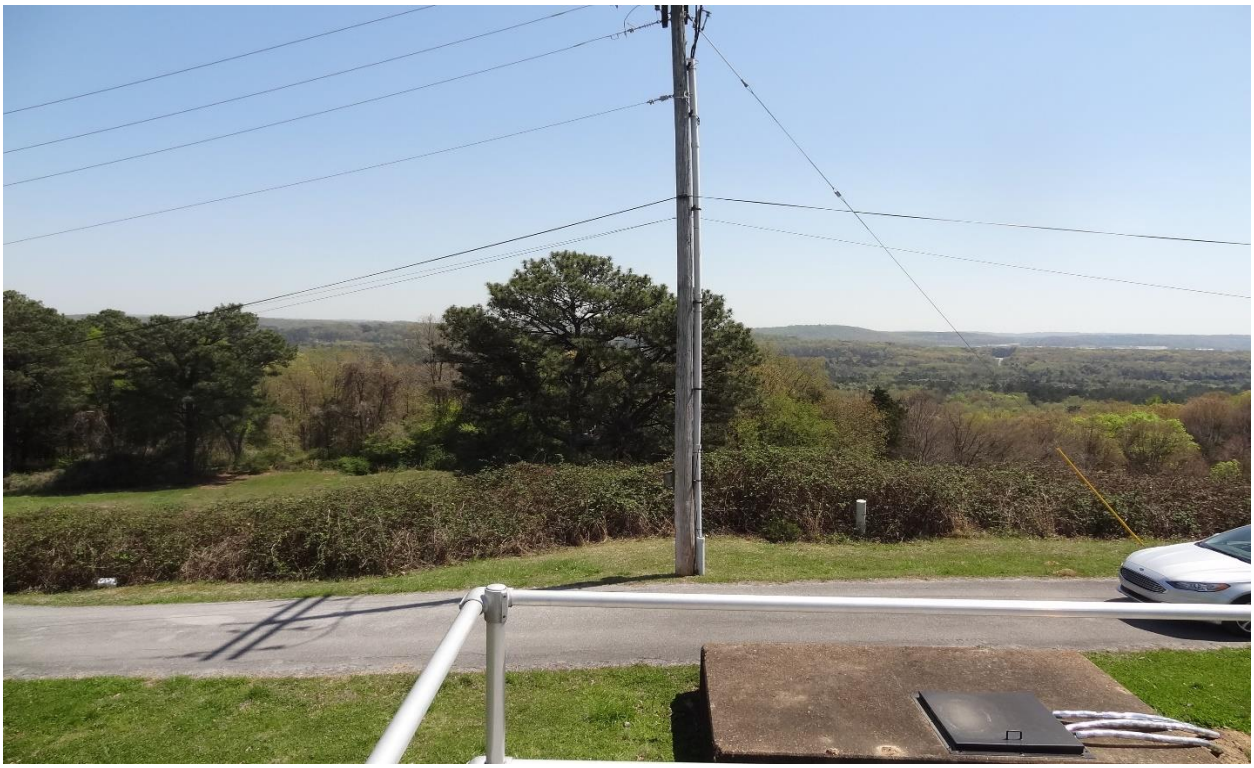
Eastside Utility -470654003 Images were taken April 12, 2018.

North

Northeast

Eastside Utility -470654003

East



Southeast

Eastside Utility-470654003

South, Southwest, and West cardinal directional pictures have been removed for security reasons. They have been supplied to EPA.

Northwest

SISKIN DRIVE/ UT Chattanooga

REP ORG NAME	CHATTANOOGA-HAMILTON COUNTY AIR POLLUTION CONTROL BUREAU			
PQAO	0170			
ADDRESS	911 SISKIN DRIVE			
AQSID	470654002			
COUNTY	HAMILTON			
CBSA	CHATTANOOGA/NORTH GEORGIA			
LAT	35.050918			
LON	-85.293019			
PARAMETER CODE	88101	88101	88501	88101
PARAMETER	$PM_{2.5}$	$PM_{2.5}$	$PM_{2.5}$ CONTINUOUS	$PM_{2.5}$ & PM_{10} CONTINUOUS
MONITOR	SLAMS	SLAMS	SPM	SPM
POC	1	2	3	3
INTERVAL	7	7	1	1
YEAR	2018	2018	2018	2018
COLL FREQ.	3-DAY	3-DAY	HOURLY	HOURLY
METHOD	145 VSCC	145 VSCC	716	236
FRM/FEM	R & P 2025 SEQ	R & P 2025 SEQ	TEOM 1400AB Not FRM/ FEM	T640 REG MODEL
ANALYSIS	GRAVIMET. LAB: IML	GRAVIMET. LAB: IML	GRAVIMETRIC 50 °C	LIGHT SCATTERING
REF MTD ID	RFPS-0202-145	RFPS-0202-145	NOT FRM/FEM	EQPM 0516-236 2.5 only
OBJECTIVE	POPULATION			
SOURCE	AREA			
MEAS SCALE	URBAN			
LAND USE	COMMERCIAL			
LOCATION	URBAN/ CENTER CITY			
ELEVATION	720 FT ABOVE SEA LEVEL			
CLOSEST MET	CHATTANOOGA METROPOLITAN AIRPORT, 1001 AIRPORT RD			
ESTAB.	1/01/1999	1/01/1999	2003 behind Admin. Blding 3/15/2004 at Siskin	2/15/2017

The Siskin Drive site was initially established January 1, 1999, as a CORE $PM_{2.5}$ site with collocated FRM monitors on the roof of the Davenport Building, 529 Oak Street, on the University of Tennessee at Chattanooga campus. The monitors were moved to the Student Center roof, 650 East 5TH Street, about early 2000; moved to a temporary site behind the University Administration Building at 400 Palmetto Street in late 2003 where the TEOM was first installed; then to a new shelter at the current site March 15, 2004, at 911 Siskin Drive. Met One Speciation was added 12/1/2001; a continuous $PM_{2.5}$ monitor was added 3/26/2004; and a URG3000 was added 10/1/2009. The continuous $PM_{2.5}$ monitor (TEOM) was operated at 30°C and had an SES predryer. The predryer failed in 2013 and was removed. The temperature was then raised to 50°C. A different early model TEOM is now being used. EPA defunded the Met One speciation and the URG3000 monitors in January 2015, and speciation monitoring ceased. FRMs were converted from WINS to VSCC models January 1, 2017. A T640 continuous was added in January, 2017, and began reporting $PM_{2.5}$ to AQS February 15, 2017.

Site Evaluation 2018

911 Siskin Drive 470654002
(Former site on University of Tennessee at Chattanooga campus)

Street Names	Average Daily Traffic Counts: TDOT website
Siskin Drive	No counts: side road behind school
Third Street	14,571 2016
Riverside Drive/Amnicola Highway	29,165 2016

Direction	Predominant Land Use (Industry, Residential, Commercial or Agricultural)
North	Commercial –Power Utility Fenced Enclosure for large transformers
South	School baseball field- Erlanger Hospital and Health Department in background
East	Nursing Home (and Rehabilitation Facility east side of the nursing home)
West	Commercial-Power Utility Fenced Enclosure. Beyond Siskin Drive to the south are parking lots and buildings for school, Chattanooga School for Arts and Sciences, K-12. The school, parking lots, and athletic fields occupy the entire block bordered by Siskin Drive, Third Street, and St. Barnabas Nursing Home (recently acquired by Siskin Rehab)

Directions	Obstructions	Height (m)	Distance (m)
North	NE-Treeline NW-Tree in Utility Enclosure		33.5 m 30.5 m
South	SW-Tree	10.0 m Shelter is on incline Top of tree is about even with probes	11. m
East			
West			
Probe POCS 1 & 2		(1) 4.9 m, (2) 5.2m	
Probe POC 3 T640		5.2 m	

Directions	Topographic Features (hills, valleys, rivers)	General Terrain (flat, rolling, rough)
North	Site is on a small rise NE	Hill rises to north
South	School facilities	Hill
East	Two story building- Nursing Home	Hill
West	Transformer enclosure	Hill

Siskin Drive-470654002 Images were taken April 12, 2018

North

Northeast

Siskin Drive-470654002

East

Southeast

Siskin Drive-470654002
South

Southwest

Siskin Drive 470654002
West

Northwest

East Ridge City Hall-Tombras Avenue

REP ORG NAME	CHATTANOOGA HAMILTON COUNTY AIR POLLUTION CONTROL BUREAU	The $PM_{2.5}$ site was originally established 5/6/1999 on the roof of the East Ridge Post Office, 1510 Maxwell Road, in the municipality of East Ridge in South Hamilton County near the Georgia border. It was moved to a temporary location behind the East Ridge City Hall on November 20, 2007. It was moved to a permanent location on the same property about 110 feet north on January 1, 2009. This site is roughly 3.5 miles from the Maple Street, North Georgia site, operated by the State of Georgia. The FRM was converted from WINS to VSCC on January 1, 2017.
PQAO	0170	
ADDRESS	1517 TOMBRAS AVENUE, EAST RIDGE	
AQS ID	470650031	
COUNTY	HAMILTON	
CBSA	CHATTANOOGA/ NORTH GEORGIA	
LAT	34.99438	
LON	-85.24293	
PARAMETER CODE	88101	
PARAMETER	$PM_{2.5}$	
MONITOR TYPE	SLAMS	
POC	1	
INTERVAL	7	
YEAR	2018	
COLL. FREQ.	3 DAY	
METHOD	145-VSCC	
FRM/FEM INSTRUMENT	R & P 2025 SEQ	
ANALYSIS	GRAVIMETRIC –LAB: IML	
REF MTD ID	RFPS-0202-145	
OBJECTIVE	POPULATION EXPOSURE	
DOM. SOURCE	AREA	
MEAS. SCALE	NEIGHBORHOOD	
LAND USE	COMMERCIAL	
LOCATION	URBAN AND CENTER CITY	
ELEVATION	720 FT ABOVE SEA LEVEL	
CLOSEST MET STATION	CHATTANOOGA METROPOLITAN AIRPORT 1001 AIRPORT ROAD	
ESTABLISHED	5/6/1999, MOVED 11/20/2007 TO CITY HALL	

Site Evaluation 2018

1517 Tombras Avenue 470650031

(Former site at East Ridge Post Office, 1510 Maxwell Road)

Street Name	Average Daily Traffic Counts: TDOT website	Approximate Distance
Tombras Avenue	About 4,371 (Bennett Road) 2016	.06 mile or 100 meters
Ringgold Road	22,700 2016	.17 mile or 269 meters

Direction	Predominant Land Use (Industry, Residential, Commercial or Agricultural)
North	East Ridge High School (134 m), NE ER Community Center (64.8 m- 1 story)
South	Residential
East	City Hall, beyond City Hall is residential
West	Residential – municipality has highest population density in Hamilton County

Directions	Obstructions	Height (m)	Distance (m)
North	NW-Treeline Closest trees (1)	15.2 m	20.7 m
	(2)	15.2 m	22.3 m
South	SE-3 Trees 1,2,3 S-Treeline	11.3 m; 14.6 m; 11.6 m 14.6 m	18.0 m; 29.3 m; 31 m 25.9 m
East	One story building (City Hall)	3.7 m	22.9 m
West	Tree line	11 m	18.6 m

Directions	Topographic Features (hills, valleys, rivers)	General Terrain (flat, rolling, rough)
North	Flat	Flat
South	Flat	Flat
East	Flat	Flat
West	Flat	Flat

East Ridge City Hall- Tombras Avenue-470650031 Images were taken April 12, 2018.

North

Northeast

East Ridge City Hall- Tombras Avenue-470650031
East

Southeast

East Ridge City Hall- Tombras Avenue-470650031

South

Southwest

East Ridge City Hall- Tombras Avenue-470650031
West

Northwest

Appendix A

Memorandum of Agreement with the State of Georgia

MEMORANDUM OF AGREEMENT

ON AIR QUALITY MONITORING FOR CRITERIA POLLUTANTS FOR

THE CHATTANOOGA-WALKER COUNTY

METROPOLITAN STATISTICAL AREA MSA

December 28, 2017

Participating Agencies:

Georgia
Georgia Department of Natural Resources (GA DNR)
Environmental Protection Division GA EPD APB

Tennessee
Chattanooga-Hamilton County Air Pollution Control Bureau (CHCAPCB)

I. PURPOSE/OBJECTIVES/GOALS

The purpose of the Memorandum of Agreement (MOA) is to establish the Chattanooga-Hamilton County-Walker County Metropolitan Statistical Area (MSA) Criteria Pollutant Air Quality Monitoring Agreement between CHCAPCB and GAEPDAPB (collectively referred to as the "affected agencies") to collectively meet United States Environmental Protection Agency (EPA) minimum monitoring requirements for particles of an aerodynamic diameter of 10 micrometers and less (PM10), particles of an aerodynamic diameter of 2.5 micrometers and less (PM2.5), and ozone; as well as other criteria pollutant air quality monitoring deemed necessary to meet the needs of the MSA as determined reasonable by all parties. This MOA will establish the terms and conditions of this collective agreement to provide adequate criteria pollutant monitoring for the Chattanooga –Hamilton County-Walker Co, GA MSA as required by 40 CFR 58 Appendix D, Section 2, (e) (March 28, 2016)[1].

II. BACKGROUND

The Chattanooga-Hamilton Co-Walker Co, GA MSA consists of the following counties: Dade, Walker, Catoosa, Hamilton, Marion, and Sequatchie. GA EPD APB has jurisdiction over Dade, Walker, and Catoosa Counties in Georgia and CHCAPCB has jurisdiction over Hamilton County, Tennessee. The State of Tennessee has jurisdiction over Marion and Sequatchie Counties in Tennessee, but does not have any permanent air monitoring sites in those counties. The CHCAPCB and GA EPD APB are required by the Clean Air Act to measure for certain criteria pollutants in the ambient air in the Chattanooga-Hamilton County-Walker Co, GA Metropolitan Statistical Area (MSA). The United States Environmental Protection Agency (EPA) has established minimum monitoring requirements based on the size of the MSA and the quality of the air in the

MSA for particles of an aerodynamic diameter of 10 micrometers and less (PM10), particles of an aerodynamic diameter of 2.5 micrometers and less (PM2.5), and ozone.

40 CFR 58 Appendix D, Section 2, (e)[1] states (in part):

"...The EPA recognizes that there may be situations where the EPA Regional Administrator and the affected State or local agencies may need to augment or to divide the overall MSA/CSA monitoring responsibilities and requirements among these various agencies to achieve an effective network design. Full monitoring requirements apply separately to each affected State or local agency in the absence of an agreement between the affected agencies and the EPA Regional Administrator."[1]

Currently each air pollution control agency (affected agency) conducts monitoring in its respective jurisdiction and coordinates its monitoring with the other air pollution control agencies within the MSA.

I. ROLES AND RESPONSIBILITIES

The parties agree to the following terms and conditions:

- CHCAPCB and GA EPD APB (the "affected agencies") commit to conducting appropriate monitoring in their respective jurisdictions of the MSA; as needed, to collectively meet EPA minimum monitoring requirements for the entire MSA for PM10, PM2.5, and ozone, as well as other criteria air pollutant monitoring deemed necessary to meet the needs of the MSA as determined reasonable by all affected agencies. The minimum air quality monitoring requirement (for PM10, PM2.5, and ozone described in 40 CFR 58) for the MSA shall apply to the MSA in its entirety and shall not apply to any sole affected agency within the MSA unless agreed upon by all affected agencies.

- The affected agencies commit to coordinating monitoring "...responsibilities and requirements...to achieve an effective network design..."[1] regarding criteria air pollutant monitoring conducted in the MSA and commit to communicate unexpected or unplanned changes in monitoring activities within their jurisdictions to the other affected agencies of this MOA. As conditions warrant, the affected agencies may conduct telephone conference calls, meetings, or other communications to discuss monitoring activities for the MSA. Each affected agency shall inform the other affected agencies via telephone or e-mail of any monitoring changes occurring in its jurisdiction of the MSA at its earliest convenience after learning of the need for the change or making the changes. Such unforeseen changes may include evictions from monitoring sites, destruction of monitoring sites due to natural disasters, or similar occurrences that result in a loss of more than 25% data in a quarter or a permanent change in the monitoring network. At least once a year in the second quarter of the year or before June 15th, each agency shall make available to the other agencies who are a party to this agreement, a copy of its proposed monitoring plan for the MSA for the next

year. The CHCAPCB will submit the network review that is submitted to the State of Tennessee for inclusion in the State's monitoring plan.

- Each party reserves the right to revoke or terminate this MOA at any time and for any reason by giving thirty (30) days written notice prior to the date of termination.

III. LIMITATIONS

A. All commitments made in this MOA are subject to the availability of appropriated funds and each party's budget priorities. Nothing in this MOA, in and of itself, obligates CHCAPCB or GA EPD APB to expend appropriations or to enter into any contract, assistance agreement, interagency agreement or other financial obligation.

B. This MOA is neither a fiscal nor a funds obligation document. Any endeavor involving reimburse or contribution of funds between parties to this MOA will be handled in accordance with applicable laws, regulations, and procedures, and will be subject to separate subsidiary agreements that will be effected in writing by representatives of the parties.

C. Except as provided in Section III, this MOA does not create any right or benefit, substantive or procedural, enforceable by law or equity against CHCAPCB or GA EPD APB, their officers or employees, or any other person. This MOA does not direct or apply to any person outside CHAPCD or GAEPD APB.

V. PROPRIETARY INFORMATION AND INTELLECTUAL PROPERTY

No proprietary information or intellectual property is anticipated to arise out of this MOA.

VI. POINTS OF CONTACT

The following individuals are designated points of contact for the MOA:

GA EPD APB DeAnna G. Oser
GAEPD APB Ambient Monitoring Program
4244 International Parkway, Suite 120
Atlanta, GA 30354

DeAnna.Oser@dnr.ga.gov
Voice: (404) 363-7004
FAX: (404) 363-7100

CHCAPCB Robert Colby
CHCAPCB
6125 Preservation Dr
Chattanooga, Tn 37416

bcolby@chattanooga.gov
Voice: (423) 643-5999
FAX: (423) 643-5972

VII. MODIFICATION/DURATION/TERMINATION

This MOA will be effective when signed by all parties. This MOA may be amended at any time by the mutual written consent of the parties. The parties will review this MOA at least once every 10 years to determine whether it should be revised, renewed, or cancelled. This MOA may be revoked or terminated by an affected agency at any time and for any reason by giving thirty (30) days written notice prior to the date of termination.

VIII. REFERENCE

1 – United States Environmental Protection Agency, Title 40 Code of Federal Regulations, Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 2 (e), "General Monitoring Requirements".

IX. APPROVALS

Georgia Department of Natural Resources, Environmental Protection Division Air Protection Branch (GA EPD APB)

BY: _____

TITLE: DIRECTOR

DATE: 1/24/18

Chattanooga-Hamilton County Air Pollution Bureau (CHCAPCB)

BY: _____

TITLE: Director

DATE: January 3, 2018

2018 Davidson's County's Annual Network Plan

Nashville-Davidson County

Air Monitoring Network Plan 2018

Metro Public Health Dept

Nashville/Davidson County

Promoting and Protecting Health

Prepared by Gillian Walshe-Langford, Ph.D.

04/10/18

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Nashville Air Monitoring Network Review 2018

Introduction

Beginning January 1, 2015, the Nashville-Davidson County Air Monitoring program (Nashville) became its own Primary Quality Assurance Organization (PQAO) where previously, it was one PQAO with the State of Tennessee's Department of Environment and Conservation (TDEC). Requirements for the Nashville-Davidson-Murfreesboro-Franklin Core-Based Statistical Area (CBSA) are met by the monitors run by both Nashville and TDEC's air monitoring networks.

The following document provides information on the current monitoring network, any proposed changes to the network, site descriptions, site evaluations, and an inventory of all instruments and their current condition. It is intended to fulfill the requirements of 40 CFR Part 58.10, where each monitoring organization must review their network on an annual basis in order to ensure that all requirements within appendices A, B, C, D, and E of Part 58 are being met.

Current Ambient Air Monitoring Network of Nashville-Davidson County

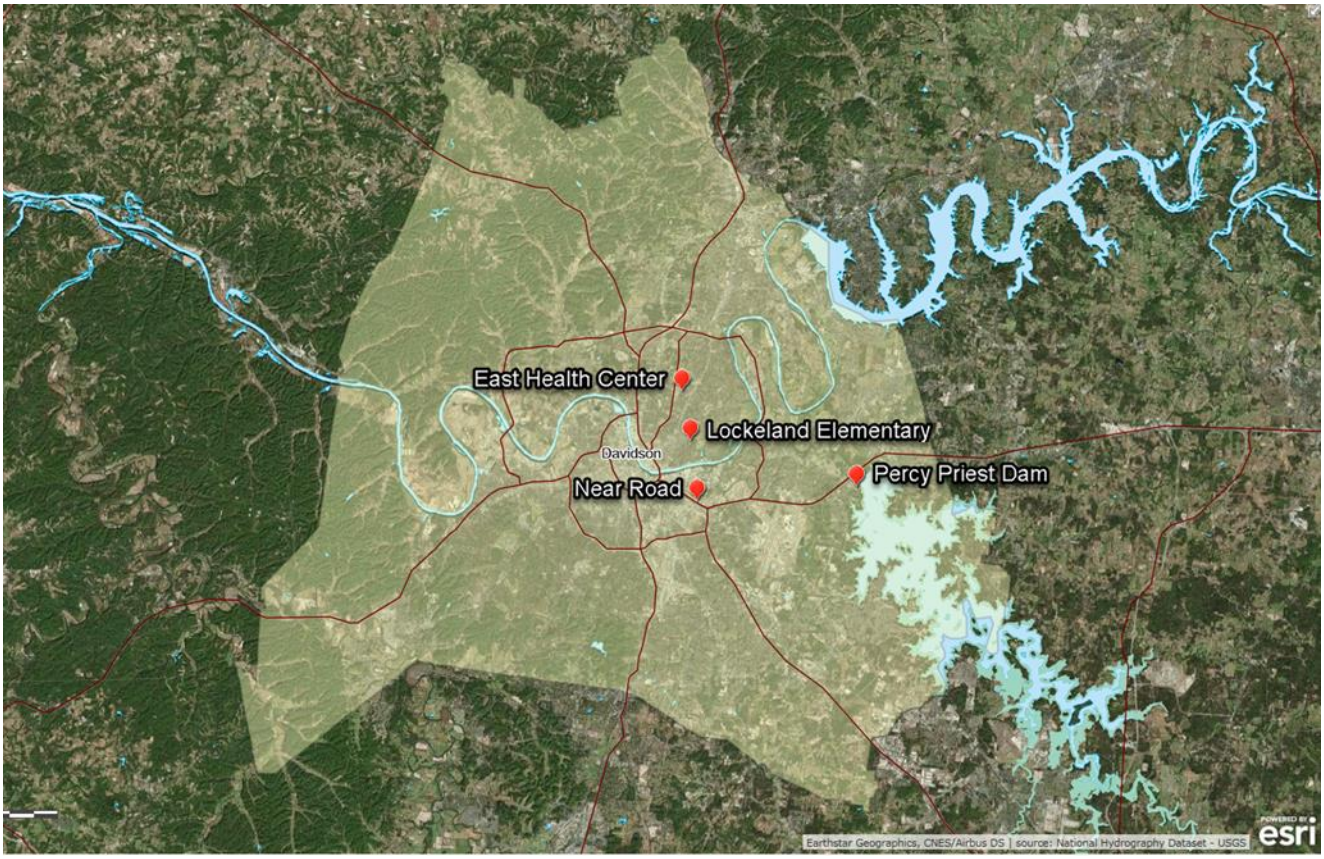
The 2018 Nashville-Davidson County monitoring network had no significant changes made from 2017. Nashville has 4 sites in operation for 2018: East Health Center which monitors for NO_2, SO_2, and O_3; Lockeland Elementary School which monitors continuous PM_{10}, and both regulatory and AQI specific $PM_{2.5}$; the Percy Priest Dam site which monitors for O_3; and the Near Road site which monitors for CO, NO_2, and $PM_{2.5}$. See the map of Davidson County below for the locations of Nashville's 2018 monitoring network.

For the Nashville-Davidson-Murfreesboro-Franklin CBSA, only one PM_{10} monitor is running at this time. Two PM_{10} monitors are required by 40 CFR Part 58, Appendix D, Section 4.6 for the CBSA but EPA approved a waiver for this requirement in the 2016 Network Plan response due to the historically low concentrations recorded in Davidson County. This waiver will be reviewed again in the 2020 five year network assessment. For all other pollutants, $PM_{2.5}$, O_3, SO_2, NO_2, and CO, the minimum monitoring requirements of the CFR are being met for the CBSA.

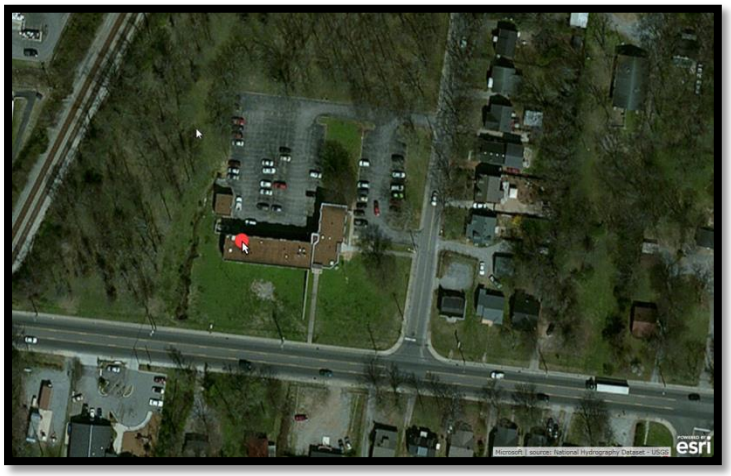
Proposed Changes to the 2018 Nashville-Davidson County Monitoring Network

No changes are planned for the Nashville-Davidson County monitoring network for the year 2018.

Davidson County Ambient Air Monitoring Network in 2018



East Health Center - Davidson County, TN



The East Health Center site monitors for ozone, sulfur dioxide, and nitrogen dioxide. This site has been in operation since 1972 and will continue to monitor for these three pollutants in 2018.

