Emissions Inventory Development for Fine-Scale Air Quality Modeling

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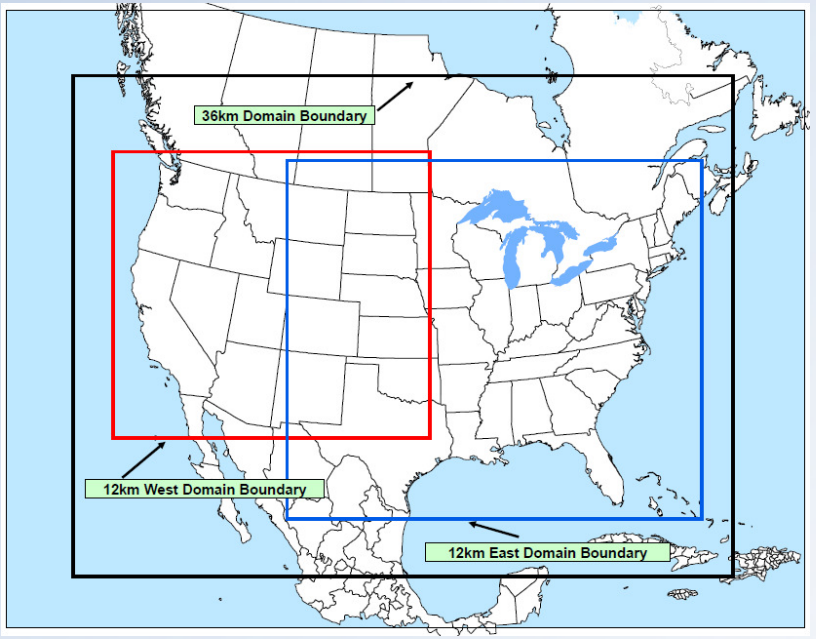
Background

Increasing attention is being given to resolving pollutant concentrations at finer spatial scales than are traditionally used for regulatory and policy assessments

- **Coarse-resolution modeling**
  - May fail to capture local source impacts on ambient $PM_{2.5}$ concentrations
  - Cannot resolve air toxics "hot spots" where fine-scale concentration gradients exist
- **Hybrid (e.g., CMAQ-AERMOD) modeling is now being used to account for local source contributions**



36-km and 12-km CMAQ modeling domains for EPA's 2005-based platform

Local-Scale EI Focus Group

Purpose

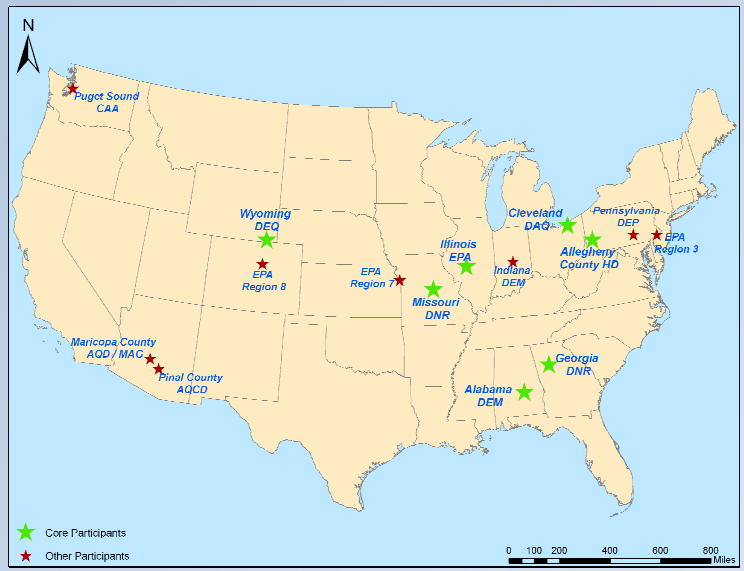
- Build capacity in EPA's EIAG and the state and local inventory community for developing more locally representative emissions estimates

Objectives

- Identify analyses that can assist state/local agencies with local-scale inventory development
- Prioritize beneficial analyses and methodologies
- Examine linkages between local-scale EIs and the NEI

