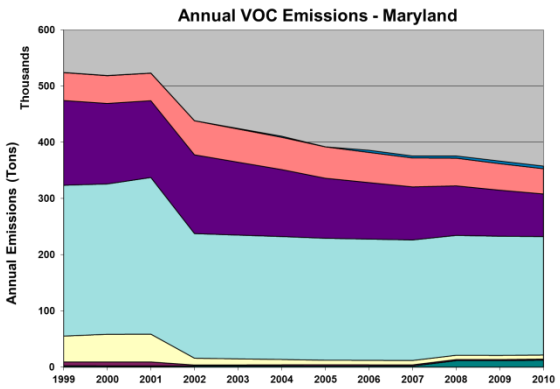
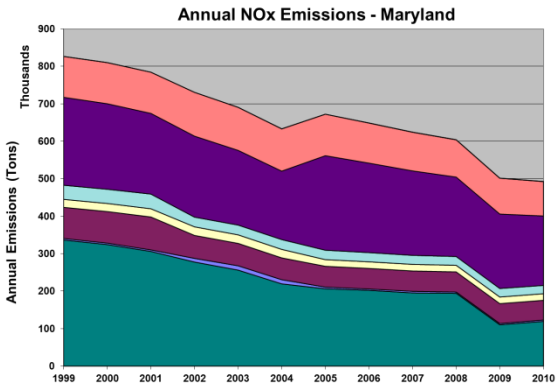
Emission and Air Quality Trends Review

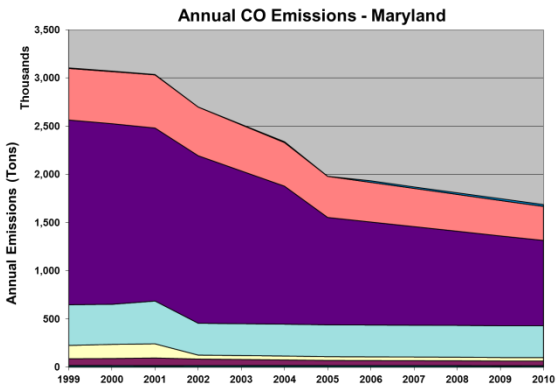
Fact Sheet – Harford, MD Monitor (240251001)

OVERVIEW

Alpine Geophysics, LLC and ENVIRON International Corporation recently reviewed trends in emissions and ambient air quality from 1999 through 2010. The results of the review show that significant ozone improvements have occurred at the same time that significant reduction in emissions have been made by the electric utility fuel combustion source category. In conjunction with this analysis, future year modeling 8-hr ozone design value calculations for 2014 and 2018 are presented accounting for a Clean Air Interstate Rule (CAIR) scenario of emission controls. Additional ozone source apportionment studies were also conducted to help identify source categories with the highest contribution to ozone concentrations at monitors within the eastern United States.







ANALYSIS METHODOLOGY

Alpine Geophysics and ENVIRON collected and processed U.S. EPA emission inventories from 1999 through 2010 by pollutant and source category. They obtained their data from U.S. EPA's National Emission Inventory and Trends web sites and augmented the data with year specific continuous emission monitoring (CEM) emissions (2002 through 2010), MOVES-generated on-road emissions (2005 through 2010), and wildfire emissions data (2005 through 2009). They analyzed the emission data by pollutant and source category.

In particular, they analyzed emission data for the ozone precursors of:

- Volatile organic compound (VOC)
- Nitrogen oxides (NOx)
- Carbon monoxide (CO)

They also analyzed the data for each of the following source categories:

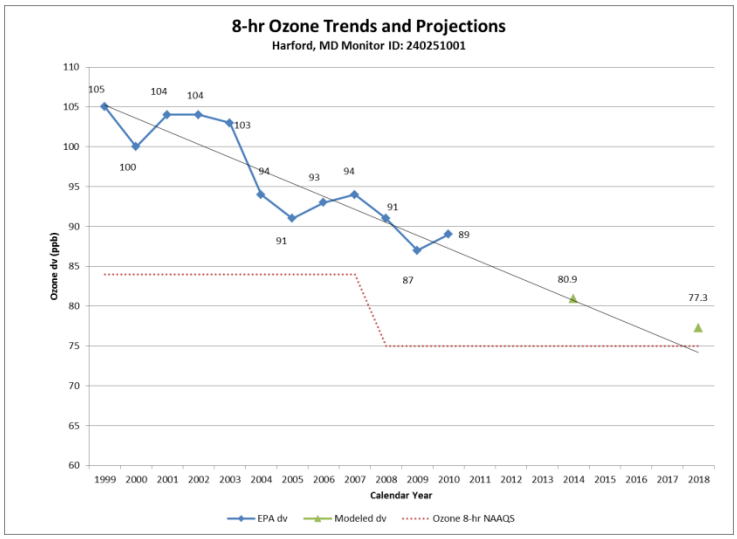
- Electric utility coal combustion
- Electric utility non-coal combustion
- Industrial fuel combustion
- Other fuel combustion
- Industrial processes
- Highway vehicles
- Off -highway vehicles
- Miscellaneous

