REVISIONS TO THE STATE IMPLEMENTATION PLAN
FOR THE CONTROL OF OZONE AIR POLLUTION

ATTAINMENT DEMONSTRATION FOR THE
DALLAS/FORT WORTH
OZONE NONATTAINMENT AREA

Appendix A

Model Selection - TNRCC/EPA Letters

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION
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Appendix A

Model Selection - TNRCC/EPA Letters

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Barry R. McBee, *Chairman*
R. B. "Ralph" Marquez, *Commissioner*
John M. Baker, *Commissioner*
Dan Pearson, *Executive Director*

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

April 13, 1998

Mr. Tom Diggs
Air Planning (6PD-L)
U.S. Environmental Protection Agency
Region 6
1445 Ross Avenue
Dallas, Texas 75202-2733

Dear Mr. Diggs:

The Air Quality Planning and Assessment Division of the Texas Natural Resource Conservation Commission (TNRCC) uses photochemical models to develop State Implementation Plans (SIPs). The photochemical model recommended by the *Guideline on Air Quality Modeling* for use in SIP development is the Urban Airshed Model version IV (UAM-IV). An updated version of the UAM is the nested grid version of UAM denoted as UAM-V. Because of the biogenic inventory used by the TNRCC, the U. S. Environmental Protection Agency (EPA) Region 6 office has required us to move to the use of a model that incorporates a modified chemistry for isoprene. The models available to the TNRCC that use this chemistry are the UAM-V version 1.24 or Comprehensive Air Quality Model with Extensions (CAMx). We have used UAM-V version 1.24 in the past, but until Models 3 is operational, we will develop all future SIPs with CAMx.

The TNRCC has used UAM-V for a number of years, but it is a proprietary model, meaning that to use it one must obtain a license from Systems Applications Incorporated (SAI), who developed the model. The version 1.24 of the model, which was used for the Ozone Transport Assessment Group modeling, is located on the EPA bulletin board, and we understand that this version can be used by state agencies for SIP development. The TNRCC has a license to use UAM-V, version 1.23, an earlier version of the model that does not include the new modifications to the isoprene chemistry; however, that license does not extend to any of the stakeholders involved in the SIP development. We do not have an independent license to use UAM-V, version 1.24.

The use of proprietary models for SIP development has recently been discussed at several national forums on model use. The Science and Technology Committee of the Federal Advisory Committee Act Subcommittee on Ozone recently sponsored a workshop on source apportionment. A strongly worded recommendation from the workshop was that proprietary models, such as UAM-V, should not be used for regulatory operations. The same recommendation was a part of the consensus recommendation from modeling experts from around the country who attended an EPA-sponsored workshop on community modeling. At the recent Science Symposium sponsored by North American Research Strategy for Tropospheric Ozone, the two papers on modeling made the same recommendation.

The issue of use of UAM-V has come up at the TNRCC Photochemical Model Oversight Committee meetings. Various stakeholders (members of the American Petroleum Institute and Electric Power Research Institute) would like to run the model with our base case and future case to test control scenarios, but cannot since they do not have a license to use the model. For our previously submitted modeling with UAM-IV, some of these members made model runs and performed various analyses on the model results. The license fee for use of UAM-V is too high for them to justify obtaining a license (see enclosure 1). The same issue came up when the East Texas Council of Governments was reviewing contractor proposals to provide the modeling portion of the technical work to be performed for the Rider 17 funds. SAI indicated that UAM-V could not be used by another consultant without a license (see enclosure 2). In the testimony from the public hearing on our Attainment Demonstration for the Houston/Galveston ozone nonattainment area, the Texas Chemical Council and the UAM Technical Committee commented that a public domain model should have been used for SIP development (see enclosure 3). It is our desire that all photochemical modeling in areas of Texas that may interact with each other be performed with the same model.

Our decision to use UAM-V was based on the principle of using the best science available. This decision was made before other alternate models were available that utilized the same level of science and other operational features included in the UAM-V. At present, both CAMx developed by ENVIRON and SARMAP (San Joaquin Valley AUSPEX Regional Modeling Adaptation Project) Air Quality Model, developed for the California Air Resources Board, incorporate the same level of science.

