MIDLOTHIAN, TEXAS AMBIENT AIR COLLECTION AND CHEMICAL ANALYSIS

QUALITY ASSURANCE PROJECT PLAN

Prepared for:

Texas Commission on Environmental Quality
12100 Park 35 Circle
Austin, TX 78753

Prepared by:

URS Corporation
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Approvals:

TCEQ Project Manager _____
Tracie Phillips *Signature* *Date*

URS Project Manager _____
Al Hendler *Signature* *Date*

URS Project QA Coordinator _____
Don Burrows *Signature* *Date*

ERG Laboratory Project Manager _____
Julie L. Swift *Signature* *Date*

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A3 Distribution List

Electronic copies of this QAPP and any subsequent revisions shall be distributed to the following:

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Randy Stephens, Sample Collector

ERG
601 Keystone Park Drive, Suite 700
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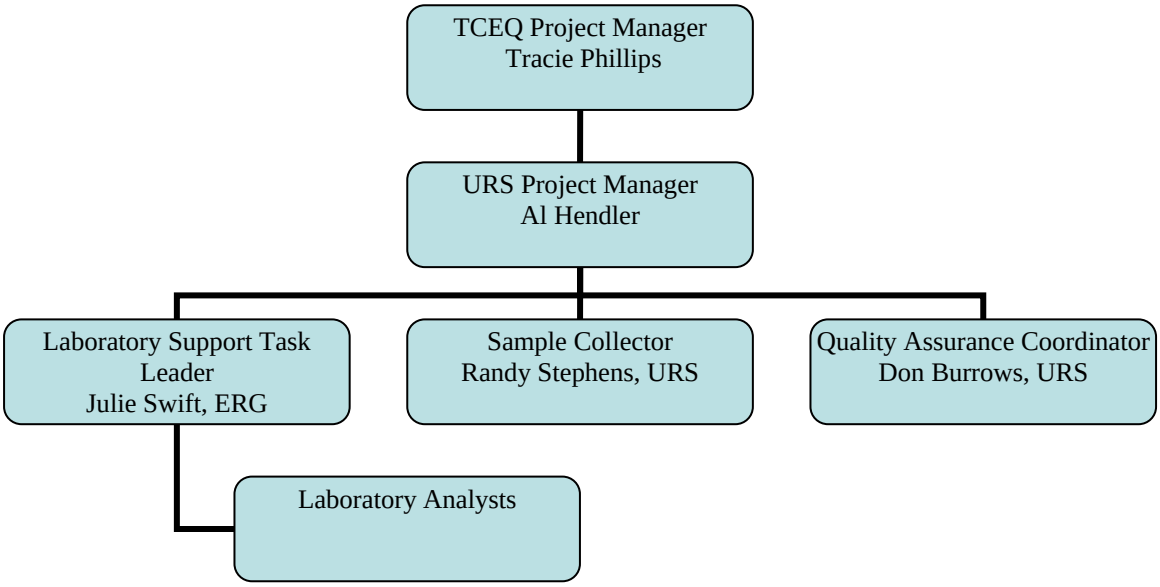
Julie L. Swift, Project Manager
Sample analysts

A4 Project Organization

The organizational structure of the Midlothian, Texas Ambient Air Collection and Chemical Analysis Project is shown on Figure A4-1. The Texas Commission on Environmental Quality (TCEQ) is the project sponsor and will be the primary data user. URS Corporation (URS), as the prime contractor, will install and operate the sampling equipment, and report validated measurement results to TCEQ. Eastern Research Group (ERG), as a subcontractor to URS, will provide all the laboratory analytical services and sampling media. The specific roles and responsibilities of each key team member are given below.

Figure A4-1. Organizational Chart



TCEQ:

- Establishes the project objectives and experimental design (e.g., number and general location of sampling stations, sampling frequency, air contaminants of interest, and measurement methods)
- Approves specific sampling sites
- Determines uses of the measurement data

Al Hendler, **URS Project Manager**:

- Responsible for implementing the contracted scope of work
- Responsible for cost and schedule control
- Responsible for deploying experienced field staff and sufficient equipment resources
- Primary point of contact between the URS/ERG project team and TCEQ
- Responsible for the quality and timeliness of all project deliverables
- Lead report writer

Julie Swift, **ERG Project Manager**:

- Oversees all laboratory analytical activities related to this project
- Responsible for timely delivery of all sampling media to URS
- Delivers validated laboratory results to URS within 30 days after receipt of samples
- Will provide 10 hexavalent chromium samplers with PM_{10} inlets

Don Burrows, **URS Quality Assurance Officer**:

- Primary author of this QAPP
- Assesses data quality and completeness
- Maintains official, approved QAPP

Randy Stephens, URS Sample Collector:

- Selects specific sampling sites that meet the general and specific siting criteria
- Coordinates site preparation (electricity hook ups and security)
- Installs and tests sampling equipment in the field
- Operates and maintains the field sampling equipment
- Promptly ships samples and associated documentation to ERG

A5 Problem Definition/Background

Residents of Midlothian, Texas, are concerned about their air quality and recently petitioned the United States Agency for Toxic Substances and Disease Registry (ATSDR) and the Texas Department of State Health Services (DSHS) to evaluate the health risks resulting from exposure to outdoor air pollution. The initial health consultation report by ATSDR, which considered the air quality data collected by TCEQ during May 1981 – March 2005, concluded that the majority of the risks associated with exposure to the analyzed chemicals were low. However, based on a concern that more air quality data are needed to fully characterize potential health hazards, ATSDR recommended (among other things) that additional air sampling be performed. The ATSDR report, which includes detailed responses to the petitioner's concerns, is available online at http://www.dshs.state.tx.us/epitox/midlothian/updates.shtm.

Following publication of the initial ASTDR report, TCEQ began a consultative process with concerned citizens to design an air sampling and analysis project to gather additional data that responds to the report's recommendation and addresses citizens' questions with regard to air quality in the area. Citizens' questions include:

- How are industries in Midlothian affecting air quality?
- Does the TCEQ every 6th day monitoring site provide an accurate representation of daily air concentrations?
- What is the air quality close to schools and parks in Midlothian?
- What percentage of total chromium does hexavalent chromium (Cr^{6+}) represent in Midlothian?

The outcome of that consultative process was an experimental design for acquiring new measurement data that specifies the air pollutants to be measured, number and general locations of the sampling sites, sampling frequency and duration, and measurement methods. The experimental design calls for measurements of 13 volatile organic compounds (VOCs) that may be present in ambient air as well as 22 metals that may be suspended in air as particulate matter in the PM_{10} size fraction, including Cr^{6+}. The plan calls for air sampling to be conducted in the predominantly downwind direction from local stationary emissions sources and in several city parks. Standard EPA measurement methods are to be used, with sample integration over 24-hour periods (the same as samples collected by TCEQ at its Midlothian air monitoring station (CAMS 52).

A6 Project Description and Schedule

The levels of 13 VOCs and 22 metals (as PM_{10}) that may be present in ambient air will be measured in air samples collected periodically at multiple sites over a period of one year. The samples will be analyzed offsite by a NELAC accredited laboratory under the Texas laboratory accreditation program using U.S. Environmental Protection Agency (EPA) methods or EPA referenced methods. Wind speed, wind direction, outdoor temperature, atmospheric pressure, and rainfall will be monitored continuously at each site during each sampling episode to aid in the data interpretation. Table 6A-1 lists the chemicals of interest and the respective measurement methods.

Once each calendar quarter, air samples will be collected at five sampling stations during five consecutive 24-hour periods (except during extended periods of rainfall or wind stagnation). Four fixed sampling stations will remain in place long enough to sample during four consecutive quarters. The fixed sampling sites will be roughly oriented in the predominantly downwind direction from local stationary emissions sources. Another sampling station will be moved at the end of each quarter so that it eventually samples for one 5-day sequence at each of four centrally located city parks. Figures A6-1 and A6-2 show the general locations of the fixed and temporary sampling sites, respectively.

The measurement results will be reported in three interim (quarterly) and one final report. Quarterly reports and data sets (in spreadsheet format) will be delivered to TCEQ within 45 days after the first, second, and third 5-day sampling episode. A final report and data delivery will combine all the data from the entire project into a single document and spreadsheet, respectively. Draft and final versions of the cumulative report will be delivered by July 31, 2009 and August 31, 2009, respectively. Each report will give the sampling dates, general weather conditions (wind speed, wind direction, and measurable precipitation) during the sampling period, daily wind roses, measurement results, and a series of tables and charts designed to facilitate the analysis of spatial and temporal variability. Additionally, each report will include notes of field and lab observations that may be helpful toward interpreting the measurement results, particularly regarding circumstances or events that might jeopardize the representativeness or validity of the data (e.g. dust from an adjacent unpaved area, nearby road construction, or an unusually large number of vehicles idling or parking directly upwind). The report will also contain any associated audit information (including meteorological field checks and laboratory audits) with explanations of potential impacts on data quality and corrective actions.

The first 5-day sampling sequence will take place during the fourth quarter of 2008. The major tasks associated with this project and scheduled completion dates are summarized in Table 6A-2.

Table A6-1. List of Target Compounds, Analytical Methods and Reporting Units

Target Compounds	Sampling/Analysis Methods	Reporting Units
Benzene 1,3-Butadiene Carbon tetrachloride Chloroform 1,2-Dibromoethane 1,2-Dichloroethane Methylene chloride 1,1,2,2-Tetrachloroethane 1,1,2-Trichloroethane 1,2,4-Trimethylbenzene 1,3,5-Trimethylbenzene Vinyl chloride m&p-Xylene	EPA Compendium Method TO-15: whole air sampling in passivated stainless steel canister with analysis using gas chromatography with mass spectrometry detection (GC/MS)	parts per billion by volume (ppb-v)
Hexavalent chromium	Modified CARB Method 039: particle collection on $NaHCO_3$-impregnated cellulose filters using a low volume sampler equipped with a Teflon® coated PM_{10} cyclone inlet; analysis is by ion chromatography (IC)	nanograms per cubic meter (ng/m^3)
Antimony Arsenic Beryllium Cadmium Chromium Cobalt Lead Manganese Mercury Nickel Selenium Aluminum Barium Copper Molybdenum Silver Thallium Thorium Uranium Vanadium Zinc	EPA Compendium Method IO-3.5: Particle collection on quartz fiber filters using high volume samplers equipped with PM_{10} inlets; analysis is by inductively coupled plasma/mass spectrometry (ICP/MS)	ng/m^3

Table A6-2. Task Descriptions and Completion Dates

Task Name	Task Description	Completion Date
Work Plan and QAPP	URS will prepare a Work Plan and QAPP for review and approval by TCEQ	Draft due Sept. 5, 2008 (14 days after contract signature by TCEQ); revised within 3 business days after receiving TCEQ comments on drafts
Mobilization	URS will: (1) select specific sampling sites (subject to TCEQ approval); (2) acquire or construct, and test, sampling systems; (3) have sites prepared with electricity service and security fencing; and (4) install sampling equipment	November 21, 2008
Field Sampling	URS will collect samples according the sampling methods referenced and described in this QAPP, and promptly ship the samples to ERG for analysis	Sampling will be conducted during four discrete episodes, once per calendar quarter, the last of which to be completed no later than the first week of July 2009
Laboratory Analysis	ERG will supply sampling media and analyze the collected samples according to the methods referenced and described in this QAPP	Quarterly data packages will be sent to URS within 30 after the end of each 5-day sampling sequence; the last data package will be sent no later than July 21, 2009
Reporting	URS will report validated measurement results to TCEQ in quarterly intervals; Text reports will describe the measurement methods, general weather conditions during the sampling periods, measured concentrations, and any problems encountered during the reporting period; data spreadsheets will also be provided	Interim reports will be provided to TCEQ within 45 days after the end of the first, second, and third quarterly sampling sequences. Draft Final and Final reports will be delivered, respectively, by July 31, 2009 and August 31, 2009
Shutdown	Sampling stations will be disassembled and the sites restored to original conditions	August 31, 2009

