2008 National Emissions Inventory, version 2 Technical Support Document

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Technical Support Document
DRAFT

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Acronyms and Chemical Notations

AERR	Air Emissions Reporting Rule
APU	Auxiliary power unit
BSO	Benzene Soluble Organics
C1	Category 1 (commercial marine vessels)
C2	Category 2 (commercial marine vessels)
C3	Category 3 (commercial marine vessels)
CAIR	Clean Air Interstate Rule
CAMD	Clean Air Markets Division (of EPA Office of Air and Radiation)
CAP	Criteria Air Pollutant
CEC	North American Commission for Environmental Cooperation
CEM	Continuous Emissions Monitoring
CERR	Consolidated Emissions Reporting Rule
CFR	Code of Federal Regulations
CHIEF	Clearinghouse for Inventories and Emissions Factors
CMU	Carnegie Mellon University
CMV	Commercial marine vessels
CO	Carbon Monoxide
CSV	Comma Separated Variable
E10	10% ethanol gasoline
EDMS	Emissions and Dispersion Modeling System
EGU	Electric Generating Utility
EIS	Emission Inventory System
EAF	Electric arc furnace
EF	Emission factor
EMFAC	Emission FACtor (model) – for California
EPA	Environmental Protection Agency
ERG	Eastern Research Group
ERTAC	Eastern Regional Technical Advisory Committee
FAA	Federal Aviation Administration
FCCS	Fuel Characteristic Classification System
GIS	Geographic information systems
GPA	Geographic phase-in area
GSE	Ground support equipment
HAP	Hazardous Air Pollutant
HCl	Hydrogen Chloride (Hydrochloric acid)
Hg	Mercury
HMS	Hazard Mapping System
ICR	Information collection request
I/M	Inspection and maintenance
IPM	Integrated Planning Model
KMZ	Keyhole Markup Language, zipped (used for displaying data in Google Earth

LRTAP	Long-range Transboundary Air Pollution
LTO	Landing and takeoff
MATS	Mercury and Air Toxics Standards
MCIP	Meteorology-Chemistry Interface Processor
MMT	Manure management train
MOBILE6	Mobile Source Emission Factor Model, version 6
MOVES	Motor Vehicle Emissions Simulator
MSO	Methylene Chloride Soluble Organics
MW	Megawatts
MWC	Municipal waste combustors
NAA	Nonattainment area
NAAQS	National Ambient Air Quality Standards
NARAP	North American Regional Action Plan
NASS	USDA National Agriculture Statistical Service
NATA	National Air Toxics Assessment
NCD	National County Database
NEEDS	National Electric Energy Data System (database)
NEI	National Emissions Inventory
NH3	Ammonia
NMIM	National Mobile Inventory Model
NO	Nitrous oxide
NO2	Nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NOX	Nitrogen oxides
O_3	Ozone
OAQPS	Office of Air Quality Standards and Planning (of EPA)
ORIS	Office of Regulatory Information Systems
OTAQ	Office of Transportation and Air Quality (of EPA)
PADD	Petroleum Administration for Defense Districts
PAH	Polycyclic Aromatic Hydrocarbons
Pb	Lead
PCB	Polychlorinated Biphenyl
PM	Particulate matter
PM25-CON	Condensable PM2.5
PM25-FIL	Filterable PM2.5
PM25-PRI	Primary PM2.5 (condensable plus filterable)
PM2.5	Particulate matter 2.5 microns or less in diameter
PM10	Particular matter 10 microns or less in diameter
PM10-FIL	Filterable PM10
PM10-PRI	Primary PM10
POM	Polycyclic Organic Matter
PSC	Program system code (in EIS)
RFG	Reformulated Gasoline

RPD	Rate per distance
RPP	Rate per profile
RPV	Rate per vehicle
Rx	Prescribed (fire)
SCC	Source classification code
SFv1	SMARTFIRE version 1
SFv2	SMARTFIRE version 2
S/L/T	State, local, and tribal (agencies)
SMARTFIRE	Satellite Mapping Automated Reanalysis Tool for Fire Incident Reconciliation
SMOKE	Sparse Matrix Operator Kernel Emissions
SO2	Sulfur dioxide
SO4	Sulfate
TAF	Terminal Area Forecasts
TEISS	Tribal Emissions Inventory Software Solution
TRI	Toxics Release Inventory
UNEP	United Nations Environment Programme
USDA	United States Department of Agriculture
VMT	Vehicle miles traveled
VOC	Volatile organic compounds
WebFIRE	Factor Information Retrieval System
WFU	Wildland fire use
WLF	Wildland fire
WRF	Weather Research and Forecasting Model

1 Introduction

1.1 What data are included in the 2008 NEI, version 2 General Public release?

The 2008 National Emissions Inventory (NEI), version 2 General Public Release (hereafter referred to as the 2008 NEI) is a national compilation of emissions sources collected from state, local, and tribal air agencies as well as from emissions information from the Environmental Protection Agency (EPA) emissions programs including the Toxics Release Inventory (TRI), emissions trading programs such as the Acid Rain Program, and data collected as part of EPA regulatory development for reducing emissions of air toxics. The NEI program develops datasets, blends data from these multiple sources, and performs quality assurance steps that further enhance and augment the compiled data. The emissions data in the NEI are compiled for detailed emissions processes within a facility for large "point" sources or as a county total for smaller "nonpoint" sources and spatially dispersed sources such as on-road and nonroad mobile sources. For some fires, the data are compiled as day-specific events in the "event" portion of the inventory.

The pollutants included in the NEI are the pollutants related to implementation of the National Ambient Air Quality Standards (NAAQS), known as criteria air pollutants (CAPs), as well as hazardous air pollutants (HAPs) associated with EPA's Air Toxics Program. The CAPs have ambient concentration limits or are precursors for pollutants with such limits from the NAAQS program. These pollutants include lead (Pb), carbon monoxide (CO), nitrogen oxides (NOX), volatile organic compounds (VOC), sulfur dioxide (SO2), ammonia (NH3), particulate matter 10 microns or less (PM10) and particulate matter 2.5 microns or less (PM2.5). The HAP pollutants include the 187 remaining HAP pollutants from the original 188 listed in Section 112(b) of the 1990 Clean Air Act Amendments[1]. Key HAP emissions sources include mercury (Hg), hydrochloric acid (HCl) and other acid gases, heavy metals such as nickel and cadmium, and hazardous organic compounds such as benzene, formaldehyde, and acetaldehyde.

1.2 What is included in this documentation?

This document provides central reference for the 2008 NEI. The primary purpose of this document is to explain the sources of information included in the inventory. This includes showing which sources of data are used for each sector, and then providing more information about the EPA-created components of the data. For each emissions sector, we provide a synopsis of the types of sources that are included in that sector.

Section 2 explains the sectors that we use for summarizing the 2008 NEI and organizing this document, and it provides an overview of the contents of the inventory and a summary of mercury emissions. Sections 3, 0, and 5 provide the sector-by-sector documentation for the stationary, mobile, and fire emissions respectively. Section 7 provides a quality assessment of the 2008 NEI. Finally, Section 8 provides instructions for accessing supporting materials, and Section 9 provides the references. A separate document contains the appendices.

[1] The current list of HAPs is available at http://www.epa.gov/ttn/atw/188polls.html.

1.3 Where can I obtain the 2008 NEI data?

The 2008 NEI data are available in several different ways, as follows. EPA continues to review and streamline the approach for accessing the NEI data.

1.3.1 Emission Inventory System Gateway

http://www.epa.gov/ttn/chief/eis/gateway/

The Emission Inventory System (EIS) Gateway is available to all EPA staff, EIS data partners responsible for submitting data to EPA (i.e., the state, local, and tribal air agency staff), and contractors working for EPA on emissions related work. The Gateway can be used to obtain raw input datasets and create summary files from these datasets as well as the 2008 NEI general public releases. Use the link provided above for more information about how to obtain an account and to access the gateway itself. Note that if you run facility, unit or process level reports in EIS, you will get the final 2008 NEI v2 emissions, but the facility inventory, which is dynamic in EIS, will reflect more current information. For example, if an Agency ID has been changed since the time we ran the reports for the public website (mid February, 2012), then that new Agency ID will be in the EIS report but not in the report on the public site.

1.3.2 2008 NEI main webpage query tool

http://www.epa.gov/ttn/chief/net/2008inventory.html

The 2008 NEI webpage is available from the Clearinghouse for Inventories and Emissions factors (CHIEF) website. It includes a query tool that allows for summaries by EIS Sector (see Section 2.1) or the more traditional Tier 1 summary level used in the EPA Trends Report. Summaries from this site include national, state-, and county-level of CAP and HAP emissions. You can choose which states, EIS Sectors, Tiers, and pollutants to include in custom-generated reports to download Comma Separated Value (CSV) files to import into Microsoft® Excel ® or other spreadsheet tools. Biogenic emissions and tribal data are also available from this tool.

1.3.3 Air Emissions and "Where you live"

Main: http://www.epa.gov/air/emissions/
Where you live: http://www.epa.gov/air/emissions/where.htm

The Air Emissions website provides emissions of CAP pollutants except for ammonia using point-and-click maps and bar charts to provide access to summary and detailed emissions data. The maps, charts, and underlying data (in CSV format) can be saved from the website and used in documents or spreadsheets.

In addition, the "Where you live" feature of the Air Emissions website allows users to select states and EIS sectors (see Section 2.1) to create KMZ files used by Google Earth. You must have Google Earth installed on your computer to open the files. You can customize the maps to select the sectors of interest, and all other sectors will go into an "Other" category on the maps. The resulting maps allow you to click on the icons for each facility to get a chart of emissions associated with each facility for all criteria pollutants.

1.3.4 Modeling files

http://www.epa.gov/ttn/chief/emch/index.html#2008

The modeling files are provided in formats that can be read by the Sparse Matrix Operator Kernel Emissions (SMOKE, http://www.smoke-model.org). These formats are also CSV formats that can be read by other systems, such as databases. EPA makes changes to the NEI prior to use in modeling, so both the original 2008 NEI v2 data as well as the latest available modeling files can be found at this website.

1.4 Why is the NEI created?

The NEI is created to provide EPA, federal and state decision makers, the U.S. public, and other countries the U.S.'s best and most complete estimates of CAP and HAP emissions. While EPA is not directly obligated to create the NEI under the Clean Air Act, the Act authorizes the EPA Administrator to implement data collection efforts needed to properly administer the NAAQS program. Therefore, the Office of Air Quality Planning and Standards (OAQPS) maintains the NEI program in support of the NAAQS. Furthermore, the Clean Air Act requires states to submit emissions to EPA as part of their State Implementation Plans that describe how they will meet the NAAQS, and the NEI is used as one mechanism for states to meet some of those emissions requirements, particularly for the 3-year reporting requirements.

While the NAAQS program is the basis on which EPA collects CAP emissions from the state, local, and tribal air agencies, it does not require collection of HAP emissions. For this reason, the HAP reporting requirements are voluntary. Nevertheless, the HAP emissions are an essential part of the NEI program. These emissions estimates allow EPA to assess progress in meeting HAP reduction goals described in the Clean Air Act amendments of 1990. These reductions seek to reduce the negative impacts to people of HAP emissions in the environment, and the NEI allows EPA to assess how much emissions have been reduced since 1990.

1.5 How is the NEI created?

The NEI is created based on both regulatory and technical components. The Air Emissions Reporting Rule (AERR) is the rule that requires states to submit emissions of CAP emissions and provides the framework for voluntary submission of HAP emissions. The 2008 NEI is the first inventory compiled using the AERR, rather than its predecessor the Consolidated Emissions Reporting Rule (CERR). The AERR requires agencies to report all sources of emissions, except fires and biogenic sources. Open fire sources such as wildfires are encouraged but not required. Sources are divided into large categories: stationary sources are "point" or "nonpoint" (county totals) and mobile sources are either on-road (cars and trucks driven on paved and unpaved roads) or non-road (locomotives, aircraft, marine, off-road vehicles and nonroad equipment such as lawn and garden equipment). The AERR has emissions thresholds that determine whether a state, local, or tribal (S/L/T) agency must report stationary source emissions as "point" sources or whether the emissions can be lumped together into a county total as "nonpoint" sources.

The AERR includes emissions thresholds above which states must report stationary emissions as point sources with the remainder of the stationary emissions reported as nonpoint sources. The AERR changed the way these reporting thresholds work as compared to the CERR to make these thresholds "potential to emit" thresholds rather than actual emissions thresholds. In both the CERR and the AERR, the emissions that are reported are actual emissions, despite that the criteria for which sources to report is now based on potential emissions. The

AERR requires emissions reporting every year, with additional requirements every third year in the form of lower point source emissions thresholds, and 2008 is one of these third-year inventories.

Table 1 provides the potential-to-emit reporting thresholds that applied for the 2008 NEI cycle. "Type B" is the terminology in the rule that represents the lower emissions thresholds required for point sources in the triennial years. The reporting thresholds are sources with potential to emit 100 tons/year or more for most criteria pollutants with the exceptions of CO (1000 tons/year) and Pb (5 tons/year). As shown in the table, special requirements apply to nonattainment area (NAA) sources, where even lower thresholds apply.

Table 1: Point source reporting thresholds (potential to emit) for criteria pollutants in the Air Emissions Reporting Rule

Pollutant		2008 NEI thresholds: potential to emit (tons/yr)	
		Everywhere (Type B sources)	NAA sources[1]
1	SOx	≥ 100	≥ 100
2	VOC	≥ 100	O_3 (moderate) ≥ 100
3	VOC	.....	O_3 (serious) ≥ 50
4	VOC	.....	O_3 (severe) ≥ 25
5	VOC	.....	O_3 (extreme) ≥ 10
6	NOX	≥ 100	≥ 100
7	CO	≥ 1000	O_3 (all areas) ≥ 100
8	CO	.....	CO (all areas) ≥ 100
9	Pb	≥ 5	≥ 5
10	PM10.....	≥ 100	PM10 (moderate) ≥ 100
11	PM10.....	.....	PM10 (serious) ≥ 70
12	PM2.5.....	≥ 100	≥ 100
13	NH3	≥ 100	≥ 100

[1] NAA = Nonattainment Area. Special point source reporting thresholds apply for certain pollutants by type of nonattainment area. The pollutants by nonattainment area are: Ozone: VOC, NOX, CO; CO: CO; PM10: PM10

Based on the AERR requirements, S/L/T agencies submit emissions of point, nonpoint, on-road mobile, nonroad mobile, and fires emissions sources. These submissions are sent to EIS (http://www.epa.gov/ttn/chief/eis/gateway/index.html) that EPA then uses to review and assemble the data from the S/L/T agencies. For the 2008 NEI, these submissions were due to EPA by June 30, 2010 and states continued to revise their submissions through November 2011. Extra time was allotted to agencies for the 2008 NEI since it was the first inventory for which EIS was used. Starting with the 2009 inventory, S/L/T agency data are due by December 31 of the year following the inventory year (e.g., 2009 submissions were due by December 31, 2010).

Once the reporting NEI period has closed, EPA works with states to identify any agencies that missed the reporting window, provide feedback on data quality such as outliers and apparently missing data by comparing to previously established emissions ranges and past inventories. In addition, EPA works to augment the HAP inventories with additional data sources such as TRI, data developed by the air toxics and residual risk programs, and other augmentation procedures. This documentation provides a detailed account of EPA's quality assurance and augmentation methods.

1.6 Who are the target audiences for the 2008 NEI?

The comprehensive nature of the NEI allows for many uses and therefore its target audiences include EPA staff and policy makers, the U.S. public, other federal and state decision makers, and other countries. Table 2 below lists the major current uses of the NEI and the plans for use of the 2008 NEI in those efforts. These uses include those by EPA in support of the NAAQS, Air Toxics, and other programs as well as uses by other federal and regional agencies and international support. In addition to this list, the NEI is used to respond to Congressional inquiries, provide data that supports university research, and allow environmental groups to understand sources of air pollution.

Table 2: Examples of major current uses of the NEI

Audience	Purposes	Last NEI data used[1]
U.S. Public	Learn about sources of air emissions	2008 NEI v2
EPA – NAAQS	Regulatory Impact Analysis – benefits estimates using air quality modeling	Modified 2005 NEI, v2 for PM NAAQS proposal
	SO2 NAAQS Monitoring Implementation - Population Weighted Emissions Index	2008 NEI v1.5
	Pb Monitoring Rule	2005 NEI v2
	Pb NAAQS final designations	2008 NEI v1.5
	PB NAAQS review	Ongoing
	Transport Rule air quality modeling (e.g., Clean Air Interstate Rule, Cross-State Air Pollution Rule)	Modified 2005 NEI, v2
	State Implementation Plans – source of emissions data for regions outside of the state jurisdiction	2008 NEI v1.5
EPA – Air toxics	National Air Toxics Assessment (NATA)	Modified 2005 NEI, v2
	Mercury and Air Toxics Standard – mercury risk assessment and Regulatory Impact Assessment	Modified 2005 NEI, v2
	Residual Risk and Technology Review – starting point for inventory development	2008 NEI v1.5 and v1
EPA - other	Inspector General – review of oil and gas industry	2008 NEI v1.5
	NEI booklet – analysis of emissions inventory data	2002 NEI, v3
	Report on the Environment	2005 NEI, v2
	Air Emissions website for providing graphical access to CAP emissions for state maps and Google Earth views of facility total emissions	2008 NEI v1.5
	Department of Transportation, national transportation sector summaries of CAPs	2008 NEI v1.5
	Black Carbon Report to Congress	Modified 2005 NEI, v2
Other federal or regional agencies	Western Regional Air Partnership – modeling in support of Regional Haze SIPs and other air quality issues	Not known
	National Oceanic and Atmospheric Administration (NOAA) air quality forecasting	Not known
International	United Nations Economic Commission for Europe's Convention on Long-range Transboundary Air Pollution (LRTAP)	2005 NEI v1.5
	United Nations Environment Programme (UNEP) – global mercury program	Modified 2005 NEI, v2
	North American Commission for Environmental Cooperation (CEC) – North American Regional Action Plan (NARAP) on Mercury	Not known

[1] These were correct at the time of 2008 NEI v2 release. Some uses of the data will be updated to use the 2008 NEI v2.

1.7 What are appropriate uses of the 2008 NEI version 2 and what are the caveats about the data?

As shown in the preceding section, the NEI provides a readily-available comprehensive inventory of both CAP and HAP emissions to meet a variety of users needs. Although the accuracy of individual emissions estimates will vary from facility-to-facility or county-to-county, the NEI largely meets the needs of these users in the aggregate. Some NEI users may wish to evaluate and revise the emission estimates for specific pollutants from specific source types for either the entire US or for smaller geographical areas as their particular needs may dictate. Regulatory uses of the NEI by the EPA such as for the Clean Air Interstate Rule always include a public review and comment period. Large-scale assessment uses such as the NATA study provide an effective screening tool for identifying potential risks, the results of which should be reviewed in more detail, including an assessment of the key emissions and other modeling inputs.

One of the primary goals of the NEI is to provide the best assessment of current emissions levels using the data, tools and methods currently available. For significant emissions sectors of key pollutants, the available data, tools and methods typically evolve over time in response to identified deficiencies and the need to understand the costs and benefits of proposed emissions reductions. As these method improvements have been made, there have not been consistent efforts to revise previous NEI year estimates to use the same methods as the current year. Therefore, care must be taken when reviewing different NEI year publications as a time series with the goal of determining the trend or difference in emissions from year to year. An example of such a method change in the 2008 NEI v2 is the use of the Motor Vehicle Emissions Simulator (MOVES) model[2] for the on-road data category. Previous NEI 2008 versions and NEI years had used the Mobile Source Emission Factor Model, version 6 (MOBILE6)[3] and earlier versions of the MOBILE model for this data category, and the change of model has been demonstrated to make significant changes in some pollutants. EPA's rulemaking packages typically provide a consistent trend estimate across base and future years using the same estimation model or methods, but these efforts do not extend to re-estimation of past NEI years. Other significant emissions sectors which have seen improvements and therefore inconsistent trend data through the years include paved and unpaved road PM emissions, animal waste ammonia emissions, and residential wood combustion emissions. In addition, the 2008 NEI v2 uses updated emissions factors for several metal HAPs and acid gases from coal-fired utility boilers.

Appendix A of this document provides a detailed listing of the issues that were identified during the course of the development of the 2008 NEI and the current status of those issues. The Appendix includes all issues identified as part of the 2008 NEI versions 1, 1.5, and 2. This same information is available in spreadsheet form from the spreadsheet "2008 NEI v2 issues 24apr2012.xlsx" (see Section 8.1 for access information), and the spreadsheet will be kept more up to date than the Appendix. If the spreadsheet is newer, it will have a different date as part of the name, and is also available from the main 2008 NEI data page listed in Section 1.3.2.

In addition to the issues, users should take caution in using the emissions data for filterable and condensible components of particulate matter (PM10-FIL, PM2.5-FIL and PM-CON) which is not complete and should not be used at any aggregated level. These data are provided for users who wish to better understand the components

[2] See http://www.epa.gov/otaq/models/moves/index.htm
[3] See http://www.epa.gov/otaq/m6.htm

of the primary PM species, where they are available, in the disaggregated, process-specific emissions reports. Where not reported by S/L/T, EPA augments these components (see Section 3.1.2). However, not all sources are covered by this routine, and in mobile source models, only the primary particulate species are estimated. Thus, users interested in PM emissions should use the primary species of particulate matter (PM10-PRI and PM25-PRI), described in this document simply as PM10 and PM2.5.

Also some data summaries may include the pollutant "Chromium." EPA speciated emissions for Chromium (pollutant code=7440473, see Section 3.1.3) into hexavalent chromium and trivalent chromium (Chromium (VI) and Chromium III), other than the less than 1 pound of nonpoint emissions inadvertently missed by the speciation routine. Therefore, 2008 NEI v2 data summaries for "Chromium" will show emissions of 0 or close to 0. Users should use the data for Chromium (VI), Chromium III, Chromic Acid (VI) and Chromium Trioxide, but not for Chromium.

The primary unresolved issues in the 2008 NEI v2 are described below.

