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Task 1.1

Update Conceptual Model through the 2016 Ozone Season

CATEGORY III QUALITY ASSURANCE PROJECT PLAN (QAPP)

Revision 0

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Prepared by:

Alamo Area Council of Governments

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The content, findings, opinions and conclusions are the work of the author(s) and do not necessarily represent the findings, opinions or conclusion of the TCEQ.

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APPROVAL SHEET

This document is a Quality Assurance Project Plan (QAPP) for the Update Conceptual Model through the 2016 Ozone Season.

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During the course of the project, any revision to the QAPP will be circulated to everyone on the distribution list. Paper copies need not be provided to individuals if equivalent electronic information systems can be used.

1 PROJECT DESCRIPTION AND OBJECTIVES

AACOG has prepared this Level III Quality Assurance Project Plan (QAPP) for the Texas Commission on Environmental Quality (TCEQ) following EPA guidelines. The nature of the technical analysis and tasks to be conducted as part of this project are consistent with quality assurance (QA) Category III – National Risk Management Research Laboratory (NRMRL) QAPP requirements for secondary data projects. This QAPP is in effect for the duration of this project through July 15th, 2017.

1.1 Purpose of Study

The Clean Air Act (CAA) is the comprehensive federal law that regulates airborne emissions across the United States.[1] This law authorizes the U.S. Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS) to protect public health and the environment. Of the many air pollutants commonly found throughout the country, EPA has recognized six "criteria" pollutants that can injure health, harm the environment, and/or cause property damage. Air quality monitors measure concentrations of these pollutants throughout the country. States are required to develop State Implementation Plans (SIP) that explain how the state will comply with air quality standards according to the federal Clean Air Act. A SIP must be submitted by the state government of any state that has areas that are designated in nonattainment of federal air quality standards.

Forecasting future air quality and modeling of air quality control strategies are among the basic elements of a SIP. Since control strategy modeling requires extensive technical analyses of control strategy impacts under a variety of typical meteorological conditions that produce high ozone, it is important that each photochemical modeling episode be based on a time period characterized by such meteorological conditions. Careful selection of photochemical episodes for use in the SIP is critical.

A conceptual model is one of the main tools used when selecting photochemical modeling episodes that are representative of high ozone events. Results from the conceptual model are used to assess and evaluate ozone simulations produced by photochemical models. Air quality trends, meteorology patterns, precursor emissions, and ozone transport will be evaluated for the San Antonio region during development of the conceptual model. The project will update the previous 2014 Conceptual model completed under 582-14-40051 contract Amendment Number 2, Task 1.1 delivered to TCEQ on March 14th, 2014.

1.2 Project Objectives

AACOG will identify necessary and sufficient conditions for high or exceeding ozone measurements in the program area (Atascosa, Bandera, Bexar, Comal, Frio, Gillespie, Guadalupe, Karnes, Kendall, Kerr, McMullen, Medina, and Wilson Counties) for the ozone National Ambient Air Quality Standards (NAAQS). The analyses will include any seasonal variations and use data through 2016 to the extent possible. Individual high ozone days will be analyzed to determine factors that contributed to high ozone. Updating the conceptual model will require completion of the following steps:

[1] US Congress, 1990. "Clean Air Act". Available online: http://www.epa.gov/air/caa/. Accessed: 07/19/2010.

- Provide summaries of the anthropogenic emissions inventory in the updated conceptual model. Important local sources will be identified especially with regard to their impact on design values. In addition, new or expanding emissions sources that may impact the design value for each monitor will be documented;
- Evaluate the wind speeds, directions and time of day associated with high ozone events to determine the local conditions and source alignments most frequently associated with high ozone events. In particular, those events which set the design values for each monitor and year will be evaluated in detail;
- Complete a daily summary of large-scale synoptic weather features and patterns during high ozone events;
- Develop 48 hour back trajectories to determine source regions most (and least) likely to affect local area ozone;
- Conduct a weekday/weekend analysis to evaluate the potential impact of various levels of local industrial and mobile source activity;
- Evaluate the range and average background ozone concentrations associated with local wind directions;
- Investigate ozone and precursor trends and estimate the annual frequency of high ozone days; and
- Address additional relevant questions listed in Section 11.1.1 of EPA's ozone modeling guidance document, *Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, PM2.5, and Regional Haze*. The current version of this guidance is dated April of 2007 and uses an ozone standard threshold of 84 ppb. The questions referenced shall be answered for the adopted ozone standard. In the event that EPA releases an updated version of this guidance prior to July 31, 2014, the Performing Party shall comply with the updated requirements of EPA.