Figure A6-1. Fixed Sampling Sites (Squares) and Stationary Emissions Sources (Circles)

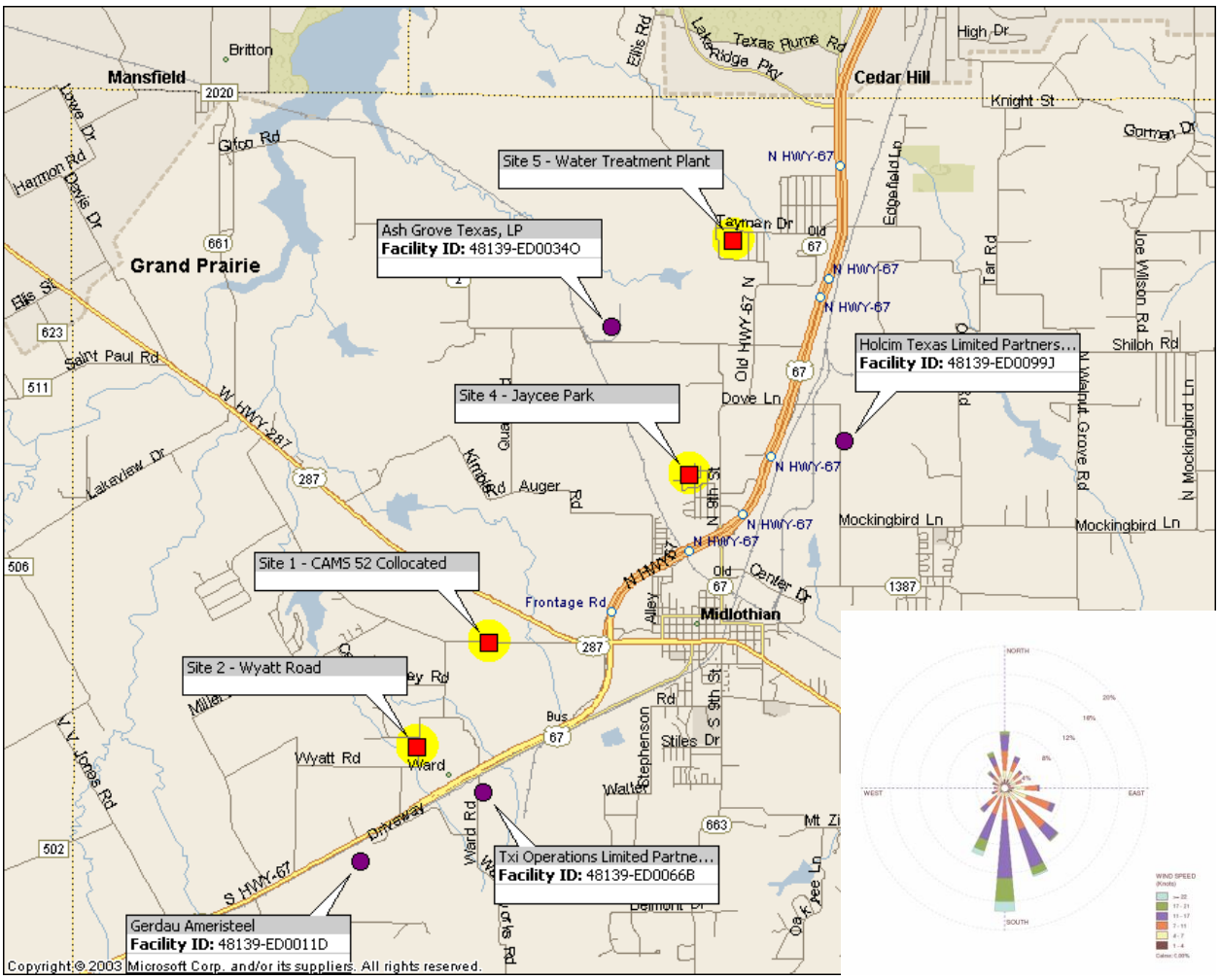
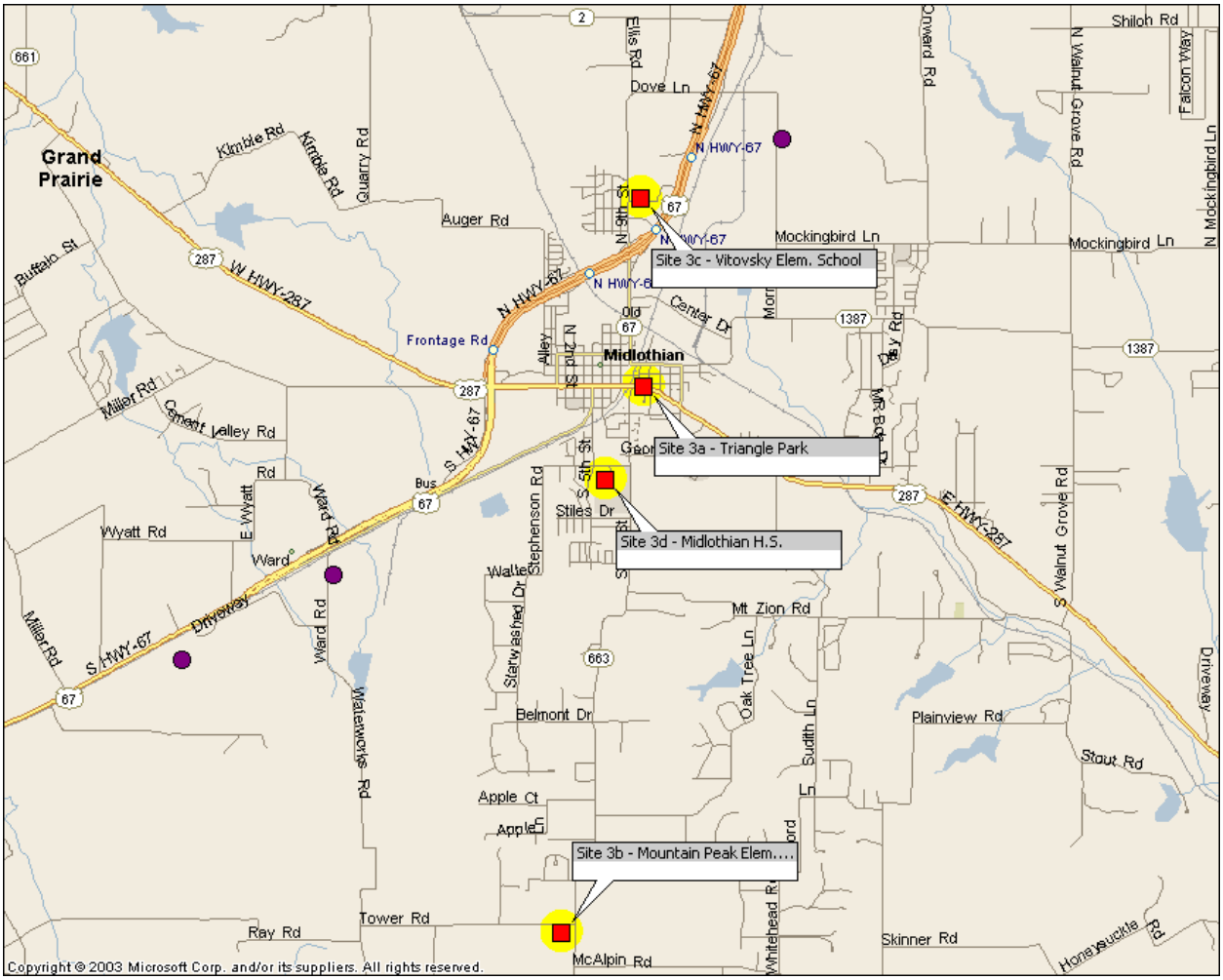


Figure A6-2. Temporary Sampling Sites



A7 Quality Objectives and Criteria for Measurement Data

The key elements of the experimental design (e.g., the number and locations of the sampling sites, sampling frequency and duration, total number of samples, target air pollutants, and measurement methods) were developed through a consultative processing involving TCEQ and concerned citizens of Midlothian. Specific measurement quality objectives (MQOs), which are listed in Table A7-1, will serve as benchmarks for assessing whether the levels of data quality expected from using the prescribed measurement methods and sampling locations are achieved. The MQOs for air pollutant concentrations are defined in terms of the following data quality indicators:

- ***Precision*** - a measure of agreement among repeated measurements of the same property usually under identical or substantially similar conditions. Measurement precision will be assessed by collecting collocated samples (i.e., two side-by-side samples collected at the same site over the same 24-hour period) once each calendar quarter. Precision for each of the measured chemicals will be estimated by the average relative percent difference between collocated measurement results.
- ***Bias*** - the systematic or persistent distortion of a measurement process which causes error in one direction. Bias for VOC measurements will be assessed before the start of the sampling program by collecting samples of humidified calibration gas standards drawn through each sampler. Bias for each VOC, expressed as a percentage of the calibration gas standard concentration, will be estimated by comparing the concentration measured in the collected sample to the known standard concentration. Bias for metals measurements will be estimated from the results of annual performance audits of the ERG laboratory by EPA.
- ***Representativeness*** - a qualitative term that expresses the degree to which data accurately and precisely represent an environmental condition. Measurement data for this project are to be representative of the air quality and meteorological conditions within a few city blocks of the general locations prescribed by the experimental design. This is sometimes referred to as ***middle scale*** representativeness.
- ***Detection Limits*** - the minimum concentration that can reliably be measured by an instrument or laboratory.
- ***Completeness*** - a measure of the amount of valid data needed to be obtained from a measurement system (relative to the amount that was expected to be obtained based on the experimental design and schedule).
- ***Comparability*** - a qualitative term that expresses the measure of confidence with which one data set can be compared to another. Measurement data for this project are to be comparable to measurements routinely made by TCEQ at CAMS 52 and other air quality monitoring sites in Texas.

More detailed descriptions of these MQOs and how they will be used to control and assess measurement uncertainty are described in other elements of this QAPP.