- The only emissions for any data category in the 2008 NEI for South Dakota are those provided by EPA. Users of the NEI are encouraged to augment 2008 South Dakota point source emissions with data from past inventories.
- It is suspected but not fully confirmed that for a few states, the point source primary PM10 and primary PM2.5 emissions may be underestimated due to the reporting of only the filterable portions of particulate matter as the full filterable plus condensable equals "primary" particulate pollutants by the States. On-road, Nonroad, and probably most of Nonpoint emissions for these States are expected to accurately reflect the full filterable plus condensable particulate emissions due to the available models and emission factors for those data categories.
- Landfills have not been estimated by EPA for the 2008 NEI, as had been done in earlier NEI years. Some States do report some pollutants for some of their larger landfills, and these have been included in the 2008 NEI. This is expected to be largely an issue for some toxics. The scope of the underestimate is uncertain, due to an expectation that many landfills have been adding gas collection systems as a result of various control programs and the value of the collected gas as a fuel.
- There may be some double-counting of rail switchyard emissions in a small number of locations, due to State reporting of nonpoint county emissions and EPA reporting of the larger switchyards as point sources. In the counties where this occurs it is not known if the nonpoint county emissions reported by the States have been adjusted to exclude the point sources reported by EPA. See also Section 4.4.6.
- EPA's methods for fires, which rely heavily on satellite data, generally do not capture the smaller fires (generally not less than 100 acres), and thus the EPA estimates for acres burned and the emissions are likely low in most cases. The same can be said for interference to remote sensing caused by excess cloud cover and/or canopy cover.
- In addition to this general underestimation for some fires, there may be minor double-counting in cases where Tribes also submitted fires data. The Tribal data were included in the 2008 NEI as submitted by the Tribes. No attempts were made to avoid the possible double count that would occur with the possible overlap of EPA data or State data and the Tribal-reported data (see Section 5.1.2). To do this, accurate shape files for the various Tribal lands would be required.

- As described in Section 2.6, 0.5 tons of Hg from boilers were inadvertently left out of the 2008 NEI, but have been added to summary tables for mercury provided in that section.
- In using the NEI in modeling applications, many unresolved inconsistencies were identified among reported stack velocities, flows, and diameters.
- For future year projections of the 2008 NEI that will substitute Integrated Planning Model (IPM) results for Electric Generating Utilities (EGUs), the mapping of NEI units to IPM units from the National Electric Energy Data System (NEEDS) database (used to define the units for IPM) is somewhat incomplete. Users of the data should confirm that any deficiencies in the mapping are resolved in 2008 NEI modeling files also provided by EPA.

2 2008 inventory contents overview

2.1 What are EIS Sectors and what list was used for this document?

EIS Sectors are being used for the first time with the release of the 2008 NEI. These sectors have been developed to better group emissions for both CAP and HAP summary purposes. The sectors are based simply on grouping the emissions by the emissions process based on the source classification code (SCC) to the EIS sector. The SCC-EIS Sector cross-walk used for the summaries provided in this document ("scc_eissector_xwalk_2008neiv2.xlsx") is part of the supporting data (see Section 8.1 for access information). In building this list, we gave consideration not only to the types of emissions sources our data users most frequently ask for, but also to the need to have a relatively concise list in which all sectors have a significant amount of emissions of at least one pollutant. Users of the NEI are free to obtain the SCC-level data and modify the EIS Sector cross-walk to make custom groupings of their own or to request assistance from EPA to do so.

Some of the sectors include the nomenclature "NEC", which stands for "not elsewhere classified." This simply means that those emissions processes were not appropriate to include in another EIS sector and their emissions were too small individually to include as its own EIS sector.

Traditionally, the inventory has been compiled and considered using four major categories, which are also categories in EIS: point, nonpoint, on-road, and nonroad. In EIS, another category called "event" has been added and is used to compile day-specific data from fires. While events could be other non-fire intermittent releases such as chemical spills, these have been a focus of the NEI creation effort. Table 3 shows the EIS sectors in the left most column and identifies the EIS category associated with that sector. It also identifies in the rightmost column the section number of this document that provides more information about that EIS sector. As the column illustrates, many EIS sectors include emissions from more than one EIS category because the EIS sectors are compiled based on the type of emissions sources rather than the category. One particularly large change from the traditional labeling of sectors and categories is for the EIS sectors "Mobile – Aircraft", "Mobile – Commercial Marine Vessels", and "Mobile – Locomotives" that are included in EIS as part of the nonpoint category rather than the nonroad category. This change is related only to how the data are compiled by EIS and has no other significance for the emissions values themselves. However, NEI users who sum emissions by EIS category rather than EIS sector should be aware that this change will give differences from historical summaries of "nonpoint" and "nonroad" data unless care is taken to assign those emissions to the historical grouping.

Table 3: EIS sectors and associated emissions categories and document sections

Sector name	Point	Nonpoint	On-road	Nonroad	Event	Document Section
Agriculture - Crops & Livestock Dust		☑				3.2
Agriculture - Fertilizer Application		☑				3.3
Agriculture - Livestock Waste	☑	☑				3.4
Bulk Gasoline Terminals	☑	☑				3.5
Commercial Cooking		☑				3.6
Dust - Construction Dust	☑	☑				3.7
Dust - Paved Road Dust		☑				3.8
Dust - Unpaved Road Dust		☑				3.9
Fires - Agricultural Field Burning		☑				5.2
Fires - Prescribed Burning		☑			☑	5.1
Fires - Wildfires		☑			☑	5.1
Fuel Comb - Comm/Institutional - Biomass	☑	☑				0
Fuel Comb - Comm/Institutional - Coal	☑	☑				0
Fuel Comb - Comm/Institutional - Natural Gas	☑	☑				0
Fuel Comb - Comm/Institutional - Oil	☑	☑				0
Fuel Comb - Comm/Institutional - Other	☑	☑				0
Fuel Comb - Electric Generation - Biomass	☑					3.10
Fuel Comb - Electric Generation - Coal	☑					3.10
Fuel Comb - Electric Generation - Natural Gas	☑					3.10
Fuel Comb - Electric Generation - Oil	☑					3.10
Fuel Comb - Electric Generation - Other	☑					3.10
Fuel Comb - Industrial Boilers, ICEs - Biomass	☑	☑				3.11
Fuel Comb - Industrial Boilers, ICEs - Coal	☑	☑				3.11
Fuel Comb - Industrial Boilers, ICEs - Natural Gas	☑	☑				3.11
Fuel Comb - Industrial Boilers, ICEs - Oil	☑	☑				3.11
Fuel Comb - Industrial Boilers, ICEs - Other	☑	☑				3.11
Fuel Comb - Residential - Natural Gas		☑				3.13
Fuel Comb - Residential - Oil		☑				3.13
Fuel Comb - Residential - Other		☑				3.13
Fuel Comb - Residential - Wood		☑				0
Gas Stations	☑	☑				0
Industrial Processes - Cement Manufacturing	☑					0
Industrial Processes - Chemical Manufacturing	☑	☑				0
Industrial Processes - Ferrous Metals	☑					0
Industrial Processes - Mining	☑	☑				0
Industrial Processes - NEC	☑	☑				0
Industrial Processes - Non-ferrous Metals	☑	☑				0
Industrial Processes - Oil & Gas Production	☑	☑				0

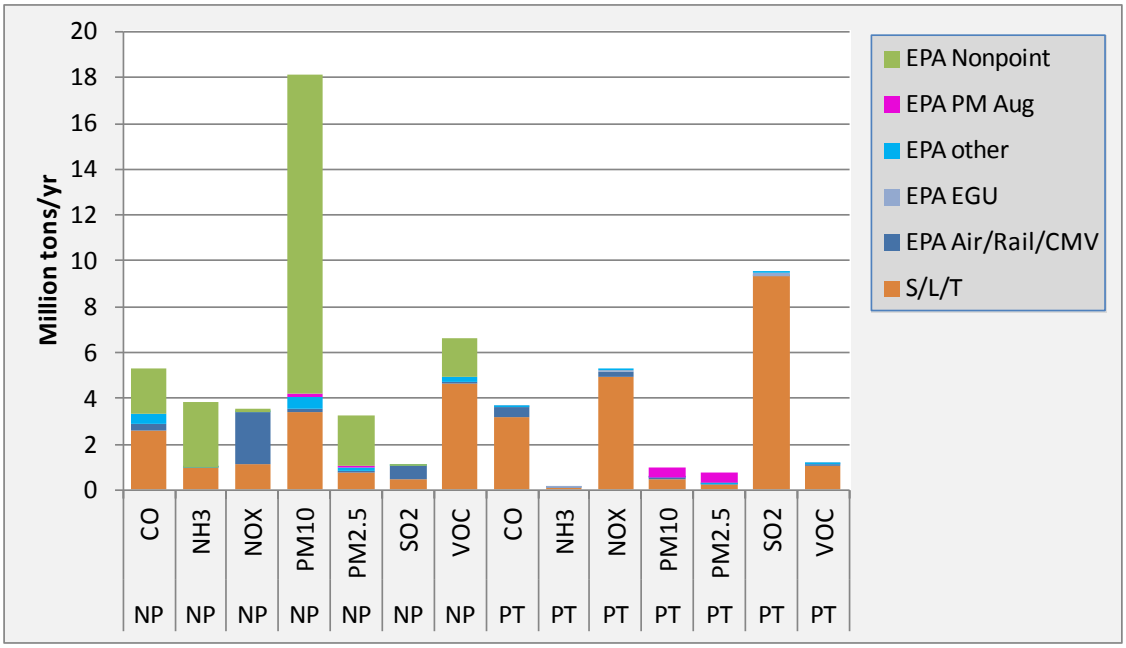
Sector name	Point	Nonpoint	On-road	Nonroad	Event	Document Section
Industrial Processes - Petroleum Refineries	☑	☑				0
Industrial Processes - Pulp & Paper	☑					0
Industrial Processes - Storage and Transfer	☑	☑				0
Miscellaneous Non-Industrial NEC	☑	☑				0
Mobile - Aircraft	☑	☑				4.2
Mobile - Commercial Marine Vessels	☑	☑				4.3
Mobile - Locomotives	☑	☑				4.4
Mobile - Non-Road Equipment - Diesel	☑			☑		4.5
Mobile - Non-Road Equipment - Gasoline	☑			☑		4.5
Mobile - Non-Road Equipment - Other	☑			☑		4.5
Mobile - On-road – Diesel Heavy Duty Vehicles			☑			4.6
Mobile - On-road – Diesel Light Duty Vehicles			☑			4.6
Mobile - On-road – Gasoline Heavy Duty Vehicles			☑			4.6
Mobile - On-road – Gasoline Light Duty Vehicles			☑			4.6
Solvent - Consumer & Commercial Solvent Use		☑				0
Solvent - Degreasing	☑	☑				0
Solvent - Dry Cleaning	☑	☑				0
Solvent - Graphic Arts	☑	☑				0
Solvent - Industrial Surface Coating & Solvent Use	☑	☑				0
Solvent - Non-Industrial Surface Coating		☑				0
Waste Disposal	☑	☑				0

2.2 What do the data show about the sources of data in the 2008 NEI?

Data in the NEI come from a variety of sources. The emissions are predominantly from S/L/T agencies for both CAP and HAP emissions. In addition, EPA quality assures and augments the data provided by states to assist with data completeness, particularly with the HAP emissions since the S/L/T HAP reporting is voluntary. Additional details on EPA's augmentation datasets are available in the remainder of this document.

Figure 1 shows the proportion of criteria pollutant emissions from various data sources in the NEI for point and nonpoint sources (data sources from on-road, nonroad, and fire sources are described later in this section; these sectors are different because they each have their own emissions model). For the nonpoint data in the figure (left 7 bars), most of the emissions come from EPA sources of data, with S/L/T agency data the majority for VOC and CO. The large "EPA Nonpoint" bar for PM10 is predominantly dust sources from unpaved roads (7 million tons), agricultural dust from crop cultivation (3.6 million tons), and construction dust (1.5 million tons). For point data in the figure (right 7 bars), most of the emissions come from S/L/T agency data, with EPA data making up a large proportion only for the PM10 and PM2.5 with the EPA PM Augmentation dataset ("EPA PM Aug" in the figure, see Section 3.1.2). The data sources shown in the figure are described in more detail in Section 3.

Figure 1: Data sources for point and nonpoint emissions for criteria pollutants



In Figure 2, the nonpoint HAP VOCs are evenly split between EPA (250,000 tons) and S/L/T agency (241,000 tons) data sources. The nonpoint acid gases are very small, with 6,700 tons from S/L/T agencies and 3,500 tons from the EPA nonpoint dataset. For point sources, the bulk of the acid gases emissions (primarily HCl) comes from two EPA EGU datasets (138,000 tons) in addition to 42,000 tons from S/L/T agencies , while most of the HAP VOC emissions come from the S/L/T/ agency data (179,000 tons) and just 33,000 tons from TRI.

Figure 2: Data sources for point and nonpoint emissions for acid gases and HAP VOCs

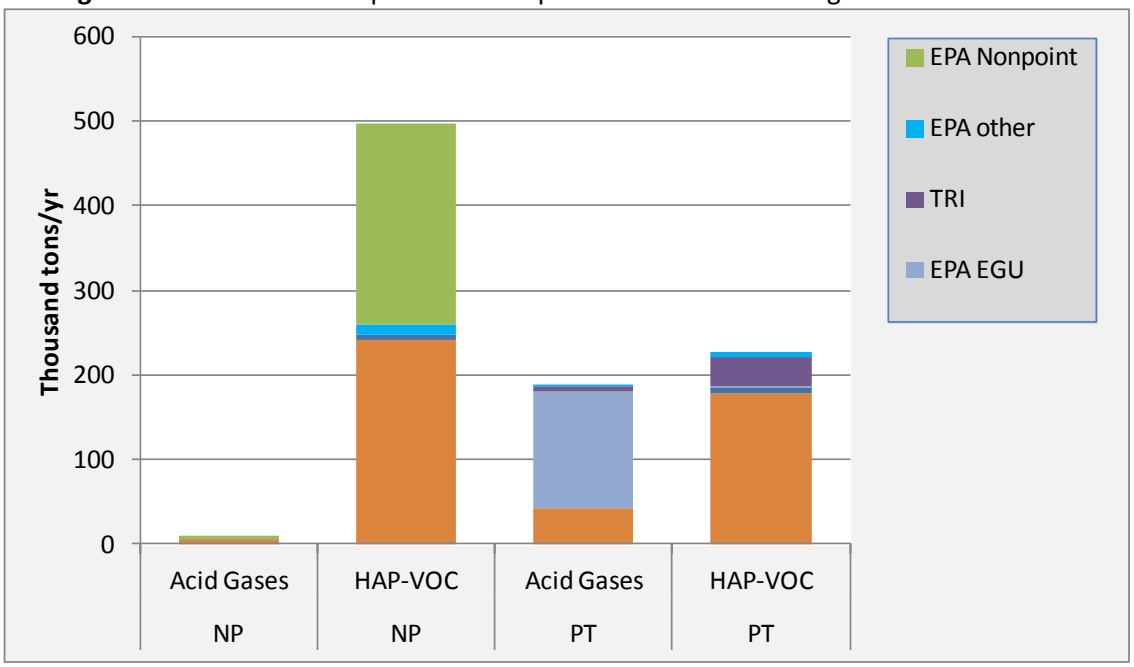
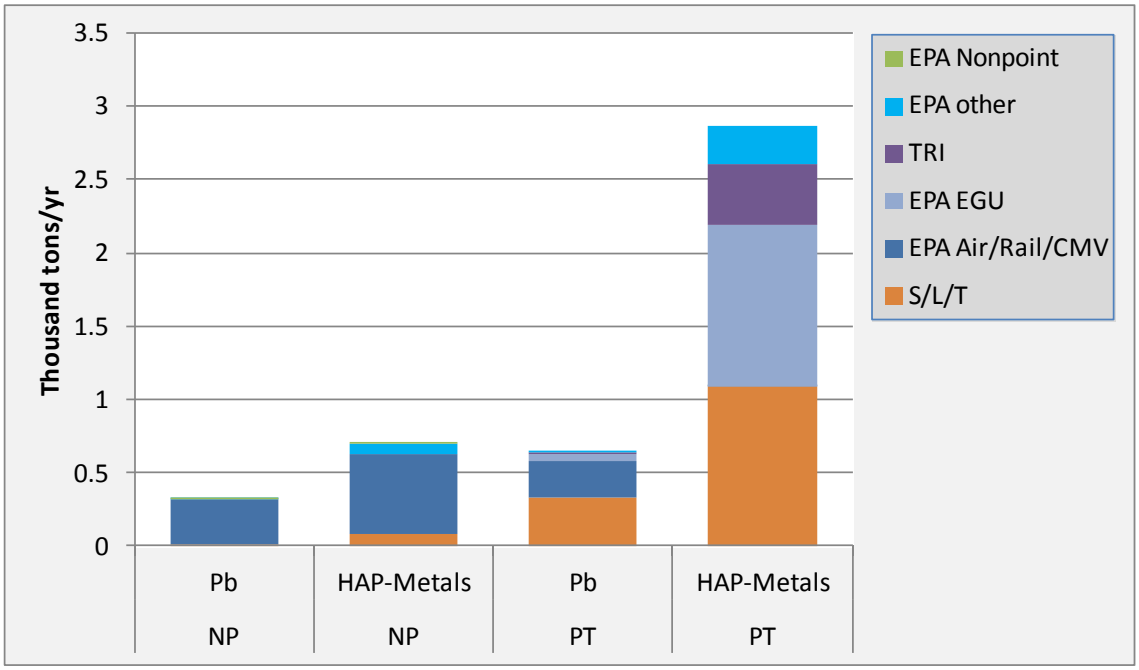


Figure 3 shows emissions sources for Pb and HAP metal emissions. For nonpoint sources, almost all of the emissions are from the EPA nonroad dataset, which includes emissions from airports, locomotives, and commercial marine vessels. For point sources, about half of the Pb comes from S/L/T agency data (330 tons),

while the EPA nonroad dataset airport emissions makes up a substantial part of the rest (250 tons). For metals, the point sources data has a significant portion from S/L/T agencies (1,090 tons), with the rest from the EPA EGU dataset (1,100 tons), TRI (420 tons), and other EPA datasets (250 tons).

Figure 3: Data sources for point and nonpoint emissions for Pb and HAP metals



As shown in the figures above, S/L/T agency data are the bulk of the stationary source emissions in the NEI for all pollutants except PM10, HAP-VOCs, and HAP-Metals. Nearly all states (and locals responsible for submitting inventories) submitted data to EPA for the 2008 NEI. The figures below provide more detail about which states submitted data to the NEI for the stationary and mobile categories. In Sections 3 through 5, we explain more about what data actually was used by EPA in creating the NEI for each sector. Usually, but not always, EPA uses the data provided by the states. These figure present the states for which data were available to EPA in compiling the 2008 NEI.

Figure 4 shows that all states except South Dakota submitted point source CAP emissions and all states but Utah, South Dakota, Indiana, Georgia, Connecticut, and Alaska submitted point source HAP emissions. Generally, when states submitted CAP emissions they submitted all of the CAPs, but for HAP emissions there is more variability in the data provided. S/L/T agencies can only report what they collect, and collection varies depending on state, local, and tribal reporting regulations. In the case of Indiana, point source HAP data are collected (voluntarily) but not reported to EPA[4].

[4] See the Indiana voluntary HAP reporting program at http://www.in.gov/idem/4582.htm.

Figure 4: Point inventory - submission types - includes local agencies

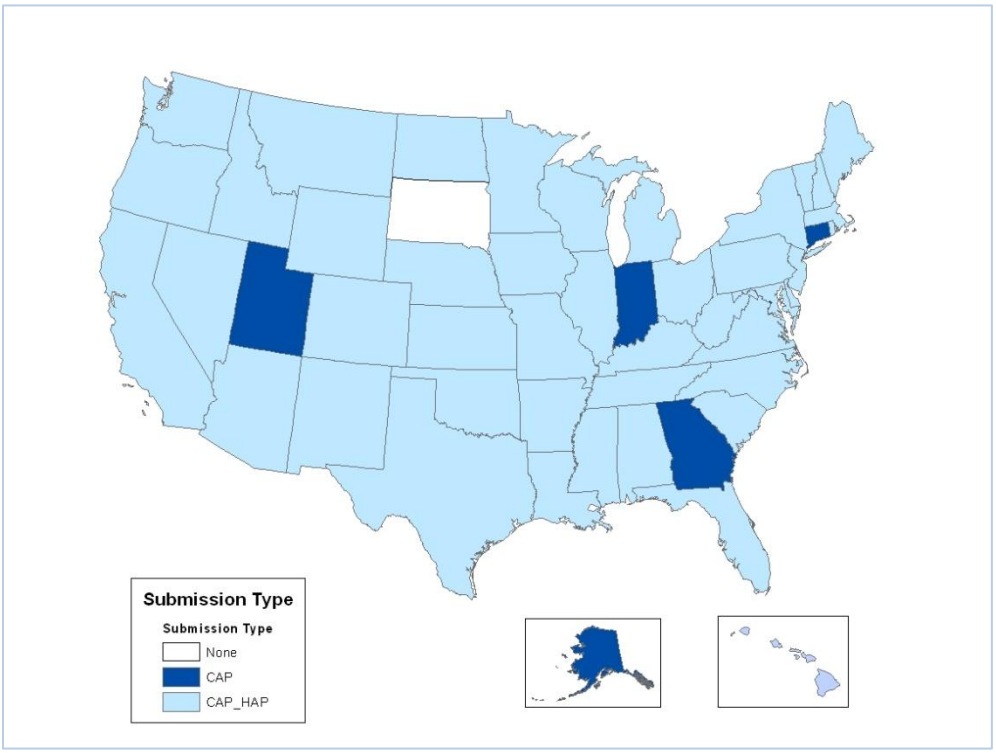
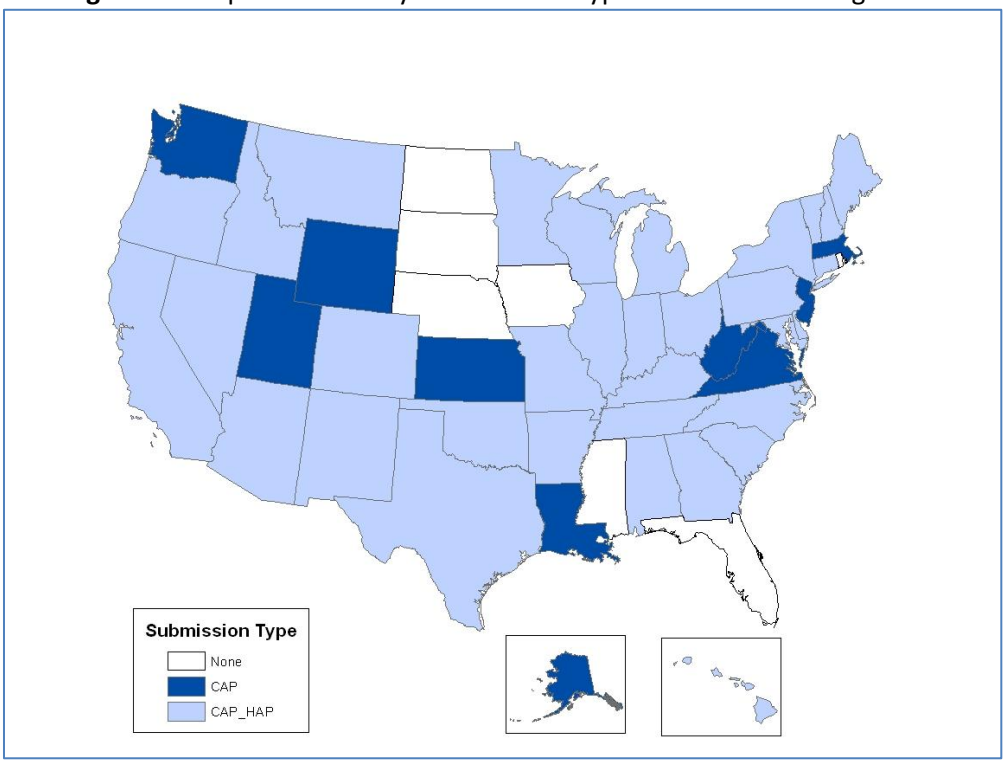