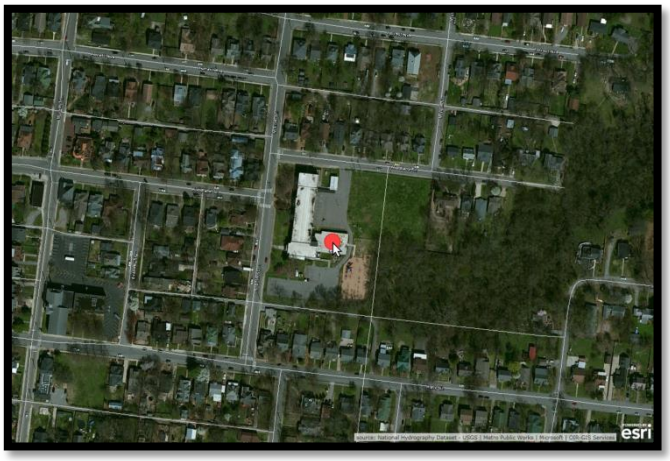
Agency Name (Code)	Metro Public Health Department (0682)		
AQS ID	470370011		
County Name	Davidson		
Address	1015 Trinity Lane		
CBSA	34980		
Latitude, Longitude	36.205000, -86.744722		
Parameter Code	42401	42602	44201
Parameter Name	SO_2	NO_2	O_3
Monitor Type	SLAMS	SLAMS	SLAMS
POC	1	1	1
Duration	1	1	1
Collection Frequency	Hourly	Hourly	Hourly
Method	060	074	047
Monitoring Instrument	Thermo 43i	Thermo 42i	Thermo 49i
Analysis	Pulsed Fluorescent	Chemiluminescence	Photometric
Ref. Method ID	EQSA-0486-060	RFNA-1289-074	EQOA-0880-047
Monitor Objective Type	Population Exposure	Highest Concentration	Population Exposure
Dominant Source	Area	Area	Area
Measurement Scale	Neighborhood	Neighborhood	Neighborhood
Land Use Type	Residential	Residential	Residential
Location Setting	Urban	Urban	Urban
Date Established	3/1/1974	1/6/1975	1/1/1972

Percy Priest Dam - Davidson County, TN

The Percy Priest Dam site is located on the Army Corps of Engineers Percy Priest Dam campus. Ozone is the only pollutant monitored at this site. Monitoring for ozone began on 1/1/1978 and will continue to operate for the 2018 ozone season.

Agency Name (Code)	Metro Public Health Department (0682)
AQS ID	470370026
County Name	Davidson
Address	3711 Bell Road
CBSA	34980
Latitude, Longitude	36.150742, -86.623301
Parameter Code	44201
Parameter Name	O_3
Monitor Type	SLAMS
POC	1
Duration	1
Collection Frequency	Hourly
Method	047
Monitoring Instrument	Thermo 49i
Analysis	Photometric
Ref. Method ID	EQOA-0880-047
Monitory Objective Type	Highest Concentration
Dominant Source	Area
Measurement Scale	Urban
Land Use Type	Agricultural
Location Setting	Urban
Date Established	1/1/1978

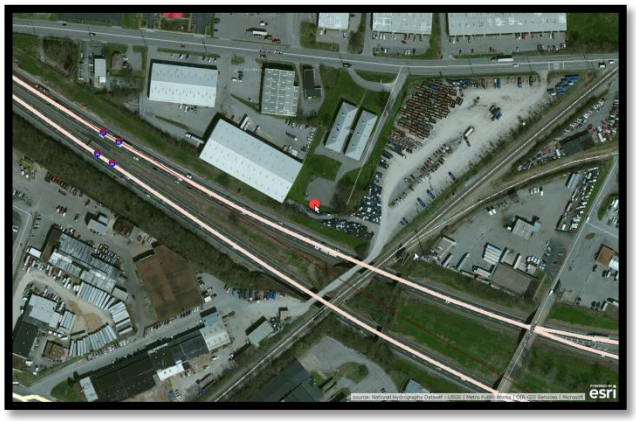
Lockeland Elementary School - Davidson County, TN



The Lockeland Elementary School monitoring site began operation in 1999 and will continue operation in 2018. This site was defunded as a CSN site and shut down the SASS and URG monitors at the end of 2014. As of January 1, 2017, a PM_{10} TEOM monitor began operating at this location as the Hi-Vol PM10 monitors at Trevecca and McCann were approved to be shut down by the end of 2016 by EPA.

Agency Name (Code)	Metro Public Health Department (0682)			
AQS ID	470370023			
County Name	Davidson			
Address	105 South 17th Street			
CBSA	34980			
Latitude, Longitude	36.176326, -86.738902			
Parameter Code	88101	88101	88502	81102
Parameter Name	$PM_{2.5}$	$PM_{2.5}$	$PM_{2.5}$	PM_{10}
Monitor Type	SLAMS	SLAMS	AQI	SLAMS
POC	1	2	3	2
Duration	7	7	7	1
Collection Frequency	1	6	Hourly	Hourly
Method	145	145	717	079
Monitoring Instrument	Thermo 2025i	Thermo 2025i	Thermo 1405	Thermo 1405
Analysis	Gravimetric	Gravimetric	Gravimetric	Gravimetric
Ref. Method ID	EQPM-0202-145	EQPM-0202-145	AQI only	EQPM-1090-079
Monitor Objective Type	Pop Exposure	Pop Exposure	Pop Exposure	Pop Exposure
Dominant Source	Area	Area	Area	Area
Measurement Scale	Neighborhood	Neighborhood	Neighborhood	Neighborhood
Land Use Type	Residential	Residential	Residential	Residential
Location Setting	Urban	Urban	Urban	Urban
Date Established	1/1/1999	1/1/1999	3/1/2001	1/1/2017

Near Road Site – Davidson County, TN



The Near Road site is located along the I-24/I-40 split in downtown Nashville and was established as part of the near road NO_2 monitoring requirement. Carbon monoxide and nitrogen dioxide monitors have been in operation since the site began and as of January 1, 2017, a $PM_{2.5}$ FRM monitor is also in operation.

Agency Name (Code)	Metro Public Health Department (0682)		
AQS ID	470370040		
County Name	Davidson		
Address	1113 Elm Hill Pike		
CBSA	34980		
Latitude, Longitude	36.142377, -86.734142		
Parameter Code	42101	42602	88101
Parameter Name	CO	NO_2	$PM_{2.5}$
Monitor Type	SLAMS	SLAMS	SLAMS
POC	1	1	1
Duration	1	1	7
Collection Frequency	Hourly	Hourly	1
Method	054	074	145
Monitoring Instrument	Thermo 48i	Thermo 42i-TL	Thermo 2025i
Analysis	Infrared	Chemiluminescence	Gravimetric
Ref. Method ID	RFCA-0981-054	RFCA-1289-074	EQPM-0202-145
Monitor Objective Type	Population Exposure	Population Exposure	Population Exposure
Dominant Source	Area	Area	Area
Measurement Scale	Urban	Urban	Urban
Land Use Type	Industrial	Industrial	Industrial
Location Setting	Urban	Urban	Urban
Date Established	7/1/2014	7/1/2014	1/1/2017

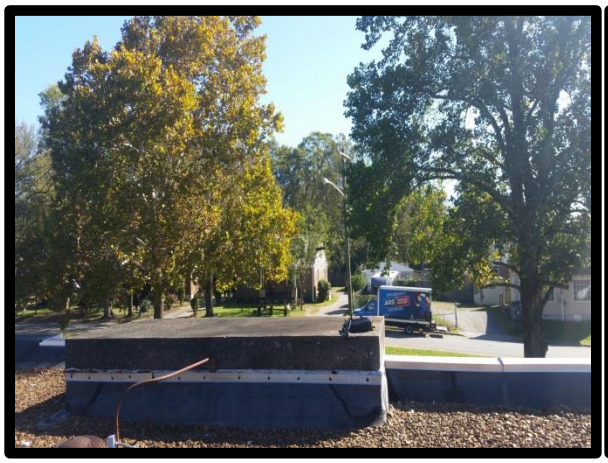
Annual Site Assessments

Each year, siting evaluations are performed to assess the impact on obstructions such as trees and buildings on the inlets at our sampling sites. These should be measured while the leaf canopy is full in order to assess the potential issues fully. The site assessments below, which include a table of measurements from obstructions and directional photos, show that each monitoring location is meeting the requirements of 40 CFR Part 58, Appendix E and have each been carried out in the last calendar year.

Site Pollutant	Date of Evaluation	Distance from Inlet to Obstruction	Height of Obstruction	Type of Obstruction	Findings
East Health Center					
O_3	10/19/2017	13.7m/35.58m	8.0m/10.2m	Two trees	Site OK; trees to the north and east will be monitored (particularly to the north)
SO_2	10/19/2017	13.7m/35.58m	8.0m/10.2m	Two trees	
NO_2	10/19/2017	13.7m/35.58m	8.0m/10.2m	Two trees	
Percy Priest Dam					
O_3	10/12/2017	44.0m	26.0m	Trees	Site OK; trees to the north will be monitored (330° unrestricted airflow)
Lockeland					
$PM_{2.5}$ - Primary	10/19/2017	--	6.1m	Building	Site OK; building to the west still allows more than 270° of unrestricted airflow
$PM_{2.5}$ - Collocated	10/19/2017	--	6.1m	Building	
$PM_{2.5}$ - TEOM	10/19/2017	--	6.1m	Building	
PM_{10} - TEOM	10/19/2017	--	6.1m	Building	
Near Road					
NO_2	10/23/2017	23.77m	14.6m	Tree	Site OK; tree to the east will be monitored (300° unrestricted airflow)
CO	10/23/2017	23.77m	14.6m	Tree	
$PM_{2.5}$	10/23/2017	23.77m	14.6m	Tree	

East Health Center

North



East

West

South

Percy Priest Dam

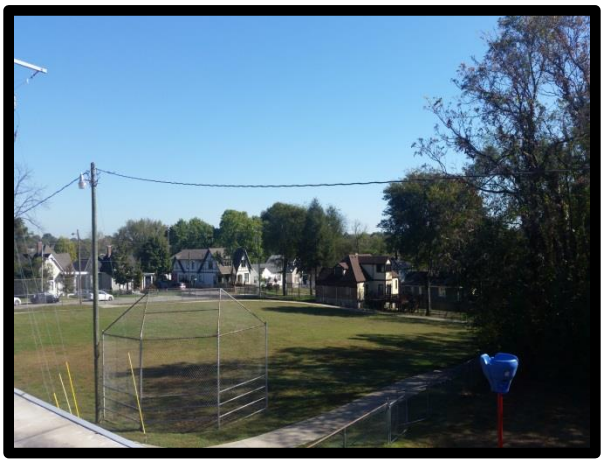
North

West

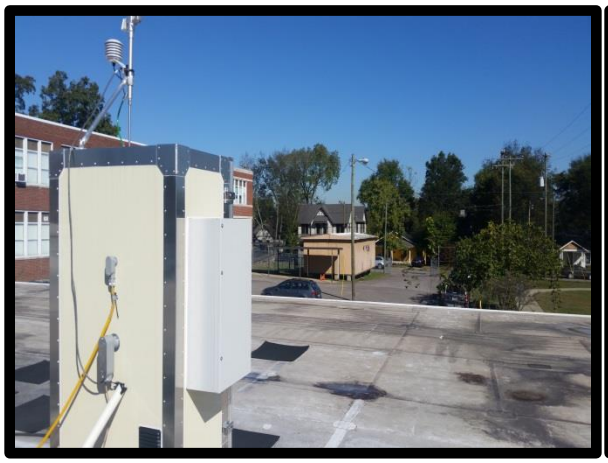
East

South

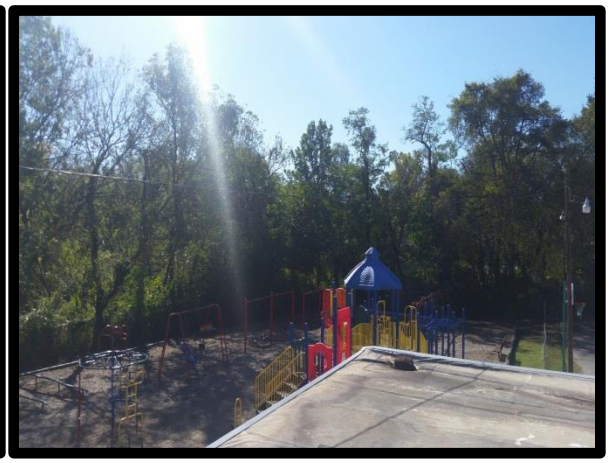
Lockeland Elementary School



North



West



East

South

Near Road Site

North

West

East

South

2018 – Annual Evaluation of Ambient Monitors

Date Reviewed April 5th 2018

Site No.	Number of Monitors	Pollutant	Equipment Supplier	Model No. Serial No.	Condition	Years In Service	Monitor Type
470370011	1	SO_2	Thermo	43i s/n 1303156453	Good	4	SLAMS
470370011	1	O_3	Thermo	49i s/n CM09130037	Good	5	SLAMS
470370011	1	NO_2	Thermo Instruments	42i s/n 1153030011	Good	5.5	SLAMS
470370011	1	Multi-gas Calibrator	Thermo Instruments	146i s/n 0827732246	Good	7	
470370011	1	Zero Air System	Thermo Instruments	111 s/n 0518112050	Good	7	
470370011	1	UV Photometer	Teledyne	T703 s/n 220	Good	4.5	
470370011	1	Data Logger	Agilaire	8832 s/n A4721K	Good	4.5	
470370040	1	CO	Thermo Instruments	48i s/n 1172850016	New	0	SLAMS
470370040	1	NO_2	Thermo Instruments	42i s/n 1324658812	Good	4.5	SLAMS
470370040	1	$PM_{2.5}$	Thermo Instruments	2025i s/n 2025i202161204	Good	5.5	SLAMS
470370040	1	Data Logger	Agilaire	8832 s/n A4689K	Good	4.5	
470370040	1	Multi-gas Calibrator	Thermo Instruments	146i s/n 1324658813	Good	4.5	
470370040	1	Zero Air System	Thermo Instruments	111 s/n 1313057860	Good	4.5	

Site No.	Number of Monitors	Pollutant	Equipment Supplier	Model No. Serial No.	Condition	Years In Service	Monitor Type
470370023	2	$PM_{2.5}$	Thermo Instruments	2025i (POC1) s/n 2025iW207831504 (POC2) s/n 2025i202241204	Good Good	5.5 5.5	SLAMS
470370023	1	$PM_{2.5}$	Thermo	TEOM 1405 s/n 1405A231091503	Good	4	SLAMS
470370023	1	PM_{10}	Thermo	TEOM 1405 s/n 1405A226501311	Good	2	SLAMS
470370023	1	$PM_{2.5}$	Met One	BAM 1022 s/n T23706	Good	2	
470370023	1	Data Logger	Agilaire	8872 s/n 0221	Good	3	
470370026	1	O_3	Thermo Instruments	49i s/n 1322458652	Good	4.5	SLAMS
470370026	1	UV Photometer	Teledyne	703E s/n 296	Good	15	
470370026	1	Zero Air System	Thermo Instruments	111 s/n 0827732247	Good	9	
470370026	1	Data Logger	Agilaire	8832 s/n A2327K	Good	4.5	
AP Lab	1	$PM_{2.5}$	Met One	BAM 1022 s/n U16171	New	1	Back up monitor
AP Lab	1	$PM_{2.5}$	Thermo	TEOM 1405 s/n 1405A238271610	New	1	Back up monitor
AP Lab	1	PM_{10}	Thermo Andersen	GUV-16H s/n 5526	Good	12.5	Out of Service
AP Lab	1	PM_{10}	Thermo Andersen	GUV-16H s/n 5527	Good	12.5	Out of Service
AP Lab	1	$PM_{2.5}$	Thermo Instruments	2025i s/n 2025i202281205	Good	5.5	Back up monitor
AP Lab	1	$PM_{2.5}$	Met One	SASS PM2.5 Speciation s/n G9191	Good	8.5	Out of Service

Site No.	Number of Monitors	Pollutant	Equipment Supplier	Model No. Serial No.	Condition	Years In Service	Monitor Type
AP Lab	1	PM_{10}	Thermo Andersen	GUV-16H s/n 4199	Good	12	Out of Service
AP Lab	1	$PM_{2.5}$	Thermo Instruments	2025 s/n 2025B2 22960806	Good	1	Back up monitor
AP Lab	1	O_3	Thermo Instruments	49i s/n 1322458653	New	1	Back up monitor
AP Lab	1	O_3	Thermo Instruments	49c s/n 0426408745	Good	7.5	Back up monitor
AP Lab	1	O_3	Thermo Instruments	49c s/n 0426408746	Good	7.5	Bench standard
AP Lab	1	Multi-Gas Calibrator	Thermo Instruments	146i s/n 1213752907	Good	4.5	Referee station
AP Lab	1	Zero Air System	Thermo Instruments	111 s/n 1333159730	Good	4.5	Referee station
AP Lab	1	CO	Thermo Instruments	48C s/n 0518112051	Fair	12	In storage; Can be used as backup monitor
AP Lab	1	CO	Thermo Instruments	48C s/n 0518112052	Fair	10	In storage; Can be used as backup monitor
AP Lab	4	Toxics/ Carbonyls	ATEC	2200 s/n 21131 and 21130	Fair	13.5	In Storage
AP Lab	1	PM_{10}	Thermo Andersen	GUV-16H s/n 4204	Good	9	In storage; Back up monitor
AP Lab	1	PM_{10}	Graseby	GMW GUV-16H s/n 3810	Fair	21	In storage; Back up monitor
AP Lab	1	NO_2	Thermo Instruments	42c s/n 0425908744	Fair	12	In storage
AP Lab	1	SO_2	Thermo Instruments	43i s/n JC1324500911	Good	4	Back up monitor
AP Lab	1	Primary Standard	Thermo Instruments	49iPS s/n 1333159739	Good	4.5	Referee station

Site No.	Number of Monitors	Pollutant	Equipment Supplier	Model No. Serial No.	Condition	Years In Service	Monitor Type
AP Lab	1	Data Logger	Agilaire	8872 s/n 0320	New	1	Backup
AP Lab	1	NO_2	Teledyne	T200 s/n 1360	New	1	Backup
AP Lab	1	CO	Teledyne	T300 s/n 1625	New	1	Backup
AP Lab	1	CO	Thermo Instruments	48i s/n 1152990095	New	1	Backup
AP Lab	1	Multi-Gas Calibrator	Teledyne	T750 s/n 61	New	1	PQAO
AP Lab	1	Multi-Gas Calibrator	Environics	6103 s/n 6587	New	1	PQAO
AP Lab	1	CO	Thermo Instruments	48i-TLE s/n 1324658815	Good	5.5	Backup
AP Lab	1	$PM_{2.5}$	Met One	BAM 1022 s/n W21431	New	0	Backup
AP Lab	1	$PM_{2.5}$	Met One	BAM 1022 s/n W21428	New	0	Backup

2018 Knox County's Annual Network Plan

Ambient Air Monitoring Plan

Knox County, TN

Department of Air Quality Management

Prepared by:
Amber Talgo and Rebecca Larocque
April 27, 2018

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Introduction

The Air Quality Monitoring Network Plan (Plan) is produced by the Knox County Department of Air Quality Management (KCDAQM) on an annual basis in order to meet three objectives. First, the Plan development process establishes the structure for the department to evaluate its existing ambient air monitoring network and to propose changes to the network based on modified data needs, changing regulatory requirements, and available resources. Second, the Plan provides opportunity for the KCDAQM to solicit, evaluate, and respond to comments and input from the State of Tennessee Department of Environment and Conservation Division of Air Pollution Control's (TDEC-APC), the general public and other interests regarding the network. Third, the Plan is developed and submitted to the Region 4 Office of the United States Environmental Protection Agency (EPA Region 4) in fulfillment of the requirements contained in Title 40 of the Code of Federal Regulations (CFR) Part 58.10.

The Plan is intended to accurately describe the monitoring sites in the network, identify their monitoring purpose, describe how the sites fulfill Network Design criteria, and describe any deviations in physical characteristics or operation from regulatory requirements. The Plan also describes changes the KCDAQM anticipates making to the network in the next year.

The KCDAQM monitors air quality principally by measuring concentrations of criteria air pollutants pursuant to the federal Clean Air Act in an endeavor to meet three basic monitoring objectives:

- Provide air pollution data to the general public in a timely manner.
- Support compliance with ambient air quality standards and emissions strategy development.
- Support air pollution research studies.

Criteria air pollutants are the most common air pollutants with known harmful human health effects. The six criteria pollutants are:

- carbon monoxide (CO);
- sulfur dioxide (SO_2);
- lead (Pb);
- nitrogen dioxide (NO_2);
- ozone (O_3); and
- particulate matter (PM). PM includes airborne materials in two size fractions, those with an aerodynamic diameter of 10 microns and less (PM_{10}), and those with an aerodynamic diameter of 2.5 microns and less ($PM_{2.5}$).

For each criteria air pollutant, National Ambient Air Quality Standards (NAAQS) are established to protect public health and the environment. Two types of federally mandated air quality standards may exist. Primary standards set limits to protect public health, including the health of at-risk populations such as people with pre-existing heart or lung disease (such as asthmatics), children, and older adults. Secondary standards set limits to protect public welfare, including protection against visibility impairment, damage to animals, crops, vegetation, and buildings.

The Plan is provided in three broad sections. The first section describes the various pollutant- specific ambient air monitoring design requirements and explains how the KCDAQM has implemented each as applicable. The second section describes changes to the monitoring network that the KCDAQM is proposing. The final section includes details on each of the monitoring locations and three appendices providing population data, climate date, and an equipment condition list.

The KCDAQM Monitoring Network has in the past been incorporated in the State of Tennessee Department of Environment and Conservation Division of Air Pollution Control's (TDEC-APC) Primary Quality Assurance Agency (PQAO). As of January 1, 2015, the KCDAQM assumed the role of PQAO for its ambient air monitoring network. TDEC-APC and KCDAQM both have ambient air monitors in the Knoxville CBSA. This document will include all required information to monitor and assess the needs of the population served by KCDAQM.

I. Ambient Air Monitoring Requirements

The term 'ambient air' is defined in 40 CFR 50.1 as "that portion of the atmosphere, external to buildings, to which the general public has access. " Federal rules implemented by the United States Environmental Protection Agency (EPA) require each state to establish a network of monitors to measure concentrations of criteria pollutants in ambient air based upon population, regional air quality, and regulatory concerns. Table 1 represents a snapshot of all the pollutants required monitors and those operating within the KCDAQM network. The following sections will explain further the ambient air monitoring requirements for each of the criteria air pollutants and explain the KCDAQM's implementation of them.

Table 1

Population Estimates		14129 Lead		42101 CO		42401 SO2		42602 NO2		44201 O3		81102 PM 10		88101 PM 2.5		88502 PM 2.5 Speciation		PM 2.5 Cont.	
CBSA 2017 Population Estimate	MSA 2017 Population Estimate	Op	Req	Op	Req	Op	Req	Op	Req	Op	Req	Op	Req	Op	Req	Op	Req	Op	Req
877,104	739,640	3	1	0	0	0	1	0	0	2	2	1	1	5	1	1	1	1	1

A. Ozone (O3) Monitoring Criteria

The minimum number of ozone monitors required by 40 CFR Part 58, Appendix D is summarized in Table 2.

Table 2- Minimum O_3 Requirements [1]

Metropolitan Statistical Area (MSA) population [2,3]	Number of Monitors Per MSA	
	Most recent 3-year design value ≥ 85% of NAAQS [4]	Most recent 3-year design value < 85% of NAAQS [4,5]
> 10 milliion	4	2
4 -10 million	3	1
350,000 - < 4 million	2	1
50,000 - < 350,000 [6]	1	0

[1] From table D-2 of Appendix D to 40 CFR Part 58

[2] Minimum monitoring requirements apply to the (MSA)

[3] Population based on latest available census figures.

[4] O_3 NAAQS levels are defined in 40 CFR part 50

[5] Minimum monitoring requirements apply in absence of a design value

[6] MSA defined as urbanized area of 50,000 or more population.

Knox County is part of the Knoxville Metropolitan Statistical Area which consists of Anderson, Blount, Knox, Loudon and Union Counties. See appendix A for further information on the Knoxville MSA. According to the 2010 Census and the extrapolated US Census Bureau's Population Estimate Program, the Knoxville MSA falls within the 350,000-<4million population category. Knox County operates ozone monitoring sites at Springhill Elementary (47-093-1020) and East Knox Elementary (47-093-0021). Table 3 summarizes the 8-hour O3 values measured at the monitoring sites during the designated ozone season (March-October) of 2017. Both sites are within 85% of the current NAAQS of .070 ppm.

Table 3 – 8hr Rolling Ozone Season 2017

Station	Concentrations (ppm)			NAAQS Design Value 2017
	Minimum	Maximum	Average	
East Knox	.000	.064	.026	.064
Springhill	.000	.070	.028	.067

The monitoring directives in 40 CFR Appendix D Section 5 contain specific requirements for the operation of Photochemical Assessment Monitoring Stations (PAMS) in areas classified as serious, severe, or extreme nonattainment for O3. Knox County does not contain any O3 nonattainment areas, therefore no PAMS monitoring is required of the KCDAQM.

B. Carbon Monoxide (CO) Monitoring Criteria

Per 40 CFR 58 Appendix D Section 4.2, the requirements for CO monitoring sites are closely related to the requirements for near-road NO2 monitoring sites (see Section I.C.). Table 4 summarizes the number of required CO monitoring sites.

Table 4 - Minimum CO Monitoring Requirements [1]

Criteria	Number of Near-Road CO Monitors Required
CBSA Population ≥ 1,000,000	One, collocated with an NO_2 monitor or in an alternative location approved by the EPA

[1] From Appendix D of 40 CFR Part 58, Sec 4.2.1

As documented in Appendix A, the Knoxville CBSA does not meet the listed criteria, and no CO monitors are required. There are no CO monitors in the KCDAQM monitoring program.

C. Nitrogen Dioxide (NO2) Monitoring Criteria

The minimum number of NO2 monitoring sites required by 40 CFR 58 Appendix D Section 4.3 is summarized in Table 5.

Table 5 - Minimum NO_2 Monitoring Requirements [1]

Requirement Type	Criteria	Minimum Monitors Required
Near road	CBSA Population ≥ 1,000,000	1
	CBSA Population ≥ 2.5 Million	2
	CBSA Population ≥ 1,000,000 and Road Segments with annual average daily traffic counts ≥ 250,000	2
Area- Wide	CBSA Population ≥ 1 Million	1
Protection of Susceptible and Vulnerable Populations	Any area inside or outside CBSAs	As required by EPA Administrator [2]

[1] From 40 CFR 58 Appendix D Section 4.3

[1] From 40 CFR 58 Appendix D
Section 4.3.4 (b)

As documented in Appendix A, the Knoxville CBSA does not meet the listed criteria, therefore none are required. There are no NO2 monitors in the KCDAQM monitoring program.