Technical Approach

- EPA recruited staff from state/local agencies that are developing local-scale EIs for fine-scale modeling
- Focus group met via teleconference biweekly from June 15 to Sept 14, 2010



- Presentations and discussions centered on five charge questions
- Agencies provided EPA and STI with technical support documents for review

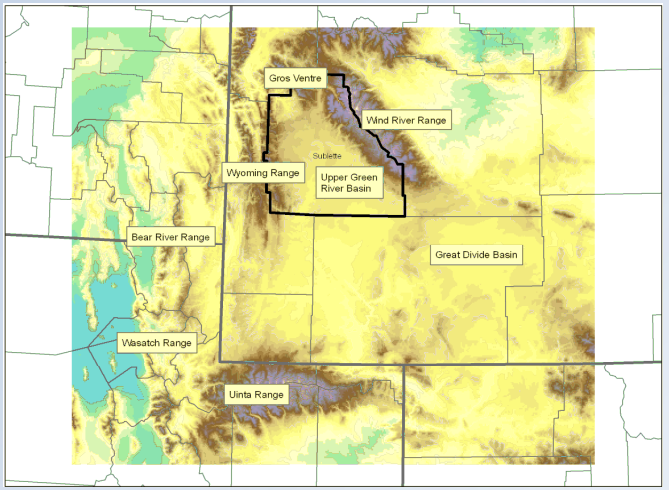
Charge Questions

- *What type of air quality problems were addressed?*
- *What analysis techniques were used?*
- *Which emissions source categories were addressed?*
- *What changes to emissions estimates and modeling results occurred?*
- *Would any NEI-related analyses be beneficial to these efforts?*

