

Executive Summary

Submit by May 1, 2012 an evaluation to demonstrate the requirements of 40 CFR Part 58.10 (a)(1) (Annual Network Evaluation) have been met.

This review was conducted in the winter of 2011 and will be discussed in more detail at the end of this letter.

Quality Assurance Procedures.

On September 26, 2007, the Forsyth County Environmental Affairs Department submitted notification that the agency was currently following the NCDENR's QMP. The Department continues to follow and update, when necessary, all SOPs associated with our equipment.

Categorization of Ambient Monitors and Auxiliary Equipment.

The evaluation was completed in November 2009. No equipment was rated as Poor. The current emphasis remains replacement of monitoring buildings and consolidation of the network. Capital funds are available in limited quantity and are available if needed for replacement equipment.

Notify EPA within 30 days after exceedances/violations of NAAQS.

The Forsyth County Environmental Affairs Department remained an active participant in the AirNow program. Part of that program ensures that all local and regional exceedances/violations of the NAAQS are submitted to EPA and all others affected in a timely fashion.

Comply with Exceptional Events Policy.

No situations requiring exceptional event flagging occurred since the last Annual Network Review period.

Submit list of urban areas for which AQI is reported.

Forsyth County reports the AQI for our part of the Greensboro-Winston-Salem-High Point MSA. AQI statistics are available in local newspapers, on the Department's web site: <http://www.co.forsyth.nc.us/EnvAffairs/>, and through the NC-DAQ's recorded 888-RU4NCAIR phone system. Real time data (updated hourly) are also available at: <http://www.co.forsyth.nc.us/envaffairs/AutoReports/default.htm>

Attend Region 4 QA Meeting & AIRS Conference.

Mr. Patrick Reagan and Mr. Deane Young attended the Region 4 QA meeting in Athens, GA during spring 2011.

Submit air quality forecasts for MSA's >500,000 population to EPA AIRNOW.

Forsyth County has been a leader in this area and submits air quality forecasts for multiple pollutants to AIRNOW on a year-round basis. Several presentations on this program have been given at recent EPA National Forecasting and Outreach Conferences.

Changes in the SLAMS/NAMS Network

No changes in the network were made during the 2011 fiscal year.

Data Submittal Criteria

All SLAMS/PARS data were submitted to AIRS within 90 days after each quarter.

National Performance Audit Program

An NPAP audit was conducted at the Union Cross site (37-067-1008) on August 4, 2011.

Continued-Annual Network Evaluation

As part of this submittal, the most recent (2012) Annual Network Review of Forsyth County monitoring sites is included.

Forsyth County has realigned the local monitoring network in recent years to account for changes in population, land use, and traffic patterns.

OZONE

The Shiloh Church site (37-067-0028) was established in 1996 to serve as the primary direction urban fringe monitor for Forsyth County. The maximum impact downwind site is operated by the State program in Rockingham County (Bethany School, 37-157-0099). The secondary wind direction is measured by the Union Cross site (37-067-1008). In addition, the Clemmons Middle site (37-067-0030), established in 2005, monitors the southwest sector of Forsyth County. An SPM ozone monitor at Hattie Avenue (37-067-0022) has operated since 1993 as part of North Carolina's ozone precursor network.

CARBON MONOXIDE

The microscale Peters Creek site (37-067-0023) has served as the maximum impact site for Forsyth County since 1988. A middle scale site (Hanes Mall 37-067-0029) was established in November 2000 as a companion maximum impact site to Peters Creek (the site could not be categorized as microscale due to a 25m road setback caused by RR tracks). This site has since been removed from the network due to budget cuts.

SULFUR DIOXIDE/NITROGEN OXIDES

Sulfur dioxide levels have been measured at the Hattie Avenue site (37-067-0022) since 1983. Readings are considered to be characteristic of background levels in Forsyth County. On occasion, the site is impacted by plume touchdowns from the Duke Energy Belews Creek Generating Station located approximately 20 miles to the north in Stokes County. In compliance with the most recent monitoring data requirements, 5-minute SO₂ averaged data from this site is reported along with 1-hour data.

Nitrogen oxide levels have been measured at the Hattie Avenue site (37-067-0022) since 1984. Readings represent the neighborhood impact of major transportation related emissions from inter-city and intra-city traffic on Business I-40 and U.S. 52 bisecting Winston-Salem.

PARTICULATE

Continuous PM₁₀ (TEOM) is measured at the Peters Creek site (37-067-0023). These readings are representative of a maximum impact particulate site influenced by background emissions and locally generated transportation emissions.

FRM STATUS

CORE PM_{2.5} sites have been established at Hattie Avenue (37-067-0022; 1/1 frequency) and Clemmons Middle (37-067-0030; 1/3 frequency + 1/6 collocated) as part of North Carolina's EPA approved PM_{2.5} monitoring plan. Data collection has been quite successful and validated concentration and QA information has been reported to AIRS through December 2006. County construction of a new animal shelter required the relocation of the North Forsyth site during 2004 to the Clemmons (37-067-0030) site beginning 2005.

CONTINUOUS STATUS

A continuous PM_{2.5} (TEOM) was installed at the Hattie Avenue site in June 1999 and it was joined by an additional PM₁₀ TEOM in October 1999. The data set continues to indicate excellent agreement between the FRM PM_{2.5} data and 24-hour averages

obtained from the TEOM. An additional PM2.5 TEOM was established in the Clemmons area of Forsyth County. Installation occurred in the spring of 2005.

SPECIATION STATUS

A speciated PM2.5 monitor (1/6 frequency) began operation on September 22, 2001 at Hattie Avenue. Validated data sets have been received from RTI through April 2005.

AIR TOXICS

A (1/6) day air toxic sampler operated in conjunction with the NC-DAQ has been resident at the Hattie Avenue site since 2000. Program support has been erratic but there has been an improvement in the past year with a greater reliability of delivered canisters. Air toxic data has been delivered for 2003 and part of 2004, however, most of the data values are below quantification limit. Toxics data was entered into AIRS in July 2005 with data fields dating back to 1999.

LEAD

No lead monitors are currently in place at any sites within the County. Based on the interpretation of the lead monitoring requirements, recent population data, and recent source emission inventory data, there are no sources that emit more than 700 lbs of lead per year. Therefore, there are no immediate plans for lead monitoring in the County.