The Conceptual Model is continually updated in preparation for new modeling episodes as they become necessary. EPA states that conceptual models "are comprehensive summaries of the "state of the knowledge" regarding the influence of emissions, meteorology, transport, and other relevant atmospheric processes on air quality in the area. For a conceptual description to be informative it should identify what processes and sources, in the generic sense, are most responsible for the air quality issue being simulated."[2]

"Well-constructed conceptual models can substantially inform the design of the attainment demonstration modeling (e.g., episode selection, choice of domain, emissions priorities, evaluation focus) and should be conducted in advance of the development of a modeling protocol. It is worth noting that conceptual descriptions can be valuable in other air quality planning efforts besides attainment demonstrations. They can also be useful in determining nonattainment area boundaries, investigating emissions control program impacts, and monitoring network design, among others."[3]

"The following bullets describe some of the key building blocks in developing a conceptual model.

[2] EPA, December, 2014. "Modeling Guidance for Demonstrating Attainment of Air Quality Goals for Ozone, PM2.5, and Regional Haze- December 2014". DRAFT. p. 9. Available online: http://www3.epa.gov/scram001/guidance/guide/Draft_O3-PM-RH_Modeling_Guidance-2014.pdf. Accessed 10/19/2015.
[3] ***Ibid***.

- Introduce the general nature of the air quality problem addressed by the conceptual model
- Describe the ambient monitoring network used for the conceptual model
- Describe the status and trends of air quality in the area
- Investigate possible relationships between emissions and air quality
- Investigate possible relationships between meteorology and air quality (AQ)
- Synthesize all of the relevant information into a detailed conceptual model"[4]

[4] ***Ibid***. pp. 9-11.

2 PROJECT ORGANIZATION AND RESPONSIBILITIES

2.1 Responsibilities of Project Participants

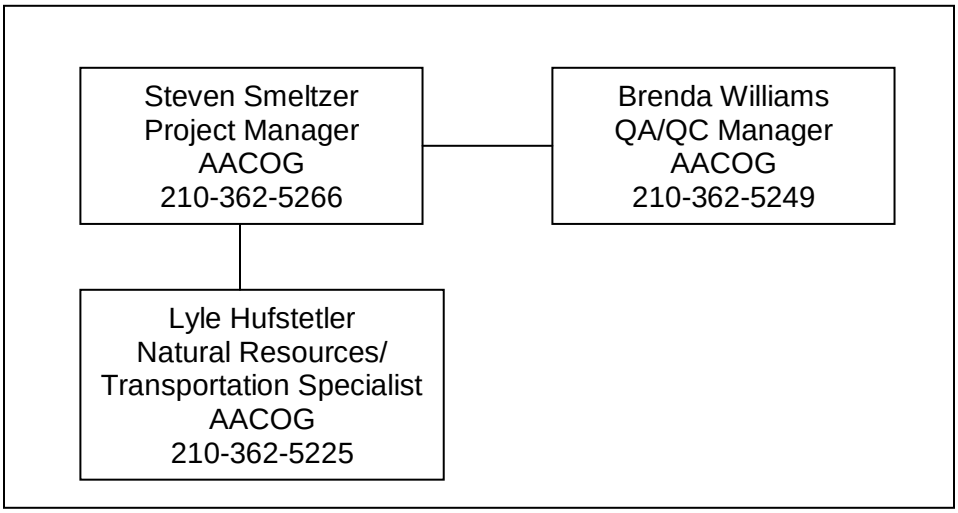
This study will be conducted by Alamo Area Council of Governments (AACOG) under 582-16-60180 contract to the Texas Commission on Environmental Quality (TCEQ). Staff working on this project and their specific responsibilities are listed below. "The project manager is ultimately responsible for assessing whether the performance and acceptance criteria for the intended modeling use were met and works iteratively with the intended users of the results."[5]

Figure 2-1: AACOG's project team participants and their responsibilities.

Participant	Project Responsibility
Steven Smeltzer	Project manager and has develop previous conceptual models for the San Antonio MSA. He will ensure the project implementation follows all contract requirements and that project quality standards are met on all deliverables. He will assist in interactions with TCEQ as required.
Brenda Williams	Expert on air quality and will be responsible for implementing project review and quality assurance.
Lyle Hufstetler	Will be responsible for collecting and analyzing raw meteorological and air quality data.