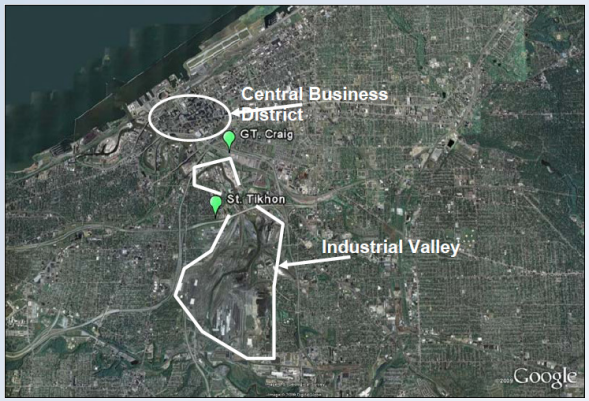
Air Quality Problems Addressed

$PM_{2.5}$ attainment issues

Ozone attainment issues

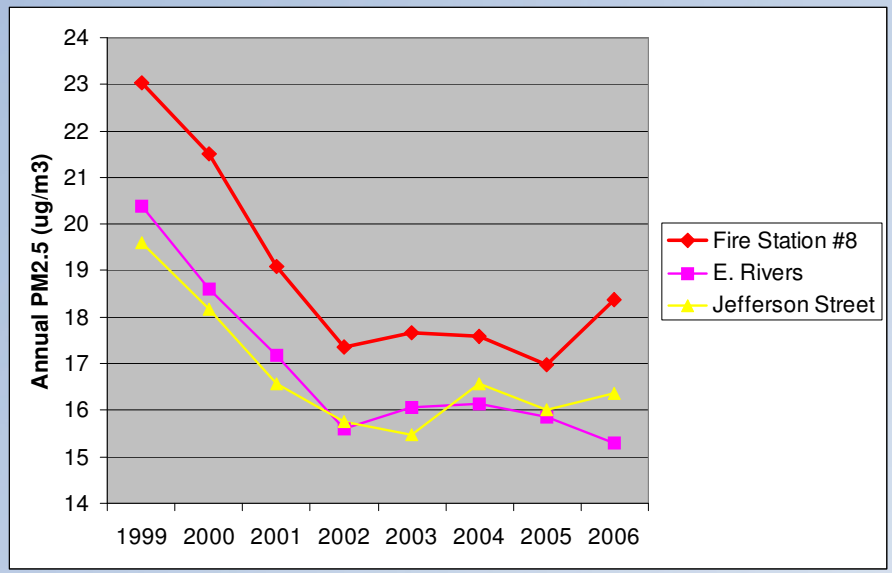


Multi-pollutant analyses

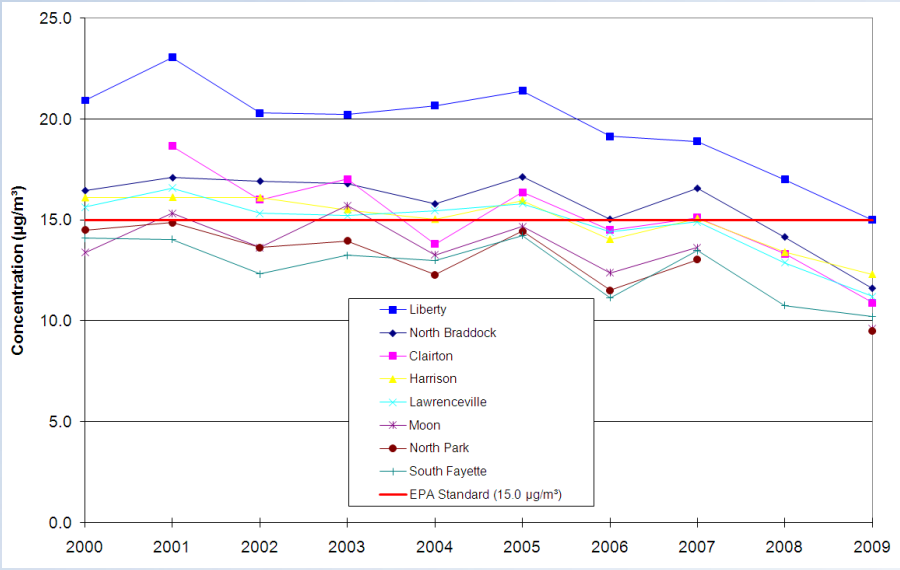


Analysis Techniques (1 of 4)

Inter-monitor comparisons



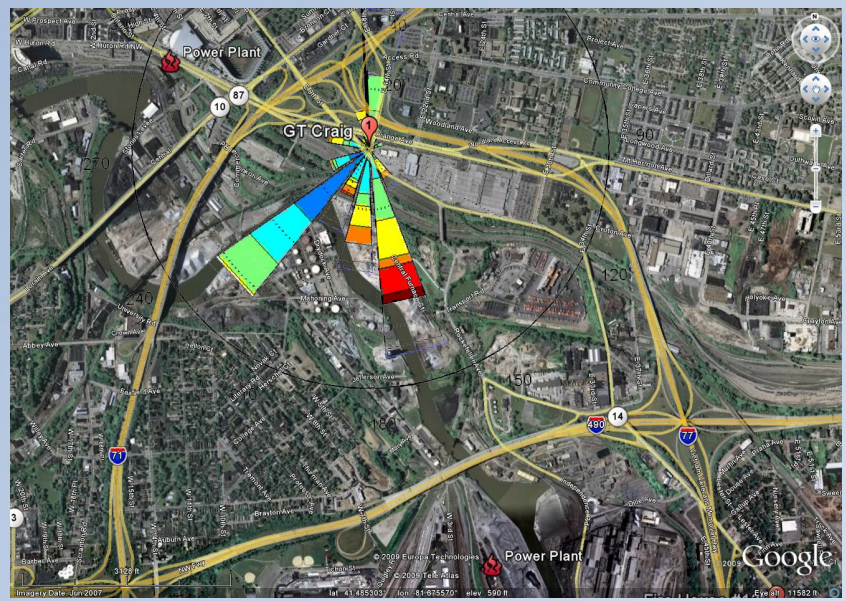
From focus group presentation by Georgia Dept. of Natural Resources (DNR) on July 13, 2010



From focus group presentation by Allegheny Co. Health Department (HD) on July 13, 2010

