Monthly Technical Report

(Due to AQRP Project Manager on the 8th day of the month following the last day of the reporting period.)

PROJECT TITLE	Targeted Improvements in the Fire INventory from NCAR (FINN) Model for Texas Air Quality Planning	PROJECT #	14-011
PROJECT PARTICIPANTS (Enter all institutions with Task Orders for this Project)	The University of Texas at Austin ENVIRON International Corporation	**DATE SUBMITTED**	2/5/15
REPORTING PERIOD	**From:** February 1, 2015 **To:** February 28, 2015	**REPORT #**	8

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

Task 1. Regional Land Cover Characterization

Land cover characterization is a critical element in the estimation of fire emissions, as it is used to establish emission factors and fuel loadings. The Moderate Resolution Imaging Spectroradiometer (MODIS) Land Cover Type (LCT) product is used to characterize vegetation types in the default FINN v.1 configuration. This study is adding alternative land cover representations based on other global and U.S. national and regional land cover products to the FINN model. These include the European Space Agency's (ESA's) Climate Change Initiative Land Cover (CCI-LC) product released in 2014, the Fuel Characteristic Classification System (FCCS) database and National Agricultural Statistical Service (NASS) Cropland Data Layer (CDL) both of which are available for the continental United States, and a high resolution regional land use/land cover database for Texas and surrounding states developed by Popescu et al. (2011). We anticipate conducting the following sensitivity studies with FINN using these land cover products alone or in combination: (1) MODIS LCT; (2) ESA CCI-LC; (3) FCCS in the continental United States; (4) FCCS with croplands characterized by the CDL in the continental United States; (5) as in (4) but with the high resolution TCEQ land cover data as a replacement for the FCCS in Texas and surrounding states. The ArcGIS raster files are currently being processed for these scenarios in conjunction with quantifying burned area from fire events in 2012, as described in the attachment.

Task 2. Mapping of Croplands Data

Cropland data has been obtained from the NASS CDL database and are being processed as described above. Crop-specific emission factors, developed by Jessica McCarty* currently at the University of Louisville, for rice, sugarcane, wheat, cotton, soy, corn, and sorghum have been added to the FINN default configuration. New emission factors to be used in FINN are shown in the attachment.

*ref. Table 1 McCarty, J. Remote Sensing-Based Estimates of Annual and Seasonal Emissions from Crop Residue Burning in the Contiguous United States, *J. Air & Waste Manage. Assoc.* 61:22-34.

Task 3. Estimation of Burned Area

Development of the algorithms and ArcGIS tools used for processing of the MODIS Rapid Response fire detection records, quantifying burned area, and characterizing the underlying land cover has largely been completed and is described in the attachment. Debugging required longer than expected, but the team does not envision any delays impactful to the project deadline.

Task 4. Sub-grid scale Partitioning of NO_x Emissions to NO_z in Fire Plumes
ENVIRON is beginning to develop the approach to partition NOx during EPS3 processing of the FINN emission estimates.

Task 5. Comprehensive Air Quality Model with Extensions (CAMx) Sensitivity Studies
This task relies on receipt of the 2012 CAMx air quality modeling episode currently under development by the TCEQ. The full episode is not ready for release, but the TCEQ has shared their emission inventory for fires. Once we have our FINN simulations completed, we will compare our emission estimates with those from the TCEQ's current inventory.

Data Collected *(Include raw and refine data.)*
As described above.

Identify Problems or Issues Encountered and Proposed Solutions or Adjustments
Slight delay for debugging during tool development for Task 3, which is not expected to impact the project deadline.

Goals and Anticipated Issues for the Succeeding Reporting Period
Priorities for next month include completion, quality assurance, and documentation of the FINN model updates; conducting sensitivity analyses in FINN to produce fire emission estimates; conducting comparisons to fire emissions estimates currently being used by the TCEQ in their 2012 CAMx episode to the extent possible; and continuing work on the manuscript.

Detailed Analysis of the Progress of the Task Order to Date *(Discuss the Task Order schedule, progress being made toward goals of the Work Plan, explanation for any delays in completing tasks and/or project goals. Provide justification for any milestones completed more than one (1) month later than projected.)*
Ongoing.

Submitted to AQRP by:

Principal Investigator: Elena McDonald-Buller