VISIBILITY PROGRAM

With financial assistance from Region 4 and the NC-DAQ, a visibility camera system was established for the Triad area during 2002. The associated web site combines pictures of two mountain scenes with hourly updated ozone and PM2.5 AQI statistics. A nephelometer was installed in 2004 to provide visual range data. The information is available at:

<http://www.sehazecam.net>.

2012 Annual Monitoring Network Plan

Forsyth County Office of Environmental Assistance and Protection



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April 25, 2012

CERTIFICATION

By the signatures below, the Forsyth County Environmental Affairs Department (FCEAD) certifies that the information contained in the 2012 Annual Monitoring Network Plan is complete and accurate at the time of submittal to EPA Region 4. However, due to circumstances that may arise during the sampling year, some network information may change. A notification of change and a request for approval will be submitted to EPA Region 4 at that time.

Print Name: Patrick A. Reagan Signature: _____ Date: _____
Program Manager, Monitoring and Mobile Sources, FCEAP

Print Name: W. Minor Barnette Signature: _____ Date: _____
Director, FCEAP

2012 ANNUAL MONITORING NETWORK PLAN

TABLE OF CONTENTS

| | |
|--|----|
| INTRODUCTION | 9 |
| SITE DESCRIPTION BACKGROUND INFORMATION AND DEFINITIONS | 10 |
| 1. Site Description | 10 |
| 2. Date Established | 10 |
| 3. Site Approval Status..... | 10 |
| 4. Monitoring Objectives | 10 |
| 5. Monitoring Stations' Designations..... | 10 |
| SLAMS..... | 11 |
| NAMS..... | 11 |
| SPM | 11 |
| NCORE | 11 |
| 6. Monitoring Methods..... | 11 |
| Particulate Matter 10 microns in size (PM ₁₀) | 11 |
| Particulate Matter 2.5 microns in size (PM _{2.5})..... | 12 |
| PM _{2.5} Speciation sampling and analysis | 12 |
| Sulfur Dioxide..... | 12 |
| Carbon Monoxide..... | 12 |
| Ozone | 12 |
| Nitrogen Dioxide | 13 |
| 7. Quality Assurance Status..... | 13 |
| 8. Scale of Representativeness..... | 13 |
| 9. Data Processing and Reporting..... | 14 |
| <i>Network Summary</i> | 15 |
| 1. Site Table and Criteria Pollutants Monitored | 15 |
| 2. Site Map..... | 16 |
| 3. Monitoring Methods..... | 17 |
| <i>Air Monitoring Station Descriptions</i> | 18 |
| 1. Clemmons Middle School..... | 18 |
| (a) Site Table | 18 |
| (b) Site Description and Statement of Purpose | 18 |
| (c) Site Photographs | 20 |
| 2. Hattie Avenue "A" | 21 |
| (a) Site Table | 21 |
| (b) Description and Statement of Purpose..... | 21 |
| (c) Site Photographs..... | 25 |
| 3. Hattie Avenue "B"..... | 26 |
| (a) Site Table | 26 |
| (b) Description and Statement of Purpose..... | 26 |
| (c) Site Photographs | 28 |
| 4. Peter's Creek | 29 |
| (a) Site Table | 29 |
| (b) Site Description and Statement of Purpose | 29 |
| (c) Site Photographs | 31 |
| 5. Shiloh Church | 32 |
| (a) Site Table | 32 |
| (b) Site Description and Statement of Purpose | 32 |
| (c) Site Photographs | 33 |
| 6. Union Cross..... | 34 |
| (a) Site Table | 34 |
| (b) Site Description and Statement of Purpose | 34 |
| (c) Site Photographs | 36 |
| REFERENCES | 37 |

Current Air Monitoring Network

Introduction

The Forsyth County Environmental Affairs Department (FCEAD) monitoring program provides air quality monitoring services in Forsyth County, NC. FCEAD is a state “certified local air pollution program” whose purpose(s) are to improve and maintain ambient air quality and reduce exposure to unhealthful air pollutants.

FCEAD has operated an air quality monitoring program since the early 1970’s. The air monitoring services provided by the program are conducted to measure concentrations of criteria air pollutants (CO, NO₂, SO₂, PM, lead, and O₃) in accordance with USEPA regulatory requirements. Measurements are used to assess compliance with National Ambient Air Quality Standards (NAAQS). The NAAQS define air pollutant concentration level thresholds judged necessary to protect the public health and welfare.

The FCEAD air monitoring program operates a network of state and local air monitoring stations (SLAMS) in Forsyth County. The current network configuration consists of seven monitoring stations that measure concentrations of criteria air pollutants. In addition to the SLAMS network the county network also includes monitoring for meteorological parameters and visibility conditions.

The annual monitoring network plan, as provided for in 40 CFR Part 58.10, *Annual Monitoring Network Plan and Periodic Network Assessment* must contain the following information for each monitoring station in the network:

1. The Air Quality System (AQS) site identification number for existing stations.
2. The location, including the street address and geographical coordinates, for each monitoring station.
3. The sampling and analysis method used for each measured parameter.
4. The operating schedule for each monitor.
5. Any proposal to remove or move a monitoring station within a period of eighteen months following the plan submittal.
6. The monitoring objective and spatial scale of representativeness for each monitor.
7. The identification of any sites that are suitable and sites that are not suitable for comparison against the annual PM_{2.5} NAAQS.
8. The Metropolitan Statistical Area (MSA), Core-Based Statistical Area (CBSA), combined Statistical Area (CSA) or other area represented by the monitor.

The following information below replicates the Forsyth County Air Quality ambient air monitoring network plan and continues in the following sections outlined below:

II. Site Description Background Information and Definitions: An outline of the designations, parameters, monitoring methods, and the basis for site selection.

III. Network Summary: This section presents an overview of the total number of sites and monitors in Forsyth County. Also included is a listing of all proposed changes to the current network.

IV. Air Monitoring Station Description: Each air monitoring station is described in detail as per the outline in (II.) above. Modification to the network as determined by

an annual review process will be made each year to maintain a current up-to-date network description document.

Site Description Background Information and Definitions

1. Site Description

Specific information is provided to show the location of the monitoring equipment at the site, if the site is located in a CSA/MSA, the AQS identification number, the GPS coordinates, and evidence that monitors and monitor probes conform to the siting criteria.

2. Date Established

The date when each existing monitoring station was established is shown in the description. For those stations, which are proposed, a date is provided when it is expected for the station to be in operation.