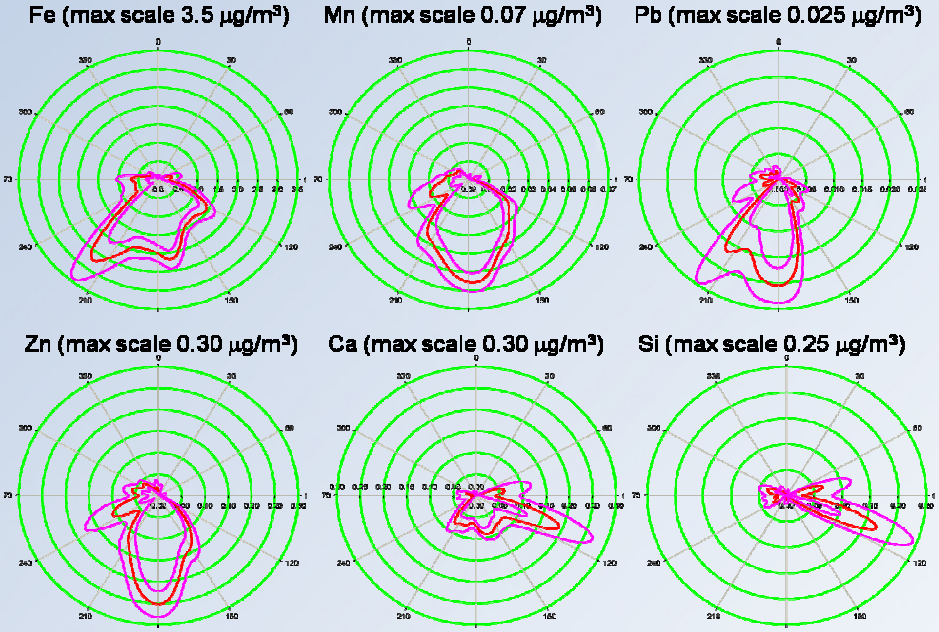
Analysis Techniques (2 of 4)

Wind direction analyses



NO_2 pollution roses for Cleveland

(Source: EPA ORD)

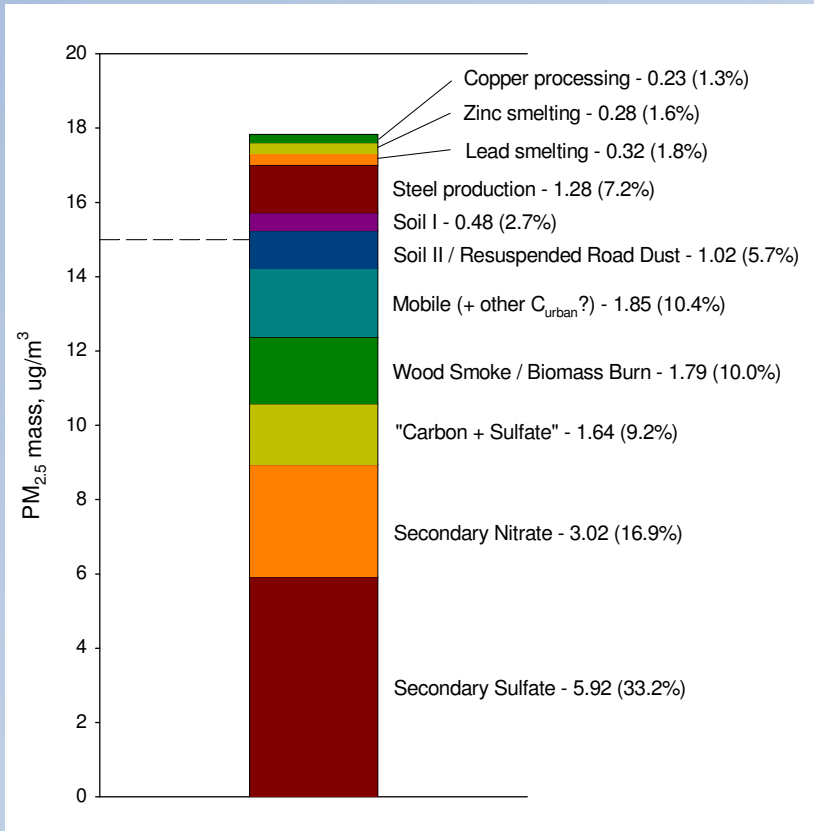


Speciated $PM_{2.5}$ pollution roses for Granite City, IL

(From focus group presentation by Illinois EPA on July 27, 2010)