Texas has spent substantial funds and time developing a state-of-the-science biogenic emissions inventory that we intend to use for SIP development. This approach uses biomass measurement from field sampling coupled with the Biogenic Emissions Model algorithms. The approach uses emission factors and other algorithms that are used in Biogenic Emissions Inventory System Number 2 (BEISII) to develop a detailed inventory. Isoprene emissions are at levels similar to those obtained when using the BEISII. The most recent guidance from the EPA Region 6 office and the EPA Office of Air Quality Planning and Standards indicates that for SIP development with this biogenics inventory, the TNRCC must use a model that uses the new chemistry for isoprene. Version 1.24 of the UAM-V has been used to develop the ozone SIP for the Houston/Galveston nonattainment area that will be submitted in the Spring of 1998. However, because of the difficulty with use of a propriety model, for future SIP development, the TNRCC Air Quality Planning and Assessment Division plans to use a model that is in the public domain and discontinue the use of UAM-V immediately.

Due to the similarity of the input files between UAM-V and CAMx, we plan to use CAMx. We will use the version of CAMx that incorporates the changes to the isoprene chemistry. Since UAM-V is not a guideline model and its use must be justified, we feel that the justification to use CAMx for SIP development should not involve a more extensive effort than that needed for the use of UAM-V.

The UAM-V and CAMx are photochemical air quality models that are based on the same algorithms. The only difference between the two models is a minor difference between the way deposition is evaluated and the algorithm used for plume-in-grid calculations. Both models incorporate the latest version of Carbon Bond IV chemistry using the same modifications to the equations involving isoprene.

The latest version of CAMx was run in the Houston/Galveston (H/G) area with data used for ozone SIP development that was derived from data collected during the *1993 Coastal Oxidant Assessment for* Southeast Texas study. This data set included an enhanced high quality emissions inventory for point, area, non-road mobile, on-road mobile, and biogenic sources. There was an extensive set of meteorological and air quality data collected during this study, including upper air measurements and surface measurements made at locations not routinely monitored. The wind fields used in the modeling were developed with the System Applications Incorporated Meteorological Model (SAIMM) using four dimensional data assimilation nudging. The regulatory version of UAM-IV and versions 1.23 and 1.24 of the UAM-V were also run with this same data set.

The model results were used to develop the standard statistical measures: unpaired peak accuracy, normalized bias, and gross error. These values along with the corresponding values for the analogous model runs with UAM-IV and version 1.24 of the UAM-V are included in the attachment. These show that CAMx performs better than UAM-IV, but that compared to UAM-V, CAMx predicted slightly higher values of ozone. The values of all the statistical measures for CAMx are within the levels recommended for use for SIP development. A summary of the statistical data and time series are enclosed (enclosure 4).

SAIMM was used to develop the meteorological data for the modeling performed in the H/G area to be submitted with the SIP in the Spring of 1998. It has also been used to develop the meteorological data for the modeling in the Dallas-Fort Worth area. Our staff has been trained to run the MM5 model, and we anticipate moving to use of MM5 to develop the meteorological data as soon as possible. This is being done since SAIMM is a proprietary model, and MM5 is a public domain model in wide use across the country. Also, preliminary information indicates that MM5 will be the model recommended for use with Models 3.

The table below briefly summarizes the features of UAM-IV, UAM-V versions 1.23 and 1.24, and CAMx. As you can see, CAMx is the model that addresses the complex needs for photochemical modeling in Texas.

	UAM-IV	UAM-V Version 1.23	Version 1.24	CAMx
Public Domain	X			X
Isoprene Chemistry			X	X
Chemical Compiler				X
Vertical Diffusion		X	X	X
Plume In Grid		X	X	X
Source Apportionment				X

If you have questions about this approach, we would appreciate hearing from you as soon as possible. Please call Mr. Cyril Durrenberger of the TNRCC's Air Quality Planning and Assessment Division (MC164) at (512) 239-1482 if you wish to discuss the matter.

Sincerely,

James W. Thomas, P.E.
Director
Air Quality Planning and Assessment Division
Texas Natural Resource Conservation Commission

JT/CD/aeb

Enclosures

Letter From EPA Region 6 to TNRCC, Dated May 6, 1998

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

MAY - 6 1998

James W. Thomas, P.E.
Director
Air Quality Planning and Assessment Division
Texas Natural Resource Conservation Commission
P. O. Box 13087
Austin, Texas 78711-3087

Dear Mr. Thomas:

This is in response to your letter dated April 13, 1998, which describes the Texas Natural Resource Conservation Commission's (TNRCC) decision to use the Comprehensive Air Quality Model with Extensions (CAMx) for all future State Implementation Plan (SIP) development. Since CAMx, like UAM-V, is not the guideline model, the application of CAMx for regulatory purposes must be addressed on a case by case basis.