In addition, TCEQ staff will participate in the review of the technical documentation generated during this project.

2.2 Project Organization Chart



[5] EPA, December, 2002. "Guidance for Quality Assurance Project Plans for Modeling EPA QA/G-5M". EPA/240/R-02/007. Washington, DC. Available online: http://www2.epa.gov/sites/production/files/2015-06/documents/g5m-final.pdf. Accessed 10/16/2015.

2.3 Project Schedule

Conceptual model development will be performed in two steps: (1) Collect raw air quality and meteorological data and (2) Identify necessary and sufficient conditions for high or exceeding ozone measurements in the San Antonio MSA. The table below shows the overall schedule for completion of this project.

Figure 2-2: Summary of project schedule and milestones

Work Element	Deliverable Date
Deliverable 1.1: QAPP	
Drafts submitted to TCEQ for review and approval	October 20th, 2015
Deliverable 1.2: Final Report	
Draft Report	June 15th, 2017
Final Report	July 15th, 2017

3 SCIENTIFIC APPROACH

3.1 Secondary Data Requirements

Data used for this project will be comprehensive of local monitoring and atmospheric measurements and will facilitate the characterization of meteorological factors impacting ground-level ozone concentrations. The use and analysis of all data will include statistical analysis of the results. This statistical analysis will include reporting r^2 and p-values where applicable. All meteorological and emission data will be obtained through TCEQ and will have been validated before being analyzed by AACOG. Other sources of meteorological data, including weather maps, will come from the National Weather Service or other related governmental organizations.

3.2 Sources of Secondary Data to be Used

There are currently 20 air quality monitors in the AACOG region that record air pollution measurements including 11 that measure ozone levels. Two additional monitors record solely meteorological data. The data collected at these sites is processed for quality assurance by the Texas Commission on Environmental Quality (TCEQ) and is accessible via the Internet.[6] Figure 3-1 displays the locations of the CAMS within the San Antonio region. All monitors indicated on the map, with the exception of three water-quality monitors at Calaveras Lake, measure the ambient levels of at least one air pollutant. In addition, several sites monitor meteorological conditions such as temperature, wind speed, wind direction, precipitation, solar radiation, and relative humidity.

In addition to the ozone monitors at C23, C58, C59, C501, C502, C503, C504, C505, C506, C622, and C678, the map shows C140 (meteorological data), C301 ($PM_{2.5}$ and PM_{10}), C676 (meteorological data and $PM_{2.5}$), C677 (meteorological data, $PM_{2.5}$, and non-real-time VOC), and C5004 (meteorological data) sites. The three water quality monitors displayed on the map are C623, C625, and C626. In the last few years, TCEQ has installed two air quality monitors equipped with Automated Gas Chromatographs (Auto-GC) that continuously measure VOCs. One of these monitors, C1038 in Floresville, also measures NOx and meteorological data. The other, C1070 at the Karnes County Courthouse, also measures NOx, meteorological data, and hydrogen sulfide. There is also a near-road NOx monitor, C1069, which measures meteorological data.