3. Site Approval Status

Each monitoring station in the existing network has been reviewed with the purpose of determining whether it meets all design criteria for inclusion in the SLAMS network. Stations that do not meet the criteria will either be relocated in a nearby area or when possible, re-sited at the present location.

4. Monitoring Objectives

Per 40 CFR 58 Appendix D, Section 1.1:

“The ambient air monitoring networks must be designed to meet three basic monitoring objectives. These basic objectives are listed below. The appearance of any one objective in the order of this list is not based upon a prioritized scheme. Each objective is important and must be considered individually.”

The objectives are summarized below:

- (a) Provide air pollution data to the general public in a timely manner.
- (b) Support compliance with ambient air quality standards and emissions strategy development. Data from FRM (Federal Reference Method), FEM (Federal Equivalent Method), and ARM (Approved Regional Method) monitors for NAAQS pollutants will be used for comparing an area’s air pollution levels against the NAAQS.
- (c) Support for air pollution research studies.

5. Monitoring Stations’ Designations

Most stations described in the air quality surveillance network are designated as State and Local Air Monitoring Stations (SLAMS). In addition, some of these stations fulfill other requirements, which must be identified. In this description of the network, designations are also made for National Air Monitoring Stations (NAMS), Special Purpose Monitors (SPM), and National Core (community oriented) stations (NCore). The following is the criteria used for each of these designations.

SLAMS

Requirements for air quality surveillance systems provide for the establishment of a network of monitoring stations designated as State and Local Air Monitoring Stations (SLAMS) that measure ambient air concentrations of those pollutants for which standards have been established. These stations must meet requirements that relate to four major areas: quality assurance, monitoring methodology, sampling interval and siting of instruments and instrument probes.

NAMS

Within the SLAMS network certain monitors are selected to provide the USEPA with timely data for use in national trends analysis. These NAMS monitors are identified in the summary of network stations.

SPM

Not all monitors and monitoring stations in the air quality surveillance network are included in the SLAMS network. In order to allow the capability of providing monitoring for various reasons such as: special studies, modeling verification and compliance status, and other objectives; certain monitors are designated as Special Purpose Monitors (SPM). These monitors are not committed to any one location or for any specified time period. They may be located as separate monitoring stations or be included at SLAMS locations. Monitoring data may be reported, provided that the monitors and stations conform to all requirements of the SLAMS network.

NCORE

National Core (community-oriented) multi-pollutant monitoring station data will be used to evaluate the regional air quality models used in developing emission strategies, and to track trends in air pollution abatement control measures' impact on improving air quality.

6. Monitoring Methods

Sampling and analytical procedures for criteria air pollutant monitoring performed in the FCEAD ambient air monitoring network are conducted in accordance with applicable USEPA Designated Federal Reference (FRM) or Equivalent (FEM) Methods unless otherwise noted. Analytical techniques for non-criteria air pollutant monitoring (methods employed that are not USEPA Designated Federal Reference (FRM) or Equivalent (FEM) Methods) are documented in the applicable FCEAD Quality Assurance Project Plans (QAPP), FCEAD Standard Operating Procedures (SOP), or the appropriate North Carolina Division of Air Quality (NCDAQ) QAPP or SOP. Methods used by FCEAD for criteria pollutant monitoring are listed below:

Particulate Matter 10 microns in size (PM₁₀)

All PM₁₀ samplers operated by FCEAD are operated as federal reference method (FRM) or equivalent samplers and are operated according to the requirements set forth in 40 CFR 50 and 40 CFR 53. Listed below is the

USEPA Designated Reference or Equivalent Method used in the FCEAD monitoring network:

| Method | Designation Number | Method Code |
|-----------------------|--------------------|-------------|
| R&P TEOM Series 1400a | EQPM-1090-079 | 079 |

Particulate Matter 2.5 microns in size (PM_{2.5})

With the exception of continuous samplers and speciation samplers all PM_{2.5} samplers operated by FCEAD are either FRM or FEM samplers. Listed below is the USEPA Designated Reference or Equivalent Method used in the FCEAD monitoring network:

| Method | Designation Number | Method Code |
|--------------------------------------|--------------------|-------------|
| R & P Partisol-Plus 2025 PM-2.5 Seq. | RFPS-0498-118 | 118 |

PM_{2.5} Speciation sampling and analysis

In addition to operating PM_{2.5} samplers that determine only PM_{2.5} mass values, FCEAD also operates PM_{2.5} speciation samplers that collect samples that are analyzed to determine the chemical makeup of PM_{2.5}. Data collected using this method cannot be compared to the NAAQS. Listed below is the method used in the FCEAD monitoring network:

| Method | Designation Number | Method Code |
|-------------|--------------------|-------------|
| MetOne SASS | NA | NA |
| URG | NA | NA |

Sulfur Dioxide

Instruments used to continuously monitor sulfur dioxide levels in the atmosphere employ the pulsed UV fluorescence method. Listed below is the USEPA Designated Reference or Equivalent Method used in the FCEAD monitoring network:

| Method | Designation Number | Method Code |
|-----------------------------------|--------------------|-------------|
| Thermo Electron 43A, 43C-TLE, 43i | EQSA-0486-060 | 100 |

Carbon Monoxide

Continuous monitoring for carbon monoxide is performed by use of the non-dispersiveinfrared (gas filter correlation) method. Listed below is the USEPA Designated Reference or Equivalent Method used in the FCEAD monitoring network:

| Method | Designation Number | Method Code |
|--|--------------------|-------------|
| Thermo Electron or Thermo Environmental Instruments 48, 48C, 48i | RFCA-0981-054 | 054 |

Ozone

Ozone is monitored using the UV photometry method. Listed below is the USEPA Designated Reference or Equivalent Method used in the FCEAD monitoring network:

| Method | Designation Number | Method Code |
|-------------------------------|--------------------|-------------|
| Teledyne – Advanced Pollution | EQOA-0992-087 | 047 |

Instrumentation, Inc. Model 400E

Nitrogen Dioxide

The chemiluminescence method is used in monitoring the nitrogen dioxide level in the ambient air. Listed below is the USEPA Designated Reference or Equivalent Method used in the FCEAD monitoring network:

| Method | Designation Number | Method Code |
|---|--------------------|-------------|
| Teledyne – Advanced Pollution Instrumentation, Inc Model 200A, 200AU, 200E, 200EU | RFNA-1194-099 | 099 |

7. Quality Assurance Status

FCEAD has an extensive quality assurance program to ensure that all air monitoring data collected meets established criteria for precision and accuracy. FCEAD operates according to EPA approved Quality Assurance Project Plans (QAPP) and Standard Operating Procedures. Staff members audit instrumentation on a scheduled basis to ensure that each instrument is calibrated and operating properly. Data validation is performed monthly to ensure data reported by each instrument is recorded accurately in the air quality monitoring database.

