



**Western Regional Air Partnership (WRAP)
Regional Modeling Center (RMC)**

**Monthly Progress Report
for February 2006**

Prepared by

University of California, Riverside (UCR)

ENVIRON International Corporation

University of North Carolina's Carolina Environmental Program (UNC-CEP)

Introduction

This is the February 2006 Monthly Progress Report that covers the activities of the Western Regional Air Partnership (WRAP) Regional Modeling Center (RMC).

Background

The WRAP RMC is composed of staff from the University of California, Riverside (UCR), ENVIRON International Corporation, and the University of North Carolina's Carolina Environmental Program (UNC-CEP). The Principal Investigator and Project Manager for the RMC is Dr. Gail Tonnesen of UCR (tonnesen@cert.ucr.edu). Mr. Ralph Morris (rmorris@environcorp.com) and Mr. Zac Adelman (zac@unc.edu) lead the RMC efforts at ENVIRON and UNC-CEP, respectively. The RMC is the contractor for meteorological, emissions, and air quality modeling and analysis performed for the WRAP region's states and tribes to provide the analytical results needed to address the requirements of the EPA Regional Haze Rule.

Current responsibilities of the RMC include:

- Emissions processing and modeling
- Air quality and visibility modeling simulations
- Analysis, display, and reporting of modeling results
- Storage and quality assurance of the modeling input and output files

The tasks and deliverables discussed in this report are based on the WRAP RMC 2005-06 work plan, which is available on the WRAP RMC web site:

<http://pah.cert.ucr.edu/aqm/308/docs.shtml>

The tasks are linked to and based on the WRAP Strategic Plan and the WRAP 2005 Work Plan, found at:

http://wrapair.org/WRAP/meetings/031014board/Tab_4_Strategic_Plan_Final.pdf

http://wrapair.org/WRAP/documents/041207WRAP_CY05_Final_Workplan.pdf

The WRAP Technical Coordinator (Tom Moore) and the cochairs of the WRAP Modeling Forum (John Vimont of the National Park Service, Mary Uhl of the New Mexico Environment Department, and Kevin Briggs of the Colorado Department of Public Health and Environment) provide day-to-day oversight of RMC activities, and the Modeling Forum oversees the activities of the RMC through monthly conference calls, topical conference calls, and periodic in-person meetings and workshops.

The WRAP is one of five Regional Planning Organizations (RPOs) consisting of states, tribes, federal and local agencies, and stakeholders charged with the responsibility for conducting technical analyses and assisting in the development of State Implementation Plans (SIPs) and Tribal Implementation Plans (TIPs) for regional haze in different areas of the United States.

Overview of WRAP RMC 2005-06 Work Effort

The WRAP RMC 2005-06 work effort is focused on the following activities (please refer to the 2005-06 work plan for background information):

- 1) Finalize the 2002 base case input data and the selection of models to be used for future-year 2018 modeling.
- 2) Implement final performance metrics, displays, and methods to project future-year model results.
- 3) Complete and analyze a 2018 base case modeling scenario.
- 4) Complete and analyze several emissions reduction and emissions sensitivity scenarios.
- 5) Perform additional source apportionment model simulations.
- 6) Complete the visibility modeling effort for Alaska.

The overall objective of the 2005-06 work plan is to complete all modeling studies and documentation needed for development of §308 SIPs and TIPs for regional haze. The WRAP visibility modeling system comprises the Sparse Matrix Operator Kernel Emissions (SMOKE) emissions model, the Fifth-Generation Mesoscale Model (MM5) meteorological model, and the Community Multiscale Air Quality (CMAQ) model. The WRAP modeling domain consists of a continental U.S. 36-km domain and a western U.S. 12-km domain. The WRAP RMC modeling efforts also include analysis of specific topics to support the other WRAP forums. The RMC's 2005-06 work effort as laid out in the work plan is divided into 12 tasks, listed below. Note that Task 3 is not covered in this report because it was essentially completed by the end of project year 2004.

- Task 1: Project Administration, Major Project Reports, and Computer Hardware and Systems Administration
- Task 2: Emissions Modeling, Processing, and Analysis
- Task 3: Test, Improve, Quality Control, Obtain External Peer Review, and Finalize 36-km and 12-km MM5 Simulations for Eventual Use in CMAQ (*completed in project year 2004*)
- Task 4: Air Quality Model Evaluation for 2002 Annual Simulation
- Task 5: Testing and Further Improvements to the Windblown Dust Emissions Modeling Methodology
- Task 6: BART Source Sensitivity Screening Using CALPUFF
- Task 7: Sensitivity Studies Designed to Evaluate Uncertainties in Fire Emissions