D. Sulfur Dioxide (SO2) Monitoring Criteria

The minimum number of SO2 monitoring sites required by 40 CFR 58 Appendix D Section 4.4 is shown in Table 6.

Table 6 - Minimum SO_2 Monitoring Requirements [1]

CBSA PWEI [2]	Minimum Number of SO_2 Monitors
≥ 1,000,000	3
<1,000,000 - ≥ 100,000	2
<100,000 - ≥ 5,000	1

[1] From Appendix D to 40 CFR Part 58, Sec 4.4.2

[2] Core Based Statistical Area Population Weighted Emissions Index

The EPA criteria used to determine the numbers of required SO2 monitors is based upon two metrics: The Core Based Statistical Area (CBSA), and the Population Weighted Emissions Index (PWEI). The emissions are based upon the most current emissions inventory calculations. The emissions inventory is updated every 3 years; therefore the 2017 data will be entered in 2018 and available for use the following year. The Knoxville CBSA as described in Appendix A, is required to have SO2 monitoring based on these metrics. The Knoxville CBSA PWEI can be calculated as follows:

Knoxville CBSA 2014 Census Estimate: 857,585

2014 SO2 Emissions (tons per year): 29,280

PWEI= (861,424 x29, 280)/1,000,000: 25,222.5

This requirement is met by the TDEC-APC site 0101 located in Anderson County within the Knoxville CBSA.

E. Lead (Pb) Monitoring Criteria

The lead monitoring design rule in 40 CFR 58 Appendix D Section 4.5 requires monitoring agencies to establish air quality monitoring near industrial facilities that emit more than 0.5 tons per year (tpy) of lead into the atmosphere, and at specified airports. None of the listed airports are located in Knox County, but one facility reports annual lead emissions in excess of the 0.5 tpy emissions threshold. The Gerdau plant reported total lead

emissions of 0.53 tons for calendar 2017. The value exceeds the 0.5 typ monitoring threshold. KCDAQM operates 2 lead monitoring sites surrounding the plant which includes one collocated site. The Ameristeel site (47-093-0023) is the source oriented site required by the rule. This site was established to provide data at the fence line of the plant. The Burnside site (47-093-0027) contains an official and collocated monitor. It was the source specific monitor until 2011 when replaced by the Ameristeel site. The KCDAQM continues to operate the Burnside site (47-093-0027) for population exposure data as well as maintaining the historical data the Burnside site provides. A third site, Rule (47-093-1017), was operated through October of 2017. The discontinuation of this site was approved in the 2017 Network Plan.

F. Particulate Matter (PM10) Monitoring Criteria

The minimum number of PM10 monitoring sites required by 40 CFR 58 Appendix D Section 4.6 is shown in Table 7.

Table 7 Minimum PM_{10} Monitoring Requirements [1]

	Number of Monitors per MSA [1]		
Population Category	**High Conc.** [2]	**Medium conc.** [3]	**Low conc.**[4][5]
>1,000,000	6 - 10	4 - 8	2 - 4
500,000 - 1,000,000	4 - 8	2 - 4	1 - 2
250,000- 500,000	3 - 4	1 - 2	0 - 1
100,000 - 250,000	1 - 2	0 - 1	0

[1] From Table D-4 of Appendix D to 40 CFR Part 58. Selection of urban areas and number of stations per MSA within ranges show are jointly determined by EPA, TDEC, and KCDAQM

[2] High concentration areas are those for which data exceeds the NAAQS by 20 % or more

[3] Medium concentration areas are those for which data exceeds 80% of the NAAQS

[4] Low concentration areas are those for which data is less than 80% of the NAAQS

[5] Low concentration requirements apply in the absence of a design value.

The Knoxville MSA is a low concentration 500,000-1,000,000 population category requiring 1-2 monitor. The KCDAQM operates one continuous TEOM 1405. In September of 2017, KCDAQM installed a Teledyne T640X at the Air Lab (47-093-1013) site. This monitor is capable of reading both PM10 and PM2.5. KCDAQM is collecting trial data from the monitor and reviewing the statistical correlation with the official TEOM data. Once an approved Standard Operating Procedure is approved, The TEOM will be discontinued.

G. Fine Particulate Matter (PM2.5) Monitoring Criteria

The minimum number of PM2.5 monitoring sites required by 40 CFR 58 Appendix D Section 4.7 is shown in Table 8.

Table 8 - Minimum $PM_{2.5}$ Monitoring Requirements [1]

	Number of Monitors per MSA	
MSA Population [2]	**Most recent 3 year design value ≥ 85% of any $PM_{2.5}$ NAAQS [3]**	**Most recent 3 year design value < 85% of any $PM_{2.5}$ NAAQS [3][4]**
> 1,000,000	3	2
500,000 - 1,000,000	2	1
50,000 -<500,000	1	0

[1] From Table D-5 of appendix D to 40 CFR Part 58.

[2] Population based on latest available census figures.

[3] $PM_{2.5}$ NAAWS levels are defined in 40 CFR part 50

[4] Minimum monitoring requirements apply in absence of design value

Based upon the population data and most recent design values, the Knoxville MSA is required to operate 2 PM2.5 monitors. The NAQQS primary standard for the annual mean and the 24-hour average is taken from a 3 year average. The Knoxville MSA stands currently at 12 µg/m^3 for the annual standard and 34 µg/m^3 for the 24-hour standard. In 2015 the design value came below 85% of the NAAQS, however in October thru December of 2016 East Tennessee and areas surrounding Knox County experienced an outbreak of wildfires that affected the PM 2.5 statistical data. KCDAQM submitted an intent to demonstrate an exceptional event in conjunction with the State of Tennessee Air Pollution Control. This request will allow KCDAQM to submit a demonstration *if* the Knox County MSA exceeds the NAQQS standard before the affected 2016 data is no longer part of the 3-year design value calculation. Therefore, the KCDAQM continues to operate as if all the data is included. The KCDAQM operates 5 SLAMS monitors including a collocated monitor and 1 special purpose continuous monitor for Air Quality Index (AQI) reporting. On January 1st 2017, KCDAQM reduced the sample frequency of the Spring Hill, Rule and Bearden PM2.5 monitors from daily sampling to the 1:3 sampling schedule. This change was made due to the price of filter analysis and is supported by 40 CFR part 58 Subpart B 58.12. KCDAQM operates these monitors to demonstrate continuing NAAQS compliance, provide information for control strategies and to inform the public of health impacts during events. Table 9 gives the design values by site.

Table 9 – PM2.5 NAAQS Comparisons

Site	NAAQS Design Values(µg/m^3)	
	24 hour	**Annual**
Air Lab	34	10
Bearden	19	8.9
Rule	22	9.6
Springhill	19	8.6

The PM2.5 monitoring criteria in 40 CFR 58 Appendix D Section 4.7 contains two additional significant requirements. First, Section 4.7.4 requires that each state continue to conduct PM2.5 Chemical Speciation

monitoring at locations designated to be part of the national Speciation Trends Network (STN). KCDAQM operates one of these speciation sites at Springhill Elementary (47-093-1020).

Second, Section 4.7.2 requires that agencies operate continuous analyzers in at least one-half of the required PM2.5 monitoring sites and at least one analyzer per MSA must be collocated with a sequential Federal Reference Method (FRM) analyzer. In 2016 KCDAQM used a Thermo Beta 5014i to meet the continuous PM 2.5 monitoring requirement. This monitor did not meet the criteria of a Federal Equivalent Method (FEM) for PM 2.5 and should not be used towards determinations of NAAQS compliance. In October of 2017, KCDAQM installed a Teledyne T640X at the Air Lab site to replace the Thermo 5014i.

H. National Core Monitoring Site (NCore) Monitoring Criteria

Section 3 of Appendix D to 40 CFR part 58 requires that each state operate at least one NCore multi-pollutant monitoring site. By definition, each NCore site must include monitoring equipment to measure PM2.5, PM10-2.5, speciated PM2.5, O3, SO2, CO, NO, NOx, lead, and basic meteorology. Knox County is not a chosen NCore site within the State of Tennessee.

II. Proposed Changes to KCDAQM Ambient Air Monitoring Network

A. Lead Monitoring South East of Gerdau Plant

KCDAQM intends to install a lead monitor on the South East side of the Gerdau plant at the recommendation of the United States Environmental Protection Agency. An exact location for this site has not been acquired. When a site is attained and approved, KCDAQM intends to request relocating the Burnside (47-093-0027) monitoring station to the new location South East of the Gerdau plant.

B. Moving to continuous PM2.5 monitoring

KCDAQM solicited and obtained a contract with Teledyne API to purchase their T640 particulate monitor. One monitor was purchased and installed at the Air Lab (47-093-1013) site to replace a broken Beta Attenuated monitor. KCDAQM intends to slowly integrate new T640 monitors as funding allows to replace our aging system of Partisol 2025 instruments.

III. Monitoring Sites

A. Air Lab, Knox County

Site Photo

Rep Org Name	Knox County Department of Air Quality Management		
PQAO	Knox County Department of Air Quality Management		
Address	939 Stewart St, Knoxville 37917		
AQSID	470931013		
County	Knox		
CBSA	28940		
Lat	35.980756N		
Lon	83.925769W		
Pollutant	PM 2.5	PM 10	PM 2.5
Parameter Code	88101	81102	88101
Monitor Type	SLAMS	SLAMS	SPM
POC	1	3	3
Interval	24-Hour	24-Hour	24-Hour
Collection Frequency	6	Hourly	Hourly
Method	145	079	238
FRM/FEM Monitoring Instrument	Thermo Partisol Plus 2025	Thermo 1405 TEOM	Teledyne T640X
Analysis	Gravimetric	Gravimetric	Light Scattering
Ref Mtd ID	RFPS-0498-118	EQPM-1090-079	EQPM-0516-238
Monitor Objective Type	Population Exposure	Population Exposure	Population Exposure
Dominant Source	Mobile	Mobile	Mobile
Measurment Scale	Middle Scale	Middle Scale	Middle Scale
Land Use Type	Mobile	Mobile	Mobile
Location Setting	Urband and City Center	Urban and City Center	Urban and City Center
Date Established	20110101	20170101	20171001

Site Background and Discussion

The Air Lab site is located in the city of Knoxville in a mixed-use zoning area. It is surrounded by residential and commercial facilities. This site was relocated in 2015 from Davanna Ave. The Beta Attenuated Monitor was replaced with the Teledyne T640X light scattering monitor as the special purpose monitor for reporting the Air Quality Index (AQI).

Knox County Health Department
Every Person, A Healthy Person

Siting Evaluation Form

Site Name:	Air Lab		Date:	10/25/2017
AQSNo:	47-093-1013		Site Address:	939 Stewart St
Coordinates:	Lat	35.980756N	Inspected by:	
	Lon	83.925769W		

Pollutant	Scale	Probe Height [1]	Flow (hi or Low)	Separation from samplers [1]	Pass/Fail	Distance to Road [1]	Pass/Fail
PM10	Middle	4.2	low	1.2	Pass	15.8	
PM2.5	Middle	4.6	low	1.2	Pass	15.8	
PM2.5 cont	Middle	4.8	low	1.2	Pass	15.3	

				Tree	
Obstruction type [2]	Obst. Height [1]	Obst. Distance [1,2]	Pass/Fail	Dripline [1]	Pass/ Fail
tree	12m	23.4	Pass	22	Pass

[1] All Measurements in meters
[2] Including vertical and horizontal separation from walls &/or parapets if applicable

Take photos to and from each cardinal direction: attached

Collocated Samplers mut be within 4 m of each other and at least 2 m apart for hi vol, at least 1 m for low volume
Obstruction Distance must be ≥ 2* (Obst height - probe height)
Dripline must be >10 m away, prefer >20m
Horizontal and vertical disance on rooftop 1m for O_3/ gases - 2m for all others
Unrestricted air flow must be ≥ 270 °

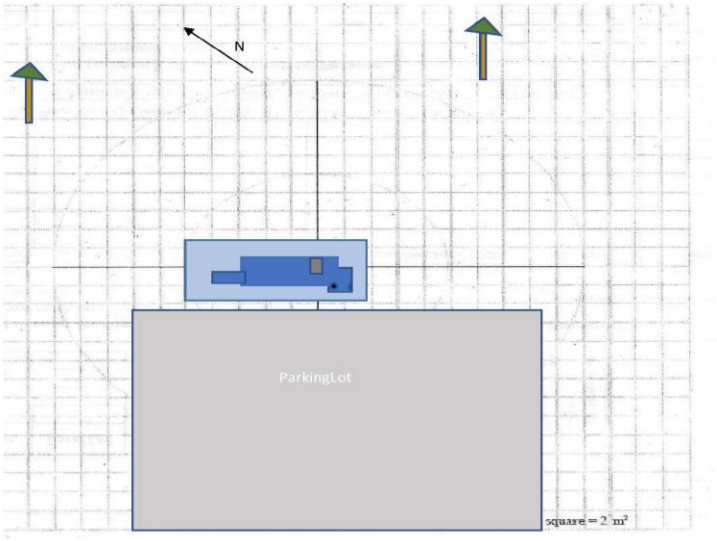
Knox County Health Department
Every Person, A Healthy Person

Siting Evaluation Form

Site Drawing

Estimated Degree of Unrestriced Air Flow: 360°

Indicate:
North
Primary Wind Dir
Shelter
Probe Postions
Nearby trees
Roadways
Buildings
Other Obstuctions
Source if Appicable



Primary wind direction from 220° SSW

Siting Evaluation Form

Photos from monitor to cardinal direction

North

South

East

West

Siting Evaluation Form

Photos from cardinal direction towards monitor

North

South

East

West

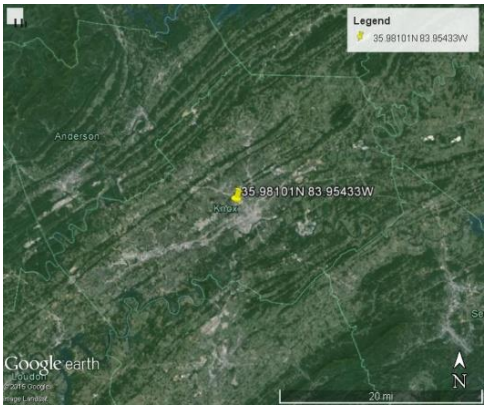
B. Ameristeel, Knox County

Site Photo

Rep Org Name	Knox County Department of Air Quality Management
PQAO	Knox County Department of Air Quality Management
Address	1526 New York Ave, 37921
AQSID	470930023
County	Knox
CBSA	28940
Lat	35.981
Lon	-83.9543
Pollutant	Lead
Parameter Code	14129
Monitor Type	SLAMS
POC	1
Interval	24-hour average
Collection Frequency	1:6
Method	193
FRM/FEM Monitoring Instrument	High Volume PB-TSP
Analysis	ISPMS Mass Spectroscopy
Ref Mtd ID	RFLA-0813-813
Monitor Objective Type	Source Oriented
Dominant Source	Point
Measurment Scale	Null
Land Use Type	Residential
Location Setting	Urban Center
Date Established	20110101

Site Background and Discussion

This is a lead only site established as a source-oriented site to fulfill the requirements in 40 CFR part 58 App. D 4.5. It is located in the urban core, downwind of the source.



Siting Evaluation Form

Site Name: Ameristeel		Date:	10/24/2017
AQSNo: 47-093-0023		Site Address:	1526 New York Ave
Coordinates:	Lat 35.981	Inspected by:	Rebecca Larocque
	Lon -83.9543		

Pollutant	Scale	Probe Height [1]	Flow (hi or Low)	Separation from samplers [1]	Pass/Fail	Distance to Road [1]	Pass/Fail
Lead	Microscale	4.6M	Hi	n/a	Pass	12.8m	

				Tree	
Obstruction type [2]	Obst. Height [1]	Obst. Distance [1,2]	Pass/Fail	Dripline [1]	Pass/ Fail
Tree ENE quadrant	6.2M	10M	Pass	10M	Pass
Tree SSW quadrant	14.2M	35M	Pass	> 10 M, Unable to measure do to fence	

[1] All Measurements in meters

[2] Including vertical and horizontal separation from walls &/or parapets if applicable

Take photos to and from each cardinal direction: Attached

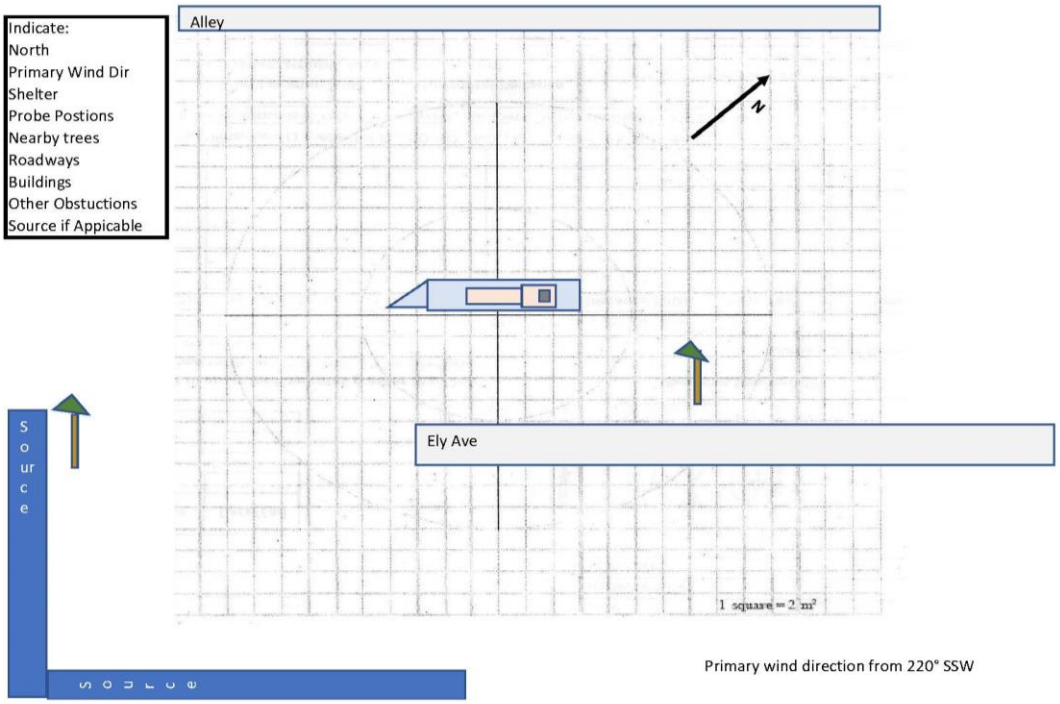
Collocated Samplers mut be within 4 m of each other and at least 2 m apart for hi vol, at least 1 m for low volume
Obstruction Distance must be ≥ 2* (Obst height - probe height)
Dripline must be >10 m away, prefer >20m
Horizontal and vertical disance on rooftop 1m for $O_{3/}$ gases - 2m for all others
Unrestricted air flow must be ≥ 270 °

Siting Evaluation Form

Site Drawing

Estimated Degree of Unrestriced Air Flow: 360°

Indicate:
North
Primary Wind Dir
Shelter
Probe Postions
Nearby trees
Roadways
Buildings
Other Obstuctions
Source if Appicable



Primary wind direction from 220° SSW

Siting Evaluation Form

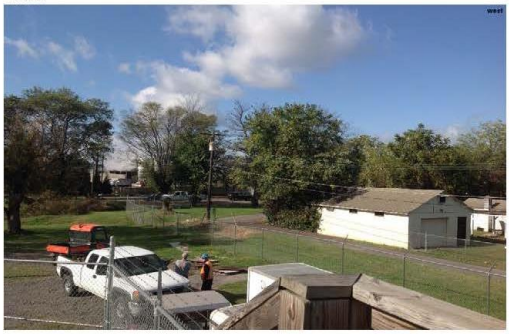
Photos from monitor to cardinal direction

North

South

East

West



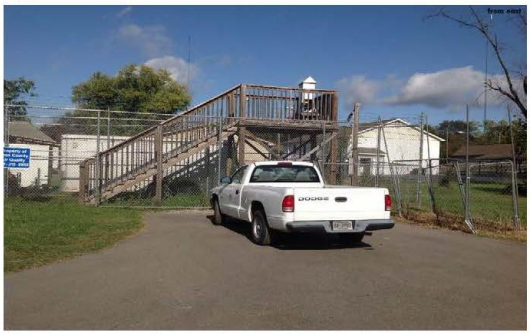
Siting Evaluation Form

Photos from cardinal direction towards monitor

North

South

East



West

C. Bearden, Knox County

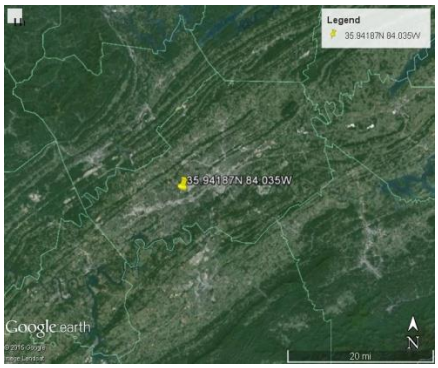
Site Photo

Rep Org Name	Knox County Department of Air Quality Management	
PQAO	Knox County Department of Air Quality Management	
Address	1000 Francis Street, Knoxville, 37909	
AQSID	47090028	
County	Knox	
CBSA	28940	
Lat	35.94190	
Lon	-84.03500	
Pollutant	PM 2.5	PM 2.5
Parameter Code	88101	88101
Monitor Type	SLAMS	SLAMS
POC	1	2
Interval	24- hour average	24-hour average
Collection Frequency	1:3	1:6
Method	145	145
FRM/FEM Monitoring Instrument	Thermo Partisol Plus 2025	Thermo Partisol Plus 2025
Analysis	GRAVIMETRIC	GRAVIMETRIC
Ref Mtd ID	RFPS-0498-118	RFPS-0498-118
Monitor Objective Type	Population Exposure	Population Exposure
Dominant Source	Mobile	Mobile
Measurment Scale	Neighborhood	Neighborhood
Land Use Type	Mobile	Mobile
Location Setting	Suburban	Suburban
Date Established	19990101	20110401

Site Background and Discussion

The Bearden site is located west of the urban center of Knoxville in a densely populated area. There are residential and commercial properties for a few kilometers in all directions. This site is centrally located in the Knoxville MSA area.

This Site is important for neighborhood scale population exposure for Knox County and serves as a collocated site.



Knox County Health Department
Every Person. A Healthy Person

Siting Evaluation Form

Site Name:	Bearden	
AQSNo:	47-093-0028	
Coordinates:	Lat	35.9419
	Lon	-84.035

Date:	10/31/2017
Site Address:	1000 Francis Street
Inspected by:	R.Larocque

Pollutant	Scale	Probe Height [1]	Flow (hi or Low)	Separation from samplers [1]	Pass/Fail	Distance to Road [1]	Pass/Fail
PM2.5	Neighborhood	2.44	Low	2.5	Pass	39.6	
PM2.5 collocate	Neighbohood	2.44	Low			41.5	

				Tree	
Obstruction type [2]	Obst. Height [1]	Obst. Distance [1,2]	Pass/Fail	Dripline [1]	Pass/ Fail
Trees	11.8			19	Pass

[1] All Measurements in meters
[2] Including vertical and horizontal separation from walls &/or parapets if applicable

Take photos to and from each cardinal direction: Attached

Collocated Samplers mut be within 4 m of each other and at least 2 m apart for hi vol, at least 1 m for low volume
Obstruction Distance must be ≥ 2* (Obst height - probe height)
Dripline must be >10 m away, prefer >20m
Horizontal and vertical disance on rooftop 1m for O_3/ gases - 2m for all others
Unrestricted air flow must be ≥ 270 °

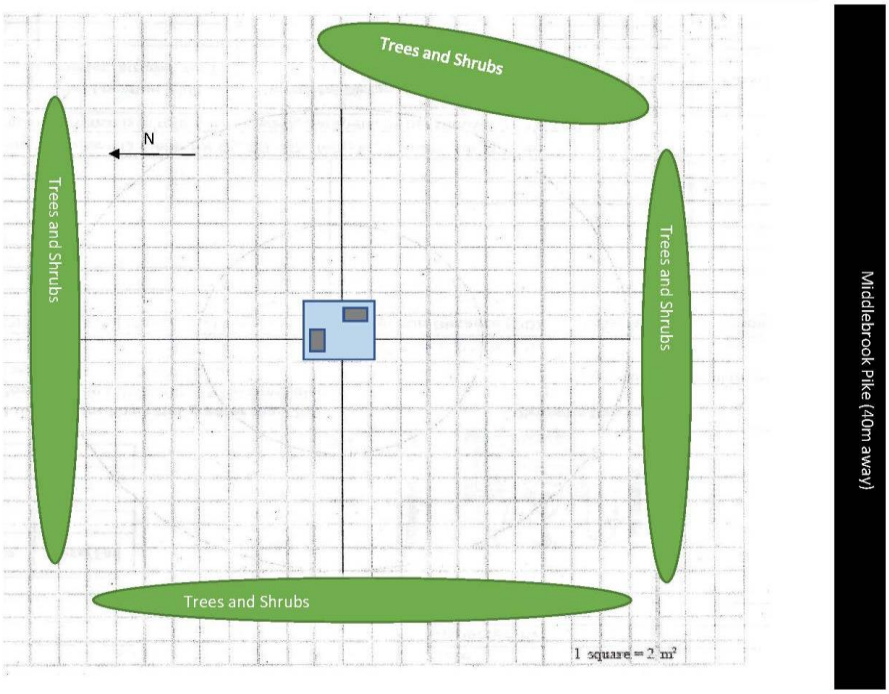
Knox County Health Department
Every Person. A Healthy Person

Siting Evaluation Form

Site Drawing

Estimated Degree of Unrestriced Air Flow: 360

Indicate:
North
Primary Wind Dir
Shelter
Probe Postions
Nearby trees
Roadways
Buildings
Other Obstuctions
Source if Appicable



Primary wind direction from 220° SSW

Siting Evaluation Form

Photos from monitor to cardinal direction

North

South

East

West

Siting Evaluation Form

Photos from cardinal direction towards monitor

North

South

East

West

D. Burnside, Knox County

Site Photo

Rep Org Name	Knox County Department of Air Quality Management	
PQAO	Knox County Department of Air Quality Management	
Address	2522 Burnside St, 37921	
AQSID	47090027	
County	Knox	
CBSA	28940	
Lat	35.98306	
Lon	-83.95226	
Pollutant	Lead	Lead
Parameter Code	14129	14129
Monitor Type	SLAMS	SLAMS
POC	1	2
Interval	24-hour average	24-hour average
Collection Frequency	1:6	1:6
Method	193	193
FRM/FEM Monitoring Instrument	Hi-Vol Pb-TSP	Hi-Vol Pb-TSP
Analysis	ISPMS Mass Spectroscopy	ISPMS Mass Spectroscopy
Ref Method ID	RFLA-0813-813	RFLA-0813-813
Monitor Objective Type	Population Exposure	Collocated
Dominant Source	Point	Point
Scale	Neighborhood	Neighborhood
Land Use Type	Industrial	Industrial
Location Setting	Urban and City Center	Urban and City Center
Date Established	19941204	19941204

Site Background and Discussion

The Burnside site is located in the Urban Industrial section of the city of Knoxville. The site was established in 1994 and serve as a source-oriented lead monitor and collocated monitoring site. The Ameristeel Site is now the source-oriented monitor and the Burnside site serves as a population exposure site.