8. Scale of Representativeness

Each station in the monitoring network must be described in terms of the physical dimensions of the air parcel nearest the monitoring station throughout which actual pollutant concentrations are reasonably similar. Area dimensions or scales of representativeness used in the network description are:

- (a) Microscale - defines the concentration in air volumes associated with area dimensions ranging from several meters up to about 100 meters.
- (b) Middle scale - defines the concentration typical of areas up to several city blocks in size with dimensions ranging from about 100 meters to 0.5 kilometers.
- (c) Neighborhood scale – defines concentrations within an extended area of a city that has relatively uniform land use with dimensions ranging from about 0.5 to 4.0 kilometers.
- (d) Urban scale - defines an overall citywide condition with dimensions on the order of 4 to 50 kilometers.
- (e) Regional Scale - defines air quality levels over areas having dimensions of 50 to hundreds of kilometers.

Closely associated with the area around the monitoring station where pollutant concentrations are reasonably similar are the basic monitoring exposures of the station. There are six basic exposures:

- (a) Sites located to determine the highest concentrations expected to occur in the area covered by the network.
- (b) Sites located to determine representative concentrations in areas of high population density.
- (c) Sites located to determine the impact on ambient pollution levels of significant sources or source categories.
- (d) Sites located to determine general background concentration levels.
- (e) Sites located to determine the extent of regional pollutant transport among populated areas; and in support of secondary standards.

- (f) Sites located to measure air pollution impacts on visibility, vegetation damage, or other welfare-based impacts.

The design intent in siting stations is to correctly match the area dimensions represented by the sample of monitored air with the area dimensions most appropriate for the monitoring objective of the station. The following relationship of the six basic objectives and the scales of representativeness are appropriate when siting monitoring stations:

| Site Type | Appropriate Siting Scales |
|--|--|
| 1. Highest concentration | Micro, middle, neighborhood (sometimes urban or regional for secondarily formed pollutants). |
| 2. Population oriented | Neighborhood, urban. |
| 3. Source impact | Micro, middle, neighborhood. |
| 4. General/background & regional transport | Urban, regional. |
| 5. Welfare-related impacts | Urban, regional. |

Table 1 - Siting Objectives and Scales

9. Data Processing and Reporting

All ambient air quality data are stored in the Environmental Data Acquisition System (EDAS) database located on the 1st floor of the Forsyth County Environmental Affairs Department, 537 N. Spruce Street, Winston-Salem, North Carolina. On a daily basis the EDAS data are backed up and maintained at an off-site location. After all monthly data validation procedures are successfully completed, data is transmitted to the USEPA's national Air Quality System (AQS) database. The AQS database is maintained by EPA as the official repository of the fully quality assured ambient air quality dataset.

Network Summary

1. Site Table and Criteria Pollutants Monitored

| Site | AQS ID # | CO | NO ₂ | O ₃ | Pb | PM _{2.5} | PM ₁₀ | SO ₂ | Air Toxics |
|------------------------|-------------|----|-----------------|----------------|----|-------------------|------------------|-----------------|---------------|
| Clemmons Middle School | 37-067-0030 | | | X | | X | | | |
| Hattie Avenue "A" | 37-067-0022 | | X | X | | | | X | X |
| Hattie Avenue "B" | 37-067-0022 | | | | | X | X | | |
| Peter's Creek | 37-067-0023 | X | | | | | X | | |
| Shiloh Church | 37-067-0028 | | | X | | | | | |
| Union Cross | 37-067-1008 | | | X | | | | | |