Analysis Techniques (3 of 4)

Receptor modeling (PMF)



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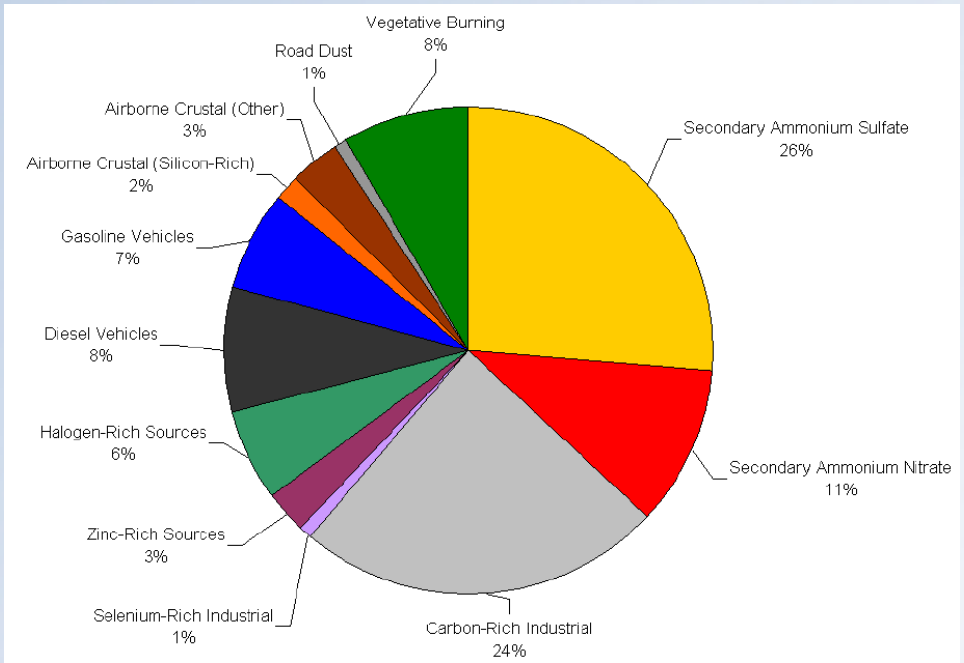


From focus group presentation by Allegheny Co. HD on July 13, 2010

Analysis Techniques (4 of 4)

Other analyses

- Ranking local sources by emissions levels (Georgia DNR)
- Calculating emissions (Q) to distance-from-monitor (D) ratios (Q/D) for individual sources (Alabama DEM)
- Fence-line sampling at key industrial facilities (Alabama DEM)

Inventory Improvement Methods (1 of 4)

Industrial facilities

- Contacting facility owners/operators to gather emissions data, operating schedules, control information, etc.
- Stack testing to develop new emission factors
- Working with permit and/or facility engineers to evaluate and update stack parameters
- Developing facility-specific inventories for sites not previously treated as point sources

Inventory Improvement Methods (2 of 4)

Industrial facilities

CMAPS

- Identified 21 key facilities using permit data
- Invited facility reps to meet with EPA, CDAQ, and STI
- Conducted phone surveys to gather emissions, production, and operating data for two intensive monitoring months (Aug 2009 and Feb 2010)