Table A7-1. Measurement Quality Objectives

Parameter	Units	Precision	Accuracy	Representativeness	Comparability/ Method Selection	Method Detection Limit	Completeness
Benzene	ppb-v	30 %	±30 %	Middle Scale	TO-15	0.004 ppbv	≥ 75%
1,3-Butadiene	ppb-v	30 %	±30 %	Middle Scale	TO-15	0.005 ppbv	≥ 75%
Carbon tetrachloride	ppb-v	30 %	±30 %	Middle Scale	TO-15	0.004 ppbv	≥ 75%
Chloroform	ppb-v	30 %	±30 %	Middle Scale	TO-15	0.007 ppbv	≥ 75%
1,2-Dibromoethane	ppb-v	30 %	±30 %	Middle Scale	TO-15	0.007 ppbv	≥ 75%
1,2-Dichloroethane	ppb-v	30 %	±30 %	Middle Scale	TO-15	0.009 ppbv	≥ 75%
Methylene chloride	ppb-v	30 %	±30 %	Middle Scale	TO-15	0.018 ppbv	≥ 75%
1,1,2,2-Tetrachloroethane	ppb-v	30 %	±30 %	Middle Scale	TO-15	0.009 ppbv	≥ 75%
1,1,2-Trichloroethane	ppb-v	30 %	±30 %	Middle Scale	TO-15	0.008 ppbv	≥ 75%
Cr^{+6}	µg/m^3	30 %	±30 %	Middle Scale	Modified CARB 039	0.0065 ng/m^3	≥ 75%
Antimony	µg/m^3	20 %	±20 %	Middle Scale	IO-3.5	0.0061 ng/m^3	≥ 75%
Arsenic	µg/m^3	20 %	±20 %	Middle Scale	IO-3.5	0.0102 ng/m^3	≥ 75%
Beryllium	µg/m^3	20 %	±20 %	Middle Scale	IO-3.5	0.0124 ng/m^3	≥ 75%
Cadmium	µg/m^3	20 %	±20 %	Middle Scale	IO-3.5	0.0076 ng/m^3	≥ 75%
Chromium	µg/m^3	20 %	±20 %	Middle Scale	IO-3.5	0.1785 ng/m^3	≥ 75%
Cobalt	µg/m^3	20 %	±20 %	Middle Scale	IO-3.5	0.0088 ng/m^3	≥ 75%
Lead	µg/m^3	20 %	±20 %	Middle Scale	IO-3.5	0.1066 ng/m^3	≥ 75%
Manganese	µg/m^3	20 %	±20 %	Middle Scale	IO-3.5	0.0214 ng/m^3	≥ 75%
Mercury	µg/m^3	20 %	±20 %	Middle Scale	IO-3.5	0.0241 ng/m^3	≥ 75%
Nickel	µg/m^3	20 %	±20 %	Middle Scale	IO-3.5	0.1103 ng/m^3	≥ 75%
Selenium	µg/m^3	20 %	±20 %	Middle Scale	IO-3.5	0.0240 ng/m^3	≥ 75%
Aluminum	µg/m^3	20 %	±20 %	Middle Scale	IO-3.5	0.0081 ng/m^3	≥ 75%
Barium	µg/m^3	20 %	±20 %	Middle Scale	IO-3.5	0.0814 ng/m^3	≥ 75%
Copper	µg/m^3	20 %	±20 %	Middle Scale	IO-3.5	0.0081 ng/m^3	≥ 75%
Molybdenum	µg/m^3	20 %	±20 %	Middle Scale	IO-3.5	0.0163 ng/m^3	≥ 75%
Silver	µg/m^3	20 %	±20 %	Middle Scale	IO-3.5	0.0081 ng/m^3	≥ 75%
Thallium	µg/m^3	20 %	±20 %	Middle Scale	IO-3.5	0.0081 ng/m^3	≥ 75%
Thorium	µg/m^3	20 %	±20 %	Middle Scale	IO-3.5	0.0081 ng/m^3	≥ 75%
Uranium	µg/m^3	20 %	±20 %	Middle Scale	IO-3.5	0.0081 ng/m^3	≥ 75%
Vanadium	µg/m^3	20 %	±20 %	Middle Scale	IO-3.5	0.0081 ng/m^3	≥ 75%
Zinc	µg/m^3	20 %	±20 %	Middle Scale	IO-3.5	0.0325 ng/m^3	≥ 75%

Table A7.2 Measurement Quality Objectives for Meteorological Parameters

Measurement Parameter	Measurement Method	Precision Criteria	Accuracy Criteria	Completeness Criteria
Wind Direction	Vane/ Potentiometer	Not Assessed	± 5° azimuth[c]	>90%
Wind Speed	Anemometer (3-cup)/ Pulse Frequency Counter	Not Assessed	± 1.12 miles per hour[c]	>90%
Ambient Temperature	Aspirated Thermistor	Not Assessed	± 1.8° Fahrenheit[c]	>90%
Rainfall	Tipping Bucket	Not Assessed	±10 % of reading[c]	>90%
Barometric Pressure	Pressure Transducer	Not Assessed	± 0.30 in.Hg	>90%

[a]Precision of meteorological systems is typically not assessed, nor is it prescribed by EPA.
[c]Represents total error for the measurement, taking into account sensor and data logger bias contributions

A8 Special Training

No special training is required for this project. All the field and laboratory personnel supporting this project have many years experience using the equipment and procedures of this project. The analytical laboratory must have NELAP accreditation through the State of Texas.

A9 Documents and Records

Data will be reported to TCEQ as part of text reports, saved in Microsoft Word or Adobe Acrobat formats, and in Microsoft Excel spreadsheets. Every data package delivered to TCEQ will include the following information for each measurement value:

- Sample date
- Sampling site
- Sample identification number assigned by the laboratory
- Date of analysis
- Chemical name
- Measurement value
- Quality assurance flag
- Sample-specific detection limit
- Unit of measure.

Written reports, in addition to presenting measurement results, will describe the general weather conditions during each sampling period, any problems encountered, and corrective actions. Meteorological data (measurements of wind speed, wind direction, temperature,

pressure, and rainfall) will be reported as 1-hour averages in text reports and as both 5-minute and 1-hour averages in spreadsheet files.

URS will maintain field operation records, including copies of the site visit logbooks, sampler flow rate calibrations and quality control checks, chain-of-custody records, and sample shipping forms in the project file for a minimum of 10 years. Copies of these records will be made available to TCEQ upon request.

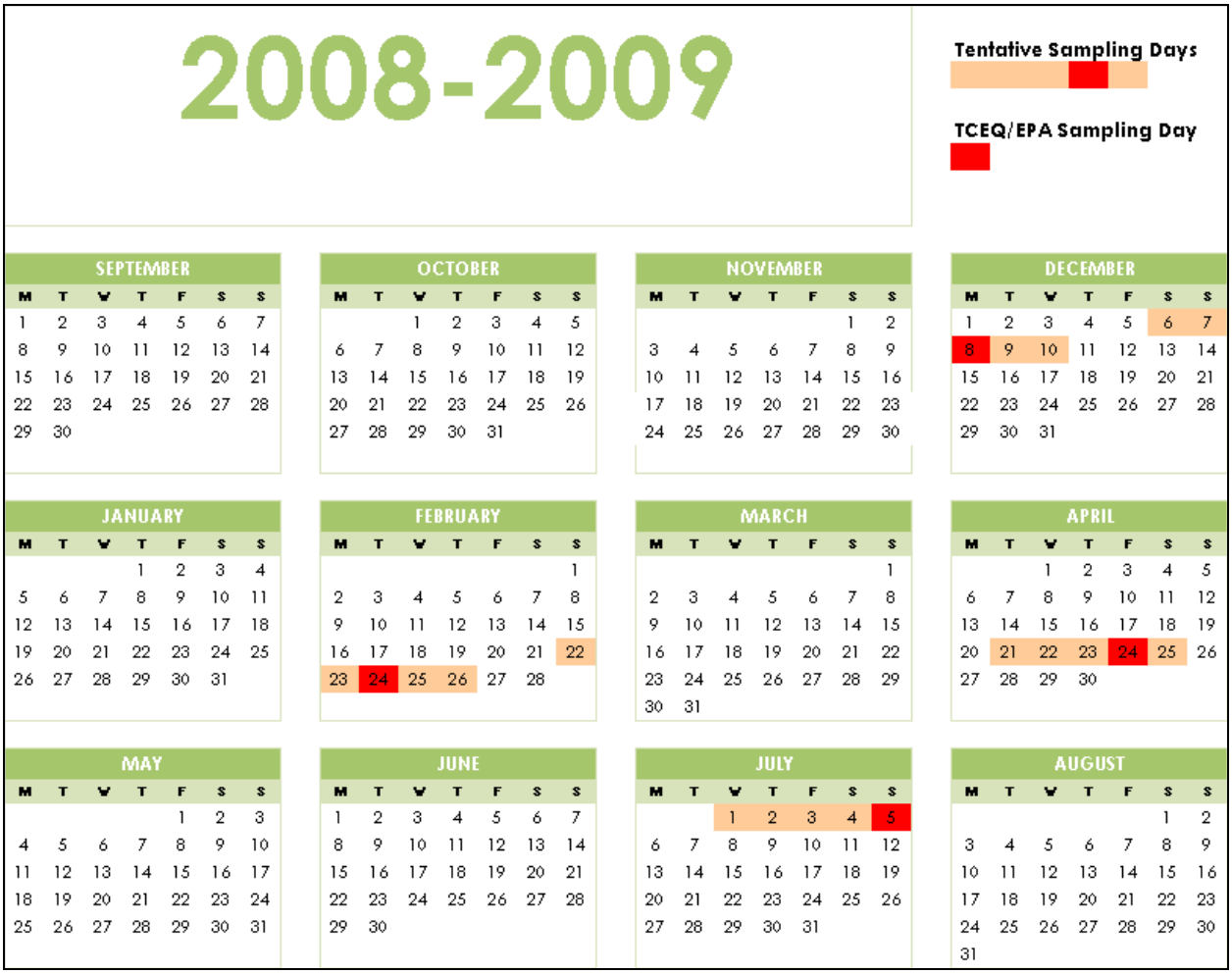
ERG has a structured records management retrieval system that allows for the efficient archive and retrieval of records. The data collected in the laboratory will be included in this system. Each laboratory archives the data from the computer systems on a compact disk (CD) or flash drive. All data are then stored on location in a temperature-controlled environment for up to five years after the close of each contract. The laboratory paper copies of all analyses are stored on site in a secured temperature-controlled laboratory area for easy retrieval. ERG will maintain all laboratory notes and raw data for at least 5 years from the date of the end of the closed project. However, if any litigation, claim, negotiation, audit or other action involving the records has been started before the expiration of the 5-year period, the records will be retained until completion of the action and resolution of all issues which arise from it, or until the end of the regular 5-year period, whichever is later.

Updates to this QAPP will be distributed by the URS Project Manager to the individual listed in A3 via email.

B DATA GENERATION AND ACQUISITION

B1 Sampling Design

Air sampling for selected air contaminants will be conducted during four separate five-day periods (sampling episodes). One sampling episode will take place per calendar quarter for four consecutive quarters, beginning with the fourth quarter of 2008. The sampling episodes may take place at any time within a calendar quarter as long as: (1) each episode begins at least 21 days after the end of the previous episode and (2) at least one 24-hour period during the episode coincides with a scheduled TCEQ sampling day at CAMS 52. URS will schedule each sampling episode at least one week in advance after consulting with TCEQ and considering both staff availability and the long-range weather forecast (periods of persistent rainfall or stagnation will be avoided). A tentative Sampling Schedule is given below.



During each sampling episode, 24-hour integrated samples will be collected, starting at midnight, on five consecutive days except during periods of excessive rainfall or stagnation. Any sampling episode may be temporarily suspended due to forecasted or current weather conditions so that no more than 25% of the samples will be collected under the following conditions:

- ***Stagnant wind conditions***, defined as no wind movement for 25% or more of the scheduled sampling period (i.e., no more than six hours per 24-hour sample and no more than 30 hours per 120 total hours). The standard for "no wind movement" is wind speed less than three miles per hour (3 mph).
- ***Significant rain event***, defined as measureable rainfall occurring for 25% or more of the scheduled sampling period (i.e., no more than six hours per 24-hour sample and no more than 30 hours per 120 total hours).