Table 2 - Forsyth County Monitoring Sites

2. Site Map

AIR QUALITY MONITORING STATIONS
FORSYTH COUNTY, NC 2009

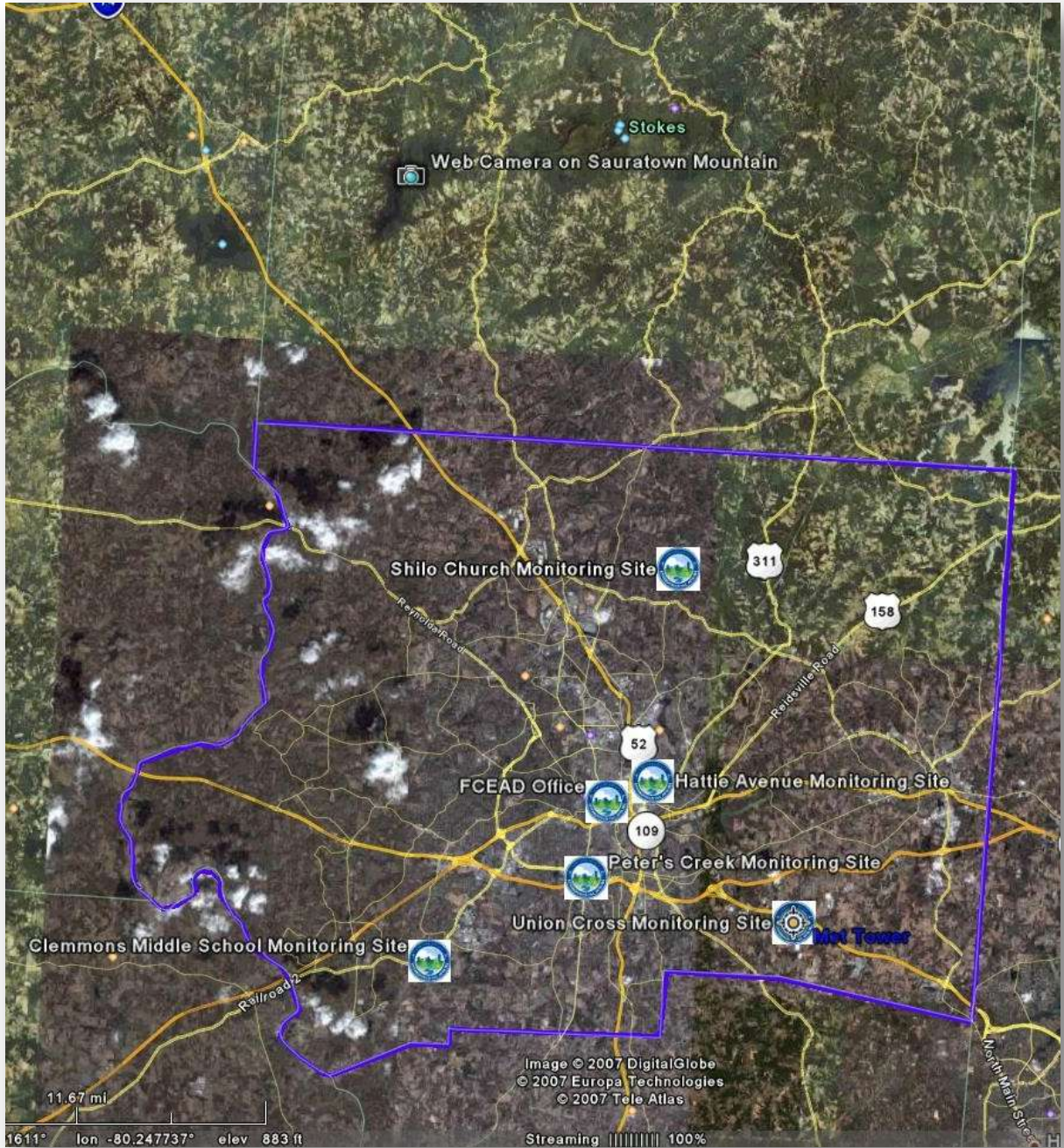


Figure 1 - Forsyth County Monitor Locations

3. Monitoring Methods

| Site | Parameter | Instrument / Method | Method Number | Parameter Number | Monitor Type [†] | Serial Number | Purchase Date | Replace Date | Condition |
|-------------|-------------------|--|---------------|------------------|---------------------------|------------------------|---------------|--------------|-----------|
| 37-067-0022 | Ozone | UV Photometric | 047 | 44201 | SLAMS | 2621 | 2009 | 2019 | New |
| 37-067-0022 | SO ₂ | Pulsed UV Fluorescent | 100 | 42401 | SLAMS | 819230552 | 2008 | 2018 | New |
| 37-067-0022 | NO | Chemi-luminescence | 099 | 42601 | SLAMS | 200A | 2007 | 2017 | Good |
| 37-067-0022 | NO ₂ | Chemi-luminescence | 099 | 42602 | SLAMS | 200A | 2007 | 2017 | Good |
| 37-067-0022 | NO _x | Chemi-luminescence | 099 | 42603 | SLAMS | 200A | 2007 | 2017 | Good |
| 37-067-0022 | Air Toxics | Compendium Method for Toxic Organics (TO) 15 | 150 | Multiple | NON | NCDENR Owned Equipment | | | |
| 37-067-0022 | PM _{2.5} | FRM | 118 | 88101 | SLAMS | 2025A202849805 | 1999 | 2009 | Fair |
| 37-067-0022 | PM _{2.5} | Speciation | 118 | Multiple | SLAMS | A2591 | 2001 | 2011 | Fair |
| 37-067-0022 | PM _{2.5} | TEOM | 701 | 88501 | SLAMS | 140AB223509812 | 2000 | 2010 | Fair |
| 37-067-0022 | PM _{2.5} | TEOM | 702 | 88502 | SLAMS | 140AB223509812 | 2000 | 2010 | Fair |
| 37-067-0022 | PM _{2.5} | Carbon Speciation | 118 | 88101 | SLAMS | 3NB0191 | 2007 | 2017 | Good |
| 37-067-0022 | PM ₁₀ | TEOM | 079 | 81102 | SLAMS | 140AB226379906 | 2000 | 2010 | Fair |
| 37-067-0023 | PM ₁₀ | TEOM | 079 | 81102 | SLAMS | 140A-2212 | 1999 | 2009 | Fair |
| 37-067-0023 | CO | Gas Filter Correlation | 054 | 42101 | SLAMS | 819230553 | 2008 | 2018 | New |
| 37-067-0028 | Ozone | UV Photometric | 047 | 44201 | SLAMS | 2217 | 2009 | 2019 | New |
| 37-067-0030 | Ozone | UV Photometric | 047 | 44201 | SLAMS | 2218 | 2009 | 2019 | New |
| 37-067-0030 | PM _{2.5} | TEOM | 701 | 88501 | SLAMS | 140AB252230406 | 2000 | 2010 | Fair |
| 37-067-0030 | PM _{2.5} | TEOM | 702 | 88502 | SLAMS | 140AB252230406 | 2000 | 2010 | Fair |
| 37-067-0030 | PM _{2.5} | FRM | 116 | 88101 | SLAMS | 2025A205999808 | 1999 | 2009 | Fair |
| 37-067-0030 | PM _{2.5} | FRM | 118 | 88101 | SLAMS | 2025B217080407 | 2004 | 2014 | Fair |
| 37-067-1008 | Ozone | UV Photometric | 047 | 44201 | SLAMS | 2219 | 2009 | 2019 | New |
| 37-067-1008 | Temp | R. M. Young | 020 | 61101 | SLAMS | | | | Fair |
| 37-067-1008 | Humidity | R. M. Young | 020 | 61103 | SLAMS | | | | Fair |
| 37-067-1008 | WD | Climatronics | 020 | 61104 | SLAMS | 102779 | 2008 | 2018 | New |
| 37-067-1008 | WS | Climatronics | 020 | 61103 | SLAMS | 102779 | 2008 | 2018 | New |
| 37-067-1008 | Pressure | R. M. Young | 011 | 64101 | SLAMS | | | | Fair |

Table 3 - Forsyth County Monitoring Methods

[†] - Monitor Type:

SLAMS- State and Local Air Monitoring Station

SPM- Special Purpose

NON- Non-regulatory

TRENDS- Trends Speciation

Air Monitoring Station Descriptions

1. Clemmons Middle School

(a) Site Table

Site Name: Clemmons Middle School
AQS Site Identification Number: 37-067-0030
Location: Fraternity Church Road
Winston-Salem, NC
Latitude: N36.026°
Longitude: W80.342°
Elevation: 245 meters
Date Monitor Established: Ozone April 27, 2005
Date Monitor Established: PM2.5 TEOM April 27, 2005
Date Monitor Established: PM2.5 FRM April 27, 2005
Nearest Road: Fraternity Church Road Distance to Road: 40 meters
Traffic Count³: 4100 Year of Count: 2005
MSA⁴: Winston-Salem, NC Metropolitan Statistical Area (2006) MSA #: 49180

| Parameter | Method | Method Number | Sampling Schedule |
|-----------|----------------|---------------|----------------------------------|
| Ozone | UV Photometric | 047 | April 1 – Oct. 31, Continuous |
| PM2.5 | TEOM | 701 | Continuous |
| PM2.5 | Gravimetric | 116 | 1 in 3 day |
| PM2.5 | Gravimetric | 118 | 1 in 6 day |

