

ERTAC Priority Projects

Identification of Priority Issues: Railroads & Railyards.

Statement of the Problem:

Railroad-related emissions contribute to both ozone and fine particulate matter (PM_{2.5}) concentrations in many urban areas. Locomotive emissions result from diesel combustion and include NO_x, primary PM_{2.5}¹, hydrocarbons, SO₂, CO, and CO₂. These emissions can be very significant and are typically poorly characterized in emissions inventories and air quality models. In addition, the emission inventories for railyards do not adequately address emissions associated with other activities besides locomotives (truck loading, moving equipment, maintenance, testing, etc).

While treated as a nonroad mobile source in emissions inventories, locomotives are not addressed in the US EPA NONROAD model so states each currently estimate their own emissions. Emissions inventory preparation guidance from the U.S. EPA² describes locomotive activity as relatively constant throughout the year (e.g. no daily, weekly, or seasonal variability) and calculations are based on nationwide estimates of locomotive fleet mix, emissions factors, and average annual fuel consumption (i.e. for switcher locomotives³). However, fleet mix is likely highly variable throughout regions of the country and emissions vary considerably with engine year and type. Activity levels may seasonally vary in some yards, and annual averaging may dilute or exaggerate concentrations during pollution episodes.

Although annual system-wide fuel use for the largest railroad companies (i.e. Class 1) is available from Form R-1 reports, it can be difficult to obtain. Inventory guidance recognizes that much of the data required for inventory calculations, such as Gross Ton Miles (GTM) traveled per rail segment, must be voluntarily provided by the rail companies or by the Association of American Railroads. Acquiring this data can be difficult and is likely not generally successful. Many states have difficulty with even rudimentary data collection tasks such as locating all railyards within their state and estimating the number of switchers in each yard.

One difficulty in obtaining this data is that much of the information that would support emissions inventory development does not appear to be routinely collected or maintained by railroads in a form that would be useful for inventory calculations and would take some effort on the part of the companies to provide. Additionally, while railyards themselves are stationary and activity in railyards is relatively constant throughout the year, rail activities are protected under interstate-commerce regulations and locomotives are categorized as mobile so are largely exempt from the level of reporting requirements for other industries with similar emissions.

Statement of Emissions Impact:

In Southern California, diesel locomotives are estimated to emit about 12,000 tons per year of NO_x, more than the combined emissions from the area's 350 largest facilities, including all of the oil refineries, power plants and major manufacturing plants⁴. In Georgia, statewide 2002 line-haul locomotives were estimated to emit almost 23,700 tons of NO_x per year and railyard locomotives were estimated to emit almost 3,100 tons, combined emissions comparable with 29 million Tier 2 automobiles⁵. Fulton County (in Atlanta, GA) has estimated yard locomotive emissions greater than 380 tons of NO_x and 8.7 tons of PM_{2.5} per year, which only account for about 25% of the total estimated railroad-related emissions in the county. Dispersion modeling, PMF analysis, and some updated inventory data indicate these emissions are drastically under estimated. It should be noted the PM_{2.5} monitor driving nonattainment in Atlanta (Fire Station #8) is located in the immediate vicinity of several Class 1 railyards (see Supporting Graphic).

¹ Diesel-generated particulate matter is categorized as a toxic pollutant by the U.S. EPA. E.g. <http://www.epa.gov/airtrends/2007/report/toxic.pdf> and <http://www.epa.gov/otaq/toxics.htm>.

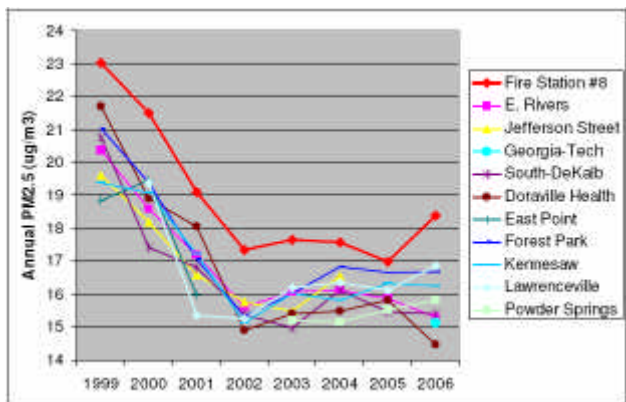
² Chapter 6, Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources. Available at <http://www.epa.gov/otaq/invntory/r92009.pdf>.

³ There are two main types of locomotives - line haul, used for traveling long distances, and switchers, mostly used in railyards for assembling and dissembling trains.

⁴ Fact Sheet, Locomotive Operations and Air Pollution in Southern California, Feb. 2006 <http://www.aqmd.gov/news1/2006/LocomotiveFactSheet2.html>.

⁵ Calculations based on the Tier 2 NO_x emissions standard (0.07gNO_x/mile) for highway vehicles and assuming 12,000 vehicle miles traveled per year. Tier 2 standards were finalized in December 1999 and were phased in beginning in 2004.

Supporting Graphic: Comparison of annual 24-hour PM2.5 averages ($\mu\text{g}/\text{m}^3$) at Atlanta, Georgia monitoring sites. The Fire Station #8 monitor is located near the Tilford, Inman, and Howells Rail Yards in Fulton County.



Eastern Inventory Solution:

First, identify critical data needs in the simplest form possible (examples of a Class I and Shortline Emission Inventory Questionnaire are attached). For example, information for railyards should include (1) name and location of yards, (2) number of switchers operating per yard, (3) the tier/year of switchers, (4) annual fuel use (gal/yr) for switchers per yard, (5) approximate duty cycle or just percent of time in idle for operating switchers, and (6) temporal characteristics of the switcher's use. Similar information could be collected for line-haul and shortline locomotives. Next, this data should be acquired for Class I and 'Shortline' (Class II/III) locomotives for CERR years (2002 and 2005) in a coordinated manner rather than subjecting railroad companies to state-by-state requests in differing formats. Finally, an internally consistent county-level regional emissions inventory should be developed and processed for air quality modeling.

Subgroup Participation Recommendation Beyond States:

Survey all states to evaluate the current status of railroad emission inventories and to identify possible techniques to most efficiently prepare an updated inventory.

Consult with the U.S. EPA, the Surface Transportation Board, Association of American Railroads, and Class I and 'Shortline' railroad companies and related associations to identify the best method for data collection.

Work with the U.S. EPA, the Surface Transportation Board, Association of American Railroads, and other related associations to identify a possible nationwide method to collect and process data at the lowest geographical denominations possible.

Document the inventory preparation procedures carefully and ensure stakeholders are aware of activities and able to provide input.

Questions or Comments:

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