- Task 8: Preliminary Meteorological, Emissions, and Air Quality Modeling Activities for Alaska
- Task 9: Further Analysis of Model Performance in Regard to the Contribution of Natural Emissions to Visibility Impairment
- Task 10: Preparation and Reporting of Geographic Source Apportionment Results
- Task 11: Technology Transfer
- Task 12: Computer Hardware

Highlights for the February 2006 Reporting Period

- *Task 1—Project Administration, Major Project Reports, and Computer Hardware and Systems Administration:* Much of this month's project management work was related to defining the 2006 work plan and budgets for the RMC. Numerous conference calls and iterations of the work plan and budgets occurred.
- *Task 2—Emissions Modeling, Processing, and Analysis:* We assigned priorities to the upcoming emissions simulations and began to formulate a plan for how to approach the emissions modeling tasks through the rest of the project period. We collected the data for and began modeling the next round of annual simulations, starting with Base 2002 version B (Base02b).
- *Task 4—Air Quality Model Evaluation for 2002 Annual Simulation:* Model evaluation results were analyzed to assist in quality assurance of the 2002 emissions inventory.
- *Task 5—Testing and Further Improvements to the Windblown Dust Emissions Modeling Methodology:* No work was performed during February. We are awaiting air quality modeling results with and without the windblown dust emissions in order to complete the final task report.
- *Task 6—BART Source Sensitivity Screening Using CALPUFF:* As part of creating the 2006 work plan and budget, we have revised the RMC work to be performed under this task. We will be assisting the States in performing BART CALPUFF modeling. For States unable to perform CALPUFF modeling, we will perform the BART CALPUFF modeling for them.
- *Task 7—Sensitivity Studies Designed to Evaluate Uncertainties in Fire Emissions:* We finished analyzing the CMAQ small-fire sensitivity simulations for two months (July and November) on the 12-km CMAQ grid in which we had removed all small fires. We also selected one wildfire event and applied an alternative plume rise algorithm. We will compare the results reflecting the effects of this different approach with results from the standard approach that we have been using. A PowerPoint presentation was prepared for the Fire Emissions Joint Forum meeting.

- *Task 8—Preliminary Meteorological, Emissions, and Air Quality Modeling Activities for Alaska:* We transferred the Alaska 2002 MM5 database processed for CALMET/CALPUFF to the Alaska DEQ.
- *Task 9—Further Analysis of Model Performance in Regard to the Contribution of Natural Emissions to Visibility Impairment:* We performed no new work on this task during February.
- *Task 10—Preparation and Reporting of Geographic Source Apportionment Results:* Activities are deferred until we complete revisions to the 2018 version B emissions.
- *Task 11—Technology Transfer:* We responded to several questions and requests from WRAP member states and tribes.
- *Task 12—Computer Hardware:* We conducted routine maintenance of computer systems.

February 2006 RMC Status Report

Below we discuss our progress during this monthly reporting period (February 2006) and expected activities during the next reporting period (March 2006). We also describe any difficulties encountered and their resolutions.

Task 1: Project Administration, Major Project Reports, and Computer Hardware and Systems Administration

Purpose:

Within Task 1, the project administration subtask includes deliverables tracking and display, coordination with modeling efforts supported by other RPOs, attending meetings, participating in conference calls, and general project management. The major project reports subtask covers preparation of four reports: the 2004 final report, the 2002 model performance report, the 2018 base case modeling report, and the RMC 2005-06 project final report. The computer hardware and systems administration subtask includes maintenance, updates, expansion, and optimization of the computing systems (software and hardware updates, maintenance of the project web site and listservs, and data backups and archiving).

Progress During This Reporting Period:

Project Administration:

UCR, ENVIRON, and UNC-CEP participated in monthly project administration and WRAP Modeling Forum conference calls. Each contractor also contributed to the monthly progress report and prepared invoices. We participated in numerous conference calls with the WRAP Modeling Forum to revise the RMC work plan and budget for 2006.

Major Project Reports:

The final 2002 model performance evaluation report was posted to the WRAP RMC web site on February 27, 2006.

Expected Progress During the Next Reporting Period:

We will revise the 2006 RMC work plan and budget.

Difficulties Encountered and Resolutions:

None.

Task 2: Emissions Modeling, Processing, and Analysis

Purpose:

To develop final emissions inventories for the 2002 model performance evaluation case, a typical 2002 case, a 2018 base case, and several 2018 emissions control strategy cases.

Progress During This Reporting Period:

Technical Activities:

Our primary focus in February was to devise an approach for completing a series of revised base 2002, planning 2002, and future base 2018 annual simulations, along with a group of emissions sensitivities, through the end of the project period. We developed a set of worksheets based on the tasks in the 2005-06 work plan and on discussions we had at the January Modeling Forum meeting in San Diego. From these task lists we developed a list of priorities for how to complete the modeling and QA of the planned simulations within the remaining time and budgets. In February we began work on the highest priority simulation, a revision to the 2002 model performance evaluation simulation, or the Base 2002 version B (Base02b) scenario. This simulation encompasses major changes to the stationary point inventories and minor changes to the Gulf of Mexico offshore area inventories; the rest of the inventory sectors did not change from the Planning 2002 version A (Plan02a) or Base 2002 version A (Base02a) scenarios.

