

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	June 8, 2025
REPORTING PERIOD	From: May 1, 2025 To: May 31, 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

Completed NO₂ and ozone base case model performance evaluation at surface monitors.

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

Compared Tropospheric Emissions: Monitoring of Pollution (TEMPO) NO₂ columns against CAMx diurnal NOx emissions for base case simulation.

Task 3: Comparison of NO₂ Columns between CAMx and TEMPO

Compared CAMx NO₂ columns by emissions sector for base case simulation against both TROPospheric Monitoring Instrument (TROPOMI) and TEMPO NO₂ columns and prepared spatial maps.

Task 4: CAMx Updates and Testing

Conducted literature review and implementation of nitrate photolysis updates in CAMx. Conducted literature review, held internal discussions and made updates to Model of Emissions of Gases and Aerosols from Nature (MEGAN) soil NOx parameterization. Performed CAMx sensitivity simulations exploring MEGAN soil NOx updates and alternative boundary conditions. Started model performance evaluation at NO₂ and ozone surface monitors for these sensitivity simulations.

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

Began 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.

Task 6: Project Management and Reporting
Submitted Monthly Technical Report for April 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. 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

Configure final CAMx simulation informed by comparison to TEMPO satellite measurements and evaluation at surface monitoring stations. Compare NO₂ columns with final CAMx simulation under Task 3. Apply MLR technique to new CAMx source apportionment results to estimate NO_x emissions by sector and time of day under Task 5.

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 AQRP 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

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