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Emissions Processing Training and Technical Assistance Final Report

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1 INTRODUCTION

The Texas Commission on Environmental Quality (TCEQ) uses chemical transport models (CTM) such as Comprehensive Air Quality Model with Extensions (CAMx) and Community Multiscale Air Quality Modeling (CMAQ) to fulfill regulatory requirements such as attainment demonstration modeling for the eight-hour ozone National Ambient Air Quality Standards (NAAQS). A key input for these models is emissions from all anthropogenic and non-anthropogenic sources such as points, mobile, area, fire, etc. Emissions processing refers generally to formatting an emission inventory for input to a CTM. Emissions processing tasks vary depending on the source categories as different source types are described by different types of data. Ensuring that emissions inputs are accurate and precise requires a good understanding of each source category and the use of specialized emissions processing software to temporize, chemically speciate, and grid emissions for input to the CTM. The TCEQ currently uses the Emissions Processing Software version 3 (EPS3) for processing the emissions inputs for CTMs. In addition, the TCEQ uses several source-specific models to estimate emissions from certain source categories such as shipping, mobile sources, fires, etc.

Over the past few years, the TCEQ's Air Modeling Team (AMT) had added several new staff, most of whom will perform supporting roles developing emissions data files for CTM but have limited experience with emissions processing. Formal EPS3 training will help prepare the next generation of modeling staff to take over the critical modeling roles currently filled by one or two experienced modelers. In this study, Ramboll provided an overview of the fundamentals of emissions processing and customized training on the various aspects of emissions processing based on TCEQ's needs. Ramboll also provided technical assistance as TCEQ's AMT staff use the training to create inputs for a new 2019 CTM Modeling Platform.

1.1 Project Objectives

The project has three objectives:

- 1) Conduct a webinar introducing the basics of emissions processing (Task 3);
- 2) Conduct virtual hands-on training for selected AMT staff on points, area, mobile and shipping emissions (Task 4);
- 3) Provide technical support to AMT staff in matters relating to 2019 Modeling Platform Development (Task 5).

2 PROJECT ACTIVITY SUMMARY

2.1 Training Activities

The training occurred in two stages. First, Ramboll provided a general introduction webinar open to Air Quality and Air Permits staff. The webinar introduced various emissions sources, emission inventory development objectives, and emission processing systems. Selected AMT staff were then trained on emission processing for four major source categories: area, point, commercial marine shipping, and mobile. For each source category, the training included an introduction webinar covering source category emissions basics as well as the use of EPS3 to prepare emissions for CTM input. The source-specific introduction was then followed by a virtual hands-on training. The hands-on training provided various exercises that introduce source category specific emissions processing tasks/concepts and guided AMT staff through the exercises. Each AMT staff was assigned a working folder (on TCEQ computers) that contains necessary training modeling files. Other training materials including PowerPoint Presentations and self-guided learning manuals were provided prior to the training. Each hands-on session was concluded with individual assignment feedbacks and group discussions. Table 2-1 summarizes training activities and schedules completed in this study. All training sessions were recorded and made available by the TCEQ project manager.

Table 2-1. Training Topics and schedules

Topic	Type	Task	Training Date	Attendance
Introduction to Emission Inventories and Emission Processing	Presentation	Deliverable 3.1	January 20, 21	AMT and interested Air Quality Division and Air Permits Division staff
Area sources	Presentation and Hands-on	Deliverable 4.2	February 2-4	Seven AMT staff
Point sources	Presentation and Hands-on	Deliverable 4.1	February 10-12	Seven AMT staff
Commercial Marine Vessels	Presentation and Hands-on	Deliverable 4.3	March 1, 3 and 4	Five AMT staff
Mobile sources	Presentation and Hands-on	Deliverable 4.4	May 3-6	Five AMT staff

2.2 Technical Assistance/Guidance for 2019 Modeling Platform

Ramboll assisted (by email, phone, and/or virtual meeting) AMT staff relating to 2019 Modeling Platform Development as necessary. Below we summarize the assistance provided.

Ramboll assisted AMT staff in the development of the Texas commercial marine vessel (CMV) for the year 2019 using year-specific vessel tracking data from the Automatic Identification System (AIS) and vessel characteristics data from the Sea-web Ships database following the latest applicable EPA guidance and methodologies. Ramboll used the MARINE Emissions Resolver (MARINER) tool to support the production of a detailed CMV EI for use in photochemical modeling. MARINER was previously developed by Ramboll (TCEQ WO 582-20-12636-017) and was recently updated (TCEQ WO 582-21-11294-001). MARINER was run for the 4 km Texas modeling domain (Figure 2-1) separating into multiple regional streams (e.g., Texas waters, federal waters, Mexico). Outputs from MARINER were processed with EPS3 to develop CAMx-ready emissions (in point source format) that can be merged with other point source files or used directly in CAMx. Ramboll provided TCEQ with the 2019 CMV EPS3 setup, inputs, and outputs.