During each sampling episode, samples will be collected at five sites. Four sites will be fixed for the entire project. That is, samples will be collected during all four 5-day sampling episodes. Another four sites will be temporary. Samples will be collected at each temporary site during only one sampling episode. The following general criteria were used to select sampling sites:

- One fixed site will be collocated with TCEQ Continuous Air Monitoring Station (CAMS) 52 (samples will be collected at fixed sites during four consecutive calendar quarters)
- One fixed site will be located in the predominantly downwind direction from the Gerdau Ameristeel facility near the intersection of Highway 67 and Wyatt Road
- Temporary sites will be located near Civic Center Park, Kimmel Park, Triangle Park, and Hawkins Spring Park (samples will be collected at each temporary site during one calendar quarter)
- One fixed site will be located near Jaycee Park
- One fixed site will be located north (predominantly downwind) of the Ash Grove Texas, LP facility.

The latitude/longitude coordinates and nearest street address of each sampling site are given in Table B1-1. Street level maps and aerial photos showing the locations of each site are given in Figures B1-1 through B1-8. Note that Site 5, Midlothian Water Treatment Facility is northeast – not north – of the Ash Grove Texas LP facility. This alternate location was chose because no reasonably secure location with readily accessible electricity service was available within 1 – 2 miles directly north of the cement manufacturing facility.

Table B1-1. Sampling Sites

Site No.	Site Name	Street Address	Latitude	Longitude
Fixed Sites				
1	CAMS 52 Collocated	2725 Old Fort Worth Rd.	32.4822	-97.0269
2	Wyatt Rd.(N. of Gerdau Ameristeel)	1291 E. Wyatt Rd.	32.4696	97.0372
4	Jaycee Park	1711 Meadow Ln.	32.5030	-96.9976
5	Water Treatment Plant (N. of Ash Grove)	440 Tayman Dr.	32.5301	-96.9918
Temporary Sites				
Site 3a	Triangle Park	200 E Ave. G	32.4823	-96.9917
Site 3b	Mountain Peak Elem. Sch.	5201 FM 663	32.42897	-97.0014
Site 3c	Vitovsky Elem. Sch.	333 Church St.	32.50068	-96.9922
Site 3d	Midlothian H.S.	923 South 9th St.	32.4732	-96.9964

Table B1-2. Number of Samples Scheduled at Each Site

Site No.	Site Name	Number of Samples		
		PM_{10}	Cr^{6+}	VOC
Fixed Sites				
1	CAMS 52 Collocated	20	20	20
2	Wyatt Road	20	20	0
4	Jaycee Park	20	20	20
5	Water Treatment Plant	20	20	20
Temporary Sites				
Site 3a	Triangle Park	5	5	5
Site 3b	Mountain Peak Elem. Sch.	5	5	5
Site 3c	Vitovsky Elem. Sch.	5	5	5
Site 3d	Midlothian H.S.	5	5	5

The measurement methods and target chemicals are listed in Table A6-1. PM_{10} samples for metals (including Cr^{6+}) analysis will be collected at every site. Canister samples for VOC determinations will be collected at every site except Site 2 (Wyatt Road). Table B1-2 summarizes the number of routine samples that are scheduled at each site.

Every site will be equipped with a 10-meter meteorological tower and sensors for monitoring wind speed, wind direction, temperature, pressure, and rainfall. Meteorological data, which may be used to aid in the air quality data interpretation, will be stored as 5-minute and one-hour averages.

Figure B1-1. Street Level Map and Aerial Photo of Site 1 (CAMS 52)

Figure B1-2. Street Level Map and Aerial Photo of Site 2 (Wyatt Rd.)

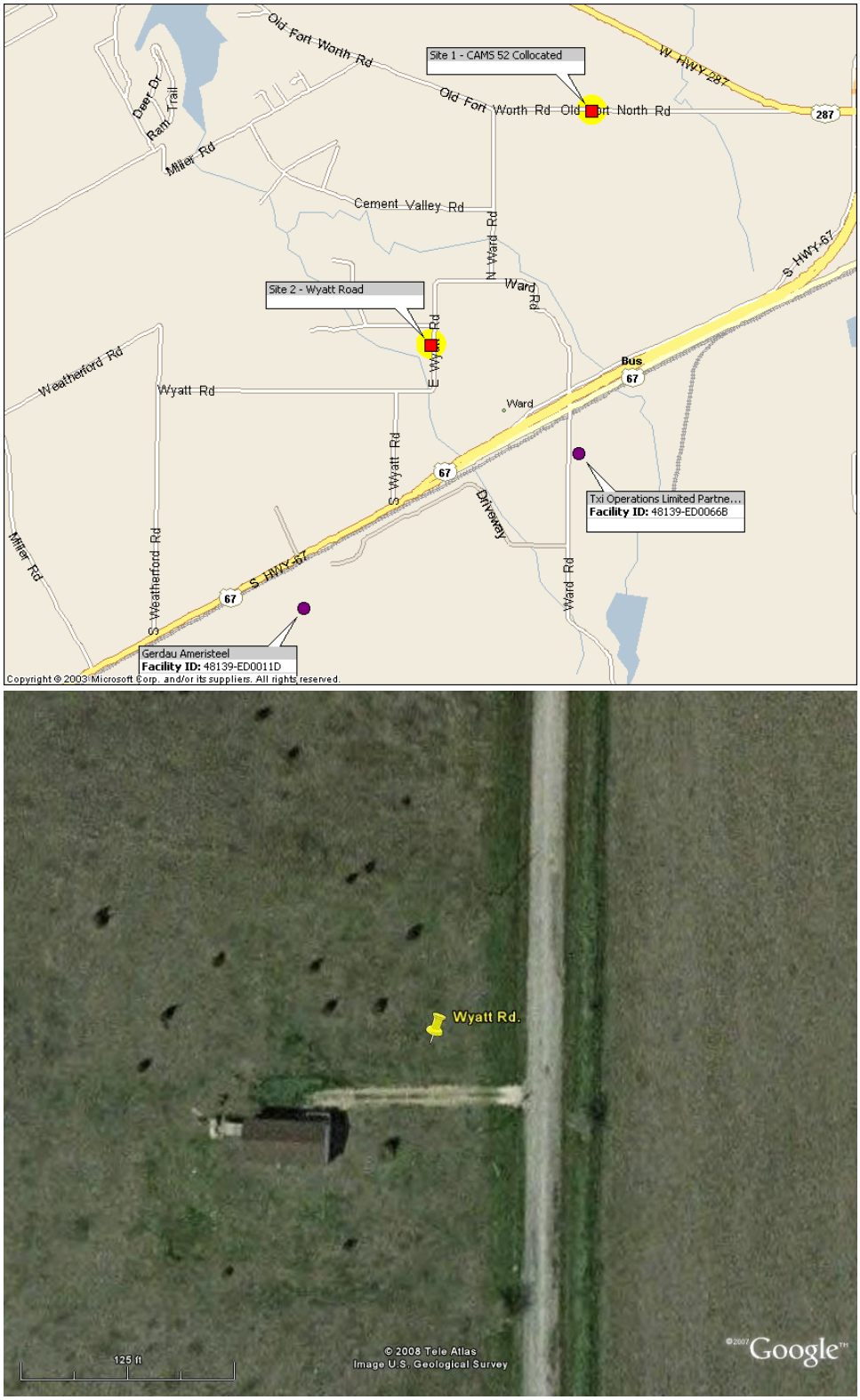


Figure B1-3. Street Level Map and Aerial Photo of Site 3a (Triangle Park)

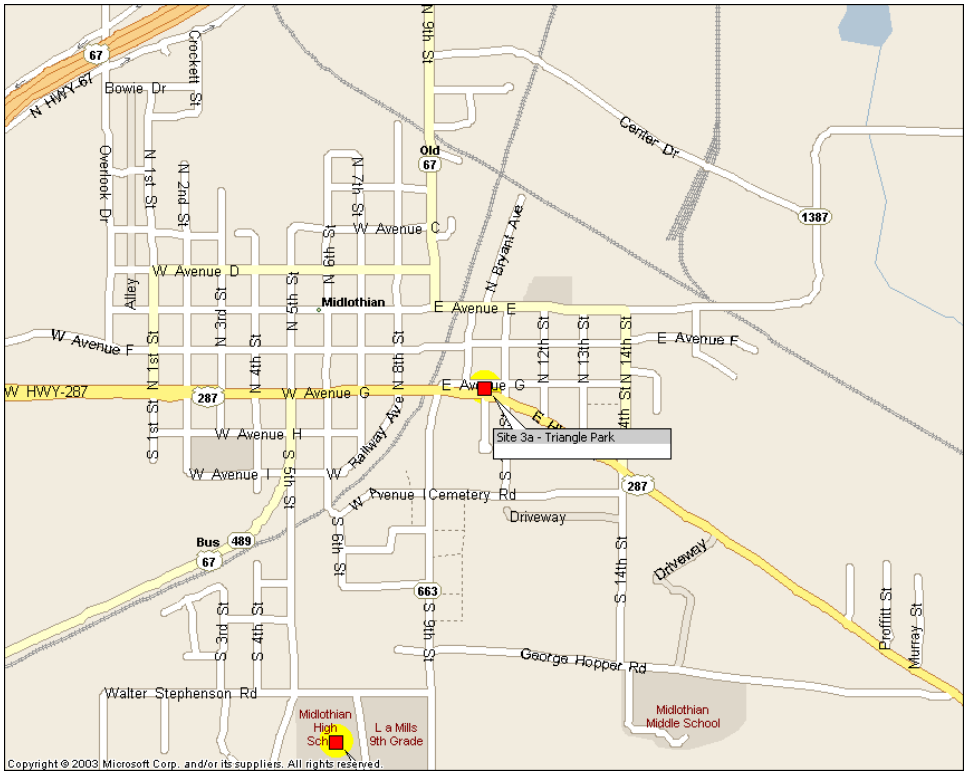


Figure B1-4. Street Level Map and Aerial Photo of Site 3b (Mountain Peak Elem.)