Knox County Health Department
Every Person. A Healthy Person

Siting Evaluation Form

Site Name:	Burnside		Date:	10/24/2017
AQSNo:	47-093-0027		Site Address:	2522 Burnside St, 37921
Coordinates:	Lat	35.98306	Inspected by:	Rebecca Larocque
	Lon	-83.9523		

Pollutant	Scale	Probe Height [1]	Flow (hi or Low)	Separation from samplers [1]	Pass/Fail	Distance to Road [1]	Pass/Fail
Lead - Official		2m	Hi	2.56m	Pass	23.8m	pass
Lead - Collocated		2m	Hi	2.56m	Pass	23.8m	pass

				Tree	
Obstruction type [2]	Obst. Height [1]	Obst. Distance [1,2]	Pass/Fail	Dripline [1]	Pass/ Fail
Tree SW quadrent	17m			12.3m	Pass
Fire house	14.5	25.1	Pass		

[1] All Measurements in meters

[2] Including vertical and horizontal separation from walls &/or parapets if applicable

Take photos to and from each cardinal direction: attached

Collocated Samplers mut be within 4 m of each other and at least 2 m apart for hi vol, at least 1 m for low volume
Obstruction Distance must be ≥ 2* (Obst height - probe height)
Dripline must be >10 m away, prefer >20m
Horizontal and vertical disance on rooftop 1m for O_3/ gases - 2m for all others
Unrestricted air flow must be ≥ 270 °

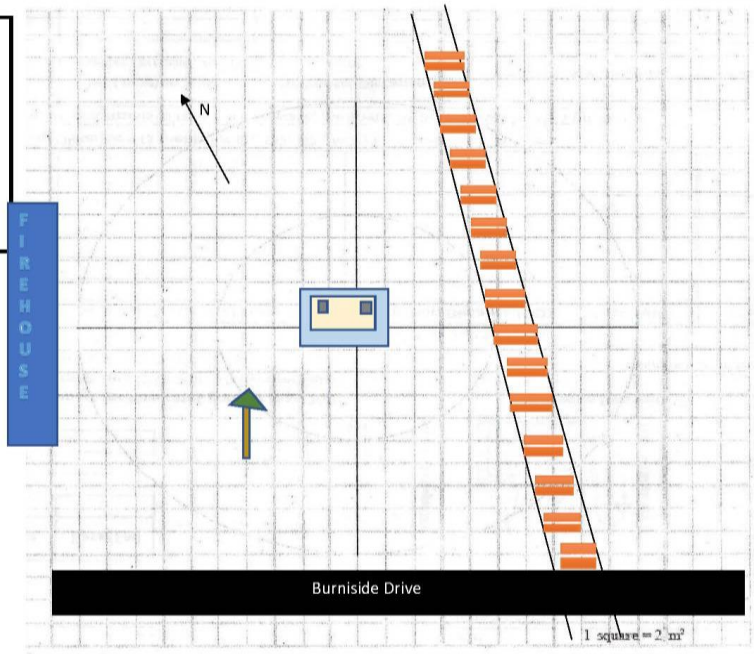
Knox County Health Department
Every Person. A Healthy Person

Siting Evaluation Form

Site Drawing

Estimated Degree of Unrestriced Air Flow: 270°

Indicate:
North
Primary Wind Dir
Shelter
Probe Postions
Nearby trees
Roadways
Buildings
Other Obstuctions
Source if Appicable



Primary wind direction from 220° SSW

Siting Evaluation Form

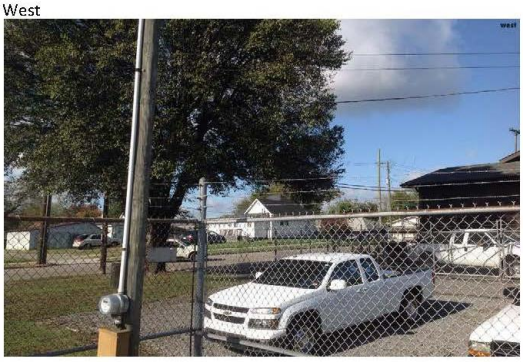
Photos from monitor to cardinal direction

North

South

East

West



Siting Evaluation Form

Photos from cardinal direction towards monitor

North

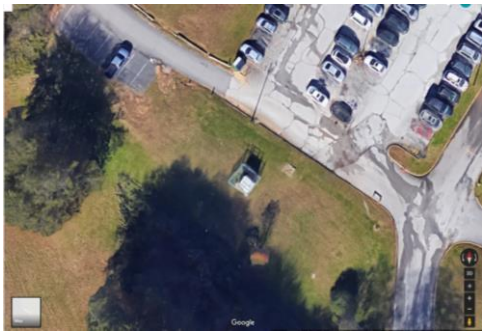
South

East

West

E. East Knox, Knox County

Site Photo

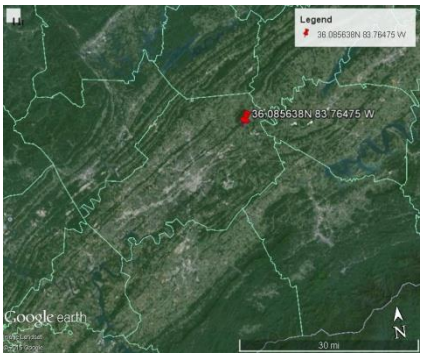


Rep Org Name	Knox County Department of Air Quality Management
PQAO	Knox County Department of Air Quality Management
Address	9315 Rutledge Pike, Mascot, 37806
AQSID	470930021
County	Knox
CBSA	28940
Lat	36.08564
Lon	-83.76475
Pollutant	Ozone
Parameter Code	44201
Monitor Type	SLAMS
POC	1
Interval	Hourly
Collection Frequency	Hourly
Method	087
FRM/FEM Monitoring Instrument	Teledyne 400E
Analysis	Ultra Violet
Ref Mtd ID	EQOA-0992-087
Monitor Objective Type	Highest Concentration
Dominant Source	Null
Measurment Scale	Urban Scale
Land Use Type	Agricultural
Location Setting	Rural
Date Established	19810601

Site Background and Discussion

This site is located in East Knox County and currently monitors for ozone. The site was initially established in 1981. The site is located downwind from the core Knoxville MSA area.

This site serves in assessing the highest concentration of ozone in the Knoxville area and used in the AQI forecasting program.



Siting Evaluation Form

Site Name:	East Knox		Date:	10/25/2017
AQSNo:	470930021		Site Address:	9315 Rutledge Pike
Coordinates:	Lat	36.0856	Inspected by:	R. Larocque
	Lon	-83.7648		

Pollutant	Scale	Probe Height [1]	Flow (hi or Low)	Separation from samplers [1]	Pass/Fail	Distance to Road [1]	Pass/Fail
Ozone	Urban	4.3	Low	n/a		180m	Pass

				Tree	
Obstruction type [2]	Obst. Height [1]	Obst. Distance [1,2]	Pass/Fail	Dripline [1]	Pass/ Fail
Tree	16.7m	27	Pass	14m	Pass

[1] All Measurements in meters

[2] Including vertical and horizontal separation from walls &/or parapets if applicable

Take photos to and from each cardinal direction: attached

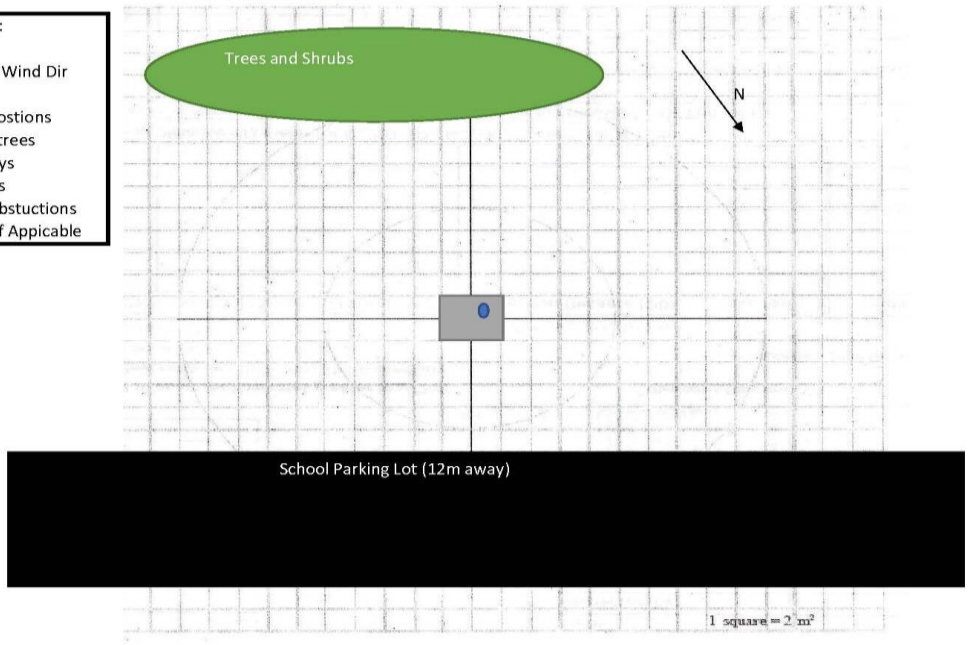
Collocated Samplers mut be within 4 m of each other and at least 2 m apart for hi vol, at least 1 m for low volume
Obstruction Distance must be ≥ 2* (Obst height - probe height)
Dripline must be >10 m away, prefer >20m
Horizontal and vertical disance on rooftop 1m for O_3/ gases - 2m for all others
Unrestricted air flow must be ≥ 270 °

Siting Evaluation Form

Site Drawing

Estimated Degree of Unrestriced Air Flow: 310

Indicate:
North
Primary Wind Dir
Shelter
Probe Postions
Nearby trees
Roadways
Buildings
Other Obstuctions
Source if Appicable



Primary wind direction from 220° SSW

Siting Evaluation Form

Photos from monitor to cardinal direction

North

South

East

West

Siting Evaluation Form

Photos from cardinal direction towards monitor

North

South

East

West

F. Rule, Knox County

Site Photo

Rep Org Name	Knox County Department of Air Quality Management
PQAO	Knox County Department of Air Quality Management
Address	1613 Vermont Ave, Knoxville, 37921
AQSID	470931017
County	Knox
CBSA	28940
Lat	35.97802
Lon	-83.95067
Pollutant	PM 2.5
Parameter Code	88101
Monitor Type	SLAMS
POC	1
Interval	24-hour average
Collection Frequency	1:3
Method	145
FRM/FEM Monitoring Instrument	Thermo Partisol Plus 2025
Analysis	Gravimetric
Ref Mtd ID	RFPS-0498-118
Monitor Objective Type	Population Exposure
Dominant Source	Mobile
Measurment Scale	Neighborhood
Land Use Type	Residential
Location Setting	Urban and Center city
Date Established	20020101

Site Background and Discussion

The Rule site serves as a population exposure site for PM2.5. The lead monitoring was discontinued in November of 2017 as approved in the 2017 Plan. It is located in a residential area that is less than .5-kilometer SE of several industries.

Knox County Health Department
Every Person, A Healthy Person

Siting Evaluation Form

Site Name:	Rule	
AQSNo:	47-093-1017	
Coordinates:	Lat	35.97802
	Lon	-83.9507

Date:	
Site Address:	1613 Vermont Ave
Inspected by:	

Pollutant	Scale	Probe Height [1]	Flow (hi or Low)	Separation from samplers [1]	Pass/Fail	Distance to Road [1]	Pass/Fail
Pm2.5	Neighborhood	2.36	Low	4.26	Pass	>36M	pass
Lead	Neighborhood	1.8	Hi			>36M	pass

				Tree	
Obstruction type [2]	Obst. Height [1]	Obst. Distance [1,2]	Pass/Fail	Dripline [1]	Pass/ Fail
Water Tower	22M	69.5m	Pass	29m	Pass

[1] All Measurements in meters
[2] Including vertical and horizontal separation from walls &/or parapets if applicable

Take photos to and from each cardinal direction: Attached

Collocated Samplers mut be within 4 m of each other and at least 2 m apart for hi vol, at least 1 m for low volume
Obstruction Distance must be ≥ 2* (Obst height - probe height)
Dripline must be >10 m away, prefer >20m
Horizontal and vertical disance on rooftop 1m for O_3/ gases - 2m for all others
Unrestricted air flow must be ≥ 270 °

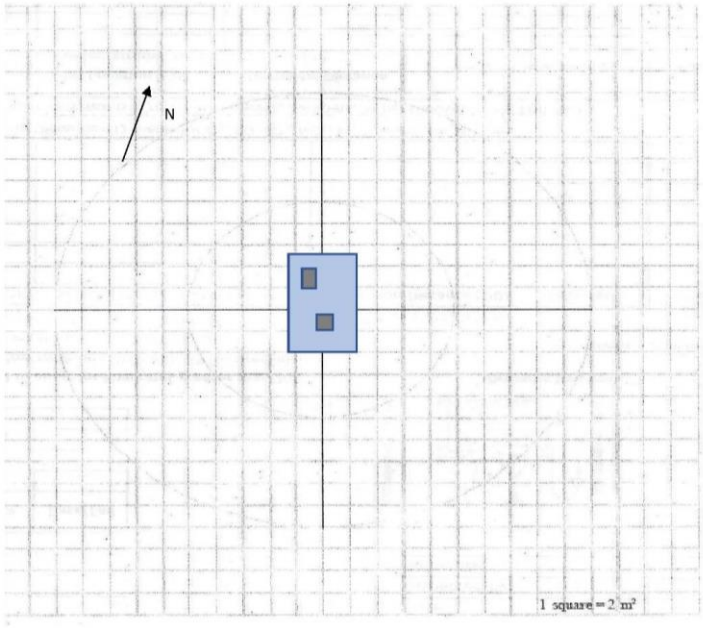
Knox County Health Department
Every Person, A Healthy Person

Siting Evaluation Form

Site Drawing

Estimated Degree of Unrestriced Air Flow: 360

Indicate:
North
Primary Wind Dir
Shelter
Probe Postions
Nearby trees
Roadways
Buildings
Other Obstuctions
Source if Appicable



Primary wind direction from 220° SSW

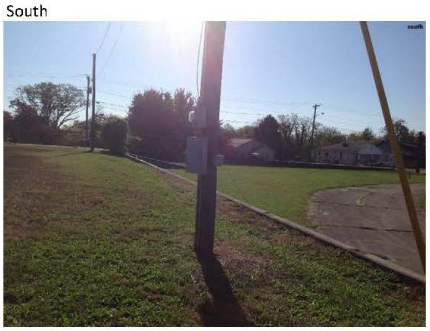
Vermont Ave

Siting Evaluation Form

Photos from monitor to cardinal direction

North

South



East

West

Siting Evaluation Form

Photos from cardinal direction towards monitor

North

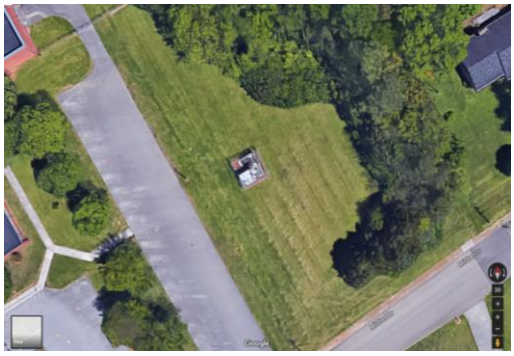
South

East

West

G. Springhill, Knox County

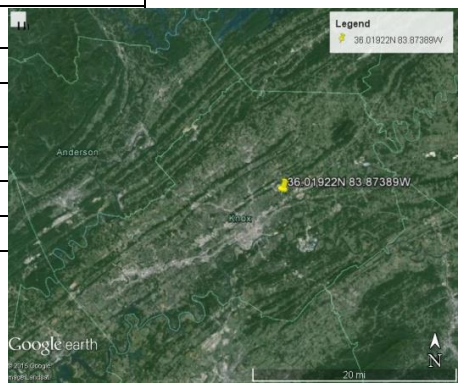
Site Photo



Rep Org Name	Knox County Department of Air Quality Management			
PQAO	KCDAQM			
Address	4711 Mildred Drive, Knoxville, 37914			
AQSID	470931020			
County	Knox			
CBSA	28940			
Lat	36.01920			
Lon	-83.87390			
Pollutant	Ozone	PM 2.5	PM 2.5 speciated	
Parameter Code	44201	88101	88502	88502
Monitor Type	SLAMS	SLAMS	Speciation	Speciation
POC	1	1	5	5
Interval	Hourly	24 Hour Average	24 Hour Average	24 Hour Average
Frequency	Hourly	1:3	1:6	1:6
Method	087	145	810	810
FRM/FEM Monitoring Instrument	Teledyne 400E	Thermo Partisol Plus 2025	Met One Super SASS	URG 3000
Analysis	Ultra Violet	Gravimetric	Gravimetric	Gravimetric
Ref Method ID	EQOA-0992-087	RFPS-0498-145	RFPS-0400-136	RFPS-0400-136
Objective	Population Exposure			
Dominant Source	Mobile			
Measurment Scale	Neighborhood			
Land Use Type	Residential			
Location Setting	Suburban			
Date Established	19810101	19990101		

Site Background and Discussion

The Springhill site is a neighborhood scale site located downwind of the urban core of Knoxville where ozone precursors are likely to occur. This site provides PM speciation information as well as Ozone and PM 2.5.



Knox County Health Department
Every Person, A Healthy Person

Siting Evaluation Form

Site Name:	Springhill	
AQSNo:	47-093-1020	
Coordinates:	Lat	36.0192
	Lon	-83.8739

Date:	10/25/2017
Site Address:	4711 Mildred Drive
Inspected by:	R.Larocque

Pollutant	Scale	Probe Height [1]	Flow (hi or Low)	Separation from samplers [1]	Pass/Fail	Distance to Road [1]	Pass/Fail
Ozone	Neighborhood	4.3m	low	2.1	Pass	36.2	
PM2.5	Neighborhood	4.6m	low	1.3	pass	36.2	
Speciation (URG)	Neighborhood	4.6m	low	1.3	Pass	36.2	
Speciation	Neighborhood	4.4m	low	1.5	Pass	36.2	

				Tree	
Obstruction type [2]	Obst. Height [1]	Obst. Distance [1,2]	Pass/Fail	Dripline [1]	Pass/ Fail
Tree	16.4m	24.6m		18.9m	Pass

[1] All Measurements in meters
[2] Including vertical and horizontal separation from walls &/or parapets if applicable

Take photos to and from each cardinal direction: attached

Collocated Samplers mut be within 4 m of each other and at least 2 m apart for hi vol, at least 1 m for low volume
Obstruction Distance must be ≥ 2* (Obst height - probe height)
Dripline must be >10 m away, prefer >20m
Horizontal and vertical disance on rooftop 1m for O_3/ gases - 2m for all others

Knox County Health Department
Every Person, A Healthy Person

Siting Evaluation Form

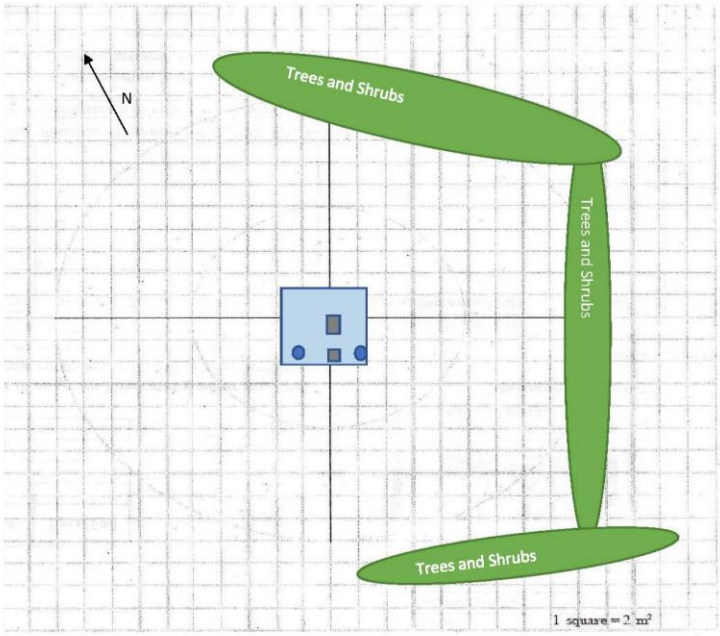
Unrestricted air flow must be ≥ 270 °

Site Drawing

Estimated Degree of Unrestriced Air Flow: 360

Indicate:
North
Primary Wind Dir
Shelter
Probe Postions
Nearby trees
Roadways
Buildings
Other Obstuctions
Source if Appicable

Primary wind direction from 220° SSW



Mildred Dr (36m away)

Photos from monitor to cardinal direction

North

South

East

West

Knox County Health Department
Every Person, A Healthy Person

Siting Evaluation Form

Photos from cardinal direction towards monitor

North

South

East

West

Appendix A. Population Data

The monitoring requirements use both the Metropolitan Statistical Area (MSA) and the Core Based Statistical Area (CBSA) as defined by the Office of Management and Budget. The Knoxville MSA as defined in the 2010 US Census consists of Anderson, Blount, Knox, Loudon and Union Counties. The CBSA for the Knoxville Area consists of Anderson, Blount, Campbell, Grainger, Knox, Loudon, Morgan, Roane and Union Counties. The KCDAQM's monitoring network works together with the State of Tennessee's monitoring network to the serve the population of this metropolitan area. Table A provides the population numbers which are used in the calculation of monitors required through the document.

Table A

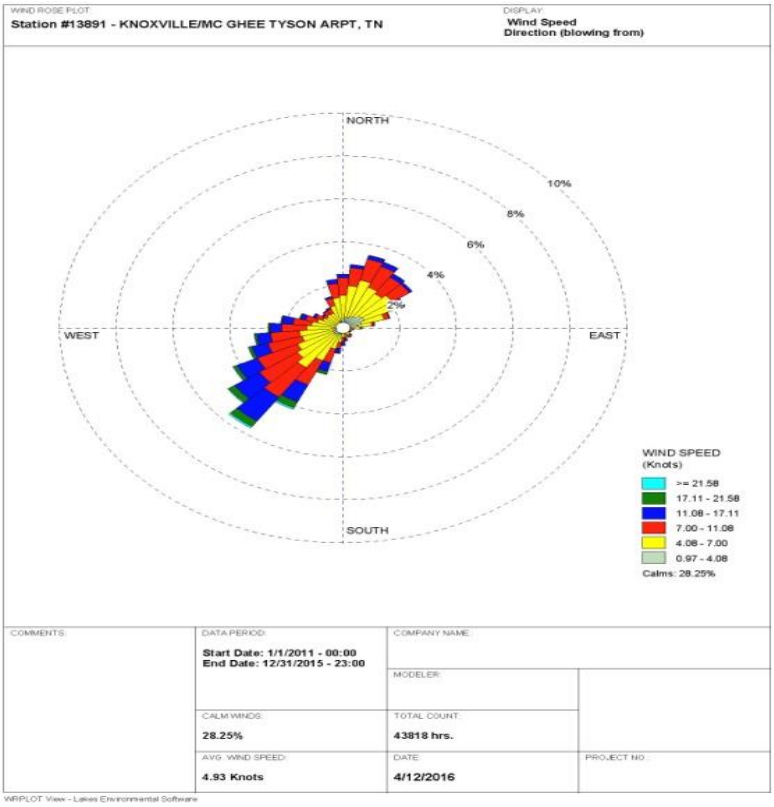
Location		Population Estimate (as of July 1)				
	Census	2013	2014	2015	2016	2017
Anderson County, Tennessee	75,129	75,258	75,131	75,459	75,585	76,257
Blount County, Tennessee	123,010	124,844	125,827	126,832	128,244	129,929
Campbell County, Tennessee	40,716	40,217	39,895	39,687	39,671	39,648
Grainger County, Tennessee	22,657	22,736	22,865	22,851	23,112	23,144
Knox County, Tennessee	432,226	444,194	447,939	451,321	456,114	461,860
Loudon County, Tennessee	48,556	50,307	50,533	50,852	51,275	52,152
Morgan County, Tennessee	21,987	21,661	21,688	21,487	21,724	21,636
Roane County, Tennessee	54,181	53,106	52,827	52,748	52,913	53,036
Union County, Tennessee	19,109	19,054	18,990	19,161	19,232	19,442
Knoxville CBSA	837,571	851,377	855,695	860,398	867,870	877,104
Knoxville MSA	698,030	713,657	718,420	723,625	730,450	739,640

1. **2010 population data from the US Census Bureau. www.census.gov**
2. **2013-2017 population estimates from the US Census Bureau's Population Estimates Program (PEP).**

Appendix B. Climate and Topography

Knox County is located within the Great East Tennessee Valley. It is paralleled with the plateau to the west and the Great Smoky Mountains to the east. The valley, which is characterized by long, narrow ridges, flanked by broad valleys, has slopes from 1,500 to 700 feet above sea level. The highest peak is 2,064 located in the northeast quadrant. The topography should be considered in monitoring plans due to the influence on inversion events.

Knox County temperatures fall within the humid subtropical climate zone. Temperature variation due to elevation can be apparent between the valley and the surrounding plateau and mountains. In the valley, summers are hot and humid, with the daily average temperature in July at 78.4 F (25.8°C), and an average of 36 days per year with temperatures reaching 90°F (32°C). Winters are generally cool, with occasional small amounts of snow. January has a daily average temperature of 38.2°F (3.4°C) **(NOAA -http://www.ncdc.noaa.gov/data-access)**



Wind Rose

The wind rose from 2011-2015 indicates the winds continue to alternate between blowing from the southwest to blowing from the northeast.