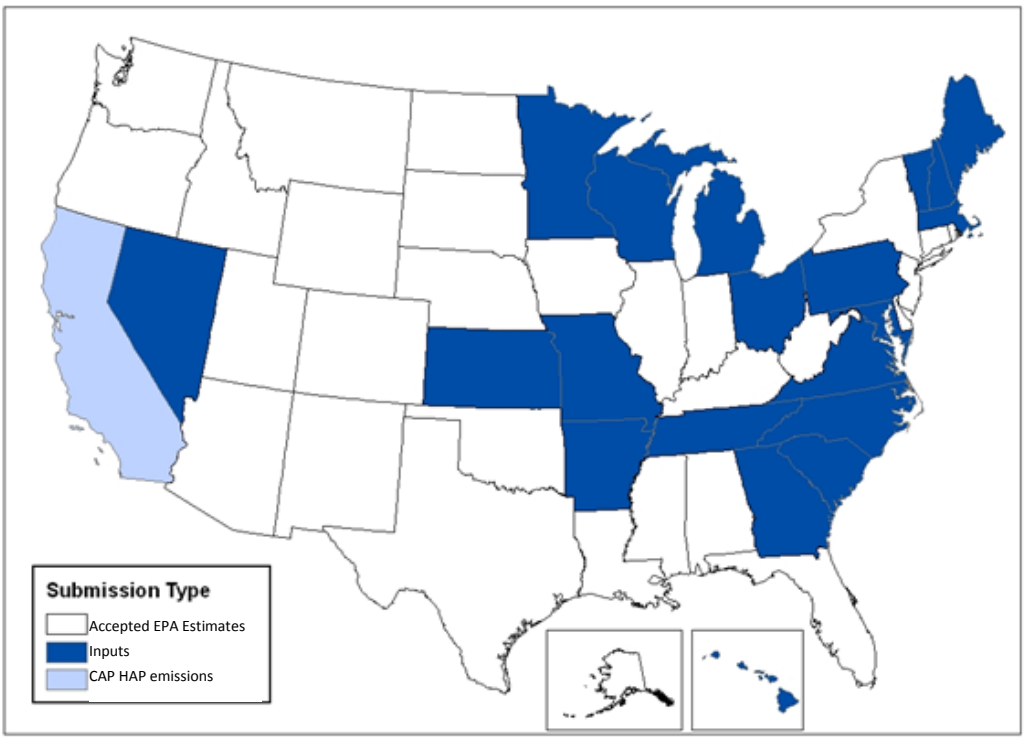
Figure 5 shows the states that submitted nonpoint emissions: 41 states submitted CAPs and 32 also submitted HAPs. Only 7 states did not submit any nonpoint emissions, and at least some of these notified EPA that EPA's estimates were acceptable for the source types that EPA estimated.

Figure 5: Nonpoint inventory – submission types – includes local agencies



For on-road mobile sources, emissions in all states except California are based on the MOVES model. California emissions are estimated by the EMFAC (short for Emission FACtor) model[5] and California has provided CAP and HAP emissions which are used in the 2008 NEI. As shown in Figure 6 below, 30 states accepted EPA estimates without providing any on-road model inputs. This is a higher number of states than in past inventories because the NEI timing relative to the release of the MOVES model did not allow for states to submit MOVES-based emissions. Nineteen states provided some form of either the National Mobile Inventory Model (NMIM)[6] or MOVES inputs to EPA, including vehicle miles traveled (VMT), which EPA used to prepare inputs to the MOVES model.

Figure 6: On-road inventory – submission types – does not include local agencies



Like on-road mobile, the nonroad mobile sector gives a patchwork of scenarios for providing different data types. Again, California has provided EPA CAP and HAP emissions based on a different model than the other states – the OFFROAD model[7]. Other states emissions come from the NONROAD model[8], often through the use of the NMIM, which drives the NONROAD model. In Idaho, Texas, and Kansas, state agencies submitted nonroad emissions for CAP and HAP pollutants. For Utah, Illinois, Pennsylvania, and New York, the states submitted CAP emissions only. Eighteen states submitted NONROAD model inputs, that EPA could use to generate emissions, and the remaining states accepted EPA estimates.

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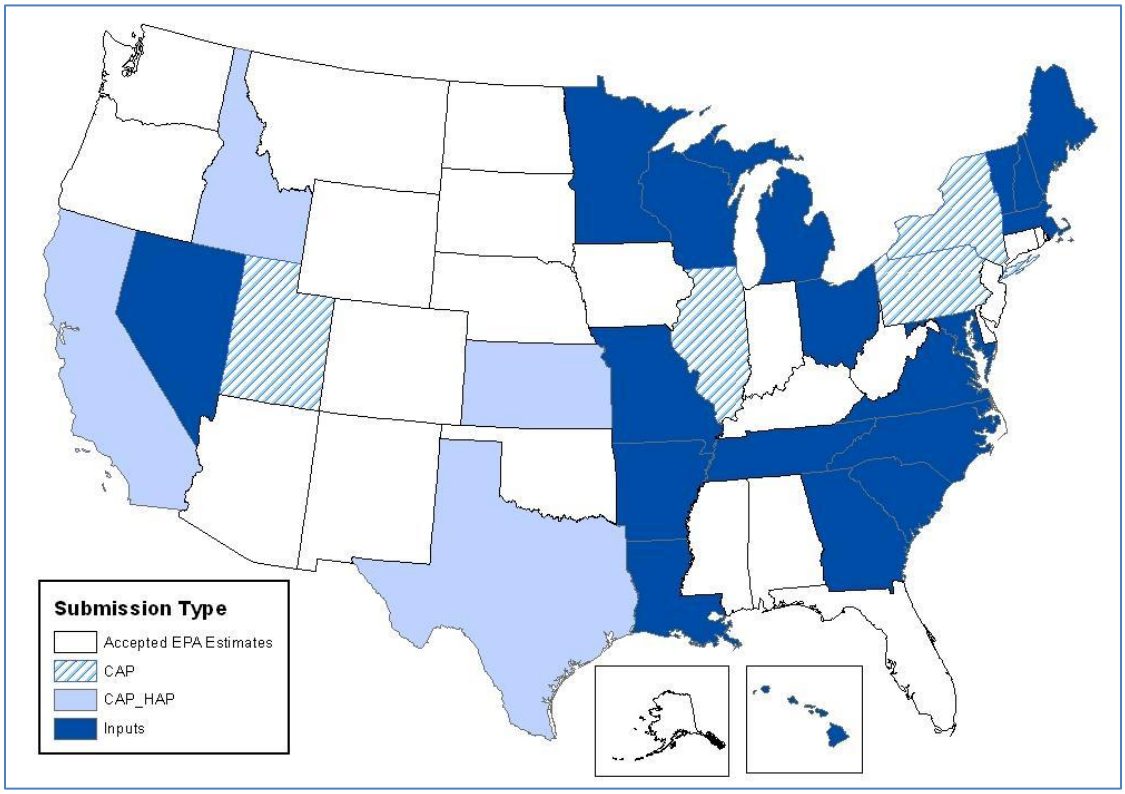
[5] See "EMFAC Overview" link available at http://www.arb.ca.gov/msei/onroad/background.htm
[6] See http://www.epa.gov/otaq/nmim.htm
[7] The OFFROAD model and documentation are available at http://www.arb.ca.gov/msei/offroad/offroad.htm.
[8] The NONROAD model and documentation are available at http://www.epa.gov/otaq/nonrdmdl.htm

Figure 7: Nonroad equipment inventory – submission types – does not include local agencies



In addition to the maps above, each sector-specific section below has maps that show the distribution of state and EPA data for CAPs and HAPs. Finally, Appendix B provides a table that shows for each EIS sector whether the data comes from S/L/T agencies or a selection of EPA created datasets including TRI.

2.3 What are the top sources of some key pollutants?

This section simply provides a summary of criteria pollutants and total HAP emissions for all of the EIS sectors, including the biogenic emissions from vegetation and soil. Emissions in federal waters and from vegetation and soils have been split out and totals both with and without these emissions are included. Emissions in federal waters includes offshore drilling platforms and commercial marine vessel emissions outside the typical 3-10 nautical mile boundary defining state waters. These emissions values are subject to change and are bounded by the caveats and methods described by this documentation.

Table 4: EIS sectors and associated CAP emissions and total HAP (1000 short tons/year)

	1,000 short tons/yr								
Sector	**CO**	**VOC**	**NOX**	**SO2**	**PM2.5**	**PM10**	**NH3**	**Lead**	**Total HAP[1]**
Agriculture - Crops & Livestock Dust					923	4,650			1.49E-2
Agriculture - Fertilizer Application							1,190		
Agriculture - Livestock Waste		92			7.49	24	2,448		1.92E-5
Bulk Gasoline Terminals	0.777	93	0.392	1.48E-2	8.78E-2	0.101	4.28E-4	2.49E-5	5.45
Commercial Cooking	30	13	6.19E-4	9.52E-5	86	89			5.22
Dust - Construction Dust	0.168	1.66E-2	7.32E-2	1.00E-3	220	2,115	8.34E-4	2.22E-9	3.64E-2
Dust - Paved Road Dust					280	1,539			
Dust - Unpaved Road Dust					812	8,104			
Fires - Agricultural Field Burning	576	53	25	3.42	66	68	3.88	9.73E-4	6.48
Fires - Prescribed Fires	8,176	1,697	139	65	701	824	119		240
Fires - Wildfires	12,203	2,847	96	70	999	1,178	198		1,051
Fuel Comb - Comm/Institutional - Biomass	17	0.541	5.49	1.70	2.52	3.07	0.219	5.80E-4	0.676
Fuel Comb - Comm/Institutional - Coal	15	0.418	20	88	2.13	4.65	0.136	3.46E-3	1.88
Fuel Comb - Comm/Institutional - Natural Gas	100	8.94	146	1.24	5.94	6.16	1.06	8.91E-4	1.50
Fuel Comb - Comm/Institutional - Oil	18	2.62	60	66	3.93	4.78	0.807	9.49E-4	0.824
Fuel Comb - Comm/Institutional - Other	12	0.932	9.20	1.22	0.541	0.657	3.64E-2	1.53E-3	8.82E-2
Fuel Comb - Electric Generation - Biomass	21	1.09	10	2.76	1.48	1.80	1.49	1.90E-3	1.38
Fuel Comb - Electric Generation - Coal	573	29	2,813	7,603	276	370	11	4.97E-2	144
Fuel Comb - Electric Generation - Natural Gas	93	9.45	181	15	20	21	11	1.27E-3	2.83
Fuel Comb - Electric Generation - Oil	13	1.95	82	142	9.45	11	1.65	3.14E-3	0.794
Fuel Comb - Electric Generation - Other	27	2.05	27	15	1.93	2.47	2.25	3.76E-3	1.27
Fuel Comb - Industrial Boilers, ICEs - Biomass	192	8.30	80	25	32	39	1.70	1.49E-2	7.34
Fuel Comb - Industrial Boilers, ICEs - Coal	59	2.17	208	663	24	51	0.495	2.08E-2	15
Fuel Comb - Industrial Boilers, ICEs - Natural Gas	367	60	777	38	29	32	6.50	5.29E-3	22
Fuel Comb - Industrial Boilers, ICEs - Oil	26	3.72	93	135	9.16	13	0.955	2.67E-3	0.740
Fuel Comb - Industrial Boilers, ICEs - Other	121	6.33	72	67	31	33	0.741	4.70E-3	2.33
Fuel Comb - Residential - Natural Gas	94	13	230	1.41	5.06	5.41	38	2.04E-4	0.920
Fuel Comb - Residential - Oil	14	1.74	57	121	5.87	6.76	2.62	3.80E-3	0.138
Fuel Comb - Residential - Other	49	2.90	38	8.90	1.07	1.56	0.380	1.33E-4	7.23E-2
Fuel Comb - Residential - Wood	2,378	350	35	10	344	345	20	4.62E-4	70
Gas Stations	9.41E-3	643	2.13E-2	2.96E-3	6.16E-3	6.44E-3	3.42E-4	5.24E-4	28
Industrial Processes - Cement Manuf	100	9.19	186	106	13	24	0.889	8.29E-3	3.61
Industrial Processes - Chemical Manuf	205	99	77	196	23	30	19	1.19E-2	31
Industrial Processes - Ferrous Metals	467	19	63	33	36	44	0.625	7.89E-2	2.41
Industrial Processes - Mining	29	1.89	5.93	3.80	106	748	1.88E-3	2.60E-3	0.824
Industrial Processes - NEC	260	217	198	158	120	187	51	4.05E-2	58
Industrial Processes - Non-ferrous Metals	328	16	16	132	20	25	0.994	8.62E-2	9.63
Industrial Processes - Oil & Gas Production	219	1,688	409	61	7.11	10	2.75E-2	5.36E-5	8.33
Industrial Processes - Petroleum Refineries	84	68	93	144	24	27	3.00	5.17E-3	5.87
Industrial Processes - Pulp & Paper	132	130	74	40	40	49	5.95	5.14E-3	54
Industrial Processes - Storage and Transfer	17	238	6.72	5.53	23	53	4.97	9.33E-3	15
Miscellaneous Non-Industrial NEC	29	227	1.81	0.159	3.18	3.73	11	4.02E-4	25
Mobile - Aircraft	458	35	121	13	4.22	10		0.571	8.49
Mobile - Commercial Marine Vessels	143	21	827	150	35	37	0.398	2.90E-3	3.35
Mobile - Locomotives	120	44	846	11	25	28	0.362	2.28E-3	4.09
Mobile - Non-Road Equipment - Diesel	870	166	1,551	32	122	127	1.08	3.27E-5	41
Mobile - Non-Road Equipment - Gasoline	15,462	2,281	250	2.35	55	61	0.837	2.14E-6	539
Mobile - Non-Road Equipment - Other	1,015	47	187	0.741	2.09	2.10	1.07		0.196

	1,000 short tons/yr								
Sector	**CO**	**VOC**	**NOX**	**SO2**	**PM2.5**	**PM10**	**NH3**	**Lead**	**Total HAP[1]**
Mobile - On-road – Diesel Heavy Duty Vehicles	981	238	3,353	85	204	224	6.00		45
Mobile - On-road – Diesel Light Duty Vehicles	47	11	75	2.64	5.64	6.23	0.334		1.91
Mobile - On-road – Gasoline Heavy Duty Vehicles	2,530	166	251	1.48	4.09	6.96	4.71		45
Mobile - On-road – Gasoline Light Duty Vehicles	32,492	2,640	3,455	29	82	138	128		733
Solvent - Consumer & Commercial Solvent Use	3.46E-2	1,619	1.04E-2	7.62E-3	1.32E-2	2.41E-2	6.89E-2	5.19E-6	174
Solvent - Degreasing	0.162	198	0.337	0.339	5.49E-2	6.06E-2	5.11E-3	5.74E-4	28
Solvent - Dry Cleaning	8.80E-4	49		5.00E-7	1.58E-2	1.58E-2	1.25E-4		3.86
Solvent - Graphic Arts	3.20	356	3.85	2.67E-2	0.252	0.277	8.84E-2	3.18E-4	24
Solvent - Industrial Surface Coating & Solvent Use	3.35	648	2.76	0.322	3.46	3.93	0.236	4.30E-3	75
Solvent - Non-Industrial Surface Coating		429					1.83E-2		68
Waste Disposal	1,384	180	97	21	205	240	66	1.15E-2	42
Sub Total (no federal waters)	**82,552**	**17,784**	**17,356**	**10,369**	**6,066**	**21,631**	**4,366**	**0.963**	**3,659**
Fuel Comb - Industrial Boilers, ICEs - Natural Gas	78	1.42	64	4.02E-2	0.383	0.383			
Fuel Comb - Industrial Boilers, ICEs - Oil	1.83	0.352	7.55	0.715	0.327	0.337			
Fuel Comb - Industrial Boilers, ICEs - Other	5.02E-3	3.06E-4	4.47E-3	2.84E-5	9.69E-5	9.69E-5			
Industrial Processes - Oil & Gas Production	1.85	58	2.31	0.266	5.99E-2	6.06E-2			
Industrial Processes - Storage and Transfer		0.909							
Mobile - Commercial Marine Vessels	61	26	738	457	56	61	0.292	1.60E-3	0.799
Sub Total (federal waters)	**143**	**87**	**813**	**458**	**57**	**62**	**0.292**	**1.60E-3**	**0.799**
Sub Total (all but vegetation and soil)	**82,696**	**17,871**	**18,168**	**10,827**	**6,123**	**21,693**	**4,367**	**0.965**	**3,660**
Biogenics - Vegetation and soil[2]	6,474	31,744	1,078						4,322
Total	**89,170**	**49,615**	**19,246**	**10,827**	**6,123**	**21,693**	**4,367**	**0.965**	**7,981**

[1] Total HAP does not include diesel PM, which is not a HAP listed by the Clean Air Act

[2] Biogenic vegetation and soil emissions excludes emissions from Alaska, Hawaii, and territories

2.4 How does this NEI compare to past inventories?

Many similarities between the 2008 NEI approaches and past NEI approaches exists, notably that the data are largely compiled from data submitted by S/L/T agencies for CAPs, and that the HAP emissions have greater augmentation by EPA because they are a voluntary contribution from the partner agencies. The NEI program continues with the 2008 NEI to work towards a complete compilation of the nation's CAPs and HAPs. EPA provided feedback to states during the compilation of the data on critical issues (such as missing Hg data) as has been done in the past and EPA improved the inventory for the release of version2. In addition to these similarities, there are some important differences in how the 2008 NEI has been created and the resulting emissions, which are described in the following two subsections.

2.4.1 Differences in approaches

The 2008 NEI is the first inventory compiled with the EIS. This new system greatly improved the collection approach from less structured approaches used in the past. The hundreds of automated QA checks in EIS have undoubtedly improved the data quality and allowed EPA more time to review the data prior to publication. One outcome of this additional QA and review is the more lengthy list of caveats identified in Section 1.7 and Appendix A.

For the inventory in general, but primarily affecting stationary sources, we have consolidated the number of HAP compounds significantly for metals and cyanides and provided conversion factors to enable S/L/T agencies to provide them as the metal or cyanide that is important for risk. For all data categories we provide only

speciated chromium and specific allowable chromium species by speciating agency-reported total chromium (see section 3.1.3). This was done to allow easier toxicity weighting of the inventories and more streamlined risk modeling.

For point sources, the augmentation approach for using TRI has changed in the 2008 NEI. Since TRI has facility total emissions and not emissions for each emissions process, EPA needs to assign a process SCC code to the emissions. In the past, the practice had been to assign a miscellaneous code of "39999999" to these emissions. This prevents the emissions from being assigned to meaningful emissions categories (like the EIS sectors) for summaries among other limitations. For the 2008 NEI, EPA apportioned the HAP emissions to the available processes at the facilities based on CAP emissions (see Section 3.1.4). For high risk sources (see Section 3.1.7), we used TRI data even if there were no CAPs to use to apportion them. For other sources, however, the approach did not use TRI emissions when CAPs were not available for apportioning, resulting in less TRI emissions used overall and missing emissions in some cases. EPA is currently evaluating the impact of this result and expects to further revise the TRI augmentation in subsequent NEI years to use more TRI data and also use better SCC assignments.

Also for point sources, HAP emissions were augmented using some new approaches. EPA used results from the 2005 NATA to help prioritize review of the highest risk sources for additional review by Sl/L/T agencies and EPA (see Section 3.1.7). Additionally, EPA used CAP-HAP emissions ratios to augment other sources, where HAP emissions were clearly missing (see Section 3.1.5).

Another difference for point sources is related to latitude/longitude coordinates. EIS allows the NEI to have both facility coordinates as well as release point (e.g., stack) coordinates, whereas previous NEI databases could store only coordinates at release points[9]. These two separate sets of values allowed EPA to assess whether the facility coordinates and the release point coordinates were in the same vicinity and make adjustments to resolve inconsistencies in collaboration with the S/L/T/ agencies. In part through this process, we have ensured that priority facilities with high emissions and/or high risk have accurate coordinates.

In past inventories, the NEI development approach carried forward a larger quantity of older NEI data for use in the NEI than was done for the 2008 NEI. We changed our approach on widespread use of prior year emissions both to prevent EPA's creation of faulty data as well as to address state concerns that EPA overestimated emissions by pulling data forward that was incorrect or duplicative. This approach prevents double counting and overestimation of emissions at the expense of potentially missing some emissions.

For nonpoint sources, EPA collaborated with S/L/T agencies to devise a more consistent approach across states and build tools for states to use for compiling nonpoint emissions (see Section 3.1.6). We believe that this approach has improved consistency in nonpoint source emission estimates across the NEI for many sectors. It also resulted in improvements to the approaches (such as updated algorithms or emission factors) for many sectors. Past feedback on some source categories such as industrial boilers had been that EPA should not

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[9] In past inventories, release point coordinates were sometimes the same for all release points, suggesting that only a facility latitude/longitude was available. Both the facility coordinates and release point coordinates are available in EIS. For released 2008 NEI data such as modeling files that are given at the process level, the release point coordinates are used whenever available, and the facility coordinates are used only when more detailed release point locations are not available.

augment the data with its own estimates because emissions were double-counted with emissions in the point source category. Therefore, as also explained in Section 3.1.6, EPA did not augment some sectors that had significant potential double-counting concerns between nonpoint and point sources. EPA still developed estimation methods for S/L/T agency use to help improve consistency.