EMISSIONS

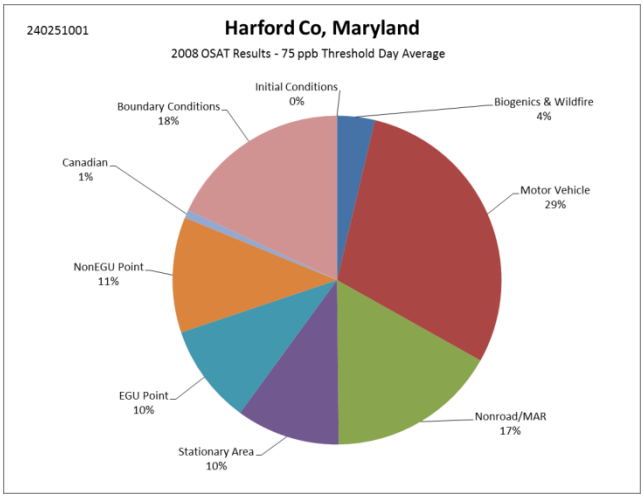
Publicly available EPA emission data sets (NEI, CAMD/CEM, MOVES SMARTFIRE) of emissions were used in the development of emission trends summaries (shown at left). For non-annually reporting categories and years outside of the three year reporting cycle (1999, 2002, 2005), values were calculated using an interpolation between the closest two reporting years. For 2010, the values for some categories were interpolated between 2005 and the 2012 model predicted inventory from EPA's most recent modeling platform. Additionally, 2014 and 2018 future year modeling exercises were conducted with the Comprehensive Air Quality Model with Extensions (CAMx) modeling system setup over a 36/12 km eastern State modeling domain. These simulations shed light on the degree to which current controls and controls considered from the implementation of CAIR provide for attainment of the NAAQS.

8-HR OZONE AIR QUALITY TRENDS

Summaries of ambient air quality measurements (blue diamonds) for the period 1999 - 2010 were obtained by ENVIRON from U.S. EPA databases. The 8-hr ozone design value trend for the Harford, MD monitor was computed, summarized, and is displayed for the period 1999 – 2010. Linear trends for monitor-specific maximum design values were calculated using least-squared regression for each overlapping three-year period starting with 1999-2001 and ending with 2008-2010. Additionally, using EPA's Modeled Attainment Test Software (MATS) and 2014 and 2018 CAIR simulations with CAMx, future year monitor-specific design value estimates were calculated and were added to the chart shown to the right (green triangles).



OZONE SOURCE APPORTIONMENT STUDY



Finally, Alpine completed an analysis designed to estimate the relative contributions of emissions from multiple source regions and source categories to resultant ozone concentrations at downwind receptors during a 2008 summer season episode. Using a recently prepared 2008 modeling platform modeled with the CAMx, the Anthropogenic Precursor Culpability Analysis (APCA) version of the Ozone Source Apportionment Technology (OSAT) apportioning schemes, Alpine calculated ozone concentrations for a domain covering most of the Upper Midwest and Northeastern United States.

OSAT/APCA was applied in CAMx to perform an 8-hour average calculation across the 2008 summer season and source-area and source-group contributions for all hours were extracted where the ozone levels were estimated to be over 75 ppb. Ozone contribution averages were summarized for all sources-regions and source-groups for hours over the threshold for each individual day and for the entire modeling period at each monitor location. The above graphic demonstrates the relative contribution of source category emissions on modeled ozone concentrations at the Harford, MD monitor during the episode in 2008.

ANALYSIS FINDINGS

Overall, this analysis reveals that there have been significant decreases in ozone forming pollutants from all source categories across the State of Maryland. As a result of these and other emission reductions in upwind states, 8-hr ozone concentrations are shown to decrease during this period. This downward trend for the past ten years documents that air quality is improving in response to current emission reduction measures and that based on recent modeling of CAIR, is anticipated to continue to decline. Finally, OSAT modeling indicates that 46% of the ozone concentration measured at the Harford, MD monitor is a result of emissions from the on-road and nonroad motor vehicle sectors in 2008.

FOR MORE INFORMATION

This work was undertaken at the request of the Midwest Ozone Group and is available at http://www.midwestozonegroup.com/. Should you have any questions or simply wish to discuss this fact sheet, please contact Gregory Stella, Senior Scientist, Alpine Geophysics, LLC at (828) 675-9045 or by email at gms@alpinegeophysics.com.

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ENVIRON

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