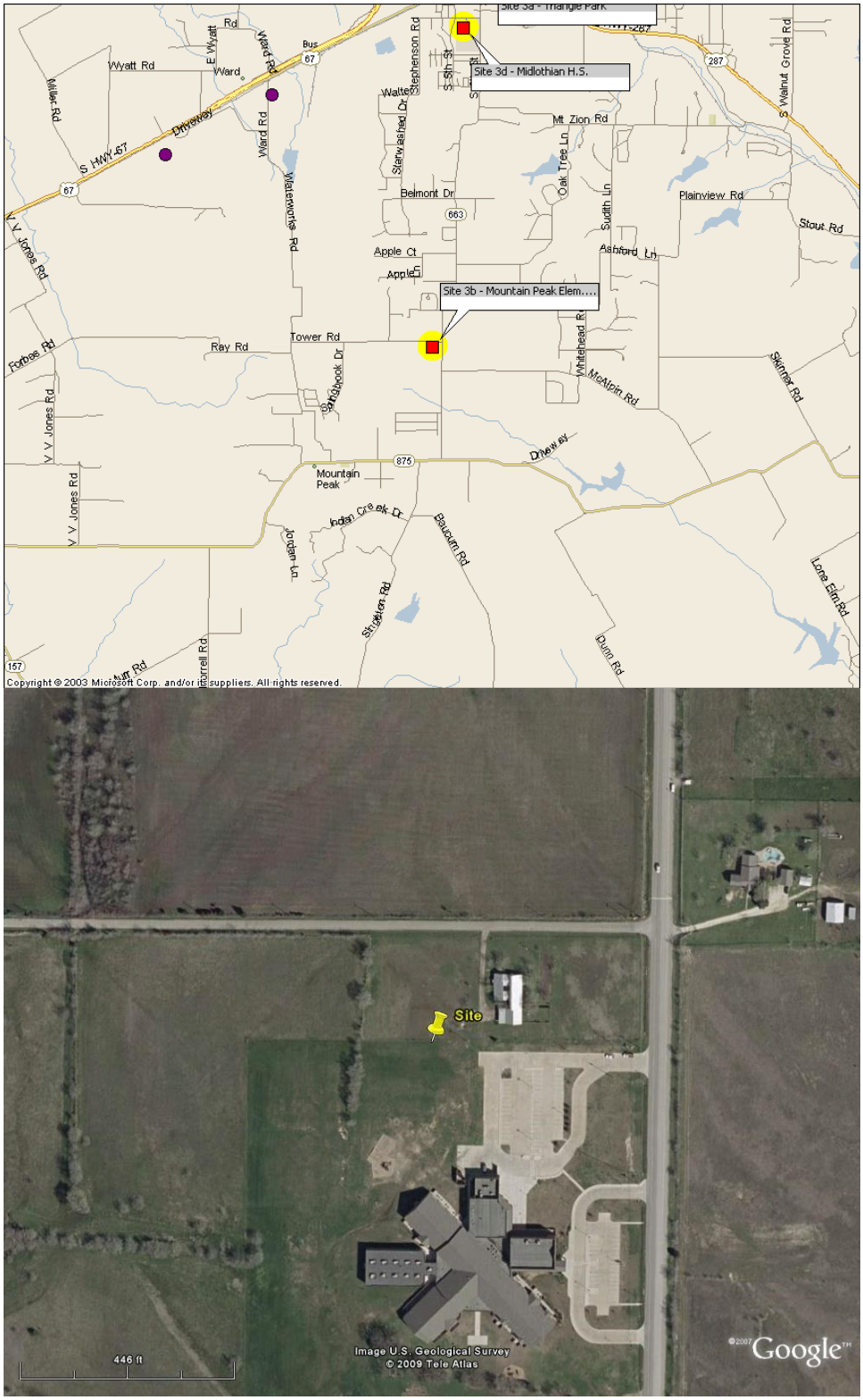


Figure B1-5. Street Level Map and Aerial Photo of Site 3c (Vitovsky Elem.)

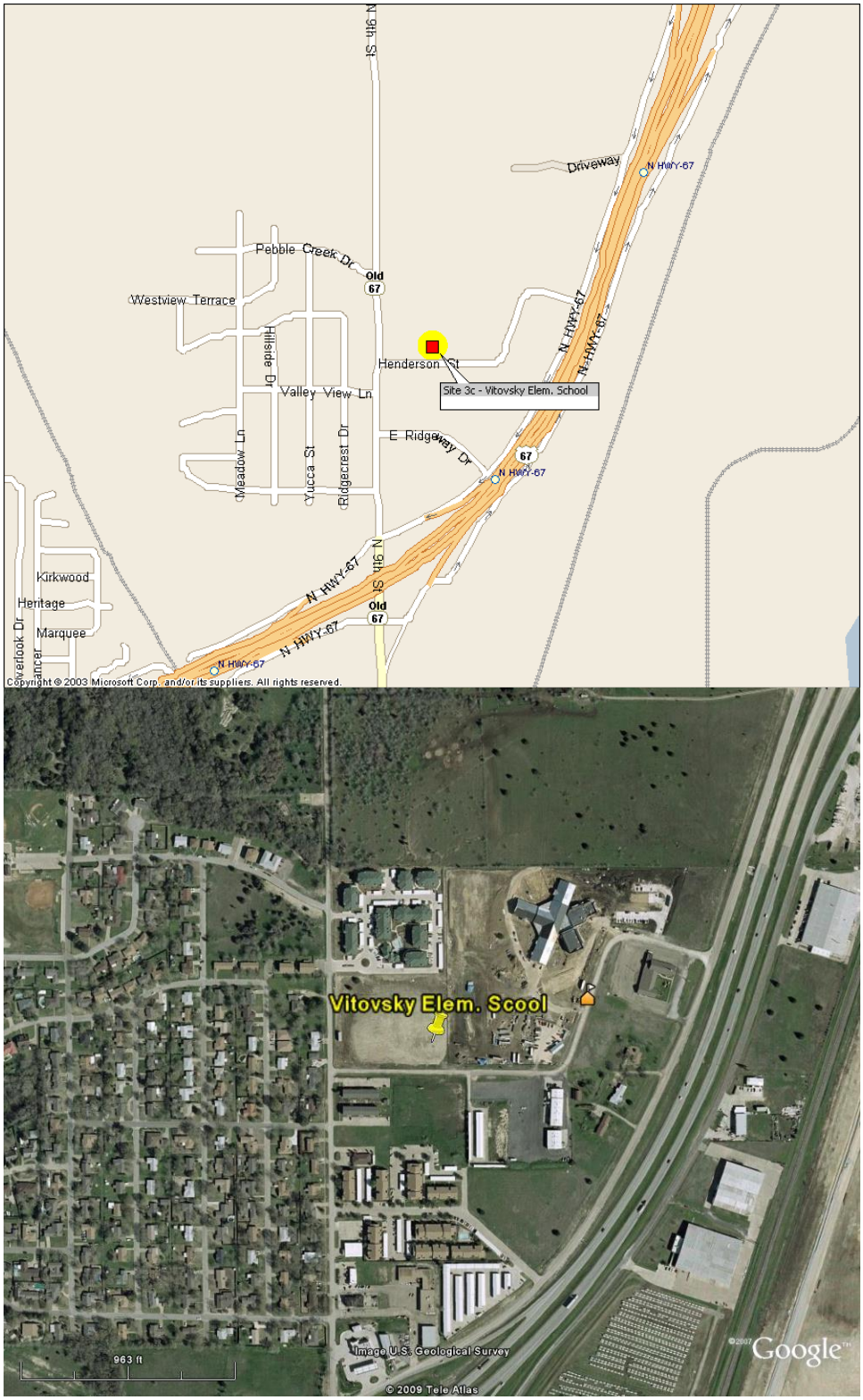


Figure B1-6. Street Level Map and Aerial Photo of Site 3d (Midlothian H.S.)

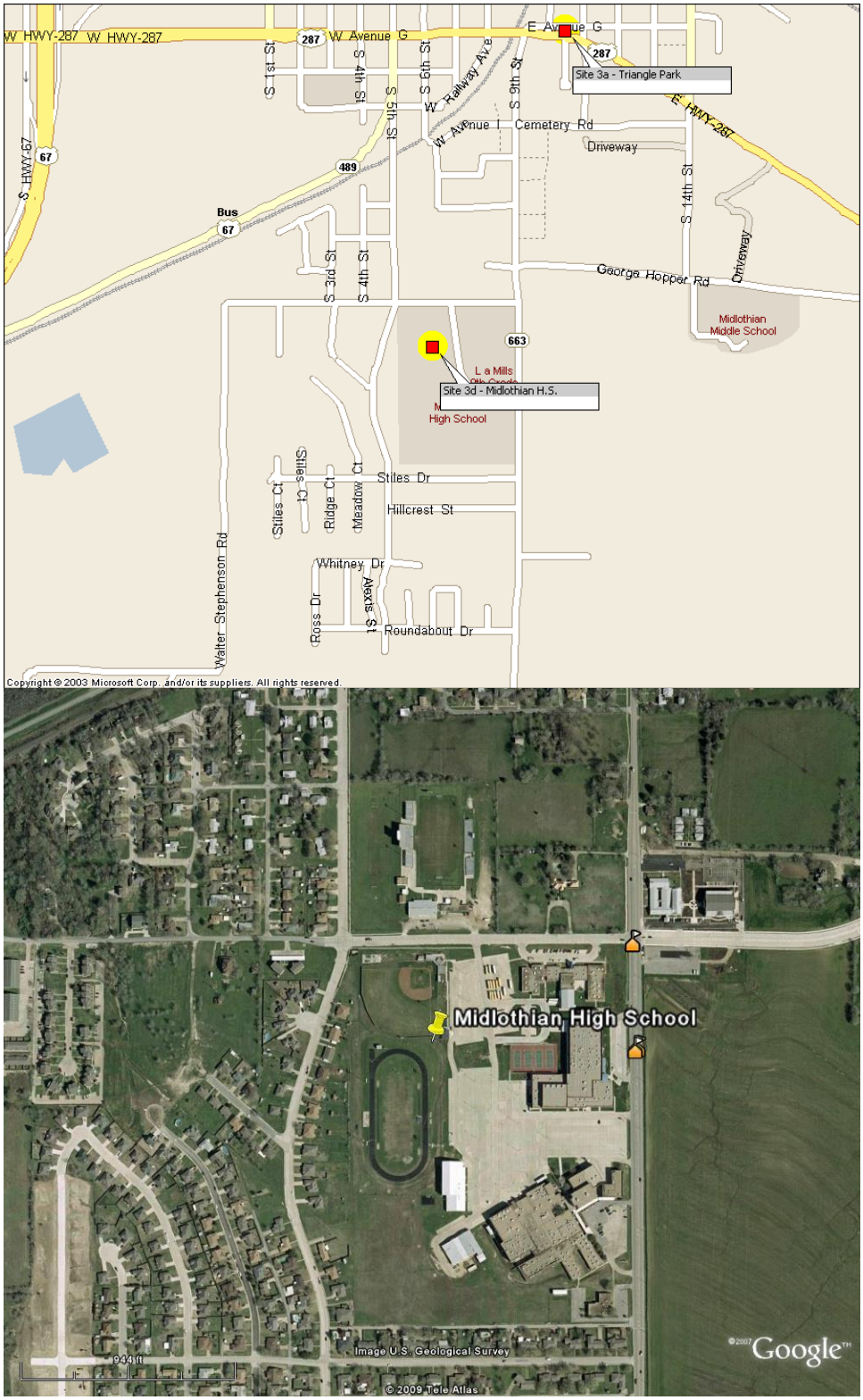


Figure B1-7. Street Level Map and Aerial Photo of Site 4 (Jaycee Park)

Figure B1-8. Street Level Map and Aerial Photo of Site 5 (Water Treatment Facility)

B2 Sampling Methods

B2.1 Sampling Equipment

Particulate matter samples in the PM_{10} size fraction (for the determination of metals other than Cr^{6+}) will be collected on 8" x 10" quartz fiber filters using conventional federal reference method PM_{10} high-volume samplers with volumetric flow control, operated at their design flow rates. Two samplers will be installed at each site and programmed to run sequentially for 24-hour periods on alternating days so that samples can be collected consecutively without any interruption for changing filters. A third PM_{10} high-volume sampler will be installed at one site for collecting field duplicates. The PM_{10} samplers will be calibrated and operated according to 40 CFR Part 50, Appendix J (Reference Method for the Determination of Particulate Matter as PM_{10} in the Atmosphere).

Filter samples (sodium bicarbonate coated cellulose fiber) for measuring hexavalent chromium will be collected using samplers built by ERG initially to support the EPA National Air Toxics Trends Stations (NATTS) network and Urban Air Toxics Monitoring Program (UATMP). The Cr^{6+} samplers will be modified for sampling the PM_{10} size fraction by the adding Teflon coated cyclones upstream of the filters. The cyclones are manufactured by URG, Chapel Hill, NC (URG-2000-ENB). The samplers will also be modified to allow sequential sampling for two consecutive 24-hour periods. The Cr^{6+} samplers will be operated according to the ERG Standard Operating Procedure, ERG-MOR-013 Revision Number 2.