For onroad mobile sources, the 2008 NEI v2 uses the MOVES model for the first time. In addition, the MOVES-based emissions have been compiled using daily meteorology data for 2008 rather than monthly averages used in past approaches, and then summed to an annual value. Section 4.6 provides more information on our approaches. Our approach predicts higher NOx and PM emissions than included in the 2005 NEI, based on the MOBILE6 model.

For nonroad mobile sources, emissions at airports are treated comprehensively as point sources. In past inventories, some airports were point sources while others were aggregated to a total nonpoint county estimate. The processes included at each airport are aircraft exhaust, ground support equipment, and auxiliary power units. The emissions for aircraft ground support equipment and aircraft auxiliary power units associated with aircraft-specific activity were estimated by the Federal Aviation Administration (FAA) Emissions and Dispersion Modeling System (EDMS) using the assumptions and defaults incorporated in the model. This is a significant change from the previous NEI emissions, for which ground support equipment estimates came from the NONROAD model and auxiliary power unit emissions were not included in EPA's estimates. In addition, in-flight Pb emissions have been included in the 2008 NEI for the first time and are reflected in the totals for the "Mobile Sources – Aircraft" sector. Section 4.2.5.2 provides more information.

For fires, EPA has used the SMARTFIRE2 system for the first time in the 2008 NEI v2. This system eliminated a shortcoming in the 2005 NEI that did not assign all fires to either wildfire or prescribe burning categories. Another update for HAP augmentation of state emissions has resulted in increases in HAP VOC emissions, most notably in California. EPA continues to review this method for subsequent NEI years. In addition, an updated method for agricultural burning has allowed EPA to include these emissions comprehensively across the US. More information on all fire approaches is available in Section 5.

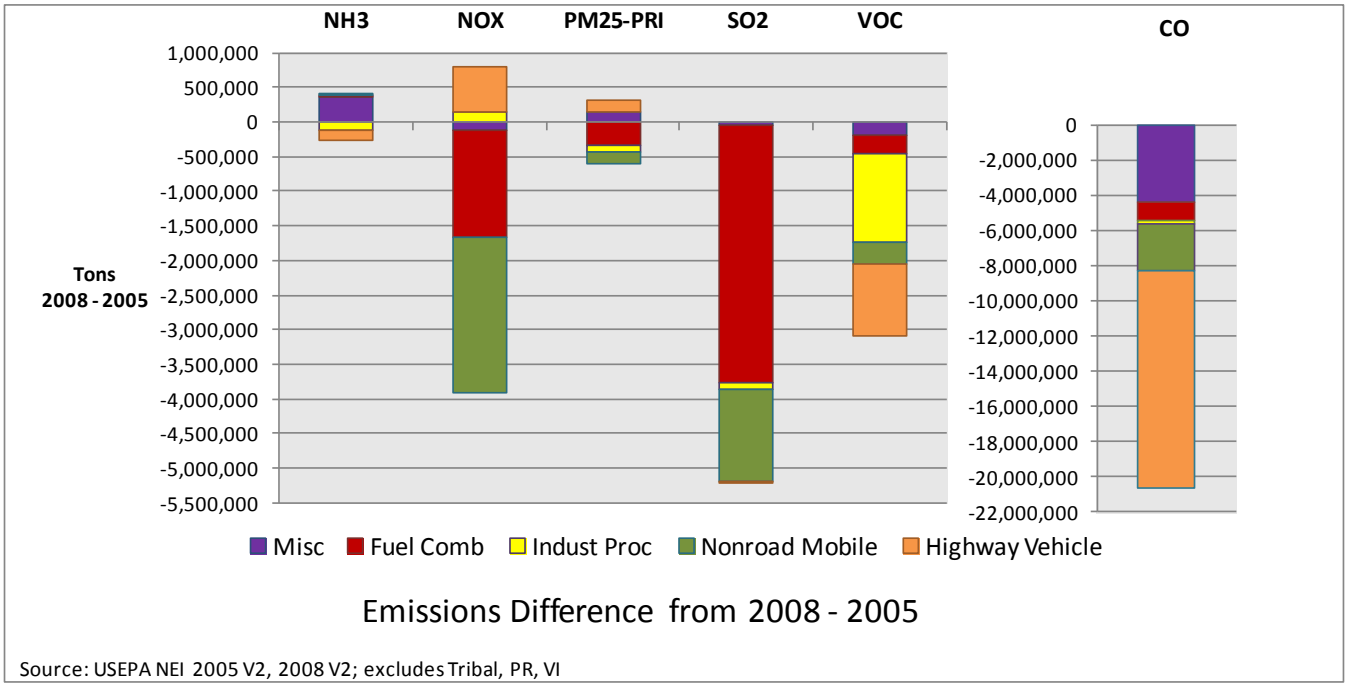
2.4.2 Differences in emissions

EPA continues to review the differences in emissions between the 2008 NEI and past inventories, and we are working to produce a more complete assessment of the 2008 NEI. In the interim, we have created this brief comparison of some selected CAPs based on highly aggregated data categories, also known as Tier1.

Figure 8 illustrates key differences between the 2008 NEI v2 and the 2005 NEI v2, excluding wildfires. As shown in the figure, emissions of all pollutants except NH3 have decreased from 2005, with some notable increases in particular sectors despite the overall decrease. As explained for each pollutant below, many of these differences are based on methods changes and do not reflect real differences from 2005 to 2008. In the following descriptions, all comparison relate to the data shown in

Figure **8,** which excludes fires classified as wildfire emissions (most notably for CO, some wildfire emissions are actually part of the miscellaneous category shown in the figure).

Figure 8: Comparison of 2008 NEI v2 to 2005 NEI v2 CAPs, excluding wildfires



2008 NH3 emissions are 3% higher than 2005 emissions. The increase in the miscellaneous category comes from an increase in prescribed fires and waste disposal, the latter largely due to the addition of municipal/commercial composting emissions. The decrease in industrial processes is largely from decreases in point sources associated with food and agricultural product production. The decrease in highway vehicle emissions is mostly caused by changing to MOVES from MOBILE6, though the VMT did decrease by 0.8% from 2005 to 2008 accounting for a very small portion of the 54% decrease in highway vehicle NH3.

For NOx, 2008 emissions are 15% lower than 2005, though the overall differences are impacts significantly by methods differences. Although NOx emissions increase from the highway vehicle and industrial production sectors, these are offset by significant reductions in fuel combustion and the nonroad mobile categories. The increase in the highway vehicle emissions is associated with the change to the MOVES model, which is primarily caused by changes in emission rates from light duty and heavy duty trucks, and a more thorough treatment of extended idle emissions from heavy duty vehicles. The industrial processes increase is the net result of increases and decreases within the grouping. Increases are apparent for metals processing (20%) and petroleum and related industries (20%), which are offset by decreases in chemical manufacturing (-10%), storage and transport (-46%), waste disposal and recycling (-34%), and other industrial processes (-15%). The decreases in fuel combustion are primarily related to implementation of the Clean Air Interstate Rule (CAIR) for EGUs and decreases in non-EGU combustion assumed to be associated with the economy (e.g., facility closures), lower facility throughputs, and controls for attainment of ozone standards. The large decrease in the nonroad mobile sector is partly real reductions in railroad emissions (-24%), gas equipment (-45%), and nonroad diesel equipment (-7%) with a largely artificial decrease in commercial marine (-70%). The commercial marine decrease is related to the attribution of emissions to states rather than to real decreases. In 2005 NEI, emissions from vessels out to 200 nautical miles (nm) were allocated to “state” emissions, whereas in the 2008 NEI, emissions only in state waters (usually 3-10 nm) were allocated to states.

For PM2.5, 2008 emissions are 6% lower than 2005, partly due again to the attribution of emissions in the commercial marine portion of the inventory (79% lower than 2005). The increases in the highway vehicle category are associated with the change to the MOVES model, which has higher PM2.5 emissions than MOBILE6 because of temperature impacts on PM2.5 included in MOVES only and based on new emissions testing. The increases in the miscellaneous category are related to increases in dust from agricultural tilling and livestock (67%) and from paved roads (128%). Increases in prescribed fires are also evident, but these are partly caused by the large number of "unclassified" fires not included as prescribed fires in our 2005 NEI total (this limitation has been removed in 2008, so more fires have been classified as prescribed in 2008 simply because of the method change). The decreases in PM2.5 associated with fuel combustion are assumed to be related to co-benefits from SO2 controls on EGUs implemented for CAIR as well as economic throughput. In addition to the nonroad category artifact reductions in commercial marine vehicles, the aircraft emissions decreased by 56% largely resulting from the updated estimation approach.

2008 SO2 emissions are 35% lower than 2005 emissions, and again an artificial 88% reduction in commercial marine emissions is a contributor. The primary source of the decreases are emissions reductions from EGUs as a result of CAIR and additional decreases in other fuel combustion sectors, perhaps related to decreased throughput and the economy and somewhat from enforcement actions.

For VOC, 2008 emissions are 17% lower than in 2005 based on decreases across all major category groups shown above. Some decreases are real, while the highway vehicle decreases are largely from methods changes. For the miscellaneous category, much of the decreases come from bulk gas terminals, agricultural burning, and nonpoint petroleum product storage. For the fuel combustion category, there was a general decrease across all combustion sectors. For industrial processes, there was an increase in some processes, most notably the oil & gas sector, but widespread decreases across many other processes with substantial decreases in the solvent surface coating industrial and non-industrial sectors accounting for the overall decrease. The nonroad mobile category has decreases across all components, though the commercial marine decreases are also an artifact of the reallocation approach in 2008. Finally, the highway vehicle decrease is caused largely by the change to the MOVES model, for which light duty cars and trucks tend to have similar or lower VOC emissions than in MOBILE6. This is because new exhaust and evaporative emissions test data has demonstrated that MOBILE6 was overly pessimistic in estimating how emissions from mid-1990s and later vehicles would increase with age.

Finally, 2008 CO emissions are 23% lower than in 2005. While the miscellaneous category has an increase in CO from prescribed fires (again due largely to methods changes), this is greatly offset by decreases from miscellaneous non-industrial processes including a 10.4 million ton decrease in SCC 2810090000 (uncategorized open fires) down to about 7,300 tons in 2008, with emissions submitted by just one state (Utah), one tribe, and one local agency. In 2005, these emissions were included by EPA for 47 states based on the uncategorized fires identified by SMARTFIRE in the 2005 process. Thus, this difference actually includes differences due to uncategorized wildfires from 2005 and is an artifact of the methods changes. The fuel combustion decrease are primarily from industrial boilers in 2008, which could be partly related to EPA not filling in nonpoint industrial boilers which has caused double counted emissions in past inventories. For nonroad sources, part of this decrease is from the artificial decreases in commercial marine as described above, with an even larger decrease from gasoline equipment. Finally, the onroad mobile source model change to MOVES in 2008 drove the CO 12 million ton decrease shown above, with diesel vehicles decreasing 17% and gasoline vehicles decreasing 56%.

2.5 How well are tribal data and regions represented in the 2008 NEI?

The 2008 NEI includes emissions from 20 Tribal regions within the borders of the continental U.S. EPA does not add emissions for Tribal Nations that do not provide data, and so a review of what data were submitted provides details about what Tribes have emissions included in the 2008 NEI. Table 5 summarizes which Tribal Nations submitted data to the NEI and for which source categories (these categories have been defined previously in Section 1.5). In this table, a "CAP_HAP" designation indicates that both criteria and hazardous air pollutants were submitted by the tribe. CAP indicates that only criteria pollutants were submitted. Facilities on Tribal land were augmented using TRI, HAPs and PM in the same manner as facilities under the State jurisdiction, as explained in Section 3; therefore Tribal Nations in Table 5 with just a CAP flag will also have some HAP emissions in most cases.

During the 2008 submission period, the Tribal Emission Inventory System Software (TEISS) was undergoing a large upgrade to adjust to the change from the National Inventory Input Format to the new Consolidated Emissions Reporting structure. TEISS is used by the majority of the Tribes in creating their emission inventories. This upgrade took much longer than anticipated and prevented many Tribes from participating in the 2008 National Emission Inventory.

Table 5: Tribal Participation in the 2008 NEI

Tribe	Point	Nonpoint	On-road	Nonroad	Events
Citizen Potawatami Nation, Oklahoma					CAP, HAP
Confederated Tribes of the Colville Reservation, Washington	CAP, HAP				
Eastern Band of Cherokee Indians		CAP, HAP	CAP, HAP	CAP, HAP	
Fond du Lac Band of Lake Superior Chippewa	CAP	CAP			
Kootenai Tribe of Idaho		CAP, HAP	CAP, HAP	CAP, HAP	
Leech Lake Band of Ojibwe Reservation	CAP	CAP			
Little River Band of Ottawa Indians, Michigan		CAP		CAP	
Makah Indian Tribe of the Makah Indian Reservation	CAP, HAP	CAP, HAP		CAP	
Navajo Nation	CAP, HAP				
Nez Perce Tribe	CAP, HAP	CAP, HAP	CAP, HAP	CAP	
Northern Cheyenne Tribe	CAP	CAP	CAP		
Omaha Tribe of Nebraska	CAP	CAP, HAP		CAP	
Prairie Band of Potawatomi Indians	CAP	CAP, HAP			
Pueblo of Pojoaque	CAP	CAP, HAP	CAP		
Red Lake Band of Chippewa Indians, Minnesota		CAP, HAP			
Sac and Fox Nation of Missouri in Kansas and Nebraska Reservation		CAP, HAP			
Salt River Pima Maricopa Indian Community Environmental Protection and Natural Resources Division	CAP, HAP				
Shoshone-Bannock Tribes of the Fort Hall Reservation of Idaho	CAP, HAP	CAP, HAP	CAP, HAP	CAP	
Southern Ute Indian Tribe	CAP, HAP				
Washoe Tribe of California and Nevada		CAP, HAP			

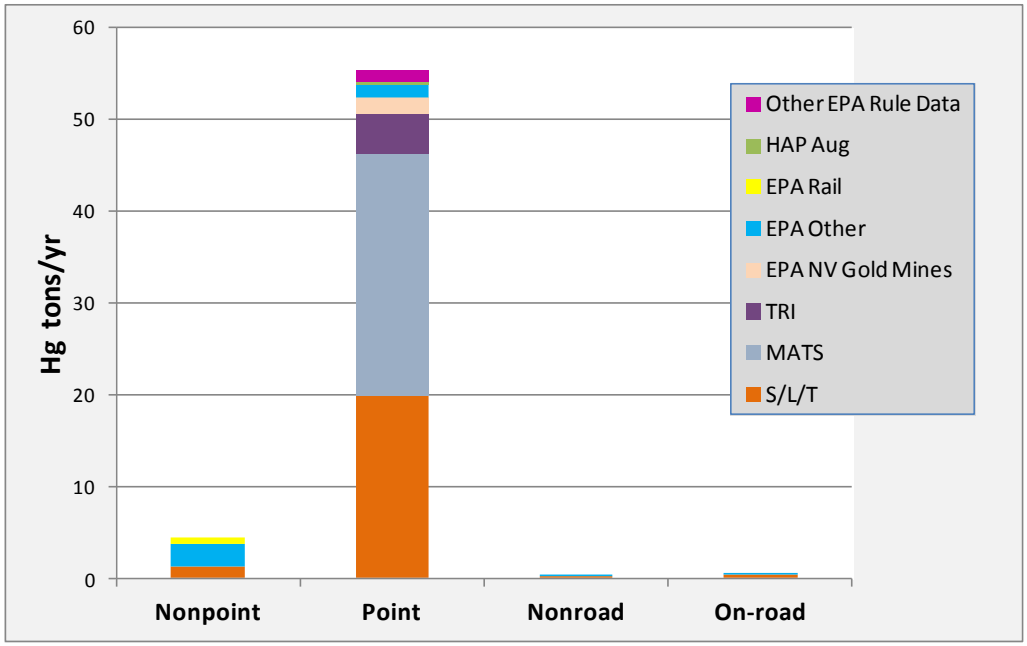
2.6 What does this NEI tell us about mercury?

This documentation includes this Hg section because of the importance of this pollutant and because the sectors used to categorize Hg are different than the sectors presented for the other pollutants. The Hg sectors primarily focus on regulatory categories and categories of interest to the international community.

Hg emission estimates in the 2008 NEI sum to 61 tons with 59 tons from stationary sources and 2 tons from mobile sources. Of the stationary source emissions, the inventory shows that 29.6 tons come from coal- or oil-fired EGUs with units larger than 25 megawatts (MW), with oil-fired units making up just 0.1 ton of that total. The other sources of emissions are summarized below for the special Hg sectors.

We used a variety of data sources to create the 2008 NEI Hg inventory, as shown Figure 9 below. The datasets are described in more detail starting in Section 3.1.1, and we highlight some key datasets here. For EGUs, we used an approach developed for the Mercury and Air Toxics Standards (MATS) rule during 2011[10], and used 2008-specific activity. The MATS-based data are labeled "MATS" in the figure. Also for EGUs, 11% of the Hg data are from S/L/T agency data instead of the MATS-based data. These data were used for units with continuous emissions monitors (CEMs) for mercury, or where EPA was aware that the units had been tested in 2008. In addition, S/L/T data were used for 65% of the other stationary source emissions, and is represented by "S/L/T" in the figure. We used several other datasets developed by EPA including TRI (see Section 3.1.4), EPA HAP Augmentation or "HAP Aug" in the figure (see Section 3.1.5), and other EPA data called "Other EPA rule data" and "EPA Other" in the figure (see Section 3.1.7). The "Other EPA rule data" is from recent EPA rule development by the EPA OAQPS Sector Policies and Programs Division (SPPD).

Figure 9: Data sources of Hg emissions in the 2008 NEI, by data category



[10] See "Memorandum: Emissions Overview: Hazardous Air Pollutants in Support of the Final Mercury and Air Toxics Standard" EPA-454/R-11-014, 12/1/2011, available at http://www.epa.gov/ttn/atw/utility/emis_overview_memo_matsfinal.pdf, or at Docket number EPA-HQ-OAR-2009-0234

In addition to Figure 9, Table 6 breaks out the emissions data sources further into the amounts of Hg from each individual dataset used in the selection. More information on these datasets is available in Sections 3.1.1 through 3.1.7 for stationary sources, Sections 4.5.2 through 4.5.5 for nonroad mobile sources, and sections 4.6.2 through 4.6.6 for on-road mobile sources.

Table 6: Datasets, groups, and amount of Hg in 2008 NEI from each

Data Category	Dataset name (see section 3.1.1)	Mercury Emissions (tons/yr) *	Grouped Data Source for Chart
Nonpoint	2008 V2 Responsible Agency Selection	1.31	S/L/T
	Misc NP Hg Cats	1.26	EPA Other
	EIAG all in NP	1.16	EPA Other
	EPA Rail, nonpoint	0.69	EPA Rail
	EPA CMV	0.04	EPA Other
	EPA Overwrite Nonpoint v1.5	0.02	EPA Other
	EPA Possible Pt Source Contrib V1_5	< 0.01	EPA Other
Point	2008 MATS-based EGU emissions	26.33	MATS
	2008 V2 Responsible Agency Selection	19.94	S/L/T
	EPA TRI Augmentation v2	4.33	TRI
	EPA NV Gold Mines	1.70	EPA NV Gold Mines
	EPA other data developed for using ahead of SLT for gapfilling	1.27	EPA Other
	2008 EPA Rule Data from OAQPS/SPPD	1.18	Other EPA Rule Data
	EPA HAP Augmentation v2	0.32	HAP Aug
	EPA 2005NATA values pulled forward to gapfill	0.17	EPA Other
	EPA Rail, point	0.05	EPA Rail
	EPA EGU v1.5	0.02	EPA Other
Nonroad (Section 4.5.2)	Responsible Agency Dataset	0.30	S/L/T
	EPA Nonroad using NCD20100602	0.01	EPA Other
	EPA Nonroad using NCD20101201	< 0.01	EPA Other
On-road (Section 4.6.2)	Responsible Agency Dataset (California and tribes only)	0.36	S/L/T
	2008_EPA_Mobile	0.32	EPA Other

Since mercury is a HAP, it is reported voluntarily by S/L/T agencies. For the 2008 NEI, 42 states reported point source Hg emissions; Figure 10 identifies the states that included state or local data. Tribal mercury data are not reflected in this figure. Two tribal agencies reported point source Hg: Confederated Tribes of the Colville Reservation, Washington and Makah Indian Tribe of the Makah Indian Reservation.

Figure 10: States with state- or local-provided Hg emissions in the point data category of the 2008 NEI

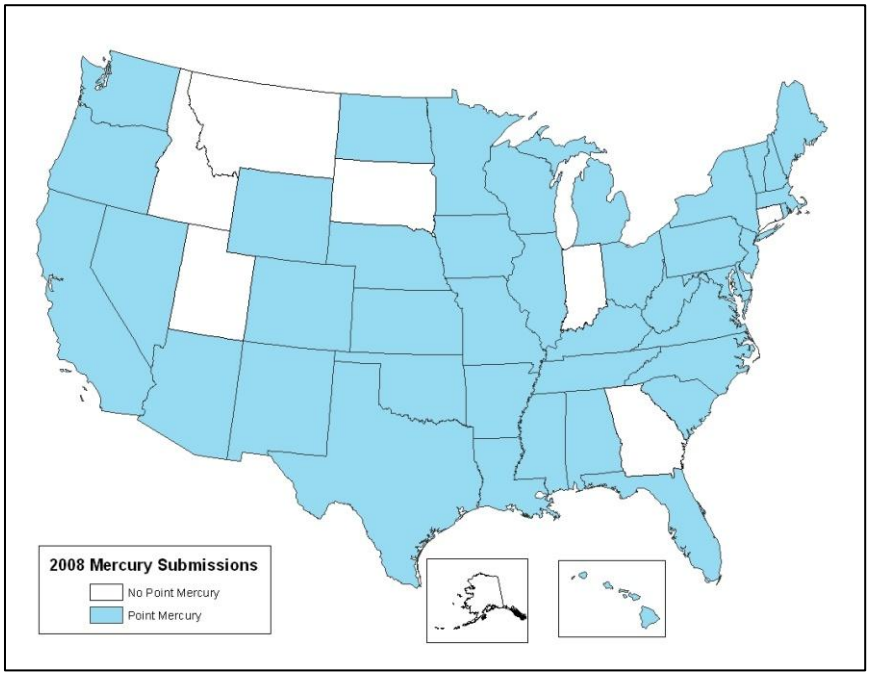


Table 7 shows the 2008 NEI mercury emissions for the key categories of interest in comparison to 1990. Also shown are the most recent 2005 emissions, which were used in support of the MATS rule. The file "epa_2008_nei_v2 _hg.accdb" shows the categories assignments at the facility-process level for point sources, the county-SCC level for the nonpoint data category and the county level for onroad and nonroad data categories (see Section 8.1 for access information).

