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Using Advanced Technology to Measure Pollution Near Rail Yards

Background

EPA researchers want to better understand local air pollution impacts of rail yard activities, and to determine whether emissions associated with a rail yard affect air quality in nearby communities.

Researchers selected a rail yard in the western Chicago suburb of Cicero, IL for its proximity to a residential neighborhood and because it had fewer emissions from other nearby sources such as industry and traffic compared to other yards. This helped to reduce the complexity of interpreting field measurements.

In a densely populated city like Chicago, it can be difficult to determine the effect a single source has on an area's air pollution simply because of the many clustered sources, including major transit sources, such as highways and airports.

Field measurements of local air pollution are an evolving field of research and require advances in air quality measurement. Previous studies have documented that air pollution concentrations within close proximity to a highway can vary significantly depending on variances in weather, terrain, time of day, and distance from the source.

The rail yard environment is considered likely to be even more complex in nature than a highway because of emissions from multiple sources that vary in time and location.

Characterizing concentrations of pollutants from a variety of sources at a rail yard such as cranes, trucks and locomotive switchers is difficult given the lack of emissions inventories for these sources.

Approach

Using a combination of methods, researchers gathered and compared two air monitoring data sets. One data set is from measurements collected using a novel air monitoring vehicle. Researchers drove the vehicle in neighborhoods surrounding the rail yard periodically for a month and mapped air pollution levels.

The second data set is from a temporary stationary air monitoring site situated in the prevailing downwind direction of the rail yard that continuously measured pollutant levels during a year.

Results

Residential areas downwind of the rail yard had elevated concentrations of black carbon, a particulate matter component that is associated with diesel fuel combustion.

These increases are estimated to be higher than levels observed in a residential area upwind of the rail yard, with concentrations varying with wind speed and time of day. Other pollutant measurements did not appear to have consistent differences in downwind neighborhoods compared to upwind neighborhoods.

The stationary monitor measured the highest concentrations of the air pollutants sulfur dioxide, black carbon, and oxides of nitrogen during weekday periods with winds from the South. Research modeling estimated that multiple source areas contributed to the elevated concentrations, including the rail yard, a nearby airport, and a nearby power plant.

While the study found variations in local air pollution levels downwind of the rail yard area, the total concentration levels measured during the study are not significantly different from those of other major urban areas in the United States.

The findings are available in a peer-reviewed report at:

http://nepis.epa.gov/Adobe/PDF/P100IVT3.pdf

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(L) air monitoring vehicle used in study. (R) the stationary air monitor.

EPA's air monitoring vehicle:
http://www.youtube.com/watch?v=1W1wix7NdAY&feature=youtu.be
Research to advance air quality monitoring:
http://www.epa.gov/air-research/next-generation-air-measuring-research