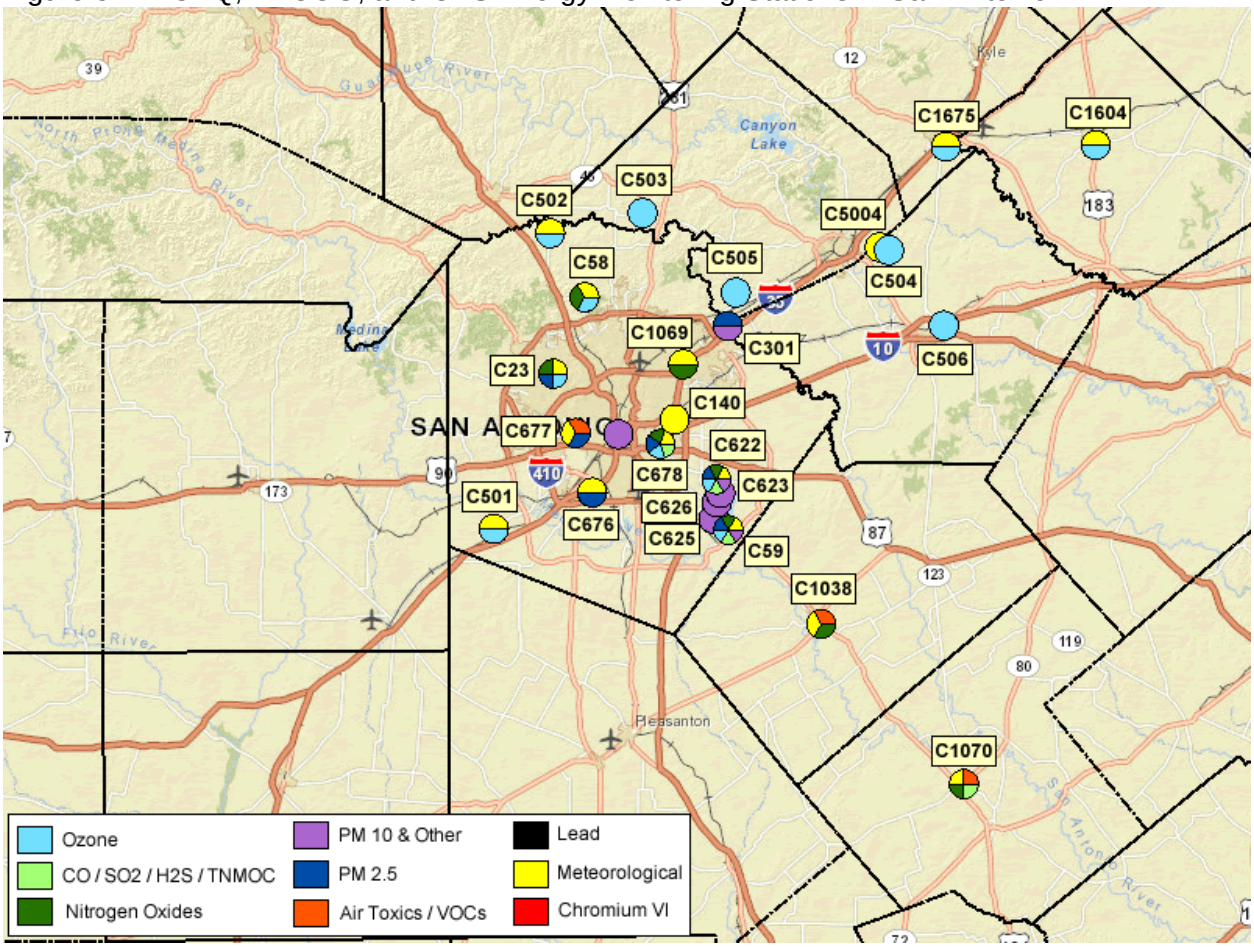
The CAMS network in the San Antonio region includes both regulatory and non-regulatory monitors. Regulatory monitors meet EPA's requirements for equipment type, siting criteria, and quality assurance. Regulatory monitors in the San Antonio area include three owned by TCEQ: C23, C58, and C59. Two monitors owned by CPS Energy, C622 and C678, meet all site and data criteria required by EPA. AACOG owns a series of monitors, C501, C502, C503, C504, C505, and C506, which have been maintained since 2007 through a subcontractor. These monitors are non-regulatory because they do not meet EPA guidelines for site selection[7] and

[6] TCEQ, "Select a Monitoring Site in Region 13 (San Antonio)". Available online: http://www.tceq.state.tx.us/cgi-bin/compliance/monops/select_summary.pl?region13.gif. Accessed 10/09/15.

[7] EPA, August 1998. "Guideline on Ozone Monitoring Site Selection". EPA-454/R-98-002. Office of Air and Radiation. Office of Air Quality Planning and Standards Research. Triangle Park, NC. Available online: http://www3.epa.gov/ttn/amtic/archive/files/ambient/criteria/reldocs/r-98-002.pdf. Accessed 10/16/15.

the data does not meet EPA criteria for determination of attainment status. Although the AACOG monitors are non-regulatory, they provide valuable information useful for monitoring background conditions, improving the conceptual model, and evaluating model performance.

Figure 3-1: TCEQ, AACOG, and CPS Energy Monitoring Stations in San Antonio



4 QUALITY METRICS

In this section, the quality requirements for the data used in this study and the procedures for determining the quality of the data are described. Note that 10% of the data used in this study will be randomly audited.