Table 7: Trends in Mercury Emissions – 1990, 2005, and 2008

Source Category	1990 Emissions (tpy) Baseline NEI for HAPs, 11/14/2005	2005 Emissions (tpy) 2005 MATS proposal 3/15/2011	2008 Emissions (tpy) 2008 NEI v2[1]	Categorization Approach, 2008 NEI
Utility Coal Boilers	58.8	52.2	29.5	Regulatory code, NESHAP: MATS rule.
Hospital/Medical/ Infectious Waste Incineration	51	0.2	0.1	Manually assigned based on examination of facility name and/or unit/process descriptions
Municipal Waste Combustors	57.2	2.3	1.3	Regulatory codes: Section 129 rules for Small Municipal Waste Combustors (MWC) and Large MWC
Industrial/Commercial/ Institutional Boilers and Process Heaters	14.4	6.4	4.5 [1]	SCC list- chose only processes with these SCCs that were not already tagged with rule or via manual approach
Mercury Cell Chlor-Alkali Plants	10	3.1	1.3	Regulatory code: NESHAP, Mercury Cell Chlor-Alkali Plants. Manually corrected a regulatory code assigned to units at a a facility that terminated the chlor-alkali process but still emitted Hg in 2008 due to remediation of the equipment and the soil around the unit.

Source Category	1990 Emissions (tpy) Baseline NEI for HAPs, 11/14/2005	2005 Emissions (tpy) 2005 MATS proposal 3/15/2011	2008 Emissions (tpy) 2008 NEI v2[1]	Categorization Approach, 2008 NEI
Electric Arc Furnaces	7.5	7.0	4.7	Regulatory code: Area Source rule for "Stainless & Non-stainless Steel Manufacturing: Electric Arc Furnaces" plus 2 major sources that have EAFs
Commercial/Industrial Sold Waste Incineration	Not available	1.1	0.02	Manually assigned based on examination of unit/process description and how it was categorized in 2005
Hazardous Waste Incineration	6.6	3.2	1.3	Combination of regulatory code, NESHAP: Hazardous Waste Incineration, and manual examination based on examination of unit/process description and how it was categorized in 2005.
Portland Cement Non-Hazardous Waste	5.0	7.5	4.2	Regulatory code: NESHAP, Portland Cement Manufacturing
Gold Mining	4.4	2.5	1.7	Facility Type
Sewage Sludge Incineration	2	0.3	0.45	Manually assigned based on examination of unit/process description, SCC, and how it was categorized in 2005
Mobile Sources	Not available	1.2	1.7	SCC
Other Categories	29.5	18	10.3	
Total (all categories)	**246**	**105**	**61**	

[1] For Industrial/Commercial/Institutional Boilers and Process Heaters, the 2008 NEI v2 raw data (i.e., in "epa_2008_nei_v2 Hg.accdb") will sum to just 4.0 tons, but we have listed the additional known 0.5 tons that should have been included.

The top emitting 2008 Mercury categories are: EGUs (rank 1), electric arc furnaces (rank 2), industrial, commercial and institutional boilers and process heaters (rank 3), Portland cement, excluding hazardous waste kilns (rank 4), and gold mining (rank 5). Note that we discovered a large number of coal-fired boilers (industrial, commercial, institutional) that did not have any Hg emissions and thus believe that emissions for this sector are underestimated. The missing emissions from boilers are 0.5 tons, which have been added to the totals above; more details on this are provided below. This addition moves that sector from rank 4 to rank 3.

As shown in Table 5, 2008 mercury emissions are 44 tons lower than in the 2005 inventory. Half of this difference is due to lower mercury emissions from EGUs covered by MATS; the other half is due to lower emissions from stationary sources other than EGUs. The lower emissions in 2008 are due to a combination of methodology differences, state rules, consent decrees, activity levels (e.g., lower cement production in 2008) and reductions that occurred from facilities prior to MACT compliance dates. For EGUs, the difference in emissions from 2005 to 2008 is due primarily to the installation of Hg controls to comply with state specific rules and voluntary reductions, and the co-benefits of Hg reductions from control devices installed for the reduction of SO2 and PM as a result of state and federal actions, such as New Source Review enforcement actions. The MATS rule is expected to reduce mercury by an additional 23 tons by 2016.

To understand better the differences in emissions from 2005 to 2008, we conducted a detailed analysis to identify and quantify the differences for the Portland Cement sector. The 2005 emissions for the Portland

Cement industry were largely the same as the emissions developed in support of the Portland Cement NESHAP whereas the 2008 emissions are from S/L/T agencies (68% of the Hg) and TRI (32% of the Hg). The Portland Cement NESHAP total of 7.5 tons/yr is 78% higher than the 2008 value of 4.2 tons/yr. After analyzing the underlying data and approach for the NESHAP emissions and conducting case studies on the NEI emissions, we estimated that about half of the 3.2 ton difference in the estimates is due to lower actual production at cement facilities in 2008 as compared to production capacity used in the NESHAP and the other half is due to differences in the emission rates used. We compared the actual 2008 clinker production[11] to the production used in the NESHAP and found that the NESHAP production for non-hazardous waste kilns was 20% higher than 2008. We also evaluated throughput data supplied by some states to the NEI and found that the throughput was much lower in NEI than that used for the NESHAP.

For other categories, the difference in emissions from 2005 to 2008 is similarly due to a combination of methodological differences in the approaches used to develop the two inventories, in addition to reductions in activity between 2008 and 2005, and reductions implemented by states ahead of Federal regulations and other factors. For the nonEGU categories, the 2008 NEI uses data primarily submitted by S/L/T agencies. Where S/L/T agency data are missing, EPA supplemented the information using the TRI for the year 2008 and other datasets such as the data gathered by EPA for rule development (e.g., National Emission Standards for Hazardous Air Pollutants); these data were used for situations in which S/L/T data were not available. In very few cases where no data were available but the facility was believed to be in operation in 2008, data were carried forward from the 2005 inventory at the request of S/L/T agencies.

Past inventories such as the 2005 NEI have used S/L/T data, but for the key Hg categories, data gathered for rule development were used *ahead* of S/L/T agency data. The Portland Cement Hg emissions discussed above is one such example. For a large number of rules data were developed from Information Collection Request (ICRs) that for some categories represented years prior to and subsequent to 2005. In the 2008 NEI, the practice of always using rule data ahead of S/L/T agency data has not continued. Instead, we reviewed the available data with the states for key Hg categories and generally allowed the states to choose which value to use (see Sections 3.1.5.4 and 3.1.7). In addition, the 2005 NEI development approach carried a larger quantity of older NEI data forward for use in the 2005 inventory than was done for the 2008 NEI. We changed our approach on widespread use of prior year emissions both to prevent EPA's creation of faulty data as well as to address state concerns that EPA overestimated emissions by pulling data forward that was incorrect or duplicative.

The 2008 NEI is also believed to be lower for some categories due to economic reasons and due to early reductions for some categories. There were facility shut downs and reduced operations at chemical manufacturing facilities and in metals industries. For other categories, a combination of voluntary and state programs has reduced Hg ahead of MACT standards. For gold mines, reductions occurred initially due to a voluntary program developed by EPA Region 9 and Nevada and then further reductions were achieved through a Nevada state regulatory program. In the mercury chlor-alkali industry, facilities have been switching technologies to eliminate Hg emissions from chlorine production. Many switched prior to 2008 and several switched after; therefore, even more reductions from chlor-alkali facilities are expected to be seen in the 2011 NEI. For electric arc furnaces, emissions are lower due to methods of emission estimating.

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[11] United States Geological Survey, Cement data: http://minerals.usgs.gov/minerals/pubs/commodity/cement/.

As stated earlier, the 2008 NEI is missing some coal fired boiler Hg emissions from industrial, commercial and institutional boilers. For this category, we used the Boiler MACT ICR emissions data to gap fill missing S/L/T agency data for only the highest emitting Hg units that were able to be matched to processes in the 2008 NEI. This gap-filling resulted in the use of 19 units (or unit groups) from the Boiler MACT ICR database out of a total of more than 7700 Boiler MACT units in the Boiler MACT ICR database. The other gap filing approaches were the use of TRI data (Section 3.1.4) and the HAP augmentation approach (Section 3.1.5).

For the HAP augmentation approach, we applied emission factor ratios of Hg to filterable PM10 to S/L/T-reported (or EPA augmented) filterable PM10. When analyzing the coal fired boilers without Hg we found 339 coal fired boiler processes with no Hg (163 facilities). Of these units, 231 coal fired boiler processes had nonzero filterable PM10, but zero Hg. This is because some filterable PM10 augmentation (resulting from quality assurance of the initial augmentation) occurred *after* the HAP augmentation was finished. Also, there were units at facilities with facility types of "EGU" that were not gap-filled because we had expected the EGU augmentation (Section 3.10.5) fill in for those source, but it did not do so for a few smaller units not regulated by MATS. We computed that these coal-fired boilers, if gap-filled via the HAP augmentation approach, would have contributed an additional 0.4 tons of Hg to this category. We also found 108 coal fired boilers that were missing PM but had other criteria pollutants. Thus, we believe we are missing at least 0.4 tons of Hg from coal-fired boilers. We also identified 1,739 oil fired boilers with no Hg; 992 of them had PM10-FIL and should have thus been gap filled, amounting to an additional 0.1 tons. Thus, the total missed emissions are estimated to be 0.5 tons.

3 Stationary sources

3.1 Stationary source approaches

Stationary source emissions data are inventoried as point sources or nonpoint sources. These data are provided by S/L/T agencies, and for certain sectors and/or pollutants, they are supplemented with data from EPA. This section describes the various sources of data and the priority for each of the datasets for choosing the data value to use when multiple data sources are available for the same emissions source.

3.1.1 Sources of data overview and selection hierarchies

Table 8 and Table 9 describe the datasets comprising the point and nonpoint inventories, respectively, and the hierarchy for combining these datasets in construction of the NEI. While the bulk of these datasets are for stationary sources of emissions, some of these datasets contain mobile sources so that emissions from airports and rail yards could be included as point sources.

EPA developed all datasets other than those containing S/L/T agency data and the Offshore platform dataset. We used various methods and databases to compile the EPA generated datasets, which the tables and subsequent subsections fully describe. The primary purpose of the EPA datasets is to add or "gap fill" pollutants or sources not provided by S/L/T agencies and to resolve inconsistencies in S/L/T-reported pollutant submissions for PM (Section 3.1.2) and chromium (Section 3.1.3). EPA also developed a dataset to overwrite S/L/T agency data where known problems or obvious outliers exist. During the fall of 2011, EPA performed an extensive review of emissions and conducted a focused data review effort for facilities identified as "high risk" in the 2005 NATA, and facilities in important Hg emitting source categories (Section 3.1.7). Results of this effort provided additional emissions estimates in both the S/L/T agency dataset and in EPA datasets. This review also resulted in emissions data for some facilities being brought forward from the 2005 NATA inventory, resulting in the dataset called "EPA 2005NATA values pulled forward to gapfill". Many of the EPA datasets used in the point source data category were developed to include the data and recommendations provided by S/L/T agencies resulting from this review.

The hierarchy or "order" provided in the tables below defines which data are to be used for situations where multiple datasets provide emissions for the same pollutant and emissions process. The dataset with the lowest order on the list is preferentially used over other datasets. The tables include the rationale for why each dataset was assigned its position in the hierarchy. Two exceptions to the hierarchy are provided in the last row of the tables. These exceptions change the hierarchy for two jurisdictions so that the EPA EGU v1.5 data were chosen ahead of the S/L/T agency data, and to exclude any greenhouse gases and pollutants in the pollutant group "dioxins/furans"[12] from the selection.

[12] Dioxins/furans include all pollutants with pollutant category name of: Dioxins/Furans as 2,3,7,8-TCDD TEQs, Dioxins/Furans as 2,3,7,8-TCDD TEQs -I/89, Dioxins/Furans as 2,3,7,8-TCDD TEQs - WHO/98, which were valid pollutant groups for reporting 2008 emissions. The specific compounds and codes are in the pollutant code tables at: http://www.epa.gov/ttn/chief/net/neip/appendix_6.mdb.

Table 8: Data sources and selection hierarchy used for point sources

Dataset name (and Short Name[λ])	Description and Rationale for the Order of the Selected Datasets	Order
EPA Overwrite Point v1.5 (2008EPA_ OverPT15)	This dataset addresses three known issues in the S/L/T agency data: 1) All acenaphthylene emissions for the airport SCC of 2275050012 (general aviation turbine) are set to a value of zero since the emission factor (EF) used in the S/L/T agency datasets was incorrect (see Section 4.2.4). 2) Some states added airport emissions to new "units" and "processes" at the EPA airport facilities. To avoid double counting, this dataset overwrites the state data for these situations with zero values. The EPA data are used instead and are located at the valid units and processes as defined by EPA (see Section 4.2.4). 3) PM emissions (all species) for 46 Pennsylvania EGU processes (based on highest emitting) are set to the values developed in the EPA EGU v1.5 dataset (9th row in this table) since it was determined that PA reported the primary PM using the filterable value, significantly underestimating the total (primary) PM. See Appendix C for details. This dataset is first because it serves to overwrite the data in the S/L/T agency datasets	1
EPA PM Augmentation, V2 (2008EPA_PM25)	PM species added to gap fill missing S/L/T agency data or make corrections where S/L/T agency have inconsistent PM species' emissions. Uses speciation factors from the PM Calculator for covered SCCs. For others, checks/corrects discrepancies or missing PM species using basic relationships such as ensuring that PM2.5 is less than or equal PM10 (See Section 3.1.2). This dataset is ahead of the S/L/T agency data because in addition to filling in missing data, it also corrects S/L/T agency values based on feedback from the agencies.	2
EPA Chromium Split v2 (2008EPA_ CHROMv2)	Contains corrected and speciated hexavalent and trivalent chromium emissions derived from the S/L/T agency data for sources in which S/L/T agency reports the total (unspeciated) chromium pollutant (See Section 3.1.3). This dataset is ahead of the S/L/T agency data because it replaces S/L/T agency total chromium with speciated chromium.	3
Other EPA data (2008EPA_OTHER)	HAP emissions that S/L/T agencies recommended EPA use as part of the high risk and NATA2005 review (see 3.1.7). S/L/T agencies could not submit data themselves for various reasons. Additionally, this dataset contains Region 2 data for benzene and coke oven emissions for Tonawanda Coke Corp based on recent testing. This datasets is ahenda of the S/L/T agency data because it changes S/L/T emission values based on feedback from the agencies.	4
2008 MATS-based EGU emissions (2008EPA_MATS)	Lead, mercury, HAP metal and acid gas HAP emissions from the MATS rule information collection request, including unit-specific test data and emissions data derived from EFs from a 2010 testing program and 2008 throughput. The dataset excludes MATS Hg emissions for units where EPA knew states had test data or that the unit had Hg continuous emission monitoring systems in 2008 (this exclusion allows the S/L/T agency Hg emissions to be chosen ahead of MATS for such units). These data are selected ahead of state data because they are expected to be generally more accurate because they are based on unit specific tests or based on the latest available EFs derived from testing of similar units, and consistent with the MATS rule. See Section 3.10.	5

Dataset name (and Short Name[λ])	Description and Rationale for the Order of the Selected Datasets	Order
2008 V2 Responsible Agency Selection	S/L/T agency submitted data (multiple datasets – one for each reporting agency) These data are selected ahead of other datasets with the five exceptions listed above.	6
EPAAirports1109 (2008EPA_AIR)	This is a mobile source dataset. Emissions of CAP and HAP for aircraft operations including commercial, general aviation, air taxis and military aircraft, auxiliary power units and ground support equipment computed by EPA for approximately 20,000 airports. Methods include the use of the Federal Aviation Administration's Emissions and Dispersion Modeling System. See Section 4.2. EPA airport data are selected for a county only if S/L/T agency data are not, with the exception of airport data discussed in the first dataset.	7
EPA Rail, point (2008EPA_RAIL)	This is a mobile source dataset. Emissions of CAP and HAP for diesel rail yard locomotives at 753 rail yards. CAP emissions computed using yard-specific emission factors using yard-specific fleet information and on national fuel values allocated to rail yards using an approximation of line haul activity within the yard. HAP emissions computed using HAP-to-CAP emission ratios. See Section 4.4. EPA Rail data are selected for a county only if S/L/T agency data are not.	8
2008 Offshore (2008EPA_MMS)	CAP Emissions from Offshore oil platforms located in Federal Waters in the Gulf of Mexico developed by the U.S. Department of the Interior, Bureau of Ocean and Energy Management, Regulation, and Enforcement (Wilson et. al, 2010) in the National Inventory Input Format and converted to the CERS format by EPA. See also http://www.gomr.boemre.gov/homepg/regulate/environ/airquality/gulfwide_emission_inventory/2008GulfwideEmissionInventory.html. The selection order for this dataset is not important because the data do not overlap with other datasets.	9
EPA EGU v1.5 (2008EPA_EGU15)	Uses Clean Air Markets Division (CAMD) NOX, SO2 and other pollutants (including HAPs) computed using CAMD heat inputs and EFs (see Section 3.10). These EPA non-MATS EGU data are selected for a facility only if S/L/T agency data are not present.	10
2008 EPA Rule Data from OAQPS/SPPD (2008EPA_Rule_Data)	Mercury emissions from categories for which rule data were used to gap fill missing S/L/T agency data. Includes: municipal waste combustors, electric arc furnaces, mercury cell chloralkali plants and industrial, commercial and institutional boilers. For this latter category, 19 units from the Boiler MACT information collection request database that were able to be matched to units in the emissions inventory system were used. These data are selected for a facility only when not included in the S/L/T agency data.	11
EPA NV Gold Mines (2008_NVGLD)	Mercury emissions developed from published results of the Nevada Mercury Control Program - Annual Emissions Reporting (http://ndep.nv.gov/bapc/hg/aer.html) for 2008. Because of issues with the 2008 testing, data for Homestake Mining Co. – Ruby Hill and Barrick Goldstrike Mines, Inc. were based on validated 2009 test data provided by Nevada. The Nevada Gold Mine data are selected for a mine only when alternative emissions are not included in the S/L/T agency data.	12

Dataset name (and Short Name[λ])	Description and Rationale for the Order of the Selected Datasets	Order
EPA coke oven (2008EPA_CK)	Coke oven emissions computed from AP-42 or updated from 2005 NATA values using 2008 production data. Emissions/approaches provided by a few states that did not report coke oven emissions in the S/L/T agency data. These data are selected for a facility only when alternative emissions are not included in the S/L/T agency data.	13
EPA TRI Augmentation v2 (2008TRI)	TRI data for the year 2008. This dataset includes the TRI data assigned manually to processes in EIS to facilities in the NATA review (Section 3.1.7) and TRI emissions assigned to processes based on the distribution of surrogate CAPs via the approach described in Section 3.1.4. These data are selected for a facility only when alternative emissions are not included in the S/L/T agency data. These data are selected for a facility only when alternative emissions are not included in the S/L/T agency data.	14
EPA HAP Augmentation v2 (2008EPA_HAPv2)	HAP data computed from S/L/T agency criteria pollutant data using HAP/CAP emission factor ratios based on the EPA Factor Information Retrieval System (WebFIRE) database as described in Section 3.1.5. These data are selected below the TRI data because the TRI data are expected to be better.	15
EPA 2005NATA values pulled forward to gapfill (2008EPA_ 05NATA_GAPFL)	Emissions from the 2005 NATA inventory used as directed by states for facilities that were part of the NATA review described in Section 3.1.7. Also includes 2005 NATA Hg emissions from some hazardous waste incinerators, where states did not provide Hg data but there were hazardous waste incinerator processes with non-zero emissions of criteria pollutants reported by the agency. These data are selected last because they are the least preferred method for supplementing HAP emissions, though the way it was developed should have not caused overlap with other datasets.	16

Exceptions to the hierarchy

1. Connecticut and Douglas County, Nebraska: Changed the hierarchy of EGUv1.5 to go ahead of state data (moved from 10 to 4). These exceptions were made because several of the EGUs reported by CTDEP had much lower emissions than the EPA EGU v1.5 dataset, even for the SO2 and NOX emissions that are CEM-based in the EPA EGU v1.5 dataset, and because the Douglas County dataset for the one EGU included in the EPA EGU v1.5 dataset did not contain unit and process specific emissions. Note that we mistakenly put the EGUv1.5 data below the PM-Augmentation data so that PM data in the selection (i.e., 2008v2) were a mix of augmented (from state-reported) and EGUv1.5, instead of a consistent set of EGUv1.5 emissions for all 5 PM species.
2. Excluded dioxin/furan individual pollutants and groups and green house gas pollutants, pending further review of the accuracy and completeness of the data.

