



## Florida Department of Transportation Research

### Modeling of Concentrations of MSATs (Mobile Source Air Toxics) along Highways and near Intersections in Florida

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Motor vehicles generate many chemicals, mostly derived from diesel and gasoline fuels, but evaporative materials are also generated by brake and tire wear. Some of these chemicals, called Mobile Source Air Toxics, or MSATs, are confirmed to be causative agents of cancer in humans, and so the risks these chemicals pose to human health is of general concern. To date, the United States Environmental Protection Agency (EPA) has not established air quality standards for MSATs, and no maximum acceptable concentrations (MACs) for these compounds have been published. Nevertheless, the Florida Department of Transportation (FDOT) decided to conduct a preliminary examination of the probable limits of MSAT concentrations on Florida roadways.

To address this question, researchers from the University of Central Florida performed dispersion modeling studies of MSATs at intersections and along Florida highways. Because this modeling is not required, there are no tools specifically designed to perform dispersion calculations for MSATs. Therefore, the researchers adapted existing software. The model CAL3QHC is widely accepted software designed to predict pollutant concentrations at roadway intersections. Originally designed to predict carbon monoxide and a few other pollutants, CAL3QHC was modified by the researchers to allow dispersion modeling of various MSATs. The resulting software was dubbed CAL3MSAT.

MACs were developed from existing standards for both acute and chronic exposure to five primary MSATs: acetaldehyde, acrolein, benzene, 1,3-butadiene, and formaldehyde. The combination of diesel particulate matter and diesel exhaust organic gases (DPM+DEOG) also poses risks for human health, but it was not possible to establish credible emission factors for this agent, and researchers decided to exclude it from the modeling.



*Pedestrians at busy intersections are surrounded by cars and their exhaust, but is that exposure harmful?*

MSAT modeling was based on intersections and roadway segments in seven urban areas in Florida. Scenarios were developed from traffic and geometry data obtained from FDOT district offices. MSAT emission factors were generated using EPA model MOVES2010a based on 2010 traffic data. Peak traffic volumes and meteorology parameters were selected to produce maximum one-hour MSAT concentrations for each scenario.

Modeling for all intersections and freeway segments suggested that MSAT concentrations were extremely low, and that MSATs from motor vehicles do not pose a threat to human health in Florida. This finding should apply some years into the future, as well. Researchers noted that trend lines indicate that MSAT emission factors will fall over the next 20 years, faster than traffic volumes are expected to increase, so 2010 data represent a maximum for the period.