Recently, TNRCC modeling staff and Environmental Protection Agency (EPA) Region 6 staff have been discussing the provisions for using CAMx instead of UAM-IV (i.e., the regulatory photochemical model) for the development of the current Dallas/Fort Worth (DFW) SIP. Due to the many advantages provided by CAMx listed in your letter (i.e., non-proprietary, source apportionment, etc), EPA is receptive to the use of CAMx for DFW, if it can be demonstrated that the model is at least as suitable as UAM-IV. Due to the relatively short time frame for completing the DFW SIP modeling, EPA agreed that the typical justification based upon a comparison of CAMx vs. UAM-IV for one or more of the current episodes being modeled for DFW was not feasible. Therefore, the justification for the use of CAMx for the current DFW SIP modeling was to be based upon a comparison between CAMx vs. UAM-IV for the recently completed Houston/Galveston (H/G) SIP modeling. As indicated in your letter, CAMx yields better statistical performance than UAM-IV (the regulatory model) based on the September 6-11, 1993 COAST episode for the H/G nonattainment area. After reviewing the modeling results coupled with a number of discussions with your staff and the Office of Air Quality Planning and Standards staff, use of CAMx for TNRCC's current DFW SIP modeling is acceptable. However, since the meteorological regimes under which ozone exceedances occur in H/G and DFW are somewhat different, as well as the emission composition; and since CAMx has not had the widespread use for regulatory applications in urban areas, TNRCC's application in the DFW area should include sufficient diagnostic and sensitivity analyses to adequately evaluate and ensure that suitable model performance is being achieved for the right reasons.

MAY 12 1998
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In the past, EPA has approved TNRCC's use of UAM-V, based on the principle of using the best science available to develop the ozone SIP for the H/G nonattainment area. Prior to that, TNRCC satisfied the requirement of conducting a comparison between UAM-V and UAM-IV (the regulatory model), and demonstrated UAM-V performs as well if not slightly better than UAM-IV. In addition, it would be more appropriate for TNRCC to use its state-of-the science biogenic emission inventory with UAM-V rather than using it with UAM-IV, as originally proposed by TNRCC. Because of the CB-IV mechanism used in the UAM-IV, which has not been adjusted for the higher isoprene rates associated with BIOME and BEIS2, the use of BIOME with UAM-IV was not recommended. Since then, TNRCC used UAM-V to develop a majority of the H/G SIP. An extensive model performance evaluation (i.e., sensitivity tests, diagnostic tests, etc.) was conducted on the UAM-V prior to using it in the attainment demonstration analyses.

As mentioned in your letter, TNRCC also intends to substitute CAMx in continuing H/G modeling to derive specific control strategies. However, we recommend that to use CAMx in a regulatory application, or any other models (i.e., UAM-IV, UAM-V) for that matter, the entire modeling application should be, at the minimum, conducted with the same model. Specifically, to use CAMx for the H/G SIP modeling, TNRCC must apply CAMx as any other model would be routinely exercised for SIP attainment demonstration purposes. This means executing CAMx for each of the COAST meteorological episode (i.e., at least three episodes, as required) which includes: (1) conducting model performance evaluation (i.e., sensitivity tests, diagnostic tests, etc.) on the base cases to demonstrate that CAMx is adequately replicating observed ozone concentrations and patterns; (2) conducting VOC and/or NOx reduction scenarios with the 2007 projected emission inventory to demonstrate attainment of ozone NAAQS; and, (3) conducting modeling to test and demonstrate the specific control measures to be used to bring the H/G area into attainment of the ozone NAAQS . Finally, the modeling protocol must also be revised accordingly and resubmitted to EPA.

Again, we wish to thank you and your staff for working with us and keeping us informed of all the SIP modeling activities. If you have any questions, please feel free to contact me or Quang Nguyen of my staff at (214) 665-7238.

Sincerely yours,

Thomas Diggs
Chief
Planning Section

cc: Ellen Baldridge