Clairton (PA) coke plant

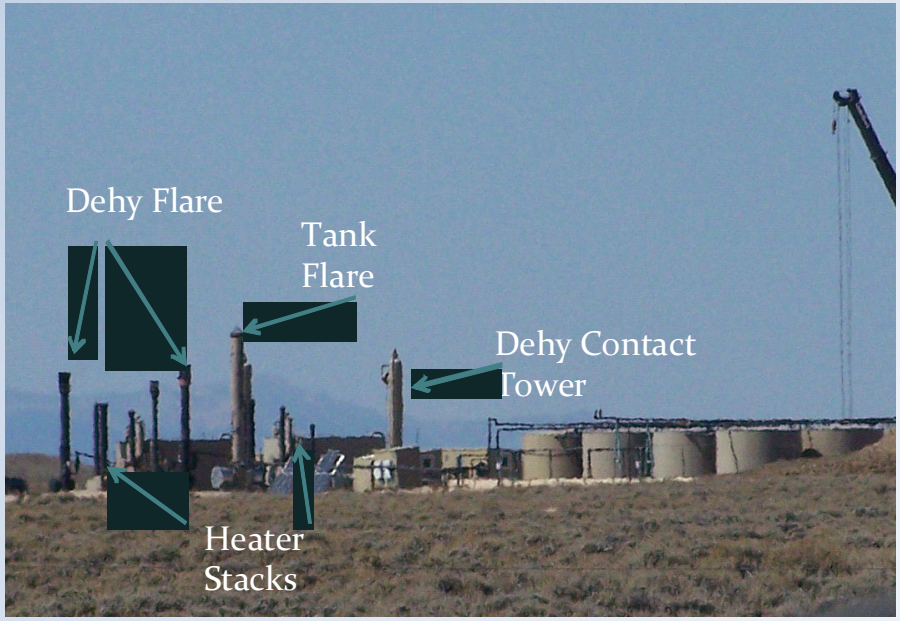
- Stack test on quench tower
- Increased condensable $PM_{2.5}$ emission factor from 0.00031 to 0.56 lb/ton of coal charged
- Decreased filterable $PM_{2.5}$ emission factor from 0.31 to 0.0785 lb/ton (due to the implementation of baffle washing)
- Overall $PM_{2.5}$ emissions 1,744 tons/year higher than NEI

Inventory Improvement Methods (3 of 4)

Non-point sources

Wyoming oil and gas wells

- Collected bottom-up emissions data on well-by-well basis
- Evaluated 14 sources (e.g., drill rigs, process burners, tanks, and dehydration units)
- Allows wells to be treated as individual point sources in air quality modeling applications



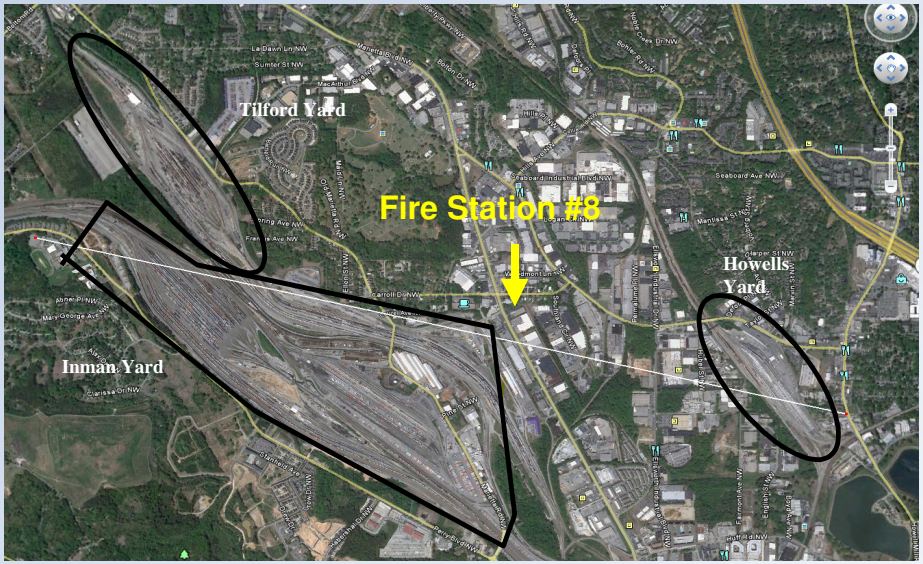
From focus group presentation by Wyoming DEQ on August 10, 2010