[λ] The dataset short name is the name that EIS will list in its process-level reports

Table 9: Data sources and selection hierarchy used for nonpoint sources

Dataset name (and Short Name[λ])	Description	Order
EPA PM Augmentation NP (PM Aug NP)	Adds PM species to fill in missing S/L/T agency data or make corrections where S/L/T agency data have inconsistent emissions across PM species. Uses the PM calculator for processes covered by that database. For other processes, checks/corrects discrepancies or missing PM species using basic relationships such as ensuring that PM2.5 is less than or equal PM10 (See Section 3.1.2).	1
EPA Overwrite Nonpoint v1.5 (2008EPA_OverNP15)	Overwrites some unreasonably high values that came in from S/L/T agencies with zero values to prevent outliers from entering the released data. Also overwrites submitted total (unspeciated) chromium for commercial marine vessel (CMV) emissions with zero value to prevent total chromium from being included in the 2008 NEI	2
Rail_EPACorrections (2008RRCOR)	This is a mobile source dataset. Overwrite submitted unspeciated chromium and other pollutants that did not conform to pollutant/SCCs in EPA dataset. Also overwrites county submittals for counties/SCCs where EPA data exists in shape files.	3
EPA Chromium Split v2 (2008EPA_CHROMv2)	Speciated S/L/T agency chromium emissions based on total chromium provided by S/L/T agencies. Speciation based on SCC code. See Section 3.1.3.	4
2008 V2 Responsible Agency Selection	S/L/T agency submitted data (multiple datasets – one for each reporting agency) These data are selected ahead of other datasets with the five exceptions listed above. See also file "matrix_submittals for Version 2 Feb 13 2011.xlsx" for a list of submitting agencies and for what nonpoint sectors they submitted data (see Section 8.2 for access information).	5
Misc NP Hg Cats (Misc NP Hg)	Dataset that includes Hg data used in the 2002 NEI for the following categories: fluorescent light breakage, fluorescent light recycling, laboratory activities, and dental amalgam. These 2002 NEI data were not estimated for 2008 but are categories that were largely unavailable from the S/L/T AGENCY data.	6
EPA CMV (2008EPA_ERG)	This is a mobile source dataset. EPA CMV estimates. See Section 4.3.	7
EPA Rail, nonpoint (2008EPA_RAIL)	This is a mobile source dataset. EPA Rail estimates. See Section 4.4.	8
EIAG all in NP (2008EPA_NPa)	Contains data for categories for which all of the data should exist in the nonpoint categories, such as residential heating, consumer solvent use and paved roads. See Section 3.1.6.	9
2008 EPA Ag Fires (2008AgFire)	Agricultural fire emissions are estimated by EPA for all agencies that did not submit them. EPA estimates relied on using satellite data to identify, by default, lands on which agricultural burning activity occurred in 2008. Geographic Information Systems (GIS) analysis was then used to cross-check these lands with those that burn only crops. These "cropland" activity data were then converted to emissions based on state- and crop-specific emission factors (compiled, as available, from the literature) combined with state usage patterns of these crops. See Section 5.1.4.	10

EPA Possible Pt Source Contrib V1_5 (2008EPA_NPd15)	Contains data for categories in which there was the possibility of point source contribution (or overlap). These categories include industrial, commercial and institutional emissions that are often accounted for in the point source inventory. EPA did not want to add these emissions to the NEI without doing some analysis to determine if the S/L/T had accounted for them in the point. To do this, the EPA queried the point source S/L/T datasets to determine if certain point source SCCs were present. If the point source SCCs were present, then EPA assumed that the S/L/T agency covered them in point and the EPA nonpoint data were not included in this dataset. If the point source SCCs were not present, then the EPA data were added to this dataset, which means that the data would be in the NEI provided the S/L/T did not provide nonpoint data (S/L/T agency dataset is #5 in this hierarchy). There was no attempt by EPA to adjust nonpoint data with the point data. See Section 3.1.6.	11
Exceptions to the hierarchy 1) Excluded S/L/T agency data submitted for SCC= 2810015000 (Prescribed Forest Burning) and 2810020000 (Prescribed Rangeland Burning) since these were included in the EVENTS county-level summary. Prescribed and wildfires are EVENTS categories whereas agricultural burning and other open burning are in the nonpoint data category. 2) Excluded dioxin/furan individual pollutants and groups and green house gas pollutants, pending further review of the accuracy and completeness of the data.		

[λ] The dataset short name is the name that EIS will list in its process-level reports

For point sources there are two known issues with the final data selected for version 2. First, when the datasets were combined, 2008 S/L/T agency emissions data were dropped for processes for which the last process year is less than 2008. The last process year indicates the last year the process was in operation so the software did not pick up these emissions for use in the 2008 NEI. In the future, emissions will not be accepted if the last process year is prior to the inventory year. The amount of emissions dropped is summarized in Appendix A, Table A-6. The second issue is an error in the order of the point source datasets for Connecticut and Douglas county Nebraska. The order should have placed the EPA EGU v1.5 dataset ahead of the "EPA PM Augmentation, v2" dataset since the "EPA PM Augmentation, v2" values are computed based on S/L/T-submitted PM. We intended to use the complete set of PM from the EGU v1.5 dataset for all PM species for these two jurisdictions. This only affects EGUs in these two geographic areas, and only affects the PM species that come from the "EPA PM Augmentation, v2" dataset for these EGUs. Table A-7 of Appendix A shows the magnitude of the error at the facility-level. In summary, for Douglas Nebraska, the error does not affect primary (i.e., total) PM2.5 or primary PM10; it affects only the filterable and condensable species. For Connecticut, primary PM2.5 is expected to be underestimated by 191 tons; the primary PM10 is not affected by the error.

3.1.2 Particulate matter augmentation

S/L/T agency submission of particulate matter (PM) emissions to the NEI are required to include primary PM10 (called PM10-PRI in EIS and NEI outputs) and primary PM2.5 (PM25-PRI). In addition, EPA requests states provide filterable PM (PM10-FIL and PM25-FIL) along with condensable PM (PM-CON). EPA needed to augment the PM components submitted by S/L/T agencies to ensure completeness of the PM components in the final NEI and to ensure that S/L/T agency data did not contain inconsistencies. An example of an inconsistency is if the S/L/T agency submitted a primary PM2.5 value that was greater than a primary PM10 value for the same process. Commonly, the augmentation added condensable PM or PM filterable (PM10-FIL and/or PM25-FIL)

where none was provided or primary PM2.5 where only primary PM10 was provided, or vice versa. Additional information on the procedure is provided in the 2008 NEI v2 PM augmentation documentation (Dorn, 2012).

In general, emissions for PM species missing from S/L/T agency inventories were calculated by applying factors to the PM emissions data supplied by the S/L/T agencies. These conversion factors were first used in the 1999 NEI's "PM Calculator" and are described in Strait et al. (2003). The resulting methodology allows EPA to derive missing PM10-FIL or PM25-FIL emissions from incomplete S/L/T agency submissions based on the SCC and PM controls that describe the emissions process. In cases where condensable emissions are not reported, conversion factors developed by Strait et al. (2003) are applied to S/L/T agency reported PM species or species derived from the PM Calculator databases.

3.1.3 Chromium augmentation

This section describes the procedure we used for augmenting chromium emissions to generate trivalent chromium and hexavalent chromium from S/L/T agency reported total (unspeciated) chromium.

EPA augmented S/L/T agency-reported chromium emissions through a dataset that splits the S/L/T agency-reported total chromium (pollutant code 7440473) into trivalent chromium and hexavalent chromium species. This dataset also computed the trivalent and/or hexavalent species where total chromium was reported with either hexavalent or trivalent chromium for the same process. This procedure had no impact on S/L/T agency data that were provided as hexavalent and/or trivalent chromium or where a S/L/T agency reported chromium trioxide and chromic acid (VI) as long as there was no total chromium at the same process.

The 2008 reporting cycle has 5 valid pollutant codes for chromium as shown in Table 10.

Table 10: Valid chromium pollutant codes

Pollutant Code	Description	Pollutant Category Name
1333820	Chromium Trioxide	Chromium Compounds
16065831	Chromium III	Chromium Compounds
18540299	Chromium (VI)	Chromium Compounds
7440473	Chromium	Chromium Compounds
7738945	Chromic Acid (VI)	Chromium Compounds

In the above table, all but "chromium" is considered speciated (chromium is referred to as "total chromium" in the remainder of this section). Total chromium could contain a mixture of chromium with different valence states. Since one of the main inventory uses is for risk assessment and the valence states of chromium have very different risks, speciated chromium is the most useful pollutants for the NEI and why we have included this augmentation.

EPA augmented the emissions by developing datasets containing speciated chromium based on the S/L/T agency reported total chromium and the process. The resulting chromium augmentation datasets contain a value of zero for total chromium, which overwrites the S/L/T submitted total chromium so as not to double count with the EPA dataset speciated chromium. The speciated data are contained in the dataset "EPA chromium Split v2" (3rd row of Table 8 for point and the 4th row of Table 9 for nonpoint).

This augmentation addresses two issues described below.

1. **Removes Ambiguity from Overlapping Pollutants:** S/L/T agencies sometimes report total chromium emissions, (pollutant code = 7440473) with hexavalent chromium (18540299) and/or trivalent chromium (16065831) for the same process. As explained in the HAP reporting webinar "How to Report HAP Emissions for the 2008 NEI" (http://www.epa.gov/ttn/chief/eidocs/training.html#eis), EPA interprets total chromium to be the sum of hexavalent chromium and trivalent chromium. Thus, EPA assumes that when a S/L/T agency submits total chromium emissions as well as hexavalent and/or trivalent chromium, then the state has submitted emissions mass that is double counted. The Emissions Inventory System (EIS) does not flag such double counting as an error, and as a result we have received data from S/L/T agencies that we need to augment to eliminate these apparently overlapping chromium compounds. Note that it is not double counting to have any form of chromium along with chromic acid mist (7738945) or chromium trioxide (7738945), which are specific chromium compounds that we treat as additive to whatever other chromium is already reported for the process. Users of the NEI data are most interested in hexavalent chromium, chromic acid mist and chromium trioxide. There may be other chromium ions (such as chromium II); however, they do not have any risk information associated them and thus we treat them along with trivalent chromium.

2. **Provides a consistent speciated chromium inventory:** EPA would like the NEI to only include speciated chromium emissions consistently throughout the inventory. While total chromium is a valid pollutant in the NEI, many users of the data request chromium emissions to be speciated into hexavalent chromium and trivalent chromium in order to estimate health risks. It is simpler for us and our users to have only the speciated forms in the released data and total chromium is available by adding the speciated emissions.

For point sources, we used the following sequential hierarchy to perform the speciation. For nonpoint sources, only the SCC code was used for speciation.

1. Regulatory Code speciation profiles; For pulp and paper (Regulatory Codes R63-0018, R63-0045 and R63-0018-02), a combination of Regulatory Code and SCC code was used.
2. SCC speciation profiles if Regulatory code speciation profiles are unavailable.
3. If Regulatory code and SCC speciation profiles are unavailable, we used a default to hexavalent chromium (18540299) percentage of 34%, which is the default value also used starting with the 1996 NATA (US EPA, 2001) and is based on the highest value tested from oil combustion (note that the average is 18%).

The speciation factors used are provided in the workbook Chromium_speciation_factors.xls (see Section 8.1 for access information). The first tab provides the Regulatory Code/SCC based chromium speciation profiles. The second tab provides the remaining Regulatory Code chromium speciation profiles. The third tab provides the SCC-based chromium speciation profiles. The fourth tab provides the SCC-based Chromium speciation profiles used for the nonpoint data category. We include the Maximum Achievable Control Technology code "MACT code" in the tables for historical reasons. The speciation data were initially developed by "MACT" category and we have mapped this to Regulatory Code for use in the 2008 NEI because MACT code has been replaced by Regulatory code.

Table 11 shows the calculations made for developing the EPA chromium corrections, speciated dataset, and meta data used for the Emissions Calculation Method Code and the Emissions Comment fields in EIS. This table does not apply to the nonpoint chromium speciation because it was more straightforward. The only step taken was to speciate the chromium using the SCC-based profiles provided in the workbook discussed above.

Table 11: Calculations for generating the point chromium augmentation dataset (EPA Chromium Split v2)

Case	S/L/T-reported the pollutants for a process:			Approach to create emissions for "EPA Chromium Split v2" dataset Manipulation	Meta data for EmissionsCalculationMethodCode (ECMC) and EmissionsComments (EC)
	Cr[1]	Hex[1]	Tri[1]		
1	X			Speciate using speciation factors in "Chromium_speciation_factors.xls"	ECMC = 5 (USEPA Speciation Profile) EC = "Speciation of <Agency> reported chromium via SCC: hex <value>%; tri <value> %" [2, 3]
2	X	X		Set Cr emissions to 0, and add Tri to be computed as follows: Tri = Cr – Hex. Note: if Tri is <0 it is set to 0.	ECMC=2 (Engineering Judgment) EC= "Replacement dataset corrects <Agency>-reported Cr overlap. Remove Cr and add Tri computed as Tri=Cr-Hex" [2]
3	X	X	X	**If Cr > Hex + Tri:** Set Cr emissions to zero. Subtract: Cr –(Hex + Tri) and add the difference to the existing Tri. Rationale: When total is greater than hex+tri, we assume total and hex as valid and re-calculate a new 'Tri'. This is because we assume that Cr^{+2} may be the difference that explains why total Cr is greater than the two pieces. **If Cr < Hex + Tri:** then set Cr emissions to 0 and keep Hex and Tri as-is. Rationale: where total Cr is less than sum of Hex+Tri, we assume that the hex and tri are correct, and thus remove the total.	**If Cr > Hex + Tri:** ECMC=2 (Engineering Judgment) EC= "Value corrects Chromium (Cr) overlap. Added difference between <Agency>-reported Aggregated Cr and <Agency>-reported hexavalent Cr to <Agency>-reported trivalent Cr. Difference assumed to represent divalent chromium, which we include with trivalent Cr." [2] **If Cr < Hex + Tri** ECMC=2 (Engineering Judgment) EC= "Replacement dataset corrects Cr overlap. Remove <Agency> reported aggregated chromium because it is assumed to overlap with <Agency>-reported hexavalent and trivalent chromium." [2]
4	X		X	Set Cr emissions to 0, and add Hex to be computed as follows: Hex = Cr – Tri Note: if Hex is <0 it is set to 0.	ECMC=2 (Engineering Judgment) EC= "Replacement dataset corrects <Agency>-reported Cr overlap. Remove Cr and add Hex computed as Hex=Cr-Tri"
5		X	X	No augmentation	
6		X		No augmentation	
7			X	No augmentation	

[1] Cr=chromium (pollutant code = 7440473); Hex=hexavalent chromium (18540299); Tri = trivalent chromium (16065831).
[2] <Agency> is the value of the agency program system code for the process containing the S/L/T agency data.
[3] <value> is the appropriate numerical value of the percent of trivalent or hexavalent chromium.

3.1.4 Use of the 2008 Toxics Release Inventory

EPA used 2008 TRI data to supplement point source HAP emissions provided to EPA by S/L/T agencies. The resulting augmentation dataset is labeled as "EPA TRI Augmentation, v2"in Table 8 and in EIS. This dataset is a combination of 1) TRI data that were assigned to facilities lacking S/L/T agency-reported HAP and Pb emissions using a mostly automated procedure (roughly 2,400 facilities) and 2) TRI data that were assigned to a relatively

small number of facilities (roughly 200 facilities) using a more manual approach as a result of the EPA high risk and Hg review. This section describes the methodology used for the automated procedure.

The basis of the TRI augmentation dataset is the 2008 EPA TRI. TRI is an EPA database containing data on disposal or other releases including air emissions of over 650 toxic chemicals from thousands of U.S. facilities. One of TRI's primary purposes is to inform communities about toxic chemical releases to the environment. Data are submitted annually by U.S. facilities that meet TRI reporting criteria. The TRI database used in this project was named US_2008_v09.zip downloaded in March 2011 and is available from http://www.epa.gov/tri/tridata/data/basicplus/index.html.

The general approach used to develop the automated portion of the TRI Augmentation file is described here, followed by a more detailed stepwise list below. In general, we matched TRI facilities with facilities in the Emission Inventory System and then apportioned TRI emissions to EIS facilities at the process-level using allocations derived from S/L/T agency-reported CAP surrogate emissions. Apportioning is necessary because emissions in the TRI database are summed to a facility-wide resolution, whereas the NEI has process-level (i.e., unit, process) resolution. Where there were no S/L/T agency-reported CAP emissions, TRI emissions were not used. The following CAP surrogates were used to apportion the emissions: (1) VOC- used for HAPs that are also VOC, (2) PM10-filterable – used for particulate HAPs and Hg, and (3) SO2 – used for acid gas HAPs. The use of these S/L/T agency data to assign the TRI data meant that if a facility did not have S/L/T agency reported emissions for the CAP surrogate, then TRI emissions for the HAP assigned to that surrogate would not be used. This limitation did not exist in the manual approach whereby TRI facility-level emissions were manually assigned to processes within the matched facilities.

The following steps describe in detail the development of automated portion of the TRI Augmentation database.

1. **Create a TRI_ID to EIS_ID crosswalk (i.e., match TRI facilities to EIS facilities)**
   The TRI emissions database contains two data elements that are used to uniquely identify a facility site. These are the TRI Facility ID (TRI_ID) and the Facility Registry System ID (FRS_ID). The TRI_ID is an identification number unique to the TRI. The EPA FRS_ID is a facility code also used in EPA's Envirofacts database. The EPA NEI uses the field "EIS Identifier" (EIS_ID) to uniquely identify facilities. A FRS_ID to EIS_ID crosswalk developed during the 2008 NEI effort was used as an initial step in linking the TRI emissions to the NEI facilities.

   This crosswalk was supplemented with additional matches from the TRI database that provided using the TRI_ID and FRS_ID fields. The crosswalk was also checked to ensure that TRI facilities matched properly to the EIS facilities using latitude, longitude, street address, facility name, city, county, and state for both TRI and EIS facilities. 'Hand checks' were performed for facilities that differed in location by more 0.01 degree longitude or 0.00725 degrees latitude (since roughly a 0.02 difference in the longitude is 1 mile and a 0.0145 difference in the latitude is 1 mile; our criteria was to look at 0.5 mile differences and greater) and which did not have identical facility names, street address, city, county, and state. We also manually removed matches where it was discovered that one TRI facility represented multiple EIS facilities to prevent double counting of TRI emissions data. Such differences can happen when the state inventories a facility in a different manner than the facility itself reports their emissions to TRI. The resulting TRI to EIS crosswalk file is "TRI to EIS crosswalk.accdb" (see Section 8.1 for access

information). This crosswalk contains all the potential matches reviewed; the ones we used in the automated approach have a "Y" in the "MATCH" field.

2. **Combine the TRI data for individual chemicals and chemical groups and create a total air emissions field**
   The TRI database organizes the air emissions into "Chemical Groups", and there is some overlap in these groups that we resolved prior to using the data. The TRI Chemical Group "metals and metal compounds" includes air releases of both elemental metals and compounds, but the metals are also included as individual elemental metals. If for the same facility, a metal compound and the metal group were reported, we summed the emissions together. For example, if a facility reported chromium compounds and chromium as separate pollutants, we summed these emissions together and assigned them to just chromium emissions. This assumed that the facility would not intentionally double count mass of a compound. We also combined stack and fugitive air emissions from the TRI datasets to generate the total air emissions for each pollutant at a facility. Our allocation method for assigning the TRI stack and fugitive emissions to the NEI emissions processes did not attempt to allocate using the "stack" or "fugitive" denotation from TRI.

3. **Update the 2008 S/L/T submission database with the PM10-FIL Augmentation updates**
   PM10-FIL is one of the criteria air pollutants used to assign TRI emissions at matching EIS facilities to the processes within that facility. The PM10-FIL data from the PM Augmentation dataset was merged with the S/L/T PM10-FIL data to provide a more complete set of PM10-FIL for use in the allocation of TRI emissions to processes at the facility. This step allowed more TRI data to be used than if we had used only the S/L/T agency submitted PM10-FIL.

4. **Map TRI pollutant codes to valid EIS pollutant codes.**
   Table 12 provides the pollutant mapping from TRI pollutants to NEI pollutants. Only CAA pollutants from the TRI are included and even some of these were not used- including ammonia (our focus was HAPs and lead), dioxins/furans (which we excluded from the inventory) and others we could not map to specific NEI pollutants (e.g., diisocyanates and certain glycol ethers).

5. **Remove TRI records to avoid double counting, as follows:**
   a. When S/L/T agency submissions contained matching HAPs or HAPs belonging to HAP groups such as cresols, xylenes and polycyclic organic matter. The pollutant group assignments are shown in Table 13. For example, if a S/L/T agency-submitted emissions for any pollutant group member at the facility, we assume that the emissions from that pollutant group were already provided by the S/L/T agency and did not add emissions of that HAP or HAP group from the TRI.
   b. When emissions records were already submitted in other EPA HAP datasets or for which TRI emissions were assigned using a manual approach (See Section 3.1.7) such as for cement and electric arc furnace facilities.
   c. When the NEI facility type was "Electricity Generation via Combustion" since this category is gap filled with two other EPA datasets (MATS and EGU).

6. **Calculate the allocation factors to develop process-level emissions.**
   S/L/T agency CAP emissions reported at the process level were used as surrogates for allocating the TRI data. The surrogate assignments are shown in Table 12. We computed allocation factors for the surrogates based on the fraction of surrogate pollutant emissions at each process. Emissions allocations were limited to processes that contributed to least 1 percent of emissions. The reason is that we did not want to allocate HAPS emissions to processes that had very small emissions. Where CAP emissions were less than 1 percent, the factor was set to zero and the allocations were re-normalized in order to use all of the facility-level TRI emissions.

   The allocation approach is done to prevent all of the HAP emissions from getting assigned to a single process, which can cause artifacts in data summaries when the processes are summed to EIS sectors or other ways. The resulting allocation approach however has the disadvantage of assigning HAPs to processes that may not actually have those HAP emissions. Thus, at facilities where TRI data have been used, the process-level HAP emissions should be viewed with this limitation in mind. Past NEIs have assigned all of these emissions to a default process code SCC of 39999999, which caused other artifacts, such as a disproportionate amount of HAP emissions getting summed to "miscellaneous" categories in some instances. While we have not eliminated the use of this SCC from this version of the NEI, we have reduced its use in hopes of eventual elimination from future inventories.

7. **Calculate process-level emissions by multiplying the TRI facility level emissions with the allocation factors computed for the surrogate CAPs.**

8. **Speciate process-level total chromium emissions into hexavalent and trivalent emissions and remove total chromium emissions.**
   This followed the procedure described in Section 3.1.3, except that we did not create zero emissions records for total chromium (we simply did not add total chromium to the dataset) and we only speciated the total chromium since the TRI does not provide either hexavalent or trivalent chromium.

The following quality assurance/quality control checks were performed in the development of the data.

1. **Review high TRI emissions values for selected and high risk HAPs and for lead; exclude any data suspected to be outliers.**
   For the following pollutants, we looked at the highest and sometimes second highest TRI facility values included in the initial version prior to building the NEI for mercury, lead, chromium, manganese, nickel, arsenic, 1,3 butadiene, benzene, toluene, ethyl benzene, p-xylene, methanol, acrolein, carbon tetrachloride, tetrachloroethylene, methylene chloride, acrylonitrile, 1,4-dichlorobenzene, ethylene oxide, hydrochloric acid, hydrogen fluoride, chlorine, 2,4-toluene diisocyanate, hexamethylene diisocyanate, and naphthalene. In some cases, we suspected these highest values to be outliers and excluded them from the augmentation dataset. For lead, we looked at all facilities with total 2008 TRI emissions greater than 0.5 tons (which will be the new threshold for reporting lead emissions to the NEI). Where there was no evidence the values were incorrect, we notified the responsible agency. As a result we changed the following prior to using the TRI data in the NEI:

a. We did not use TRI lead (pollutant code = 7439921) from PEMCO (TRI ID = 35983CHVTCEWING; EIS Facility ID = 7915711). Rationale: 2008 emissions above 0.5 tons (regulatory threshold) and determine that 2008 was inconsistent with TRI data from other years, plus this is a coating manufacturer, which is very unlikely to emit lead at the levels reported to TRI.
b. We did not use TRI lead (7439921) from APPLETON COATED L.L.C. (TRI ID= 54113PPLTN540PR; EIS Facility ID= 6805511).
c. We did not use manganese (7439965) from Orthman Manufacturing Inc (TRI ID = 68850RTHMNRR2; EIS Facility ID = 6702911) – the 2008 value in TRI exceeded 2 million pounds and was very inconsistent with TRI data from other years
d. We changed tetrachloroethylene total emissions (facility wide) (127184) from 19500 pounds to 1815 pounds for Flint Hills Resources LP – Pine Bend (TRI ID = 55164KCHRFPOBOX; EIS Facility ID = 6275811). We called facility and were informed that the TRI value was an outlier. We received a revised value by email on 12/15/2011 from the plant representative.