Preparation of the 2002 Model Performance Report, 2018 Base Case Modeling Report, and 2005-06 Project Report:

We documented the changes to simulation Base02b relative to the Base02a and Plan02a simulations. We will include the documentation of these changes in the 2005-06 final project report. We also compiled a list of the changes that will be implemented in the Planning 2002 version B (Plan02b) and Base 2018 version B (Base18b) simulations relative to the initial versions of these simulations.

Expected Progress During the Next Reporting Period:

In March, we plan to complete version B of the Base 2002 simulation and to begin version B of the Base 2018 simulation. These simulations will include a series of corrections to issues that we discovered during the first round of modeling using these datasets.

Difficulties Encountered and Resolutions:

The only issues that we worked through during February concerned reconciling the planned activities in the 2005-06 work plan with what we have accomplished to date. We also developed budget and timing estimates for a list of pending simulations developed during discussions at the January Modeling Forum meeting. After working to clarify the status of the remaining budget

and timing for the remainder of the project period, we were able to assign priorities to the simulations that we will work to complete between now and the end of the project.

Task 4: Air Quality Model Evaluation for 2002 Annual Simulation

Purpose:

To complete the 2002 base-year air quality modeling performed with CMAQ and CAMx, 2000-2004 typical-year modeling, 2018 base case modeling, and a series of 2018 control strategy modeling runs. Also, to perform model bug fixes, model version updates, and sensitivity experiments.

Progress During This Reporting Period:

Technical Activities:

We completed the annual 36-km CMAQ 2018 simulation and the comparison of CMAQ 2018 to the CMAQ 2002 typical simulation for the purpose of completing the glide path calculations. We posted all results to the project web site (see <http://pah.cert.ucr.edu/aqm/308/cmaq.shtml>). Further model evaluation activities under this task in February were aimed at assisting in the quality assurance of the 2002 emissions.

Preparation of the 2002 Model Performance Report, 2018 Base Case Modeling Report, and 2005-06 Project Report:

We completed the final 2002 model performance evaluation report and posted it to the RMC web site on February 27, 2006.

Expected Progress During the Next Reporting Period:

We will revise the emissions inventories for the 2002 typical simulation and the 2018 simulation to develop a version B.

Difficulties Encountered and Resolutions:

None.

Task 5: Testing and Further Improvements to the Windblown Dust Emissions Modeling Methodology

Purpose:

To implement further improvements to the windblown dust emissions modeling methodology, and to test the effect of alternative schemes in CMAQ. (This is an optional task that is a follow-on to the 2004 task covering the same topic, and will be implemented only if we are directed to do so by the WRAP Dust Emissions Joint Forum.)

Progress During This Reporting Period:

Technical Activities:

No work was performed on this task. We are awaiting results from the CMAQ model with and without the windblown dust emissions in order to complete the analysis and the final task report.

Preparation of the 2002 Model Performance Report and 2005-06 Project Report:

None.

Expected Progress During the Next Reporting Period:

The windblown dust emissions model task report will be revised to discuss the updates to the model. CMAQ modeling runs and analyses will be performed using the new dust estimates. We will implement the new results and address the comments on the revised draft task report. Improvements to the methodologies will be incorporated as appropriate.

Difficulties Encountered and Resolutions:

None.

Task 6: BART Source Sensitivity Screening Using CALPUFF

Purpose:

To assist States in addressing the modeling requirements of the Best Available Retrofit Technology (BART) component of the Regional Haze Rule (RHR).

Progress During This Reporting Period:

Technical Activities:

The anticipated RMC role could consist of (1) assisting states as requested, such as providing MM5 data for CALPUFF modeling and recommending CALPUFF modeling approaches that can be used by the states; (2) performing CALMET/CALPUFF modeling of BART-eligible sources in Alaska; and (3) performing regional modeling using CAMx/PSAT and/or CMAQ to examine alternative programs or other aspects of BART. In January, we prepared a BART modeling plan outline for review by the appropriate WRAP forums. In February, the RMC BART modeling work effort was refined as part of developing the RMC 2006 work plan and budget.

Preparation of the 2002 Model Performance Report, 2018 Base Case Modeling Report, and 2005-06 Project Report:

None.

Expected Progress During the Next Reporting Period:

The RMC will assist States in performing their BART CALPUFF modeling by providing CALMET/CALPUFF-ready MM5 data for 2001 (36 km), 2002 (12 km), and 2003 (36 km) for States that request them. Also, we are currently discussing with some States whether they would like the RMC to conduct the BART CALPUFF modeling for them.