Inventory Improvement Methods (4 of 4)

Non-road mobile sources

Atlanta rail yards

- Collected data on switcher, line haul locomotive usage
- Treated rail yards as volume sources in AERMOD
- Accounted for replacement of switchers with ultra-low emission Gensets



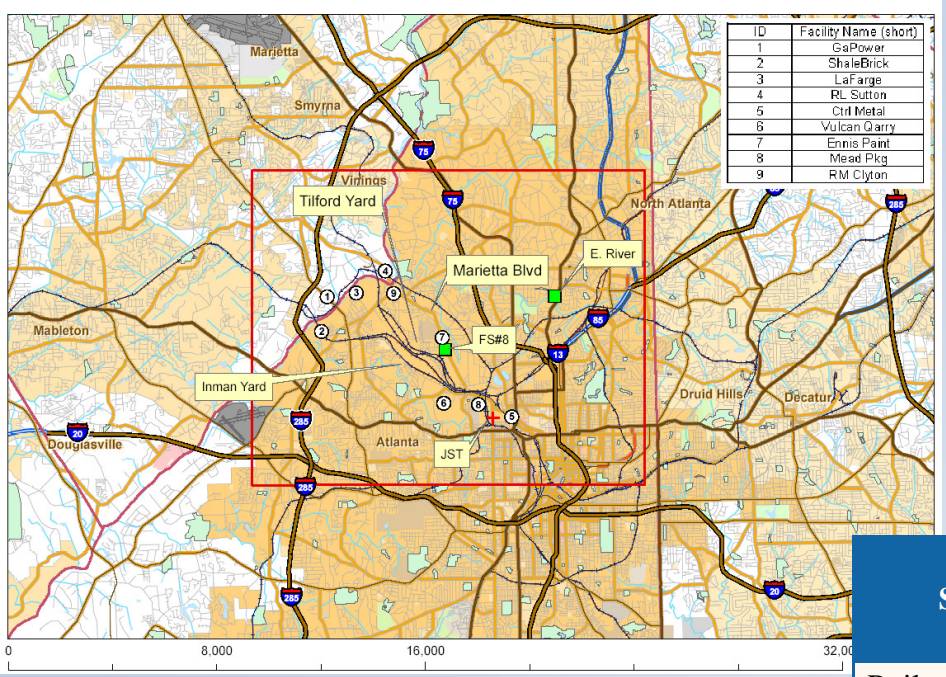
From focus group presentation by Georgia (DNR) on July 13, 2010

Port of Cleveland

- 2005 NEI updated using 2009 vessel call data

Example Outcomes

Atlanta local-area analysis



From focus group presentation by Georgia (DNR) on July 13, 2010

As a result of local-scale EI development and fine-scale modeling, the 2012 design value for the FS#8 monitor was lowered from 15.4 to 14.5 µg/m^3

Source	2002 $PM_{2.5}$ Contribution at FS#8 (µg/m^3)	2012 $PM_{2.5}$ Contribution at FS#8 (µg/m^3)	Reduction (µg/m^3)
Rail yards	1.9	0.6	1.3
On-road mobile sources	0.4	0.2	0.2
Industrial sources	1.3	1.3	0.0
Total	**3.6**	**2.1**	**1.5**

Findings and Recommendations (1 of 2)

Sample recommended actions for local-scale EI development

- Start with what you know – identify local emissions sources using existing inventories, permit data, etc.
- Communicate with facility owners/operators early and often using multiple approaches (letters, meetings, etc.)
- Understand your monitoring data thoroughly, particularly speciated data
- To evaluate local source contributions, use a weight of evidence approach (combine PMF, wind analyses, etc.)

Findings and Recommendations (2 of 2)

Barriers between local-scale inventories and the NEI

- The timing of inventory updates
- Resource limitations
- Parallel modeling inventories
- Emissions thresholds
- Perceived usefulness of local data for other agencies

Questions & Discussion

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