Appendix C. Equipment List and Condition

	Description	Serial Number	Condition	Put in service	Comments:
Air Lab Site: 47-093-1013					
PM 10 Continuous	TEOM 1405	SN 1405A209531006	Good	2011	
PM 2.5 Sequential	Thermo Partisol Plus 2025	SN B**22576**0909	Fair	2010	
Data Logger	ESC 8832	SN A3760K	Good	2010	
PM 10 Hi-Vol	Andersen/GMW	SN P3084	Good	Unknown	No longer in Service
PM 10 Hi-Vol	Andersen/GMW	SN P999	Good	Unknown	No longer in Service
PM2.5/ PM10	T640 X	SN192	Good	2017	
Rule Site: 47-093-1017					
PM 2.5 Sequential	Thermo Partisol Plus 2026	SN B**22654**1005	Good	2012	
TSP Hi-Vol	General Metal Works	SN P1938	Good	Unknown	No longer in Service
Burnside Site: 47-093-0027					
TSP Hi-Vol	General Metal Works	SN P2875	Good	Unknown	
TSP Hi-Vol	Anderson/GMW	SN P04302	Good	Unknown	
Ameristeel Site: 47-093-0023					
TSP Hi-Vol	General Metal Works	SN P04304	Good	Unknown	
Bearden Site: 47-093-0028					
PM 2.5 Sequential	Thermo Partisol Plus 2025	SN B**21893**0606	Fair	2007	Collocated Monitor
PM 2.5 Sequential	Thermo Partisol Plus 2025	SN B**21894**0606	Fair	2007	
Spring Hill Site: 47-093-1020					
PM 2.5 Sequential	Thermo Partisol Plus 2025	SNB218920606	Fair	2007	
Carbon Sampler	URG 3000N	SN 3N-B0409	Fair	2016	
PM 2.5 Speciation	Met One Super SASS	SN G9188	Fair	2008	
Ozone Analyzer	Teledyne / API 400E	2013	Fair	2009	
Ozone Calibrator	Teledyne / API 703E	190	Fair	2009	
Data Logger	ESC 8832	A 3758 K	Fair	2010	
East Knox Site: 47-093-0021					

Ozone Analyzer	Teledyne / API 400E	2014	Fair	2009	
Ozone Calibrator	Teledyne / API 703E	189	Fair	2009	
Data Logger	ESC 8832	A 3757 K	Good	2010	
Back-up equipment located at the Air Lab					
PM 2.5 Sequential	Thermo Partisol Plus 2025i	2025IWZ09521601	NEW	2016	Prepping for field
Ozone Calibrator	Teledyne / API 703U	179	Good	2017	Audits
Ozone Analyzer	Teledyne / API 400E	2259	Fair	2009	
Ozone Analyzer	Teledyne / API 400E	2697	Poor	2011	Being scavenged
Ozone Calibrator	Teledyne / API 703E	188	Fair	2009	Back up
Ozone Calibrator	Teledyne / API 703E	187	Good	2009	Bench Standard
Data Logger	ESC 8832	A 3759 K	Good	2010	
Gist (pump for 0 air)	DOA-P704-AA	0611014883	Good	2011	
Gast (pump for 0 air)	DOA-P704-AA	0611013627	Good	2011	Bench use
PM 2.5 Sequential	Thermo Partisol Plus 2025	SN B**21895**0606	Fair	2007	Remote Connection issues
Gast pump (Beta)	75R647-V45-H306X	813944551	Good	2015	
PM 2.5 Continuous	Thermo BAM 5014i	CM14521015	Poor	2015	Needs repair
Hi-Vol Orifice	Anderson/GMW	P2861	Good	Unknown	
Hi-Vol Orifice	Anderson/GMW	P4306	Good	Unknown	
Hi-Vol Orifice	Anderson/GMW	P3927	Good	Unknown	loaned to Memphis
PM 10 inlet head for Hi-Vol	Anderson/GMW	3555	Good	Unknown	
PM 10 inlet head for Hi-Vol	Anderson/GMW	3874	Good	Unknown	Loaned to Memphis
PM 10 inlet head for Hi-Vol	Anderson/GMW	3079	Good	Unknown	in mosquito garage
PM 10 inlet head for Hi-Vol	Anderson/GMW	1536	Poor	Unknown	in mosquito garage
GAST (Pump for 0 Air)	DOA-P704-AA	611014884	Good	2011	For audit use
Discontinued / Out of Service (located at Air Lab)					
PM 2.5 Sequential	Thermo Partisol Plus 2025	SN B**21898**0606	Poor	2007	being scavenged
PM 2.5 Sequential	Anderson- RAAS	RAAS2.5-300-00124	Non-Working	N/A	Mostly disassembled

PM 2.5 Sequential	Anderson- RAAS	RAAS2.5-300-00166	Non-Working	N/A	Mostly disassembled
PM 2.5 Sequential	Anderson- RAAS	RAAS2.5-300-00497	Poor	N/A	
PM 2.5 Sequential	Anderson- RAAS	RAAS2.5-300-00137	Non-Working	N/A	Mostly disassembled
PM 2.5 Sequential Speciation	Anderson- RAAS	RAAS2.5-401-00264	Non-Working	N/A	Mostly disassembled
PM 2.5 Sequential Speciation	Anderson- RAAS	RAAS2.5-401-00025	Non-Working	N/A	Mostly disassembled
SO_2 Analyzer	Thermo 43A	43A-39269-262	Unknown	N/A	Loaned to UT
Gas calibrator	Thermo 146	146-45988-275	Unknown	N/A	Loaned to UT
BIOS (Air Pro Sentry II)	SR-24-6-115A	SR 50018	Unknown	N/A	Loaned to UT
BIOS (Air Pro Sentry II)	SR-24-6-115A	SR 50019	Unknown	N/A	Loaned to UT
Ozone analyzer	Thermo 49	49-50547-285	Unknown	N/A	Loaned to UT
Ozone analyzer	Thermo 49	49-29875-237	Unknown	N/A	Loaned to UT
Ozone Calibrator	Thermo 49CPS	49CPS-55290-303	Unknown	N/A	Loaned to UT
Zero Air Supply	ESC 116-7700P	0139	Non-working	N/A	Loaned to UT
Zero Air Supply	ESC 116-7700P	0142	Non-Working	N/A	Loaned to UT
Zero Air Supply	ESC 116-7700P		Unknown	N/A	Loaned to UT

2018 Shelby County's Ambient Air Monitoring Plan

2018 Ambient Air Monitoring Plan

Shelby County Health Department

Air Pollution Control Program

Including the Metropolitan Statistical Area

(Memphis, TN-MS-AR)

Public Health
Prevent. Promote. Protect.

Prepared by:

Judy Low

Supervisor A

April 25th, 2018

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I. Introduction to the 2018 Ambient Air Monitoring Plan

Shelby County Health Department

Pollution Control Section

Air Monitoring Branch

The Shelby County Health Department (SCHD) Air Monitoring Branch (AMB) is required to evaluate the ambient air monitoring network each year in accordance with the requirements specified in 40 CFR Subpart B 58.10. This plan will address the requirements specified in the CFR. An overview of the geography, general climate, wind direction and population trends are included to provide background information that will assist in understanding the current air monitoring network and reasons for placement of the existing monitoring sites.

The principal areas in Shelby County with air monitoring sites are depicted showing the location for each of the monitoring sites. The sites are identified by a site number, site name, site address, an air quality site identification number and the types of pollutants monitored at each location. Tables containing relevant information are also included. A Network Review that requests for changes or provides updates is included along with the Memorandum of Agreement between Crittenden County, AR and Desoto County, MS.

This Network Plan submitted by Shelby County will be incorporated with the 2018 Network Plan submitted by the State of Tennessee Department of Environment and Conservation Division of Air Pollution Control.

II. Shelby County's Interpretation of Ambient Air Monitors Needed to Meet the 40CFR, Part 58 Requirements

Census Area Identification and Population Data			14129 Lead		42101 CO		42401 SO_2		42602 NO_2		44201 Ozone			81102 PM_{10} and 85101 PM_{10} Lo Vol		88101 $PM_{2.5}$				88502 $PM_{2.5}$ Specia-tion		88502 $PM_{2.5}$ Contin-uous	
CBSA Code	Census 2010 /Est. 2015	CBSA Title (MS Areas)	Operating	Required	Operating	Required	Operating	Required	Operating	Required	Operating	2015-2017 8 Hr. DV	Required	Operating	Required	Operating	2015 -2017 Annual DV µg/m^3	2015 -2017 24 Hr DV µg/m^3	Required	Operating	Required	Operating	Required
32820	1324829 / 1344127	Memphis, TN-MS-AR	0	0	2[2,3]	1	1[2]	1	1[1,3,4]	2	3	0.067 Shelby Farms NCore	2	2[5]	2 - 4	3[1]	7.6 Shelby Farms NCore	15 Shelby Farms NCore	2	1	1	1	1 - 2

[1]The Memphis and Shelby County Health Department and the states of Arkansas and Mississippi have implemented a joint MOA that provides for meeting the MSA monitoring requirements for the combined MSA area. See page 41 in the Appendix.

[2] Includes trace level analyzer at Shelby Farms NCore

[3] Includes trace level analyzer at Southwest Tennessee Community College Near Road Air Monitoring Station

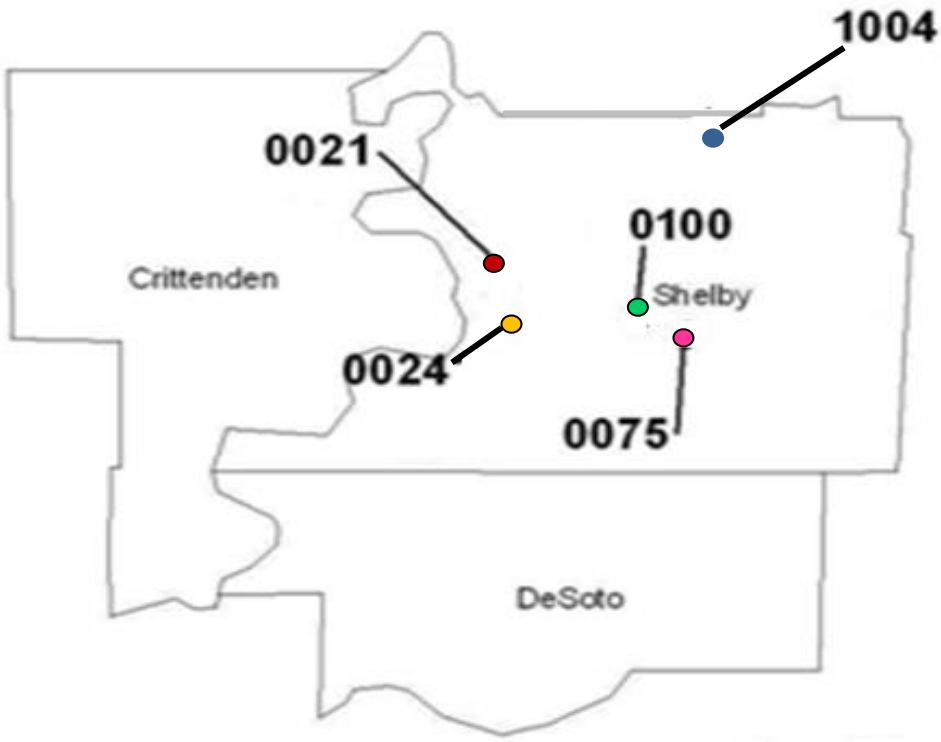
[4] Monitor located in Marion, Arkansas just to the northwest of downtown Memphis.

[5]Includes the low volume PM sampler at Shelby Farms NCore

Discussions of any proposals to re-locate monitors in the next 18 months and suitability of $PM_{2.5}$ sites for use in comparisons to the annual $PM_{2.5}$ standard:

- The TEOM POC 3 $PM_{2.5}$ particulate monitor and the speciation POC 6 STN monitor are generally not suited to be used for comparisons to the annual $PM_{2.5}$ standards. The TEOM POC 3 $PM_{2.5}$ particulate monitor is used for AQI forecasting purposes.

III. Map of Shelby County Site Locations



Address

0021	1330 Frayser Blvd.
0024	416 Alabama Ave.
0075	6388 Haley Road
0100	5767 Macon Cove
1004	6855 Mudville Rd.

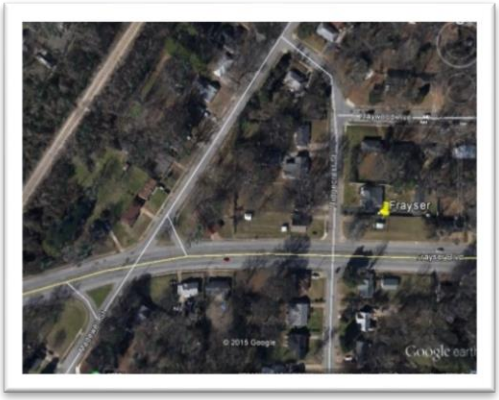
County Boundaries

IV. Shelby County Air Monitoring Sites

(Background, Discussion, Site Evaluation Form and Site Pictures)

A. Frayser
B. Alabama
C. Shelby Farms NCore
D. Southwest Tennessee Community College Near Road Monitoring
E. Edmund Orgill Park

A. Frayser, Shelby County, TN



Reporting Org. Name	Memphis/Shelby County Health Dept.
PQAO	673
Address	1330 Frayser Blvd.
AQS ID	47-157-0021
County Name	Shelby
CBSA	32820
Latitude	35.217501
Longitude	-90.019707
Parameter Code	44201
Parameter Name	Ozone
Monitor Type	SLAMS
POC	1
Interval	1
Year	2018
Collection Frequency	Hourly
Method	087
FRM/FEM Monitoring Instrument	Teledyne Advanced Pollution Instrumentation, Inc. Model 400/400A/400E/T400
Analysis	Ultraviolet Absorption
Ref. Method ID	EQOA-0992-087
Monitor Objective Type	Population Exposure
Dominant Source	Area
Measurement Scale	Neighborhood
Land Use Type	Residential
Location Setting	Suburban
Date Site Established	19720901

Site Background and Discussion

This site is located on Frayser Blvd. in Shelby County, Tennessee and currently supports monitoring for ozone. This site was originally established in 1972 and is expected to operate during CY's 2018 and 2019.

This site is located downwind of the Metro-Memphis area in a heavily populated area. There are railroad tracks and an overpass that are approximately 250 meters west of the site.

Site Evaluation Field Form

SITE NAME: FRAYSER

AQS Site ID: 47-157-0021 Location: 1330 Frayser Blvd. Date: 04/06/18 Evaluator: JL

Site Coordinates: LATITUDE 35.217501 LONGITUDE -90.019707

Monitoring Scale: Neighborhood

PARTICULATES						
		$PM_{2.5}$	$PM_{2.5}$ Collocated	PM_{10}	PM_{10} Collocated	TEOM ($PM_{2.5}$)
Inlet Height						
Inlet Location						
Distance to Nearest Road						
Tree Obstruction Height						
Tree Obstruction Distance to dripline						
Other Obstruction Height						

CONTINUOUS						
		CO	NO_2	NOy	O_3	SO_2
Inlet Height					3.6 m	
Inlet Location					Side of shelter	
Distance to Nearest Road					17.39 m to Frayser Blvd.	
Tree Obstruction Height					33 m to the nearest tree	
Tree Obstruction Distance to dripline					30 m to the nearest tree	
Other Obstruction Height					N/A	

Are all probes at least 1 meter apart? YES

Are all collocated low volume samplers between 1 to 4 meters apart? N/A

Are all collocated high volume samplers between 2 to 4 meters apart? N/A

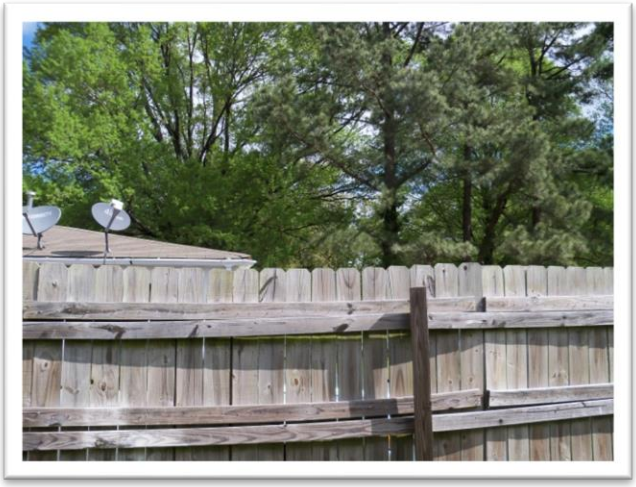
Are all probes located in an area that is paved or has vegetative ground cover? YES

Are all rooftop samplers located at least 2 meters away from any structure? YES

Is there unrestricted air flow 270 degrees around the probe or sampler? YES

Site Pictures for Frayser

Frayser (North)



Frayser (Northeast)

Frayser (East)

Frayser (Southeast)

Site Pictures for Frayser

Frayser (South)

Frayser (Southwest)

Frayser (West)

Frayser (Northwest)

B. Alabama Ave., Shelby County, TN

Reporting Org. Name	Memphis/Shelby County Health Dept.	
PQAO	673	
Address	416 Alabama Ave.	
AQS ID	47-157-0024	
County Name	Shelby	
CBSA	32820	
Latitude	35.151194	
Longitude	-90.041559	
Parameter Code	88101	88502
Parameter Name	PM 2.5	PM 10
Monitor Type	SLAMS	SLAMS
POC	1	1
Interval	7	1
Year	2018	2018
Collection Frequency	1 in 3	Hourly
Method	118	079
FRM/FEM Monitoring Instrument	Thermo 2025I PM 2.5 Sequential Sampler	Thermo Scientific TEOM 1405 Ambient Particulate Monitor
Analysis	Gravimetric	Gravimetric
Ref. Method ID	RFPS-0498-118	EQPM-1090-079
Monitor Objective Type	Population Exposure	Population Exposure
Dominant Source	Area	Area
Measurement Scale	Neighborhood	Neighborhood
Land Use Type	Residential	Residential
Location Setting	Suburban	Suburban
Date Site Established	20170101	20160403

Site Background and Discussion

The Alabama Ave. site is located in Shelby County, Tennessee and currently supports monitoring for $PM_{2.5}$, PM_{10} and the Radnet program. This site is approximately 25 meters south of Interstate 40 and 50 meters north of apartment complexes.

This site was originally established in 1973 and is expected to operate during CY's 2018 and 2019.

Site Evaluation Field Form

SITE NAME: ALABAMA

AQS Site ID: 47-157-0024 Location: 416 Alabama Ave. Date: 04/06/18 Evaluator: JL

Site Coordinates: LATITUDE 35.151194 LONGITUDE -90.041559

Monitoring Scale: Neighborhood

PARTICULATES						
		$PM_{2.5}$	$PM_{2.5}$ Collocated	PM_{10}	PM_{10} Collocated	TEOM (PM_{10})
Inlet Height		2.0 m		1.5 m		4.6 m
Inlet Location		Ground level support		Ground level support		Roof of shelter
Distance to Nearest Road		26 m to Danny Thomas Blvd.		24 m to Danny Thomas Blvd.		22 m to Danny Thomas Blvd.
Tree Obstruction Height		19 m		19 m		19 m
Tree Obstruction Distance to dripline		12 m to nearest tree		14 m to nearest tree		16 m to nearest tree
Other Obstruction Height		N/A		N/A		N/A

CONTINUOUS						
		CO	NO_2	NOy	O_3	SO_2
Inlet Height						
Inlet Location						
Distance to Nearest Road						
Tree Obstruction Height						
Tree Obstruction Distance to dripline						
Other Obstruction Height						

Are all probes at least 1 meter apart? YES

Are all collocated low volume samplers between 1 to 4 meters apart? YES

Are all collocated high volume samplers between 2 to 4 meters apart? YES

Are all probes located in an area that is paved or has vegetative ground cover? YES

Are all rooftop samplers located at least 2 meters away from any structure? YES

Is there unrestricted air flow 270 degrees around the probe or sampler? YES

Site Pictures for Alabama

Alabama (North)

Alabama (Northeast)

Alabama (East)

Alabama (Southeast)

Site Pictures for Alabama

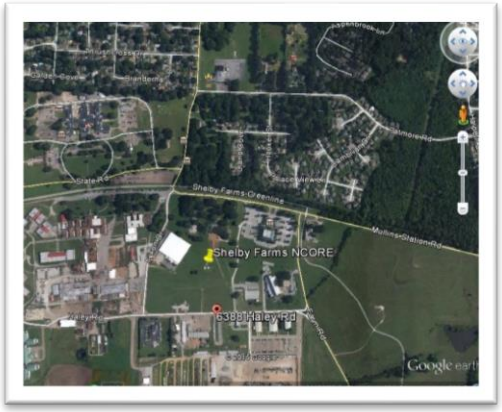
Alabama (South)

Alabama (Southwest)

Alabama (West)

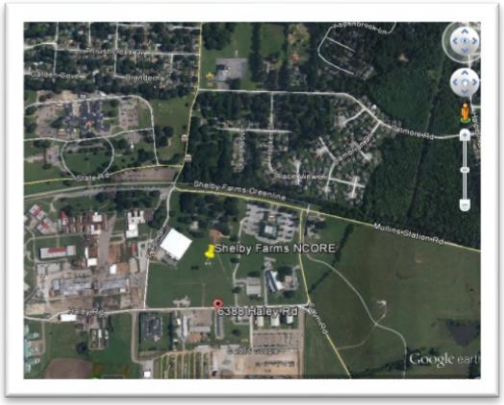
Alabama (Northwest)

C. Shelby Farms NCore,
ShelbyCounty, TN



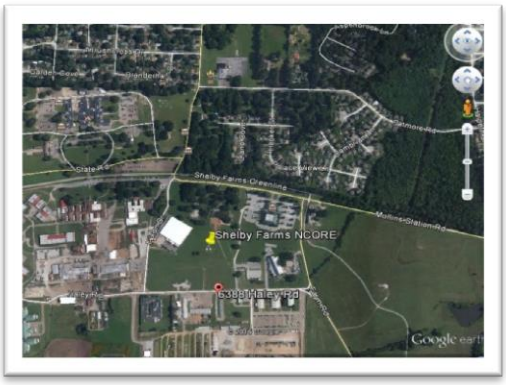
Reporting Org. Name		Memphis/Shelby County Health Dept.	
PQAO			673
Address			6388 Haley Rd.
AQS ID			47-157-0075
County Name			Shelby
CBSA			32820
Latitude			35.151699
Longitude			-89.850249
Parameter Code	42101	42401	42600
Parameter Name	CO (trace)	SO_2 (trace)	NOy
Monitor Type	NCore (SLAMS)	NCore (SLAMS)	NCore (SLAMS)
POC	1	1	1
Interval	1	1	1
Year	2018	2018	2018
Collection Frequency	Hourly	Hourly	Hourly
Method	093	100	699
FRM/FEM Monitoring Instrument	Teledyne Advanced Pollution Instrumentation, Inc. Models 300/300E/300EU/T300/T300U	Teledyne Advanced Pollution Instrumentation, Inc. Models 100A/100E/100EU/T100/ T100U	Teledyne Advanced Pollution Instrumentation, Inc. Models 200A/200AU/200E/200EU/ T200/T200U
Analysis	Gas Filter Correlation	Ultraviolet Fluorescence	Chemiluminescence
Ref. Method ID	RFCA-1093-593	EQSA-0495-100	RFNA-1194-699
Monitor Objective Type	Population Exposure	Population Exposure	Population Exposure
Dominant Source	Area	Area	Area
Measurement Scale	Neighborhood and Urban Scale	Neighborhood and Urban Scale	Neighborhood and Urban Scale
Land Use Type	Industrial	Industrial	Industrial
Location Setting	Urban	Urban	Urban
Date Site Established	20110401	20110621	20110617

C. Shelby Farms NCore,
Shelby County, TN



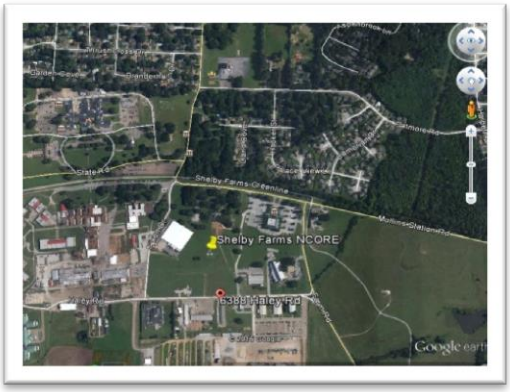
Reporting Org. Name		Memphis/Shelby County Health Dept.	
PQAO			673
Address			6388 Haley Rd.
AQS ID			47-157-0075
County Name			Shelby
CBSA			32820
Latitude			35.151699
Longitude			-89.850249
Parameter Code	44201	61103	61104
Parameter Name	O_3	Wind Speed-Resultant	Wind Direction - Resultant
Monitor Type	NCore (SLAMS)	NCore (SLAMS)	NCore (SLAMS)
POC	1	1	1
Interval	1	1	1
Year	2018	2018	2018
Collection Frequency	Hourly	Hourly	Hourly
Method	087	061	061
FRM/FEM Monitoring Instrument	Teledyne Advanced Pollution Instrumentation, Inc. Models 400E/T400/400/400A	Met One Sonic Anemometer Model 50.5	Met One Sonic Anemometer Model 50.5
Analysis	Ultraviolet Absorption	miles per hour	Degrees compass
Ref. Method ID	EQOA-0992-087	N/A	N/A
Monitor Objective Type	Population Exposure	Population Exposure	Population Exposure
Dominant Source	Area	Area	Area
Measurement Scale	Neighborhood and Urban Scale	Neighborhood and Urban Scale	Neighborhood and Urban Scale
Land Use Type	Industrial	Industrial	Industrial
Location Setting	Urban	Urban	Urban
Date Site Established	20110311	20120701	20120701

