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AIR QUALITY MODELING OF THE RELATIONSHIP BETWEEN SIMULATED PM2.5 IN RESPONSE TO VARYING REDUCTIONS OF AMMONIA EMISSIONS OVER THE SOUTH COAST AIR BASIN

Executive Summary

May 2018

COORDINATING RESEARCH COUNCIL, INC.

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Executive Summary

CRC Project A-109

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Executive Summary

Projected Changes in Particulate Matter Concentrations in the South Coast Air Basin due to Basin-Wide Reductions in Nitrogen Oxides, Volatile Organic Compounds and Ammonia Emissions

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An emission reduction strategy that focuses on nitrogen oxides (NO_x) is being advocated by the South Coast Air Quality Management District and the California Air Resources Board for California's South Coast Air Basin (SoCAB). The goal of the strategy is to reduce ozone concentrations by the year 2030. In addition to ozone, particulate matter ($PM_{2.5}$) concentrations are of concern in the SoCAB. A trend analysis of ambient air monitoring data was conducted within this project and it showed that the annual mean concentrations of particulate matter have remained relatively constant since the year 2010; reductions in particulate matter concentrations are needed in addition to ozone reductions. Therefore, the effect of NO_x and other emission reductions on $PM_{2.5}$ concentrations were investigated within this project.

The year 2008 was chosen as the base year and two episodes with high concentrations of particulate matter that occurred during September and November were investigated. The Community Multi-scale Air Quality Model (CMAQ) was used to simulate these two episodes with different levels of volatile organic compounds, nitrogen oxide and ammonia emissions for the year 2030. The project found that the proposed NO_x emission reductions had a strong effect on future $PM_{2.5}$ and ammonium nitrate concentrations. The CMAQ simulations showed that the proposed NO_x focused control strategy was the least effective in reducing $PM_{2.5}$ concentrations of the scenarios simulated. The proposed control strategy for 2030 has a level of NO_x emissions that, given the level of volatile organic compound and ammonia emissions, are nearly optimal for the production of ammonium nitrate which leads to the greater formation of secondary $PM_{2.5}$. Control strategies with higher levels of NO_x emissions or control strategies with lower levels than the proposed strategy would be more effective in reducing $PM_{2.5}$ in the SoCAB for the year 2030. The project found that reductions in ammonia emissions reduce $PM_{2.5}$ and therefore ammonia emissions should be considered as part of a control strategy for $PM_{2.5}$ in the SoCAB.