4.1 Data

The data for the conceptual model must meet a number of requirements and include sufficient data to evaluate those requirements prior to use. The data must be reasonably consistent with other studies and the data must be sufficiently complete to be expected to adequately represent meteorological conditions and local air quality. In addition, collected data will be assessed for missing data and outliers through communications with TCEQ.

4.2 Quality Control

Quality control (QC) activities include technical reviews, accuracy checks, and the use of approved standardized procedures. These activities should be included in development planning, data collection and analysis, calculations, and reporting. Special emphases will be put on critical components, such as ozone readings, meteorological inputs, and formulas, for quality checks. Meteorological and air quality data developed through this process will be compared to previous data sets from other conceptual models. Twenty five percent of calculations will be independently replicated to ensure accuracy. The project manager will ensure that all of the QA checks performed are compiled, and maintained in the project archives.

When errors and omissions are identified, they will be corrected and all documentation will be updated with the corrections. All calculation methodologies will be documented and described in detail so external officials and other interested parties can replicate the results. For every air quality analysis, documentation will be consistent and contain data sources, methodology, formulas, and results. Pertinent information and supporting statistics used for developing the conceptual model will be analyzed to ensure that the information and statistics are reasonable (i.e., avoiding extremely low or high values that are indicative of errors). Data that are found to be questionable will be examined in greater detail to determine what errors might be present and what adjustments might be needed. If data are revised, the procedures and assumptions used will be thoroughly documented. The Project Manager will review and approve all data adjustments.

AACOG will use a senior peer reviewer not directly involved in conducting the project to review all methods and results of the work. The senior peer reviewer will be involved in the initial planning stages of this project to ensure the planned approaches are technically sound, and will also provide quality checks and review on all final products prior to submittal to TCEQ to ensure the project procedures were properly implemented. When the conceptual model is completed, documentation and spreadsheets will be sent to TCEQ and other interested parties for review.

5 DATA ANALYSIS, INTERPRETATION AND MANAGEMENT

5.1 Data Reporting Requirements

Primary data on meteorology and air quality that are assembled for this study will be reported electronically and documented in the project final report. Any data that are assembled for this study will also be delivered electronically and documented in the final report. Data that are documented elsewhere, such as methodologies and models used, will be documented in the final report by reference to the original data source. Records will be maintained that include sufficient information to reconstruct each calculation.

5.2 Data Validation Procedures

Raw data will be assessed for accuracy and any extreme values or outliers will be identified and noted in the final report. If a daily average of hourly values is calculated, it will only be done if there is at least 90% data capture.

5.3 Data Analysis and Interpretation

Most of the data will be analyzed quantitatively, using the mean if the data is normally distributed and median or percentiles if it is not normally distributed. Data will be analyzed qualitatively in the daily summary of weather patterns during high ozone events. Inferential statistics will be used to determine the significance of relationships between selected emissions and meteorological variables. All data will be reported using the metric system where applicable for data constancy (meters/second, Celsius, etc.).

5.4 Data Storage Requirements

Hard copy data received during the course of the project will be cataloged into the file index and made available for copying or checkout. Electronic data files will be stored in a specific project directory on AACOG's fileserver network drives. Original data files will be kept in a separate folder and will not be altered or changed. Project staff will make copies of any data files needed and perform their work with the copy. All project staff will have access to these files and all files on the network drive undergo automatic backup each night such that any information can be easily retrieved as necessary. After the final product is completed and approved by TCEQ, all project data will be archived on CD-ROM for storage.

6 DATA REPORTING

6.1 Project Deliverables

The project final delivery will include a report documenting the conceptual model and all data files used in the analysis. The report will describe the steps taken and any background that is relevant to the project. The report will be provided in Microsoft Office Word and Adobe Acrobat Reader (*.pdf) formats. The final report will include the following components:

1. An executive summary and abstract.
2. An introduction that discusses background and objectives. Relationships to other studies will be provided, if applicable.
3. A discussion of the pertinent accomplishments, shortfalls, and limitations of the work completed.
4. Recommendations, if any, for what should be considered next as a new study.

The final report will provide a comprehensive overview of activities undertaken and data collected and analyzed during the grant activity. The final report will highlight major activities and key findings, provide pertinent analyses, describe encountered problems and associated corrective actions, and detail relevant statistics including data, parameter, or model completeness, accuracy and precision.