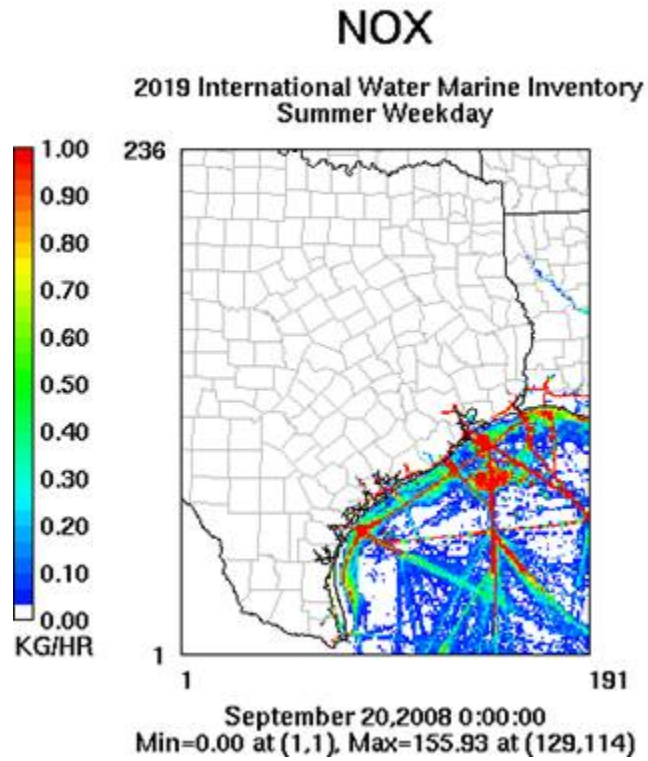


Figure 2-1. 2019 CMV NOx emissions in the Texas 4 km modeling domain

Other assistances performed until this Task include:

- Assisted TCEQ in the projection of the CEDS global emissions inventory from its base year 2014.
- Provided guidance on quality assurance of the FINN fire emissions.
- Conference calls on CAMx Utilities to reformat emission files

3 CONCLUSIONS AND RECOMMENDATIONS

Emissions processing is a critical step in the preparation of emissions inputs to the CTM. Emissions processing tasks vary depending on the source categories as different source types are described by different types of data. Understanding these differences and operation of emission processing tools helps ensure accurate emissions inputs to the CTM.

Ramboll provided emissions processing training to the TCEQ's AMT staff so that they can use the training to create emission inputs using EPS3 for a new 2019 CTM Modeling Platform. The training was conducted in series:

- Introduction webinar provided an overview of the fundamentals of emission inventory development and emissions processing. The webinar was open to AMT and other TCEQ departments. The introduction webinar provided was well-received by audiences with different knowledge background as indicated by the constructive feedbacks shared by the TCEQ project manager.
- Customized hands-on training to selected AMT staff for four major source categories: area, point, commercial marine shipping, and mobile.
 - Overview of the source category and required processing tasks
 - Hands-on exercises with self-guided manual for reference

TCEQ's AMT staff are currently using the training to create inputs for the new 2019 modeling platform.

In addition to the training, Ramboll provided technical assistance on development of emission inputs for other sources not covered in this training. The major effort went into the development of the 2019 CMV EI for the TCEQ 4 km modeling domain. Ramboll provided TCEQ with the 2019 CMV EPS3 setup, inputs, and outputs.

3.1 Recommendations

AMT staff may benefit from new utilities and additional trainings:

- Hands-on training on the latest MEGAN biogenic emission model
- Hands-on training on the MARINER software that automates the generation of commercial marine vessels' emissions
- Trainings on utilities related to emission formatting
- Improvement of PM speciation data representation in Texas point source inventories. Unlike VOC, the Texas STARS inventory doesn't contain individual PM compounds so we will rely on SPECIATE profiles and assign them to Texas inventory sources.
- Improvement of the MARINER software to speed-up the processing time

4 REFERENCES

Ramboll Environ, 2015. EPS3 User's Guide. Emission Processor Version 3.22