Canister samples for measuring VOCs by TO-15 will be collected using sampling systems custom-designed and built for the Midlothian project by URS. Each sampler will meet TO-15 design specifications and have additional features for added quality control such as continuous monitoring of canister pressure and flow rate. Each sampler will have at least two channels so that samples may be collected over sequential 24-hour periods, midnight to midnight, with no interruption for changing canisters. Samples will be collected in 6-L SUMMA canisters filled to sub-atmospheric pressures.

Wind speed, wind direction, temperature, and barometric pressure will be monitored using sensors manufactured by MetOne. The wind direction vane and cup anemometers will be mounted at 10-meters above the ground on vertical towers. The meteorological data will be stored as 5-minute and 1-hour averages.

Tables B2-1 summarizes the sampling methods. Tables B2-2 and B2-3 give the number of samples to be collected at each site and the sample collection specifications, respectively. The specific compounds of interest are given in Table A6-1.

Table B2-1. Sampling Methods

Parameter Group	Method	Equipment	References
Volatile Organic Compounds	TO-15 "Determination Of Volatile Organic Compounds (VOCs) In Air Collected In Specially-Prepared Canisters And Analyzed By Gas Chromatography/ Mass Spectrometry (GC/MS)"	URS-built VOC sampler compliant w/ TO-15 specifications	Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air (EPA/625/R-96/010b)
Metals as PM_{10} (except Cr^{6+})	40 CFR 50, App. J "Reference Method for the Determination of Particulate Matter as PM_{10}in the Atmosphere"	Tisch Environmental, Inc. TE-6070V PM_{10} High Volume Air Sampler	Code of Federal Regulations, Title 40--Protection of Environment, Chapter I—Environmental Protection Agency, Subchapter C—Air Programs, Part 50--"National Primary and Secondary Ambient Air Quality Standards" Compendium of Methods for the Determination of Inorganic Compounds in Ambient Air (EPA/625/R-96/010a)
Hexavalent Chromium as PM_{10}	CARB Method 039 and ERG-MOR-013, Field Procedure for Collecting Ambient Air Hexavalent Chromium Samples Using the ERG:CR6 Sampling System	Eastern Research Group ERG:CR6 Sampling System with Teflon-coated PM_{10} cyclone head.	California Air Resources Board. EPA Technical Assistance Document for the National Ambient Air Toxics Trends and Assessment Program, and Eastern Research Group (ERG) Engineering and Science Division

Table B2-2. Sampling Design

Number of Samples to be Collected per Calendar Quarter					
Sample Type	**Sampling Period**	**No. of Routine Samples per Site [a]**	**No. of Field Blanks [b]**	**No. of Field Duplicates [b]**	**No. of Analytical Replicates [b]**
VOCs Canister	24 ±1 hour	5	1	1	1
Metals (except Cr^{6+}) Quartz Filter	24 ±1 hour	5	1	1	1
Cr^{6+} Cellulose Filter	24 ±1 hour	5	1	1	1

[a] VOC samples will be collected at every site except at CAMS 302.
[b] Blanks and duplicates will be collected at only one site per quarter.

Table B2-3. Specifications for Sample Collection

Equipment	Specification
Volatile Organic Compounds	
Sample Collection Media	6-liter spherical, passivated SUMMA or glass-lined electro-polished stainless steel canister
Sampler Flow Rate	3-4 mL/min
Sampling Period	24 ± 1 hours
Metals	
Sample Collection Media	8.5in. x 11in. Quartz Fiber Filter 0.50 mm thickness
Sampler Flow Rate	1.13 m^3/min
Sampling Period	24 ± 1 hours
Hexavalent Chromium	
Sample Collection Media	47-mm Grade 41 Whatman cellulose filters impregnated with sodium bicarbonate in Teflon filter holders
Sampler Flow Rate	15.0 L/min
Sampling Period	24 ± 1 hours

B2.2 Sampling Procedures

The Sample Collector will visit each site the day before each 5-day episode to audit the meteorological sensors, test the sampling equipment, install fresh particulate matter filters and TO-15 canisters, and program the samplers to run sequentially on the next two days. The Sample Collector will return to each site every day for the next six days to complete up to 3 tasks as given in Table B2-4. Each sample will be shipped to ERG for analysis within 24-hours after collection, along with associated documentation and chain of custody papers. Hexavalent chromium samples will be shipped in insulated, chilled containers.

Spare equipment and/or parts will be available to facilitate efficient corrective actions in response to malfunctioning instrumentation.

Table B2-4. Generic Site Visit Schedule

Day	Task 1	Task 2	Task 3
0	Test samplers	Check meteorological sensors	Install Days 1 and 2 filters and canisters
1	Check Day 1 samples		
2	Retrieve Day 1 samples	Check Day 2 samples	Install Day 3 filters and canisters
3	Retrieve Day 2 samples	Check Day 3 samples	Install Day 4 filters and canisters
4	Retrieve Day 3 samples	Check Day 4 samples	Install Day 5 filters and canisters
5	Retrieve Day 4 samples	Check Day 5 samples	
6	Retrieve Day 5 samples	Check meteorological sensors	Secure sites

B3 Sample Handling and Custody

Standardized chain of custody forms will be used to track TO-15 canisters and particulate matter filters from the laboratory to the sampling sites, and back to the laboratory. An example of the chain of custody form for TO-15 canisters is shown in Figure B3-1. It is the same color-coded, three-copy form that ERG uses in support of the Urban Air Toxics Monitoring Program (UATMP) and other EPA-sponsored national air sampling projects. The top section of the form, which will be completed in the laboratory before the canister is sent to the sampling site, identifies the sampling site, date, canister identification number, and initial canister pressure (after cleaning and evacuation). The rest of the form is used to track the canister chain of custody and canister pressure through various stages of the sampling and analysis process.

One copy of the chain of custody form will be retained by the site operator and the other copies will be returned to the laboratory with the canister. Back in the laboratory, the sample canister pressure will be compared with the pressure recorded in the field as a check on whether any leakage into the canister occurred during transport. The information from the chain of custody form is then entered into the laboratory database. The sample is given a unique identification (ID) number and tagged with the site name and the sample collection date.

Similar chain of custody forms will be used to track filter samples (see, for example, Figure B3-2). Canisters and filters will be sent to and from the sampling sites via FedEx. Requirements for sample preservation are given in Table B3-1. All sample hold times will be limited by the 30-days from sample collection reporting requirement.

Table B3-1. Sample Preservation and Holding Time Requirements

Sample Type	Preservation	Holding Time
VOCs	Close valves and cap canister inlet. Ship in a protective case at ambient temperature.	30 days from completion of sampling to analysis
PM_{10}/Metals	Retrieve the exposed filter within 24 hours of sampling. Ship the filter in its protective folder and envelope at ambient temperature.	30 days from completion of sampling to analysis
Cr^{6+}	Keep filters cool prior to sampling. Keep filters in a freezer after collection and cool for shipment to the laboratory.	30 days from completion of sampling to analysis

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Figure B3-1. TO-15 Canister Chain of Custody Form

ERG

ERG Lab ID #

TOXICS/SNMOC SAMPLE DATA SHEET

Lab Pre-Sampling

Site Code: _____ Canister Number: _____
City/State: _____ Lab Initial Can. Press. ("Hg): _____
AQS Code: _____ Date Can. Cleaned: _____
Collection Date: _____ Cleaning Batch # : _____
Options
SNMOC (Y/N): _____ Duplicate Event (Y/N): _____
TOXICS (Y/N): _____ Duplicate Can # : _____

Field Setup

Operator: _____ Sys. #: _____ MFC Setting: _____
Setup Date: _____ Elapsed Timer Reset (Y/N): _____
Field Initial Can. Press. ("Hg): _____ Canister Valve Opened (Y/N): _____

Field Recovery

Recovery Date: _____ Sample Duration (3 or 24 hr): _____
Field Final Can. Press. ("Hg): _____ Elapsed Time: _____
Canister Valve Closed (Y/N): _____

Lab Recovery

Received by: _____ Date: _____ Lab Final Can. Press. ("Hg): _____
Status: Valid Void (Circle one)
If void, why: _____

SNMOC

Analyst: _____ Date: _____
Batch I.D.: _____

Toxics

Analyst: _____ Date: _____
Batch I.D.: _____

Comments: _____

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

Figure B3-2. Cr^{6+} Filter Sample Chain of Custody Form

ERG

ERG Lab ID #

AMBIENT HEXAVALENT CHROMIUM DATA SHEET

Lab Pre-Sampling

Site Code: _____ Collection Date: _____

City/State: _____ Primary Event (Y/N): _____

AQS Code: _____ Collocated Event (Y/N): _____

Field Setup

Site Operator: _____ Sampler ID: _____

Set-Up Date: _____ Elapsed Timer Reset (Y/N): _____

Collection Date: _____

Batch I.D. No.: _____

Initial Rotameter Setting (C.O. B.): _____ (After 5 minutes warm-up)

Programmed Start Time: _____ Programmed End Time: _____

Field Recovery

Recovery Date: _____ Recovery Time: _____

Final Rotameter Reading (C.O.B.): _____ (After 5 minutes warm-up)

Elapsed Time: _____

Lab Recovery

Received by: _____ Date: _____ Refrigerator No: _____

Status: Valid Void (Circle one)

If void, why: _____

Collection Time (Minutes): _____

Flowrate (L/min): _____

Total Volume of Air Sampled (m^3): _____

Comments: _____

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

B4 Analytical Methods

Samples will be analyzed by the ERG Laboratory in RTP, North Carolina, according to the reference methods cited in Table B4-1. Detailed descriptions of the equipment and procedures are provided in the ERG QAPP for support of the EPA national monitoring programs, which is accessible online to EPA, States, Local, and Tribal agencies at the ERG web address: http://www.ergweb2.com/uatmp/index.htm.

For permission to access this information, please contact:

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fax: 919-468-7803

Table B4-1. Analytical Methods

Parameter Group	Method	Reference
Volatile Organic Compounds (GC/MS)	TO-15 "Determination Of Volatile Organic Compounds (VOCs) In Air Collected In Specially-Prepared Canisters And Analyzed By Gas Chromatography/ Mass Spectrometry (GC/MS)"	Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air (EPA/625/R-96/010b)
Metals (ICP/MS)	IO-3.5 "Determination of Metals in Ambient Particulate Matter Using Inductively Coupled Plasma/Mass Spectrometry (ICP/MS)"	Compendium of Methods for the Determination of Inorganic Compounds in Ambient Air (EPA/625/R-96/010a)
Hexavalent Chromium (Ion Chromatography)	Modified CARB-039 "Standard Operating Procedure for Analysis of Hexavalent Chromium at Ambient Atmospheric Levels by Ion Chromatography"	http://www.epa.gov/ttn/amtic/files/ambient/airtox/hexchromsop.pdf

B5 Quality Control

B5.1 Field Quality Control

The Sample Collector will perform and document a series of quality control (QC) checks at specified frequencies, and will take appropriate corrective action if results of the field quality control checks are outside acceptable ranges. All activities and results of QC checks will be recorded in a logbook before the Sample Collector leaves the site. The QC activities include the following:

- URS Sample Collector will maintain a file of site information that will include site visit logs, calibration data, and sample chain-of-custody forms. Copies of this documentation will be forwarded to the Program Manager at the end of each quarterly sampling episode, and these items will be retained in the project files.
- Field duplicate (collocated) samples will be collected at a rate of 1 per quarterly sampling episode for VOCs, metals and hexavalent chromium at one of the sites that is equipped with duplicate sampling ports. The duplicate samples will be designated on the chain-of-custody form for laboratory duplicate analysis as well (nested duplicates).
- Field blank samples will be collected once per quarterly sampling episode for VOCs, metals and hexavalent chromium.
- A chain-of-custody record, indicating sample identification number, sampling location, and all required data particular to the sample will accompany each filter or canister during shipment to and from the field.
- Sampler flow rate checks will be performed during each quarterly sampling episode for the PM_{10} samplers.
- While on site, the Sample Collector will download the TO-15 flow rate and canister pressure data to a laptop computer and examine the time series for confirmation that the previous day's canister collected air at a uniform rate over the 24-hour period.
- Prior to sampling, the pressure inside each canister will be measured in the field and compared with the initial pressure recorded by the laboratory.
- Canister sampling system leak checks will be performed each time canisters are loaded in the sampler for sample collection.
- Upon receipt of Cr^{6+} sample filters from ERG, URS staff will immediately remove the unused sample media from the shipping cooler and place materials in a clean, uncontaminated freezer.
- Meteorological data will be checked on each sampling day for reasonableness with respect to observed conditions and site-to-site agreement.