C. Shelby Farms NCore,
Shelby County, TN



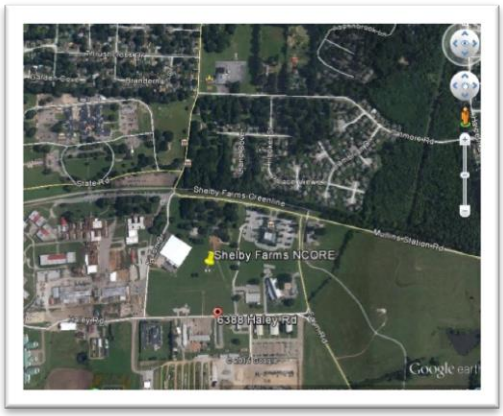
Reporting Org. Name		Memphis/Shelby County Health Dept.	
PQAO		673	
Address		6388 Haley Rd.	
AQS ID		47-157-0075	
County Name		Shelby	
CBSA		32820	
Latitude		35.151699	
Longitude		-89.850249	
Parameter Code	62101	62201	64101
Parameter Name	Outdoor Temperature	Relative Humidity	Barometric Pressure
Monitor Type	NCore (SLAMS)	NCore (SLAMS)	NCore (SLAMS)
POC	1	1	1
Interval	1	1	1
Year	2018	2018	2018
Collection Frequency	Hourly	Hourly	Hourly
Method	061	061	014
FRM/FEM Monitoring Instrument	Met One 083D	Met One 083D	Barometric Sensor
Analysis	percent relative humidity	degrees fahrenheit	Millibars
Ref. Method ID	N/A	N/A	N/A
Monitor Objective Type	Population Exposure	Population Exposure	Population Exposure
Dominant Source	Area	Area	Area
Measurement Scale	Neighborhood and Urban Scale	Neighborhood and Urban Scale	Neighborhood and Urban Scale
Land Use Type	Industrial	Industrial	Industrial
Location Setting	Urban	Urban	Urban
Date Site Established	20120701	20120701	20120701

C. Shelby Farms NCore,
Shelby County, TN



Reporting Org. Name		Memphis/Shelby County Health Dept.	
PQAO		673	
Address		6388 Haley Rd.	
AQS ID		47-157-0075	
County Name		Shelby	
CBSA		32820	
Latitude		35.151699	
Longitude		-89.850249	
Parameter Code	85101	86101	88101
Parameter Name	PM 10 (low volume)	PM 10-2.5 (coarse)	PM 2.5
Monitor Type	NCore (SLAMS)	NCore (SLAMS)	NCore (SLAMS)
POC	1	1	1
Interval	7	7	7
Year	2018	2018	2018
Collection Frequency	1 in 3	1 in 3	1 in 3
Method	127	176	118
FRM/FEM Monitoring Instrument	R&P Partisol Plus 2025 Sequential Sampler	R&P Partisol Plus 2025 Sequential Sampler	R&P Partisol Plus 2025 Sequential Sampler
Analysis	Gravimetric	Gravimetric	Gravimetric
Ref. Method ID	RFPS-1298-127	RFPS-0509-176	RFPS-0498-118
Monitor Objective Type	Population Exposure	Population Exposure	Population Exposure
Dominant Source	Area	Area	Area
Measurement Scale	Neighborhood and Urban Scale	Neighborhood and Urban Scale	Neighborhood and Urban Scale
Land Use Type	Industrial	Industrial	Industrial
Location Setting	Urban	Urban	Urban
Date Site Established	20120116	20120116	20110223

C. Shelby Farms NCore,
Shelby County, TN



Reporting Org. Name		Memphis/Shelby County Health Dept.	
PQAO		673	
Address		6388 Haley Rd.	
AQS ID		47-157-0075	
County Name		Shelby	
CBSA		32820	
Latitude		35.151699	
Longitude		-89.850249	
Parameter Code	88101	88502	88502
Parameter Name	PM 2.5	PM 2.5 continuous	PM 2.5 Speciation
Monitor Type	NCore (SLAMS)	NCore (SLAMS)	NCore (SLAMS)
POC	2	3	6
Interval	7	1	7
Year	2018	2018	2018
Collection Frequency	1 in 6	Hourly	1 in 3
Method	118	711	N/A
FRM/FEM Monitoring Instrument	R&P Partisol Plus 2025 PM 2.5 Sequential Sampler	R&P TEOM Gravimetric 50 degrees Celsius PM 2.5 SSI w/no correction factor	Met One SASS 810/ URG 3000N
Analysis	Gravimetric	TEOM Gravimetric 50 degrees Celsius	Speciation Analysis
Ref. Method ID	RFPS-0498-118	711	N/A
Monitor Objective Type	Population Exposure	Population Exposure	Population Exposure
Dominant Source	Area	Area	Area
Measurement Scale	Neighborhood and Urban Scale	Neighborhood and Urban Scale	Neighborhood and Urban Scale
Land Use Type	Industrial	Industrial	Industrial
Location Setting	Urban	Urban	Urban
Date Site Established	20160101	20110408	20110208

Site Background and Discussion for Shelby Farms NCore

The Shelby Farms NCore site is located in Shelby County Tennessee and currently supports monitoring for carbon monoxide (trace), ozone, total reactive nitrogen (trace), particulate matter ($PM_{2.5}$; $PM_{10-2.5}$ and PM_{10} low volume, sulfur dioxide (trace), and meteorological data (ambient temperature, barometric pressure, relative humidity, wind direction and wind speed).

This site was established in 2011 and is expected to operate in CY's 2018 and 2019.

In the summer of 2019, the Shelby County Air Monitoring Section will be adding PAMS to this site location. This site location will have an auto gas chromatograph by Consolicated Analytical Systems first. Then a true NO_2 analyzer and a ceilometer will be added.

The placement of the NCore site is east of the urban core and provides the best location for measuring transport and secondary pollutant formation from that area. The site is located downwind of the more industrialized areas.

Site Evaluation Field Form

SITE NAME: SHELBY FARMS NCore

AQS Site ID: 47-157-0075 Location: 6388 Haley Rd. Date: 04/05/18 Evaluator: JL

Site Coordinates: LATITUDE 35.151699 LONGITUDE -89.850249

Monitoring Scale: Neighborhood and Urban Scale

PARTICULATES						
		$PM_{2.5}$	$PM_{2.5}$ Collocated	PM_{10}	PM_{10} Collocated	TEOM ($PM_{2.5}$)
Inlet Height		2.0 m	2.0 m	2.0 m		4.6 m
Inlet Location		Ground level support	Ground level support	Ground level support		Roof of shelter
Distance to Nearest Road		139 m to Haley Rd.	139 m to Haley Rd.	139 m to Haley Rd.		141 m to Haley Rd.
Tree Obstruction Height		N/A	N/A	N/A		N/A
Tree Obstruction Distance to dripline		88 m to closest tree	87 m to closest tree	89 m to closest tree		85 m to closest tree
Other Obstruction Height		N/A	N/A	N/A		N/A

CONTINUOUS						
		CO	NO_2	NOy	O_3	SO_2
Inlet Height		3.8 m		10 m	3.7 m	3.6 m
Inlet Location		Side of shelter		Met tower	Side of shelter	Side of shelter
Distance to Nearest Road		136 m to Haley Rd.		145 m to Haley Rd.	135 m to Haley Rd.	137 m to Haley Rd.
Tree Obstruction Height		N/A		N/A	N/A	N/A
Tree Obstruction Distance to dripline		86 m to closest tree		93 m to closest tree	83 m to closest tree	85 m to closest tree
Other Obstruction Height		N/A		N/A	N/A	N/A

Are all probes at least 1 meter apart? YES

Are all collocated low volume samplers between 1 to 4 meters apart? YES

Are all collocated high volume samplers between 2 to 4 meters apart? N/A

Are all probes located in an area that is paved or has vegetative ground cover? YES

Are all rooftop samplers located at least 2 meters away from any structure? YES

Is there unrestricted air flow 270 degrees around the probe or sampler? YES

Site Pictures for Shelby Farms NCore

Shelby Farms NCore (North)

Shelby Farms NCore (Northeast)

Shelby Farms NCore (East)

Shelby Farms NCore (Southeast)

Site Pictures for Shelby Farms NCore

Shelby Farms NCore (South)

Shelby Farms NCore (Southwest)

Shelby Farms NCore (West)

Shelby Farms NCore (Northwest)

D. Southwest Tennessee Community College,
Near Road Monitoring Station, Shelby County, TN

Reporting Org. Name	Memphis/Shelby County Health Dept.	
PQAO		673
Address		5767 Macon Cove
AQS ID		47-157-0100
County Name		Shelby
CBSA		32820
Latitude		35.161264
Longitude		-89.870646
Parameter Code	42101	42602
Parameter Name	CO (trace)	NO_2 (trace)
Monitor Type	Near Road (SLAMS)	Near Road (SLAMS)
POC	1	1
Interval	1	1
Year	2018	2018
Collection Frequency	hourly	hourly
Method	593	599
FRM/FEM Monitoring Instrument	Teledyne Advanced Pollution Instrumentation, Inc. Models 300/300E/300EU/T300/ T300U	Teledyne Advanced Pollution Instrumentation, Inc. Models 200A/200AU/200E/200EU/ T200/T200U
Analysis	Gas Filter Correlation	Chemiluminescence
Ref. Method ID	RFCA-1093-593	RFNA-1194-599
Monitor Objective Type	Highest Concentration	Highest Concentration
Dominant Source	Mobile	Mobile
Measurement Scale	Neighborhood and Urban Scale	Neighborhood and Urban Scale
Land Use Type	Residential	Residential
Location Setting	Urban	Urban
Date Site Established	20140715	20140701

Site Background and Discussion

The Near Road Air Monitoring Station is located on the campus of Southwest Tennessee Community College in Shelby County, Tennessee and currently supports monitoring for carbon monoxide (trace), nitrogen dioxide (trace) and $PM_{2.5}$.

This site was established in 2014 as part of the second phase of the core based statistical area Near Road NO_2 monitoring. This site is expected to operate during CY's 2018 and 2019.

D. Southwest Tennessee Community College,
Near Road Monitoring Station, Shelby County, TN

Reporting Org. Name	Memphis/Shelby County Health Dept.
PQAO	673
Address	5767 Macon Cove
AQS ID	47-157-0100
County Name	Shelby
CBSA	32820
Latitude	35.161264
Longitude	-89.870646
Parameter Code	88101
Parameter Name	PM 2.5
Monitor Type	Near Road (SLAMS)
POC	1
Interval	7
Year	2018
Collection Frequency	1 in 3
Method	118
FRM/FEM Monitoring Instrument	Thermo 2025I PM 2.5 Sequential Sampler
Analysis	Gravimetric
Ref. Method ID	RFPS-0498-118
Monitor Objective Type	Highest Concentration
Dominant Source	Mobile
Measurement Scale	Neighborhood and Urban Scale
Land Use Type	Residential
Location Setting	Urban
Date Site Established	20170101

Site Evaluation Field Form

SITE NAME: SOUTHWEST TENNESSEE COMMUNITY COLLEGE NEAR ROAD

AQS Site ID: 47-157-0100 Location: 5787 Macon Cv. Date: 04/05/18 Evaluator: JL

Site Coordinates: LATITUDE 35.161264 LONGITUDE -89.870646

Monitoring Scale: Neighborhood and Urban Scale

PARTICULATES						
		$PM_{2.5}$	$PM_{2.5}$ Collocated	PM_{10}	PM_{10} Collocated	TEOM ($PM_{2.5}$)
Inlet Height		4.5 m				
Inlet Location		Roof of shelter				
Distance to Nearest Road		18.2 m to I-40 East				
Tree Obstruction Height		24.7 m				
Tree Obstruction Distance to dripline		22.9 m to closest tree				
Other Obstruction Height		N/A				

CONTINUOUS						
		CO	NO_2	NOy	O_3	SO_2
Inlet Height		4.2 m	4.2 m			
Inlet Location		Roof of shelter	Roof of shelter			
Distance to Nearest Road		20.2 m to I-40 East	20.2 m to I-40 East			
Tree Obstruction Height		24.7 m	24.7 m			
Tree Obstruction Distance to dripline		22.9 m to closest tree	22.9 m to closest tree			
Other Obstruction Height		N/A	N/A			

Are all probes at least 1 meter apart? YES

Are all collocated low volume samplers between 1 to 4 meters apart? YES

Are all collocated high volume samplers between 2 to 4 meters apart? N/A

Are all probes located in an area that is paved or has vegetative ground cover? YES

Are all rooftop samplers located at least 2 meters away from any structure? YES

Is there unrestricted air flow 270 degrees around the probe or sampler? YES

Site Pictures for Southwest Tennessee Community College (SWTCC) Near Road

SWTCC (North)

SWTCC (Northeast)

SWTCC (East)

SWTCC (Southeast)

Site Pictures for Southwest Tennessee Community College (SWTCC) Near Road

SWTCC (South)

SWTCC (Southwest)

SWTCC (West)

SWTCC (Northwest)

G. Edmund Orgill Park, Shelby County, TN

Reporting Org. Name	Memphis/Shelby County Health Dept.
PQAO	673
Address	6855 Mudville Rd.
AQS ID	47-157-1004
County Name	Shelby
CBSA	32820
Latitude	35.161264
Longitude	-89.870646
Parameter Code	44201
Parameter Name	Ozone
Monitor Type	SLAMS
POC	1
Interval	1
Year	2018
Collection Frequency	Hourly
Method	087
FRM/FEM Monitoring Instrument	Teledyne Advanced Pollution Instrumentation, Inc. Model 400/400A/400E/T400
Analysis	Ultraviolet Absorption
Ref. Method ID	EQOA-0992-087
Monitor Objective Type	Highest Concentration
Dominant Source	Area
Measurement Scale	Urban
Land Use Type	Agricultural
Location Setting	Rural
Date Site Established	19800201

Site Background and Discussion

The Edmund Orgill Park site is located in the City of Millington in Shelby County, Tennessee and currently supports monitoring for ozone.

This site was established in 1980 and is expected to operate during CY's 2018 and 2019.

Site Evaluation Field Form

SITE NAME: EDMUND ORGILL PARK

AQS Site ID: 47-157-1004 Location: 6855 Mudville Rd. Date: 04/10/18 Evaluator: JL
Site Coordinates: LATITUDE 35.161264 LONGITUDE -89.870646

Monitoring Scale: Agricultural

PARTICULATES						
		$PM_{2.5}$	$PM_{2.5}$ Collocated	PM_{10}	PM_{10} Collocated	TEOM ($PM_{2.5}$)
Inlet Height						
Inlet Location						
Distance to Nearest Road						
Tree Obstruction Height						
Tree Obstruction Distance to dripline						
Other Obstruction Height						

CONTINUOUS						
		CO	NO_2	NOy	O_3	SO_2
Inlet Height					3.3 m	
Inlet Location					Side of shelter	
Distance to Nearest Road					23.7 m to Mudville Rd.	
Tree Obstruction Height					24.6 m	
Tree Obstruction Distance to dripline					21.9 m to closest tree	
Other Obstruction Height					N/A	

Are all probes at least 1 meter apart? YES
Are all collocated low volume samplers between 1 to 4 meters apart? N/A
Are all collocated high volume samplers between 2 to 4 meters apart? N/A
Are all probes located in an area that is paved or has vegetative ground cover? YES
Are all rooftop samplers located at least 2 meters away from any structure? YES
Is there unrestricted air flow 270 degrees around the probe or sampler? YES

Site Pictures for Edmund Orgill Park

Edmund Orgill (North)

Edmund Orgill (Northeast)

Edmund Orgill (East)

Edmund Orgill (Southeast)

Site Pictures for Edmund Orgill Park

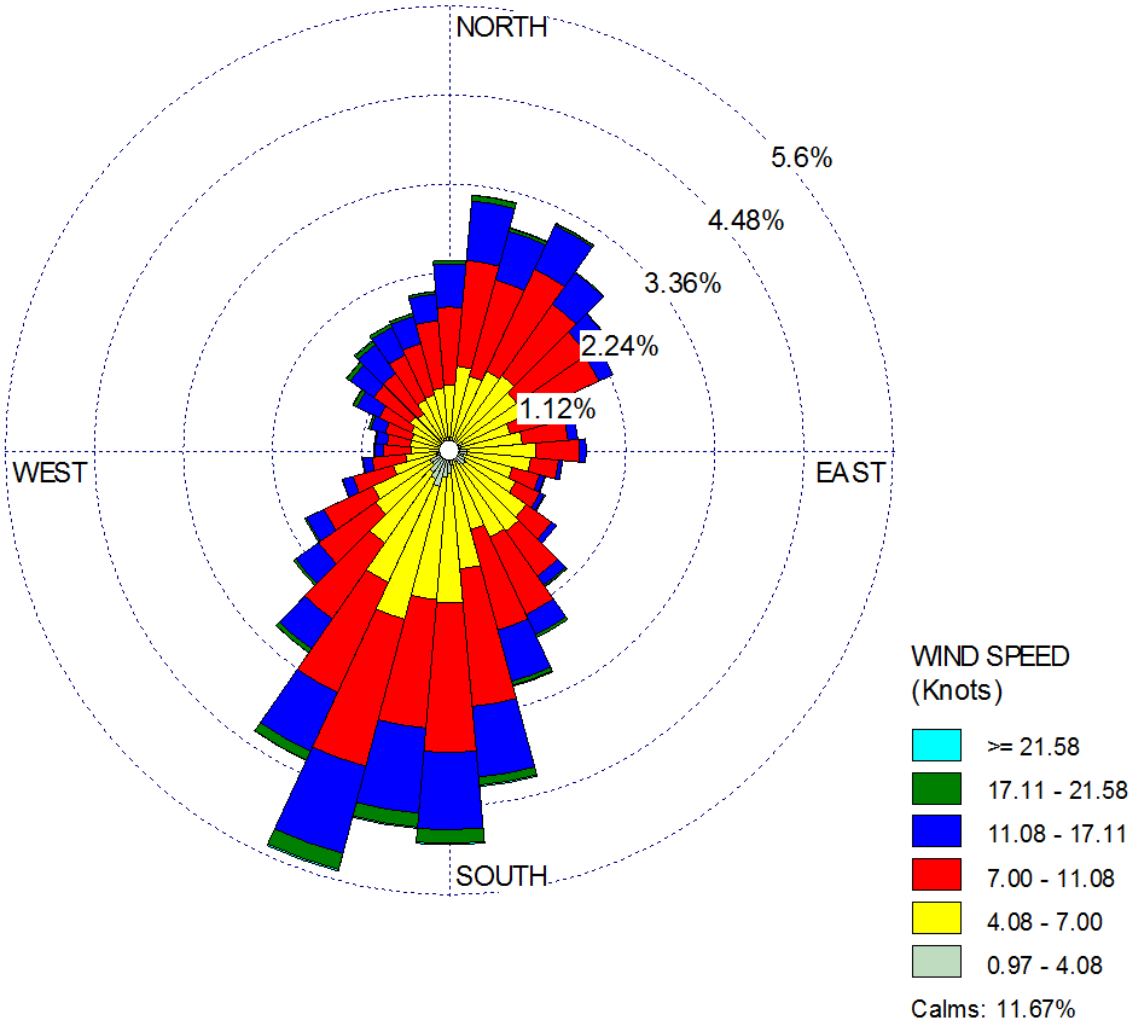
Edmund Orgill (South)

Edmund Orgill (Southwest)

Edmund Orgill (West)

Edmund Orgill (Northwest)

V. Shelby County Climatology and Geography



Wind Rose for Memphis, TN-MS-AR MSA

Shelby County Geography

Shelby County, the largest county in area in Tennessee covers an area of 754.871 square miles or 483,117.44 acres (http://cber.bus.utk.edu/census/cntyarea.pdf). The 2017 population estimate from the U.S. Census for Shelby County is 936,961 (https://www.census.gov/quickfacts/table/PST045217). The elevation ranges from 185 above mean sea level (MSL) along the islands in the Mississippi River in the southern portion of the county to about 416 feet above MSL in the rolling hills of the southeastern area of Shelby County. Bluffs that are located in the western area of the county near the Mississippi River are derived from the wind-driven buildup of

silt, sand, and clay known as loess, and are approximately 250 feet above MSL. The central region of the county is located on an ancient alluvial plain, a mostly flat area consisting of several layers of silt, sand, gravel, and clay, approximately 300-320 feet above MSL. The eastern area of the county consists of gentle, rolling hills, approximately 340-400 feet above MSL. Cities and towns within Shelby County include Memphis with a population of 651,836; Millington (10,974); Bartlett (58,622); Lakeland (12,494); Arlington (11,566); Collierville (49,177); and Germantown (39,056).

All city population estimates were from the year 2016 (2017 was not available) and were obtained using the QuickFacts Table from http://www.census.gov/

Shelby County Climatology

Like most of the Southeast U.S. and southern Mid-Atlantic states, Shelby County, TN falls within the humid subtropical climate zone (Cfa on the Köppen Climate Classification). This can be described as hot, humid summers with mild to cool winters. Using the latest 30-year climate data set (1981-2010) obtained by the National Climatic Data Center, the normal conditions are as follows:

Coldest Month: January (avg max temp=49.8 degrees; avg min temp=31.8 degrees)

Warmest Month: July (avg max temp=91.6 degrees; avg min temp=73.8 degrees)

Yearly Precipitation Normal: 53.68 inches (49.88 inches of rainfall and 3.8 inches of snowfall)

Wettest Months: November-December and March-May (avg of 5.49, 5.74 and 5.16, 5.5, and 5.25 inches, respectively)

Driest Months: August-September (avg of 2.88 and 3.09 inches, respectively)

Wind direction is most prevalent from the south to southwest (see wind rose data)

Most frontal activity occurs in the Spring and Autumn. Summer experiences lower humidity at the start of the season with higher humidity levels starting by early to mid-July as the Bermuda High pressure system pulls warm, moist air into the lower Mississippi Valley from the Gulf of Mexico. Localized thunderstorms are common in the afternoon. By September, the humidity begins to lower as the Bermuda high breaks down. Winters are usually mostly mild with periods of very cold air. Severe weather is most common in the Spring, but can occur any time of year.

VI. Local Programs Submittals of Ambient Monitoring Plan

Memphis AMP

These documents are provided as submitted by the respective monitoring agency for use by the state in updating the overall ambient monitoring plan document.

A. Memphis Air Monitoring Plan
B. Shelby County Air Pollution Active Sites 2018
C. 2017 Ambient Monitor and Auxillary Support Equipment Evaluation

A. Memphis Air Monitoring Plan

Shelby County Health Department Air Pollution Control Program

Network Review

2018

An assessment of the Shelby County Health Department's (SCHD) ambient air monitoring network has been conducted. The SCHD Air Monitoring Branch has evaluated each air monitoring site according to the requirements and provisions as required by the Code of Federal Regulations 40, Parts 50, 53, and 58 and have concluded that the number and locations of the monitors in our network comply with the CFR provisions. In some areas of the network, more monitors are operating than required. Therefore, the SCHD is forwarding the enclosed documents with the pertinent air monitoring site information so that the contents may be incorporated into the State of Tennessee's Monitoring Network plan to EPA.

Changes to our air monitoring network include the following:

1. PAMS at the Shelby Farms NCore site

The Shelby County Health Department Air Monitoring Branch is anticipating on adding PAMS to the NCORE site in 2019. The sampling will begin once the equipment has been provided by the EPA and tested by the SCHD AMB. Sampling is to begin in June 2019 or as near practical after deployment. The SCHD AMB selected instrumentation on the national contract provided by Consolidated Analytical Systems. We anticipate on operating an auto gas chromatograph by Consolidated Analytical Systems. A carbonyl, true NO_2 and a ceilometer will be added in subsequent years or when instrumentation or funding has been provided by the EPA. The specific types of instrumentation wil be determined and included in the 2019 Annual Network Plan.

