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**	5/7/15
REPORTING PERIOD	**From:** May 1, 2015 **To:** May 31, 2015	**REPORT #**	10

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

Work this month is focusing on preparations for the AQRP Data Workshop to be held on June 17-18, 2015.

Task 1. Regional Land Cover Characterization

Processing of ArcGIS raster files for the global and U.S. national and regional land cover datasets has been completed as described in previous reports. These land cover products are being used alone or in combination as FINN input. We also processed the recently released Moderate Resolution Imaging Spectroradiometer (MODIS) Vegetation Continuous Fields (VCF) product for 2012 (version 5.1) this month, which contains proportional estimates for vegetative cover types: woody vegetation, herbaceous vegetation, and bare ground. MODIS VCF data is used in FINN to identify the density of the vegetation at active fire locations. Sensitivity studies will be conducted with the final FINN v.2 configuration to estimate emissions of carbon monoxide (CO), nitrogen oxides (NO_x), and fine particulate matter ($PM_{2.5}$) associated with fire events during 2012.

Task 2. Mapping of Croplands Data

Cropland data has been obtained from the USDA CDL. Crop-specific emission factors, developed by Jessica McCarty at the University of Louisville have been added to the FINN default configuration. Fuel loading and CO emissions for the generic croplands classification used as the FINN default configuration are compared to those for specific crop types in Table 1 below.

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 been largely completed. On-going work is examining burned area estimates for distinct agricultural fire events in the southeastern United States and wildfires throughout the southeastern and western United States.

Table 1. Fuel loading (kg m^{-2}) and carbon monoxide emission factors (g/kg) by crop type.

	Fuel Loading (kg/m^2)	CO Emission Factor (g/kg)
Crop (Generic)	0.66	53
Rice	0.67	64
Wheat	0.66	55
Cotton	0.38	73
Soy Bean	0.56	69
Corn	1.62	53
Sorghum	0.66	64
Sugar Cane	1.50	59

Task 4. Sub-grid scale Partitioning of NO_x Emissions to NO_z in Fire Plumes
An approach has been developed to incorporate re-speciation of FINN NO_x to NO_z compounds as a function of fire size relative to grid resolution and fire plume rise during the EPS3 fire processing chain. Modifications to the EPS3/PREFIR code to support the NO_x breakout were begun this month.

Task 5. Comprehensive Air Quality Model with Extensions (CAMx) Sensitivity Studies
Sensitivity studies using emissions estimates from the final FINNv.2 configuration will be conducted as soon as possible.

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

Identify Problems or Issues Encountered and Proposed Solutions or Adjustments
Differences in emission estimates associated with the FINN v.2 and FINNv1/1.5 burned area algorithms are substantial. We feel this is a positive development because FINN v.1/1.5 had a known underprediction bias for burned area, especially for large wildfires. We took additional time this month to examine the impacts of the changes in the algorithm on specific wildfire and agricultural burning events before finalizing the FINN v.2 configuration. We do not anticipate any delays in the overall project schedule.

Goals and Anticipated Issues for the Succeeding Reporting Period
Priorities for next month include completing sensitivity analyses using the final FINN v. 2 configuration to produce fire emission estimates; continuing updates to the EPS3 system for the NO_x-to-NO_z conversion approach, and preparing for the AQRP data workshop in June.

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:
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