

AQRP Monthly Technical Report

PROJECT TITLE	Evaluating Updates to CAMx and NOx Emission Inventories using TEMPO Measurements over Texas	PROJECT #	24-004
PROJECT PARTICIPANTS	Ramboll George Washington University Saint Louis University	DATE SUBMITTED	July 9, 2025
REPORTING PERIOD	From: June 1, 2025 To: June 30, 2025	REPORT #	6

A Financial Status Report (FSR) and Invoice will be submitted separately from each of the Project Participants reflecting charges for this Reporting Period. I understand that the FSR and Invoice are due to the AQRP by the 15th of the month following the reporting period shown above.

Detailed Accomplishments by Task for reporting period

Task 1: Texas 4-km Comprehensive Air quality Model with Extensions (CAMx) baseline simulation for Nitrogen Dioxide (NO₂) and Ozone

None.

Task 2: Create TEMPO NO₂ Diurnal Profiles and Compare to Diurnal Nitrogen Oxides (NOx) Emission Maps

None.

Task 3: Comparison of NO₂ Columns between CAMx and TEMPO

Compared CAMx NO₂ columns by emissions sector for new sensitivity simulation against both TROPOspheric Monitoring Instrument (TROPOMI) and TEMPO NO₂ columns and prepared spatial maps.

Task 4: CAMx Updates and Testing

Continued literature review, held internal discussions and made updates to Model of Emissions of Gases and Aerosols from Nature (MEGAN) soil NOx parameterization. Continued CAMx sensitivity simulations exploring MEGAN soil NOx updates. Continued model performance evaluation at NO₂ and ozone surface monitors for these sensitivity simulations. Selected final CAMx simulation with updated MEGAN soil NOx updates, completed CAMx simulation and completed model performance evaluation at NO₂ and ozone surface monitors.

Task 5: Estimating NOx Emissions by Sector and by Time of Day using CAMx Source Apportionment and TEMPO Retrievals

Continued using Multi-Linear Regression (MLR) technique to estimate NOx emissions by sector and time of day using CAMx NO₂ source apportionment results and TROPOMI and TEMPO satellite retrievals. Began using same MLR technique applied to final CAMx simulation.

Task 6: Project Management and Reporting

Submitted Monthly Technical Report for May 2025.

Preliminary Analysis

Our comparison of the CAMx base case against satellite NO₂ columns reveals a high bias in rural areas. Additionally, we found the base case simulation has a high ozone bias across most of the East Texas CAMx 4 km domain. We therefore investigated MEGAN soil Nitrogen Oxide (NO) and Nitrous Acid (HONO) emissions and made updates based on literature review. Using these new, lower soil NO_x emissions, we performed a CAMx sensitivity simulation for a short period that showed improved performance for surface NO₂ and ozone. We then created MEGAN biogenic emissions applying these updates and ran a CAMx simulation for the entire modeling period. Evaluation of this final CAMx simulation against satellite NO₂ measurements is underway. Our final report will document our biogenic emissions updates and comparison of both simulations against TEMPO and TROPOMI NO₂ columns.

Data Collected

None.

Identify Any Problems or Issues Encountered and Proposed Solutions or Adjustments

None.

Goals and Anticipated Issues for the Succeeding Reporting Period

Complete comparison of NO₂ columns with final CAMx simulation under Task 3. Continue application of MLR technique to final CAMx source apportionment results to estimate NO_x emissions by sector and time of day under Task 5. Begin compiling draft final report with delivery by August 1.

Detailed Analysis of the Progress of the Task Order to Date

None.

Do you have any publications related to this project currently under development? If so, please provide a working title, and the journals you plan to submit to.

Yes No

Do you have any publications related to this project currently under review by a journal? If so, what is the working title and the journal name? Have you sent a copy of the article to your AQR Project Manager and your TCEQ Liaison?

Yes No

Do you have any bibliographic publications (ie: publications that cite the project) related to this project that have been published? If so, please list the reference information. List all items for the lifetime of the project.

Yes No

Do you have any presentations related to this project currently under development? If so, please provide working title, and the conference you plan to present it (this does not include presentations for the AQRP Workshop).

Yes No

Do you have any presentations related to this project that have been published? If so, please list reference information. List all items for the lifetime of the project.

Yes No

Have any personnel changes occurred that were not listed in the original proposal? If so, please include a detailed description of the personnel change(s) below.

Yes No

We propose a reallocation of budget allocated to Ramboll subcontractors. Our original Workplan and contract set up the following budget amounts for three subcontractors to Ramboll:

Benjamin de Foy: \$30,000

Dan Goldberg: \$30,000

Daniel Huber: \$10,000

We do not propose any change to Benjamin de Foy's budget amount.

Dan Goldberg ended has performed more work than anticipated for this project, due to Daniel Huber's involvement with other research projects.

Our team (Ramboll and subcontractors Dan Goldberg and Daniel Huber) proposes that the budget should be reallocated to:

Dan Goldberg: \$37,500

Daniel Huber: \$2,500

The total amount of \$70,000 to Ramboll subcontractors would not change.

Are any delays expected in the progress of the research? If so, please include a detailed description of the potential delay below.

Yes No

Describe any possible concerns/issues (technical or non-technical) that AQRP should be made aware of.

**Are you anticipating using all the available funds allocated to this project by the end date?
If not, why and approximately what is the amount to be returned?**

Yes **No**

Submitted to AQRP by Jeremiah Johnson