B5.2 Analytical Quality Control

Summaries of laboratory quality control measures are in Tables B5-1 through B5-3.

Table B5-1. TO-15 (VOCs) Laboratory Quality Control

QC Check	Frequency	Acceptance Criteria	Corrective Action
Bromofluorobenzene (BFB) Instrument Tune Performance Check	Daily[b] prior to sample analysis	Evaluation criteria in Table 11-1 presented in this QAPP.	1) Retune 2) Clean ion source and/or quadrupole
Five point calibration bracketing the expected sample concentration, Certified Standard, LCS.	Following any major change, repair or maintenance or if daily QC is not acceptable. Recalibration not to exceed three months.	1) Relative Standard Deviation (RSD) of response factors≤30% 2) Relative Retention Times (RRTs) for target peaks ±0.06 units from mean relative retention time	1) Repeat individual sample analysis 2) Repeat linearity check 3) Prepare new calibration standards and repeat analysis
Calibration check using mid-point of calibration curve or one other point in curve[a], Certified Standard.	Daily[b] on the days of sample analysis	Analyst verifies that the response factor ≤ 30% RSD from calibration curve average response factor	1) Repeat calibration check 2) Repeat calibration curve
Second source calibration check following the calibration curve	Following the calibration curve	Analyst verifies that the response factor ≤ 30% RSD from calibration curve average response factor	1) Repeat calibration check 2) Repeat calibration curve
System Blank Analysis[a]	Daily[b] following BFB and calibration check; prior to sample analysis	1) 0.2 ppbv per analyte or the MDL, whichever is greater 2) Internal Standard (IS) area response ±40% and IS Retention Time (RT) ±0.33 min. of most recent calibration check	1) Repeat analysis with new blank canister 2) Check system for leaks, contamination 3) Reanalyze blank
Duplicate and Replicate Analysis[a]	All duplicate field samples	<30% Relative Percent Difference (RPD) for compounds greater than 5 times MDL	Repeat sample analysis

LCS = Laboratory control standard (second source)
[a] QA criteria are based on EPA Urban Air Toxics Monitoring Program specifications
[b] Daily = approximately every 24 hours

Table B5-1. continued

QC Check	Frequency	Acceptance Criteria	Corrective Action
Canister Cleaning Certification	One can analyzed on the Air Toxics system per batch of eight	<0.2 ppbv per VOC targeted compound or MDL, whichever is greater	Reclean canisters and reanalyze
Sampler Certification	Annual	1) Recovery 80% to 120% of targeted compounds for certification challenge 2) <0.2 ppbv or the MDL, whichever is greater, of targeted compounds for blank certifications	Repeat certification of canisters
Samples	All samples	IS area response ±40% and IS RT ±0.33 min. of most recent calibration validation	Repeat analysis

LCS = Laboratory control standard (second source)
[a] QA criteria are based on EPA Urban Air Toxics Monitoring Program specifications
[b] Daily = approximately every 24 hours

Table B5-2. IO-3.5 (Metals) Laboratory Quality Control

Parameter	Frequency	Acceptance Criteria	Corrective Action
Initial calibration standards (ICAL)	Daily, at least 4 calibration points	Correlation coefficient 0.995	1) Repeat analysis of calibration standards. 2) Reprepare calibration standards and reanalyze.
Initial calibration blank (ICB)	Immediately after HSV	Must be ≤ MDL	1)Locate and resolve contamination problems before continuing. 2) Reanalyze
High standard verification (HSV)	Before ICB	Recovery from 95 to 105%	1) Repeat analysis of HSV. 2) Reprepare HSV.
Initial calibration verification (ICV)	Immediately after calibration	Recovery 90-110%	1) Repeat analysis of calibration check standard. 2) Repeat analysis of calibration standards. 3) Reprepare calibration standards and reanalyze.
Interference Check Standard (ICS)	Following the ICV/QCS, every 8 hours and at the end of each run	Recovery from 80 to 120%	1) Repeat analysis of ICS. 2) Reprepare ICS.
Continuing calibration verification (CCV)	Analyze before the 1st sample, after every 10 samples, and at the end of the run	Recovery 90-110%	1) Repeat analysis of continuing calibration verification sample. 2) Reprepare continuing calibration. 3) Reanalyze samples since last acceptable continuing calibration verification.
Continuing calibration blanks (CCB)	Analyzed after each CCV	Must be ≤ MDL	1)Locate and resolve contamination problems before continuing. 2) Reanalyze samples since last acceptable continuing calibration verification.

Table B5-2. continued

Parameter	Frequency	Acceptance Criteria	Corrective Action
MB	1 per 20 samples, a minimum of 1 per batch	Analytes below MDL	1) Reanalyze. 2) Reprepare blank and reanalyze. 3) Repeat analyses of all samples since last clean blank.
LCS	1 per 20 samples, a minimum of 1 per batch	Recovery 80-120%, with the exception of Ag and Sb	1) Reprepare sample batch. 2) Reanalyze.
MS/MSD	1 per 20 samples per sample batch	Recovery 75-125%, with the exception of Ag and Sb	1) Reprepare sample batch. 2) Reanalyze.
Serial Dilution	1 per batch	Recovery 90-110% of undiluted sample	1) Reprepare dilution 2) Flag data.

Table B5-3. Cr^{6+} Laboratory Quality Control

Parameter	Frequency	Acceptance Criteria	Corrective Action
Initial 5-point calibration standards	Following any major change, or repair or maintenance or if QC is not acceptable. Not to exceed 1 month.	Correlation coefficient 0.995	1) Repeat analysis of calibration standards. 2) Reprepare calibration standards and reanalyze.
Calibration check standard, LCS	Daily, following the initial calibration	Recovery 90-110%	1) Repeat analysis of calibration check standard. 2) Repeat analysis of calibration standards. 3) Reprepare calibration standards and reanalyze.
LCS	Every 10 samples	Recovery 90-110%	1) Repeat analysis of LCS. 2) Reprepare LCS. 3) Flag data bracketed by unacceptable LCS.
Method blanks	One per batch	Below MDL	1) Reanalyze. 2) Reprepare blank and reanalyze. 3) Correct contamination and reanalyze blank. 4) Flag data of all samples in the batch.
Method Spike	One per 10 samples	Recovery 80-120%	1) Reanalyze. 2) Reprepare spike and reanalyze. 3) Flag data of all samples since the last acceptable spike.

B6 Instrument/Equipment Testing, Inspection and Maintenance

All the canister samplers will be blank checked and challenged by ERG with humidified zero air and a calibration standard, respectively, consistent with TO-15 prior to installation at the sampling sites. The blank test is passed when no greater than 0.2 ppbv of any target compound is detected in the humidified zero air sample drawn through the sampling system. Samplers will undergo repeated purge and test cycles until the blank test is passed. No pass/fail threshold is specified for testing the samplers with humid calibration standards; however, recoveries in the range of 90% to 110% of the known concentrations are expected according to TO-15. The canister samplers will be constructed just before the start of this project and with only periodic use during this project no particular preventative maintenance will be required before the end of the approximately one-year study. The accuracy of the canister pressure transducers relative to the laboratory gauges will be checked as part of the sampler certification. Sampler pressure transducers reading outside a range of ±5% of the laboratory gauge will be adjusted.

The high volume particulate matter samplers will be inspected by the Sample Collector prior to installation to verify that inlets are clean, motor housings are installed tightly, electrical wiring and flow tubing are in good condition, and all gaskets and fasteners have no signs of failure. Any parts that appear to be near failure will be replaced. Periodic maintenance of the PM_{10} samplers such as motor brush replacement, motor replacement, and cleaning will be performed as needed. Spare samplers will be available from the URS equipment inventory in Austin.

B7 Instrument/Equipment Calibration and Frequency

All sampling and analytical equipment will be calibrated against reference standards prior to use. Analytical instrumentation will be calibrated in accordance with the referenced methods and the ERG QAPP for support of the EPA national programs.

Calibration of the high-volume samplers (for PM_{10} and metals) consists of an independent measurement of the ability of the sampler flow orifice to maintain the desired flow rate of 1.13 m^3/minute within ±10% at a measurement accuracy of ±7%. A variable flow orifice traceable to a primary standard Rootsmeter is installed in place of the filter cassette, and a manometer is used to measure pressure differential within the orifice. Adjusting the resistance of the orifice simulates a series of 4 flow rates within the sampler operating range. The sampler calibration relationship is expressed by a linear regression, which is used to generate sampler flow rate "Look-Up" tables. The Look-Up tables allow the user to determine sampler flow rate quickly under the expected range of ambient temperature and pressure conditions during each sampling episode. This calibration and linear regression are performed upon installation of the

samplers before samples are taken, and are repeated whenever the result from a monthly calibration check indicates the need for revision. The monthly calibration check is accomplished using the same technique as for the initial calibration, but only one flow rate is measured by the office and compared to the Look-Up table.

Sample collection for the VOC samplers is controlled using a mass flow controller that is calibrated against a reference Dri-Cal flow meter. The sample volume is determined from laboratory measurements of the canister vacuum taken before and after sampling using a vacuum gauge capable of measuring vacuum (–100 to 0 kPa or 0 to - 30 in Hg).

Prior to each quarter sampling episode, the Sample Collector will verify that the wind direction vane is aligned to true north (i.e., accounting for magnetic declination), check wind direction and wind speed initial torque response, and verify the temperature and atmospheric pressure responses against NIST-traceable audit equipment. The performance criteria for the meteorological equipment are given in Table B7-1.