B. 2018 Shelby County Active Sites

Shelby County Health Department Active Sites	Pollutant	Monitor	AQS ID
416 Alabama	PM 2.5 (1 in 3 day) PM 10 continuous	Thermo Environmental 2025I Sequential and TEOM 1405	47-157-0024
6855 Mudville (Edmund Orgill Park)	O_3 Continuous	Teledyne API	47-157-1004
1330 Frayser	O_3 Continuous	Teledyne API	47-157-0021
6388 Haley Rd.	CO (Trace) Continuous SO_2 (Trace) Continuous NO_Y Continuous O_3 Continuous PM_{10} (lo vol) (1 in 3 day) $PM_{10-2.5}$ (1 in 3 day) $PM_{2.5}$ (1 in 3 day) $PM_{2.5}$ Continuous $PM_{2.5}$ Speciation (1 in 3 day) Carbon (1 in 3 day) Wind Speed Wind Direction Ambient Temperature Relative Humidity Barometric Pressure	Teledyne API Teledyne API Teledyne API Teledyne API R&P 2025 PM 10 R&P 2025 PM 2.5 R&P 2025 PM 2.5 R&P TEOM Met One Super SASS URG 3000 Met One Sonic Anemometer Met One Sonic Anemometer Met One Met One Climatronics Met Sensor	47-157-0075
5767 Haley Rd.	CO (Trace) Continuous NO_2 (Trace) Continuous $PM_{2.5}$ (1 in 3 day)	Teledyne API Teledyne API Thermo Environmental 2025I Sequential	47-157-0100

2017 Ambient Monitor and Auxillary Support Equipment Evaluation

Site	Location	AQS ID	Make	Model	Serial Number	Condition
Alabama	416 Alabama Ave.	47-157-0024	Met One	SASS	Control Box B1480	Good
Alabama	416 Alabama Ave.	47-157-0024	Met One	SASS	Pump Box B2919	Good
Alabama	416 Alabama Ave.	47-157-0024	Met One	SASS	Sampling Head A7084	Fair
Alabama	416 Alabama Ave.	47-157-0024	URG	3000N	Controller 3N-B0690	Poor
Alabama	416 Alabama Ave.	47-157-0024	URG	3000N	Stand (Pump) 3N-B0630	Good
Alabama	416 Alabama Ave.	47-157-0024	URG	3000N	Module C 3N-B0847	Good
Alabama	416 Alabama Ave.	47-157-0024	ESC	8816	1264	Good
Alabama	416 Alabama Ave.	47-157-0024	Teledyne API	300E	700	Poor
Alabama	416 Alabama Ave.	47-157-0024	Teledyne API	T300	1539	Good
Alabama	416 Alabama Ave.	47-157-0024	Teledyne API	700	487	Good
Alabama	416 Alabama Ave.	47-157-0024	Teledyne API	701	644	Good
Alabama	416 Alabama Ave.	47-157-0024	Teledyne API	300	999	Poor
Alabama	416 Alabama Ave.	47-157-0024	Graseby GMW	PM 10 sampler	2375	Good
Alabama	416 Alabama Ave.	47-157-0024	Measurement Technologies	1001	Asset #921261	Poor
Alabama	416 Alabama Ave.	47-157-0024	Thermo Environmental	1405	1405A223701302	Good
Alabama	416 Alabama Ave.	47-157-0024	General Atomics	Radnet		Good

Site	Location	AQS ID	Make	Model	Serial Number	Condition
Alabama	416 Alabama	47-157-0024	Thermo Environmental	2025I	2025IW207371501	Good
Edmund Orgill	6855 Mudville Rd.	47-157-1004	Teledyne API	T703	235	Good
Edmund Orgill	6855 Mudville Rd.	47-157-1004	Teledyne API	T400	1138	Good
Edmund Orgill	6855 Mudville Rd.	47-157-1004	ESC	8832	A1570	Good
Frayser	1330 Frayser Blvd.	47-157-0021	Teledyne API	400A	650	Good
Frayser	1330 Frayser Blvd.	47-157-0021	Teledyne API	T703	169	Good
Frayser	1330 Frayser Blvd.	47-157-0021	Teledyne API	T400	1304	Good
Frayser	1330 Frayser Blvd.	47-157-0021	ESC	8832	A1571	Good
Frayser	1330 Frayser Blvd.	47-157-0021	Measurement Technologies	1001		Poor
Shelby Farms (NCORE)	6388 Haley	47-157-0075	URG	3000N	Controller 3N-BO742	Good
Shelby Farms (NCORE)	6388 Haley	47-157-0075	URG	3000N	Module C 3N-B0794	Good
Shelby Farms (NCORE)	6388 Haley	47-157-0075	URG	3000N	Stand (Pump) 3N-B0592	Good
Shelby Farms (NCORE)	6388 Haley	47-157-0075	Met One	SuperSASS	Control Box K16485	Good
Shelby Farms (NCORE)	6388 Haley	47-157-0075	Met One	SuperSASS	Pump Box K17956	Good
Shelby Farms (NCORE)	6388 Haley	47-157-0075	Met One	SuperSASS	Sample Head K17985	Good

Site	Location	AQS ID	Make	Model	Serial Number	Condition
Shelby Farms (NCORE)	6388 Haley	47-157-0075	Sierra Andersen		0240962025U	Good
Shelby Farms (NCORE)	6388 Haley	47-157-0075	Rupprecht & Pataschnick	2025	2025B218020506	Good
Shelby Farms (NCORE)	6388 Haley	47-157-0075	Rupprecht & Pataschnick	2025	2025A209179811	Good
Shelby Farms (NCORE)	6388 Haley	47-157-0075	Rupprecht & Pataschnick	2025	2025A209219811	Good
Shelby Farms (NCORE)	6388 Haley	47-157-0075	Kipp & Zonen	BD 300	51518	Good
Shelby Farms (NCORE)	6388 Haley	47-157-0075	ESC	8832	A-1578	Good
Shelby Farms (NCORE)	6388 Haley	47-157-0075	Teledyne API	400E	2664	Good
Shelby Farms (NCORE)	6388 Haley	47-157-0075	Teledyne API	703E	297	Good
Shelby Farms (NCORE)	6388 Haley	47-157-0075	Teledyne API	701H	80	Good
Shelby Farms (NCORE)	6388 Haley	47-157-0075	Teledyne API	100EU	135	Good
Shelby Farms (NCORE)	6388 Haley	47-157-0075	Teledyne API	300EU	246	Good

Site	Location	AQS ID	Make	Model	Serial Number	Condition
Shelby Farms (NCORE)	6388 Haley	47-157-0075	Teledyne API	100E	236	Good
Shelby Farms (NCORE)	6388 Haley	47-157-0075	Teledyne API	200EU	184	Good
Shelby Farms (NCORE)	6388 Haley	47-157-0075	Teledyne API	700EU	88	Good
Shelby Farms (NCORE)	6388 Haley	47-157-0075	Teledyne API	701H	1621	Good
Shelby Farms (NCORE)	6388 Haley	47-157-0075	Teledyne API	501Y	145	Good
Shelby Farms (NCORE)	6388 Haley	47-157-0075	Rupprecht & Pataschnick	1400a	140AB231030006	Good
Shelby Farms (NCORE)	6388 Haley	47-157-0075	Meteorological Gear with Crank Tower		T-135	Good
Shelby Farms (NCORE)	6388 Haley	47-157-0075	Climatronics Omega	100093 / temp sensor	R19750	Good
Shelby Farms (NCORE)	6388 Haley	47-157-0075	Met One	50.5 Sonic Wind Sensor	K13566	Good
Shelby Farms (NCORE)	6388 Haley	47-157-0075	Climatronics	102663 BP Sensor	R23352	Good
Shelby Farms (NCORE)	6388 Haley	47-157-0075	Vaisala	RH sensor	T16788	Good

Site	Location	AQS ID	Make	Model	Serial Number	Condition
Southwest Tennessee Community College (Near Road Monitoring)	5767 Macon Cove	47-157-0100	Teledyne API	T700U	206	Good
Southwest Tennessee Community College (Near Road Monitoring)	5767 Macon Cove	47-157-0100	Teledyne API	T300U	174	Good
Southwest Tennessee Community College (Near Road Monitoring)	5767 Macon Cove	47-157-0100	Teledyne API	T200U	182	Good
Southwest Tennessee Community College (Near Road Monitoring)	5767 Macon Cove	47-157-0100	Teledyne API	701H	809	Good
Southwest Tennessee Community College (Near Road Monitoring)	5767 Macon Cove	47-157-0100	ESC	8832	A4830K	Good

Site	Location	AQS ID	Make	Model	Serial Number	Condition
Southwest Tennessee Community College (Near Road Monitoring)	5767 Macon Cove	47-157-0100	Thermo Scientific	2025I	20740	Good
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Teledyne API	T400	631	Good
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Teledyne API	T700	1800	Good
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Teledyne API	401	253-S	Poor
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		ESC	8832	A1567	Good
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Rupprecht & Pataschnick	2025	2025A209189811	Poor
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Teledyne API	401	188	Good
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Teledyne API	700	404	Good
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Teledyne API	401	227	Good
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Teledyne API	400	733	Good
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		ESC	8832	A1569	Bad
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Environics	6103	3445	Bad
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Sartorius		40100003	Good
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Boekel Scientific		124046600	Good
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Troemner	Class 1 Weights	38380	Good

Site	Location	AQS ID	Make	Model	Serial Number	Condition
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Troemner	Class 1 Weights	A125	Good
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Vaisala	Humidity/Temp HMP50	UAC1A1A/ F1650007	Good
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Climatronics Omega	100093 / temp sensor	J2850C	Good
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Met One	50.5 Sonic Wind Sensor	K13566	Good
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Climatronics	102663 BP Sensor	43970	Good
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Climatronics	102874 Wind Tunnel Sensor	T12878	Good
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Vaisala	RH sensor	T25685	Good
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Dresser Roots Meter	5M125	8622376	Good
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Teledyne API	T300	1539	Good
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Teledyne API	701H	113	Good
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Teledyne API	701	1084	Good
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Teledyne API	400A	459	Good
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		VWR	Oven 89511-410	41747908	Good
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Teledyne API	T400	1779	Good
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Teledyne API	501Y	104	Good

Site	Location	AQS ID	Make	Model	Serial Number	Condition
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Teledyne API	T200U	209	Good
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Teledyne API	701H	1622	Good
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Thermo Environmental	2025I	2025IW207391501	Good
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Rupprecht & Pataschnick	2025	2025A209189811	Poor
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Kipp & Zonen	BD300	50519	Poor
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Teledyne API	T750U	55	Good
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Teledyne API	T703	312	Good
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Teledyne API	T751H	84	Good
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		ESC	8832	1568	Bad
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Teledyne API	T400	3521	Good
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		ESC	8872	795	Good
Health Dept. Lab	814 Jefferson Ave. (Room 438R)		Thermo Environmental	2025I	2025I203531302	Bad
Health Dept. Warehouse	3065 Fite Rd.		Beckman Industrial	Circuitmate 9020 20 Mhz Oscilloscope	6090378	Poor
Health Dept. Warehouse	3065 Fite Rd.		Teledyne API	100A	1765	Poor
Health Dept. Warehouse	3065 Fite Rd.		Teledyne API	400	299	Poor

Site	Location	AQS ID	Make	Model	Serial Number	Condition
Health Dept. Warehouse	3065 Fite Rd.		Teledyne API	401	214	Poor
Health Dept. Warehouse	3065 Fite Rd.		ESC	8816	1263	Poor
Health Dept. Warehouse	3065 Fite Rd.		ESC	8816	3458	Poor
Health Dept. Warehouse	3065 Fite Rd.		ESC	8816	1265	Poor
Health Dept. Warehouse	3065 Fite Rd.		ESC	8816	1264	Poor
Health Dept. Warehouse	3065 Fite Rd.		Teledyne API	M701	994	Poor
Health Dept. Warehouse	3065 Fite Rd.		ESC	8816	1266	Poor
Health Dept. Warehouse	3065 Fite Rd.		ESC	8816	1268	Poor
Health Dept. Warehouse	3065 Fite Rd.		Measurement Technologies	1001	7930553	Poor
Health Dept. Warehouse	3065 Fite Rd.		ESC	8816	1267	Poor
Health Dept. Warehouse	3065 Fite Rd.		Teledyne API	701	819	Poor
Health Dept. Warehouse	3065 Fite Rd.		Teledyne API	100A	1656	Poor

Site	Location	AQS ID	Make	Model	Serial Number	Condition
Health Dept. Warehouse	3065 Fite Rd.		DuPont Constant Flow Sampler Calibrator	P4000		Poor
Health Dept. Warehouse	3065 Fite Rd.		Yokagawa	4182	T4182LA619	Poor
Health Dept. Warehouse	3065 Fite Rd.		Rupprecht & Pataschnick	2025	2025A209149811	Poor
Health Dept. Warehouse	3065 Fite Rd.		TSP Hi Vol Sampler			Poor
Health Dept. Warehouse	3065 Fite Rd.		Boeckel Dessicator			Poor
Health Dept. Warehouse	3065 Fite Rd.		PM 10 Sampler	UVIIH		Poor
Health Dept. Warehouse	3065 Fite Rd.		Young	Met Gear		Poor
Health Dept. Warehouse	994 Bellevue		Rupprecht & Pataschnick	2000FRM	20122	Good
Health Dept. Warehouse	994 Bellevue		Teledyne API	701	644	Poor
Health Dept. Warehouse	994 Bellevue		Teledyne API	300	609	Poor
Health Dept. Warehouse	994 Bellevue		Teledyne API	100A	1450	Poor

Site	Location	AQS ID	Make	Model	Serial Number	Condition
Health Dept. Warehouse	994 Bellevue		Teledyne API	200A	415	Poor
Health Dept. Warehouse	994 Bellevue		Teledyne API	300	123	Poor
Health Dept. Warehouse	994 Bellevue		Teledyne API	201E	57	Good
Health Dept. Warehouse	994 Bellevue		Teledyne API	702	317	Good
Health Dept. Warehouse	994 Bellevue		Teledyne API	501NH	438	Good
Health Dept. Warehouse	994 Bellevue		Dasibi	1008PC	5549	Poor
Health Dept. Warehouse	994 Bellevue		ESC	8816	3457	Poor

VII. Appendix

Memorandum of Agreement for Memphis, TN-MS-AR…….……..…40

SHELBY COUNTY HEALTH DEPARTMENT

MARK H. LUTTRELL, JR.
MAYOR

ALISA R. HAUSHALTER, DNP, RN, PHNA-BC
DIRECTOR

HELEN MORROW, MD, MPA
HEALTH OFFICER

Public Health
Prevent. Promote. Protect.

April 3rd, 2018

Mr. Robert Brawner, Environmental Fellow
Tennessee Department of Environment and Conservation
Air Pollution Control Division
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Ave., 15th Floor
Nashville, TN 37243-1531

Mr. Jason Stephens, Environmental Manager
Tennessee Department of Environment and Conservation
Air Pollution Control Division
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Ave., 15th Floor
Nashville, TN 37243-1531

Mr. Chad LaFontaine, Air Director
Mississippi Department of Environmental Quality
Office of Pollution Control, Air Division
P.O. Box 2261
Jackson, MS 39201

Mr. Stuart Spencer, Chief of the Air Division
Arkansas Department of Environmental Quality
5301 Northshore Dr.
North Little Rock, AR 72118-5317

Dear All,

In accordance with the provisions of the Memorandum of Agreement (MOA) signed in May and June of 2008 between the Shelby County Health Department (SCHD), Mississippi Department of Environmental Quality (MDEQ) and the Arkansas Department of Environmental Quality (ADEQ), this letter serves as a notification that no changes have been made in our current network. A copy of this agreement will be included in Shelby County's current year's annual network plan.

If your agencies do not have current changes to the Network or may be contemplating changes in the near future, please notify the respective agencies of your intentions.

If you have any questions, please call me at (901) 222-9599.

Sincerely,

Robert Rogers

Robert Rogers, P.E. / Technical Manager
Pollution Control
Shelby County Health Department

Mission
To promote, protect and improve the health and environment of all Shelby County residents.

814 Jefferson Avenue ♦ Memphis, TN 38105 ♦ 901 222-9000 ♦ www.shelbytnhealth.com

MEMORANDUM OF AGREEMENT ON AIR QUALITY MONITORING FOR CRITERIA POLLUTANTS FOR THE MEMPHIS, TN- MS- AR METROPOLITAN STATISTICAL AREA (MSA)

Participating Agencies:

Shelby County Health Department (SCHD)
Air Pollution Control Program

Mississippi Department of Environmental Quality (MDEQ)
Office of Pollution Control, Air Division

Arkansas Department of Environmental Quality (ADEQ)

PURPOSE / OBJECTIVE / GOALS

The purpose of this Memorandum of Agreement (MOA) is to inform the entities of the Memphis, Tennessee-Mississippi-Arkansas Metropolitan Statistical Area of monitoring network changes. The MOA between SCHD, MDEQ, and ADEQ is to collectively meet United States Environmental Protection Agency (EPA) minimum monitoring requirements for particles of an aerodynamic diameter of 10 micrometers and less (PM_{10}), particles of an aerodynamic diameter of 2.5 micrometers and less ($PM_{2.5}$), and ozone; as well as other criteria pollutants air quality monitoring deemed necessary to meet the needs of the MSA as determined reasonable by all parties. This MOA will formalize and reaffirm the collective agreement in order to provide adequate criteria pollutant monitoring for the Memphis, TN-MS-AR MSA as required by 40 CFR 58 Appendix D, Section 2, (e).

PM 2.5 MSA monitoring network include:

County	Federal Referenced Method $PM_{2.5}$	Continuous $PM_{2.5}$	Speciation $PM_{2.5}$	Co located $PM_{2.5}$
Shelby County, TN **SCHD**	3 (includes 1 at the Near Road Station)	1	1	1
Crittenden County , AR **ADEQ**	1	1		
DeSoto County, MS **MDEQ**	1	1		1

Criteria Air Pollutant MSA monitoring network include:

County	PM_{10}	O_3	$NO_x/NO/NO_2$	CO	SO_2
Shelby County, TN **SCHD**	2 (includes low volume PM_{10} at NCore)	3	1 (includes 1 at the Near Road Station)	2 (includes 1 trace at NCore and 1 trace at the Near Road Station)	1 (trace at NCore)
Crittenden County , AR **ADEQ**		1	1		
DeSoto County, MS **MDEQ**		1			

RESPONSIBILITIES / ACTIONS

Each of the parties to this Agreement is responsible for ensuring that its obligations under the MOA are met. As conditions warrant, the affected agencies may conduct telephone conference calls, meetings, or other communications to discuss monitoring activities for the MSA. Each affected agency shall inform the other affected agencies via telephone or email of any monitoring changes occurring within its jurisdiction of the MSA at its earliest convenience, after learning of the need for the change or making the changes. Such unforeseen changes may include evictions from monitoring sites,

destruction of monitoring sites due to natural disasters, or any occurrences that result in an extended (greater than one quarter) or permanent change in the monitoring network.

LIMITATIONS

- All commitments made in this MOA are subject to the availability of appropriated funds and each agency's budget priorities. Nothing in this MOA obligates SCHD, MDEQ, or ADEQ to expend appropriations or to enter into any contract, assistance agreement, interagency agreement or other financial obligation.

- This MOA is neither a fiscal nor a funds obligation document. Any endeavor involving reimbursement or contribution of funds between parties to this agreement will be handled in accordance with applicable laws, regulations, and procedures, and will be subject to separate agreements that will be affected in writing by representatives of the parties.

- This MOA does not create any right or benefit enforceable by law or equity against SCHD, MDEQ, or ADEQ, their officers or employees, or any other person. This MOA does not apply to any entity outside SCHD, MDEQ, or ADEQ.

- No proprietary information or intellectual property is anticipated to arise out of this MOA.

TERMINATION

This Memorandum of Agreement may be revised upon the mutual consent of SCHD, MDEQ and ADEQ. Each party reserves the right to terminate this MOA. A thirty (30) day written notice must be given prior to the date of termination.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

JUL 2 4 2018

Ms. Michelle Walker Owenby
Director
Division of Air Pollution Control
Tennessee Department of Environment and Conservation
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 15th Floor
Nashville, Tennessee 37243

Dear Ms. Owenby:

Thank you for submitting the State of Tennessee's 2018 annual ambient air monitoring network plan (Network Plan) dated July 10, 2018. The Network Plan is required by 40 Code of Federal Regulations (CFR) § 58.10. The Network Plan covers the ambient air monitoring network operated by the Tennessee Department of Environment and Conservation (TDEC) and the local air quality agencies in Tennessee.

The U.S. Environmental Protection Agency understands that TDEC provided a 30-day public comment period from June 1, 2018 through July 3, 2018, and received no comments other than those submitted by the EPA Region 4. TDEC provided a response to the EPA comments. This public comment period and response to comments satisfies the requirements 40 CFR § 58.10(a)(1).

This letter provides partial approval of the Network Plan. The EPA approves the Eastman Andrew Johnson Elementary and Eastman Happy Hill sulfur dioxide (SO_2) monitoring site proposals described in the Network Plan. This approval is being provided separately to support the EPA's anticipated upcoming action on Tennessee's May 12, 2017, attainment demonstration submission for the 2010 1-hour SO_2 National Ambient Air Quality Standard (NAAQS). The EPA recognizes and appreciates all the work that TDEC staff put into identifying and obtaining access to these two sites.

The EPA has not completed its review of the other parts of the Network Plan. The EPA's response to the other sections of the Network Plan will be provided in a separate letter by the 120-day regulatory due date.

Thank you for working with us to monitor air pollution and promote clean air in Tennessee. If you have any questions or concerns, please contact Gregg Worley at (404) 562-9141 or Sara Waterson at (404) 562-9061.

Sincerely,

Beverly H. Banister
Director
Air, Pesticides and Toxics Management Division

cc: Mr. Bradley King
TN Division of Air Pollution Control

Mr. Robert Brawner
TN Division of Air Pollution Control

Dr. Jason Stephens
TN Division of Air Pollution Control

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

SEP 19 2018

Ms. Michelle Owenby
Director
Division of Air Pollution Control
Tennessee Department of Environment and Conservation
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 15th Floor
Nashville, Tennessee 37243

Dear Ms. Owenby:

Thank you for submitting the state of Tennessee's 2018 Annual Ambient Air Monitoring Network Plan (Network Plan) dated July 10, 2018. The Network Plan is required by 40 Code of Federal Regulations (CFR) §58.10. The U.S. Environmental Protection Agency Region 4 understands that the Tennessee Department of Environment and Conservation (TDEC) provided the public a 30-day review period and no comments were received. With this letter, the EPA approves the Tennessee Network Plan.

The EPA approved the Eastman Andrew Johnson Elementary and Eastman Happy Hill sulfur dioxide (SO_2) monitoring site proposals described in the Network Plan on July 24, 2018. These approvals were provided separately to support the EPA's anticipated upcoming action on Tennessee's May 12, 2017 attainment demonstration submission for the 2010 1-hour SO_2 National Ambient Air Quality Standard (NAAQS).

In the Network Plan, two agencies did not include calculations of the heights and distances to the nearest obstructions in the site assessments; however, these measurements were provided to the EPA prior to the submittal of the Network Plan. The EPA requests these calculations be provided in future site assessments to determine if airflow to a monitor is obstructed.

Memphis-Shelby County is operating a particulate matter less than 10 microns (PM_{10}) monitor at Shelby Farms to meet the NCore requirement for $PM_{10\text{-}2.5}$ measurement. However, the PM_{10} data from this monitor is being reported to the Air Quality System (AQS) as a non-regulatory parameter code, 85101, and does not count towards meeting the minimum PM_{10} monitoring requirement of two PM_{10} monitors in the metropolitan statistical area (MSA). The Alabama avenue monitor is currently the only PM_{10} regulatory monitor in the MSA. The EPA has provided recommendations for the Memphis area monitoring network to meet this PM_{10} monitoring requirement in the enclosed comments.

The Network Plan states that Knoxville is searching for a new location for the Burnside lead (Pb) monitor (AQS # 47-093-0027) on the southeast side of the Gerdau Plant. Knoxville provided preliminary modeling to the EPA, and noted the maximum expected Pb concentrations are on the southeast side of the facility near Tennessee Avenue. To address the 40 CFR Part 58, Appendix D 4.5 regulatory requirement to locate a monitor in the area of maximum expected concentration,

the EPA requests Knoxville provide documentation for placement of a monitor at the highest modeled Pb concentration possible. Please note that once Knoxville identifies a suitable site, the proposed revisions to the network, including the identification of monitors to be discontinued or relocated, must have a 30-day public comment period prior to submittal to the EPA as a Network Plan Addendum. We have enclosed these comments, as well as additional minor comments, on your Network Plan.

Thank you for working with the EPA to monitor air pollution and promote healthy air quality in Tennessee. Please let us know of any problems in meeting any of the requirements we have identified. If you have any questions or concerns, please contact Gregg Worley at (404) 562-9141 or Sara Waterson at (404) 562-9061.

Sincerely,

Beverly H. Banister

Beverly H. Banister, Director
Air, Pesticides and Toxics
Management Division

Enclosure

cc: Ms. Lynne A. Liddington, Director
Knox County Air Quality

Mr. Robert Rogers, Technical Manager
SCHD, Pollution Control Section

Mr. Bob Colby, Director
CHC Air Pollution Control Bureau

Mr. John Finke, Director
Nashville / Davidson County Metro Public
Health Department Pollution Control Division

CY 2018 State of Tennessee Ambient Air Monitoring Network Plan
U.S. EPA Comments and Recommendations

This document contains the U.S. Environmental Protection Agency comments and recommendations on the state of Tennessee's 2018 Ambient Air Monitoring Network Plan (Network Plan). Ambient air monitoring rules, which include regulatory requirements that address network plans, data certification, and minimum monitoring requirements, among other requirements, are found in 40 CFR Part 58. Minimum monitoring requirements for criteria pollutants are listed in 40 CFR Part 58, Appendix D, including those for ozone (O_3), particulate matter less than 2.5 microns ($PM_{2.5}$), particulate matter less than 10 microns (PM_{10}), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), and lead (Pb).

The minimum monitoring requirements are based on core based statistical area (CBSA) boundaries as defined by the U.S. Office of Management and Budget (OMB), July 1, 2017, population estimates from the U.S. Census Bureau, and historical ambient air monitoring data. Minimum monitoring requirements for O_3, $PM_{2.5}$, and PM_{10}, only apply to metropolitan statistical areas (MSAs), which are a subset of CBSAs. OMB currently defines 26 CBSAs in the state of Tennessee. These CBSAs and the respective July 1, 2017, population estimates from the U.S. Census Bureau are shown in Table 1.

Table 1: Core Based Statistical Areas and July 1, 2017 Population Estimates

CBSA Name	CBSA Type	Population
Nashville-Davidson-Murfreesboro-Franklin, TN	Metropolitan Statistical Area	1,903,045
Memphis, TN-MS-AR	Metropolitan Statistical Area	1,348,260
Knoxville, TN	Metropolitan Statistical Area	877,104
Chattanooga, TN-GA	Metropolitan Statistical Area	556,548
Kingsport-Bristol-Bristol, TN-VA	Metropolitan Statistical Area	306,659
Clarksville, TN-KY	Metropolitan Statistical Area	285,042
Johnson City, TN	Metropolitan Statistical Area	202,053
Jackson, TN	Metropolitan Statistical Area	129,235
Cleveland, TN	Metropolitan Statistical Area	122,317
Morristown, TN	Metropolitan Statistical Area	118,081
Cookeville, TN	Micropolitan Statistical Area	111,363
Tullahoma-Manchester, TN	Micropolitan Statistical Area	103,070
Sevierville, TN	Micropolitan Statistical Area	97,638
Greeneville, TN	Micropolitan Statistical Area	68,808
Crossville, TN	Micropolitan Statistical Area	59,078
Athens, TN	Micropolitan Statistical Area	52,877
Shelbyville, TN	Micropolitan Statistical Area	48,117
Lawrenceburg, TN	Micropolitan Statistical Area	43,396
McMinnville, TN	Micropolitan Statistical Area	40,651
Dyersburg, TN	Micropolitan Statistical Area	37,463
Union City, TN-KY	Micropolitan Statistical Area	36,577
Newport, TN	Micropolitan Statistical Area	35,556
Martin, TN	Micropolitan Statistical Area	33,337
Lewisburg, TN	Micropolitan Statistical Area	32,931
Dayton, TN	Micropolitan Statistical Area	32,691
Paris, TN	Micropolitan Statistical Area	32,450
Brownsville, TN	Micropolitan Statistical Area	17,573

Monitoring Network Changes Proposed by the Tennessee

The TDEC's Network Plan identified proposed changes to the state's ambient air monitoring network. The local agency monitoring programs included in the state Network Plan are operated by the Chattanooga-Hamilton County Air Pollution Control Bureau (Chattanooga), the Metro Public Health Department (Nashville), the Knox County Department of Air Quality Management (Knoxville), and the Memphis/Shelby County Health Department (Memphis). The EPA's rationale for approval or disapproval of specific network changes can be found below in the pollutant sections of this document. Monitors proposed for reconfiguration, relocation, or monitor start-up and the EPA's determination are summarized in Table 2.