Table 4 - Clemmons Middle School Monitoring Station Summary

(b) Site Description and Statement of Purpose

An ozone monitor, PM_{2.5} TEOM, and PM_{2.5} FRM have been located at a manufactured structure since April 27, 2005. A collocated PM_{2.5} FRM sampler has been located less than 3m N of the reporting sampler since the same date. The site is located in a mixed use environment at latitude N36.026° and longitude W80.342°. The site elevation is 245 meters above sea level. The nearest road is Fraternity Church Road with an annual traffic volume of 4100 vehicles (2005) at a distance of 40 meters from the sample inlet. This site combined the PM_{2.5} equipment from site 37-067-0024 and the ozone equipment from site 37-067-0027 when these sites were forced to relocate.

The inlet of the samplers is approximately 4 meters above ground level and 1 meter above roof level. The area is a transition zone of business (~50%) to residential (~50%) within a 1 km radius. The samplers are SLAMS.

The sampling frequency for PM_{2.5} is 1 in 3 and 1 in 6 day sampling. The sampling interval is 24 hours, from midnight to midnight. The ozone instrument is operated during the North Carolina ozone monitoring season which begins April 1 and ends October 31. The ozone instrument operates continuously during this period.

The site complies with the siting requirements of 40CFR58 for criteria air pollutants. There are no proposed changes for this site. It is recommended that the current site status be maintained.

OBJECTIVE AND SPATIAL SCALE

The monitoring objectives of the instruments are to measure: 1) upwind background ambient concentrations and 2) population exposure.

The site is a neighborhood spatial scale for ozone and PM_{2.5}. Data from this site is used to assess compliance with the NAAQS for ozone and PM_{2.5}.

The site is located in the Winston-Salem, NC Metropolitan Statistical Area⁴. The principal cities and counties in the MSA are Winston-Salem, Davie County, Forsyth County, Stokes County, and Yadkin County, NC.

(c) Site Photographs



NORTH



EAST



SOUTH



WEST

2. Hattie Avenue "A"

(a) Site Table

Site Name: Hattie Avenue "A"
 AQS Site Identification Number: 37-067-0022
 Location: 1300 Hattie Avenue
 Winston-Salem, NC
 Latitude: N36.110556°
 Longitude: W80.226667°
 Elevation: 284 meters
 Date Monitor Established: Ozone May 21, 1993
 Date Monitor Established: NO₂ January 1, 1984
 Date Monitor Established: SO₂ January 1, 1983
 Date Monitor Established: Air Toxics January 1, 2000
 Nearest Road: Hattie Avenue Distance to Road: 27 meters
 Traffic Count³: 3300 Year of Count: 2003
 MSA⁴: Winston-Salem, NC Metropolitan Statistical Area (2006) MSA #: 49180

| Parameter | Method | Method Number | Sampling Schedule |
|-----------------|--|---------------|-------------------|
| Ozone | UV Photometric | 047 | Continuous |
| NO ₂ | Chemiluminescence | 099 | Continuous |
| SO ₂ | UV Pulsed Fluorescence | 100 | Continuous |
| Air Toxics | Compendium Method for Toxic Organics (TO) 15 | 150 | 1 in 6 day |

Table 5 - Hattie Avenue "A" Monitoring Station Summary

(b) Description and Statement of Purpose

The Hattie Avenue site monitors ozone, sulfur dioxide, and oxides of nitrogen. The site is located in the 1300 block of Hattie Avenue in downtown Winston-Salem. The site is located approximately 2.2 km NE of downtown, 1.1 km E of US52 and approximately 1.8 km NNW of Interstate 40 Business in a residential district at latitude N36.110556° and longitude W80.226667°. The site elevation is 284 meters. The nearest road, Hattie Avenue, is 27 meters from the inlets and has a daily traffic flow of 3300 vehicles (2003). The nearest tallest building is St. Benedict's Church (approximately 10 meters). The inlets are approximately 43 meters from the shopping center. The inlets are approximately 4 meters above the ground and 1 meter above the roof of the monitoring station. The area is residential. The ozone, sulfur dioxide, and NO₂ monitors are all SLAMS.

The ozone instrument is operated during the North Carolina ozone monitoring season which begins April 1 and ends October 31. The ozone instrument operates continuously during this period.

The SO₂ and NO₂ instruments operate continuously.

Monitoring for Urban Air Toxics (UAT) is currently conducted at this site by the North Carolina Division of Air Quality (NC-DAQ), Toxics Protection Branch (TPB). Currently, the NC-DAQ TPB collects whole air samples in stainless steel 6 liter- pressurized canisters. The samples are then analyzed using cryogenic preconcentration gas chromatography with mass spectrometric detection (GC/MS) via the Compendium Method for Toxic Organics (TO) 15 for the list of 68 compounds (below).

- Propene
- Freon 12
- Freon 22
- Freon 114
- Chloro Methane
- (Methylchloride)
- Isobutene
- Vinyl chloride
- 1,3-Butadiene
- Bromomethane
- Chloroethane
- Freon 11
- Pentane
- Ethanol
- Isoprene
- Acrolein
- 1,1-Dichloroethene
- (Vinylidene chloride)
- Freon 113
- Methyl Iodide
- Isopropyl Alcohol
- Carbon Disulfide
- Acetonitrile
- Methylene chloride
- Cyclopentane
- MTBE
- Hexane
- Methacrolein
- Vinyl Acetate
- 1,1-Dichloroethane
- Methyl Vinyl Ketone
- Methyl Ethyl Ketone
- 1,2 Dichloroethene
- Chloroform
- 1,1,1-Trichloroethane
- (Methyl chloroform)
- Cyclohexane
- Carbon Tetrachloride
- Benzene
- 1,2-Dichloroethane
- (ethylene dichloride)
- 1-Butanol
- Trichloroethylene
- 2-Pentanone
- 3-Pentanone
- 1,2-Dichloropropane
- 1,4-Dioxane
- Bromodichloromethane
- trans-1,3
Dichloropropene
- Methyl Isobutyl Ketone
- Toluene
- cis-1,3
Dichloropropene
- 1,1,2-Trichloroethane
(vinyl trichloride)
- Ethylpropylketone
- Tetrachloroethylene
- (perchloroethylene)
- Methyl Butyl Ketone
- Dibromoethane
- Chlorobenzene
- (phenylchloride)
- Ethylbenzene
- m- & p-Xylene
- o-Xylene
- Styrene
- Bromoform
- 1,1,2,2-
Tetrachloroethane
- 1,3,5-Trimethylbenzene
- (mesitylene)
- 1,2,4-Trimethylbenzene
- (pseudocumene)
- m-Dichlorobenzene
- 1,2,3-Trimethylbenzene
- p-Dichlorobenzene
- Benzylchloride
- o-Dichlorobenzene
- 1,2,4-Trichlorobenzene

