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IMPACT AND ASSESSMENT OF MARINE VESSELS EMISSIONS ON THE CORPUS CHRISTI URBAN AIRSHED

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ABSTRACT

The two largest and yet uncertain sub-categories of air emissions from non-road sources include marine vessels and pleasure crafts. Ocean going vessels and pleasure crafts contribute a significant amount of emissions in the Corpus Christi urban airshed (CCUA). CCUA is classified as a near non-attainment area. It is the largest industrialized urban area in South Texas that is currently in compliance with the National Ambient Air Quality Standards (NAAQS) for ozone. Marine vessels represent a significant source with all other sources of emissions of ozone precursors, namely oxides of nitrogen (NOx) and volatile organic compounds in the CCUA. To find out the impact of marine vessels emissions on ozone levels, a comprehensive emission inventory was developed. Methodology adopted by ENVIRON was used to develop an emissions inventory for the Corpus Christi ship channel. It followed the EPA guidance regarding estimation of marine vessel emissions. To accomplish this work vessels-specific activity, engine characteristics, and emission factors information were collected. Vessel-specific information was needed because each ship entering and leaving the ship channel has a unique activity profile (ship cruise, speed, berthing, etc.) and a unique set of emission factors based on the size of the ship, its engines, and its activity profile while operating within the ship channel. It was determined that emissions from large ocean-going vessels contributed approximately 3% to the total NOx in the CCUA and that approximately 66% of the total marine vessels emissions were at docks while hoteling (docking). The NONROAD model was then used to estimate pleasure crafts emissions with local activities, population, temperature and other data collected from surveys. Spatial allocation of the estimated emissions was done using Geographical Information System (GIS) tools. A regional-scale photochemical model (Comprehensive Air Modeling system with extensions - CAMx) was used to evaluate the impact of these two sub-categories of precursor emissions on the urban ozone level of Corpus Christi and surrounding area. A high ozone episode of September 13-20, 1999 was used as the base case for the modeling analysis. The analysis showed that the impact from marine vessels on ozone levels was between 1 and 3 ppb within the urban airshed. Other source categories including on-road mobile sources had larger impact on local ozone levels.

Keywords: NONROAD model, marine vessel emissions, pleasure crafts, GIS