Table B7-1. Meteorological Equipment Performance Checks

Parameter	How Measured	Criteria
Wind Direction	Verify alignment to true north using a certified transit	± 2°
Wind Speed	Verify response at five points ranging from 0 to 54 mph using a certified rotational drive	± 0.4 mph
Temperature	Comparison of ambient reading with certified thermometer	± 1.8°F
Atmospheric Pressure	Comparison of ambient reading with certified barometer	± 7.6 mmHg
Rainfall	Standard volume	± 10% of Reading

B8 Inspection/Acceptance of Supplies and Consumables

All consumables and supplies used for sample analysis, including sampling media used for sample collection, will be inspected and accepted according to the procedures and criteria given in the ERG QAPP for support of the EPA national programs. Tracking and quality verification of supplies and consumables, according to the ERG QAPP, have two main components. The first is the need of the end user of the supply or consumable to have an item of the required quality. The second need is for the purchasing department to accurately track goods received so that payment or credit of invoices can be approved. In order to address these two issues, the following procedures outline the proper tracking and documentation procedures to follow:

- Receiving personnel will perform a rudimentary inspection of the packages as they are received from the courier or shipping company.
- Note any obvious problems with a receiving shipment such as crushed box or wet cardboard.
- The package will be opened, inspected, and contents compared against the packing slip.
- If there is a problem with the equipment/supply, note it on the packing list and notify the Purchasing Agent who will immediately call the vendor.
- If the equipment/supplies appear to be complete and in good condition, sign and date the packing list and sent to the Purchasing Agent so that payment can be made in a timely manner.
- Notify appropriate personnel that equipment/supplies are available. For items such as the filters, it is critical to notify the laboratory manager of the weigh room so sufficient time for processing of the filters can be allowed.
- Stock equipment/supplies in appropriate pre-determined area

B9 Non-direct Measurements

This program involves only direct measurements based on sampling and analysis.

B10 Data Management

The ERG procedures for laboratory data recording, validation, transformation, transmittal, reduction, analysis, management, storage, and retrieval are given in the ERG QAPP for support of the EPA national programs. Within 30 days after the end of each 5-day sampling sequence, ERG will transmit the processed measurement results in a spreadsheet format to URS via email. Each data record will include the following fields:

- Sample date
- Sampling site
- Sample identification number assigned by the laboratory
- Date of analysis
- Chemical name
- Measurement value
- Quality assurance flag
- Sample-specific detection limit
- Unit of measure

.

URS will perform final review and validation of the measurement results and maintain the official project database in a protected Excel spreadsheet. Final data review and validation will be performed according to the procedures given in Group D of this QAPP.

C ASSESSMENT AND OVERSIGHT

C1 Assessment and Response Action

The QA Coordinator or Project Manager will internally assess the data after each quarterly sampling episode. This will be done during the 15-day period between reporting the measurement results by ERG to URS and delivery of the validated data to TCEQ. The internal assessment will include estimations of measurement precision based on collocated sample results, evaluations of field blank data, review of the data set for unusual patterns or outliers, and review of field notes and diagnostic data for signs of recurring or persistent equipment problems. Signs that any of the MQOs listed in Table A7-1 are not being met will be discussed with field or laboratory staff and appropriate corrective actions will be identified and implemented. Such actions may include:

- Recalibration of equipment flow controllers
- Replacement of equipment components or entire samplers
- More frequent monitoring of data quality indicators and instrument performance
- Review of laboratory QC data
- Laboratory confirmation of reported results

The ERG laboratory is audited by EPA once per year to assess ERG's quality procedures and verify compliance with its QAPP. Accuracy assessments of the laboratory metals analyses performed by EPA during the period of this study will be included in the final report. ERG's response plan is described in the ERG QAPP for support of the national programs.

No external assessment or oversight of field sampling activities is planned for this project; however, an independent assessment of the meteorological parameters will be performed by setting one sampling station within a few meters of the TCEQ CAMS 52 station and comparing the side-by-side measurements for consistency. URS will accommodate TCEQ should the agency elect to audit the field sites and sampling procedures.

C2 Reports to Management

Any deficiencies or defects identified by project staff will be brought to the immediate attention of the URS Project Manager. The problems will be documented and tracked to ensure satisfactory resolution of the problem. The impact on measurement data and project objectives will be assessed and included in quarterly reports to TCEQ along with a description of corrective actions.

D DATA VALIDATION AND USABILITY

D1 Data Review, Verification, and Validation

Upon completion of sample collection, the Sample Collector will review the sample collection data to verify that samples collected were valid. The Sample Collector will verify that the sampling equipment operated properly, starting and stopping at the correct times and collecting specified sample volumes. Sample media will be inspected to verify that there is no damage that would compromise sample integrity. Any issues affecting sample validity will be documented in the field logbook and communicated immediately to the Project Manager, and project QA officer. Data will be declared invalid whenever documented evidence exists demonstrating that a sampler was not collecting data under representative conditions or was malfunctioning.

ERG will perform a second tier of data validation in accordance with its EPA QAPP by taking account of laboratory QC checks and chain of custody documentation provided by URS, and will apply appropriate data quality flags (Tables D1-1 through D1-3) as needed.

Table D1-1. Laboratory Data Flags

Qualifier Type	Qualifier Type Description	Qualifier Code	Qualifier Description
NULL	Null Data Qualifier	AR	General lab error
NULL	Null Data Qualifier	AS	Poor quality assurance results
NULL	Null Data Qualifier	BH	Interference / co-elution
QA	Quality Assurance Qualifier	FB	Field blank value above acceptable limit
QA	Quality Assurance Qualifier	TB	Trip blank value above acceptable limit
QA	Quality Assurance Qualifier	LB	Lab blank value above acceptable limit
QA	Quality Assurance Qualifier	LJ	Analyte identified; reported value estimated
QA	Quality Assurance Qualifier	LK	Analyte identified; reported value may be biased high
QA	Quality Assurance Qualifier	LL	Analyte identified; reported value may be biased low
QA	Quality Assurance Qualifier	EH	Estimated; exceeds upper range
QA	Quality Assurance Qualifier	CC	Clean canister residue
QA	Quality Assurance Qualifier	7	Below lowest calibration level

Table D1-2. Chain of Custody Flags

Qualifier Type	Qualifier Type Description	Qualifier Code	Qualifier Description
NULL	Null Data Qualifier	MC	Module end cap missing
NULL	Null Data Qualifier	TS	Holding time or transport temperature out of spec
NULL	Null Data Qualifier	AF	Scheduled but not collected
NULL	Null Data Qualifier	AG	Sample time out of limits
NULL	Null Data Qualifier	AJ	Filter damage
NULL	Null Data Qualifier	AK	Filter or sample leak
NULL	Null Data Qualifier	AL	Voided by operator
NULL	Null Data Qualifier	AM	Miscellaneous void
NULL	Null Data Qualifier	AQ	Collection error
NULL	Null Data Qualifier	FI	Filter Inspection flag

Table D1-3. Field Operations and Maintenance Flags

Qualifier Type	Qualifier Type Description	Qualifier Code	Qualifier Description
NULL	Null Data Qualifier	AA	Sample pressure out of limits
NULL	Null Data Qualifier	AB	Technician unavailable
NULL	Null Data Qualifier	AC	Construction repairs in the area
NULL	Null Data Qualifier	AD	Shelter storm damage
NULL	Null Data Qualifier	AE	Shelter temperature out of specification
NULL	Null Data Qualifier	AH	Sample flow rate out of limits
NULL	Null Data Qualifier	AI	Insufficient data to make calculation
NULL	Null Data Qualifier	AN	Machine malfunction
NULL	Null Data Qualifier	AO	Bad weather
NULL	Null Data Qualifier	AP	Vandalism
NULL	Null Data Qualifier	AT	Calibration
NULL	Null Data Qualifier	AU	Monitoring waived
NULL	Null Data Qualifier	AV	Power failure
NULL	Null Data Qualifier	AW	Wildfire damage
NULL	Null Data Qualifier	AX	Precision check performed
NULL	Null Data Qualifier	AY	QC Control points (Zero /Span)
NULL	Null Data Qualifier	AZ	QC audit
NULL	Null Data Qualifier	BA	Maintenance / routine repairs
NULL	Null Data Qualifier	BB	Unable to reach site
NULL	Null Data Qualifier	BC	Multipoint calibration
NULL	Null Data Qualifier	BD	Auto calibration
NULL	Null Data Qualifier	BE	Building site repair
NULL	Null Data Qualifier	BF	Precision, zero or span performed
NULL	Null Data Qualifier	BI	Lost or damaged in transit
NULL	Null Data Qualifier	BJ	Operator Error
NULL	Null Data Qualifier	BK	Site computer/data logger down
QA	Quality Assurance Qualifier	2	Operational Deviation
QA	Quality Assurance Qualifier	3	Field Issue
QA	Quality Assurance Qualifier	V	Validated value
QA	Quality Assurance Qualifier	W	Flow rate average out of specs.
QA	Quality Assurance Qualifier	X	Filter temperature difference out of spec.
QA	Quality Assurance Qualifier	HT	Sample pick-up hold time exceeded; data questionable

D2 Verification and Validation Methods

The Project Manager or QA Officer will use graphical techniques including time series charts and scatter plots to identify suspicious patterns and data outliers. Data will never be declared invalid solely because they appear anomalous, but may be flagged as suspect and subjected to further review until the cause for the apparent anomaly is determined. Evidence of overwhelming measurement bias, external influences on the representativeness of the data, or

lack of reproducibility of the measurement data (e.g., from field blank or duplicate measurement results) may be cause for the data to be judged invalid.

D3 Reconciling with User Requirements

If the sample collection, analysis, and QC procedures written in the QAPP are followed, and the sites are representative of the conditions for which they were selected, then the measurement results are expected to meet the user requirements. URS is contractually obligated to achieve the 75% completeness objective and will collect supplemental samples at the end of any 5-day sampling sequence, if needed Failure to achieve any of the other MQOs given in Table A7-1 does not mean the affected measurement results are not useable. Any signs that particular MQOs were not achieved will be described in the quarterly and final reports to TCEQ and recommendations on the usability of the affected measurement results will be addressed on a case by case basis.

E REFERENCES

Quality Assurance Handbook for Air Pollution Measurement Systems, Volume IV. U.S. Environmental Protection Agency, March 1995.

Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Section 20.11. U.S. Environmental Protection Agency.

Ambient Monitoring Guidelines for the Prevention of Significant Deterioration. U.S. Environmental Protection Agency.

Method TO-15 "Determination Of Volatile Organic Compounds (VOCs) In Air Collected In Specially-Prepared Canisters And Analyzed By Gas Chromatography/Mass Spectrometry (GC/MS)," *Compendium of Methods for Determination of Toxic Organic Compounds in Ambient Air*. U.S. Environmental Protection Agency 625/R-96/101b, Research Triangle Park, North Carolina, January 1999.

Method IO-2.1, "Sampling of Ambient Air for Total Suspended Particulate Matter and PM10 Using High Volume Sampler," *Compendium of Methods for Determination of Inorganic Compounds in Ambient Air*. U.S. Environmental Protection Agency 625/R-96/101b, Research Triangle Park, North Carolina, June 1999.

Method IO-3.5, "Determination of Metals in Ambient Particulate Matter Using Inductively Coupled Plasma/Mass Spectrometry (ICP/MS)," *Compendium of Methods for Determination of Inorganic Compounds in Ambient Air*. U.S. Environmental Protection Agency 625/R-96/101b, Research Triangle Park, North Carolina, June 1999.

CARB-MLD039, "Standard Operating Procedure for Analysis of Hexavalent Chromium at Ambient Atmospheric Levels by Ion Chromatography," California Environmental Protection Agency, California Air Resources Board.

ERG-MOR-013, "Field Procedure for Collecting Ambient Air Hexavalent Chromium Samples Using the ERGLCR6 Sampling System," Environmental Research Group, Engineering and Science Division, May 2004.

"Draft Technical Assistance Document for the National Ambient Air Toxics Trends and Assessment Program," Emissions, Monitoring and Analysis Division (C339-02) Office of Air Quality Planning and Standards U.S. Environmental Protection Agency Research Triangle Park, NC, June 2003.