The site complies with the siting requirements of 40CFR58 for criteria air pollutants. There are no proposed changes for this site. It is recommended that the current site status be maintained.

OBJECTIVE AND SPATIAL SCALE

The monitoring objectives of the instruments are to measure: 1) background ambient concentrations and 2) population exposure.

The site is a neighborhood spatial scale. Data from this site is used to assess compliance with the NAAQS for ozone, sulfur dioxide, and nitrogen dioxide.

The site is located in the Winston-Salem, NC Metropolitan Statistical Area⁴. The principal cities and counties in the MSA are Winston-Salem, Davie County, Forsyth County, Stokes County, and Yadkin County, NC.

(c) Site Photographs



NORTH



EAST



SOUTH



WEST

3. Hattie Avenue "B"

(a) Site Table

Site Name: Hattie Avenue "B"
 AQS Site Identification Number: 37-067-0022
 Location: 1300 Hattie Avenue
 Winston-Salem, NC
 Latitude: N36.110556°
 Longitude: W80.226667°
 Elevation: 284 meters
 Date Monitor Established: PM_{2.5} - FRM January 1, 1999
 Date Monitor Established: PM_{2.5} - Speciation January 1, 1999
 Date Monitor Established: PM_{2.5} - TEOM June 16, 1999
 Date Monitor Established: PM₁₀ - TEOM October 18, 1999
 Nearest Road: Hattie Avenue Distance to Road: 27 meters
 Traffic Count³: 3300 Year of Count: 2003
 MSA⁴: Winston-Salem, NC Metropolitan Statistical Area (2006) MSA #: 49180

| Parameter | Method | Method Number | Sampling Schedule |
|-------------------|--------------------|---------------|-------------------|
| PM _{2.5} | FRM Gravimetric | 118 | 1 in 1 day |
| PM _{2.5} | MetOne, Speciation | 701 | 1 in 6 day |
| PM _{2.5} | TEOM, Continuous | 701, 702 | Continuous |
| PM ₁₀ | TEOM, Continuous | 079 | Continuous |

Table 6 - Hattie Avenue "B" Monitoring Station Summary

(b) Description and Statement of Purpose

This Hattie Avenue site monitors PM_{2.5} and PM₁₀. The site is located in the 1300 block of Hattie Avenue in downtown Winston-Salem. The site is located approximately 2.2 km NE of downtown, 1.1 km E of US52 and approximately 1.8 km NNW of Interstate 40 Business in a residential district at latitude N36.110556° and longitude W80.226667°. The site elevation is 284 meters. The nearest road, Hattie Avenue, is 27 meters from the inlets and has a daily traffic flow of 3300 vehicles (2003). The nearest tallest building is St. Benedict's Church (approximately 10 meters). The inlets are approximately 43 meters from the shopping center. The inlets are approximately 4 meters above the ground and 1 meter above the roof of the monitoring station. The area is residential. The all monitors are SLAMS.

The PM_{2.5} FRM sampling frequency is everyday. The sampling interval is 24 hours, from midnight to midnight every day.

The PM_{2.5} Speciation sampling frequency is 1 in 6 days. The sampling interval is 24 hours, from midnight to midnight every six days.

The PM_{2.5} and PM₁₀ TEOM instruments operate continuously.

The site complies with the siting requirements of 40CFR58 for criteria air pollutants. There are no proposed changes for this site. It is recommended that the current site status be maintained.

OBJECTIVE AND SPATIAL SCALE

The monitoring objective of the instruments is to measure population exposure.

The site is a neighborhood spatial scale. Data from this site is used to assess compliance with the NAAQS for PM_{2.5} and PM₁₀.

The site is located in the Winston-Salem, NC Metropolitan Statistical Area⁴. The principal cities and counties in the MSA are Winston-Salem, Davie County, Forsyth County, Stokes County, and Yadkin County, NC.

(c) Site Photographs



NORTH



EAST



SOUTH



WEST

4. Peter's Creek

(a) Site Table

Site Name: Peter's Creek
AQS Site Identification Number: 37-067-0023
Location: 1401 Corporation Parkway
Winston-Salem, NC
Latitude: N36.065833°
Longitude: W80.258333°
Elevation: 233 meters
Date Monitor Established: PM10 March 12, 1990
CO November 14, 1988
Nearest Road: Peter's Creek Parkway Distance to Road: 6 meters
Traffic Count³: 24000 Year of Count: 2005
MSA⁴: Winston-Salem, NC Metropolitan Statistical Area (2006) MSA #: 49180

| Parameter | Method | Method Number | Sampling Schedule |
|-----------|------------------------|---------------|-------------------|
| CO | Gas Filter Correlation | 054 | Continuous |
| PM10 | Gravimetric | 63 | Continuous |

Table 7 - Peter's Creek Monitoring Station Summary

(b) Site Description and Statement of Purpose

A CO sampler was located at the Peter's Creek station on November 14, 1998. A PM₁₀ sampler has been located at 310 1401 Corporation Parkway since March 12, 1990. The site is located approximately 4 kilometers SW of the central business district at latitude N36.065833° and longitude W80.258333°. The site elevation above sea level is 233 meters. The nearest road is Peter's Creek Parkway at a distance of approximately 6 meters. The estimated daily traffic flow is 24,000 vehicles (2005). The inlet is approximately 4 meters above the ground and 1 meter from the roof. The area is commercial with several residential areas near the sampler. The CO sampler is SLAMS and the PM₁₀ sampler is a SPM.