Difficulties Encountered and Resolutions:

None.

Task 7: Sensitivity Studies Designed to Evaluate Uncertainties in Fire Emissions

Purpose:

To perform additional modeling studies to evaluate sensitivity to uncertainty in the fire emissions inventory. Major uncertainties include the effect of the plume rise height for fire emissions, and the effects of small fires in or near Class I areas.

Progress During This Reporting Period:

Technical Activities:

We finished analyzing the results of the CMAQ small-fire sensitivity simulations for two months (July and November) for the 12-km CMAQ grid in which we removed all small fires. We also processed one wildfire event to determine differences in the plume rise and vertical distribution of the emissions using two plume rise algorithms: (1) hourly precomputed plume rise values supplied by the Fire Emissions Joint Forum (FEJF), and (2) the EPA/USFS Blue Sky algorithm that uses the spatial area and heat flux to calculate plume rise. We are comparing the vertical distribution of the emissions from this fire event using these two approaches. A PowerPoint presentation was prepared for the FEJF meeting.

Preparation of the 2002 Model Performance Report and 2005-06 Project Report:

None.

Expected Progress During the Next Reporting Period:

We will prepare a report describing the fire sensitivity simulations. In addition, after the initial comparison of the two plume rise algorithms, we will choose 5-6 other fire events to process and input to CMAQ for a sensitivity analysis assessing how each plume rise approach affects CMAQ predictions.

Difficulties Encountered and Resolutions:

None.

Task 8. Preliminary Meteorological, Emissions, and Air Quality Modeling Activities for Alaska

Purpose (exact purpose is TBD):

To model point and urban sources in Alaska using a 2002 modeling database based on the MM5, CALMET, and CALPUFF models.

Progress During This Reporting Period:

Technical Activities:

Previously we submitted a report on Alaska 2002 MM5 meteorological modeling. During February, we transferred the 2002 MM5 data in a CALMET-ready format to the Alaska DEQ, at their request.

Expected Progress During the Next Reporting Period:

We will continue preparing the Alaska CALPUFF modeling report.

Difficulties Encountered and Resolutions:

None.

Task 9. Further Analysis of Model Performance in Regard to the Contribution of Natural Emissions to Visibility Impairment

Purpose:

To identify the CMAQ “floor” (i.e., the minimum level to which visibility impairment could be reduced by controlling all anthropogenic emissions), and determine whether the base model runs are too “clean.”

Progress During This Reporting Period:

Technical Activities:

We performed no new work on this task during February.

Preparation of the 2002 Model Performance Report and 2005-06 Project Report:

None.

Expected Progress During the Next Reporting Period:

We will re-create the natural emissions simulation during the next two months, further refining the definition of natural emissions sources. We plan on re-creating the windblown dust emissions to differentiate between the natural and anthropogenic components of these data. There is also discussion on whether we should use the typical fire inventories or continue to use the actual 2002 data.

Difficulties Encountered and Resolutions:

None.

Task 10. Preparation and Reporting of Geographic Source Apportionment Results

Purpose:

To perform additional source apportionment simulations using either the CMAQ Tagged Species Source Apportionment (TSSA) or CAMx PM Source Apportionment Technology (PSAT) models, with the choice to be made based on further evaluation of both models.

Progress During This Reporting Period:

Technical Activities:

None.

Preparation of the 2002 Model Performance Report, 2018 Base Case Modeling Report, and 2005-06 Project Report:

None.

Expected Progress During the Next Reporting Period:

We expect to begin the CAMx PSAT simulations using the 2018 scenario, but we still need to finish selecting the emissions categories to be analyzed for source apportionment. After finalizing the setup, we will create the needed emissions files and begin the source apportionment model simulations. It could take several months to complete emissions processing and CAMx PSAT modeling.

Difficulties Encountered and Resolutions:

None.

Task 11: Technology Transfer

Purpose:

To transfer the models, model evaluation tools, and data sets to the states and tribes so that they can perform additional studies of emissions reduction strategies, including supporting these groups in model setup and operation.

Progress During This Reporting Period:

Technical Activities:

We replied to several requests for data and information about the visibility modeling.

Preparation of information on the availability of data and tools, to be included in the 2002 Model Performance Report, 2018 Base Case Modeling Report, and 2005-06 Project Report:

None.

Expected Progress During the Next Reporting Period:

We will perform routine updates to the web site, as needed.

Difficulties Encountered and Resolutions:

None.

Task 12: Computer Hardware

Purpose:

To acquire new/additional equipment to support the RMC's work on the above tasks.

Progress During This Reporting Period:

We conducted routine maintenance and repair of computers and data storage systems.

Expected Progress During the Next Reporting Period:

None.

Difficulties Encountered and Resolutions:

None.