2. **Excluded the TRI Polycyclic Aromatic Hydrocarbons (PAH) for facilities with coke oven emissions**. Where we found TRI PAH at the same processes as coke oven emissions we did not use it. The PAH removal was to prevent possible double counting between PAH and the coke oven emissions pollutants. In the state reported data, if a state reported PAH and coke oven emissions we did not take any action; but here we chose not to add PAH from TRI from an EPA dataset to prevent double counting emissions.

3. **Check overlaps across TRI and other datasets.** As explained in step 5 above, we analyzed other datasets to make sure we would not be double counting emissions when adding TRI data. Once we put all of the datasets together, we checked again for overlaps. From this check we discovered overlaps between the TRI dataset and the 2008EPA_MATS and EPA EGU v1.5 datasets. These overlaps occurred because for EGUs, we used the EIS "Facility type" field to identify (and remove from TRI) EGUs rather than comparing the facilities in these datasets to facilities in the TRI. It would have been a better approach to directly compare the datasets because there are facilities that do not have a facility type of "Electricity Generation Via Combustion" in the 2008EPA_MATS and EPA EGU v1.5 datasets. For these facilities, emissions for the same pollutant were taken from two separate datasets and assigned to processes differently such that when combined to generate the NEI, the facility total no longer matched the TRI. To prevent a double count, we changed some of the emissions in the TRI dataset as follows:

   a. HORSEHEAD CORP/MONACA SMELTER (EIS Facility ID = 7991511). The MATS data overlap the original TRI dataset. Because the MATS value was greater than the TRI value, we removed the TRI dataset selenium emissions. We adjusted the cadmium value in the TRI dataset so that when summed with the MATS value, the facility total would reflect the original value in 2008 TRI. We did not change chromium due to speciation issues –, the amount of hexavalent chromium at the coal fired boilers (MATS sources) is 60.5 lbs which is greater than the facility total TRI value of 53.9 lbs. Of the 53.9 lbs total TRI, 9 lbs was allocated to the MATS sources and the rest to the other industrial processes. If any double counting did occur, it would have been less than the 44.9 lbs of TRI allocated to the non-MATS industrial processes.

b. DOMTAR PAPER CO/JOHNSONBURG MILL (EIS Facility ID = 6559611). We adjusted the TRI phenol value for the non EGU processes such that when summed with the value from the EPA EGU v1.5 dataset, the NEI facility total would equal the TRI facility total.

c. CEMEX CNSTRCTION MATERIALS FLORIDA, LLC (EIS Facility ID = 716011). We allocated TRI nickel emissions to the cement kilns and made sure total emissions match the original TRI value when the TRI cement kiln value for nickel was summed with MATS coal-fired boiler value for nickel.

d. Did not adjust overlaps found at NEW ENERGY CORPORTION (EIS Facility ID = 5552411) and HGLATFELTER CO/SPRING GROVE (EIS Facility ID = 4966111) as they were determined to be insignificant.

Table 12: Mapping of TRI Pollutant Codes to EIS Pollutant codes

TRI CAS	TRI Pollutant Name	EIS Pollutant Code	EIS Pollutant Name	Allocation Surrogate
79345	1,1,2,2-TETRACHLOROETHANE	79345	1,1,2,2-TETRACHLOROETHANE	VOC
79005	1,1,2-TRICHLOROETHANE	79005	1,1,2-TRICHLOROETHANE	VOC
57147	1,1-DIMETHYL HYDRAZINE	57147	1,1-DIMETHYL HYDRAZINE	VOC
120821	1,2,4-TRICHLOROBENZENE	120821	1,2,4-TRICHLOROBENZENE	VOC
96128	1,2-DIBROMO-3-CHLOROPROPANE	96128	1,2-DIBROMO-3-CHLOROPROPANE	VOC
106887	1,2-BUTYLENE OXIDE	106887	1,2-EPOXYBUTANE	VOC
75558	PROPYLENEIMINE	75558	1,2-PROPYLENIMINE	VOC
106990	1,3-BUTADIENE	106990	1,3-BUTADIENE	VOC
542756	1,3-DICHLOROPROPYLENE	542756	1,3-DICHLOROPROPENE	VOC
1120714	PROPANE SULTONE	1120714	1,3-PROPANESULTONE	VOC
106467	1,4-DICHLOROBENZENE	106467	1,4-DICHLOROBENZENE	VOC
95954	2,4,5-TRICHLOROPHENOL	95954	2,4,5-TRICHLOROPHENOL	VOC
88062	2,4,6-TRICHLOROPHENOL	88062	2,4,6-TRICHLOROPHENOL	VOC
94757	2,4-DICHLOROPHENOXY ACETIC ACID	94757	2,4-DICHLOROPHENOXY ACETIC ACID	VOC
51285	2,4-DINITROPHENOL	51285	2,4-DINITROPHENOL	VOC
121142	2,4-DINITROTOLUENE	121142	2,4-DINITROTOLUENE	VOC
53963	2-ACETYLAMINOFLUORENE	53963	2-ACETYLAMINOFLUORENE	VOC
79469	2-NITROPROPANE	79469	2-NITROPROPANE	VOC
119937	3,3'-DIMETHYLBENZIDINE	119937	3,3'-DIMETHYLBENZIDINE	VOC
101144	4,4'-METHYLENEBIS(2-CHLOROANILINE)	101144	4,4'-METHYLENEBIS(2-CHLORANILINE)	VOC
101779	4,4'-METHYLENEDIANILINE	101779	4,4'-METHYLENEDIANILINE	VOC
534521	4,6-DINITRO-O-CRESOL	534521	4,6-DINITRO-O-CRESOL	VOC
92671	4-AMINOBIPHENYL	92671	4-AMINOBIPHENYL	VOC
100027	4-NITROPHENOL	100027	4-NITROPHENOL	VOC
75070	ACETALDEHYDE	75070	ACETALDEHYDE	VOC
60355	ACETAMIDE	60355	ACETAMIDE	VOC
75058	ACETONITRILE	75058	ACETONITRILE	VOC
98862	ACETOPHENONE	98862	ACETOPHENONE	VOC
107028	ACROLEIN	107028	ACROLEIN	VOC
79061	ACRYLAMIDE	79061	ACRYLAMIDE	VOC
79107	ACRYLIC ACID	79107	ACRYLIC ACID	VOC
107131	ACRYLONITRILE	107131	ACRYLONITRILE	VOC
107051	ALLYL CHLORIDE	107051	ALLYL CHLORIDE	VOC
62533	ANILINE	62533	ANILINE	VOC
7440360	ANTIMONY	7440360	ANTIMONY	PM10-FIL
N010	ANTIMONY COMPOUNDS	7440360	ANTIMONY	PM10-FIL
7440382	ARSENIC	7440382	ARSENIC	PM10-FIL
N020	ARSENIC COMPOUNDS	7440382	ARSENIC	PM10-FIL
1332214	ASBESTOS (FRIABLE)	1332214	ASBESTOS	PM10-FIL
71432	BENZENE	71432	BENZENE	VOC
92875	BENZIDINE	92875	BENZIDINE	VOC
98077	BENZOIC TRICHLORIDE	98077	BENZOTRICHLORIDE	VOC
100447	BENZYL CHLORIDE	100447	BENZYL CHLORIDE	VOC
7440417	BERYLLIUM	7440417	BERYLLIUM	PM10-FIL
N050	BERYLLIUM COMPOUNDS	7440417	BERYLLIUM	PM10-FIL
92524	BIPHENYL	92524	BIPHENYL	VOC
117817	DI(2-ETHYLHEXYL) PHTHALATE	117817	BIS(2-ETHYLHEXYL)PHTHALATE	VOC
75252	BROMOFORM	75252	BROMOFORM	VOC
7440439	CADMIUM	7440439	CADMIUM	PM10-FIL
N078	CADMIUM COMPOUNDS	7440439	CADMIUM	PM10-FIL

TRI CAS	TRI Pollutant Name	EIS Pollutant Code	EIS Pollutant Name	Allocation Surrogate
156627	CALCIUM CYANAMIDE	156627	CALCIUM CYANAMIDE	PM10-FIL
133062	CAPTAN	133062	CAPTAN	VOC
63252	CARBARYL	63252	CARBARYL	VOC
75150	CARBON DISULFIDE	75150	CARBON DISULFIDE	VOC
56235	CARBON TETRACHLORIDE	56235	CARBON TETRACHLORIDE	VOC
463581	CARBONYL SULFIDE	463581	CARBONYL SULFIDE	VOC
120809	CATECHOL	120809	CATECHOL	VOC
57749	CHLORDANE	57749	CHLORDANE	VOC
7782505	CHLORINE	7782505	CHLORINE	SO2
79118	CHLOROACETIC ACID	79118	CHLOROACETIC ACID	VOC
108907	CHLOROBENZENE	108907	CHLOROBENZENE	VOC
67663	CHLOROFORM	67663	CHLOROFORM	VOC
107302	CHLOROMETHYL METHYL ETHER	107302	CHLOROMETHYL METHYL ETHER	VOC
126998	CHLOROPRENE	126998	CHLOROPRENE	VOC
7440473	CHROMIUM	7440473	CHROMIUM	PM10-FIL
N090	CHROMIUM COMPOUNDS(EXCEPT CHROMITE ORE MINED IN THE TRANSVAAL REGION)	7440473	CHROMIUM	PM10-FIL
7440484	COBALT	7440484	COBALT	PM10-FIL
N096	COBALT COMPOUNDS	7440484	COBALT	PM10-FIL
1319773	CRESOL (MIXED ISOMERS)	1319773	CRESOL/CRESYLIC ACID (MIXED ISOMERS)	VOC
108394	M-CRESOL	108394	M-CRESOL	VOC
95487	O-CRESOL	95487	O-CRESOL	VOC
106445	P-CRESOL	106445	P-CRESOL	VOC
98828	CUMENE	98828	CUMENE	VOC
N106	CYANIDE COMPOUNDS	57125	CYANIDE	PM10-FIL
132649	DIBENZOFURAN	132649	DIBENZOFURAN	VOC
84742	DIBUTYL PHTHALATE	84742	DIBUTYL PHTHALATE	PM10-FIL
111444	BIS(2-CHLOROETHYL) ETHER	111444	DICHLOROETHYL ETHER	VOC
62737	DICHLORVOS	62737	DICHLORVOS	VOC
111422	DIETHANOLAMINE	111422	DIETHANOLAMINE	VOC
64675	DIETHYL SULFATE	64675	DIETHYL SULFATE	VOC
131113	DIMETHYL PHTHALATE	131113	DIMETHYL PHTHALATE	VOC
77781	DIMETHYL SULFATE	77781	DIMETHYL SULFATE	VOC
79447	DIMETHYLCARBAMYL CHLORIDE	79447	DIMETHYLCARBAMOYL CHLORIDE	VOC
N120	DIISOCYANATES		NA- pollutant not used	
N150	DIOXIN AND DIOXIN-LIKE COMPOUNDS		NA- pollutant not used	
106898	EPICHLOROHYDRIN	106898	EPICHLOROHYDRIN	VOC
140885	ETHYL ACRYLATE	140885	ETHYL ACRYLATE	VOC
51796	URETHANE	51796	ETHYL CARBAMATE CHLORIDE	VOC
75003	CHLOROETHANE	75003	ETHYL CHLORIDE	VOC
100414	ETHYLBENZENE	100414	ETHYL BENZENE	VOC
106934	1,2-DIBROMOETHANE	106934	ETHYLENE DIBROMIDE	VOC
107062	1,2-DICHLOROETHANE	107062	ETHYLENE DICHLORIDE	VOC
107211	ETHYLENE GLYCOL	107211	ETHYLENE GLYCOL	VOC
75218	ETHYLENE OXIDE	75218	ETHYLENE OXIDE	VOC
96457	ETHYLENE THIOUREA	96457	ETHYLENE THIOUREA	VOC
75343	ETHYLIDENE DICHLORIDE	75343	ETHYLIDENE DICHLORIDE	VOC
50000	FORMALDEHYDE	50000	FORMALDEHYDE	VOC
N230	CERTAIN GLYCOL ETHERS	171	N/A Pollutant not used	
76448	HEPTACHLOR	76448	HEPTACHLOR	VOC
118741	HEXACHLOROBENZENE	118741	HEXACHLOROBENZENE	VOC
87683	HEXACHLORO-1,3-BUTADIENE	87683	HEXACHLOROBUTADIENE	VOC
77474	HEXACHLOROCYCLOPENTADIENE	77474	HEXACHLOROCYCLOPENTADIENE	VOC
67721	HEXACHLOROETHANE	67721	HEXACHLOROETHANE	VOC
110543	N-HEXANE	110543	HEXANE	VOC
302012	HYDRAZINE	302012	HYDRAZINE	VOC
7647010	HYDROCHLORIC ACID (1995 AND AFTER “ACID AEROSOLS” ONLY)	7647010	HYDROCHLORIC ACID	SO2
7664393	HYDROGEN FLUORIDE	7664393	HYDROGEN FLUORIDE	SO2
123319	HYDROQUINONE	123319	HYDROQUINONE	VOC
7439921	LEAD	7439921	LEAD	PM10-FIL
N420	LEAD COMPOUNDS	7439921	LEAD	PM10-FIL
58899	LINDANE	58899	1,2,3,4,5,6-HEXACHLOROCYCLOHEXANE	VOC
108316	MALEIC ANHYDRIDE	108316	MALEIC ANHYDRIDE	VOC

TRI CAS	TRI Pollutant Name	EIS Pollutant Code	EIS Pollutant Name	Allocation Surrogate
7439965	MANGANESE	7439965	MANGANESE	PM10-FIL
N450	MANGANESE COMPOUNDS	7439965	MANGANESE	PM10-FIL
7439976	MERCURY	7439976	MERCURY	PM10-FIL
N458	MERCURY COMPOUNDS	7439976	MERCURY	PM10-FIL
67561	METHANOL	67561	METHANOL	VOC
72435	METHOXYCHLOR	72435	METHOXYCHLOR	VOC
74839	BROMOMETHANE	74839	METHYL BROMIDE	VOC
74873	CHLOROMETHANE	74873	METHYL CHLORIDE	VOC
71556	1,1,1-TRICHLOROETHANE	71556	METHYL CHLOROFORM	VOC
74884	METHYL IODIDE	74884	METHYL IODIDE	VOC
108101	METHYL ISOBUTYL KETONE	108101	METHYL ISOBUTYL KETONE	VOC
624839	METHYL ISOCYANATE	624839	METHYL ISOCYANATE	VOC
80626	METHYL METHACRYLATE	80626	METHYL METHACRYLATE	VOC
1634044	METHYL TERT-BUTYL ETHER	1634044	METHYL TERT-BUTYL ETHER	VOC
75092	DICHLOROMETHANE	75092	METHYLENE CHLORIDE	VOC
60344	METHYL HYDRAZINE	60344	METHYLHYDRAZINE	VOC
121697	N,N-DIMETHYLANILINE	121697	N,N-DIMETHYLANILINE	VOC
68122	N,N-DIMETHYLFORMAMIDE	68122	N,N-DIMETHYLFORMAMIDE	VOC
91203	NAPHTHALENE	91203	NAPHTHALENE	VOC
7440020	NICKEL	7440020	NICKEL	PM10-FIL
N495	NICKEL COMPOUNDS	7440020	NICKEL	PM10-FIL
98953	NITROBENZENE	98953	NITROBENZENE	VOC
90040	O-ANISIDINE	90040	O-ANISIDINE	VOC
95534	O-TOLUIDINE	95534	O-TOLUIDINE	VOC
60117	4-DIMETHYLAMINOAZOBENZENE	60117	4-DIMETHYLAMINOAZOBENZENE	VOC
123911	1,4-DIOXANE	123911	P-DIOXANE	VOC
82688	QUINTOZENE	82688	PENTACHLORONITROBENZENE	VOC
87865	PENTACHLOROPHENOL	87865	PENTACHLOROPHENOL	VOC
108952	PHENOL	108952	PHENOL	VOC
75445	PHOSGENE	75445	PHOSGENE	VOC
7803512	PHOSPHINE	7803512	PHOSPHINE	VOC
7723140	PHOSPHORUS (YELLOW OR WHITE)	7723140	PHOSPHORUS	PM10-FIL
85449	PHTHALIC ANHYDRIDE	85449	PHTHALIC ANHYDRIDE	PM10-FIL
1336363	POLYCHLORINATED BIPHENYLS	1336363	POLYCHLORINATED BIPHENYLS	VOC
191242	BENZO(G,H,I)PERYLENE	191242	BENZO[G,H,I,]PERYLENE	PM10-FIL
85018	PHENANTHRENE	85018	PHENANTHRENE	PM10-FIL
N590	POLYCYCLIC AROMATIC COMPOUNDS	130498292	PAH, total	PM10-FIL
106503	P-PHENYLENEDIAMINE	106503	P-PHENYLENEDIAMINE	VOC
123386	PROPIONALDEHYDE	123386	PROPIONALDEHYDE	VOC
114261	PROPOXUR	114261	PROPOXUR	VOC
78875	1,2-DICHLOROPROPANE	78875	PROPYLENE DICHLORIDE	VOC
75569	PROPYLENE OXIDE	75569	PROPYLENE OXIDE	VOC
91225	QUINOLINE	91225	QUINOLINE	VOC
106514	QUINONE	106514	QUINONE	VOC
7782492	SELENIUM	7782492	SELENIUM	PM10-FIL
N725	SELENIUM COMPOUNDS	7782492	SELENIUM	PM10-FIL
100425	STYRENE	100425	STYRENE	VOC
96093	STYRENE OXIDE	96093	STYRENE OXIDE	VOC
127184	TETRACHLOROETHYLENE	127184	TETRACHLOROETHYLENE	VOC
7550450	TITANIUM TETRACHLORIDE	7550450	TITANIUM TETRACHLORIDE	VOC
108883	TOLUENE	108883	TOLUENE	VOC
95807	2,4-DIAMINOTOLUENE	95807	TOLUENE-2,4-DIAMINE	VOC
8001352	TOXAPHENE	8001352	TOXAPHENE	VOC
79016	TRICHLOROETHYLENE	79016	TRICHLOROETHYLENE	VOC
121448	TRIETHYLAMINE	121448	TRIETHYLAMINE	VOC
1582098	TRIFLURALIN	1582098	TRIFLURALIN	VOC
108054	VINYL ACETATE	108054	VINYL ACETATE	VOC
75014	VINYL CHLORIDE	75014	VINYL CHLORIDE	VOC
75354	VINYLIDENE CHLORIDE	75354	VINYLIDENE CHLORIDE	VOC
108383	M-XYLENE	108383	M-XYLENE	VOC
95476	O-XYLENE	95476	O-XYLENE	VOC
106423	P-XYLENE	106423	P-XYLENE	VOC
1330207	XYLENE (MIXED ISOMERS)	1330207	XYLENES (MIXED ISOMERS)	VOC

Table 13: Pollutant Groups

Group Name	Pollutant Code	Pollutant
Chromium	7440473	Chromium
	1333820	Chromium Trioxide
	7738945	Chromic Acid (VI)
	18540299	Chromium (VI)
	16065831	Chromium III
Xylenes (Mixed Isomers)	1330207	Xylenes (Mixed Isomers)
	95476	o-Xylene
	106423	p-Xylene
	108383	m-Xylene
Cresol/Cresylic Acid (Mixed Isomers)	1319773	Cresol/Cresylic Acid (Mixed Isomers)
	95487	o-Cresol
	108394	m-Cresol
	106445	p-Cresol
Polychlorinated Biphenyls	1336363	Polychlorinated Biphenyls (PCBs)
	2050682	4,4'-Dichlorobiphenyl (PCB-15)
	2051243	Decachlorobiphenyl (PCB-209)
	2051607	2-Chlorobiphenyl (PCB-1)
	25429292	Pentachlorobiphenyl
	26601649	Hexachlorobiphenyl
	26914330	Tetrachlorobiphenyl
	28655712	Heptachlorobiphenyl
	53742077	Nonachlorobiphenyl
	55722264	Octachlorobiphenyl
	7012375	2,4,4'-Trichlorobiphenyl (PCB-28)
Polycyclic Organic Matter (POM)	120127	Anthracene
	129000	Pyrene
	130498292	PAH, total
	189559	Dibenzo[a,i]Pyrene
	189640	Dibenzo[a,h]Pyrene
	191242	Benzo[g,h,I,]Perylene
	191300	Dibenzo[a,l]Pyrene
	192654	Dibenzo[a,e]Pyrene
	192972	Benzo[e]Pyrene
	193395	Indeno[1,2,3-c,d]Pyrene
	194592	7H-Dibenzo[c,g]carbazole
	195197	BenzoIphenanthrene
	198550	Perylene
	203123	Benzo(g,h,i)Fluoranthene
	203338	Benzo(a)Fluoranthene
	205823	Benzo[j]fluoranthene
	205992	Benzo[b]Fluoranthene
	206440	Fluoranthene
	207089	Benzo[k]Fluoranthene
	208968	Acenaphthylene
	218019	Chrysene
	224420	Dibenzo[a,j]Acridine

Group Name	Pollutant Code	Pollutant
	226368	Dibenz[a,h]acridine
	2381217	1-Methylpyrene
	2422799	12-Methylbenz(a)Anthracene
	250	PAH/POM – Unspecified
	26914181	Methylanthracene
	3697243	5-Methylchrysene
	41637905	Methylchrysene
	42397648	1,6-Dinitropyrene
	42397659	1,8-Dinitropyrene
	50328	Benzo[a]Pyrene
	53703	Dibenzo[a,h]Anthracene
	5522430	1-Nitropyrene
	56495	3-Methylcholanthrene
	56553	Benz[a]Anthracene
	56832736	Benzofluoranthenes
	57835924	4-Nitropyrene
	57976	7,12-Dimethylbenz[a]Anthracene
	602879	5-Nitroacenaphthene
	607578	2-Nitrofluorene
	65357699	Methylbenzopyrene
	7496028	6-Nitrochrysene
	779022	9-Methyl Anthracene
	8007452	Coal Tar
	832699	1-Methylphenanthrene
	83329	Acenaphthene
	85018	Phenanthrene
	86737	Fluorene
	86748	Carbazole
	90120	1-Methylnaphthalene
	91576	2-Methylnaphthalene
	91587	2-Chloronaphthalene
Cyanide & Compounds	57125	Cyanide
	74908	Hydrogen Cyanide
Nickel & Compounds	7440020	Nickel
	12035722	Nickel Subsulfide
	1313991	Nickel Oxide
	604	Nickel Refinery Dust

3.1.5 HAP augmentation based on emission factor ratios

For use in cases where S/L/T agencies did not report HAP emissions and TRI data were not available, we calculated HAP emissions by multiplying the appropriate surrogate CAP emissions (provided by S/L/T agencies) by an emissions ratio of HAP to CAP emission factors from WebFIRE (http://www.epa.gov/ttn/chief/webfire/index.html). The spreadsheet "HAP EF Ratios Derived from WebFIRE.xls" (see Section 8.1 for access information) provides the 2,417 emissions ratios by SCC. For each ratio, the spreadsheet provides the HAP and CAP Factor Ids for the Efs used to build these ratios. These Factor Ids

identify each unique EF in the WebFIRE database. Where the factor Ids in that spreadsheet are null, it means we used a ratio from a similar WebFIRE SCC. This was only done for Hg from boilers, to allow for a more complete gap filling of Hg from boilers. Additional ratios were added to allow more complete gap filling of boilers and process heaters that used fuel types similar to those covered in WebFIRE but are not explicitly in WebFIRE.

