Title: Input Data Development for the Motor Vehicle Emissions Simulator (MOVES)

Purpose of Project: The U.S. Environmental Protection Agency (EPA) produces a variety of computer models to support its mission of protecting human health and the environment. These models help stakeholders gain insight of possible problems, forecast future events, and make informed decisions. The EPA periodically up-dates their models to take advantage of the most recent scientific advancements in the field, which in turn increase the sophistication of the models. However, in spite of improvements to a model, the quality of the input data is essential because it still affects the quality of the model's results.

The Motor Vehicle Emissions Simulator (MOVES) is an EPA computer program that is used to estimate emissions from mobile sources for criteria air pollutants, greenhouse gases, and air toxics. Mobile sources include on-road vehicles (e.g., passenger cars and trucks) and non-road equipment (e.g., farm tractors and bulldozers). In April 2004, the EPA released MOVES to the public. It was in-line to replace an earlier program called MOBILE (the Mobile Source Emission Factor Model). The new model is considered to be superior to the older model because it contains algorithms that estimate emissions more accurately. Additionally, MOVES has different input data requirements that are much larger in scope than the data requirements necessary to run MOBILE.

As of March 2, 2013, the EPA requires that MOVES is used for inventory development in State Implementation Plans (SIP) and regional emissions analysis for showing transportation conformity by all states, except for California. Currently several versions of the model exist for these purposes: MOVES2010, MOVES2010a, and MOVES2010b. Each one in the series contains minor revisions relative to the previous version. In July 31, 2014, a newer version of the model (MOVES2014) was released, which among other significant modifications, includes the ability to estimate emissions from non-road equipment. On November 4, 2014, EPA released still another version of the model (MOVES2014a) that contains minor revisions to the previously released model (MOVES2014). It should be noted that the grace period between using the 2010 and 2014 versions of the model for regulatory purposes will end on October 7, 2016.

The EPA strongly recommends states to use the latest version of MOVES that is available instead of relying on previous versions of the model. The EPA also recommends that states derive input data from local sources whenever possible instead of using default data to run the model. Since MOVES has been introduced, hardly any state in the country had adequate data in the appropriate format to run the model. Thus, the purpose of this project is to develop several of the major input datasets that are necessary to run MOVES for the State of Tennessee.

Scope and significance of the project: Certain information about vehicles collected by the state are not specifically tailored as input data to run MOVES, but estimates of vehicle emissions are necessary for a variety of regulatory purposes using the model. Motor vehicle registration data are collected by the Tennessee Department of Revenue (TDOR). Countywide daily vehicle miles traveled (DVMT) on urban and rural roads, statewide vehicle classification summaries by the functional road types, and monthly variation factors by day of week are collected by the Tennessee Department of Transportation (TDOT). Preprocessing of the data received from those departments are necessary because the former are categorized by a system designed by TDOR,

and the latter are categorized by the Highway Performance Management System (HPMS). The Federal Highway Administration (FHWA) manages the HPMS. The problem is a one-to-one relationship does not exist for vehicle and road classifications among these various data sources and MOVES.

The scope of the project is the development of input data for MOVES on a county basis for the calendar year (or time span) of evaluation. Input data are required yearly or on an as-needed basis by various agencies. The crucial evaluation years are those years for the National Emission Inventory (NEI). The NEI is released every three years by the EPA and is based primarily upon data provided by state and local agencies. The characteristics of both the initial preprocessed data and the final input data can have a significant impact on overall emissions inventories. More significantly, results from MOVES can influence transportation policy decisions at state and local levels.

Expecting outcomes: Data that the state collects are transformed into MOVES input data using several methods that are explained in a detailed report which accompanies the data. The primary datasets that are developed are Source Type Population, Age Distribution, Road Type Distribution, Vehicle Type Vehicle Miles Traveled (VMT), and Average Speed Distribution. Not all the datasets that are required to run MOVES will be developed by this project. The datasets that will not be developed are Meteorological Data, Properties of Fuels, and Inspection/Maintenance Programs.

Time periods and status of the project: The time period of the project is between June 1, 2013 and May 31, 2018. Input data have been generated so far for the following calendar years: 2010, 2011, 2012, 2013, and 2014. The NIF years are 2011 and 2014; the next year for the NIF submittal is 2017. It should be noted that previous datasets created for older versions of the model must be used with caution because EPA recommends that the most recent version of the model be used to estimate emissions. (Also, input data for older versions are not necessarily appropriate for use in newer versions of the model.) However, this project will provide more recent datasets for previous years on an as-needed basis if requested by TDOT.

Currently the project is approximately 65% complete. Motor vehicle registration data have been received for calendar years 2015 and 2016 but have not been fully processed. Research is ongoing for development of Average Speed Distribution data. Currently agencies must rely on data generated by Travel Demand Models (TDM) conducted by the Metropolitan Planning Organization (MPO) representative for the county or areas of concern.

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