Table 2: Proposed Changes in Monitoring

Agency	AQS ID	Site Name	Pollutant	Type	Comments
TDEC	47-163-2002	Blountville	O_3	SLAMS	Acknowledged, reconfiguration to meet siting criteria.
TDEC	47-189-0103	Cedars	O_3	SLAMS	Acknowledged, reconfiguration to meet siting criteria.
TDEC	47-187-0106	Fairview	O_3	SLAMS	Acknowledged, reconfiguration to meet siting criteria.
TDEC	47-001-0101	Freels Bend	O_3 and SO_2	SLAMS	Acknowledged, reconfiguration to meet siting criteria.
TDEC	47-165-0007	Hendersonville	O_3 and $PM_{2.5}$	SLAMS	Acknowledged, reconfiguration to meet siting criteria.
TDEC	47-163-2003	Kingsport O_3	O_3	SLAMS	Acknowledged, reconfiguration to meet siting criteria.
TDEC	47-105-0109	Loudon	O_3 and $PM_{2.5}$	SLAMS	Acknowledged, reconfiguration to meet siting criteria.
TDEC	47-089-0002	New Market	O_3	SLAMS	Acknowledged, reconfiguration to meet siting criteria.
Chattanooga	47-065-4002	Siskin Drive	$PM_{2.5}$	SLAMS	Acknowledged, reconfiguration to meet siting criteria.
Knoxville	47-093-1013	Air Lab	$PM_{2.5}$	SPM	Acknowledged, change in monitor type. Once the T640x SOP is approved, the TEOM will be discontinued.
Knoxville	47-093-0027	Burnside	Pb	SLAMS	Future relocation. Knoxville is looking at possible sites to relocate the Burnside monitor on the southeast side of the Gerdau Plant. The EPA supports relocating the monitor to a higher modeled concentration area.
TDEC	47-125-1009	Clarksville	$PM_{2.5}$	SLAMS	Approved, relocation: The monitor at the existing site is located on a platform. TDEC is removing all platforms for safety reasons. Once the monitor is placed on the ground it will no longer meet siting criteria. The proposed site is upwind of the Clarksville, TN-KY area. The AQS # at the proposed new site is 47-125-2001

TDEC	47-113-0006	Jackson	$PM_{2.5}$	SLAMS	Approved, relocation: Trees located to the north and south of the existing site do not allow the site to meet siting criteria. The property owner at the existing site will not allow the trees to be trimmed or removed. The proposed site is downwind of the City of Jackson's industrial areas. The AQS # at the proposed new site is 47-113-0010.
TDEC	47-099-0002	Lawrence	$PM_{2.5}$	SLAMS	Approved, relocation: Trees located to the north and south of the existing site do not allow the site to meet siting criteria. The property owner at the existing site will not allow the trees to be trimmed or removed. The AQS # at the proposed new site is 47-099-0003.
TDEC	47-163-6003	Andrew Jackson	SO_2	SLAMS	Approved, start-up: Approved on July 24, 2018 to support the EPA's anticipated upcoming approval of Tennessee's May 12, 2017, attainment demonstration submission for the 2010 1-hour SO_2 NAAQS. The AQS # at the proposed new site is 47-163-6003.
TDEC	47-163-6004	Happy Hill	SO_2	SLAMS	Approved, start-up: Approved on July 24, 2018 to support the EPA's anticipated upcoming approval of Tennessee's May 12, 2017, attainment demonstration submission for the 2010 1-hour SO_2 NAAQS. The AQS # at the proposed new site is 47-163-6004.

Air Quality Index (AQI) Reporting
40 CFR § 58.50

AQI reporting is required for MSAs with populations of 350,000 or more. Four MSAs in the state of Tennessee meet this criterion: Chattanooga, Tennessee-Georgia; Knoxville, Tennessee; Memphis, Tennessee-Mississippi-Arkansas; and Nashville-Davidson-Murfreesboro, Tennessee. The Network Plan indicates that an AQI is being reported in each of these MSAs. Thus, the state is meeting its AQI reporting requirements. In addition, the TDEC is voluntarily reporting an AQI for the Kingsport-Bristol-Bristol, TN-VA and the Clarksville, TN-KY CBSAs.

National Core (NCore) Monitoring Network
40 CFR Part 58, Appendix D, Section 3.0

The TDEC designated two NCore sites in its Network Plan. The first site (AQS # 47-157-0075) is located at Shelby Farms on Haley Road in Memphis.

The second NCore site, Look Rock (AQS # 47-009-0101), is designated as a rural NCore site and is in the Great Smoky Mountains National Park. The site has been operated collaboratively for many years by the National Park Service (NPS), the TDEC, and the EPA. The TDEC has discontinued funding support

for the Look Rock site. The National Park Service, with support from US EPA, will continue full operations for the 2019 season.

The proposed NCore monitoring network described in the Network Plan meets all design criteria of 40 CFR Part 58.

O_3 Monitoring Requirements
40 CFR Part 58, Appendix D, Section 4.1 and Table D-2

The O_3 network described in the Network Plan meets the minimum monitoring requirements specified by 40 CFR Part 58, Appendix D, Table D-2 in all areas.

The TDEC notified the EPA of reconfigurations to eight O_3 monitoring sites in order to meet siting requirements. The EPA acknowledges the reconfigurations of the Blountville (AQS # 47-163-2002), Cedars (AQS # 47-189-0103), Fairview (AQS # 47-187-0106), Freels Bend (AQS # 47-001-0101), Hendersonville (AQS # 47-165-0007), Kingsport O_3 (AQS # 47-163-2003), Loudon (AQS # 47-105-0109), and New Market (AQS # 47-089-0002) monitoring sites. The reconfigured monitors will continue to report data to the same AQS site IDs.

The TDEC discontinued funding support for O_3 monitoring operations at the Cades Cove and Clingmans Dome air monitoring stations in the Great Smoky Mountains National Park. The National Park Service will continue full operations at these sites during the 2019 season.

The proposed O_3 monitoring network described in the Network Plan meets the design criteria of 40 CFR Part 58.

CO Monitoring Requirements
40 CFR Part 58, Appendix D, Section 4.2

Ambient air monitoring network design criteria for CO are found in 40 CFR Part 58, Appendix D, Section 4.2. This section requires CBSAs with populations over one million but less than 2.5 million to operate one CO monitor collocated with a near-road NO_2 monitor, by January 1, 2017. This requirement is met in the Nashville-Davidson-Murfreesboro-Franklin, TN CBSA by the CO monitor operating at the near-road site (AQS # 47-037-0040) and in the Memphis, TN-MS-AR CBSA by the CO monitor operating at the Southwest TN Community College near-road site (AQS # 47-157-0100). Memphis operates one CO monitor in addition to the near-road NO_2 monitor at the Shelby Farms NCore site (AQS # 47-157-0075).

The proposed CO monitoring network described in the Network Plan meets all design criteria of 40 CFR Part 58.

NO_2 Monitoring Requirements
40 CFR Part 58, Appendix D, Section 4.3

Ambient air monitoring network design criteria for NO_2 are found in 40 CFR Part 58, Appendix D, Section 4.3. Three types of NO_2 monitoring are required: near-road, area-wide, and Regional Administrator required. These types of NO_2 monitoring are described in Sections 4.3.2, 4.3.3, and 4.3.4, respectively.

The EPA previously approved the Nashville near-road site (AQS # 47-037-0040) and the Southwest Tennessee Community College near-road site (AQS # 47-157-0100) to meet the near-road NO_2 requirements for the Nashville-Davidson-Murfreesboro-Franklin, TN and Memphis, TN-MS-AR CBSAs, respectively.

Ambient air monitoring network design criteria for area-wide NO_2 sites are found in 40 CFR Part 58, Appendix D, Section 4.3.3. Any CBSA with a population of 1,000,000 or more persons is required to monitor a location of expected highest NO_2 concentration representing the neighborhood or larger spatial scales. The East Health Center site (AQS # 47-037-0011) was approved as the area-wide NO_2 monitoring site for the Nashville-Davidson-Murfreesboro-Franklin, TN CBSA in 2013. The area-wide requirement for the Memphis, TN-MS-AR CBSA is met by the monitor operated in Marion, Arkansas by the state of Arkansas (AQS # 05-035-0005). The operation of this site was agreed to in a memorandum of agreement (MOA) between Memphis and the states of Arkansas and Mississippi. The MOA was included in the Network Plan.

Ambient air monitoring network design criteria for the Regional Administrator required NO_2 monitoring, often referred to as RA-40 monitoring, are found in 40 CFR Part 58, Appendix D, Section 4.3.4. This section states that "the Regional Administrators, in collaboration with states, must require a minimum of forty additional NO_2 monitoring stations nationwide in any area, inside or outside of CBSAs, above the minimum monitoring requirements, with a primary focus on siting these monitors in locations to protect susceptible and vulnerable populations. The Regional Administrators, working with states, may also consider additional factors to require monitors beyond the minimum network requirement." However, not all states are required to have such monitors and EPA did not propose any for Tennessee. As a result, the state did not include a Regional Administrator required NO_2 monitor in its Network Plan. The full list of NO_2 monitors identified by the Regional Administrators can be found on the EPA's website at http://www.epa.gov/ttnamti1/svpop.html.

The NO_2 monitoring network described by the TDEC in its Network Plan meets all design criteria of 40 CFR Part 58.

SO_2 Monitoring Requirements
40 CFR Part 58, Appendix D, Section 4.4

Ambient air monitoring network design criteria for SO_2 are found in 40 CFR Part 58, Appendix D, Section 4.4. This section requires that "The population weighted emissions index (PWEI) shall be calculated by states for each core based statistical area (CBSA)…" As a result, the SO_2 monitoring site(s) required in each CBSA will satisfy minimum monitoring requirements if the monitor(s) is sited within the boundaries of the parent CBSA and is of the following site types: population exposure, maximum concentration, source-oriented, general background, or regional transport. A SO_2 monitor at an NCore station may satisfy minimum monitoring requirements if that monitor is located within a CBSA with minimally required monitors consistent with Appendix D, Section 4.4.

The TDEC operates SO_2 monitors in Anderson County (AQS # 47-001-0101) and Sullivan County (AQS # 47-163-0007) to meet the PWEI requirement of one SO_2 monitor for the Knoxville, TN CBSA and the Kingsport-Bristol-Bristol, TN-VA CBSA, respectively. SO_2 monitors are also required and operating in the Memphis, TN-MS-AR CBSA (AQS # 47-157-0075) and the Nashville-Davidson-

Murfreesboro-Franklin, TN CBSA (AQS # 47-037-0011) to meet the PWEI requirement of one SO_2 monitor for each respective CBSA.

The TDEC proposed to establish two additional SO_2 monitoring sites to characterize the maximum SO_2 concentrations in the Sullivan County SO_2 nonattainment area. On July 24, 2018, the EPA approved the Eastman Andrew Johnson Elementary (AQS # 47-163-6003) and Eastman Happy Hill (AQS # 47-163-6004) SO_2 monitoring site proposals described in the Network Plan. The approval was provided separately to support the EPA's anticipated upcoming action of Tennessee's May 12, 2017 attainment demonstration submission for the 2010 1-hour SO_2 NAAQS.

The proposed SO_2 monitoring network described in the Network Plan meets all design criteria of 40 CFR Part 58.

Pb Monitoring Requirements
40 CFR Part 58, Appendix A, Section 3.4
40 CFR Part 58, Appendix D, Section 4.5

The monitoring requirements for Pb found at 40 CFR Part 58, Appendix D, Section 4.5 require that "[a]t a minimum, there must be one source-oriented SLAMS [State and Local Air Monitoring Station] site located to measure the maximum Pb concentration in ambient air resulting from each non-airport Pb source which emits 0.50 or more tons per year and from each airport which emits 1.0 or more tons per year…" Currently, monitoring is required near two sources in Tennessee: the former Exide Technologies facility in Bristol and the Gerdau facility in Knoxville. Monitors, including collocated quality control monitors, near both sources are identified in the Network Plan.

The Network Plan states that Knoxville is searching for a new location for the Burnside Pb monitor (AQS # 47-093-0027) on the southeast side of the Gerdau Plant. Knoxville provided preliminary modeling to the EPA, and noted the maximum expected Pb concentrations are on the southeast side of the facility near Tennessee Avenue. Forty (40) CFR Part 58, Appendix D 4.5, Lead Design Criteria states, "[a]t a minimum, there must be one source-oriented SLAMS site located to measure the maximum Pb concentration in ambient air resulting from each non-airport Pb source which emits 0.50 or more tons per year..." To address the regulatory requirement to locate a monitor in the area of maximum expected concentration, EPA requests that Knoxville provide documentation for placement of a monitor at the highest modeled concentration possible. One way to do this would be to conduct an analysis similar to what was used in siting the SO_2 Data Requirements Rule monitors. Following that approach, the receptors would be ranked by modeled concentration and then Knoxville would investigate the monitoring locations in order of highest to lowest ranking until an acceptable site is identified. The package would provide:

- A narrative description and relevant documentation of the site selection process.
- The identification of any sites that are suitable and sites that are not suitable for monitor placement. Sites that are not suitable would contain an explanation of why the site is unsuitable. If there are no logistically feasible sites, then the existing sites may suffice for monitoring.

Please note that once Knoxville identifies a suitable site, the proposed revisions to the network, including the identification of monitors to be discontinued or relocated, must have a 30-day public comment period prior to submittal to the EPA as a Network Plan Addendum.

PM_{10} Monitoring Requirements
40 CFR Part 58, Appendix A, Section 3.3
40 CFR Part 58, Appendix D, Section 4.6 and Table D-4

The minimum number of PM_{10} monitors required for the Nashville-Davidson-Murfreesboro-Franklin, TN, CBSA is two. In the 2016 Network Plan, Nashville requested a waiver of the PM_{10} minimum monitoring requirement. The EPA approved the waiver request in its response to the 2016 Network Plan. Chattanooga petitioned the EPA on August 28, 2014, to delete the collocated PM_{10} site at South Broad Street (AQS # 47-065-0006). The EPA approved the waiver request in its response to the 2015 Network Plan. Please note that the waiver requests must be renewed during the next five-year Network Assessment (2020).

Knoxville installed a Teledyne T640x federal equivalent method (FEM) continuous monitor at the Air Lab site (AQS # 47-093-1013) in September 2017. This monitor is capable of reading both $PM_{2.5}$ and PM_{10}. Knoxville is collecting trial data from the monitor and reviewing the statistical correlation with the official tapered-element oscillation microbalance (TEOM) data. Once the standard operating procedure is approved, the TEOM will be discontinued.

Memphis is required to operate, at a minimum, two PM_{10} monitors in the MSA. The monitors include the monitor at Shelby Farms NCore (AQS # 47-157-0075) and a continuous PM_{10} monitor at Alabama Avenue (AQS # 47-157-0024). The PM_{10} at Shelby Farms NCore site is being used for $PM_{10-2.5}$ measurements; therefore, it is being reported to parameter 85101 and not parameter 81102. Consequently, the Alabama Avenue site is the only PM_{10} regulatory site in the Memphis MSA. To meet minimum monitoring requirements, Memphis has three possible options. One option that Memphis could consider is converting the PM_{10} data at the Shelby Farms NCore site to EPA standard temperature and pressure (STP) and reporting the data to the AQS as parameter code 81102 to meet the minimum monitoring requirements for the MSA. The monitoring operations would not change in this scenario. The formula to convert PM_{10} local conditions (LC) to PM_{10} STP is found in 40 CFR Part 50 Appendix J Section 11. The PM_{10} sampler would need to continue operating at LC to calculate PM_{10}-$PM_{2.5}$ for required NCore measurements.

A second option that Memphis could consider is installing a continuous FEM $PM_{2.5}$ monitor and a continuous FEM PM_{10} monitor. The continuous $PM_{2.5}$ monitor would be required to be collocated with a $PM_{2.5}$ FRM on a 1:3-day schedule (40 CFR Part 58 Appendix A 3.2.3.2 and 58.12(d)(2)). In this case, Memphis would not need to operate a TEOM for meeting the AQI requirement at the site. Collocation for PM_{10} would not be required since the PM_{10} measurement is continuous (40 CFR Part 58 Appendix A 3.3.4). A continuous FEM monitor that collects both $PM_{2.5}$ and PM_{10} would be acceptable in this scenario.

A third option would be to enter into an MOA with Tennessee, Mississippi or Arkansas to establish a second PM_{10} monitor in the MSA.

The state is meeting all PM_{10} collocation requirements for manual methods found in 40 CFR Part 58, Appendix A, 3.3.4. Those requirements include that: 15% percent of each network of manual PM_{10} methods (at least one site) must be collocated, and the sites with collocated monitors should be among those measuring annual mean concentrations in the highest 25 percent of the network. These collocation requirements are assessed at the primary quality assurance organization (PQAO) level.

$PM_{2.5}$ Monitoring Requirements
40 CFR Part 58, Appendix A, Section 3.2.3
40 CFR Part 58, Appendix D, Section 4.7 and Table D-5

The state of Tennessee's $PM_{2.5}$ monitoring network meets the minimum requirements found in 40 CFR Part 58, Appendix D, Table D-5 for all MSAs. All manual $PM_{2.5}$ collocation requirements found in 40 CFR Part 58, Appendix A, Section 3.2.3 are also met. Fifteen percent of each network of manual $PM_{2.5}$ methods (at least one site) must be collocated. Additionally, according to Appendix A, 3.2.3.4, 50 percent of collocated monitors should be deployed at sites with annual mean concentrations within +/- 20 percent of the NAAQS.

The TDEC notified the EPA of reconfigurations to two monitoring sites to meet siting requirements. The EPA acknowledges the reconfigurations of the Hendersonville (AQS # 47-165-0007) and Loudon (AQS # 47-105-0109) monitoring sites. Chattanooga removed the shelter at the Siskin Drive (AQS # 47-065-4002) due to poor condition and replaced it with a platform. Once the platform was built, the TEOM was taken out of service and replaced with the T640 continuous $PM_{2.5}$ monitor. The monitors will continue to report data to the same AQS ID.

The TDEC submitted a request to relocate three monitoring sites in order to meet 40 CFR Part 58, Appendix E siting requirements. The Clarksville $PM_{2.5}$ monitor (AQS # 47-125-1009) is currently located on a platform. TDEC is removing all platforms for safety reasons. Once the monitor is placed on the ground it will no longer meet siting criteria. The proposed site is upwind of the Clarksville, TN-KY MSA. The AQS ID at the proposed new site will be 47-125-2001. The TDEC requested relocations of the Jackson monitoring site (AQS # 47-113-0006) in Jackson, TN and the Lawrence monitoring site (AQS # 47-099-0002) located in Loretto, TN. The TDEC noted existing trees are encroaching on the monitoring sites and the property owners will not allow the trees to be trimmed or removed. The AQS ID at the proposed new sites will be 47-113-0010 and 47-099-0003, respectively. Currently, $PM_{2.5}$ monitoring is not required in any of these MSAs. The EPA approves the relocation of the Clarksville, Jackson, and Lawrence monitoring sites.

The TDEC determined the Loudon monitor (AQS # 47-105-0109) measured a higher 3-year (2014-2016) DV than the Jackson monitor (AQS # 47-113-0006); therefore, the collocated $PM_{2.5}$ monitor was moved to the Loudon site.

The TDEC's Network Plan Table 1: Metropolitan Monitoring Configuration for 2018 shows an incorrect number of required $PM_{2.5}$ monitors for the Chattanooga and Clarksville MSAs. Based on the annual and 24-hour design values and population size, Table D-5 of 40 CFR Part 58 Appendix D indicates that one $PM_{2.5}$ monitor is required in the Chattanooga MSA and no $PM_{2.5}$ monitors are required in the Clarksville MSA.

Region 4 understands that funds were budgeted for the purchase of two T640 monitors in Memphis' 103 grant application submitted to the EPA on December 14, 2017, and one T640 monitor in Memphis' 105 grant application submitted to the EPA on July 31, 2018. Memphis' Network Plan did not indicate any expected changes in $PM_{2.5}$ monitoring methods. Please include anticipated changes in monitoring methods in future network plans.

The $PM_{2.5}$ monitoring network described in the 2018 Network Plan meets all design criteria of 40 CFR Part 58.

$PM_{2.5}$ Near-road Monitoring Requirements
40 CFR Part 58, Appendix D, Section 4.7.1(b)(2)

Regulatory requirements in 40 CFR Part 58, Appendix D, 4.7.1(b)(2) require that "CBSAs with a population of 1,000,000 or more persons, at least one $PM_{2.5}$ monitor is to be collocated at a near-road NO_2 station." $PM_{2.5}$ near-road monitoring was required in the Memphis, TN-MS-AR CBSA and the Nashville-Davidson-Murfreesboro-Franklin, TN CBSA by January 1, 2017. The Memphis Southwest Tennessee Community College near-road site (AQS # 47-157-0100) and the Nashville near-road site (AQS # 47-037-0040) both began $PM_{2.5}$ near-road monitoring on January 1, 2017.

$PM_{2.5}$ Continuous Monitoring Requirements
40 CFR Part 58, Appendix D, Section 4.7.2

Regulatory requirements for continuous $PM_{2.5}$ monitoring require that "The State, or where appropriate, local agencies must operate continuous $PM_{2.5}$ analyzers equal to at least one-half (round up) the minimum required sites listed in Table D–5 of this appendix. At least one required continuous analyzer in each MSA must be collocated with one of the required FRM/FEM/ARM [federal reference method/federal equivalent method /approved regional method] monitors, unless at least one of the required FRM/FEM/ARM monitors is itself a continuous FEM or ARM monitor in which case no collocation requirement applies."

Chattanooga installed a Teledyne T640 FEM continuous monitor at the Siskin Drive site (AQS # 47-065-4002) and Knoxville installed a Teledyne T640x FEM continuous monitor at the Air Lab site (AQS # 47-093-1013). These monitors are operating as special purchase monitors. Knoxville plans to replace the Beta Attenuation Monitors with the new T640x monitors as funding allows.

These minimum continuous $PM_{2.5}$ monitoring requirements are being met in all the MSAs in the state. Also, the continuous $PM_{2.5}$ collocation requirements are being met in all MSAs. Therefore, the continuous $PM_{2.5}$ monitoring network described in the Network Plan meets all design criteria of 40 CFR Part 58.

$PM_{2.5}$ Background and Transport Sites
40 CFR Part 58, Appendix D, Section 4.7.3

Monitoring requirements in 40 CFR Part 58, Appendix D, Section 4.7.3 state that "each State shall install and operate at least one $PM_{2.5}$ site to monitor for regional background and at least one $PM_{2.5}$ site to monitor for regional transport." The following sites were identified in the AQS as background (Table 3) and transport sites (Table 4).

Table 3. $PM_{2.5}$ Background Sites

AQS ID	County Name	CBSA Short Name	Parameter Description	Monitoring Objective
47-099-0002	Lawrence	Lawrenceburg, TN	$PM_{2.5}$ - Local Conditions Acceptable $PM_{2.5}$ AQI & Speciation Mass	UPWIND BACKGROUND

Table 4. $PM_{2.5}$ Transport Sites

AQS ID	County Name	CBSA Short Name	Parameter Description	Monitoring Objective
47-065-0031	Hamilton	Chattanooga, TN-GA	$PM_{2.5}$ - Local Conditions	REGIONAL TRANSPORT
47-009-0101	Blount	Knoxville, TN	Acceptable $PM_{2.5}$ AQI & Speciation Mass	REGIONAL TRANSPORT

The EPA requests that the TDEC provide a statement or table in its 2019 Network Plan that describes how the $PM_{2.5}$ background and transport requirements in Tennessee are met.

$PM_{2.5}$ Chemical Speciation Network (CSN)
40 CFR Part 58, Appendix D, Section 4.7.4

The state of Georgia operates a $PM_{2.5}$ speciation monitor in the Chattanooga-Hamilton County/North Georgia/Alabama maintenance area (AQS # 13-295-0002). Knoxville operates a speciation monitor at the Spring Hill monitoring site (AQS # 47-093-1020). Memphis operates a speciation monitor at the Shelby Farms monitoring site (AQS # 47-157-0075). The operation of these monitors is consistent with the CSN review recently completed by EPA.

Photochemical Assessment Monitoring Stations (PAMS)
40 CFR Part 58, Appendix D, Section 5.0

With the promulgation of a new O_3 NAAQS on October 1, 2015, the EPA finalized changes to the PAMS requirements. By June 1, 2019, Memphis will be required to implement PAMS monitoring at its NCore site at Shelby Farms (AQS # 47-157-0075).

The EPA will work closely with Memphis to address the implementation challenges of this new monitoring program. At this time, however, the PAMS requirement is being met in the state.

Memoranda of Agreement (MOA) with Neighboring States

The TDEC and its local agencies maintain several MOAs with neighboring jurisdictions to address minimum monitoring requirements. The TDEC and Kentucky have a MOA addressing O_3 and continuous $PM_{2.5}$ monitoring in the Clarksville, TN-KY CBSA. The TDEC and Virginia have a MOA addressing O_3 in the Kingsport-Bristol-Bristol, TN-VA CBSA. Memphis, Arkansas, and Mississippi have an MOA addressing PM_{10}, $PM_{2.5}$, and O_3 monitoring in the Memphis, TN-MS-AR CBSA. Chattanooga and Georgia have a MOA addressing PM_{10}, $PM_{2.5}$, and O_3 monitoring in the Chattanooga, TN-GA CBSA.

Exceptional Events

As referenced in the Network Plan, the EPA received exceptional event intent letters from the TDEC, Chattanooga and Knoxville. The EPA will not act on the letters unless the exceptional event causes a regulatory impact.

Site Assessments

In reference to the Network Plan, 40 CFR Part 58.10(a)(1) states, "[t]he plan shall include a statement of whether the operation of each monitor meets the requirements of appendices A, B, C, D, and E of this part, where applicable. The Regional Administrator may require additional information in support of this statement." Site assessment information was included for all monitoring sites in the 2018 Network Plan. However, Chattanooga and Memphis did not include the calculations to the nearest obstructions. Forty (40) CFR Part 58, Appendix E, table E-4, footnote 4 states "[d]istance from sampler, probe, or 90 percent of monitoring path to obstacle, such as a building, must be at least twice the height the obstacle protrudes above the sampler, probe, or monitoring path." The EPA appreciates the inclusion of this information in the Network Plan, and the continued efforts to ensure that the monitoring network meets siting criteria requirements.

The site assessments submitted by Nashville include pictures that were taken in the four cardinal directions (North, South, West, and East) and of the frontal views. In addition to this and the other information provided in the plan, the EPA requests that the Nashville include the date(s) of the most recent annual siting criteria evaluations.

Finally, additional measurements to obstructions were provided by Chattanooga and Memphis to the EPA prior to the submittal by the state of the Network Plan. Please include these calculations to determine if airflow to a monitor is obstructed in future site assessments.