The sampling frequency for CO and PM₁₀ is continuous.

The site complies with the siting requirements of 40CFR58 for criteria air pollutants. There are no proposed changes for this site. It is recommended that the current site status be maintained.

OBJECTIVE AND SPATIAL SCALE

The monitoring objective of the Peter's Creek site is population exposure. The site is a micro spatial scale. Data is used to assess trends and compliance to the NAAQS.

The site is located in the Winston-Salem, NC Metropolitan Statistical Area⁴. The principal cities and counties in the MSA are Winston-Salem, Davie County, Forsyth County, Stokes County, and Yadkin County, NC.

(c) Site Photographs



NORTH



EAST



SOUTH



WEST

5. Shiloh Church

(a) Site Table

Site Name: Shiloh Church
AQS Site Identification Number: 37-067-0028
Location: 6496 Baux Mountain Road
Winston-Salem, NC
Latitude: N36.203056°
Longitude: W80.215833°
Elevation: 294 meters
Date Monitor Established: Ozone April 1, 1996
Nearest Road: Baux Mountain Rd Distance to Road: 20 meters
Traffic Count³: 2000 Year of Count: 2003
MSA⁴: Winston-Salem, NC Metropolitan Statistical Area (2006) MSA #: 49180

| Parameter | Method | Method Number | Sampling Schedule |
|-----------|---------------|---------------|-------------------|
| Ozone | UV Photometry | 47 | Continuous |

Table 8 - Shiloh Church Monitoring Station Summary

(b) Site Description and Statement of Purpose

An ozone monitor has been located at this site since April 1, 1996. The site is located approximately 12 km NNE of the central business district at latitude N36.203056° and longitude W80.215833°. The site elevation is 294 meters above sea level. The nearest road is Baux Mountain Road with an annual traffic volume of 2000 vehicles (2003) at a distance of 20 meters from the sample inlet.

The inlet is approximately 4 meters above the ground and 1 meter from the roof. The area is residential. The ozone sampler is SLAMS.

The ozone instrument is operated during the North Carolina ozone monitoring season which begins April 1 and ends October 31. The ozone instrument operates continuously during this period.

The site complies with the siting requirements of 40CFR58 for criteria air pollutants. There are no proposed changes for this site. It is recommended that the current site status be maintained.

OBJECTIVE AND SPATIAL SCALE

The monitoring objective of the instrument is to measure population exposure.

The site is a neighborhood spatial scale for ozone. Data from this site is used to assess compliance with the NAAQS for ozone.

The site is located in the Winston-Salem, NC Metropolitan Statistical Area⁴. The principal cities and counties in the MSA are Winston-Salem, Davie County, Forsyth County, Stokes County, and Yadkin County, NC.

(c) Site Photographs



NORTH



EAST



SOUTH



WEST

6. Union Cross

(a) Site Table

Site Name: Union Cross
AQS Site Identification Number: 37-067-1008
Location: 3656 Piedmont Memorial Drive
Winston-Salem, NC
Latitude: N36.050833°
Longitude: W80.143889°
Elevation: 285 meters
Date Monitor Established: Ozone April 1, 1998
Nearest Road: Piedmont Memorial Dr. Distance to Road: 55 meters
Traffic Count³: 820 Year of Count: 2005
MSA⁴: Winston-Salem, NC Metropolitan Statistical Area (2006) MSA #: 49180

| Parameter | Method | Method Number | Sampling Schedule |
|------------------------|------------------|---------------|-------------------|
| Ozone | UV Photometry | 047 | Continuous |
| Wind Speed | R. M. Young | 020 | Continuous |
| Wind Direction | R. M. Young | 020 | Continuous |
| Pressure | R. M. Young | 011 | Continuous |
| Outdoor Temperature | R. M. Young | 020 | Continuous |
| Relative Humidity | R. M. Young | 020 | Continuous |

Table 9 - Union Cross Monitoring Station Summary

(b) Site Description and Statement of Purpose

An ozone monitor has been located at this site since April 1, 1998 along with a meteorological tower since 1997. The site is located approximately 10 km SE of the central business district at latitude N36.050833° and longitude W80.143889°. The site elevation is 285 meters above sea level. The nearest road is Piedmont Memorial Drive with an annual traffic volume of 820 vehicles (2005) at a distance of 55 meters from the sample inlet.

The inlet is approximately 4 meters above the ground and 1 meter from the roof. The area is residential. The ozone sampler is SLAMS.

The ozone instrument is operated during the North Carolina ozone monitoring season which begins April 1 and ends October 31. The ozone instrument operates continuously during this period.

The site complies with the siting requirements of 40CFR58 for criteria air pollutants. There are no proposed changes for this site. It is recommended that the current site status be maintained.

OBJECTIVE AND SPATIAL SCALE

The monitoring objective of the instrument is to measure population exposure.

The site is a neighborhood spatial scale for ozone. Data from this site is used to assess compliance with the NAAQS for ozone.

The site is located in the Winston-Salem, NC Metropolitan Statistical Area⁴. The principal cities and counties in the MSA are Winston-Salem, Davie County, Forsyth County, Stokes County, and Yadkin County, NC.

(c) Site Photographs



NORTH

EAST



SOUTH

WEST

References

1. Title 40 Code of Federal Regulations Part 58, Ambient Air Quality Surveillance. Part 58 and Part 58 Amended: Federal Register/Vol. 71 No. 200/Tuesday, October 17, 2006/Rules and Regulations.
2. Watson, John G., Chow, Judith C., DuBois, David, Green, Mark, Frank, Neil, Pitchford, Marc. Guidance for Network Design and Optimum Site Exposure for PM2.5 and PM10. Office of Air Quality Planning and Standards, U. S. Environmental Protection Agency, Research Triangle Park, NC 27711. December 15, 1997.
3. Winston-Salem Department of Transportation. Traffic Counts 1965-2005. <http://www.cityofws.org/Home/Departments/Transportation/Planning/Articles/TrafficCounts>. Winston-Salem, NC. 2007.
4. US Census Bureau. Current Lists of Metropolitan and Micropolitan Statistical Areas and Definitions. <http://www.census.gov/population/www/estimates/metrodef.html>. (301) 763-2419. 2006.

2012 Annual Monitoring Network Plan

Appendix A

2012 Annual Monitoring Network Plan

Appendix B

No comments were received