Table 14 provides the specific CAPs used for each HAP emission factor calculated.

A key result of our approach is that the resulting HAP augmentation dataset does not include HAP emissions for facilities where the HAP was reported by an S/L/T agency at any process at the facility. For example, if a facility reported formaldehyde at process A only, and the WebFIRE Emission factor database yields formaldehyde emissions for processes A, B, and C, then the HAP augmentation dataset would not contain formaldehyde from any processes at the facility. If that facility had no formaldehyde, then the HAP augmentation dataset would have formaldehyde for processes A, B and C. This approach was taken to be conservative in our attempt to prevent double counted emissions, which is necessary because we know that some states aggregate their HAP emissions and assign to fewer or different processes than their CAP emissions. These types of differences are expected since CAPs are required at the process level, but HAPs are entirely voluntary.

Table 14: CAP Surrogate assignments to derive HAP-to-CAP Emission Factor Ratios

Description	Pollutant Code	CAP Surrogate	Description	Pollutant Code	CAP Surrogate
1,1,2,2-Tetrachloroethane	79345	VOC	Ethyl Chloride	75003	VOC
1,1,2-Trichloroethane	79005	VOC	Ethylene Dibromide	106934	VOC
1,3-Butadiene	106990	VOC	Ethylene Dichloride	107062	VOC
1,3-Dichloropropene	542756	VOC	Ethylidene Dichloride	75343	VOC
1,4-Dichlorobenzene	106467	VOC	Fluoranthene	206440	PM10-FIL
2,2,4-Trimethylpentane	540841	VOC	Fluorene	86737	PM10-FIL
2,4-Dinitrophenol	51285	VOC	Formaldehyde	50000	VOC
2-Chloronaphthalene	91587	PM10-FIL	Hexane	110543	VOC
2-Methylnaphthalene	91576	PM10-FIL	Hydrochloric Acid	7647010	SO2
4,4'-Methylenediphenyl Diisocyanate	101688	VOC	Hydrogen Fluoride	7664393	SO2
4-Nitrophenol	100027	VOC	Hydroquinone	123319	VOC
Acenaphthene	83329	PM10-FIL	Indeno[1,2,3-c,d]Pyrene	193395	PM10-FIL
Acenaphthylene	208968	PM10-FIL	Isophorone	78591	VOC
Acetaldehyde	75070	VOC	Lead	7439921	PM10-FIL
Acetonitrile	75058	VOC	Manganese	7439965	PM10-FIL
Acetophenone	98862	VOC	Mercury	7439976	PM10-FIL
Acrolein	107028	VOC	Methanol	67561	VOC
Acrylonitrile	107131	VOC	Methyl Bromide	74839	VOC
Anthracene	120127	PM10-FIL	Methyl Chloride	74873	VOC
Antimony	7440360	PM10-FIL	Methyl Chloroform	71556	VOC
Arsenic	7440382	PM10-FIL	Methyl Iodide	74884	VOC
Benz[a]Anthracene	56553	PM10-FIL	Methyl Isobutyl Ketone	108101	VOC
Benzene	71432	VOC	Methyl Tert-Butyl Ether	1634044	VOC

Description	Pollutant Code	CAP Surrogate
Benzo[a]Pyrene	50328	PM10-FIL
Benzo[b]Fluoranthene	205992	PM10-FIL
Benzo[e]Pyrene	192972	PM10-FIL
Benzo[g,h,I,]Perylene	191242	PM10-FIL
Benzo[k]Fluoranthene	207089	PM10-FIL
Beryllium	7440417	PM10-FIL
Biphenyl	92524	VOC
Bis(2-Ethylhexyl)Phthalate	117817	VOC
Cadmium	7440439	PM10-FIL
Carbon Disulfide	75150	VOC
Carbon Tetrachloride	56235	VOC
Chlorine	7782505	SO2
Chlorobenzene	108907	VOC
Chloroform	67663	VOC
Chromium	7440473	PM10-FIL
Chromium (VI)	18540299	PM10-FIL
Chromium Trioxide	1333820	PM10-FIL
Chrysene	218019	PM10-FIL
Cobalt	7440484	PM10-FIL
Cumene	98828	VOC
Dibenzo[a,h]Anthracene	53703	PM10-FIL
Dibenzofuran	132649	VOC
Dibutyl Phthalate	84742	PM10-FIL
Dimethyl Phthalate	131113	VOC
Ethyl Benzene	100414	VOC

Description	Pollutant Code	CAP Surrogate
Methylene Chloride	75092	VOC
Naphthalene	91203	VOC
Nickel	7440020	PM10-FIL
Nickel Oxide	1313991	PM10-FIL
o-Xylene	95476	VOC
PAH, total	130498292	PM10-FIL
PAH/POM – Unspecified	250	PM10-FIL
Pentachlorophenol	87865	VOC
Perylene	198550	PM10-FIL
Phenanthrene	85018	PM10-FIL
Phenol	108952	VOC
Phosgene	75445	VOC
Phosphorus	7723140	PM10-FIL
Polychlorinated Biphenyls	1336363	VOC
Propionaldehyde	123386	VOC
Propylene Dichloride	78875	VOC
Pyrene	129000	PM10-FIL
Selenium	7782492	PM10-FIL
Styrene	100425	VOC
Tetrachloroethylene	127184	VOC
Toluene	108883	VOC
Trichloroethylene	79016	VOC
Vinyl Chloride	75014	VOC
Vinylidene Chloride	75354	VOC
Xylenes (Mixed Isomers)	1330207	VOC

The HAP Augmentation process consisted of three main steps: (1) calculating HAP-to-CAP ratios from existing WebFIRE emission factors, (2) adding Hg ratios for boiler and process-heater SCCs using similar fuels as those covered in step 1, and (3) calculating HAP emissions from these ratios and the surrogate CAP emissions. In addition, a fourth step was used to perform special quality assurance for Hg. These steps are described in more detail in the three subsections below.

3.1.5.1 Step 1: Extract and Modify WebFIRE Emission Factors and Calculate HAP-to-CAP ratios

The following list provides the various parts of Step 1 to extract and modify the WebFIRE emission factors and calculate the HAP-to-CAP ratios

1. Download latest WebFIRE database from the U.S. EPA: (WebFIREFactors.csv downloaded on 12/19/10). Each separate record in that file is identified with a unique "Factor ID".
2. Delete all Revoked and Controlled Emission Factors. This means that only ratios of uncontrolled emission factors were used in this approach.
3. Change WebFIRE pollcode 246 to 130498292 (PAH).

4. Change WebFIRE pollcode 40 to 250 (unspecified PAH/POM).
5. Change WebFIRE pollcode 102 (Benzo[b+k]Fluoranthene to 205992 (Benzo[b]Fluoranthene). Although these are not identical compounds, both have the same risk factors.
6. Remove Efs for the pollutants shown in Table 15: Invalid pollutant codes for HAP augmentationTable 15 because they are not valid pollutant codes in the 2008 NEI and there are no valid pollutant codes that represent these pollutants.

Table 15: Invalid pollutant codes for HAP augmentation

Pollutant code	Last Valid Year	Pollutant description
37871004	2005	Total Heptachlorodibenzo-p-Dioxin
34465468	2005	Hexachlorodibenzo-p-Dioxin
30402154	2005	Total Pentachlorodibenzofuran
136677093	2005	Dioxins, Total, W/O Individ. Isomers Reported {PCDDS}
136677106	2005	Polychlorinated Dibenzofurans, Total

7. Remove Efs for pollcode 140 (coke oven emissions) since (at the time) we did not have an approach to map from this code to the benzene soluble organics (BSO) or Methylene Chloride Soluble Organics (MSO) pollutant codes.[13]
8. Remove Efs for pollcode 78933 (methyl ethyl ketone) because it is no longer a HAP.
9. Remove Efs for pollcode 123739 (crotonaldehyde) because it is not a HAP.
10. Remove Efs that begin with "<" because these are usually based on minimum detection limits. We chose to ignore emission factors based on minimum detection limits as a conservative approach to not adding emissions where they may not exist.
11. Assign the midpoint of emission factor ranges as new emission factor for the situation in which emission factor is given as a range of values.
12. Multiply the EF for pollcode 1317368 (Lead (II) Oxide) by 0.92832 and rename pollcode to 7439921 (lead). The 0.92832 value is the fraction of lead ion in the total compound.
13. Multiply EF for pollcode 1317346 (Manganese Trioxide) by 0.69599 and rename pollcode to 7439965 (manganese). The 0.69599 value is the fraction of manganese ion in the total compound.
14. Delete PAH, total and PAH/POM-Unspecified factors when the SCC has other specific POM Efs. This affects FactorIDs: 5530, 5859, 8111, 9741, 11611, 11971, 12109, 12176, 12295, 12651, and 22965.
15. Remove all records for which there is a HAP emission factor but no Surrogate CAP factor.
16. Convert HAPs with different EF bases (denominators) as compared to the CAP Efs using the default heat content by fuel type as shown in Table 16 and other physical conversion factors as shown in Table 17.

[13] We have since determined that we could have used either of the MSO or BSO codes, since these two methods for measuring extractable organic matter extract about the same quantity of coke oven pollutant mass.

Table 16: Conversion factors HAP emission factors for HAP augmentation

Fuel	Heat Content
Coal	13,000 BTU/lb or 26 mmBTU/ton
Anthracite coal	12,300 BTU/lb or 24.6 mmBTU/ton
lignite coal	7,200 BTU/lb or 14.4 mmBTU/ton
Residual oil	150,000 BTU/gallon
Distillate oil	140,000 BTU/gallon
Diesel	137,000 BTU/gallon
Kerosene	135,000 BTU/gallon
LPG	94,000 BTU/gallon
Natural gas	1,050 BTU/SCF
Coke Oven gas	590 BTU/SCF
Wood	5,200 BTU/lb
Process Gas	not assigned a default heat content

Table 17: Physical Conversion Factors Used

Conversion	Physical factors used
lb/k-gal	mg/kL×(3.785L/gal)×(2.2046E-6 lb/mg)
lb/ton	g/Mg×(1Mg/1E6g)×(2000 lb/ton) µg/kg×(1kg/1E9µg)×(2000 lb/ton)
lb/1000 barrels	lb/MMBTU×(140 MMBTU/1000 gallons oil)×(42 gallons/barrel)
lb/MMBTU	lb/ton wood×(1 ton/2000lb)×(1lb/5200BTU)×(1E6 BTU/MMBTU)
lb/million cubic feet	ng/J×(1kg/1E12ng)×(2.204lb/kg)×(1.055E9 J/MMBTU)×(1050 MMBTU/million cubic feet NG)

17. Remove all HAP emission factors that cannot be physically converted to the same units as the associated CAP emission factor units. A ratio will not be valid if it is not in the same units.
18. Remove any CAP emission factors that have formulas that cannot be calculated. In practice, this step applied only to one natural gas fired ceramic kiln emission factor with a formula in terms of the sulfur content of the raw material (FactorID 18899).
19. Calculate all CAP emission factors with formulas, using default ash content of 8% and sulfur content of 1.7% for coal (bituminous), 0.24% sulfur content for distillate oil, 1.2% sulfur content for residual oil.
20. Calculate minimum and maximum HAP factors per SCC and pollutant. Delete Factor IDs 12817-12846 because there were 30 different factors, very different in EF, for different processes not distinguishable at the SCC level. Delete Factor IDs 13047-13054 because there were 8 different factors, very different in EF, for different processes not distinguishable at the SCC level.
21. Delete HAP factors with multiple unrated factors for an SCC/pollutant combo that are at least an order of magnitude apart and have no way to be distinguished for accuracy. An unrated factor is one in which the Webfire database Quality field is "U". FactorIDs affected include: 13444-13446, 13441-13443, 13482-13484, 15222-15224, 22936-22937, 13836-13841, 15890-15891, 12864-12865, 24974-24977.
22. Speciate total chromium (pollutant code 7440473) WebFIRE emission factors into hexavalent and trivalent chromium by SCC using the SCC-based speciation factors that were used for developing the "EPA chromium fix overlaps and speciate" dataset (see Section 3.1.3). SCCs without process-specific factors were speciated using the default speciation factor of 34% hexavalent chromium. Where there was an existing WebFIRE

factor for hexavalent or trivalent chromium, the WebFIRE factor took precedence. Afterwards, all total chromium factors are deleted prior to computing HAP emissions.

23. Calculate dimensionless ratios of HAPs to surrogate CAPs for all HAPs.
24. Delete HAP factors with a HAP to CAP EF ratio greater than 1. This was done because it is not plausible to have more metal PM than total PM or more VOC HAPs than total VOC. We did not want to create implausible inconsistencies in the EPA-supplied data.
25. Renormalize HAP to CAP ratios in cases where the SCC-level HAP to CAP ratios exceed 1 (342 ratios affected).

3.1.5.2 Step 2: Add HAP-to-CAP ratios for Hg from boiler and process heaters

We investigated all boiler and process heater SCCs that did not have ratios because they were missing from WebFIRE. We determined that some of these SCCs were similar to other SCCs covered in WebFIRE and thus used the ratios from the similar SCCs. We chose the ratio based on fuel type. If there were multiple WebFIRE SCCs with that fuel type, we chose the lowest ratio. In this step we also removed ratios associated with Hg emissions from natural gas combustion since there is uncertainty in the amount of Hg emitted from this process, and we do not compute Hg emissions from natural gas consumption in the nonpoint data category.

3.1.5.3 Step 3: Emissions Calculations

The following list provides the steps needed to calculate the HAP emissions to be included in the HAP Augmentation dataset.

1. Extract the CAP data for VOC, PM-10FIL and SO2 from a modified version of the 2008 RAS that incorporated PM Augmentation updates (PM augmentation is described in Section 3.1.2). Therefore, VOC and SO2 CAP emissions are always from the S/L/T dataset, but PM10-FIL come from both the S/L/T dataset and from the EPA Augmentation dataset for processes for which S/L/T data have no PM10-FIL and the PM Augmentation dataset included data. The extraction only considered annual CAP emissions and all emissions were converted to pounds.
2. Apply ratios to all surrogate emissions data.
3. Keep only HAP emissions for which there are no HAP emissions of that particular HAP at any process in the facility. The one exception is that we allowed Hg from boilers to be gap filled by the HAP Augmentation dataset at unmatched processes. As part of this step, we considered overlapping pollutant groups. For example, we considered that if any PCB was reported at a facility, then no other PCB's should be allowed. Pollutant groups were created for Chromium, Xylenes (Mixed Isomers), Cresol/Cresylic Acid (Mixed Isomers), Polychlorinated Biphenyls, Polycyclic Organic Matter, Selenium, Cyanide, and Nickel. The one exception to this is that we did not remove Hg from boiler SCCs (other than boilers at the facilities described in Step 7).
4. Exclude HAP emissions that are higher than the maximum emissions level reported by any S/L/T for that pollutant and SCC (to avoid producing HAP emissions through HAP augmentation that are higher than any S/L/T reported value for the SCC/HAP, which could be an outlier). When determining the maximum reported S/L/T value, we excluded the suspect S/L/T data. For hexavalent chromium, we excluded emissions from the final HAP Augmentation dataset if the hexavalent chromium exceeded the maximum S/L/T total chromium multiplied by the default speciation factor of 0.34; for and trivalent chromium, we excluded emissions from the final HAP Augmentation dataset if the trivalent chromium exceeded the maximum S/L/T total chromium multiplied by the default speciation factor of 0.66.

5. Exclude HAP emissions that have no SCC/pollutant match in S/L/T reported data. These were excluded because there was no comparison dataset to determine whether any of these records could be outliers, which is a conservative approach to avoid adding erroneous data.
6. Exclude HAP emissions that were included in other EPA datasets that were higher in hierarchy.
7. Exclude HAP emissions from the HAP augmentation dataset for any sources with "Facility Type" set to "Electricity Generation via Combustion".

3.1.5.4 Step 4: Special QA for Hg

We investigated the SCCs with the greatest Hg emissions in the HAP Augmentation dataset. In particular, we looked at SCCs where national total augmented Hg emissions exceeded 40 pounds and the SCC was not coal burning. As a result of that QA, we adjusted the final HAP Augmentation dataset. The adjustments made were not only for Hg but also for other HAPs since the issues we identified by looking only at Hg were present for other HAPs as well. The following items describe the results of this special QA:

Based on a national SCC-level summary of the HAP augmentation dataset, we found that SCC 30600106 (Industrial Processes; Petroleum Industry; Process Heaters; Process Gas-fired) had the highest augmented Hg emissions of any SCC; in fact, augmented emissions from this SCC was higher than the next highest SCC by a factor of 3. The cause of this outlier was that this SCC had different units of measure for the HAP versus CAP emission factor. The units for the Hg EF are pounds per million BTUs heat input, and the units for the CAP surrogate (PM10-FIL) are pounds per million cubic feet process gas burned. Although this is a process gas SCC, we had chosen to use the natural gas default heat content to convert the HAP Efs to the same units as the surrogate CAP EF. We suspect that the very high HAP/CAP ratios for Hg were a result of the impact of the heat content of process gas being different from the heat content as natural gas. We presumed this issue would not only be Hg-specific but would impact all of the HAPs because all had the same discrepancy in the EF units between HAP and CAP; therefore, we decided to remove all HAP emissions from this SCC from the HAP augmentation dataset. In addition, this QA prompted our investigation of any other process gas SCC that had different units of measure and were converted to the same units based on the heat content of natural gas. We found three additional SCCs where this occurred and removed all HAP emissions from the HAP augmentation dataset from these SCCs as well. The final result of this check was that we excluded all HAP emissions from the HAP Augmentation dataset for any process with the following process gas SCCs: 10200701, 10300701, 30600106, and 30609904.

Also as part of the QA, we found 255 lbs of Hg augmented from 8 processes with SCC= 50100101 (Waste Disp-Govt /Municipal Incineration /Starved Air: Multiple Chamber). This was unexpected because this SCC represents the municipal waste combustion process for which we had already filled in Hg emissions from other EPA datasets and the HAP augmentation approach excludes gap filling for processes covered by other datasets (except for boiler Hg). We discovered that these 8 processes had the incorrect SCC included in EIS by reviewing other descriptive information on the facilities, units and processes. Since the basis of the HAP to CAP ratios is the SCC, we chose not to use any augmented emissions for these 8 processes. We also reviewed EIS emissions processes for SCC 50200501 (Waste Disposal; Solid Waste Disposal – Commercial/Institutional; Incineration: Special Purpose; Med Waste Controlled Air Incin-aka Starved air, 2-stg, or Modular comb). These appeared all to be medical/hospital/infectious waste processes and were missing 2008 Hg emissions that had been present in

previous NEIs (2002,2005). Based on this review, no adjustments were made to the HAP Augmentation dataset for this SCC.

3.1.6 EPA nonpoint data

For the 2008 NEI, the EPA developed emission estimates for many nonpoint sectors in collaboration with a consortium of state and regional planning organizations called the Eastern Regional Technical Advisory Committee (ERTAC, http://www.ertac.us/). This task is referred to by ERTAC as the "Area Source Comparability" project on the ERTAC website, and a subgroup was developed to work on this project. The purpose of the subgroup and project was to agree on methodologies, emission factors, and SCCs for a number of important nonpoint sectors, and then EPA would prepare the emissions estimates for all states using the group's final approaches. During the 2008 NEI inventory development cycle while the S/L/T agencies were submitting emissions data, states could accept the ERTAC estimates or they could go beyond the "default" methodologies and submit further improved data. The ERTAC process is described in Dorn et al. (2010) and a spreadsheet showing the sectors, SCCs, emission factors, and a brief description of the methodologies called "ERTAC_state_comparison.xlsx" (see Section 8 for access information). Below are tables that describe the sectors for which EPA developed emission estimates. Some sectors EPA expects to be entirely in the nonpoint (and not point source) data category, i.e., residential heating. These are listed in Table 18.

Table 18: EPA-estimated emissions sources expected to be exclusively nonpoint

EPA-estimated emissions source description	Supporting data file name (see also Section 8)	EIS Sector Name
Residential Heating; anthracite coal	res_anthra_coal_epa_data.zip	Fuel Comb – Residential – Other
Residential Heating; bituminous coal	res_bit_coal_epa_data.zip	Fuel Comb – Residential – Other
Residential Heating; distillate oil	res_distillate_fuel_rvsd090711.zip	Fuel Comb – Residential – Oil
Residential Heating; natural gas	res_ng_rvsd090711.zip	Fuel Comb – Residential – Natural Gas
Residential Heating; liquefied petroleum gas	res_lpg_rvsd090711.zip	Fuel Comb – Residential – Other
Residential Heating; Fireplaces	res_wood_comb_epa_data.zip	Fuel Comb – Residential – Wood
Residential Heating; Free standing woodstoves	res_wood_comb_epa_data.zip	Fuel Comb – Residential – Wood
Residential Heating; Fireplace Inserts	res_wood_comb_epa_data.zip	Fuel Comb – Residential – Wood
Residential Heating; Pellet Stoves	res_wood_comb_epa_data.zip	Fuel Comb – Residential – Wood
Residential Heating; Indoor Furnaces	res_wood_comb_epa_data.zip	Fuel Comb – Residential – Wood
Residential Heating; Outdoor Hydronic Heaters	res_wood_comb_epa_data.zip	Fuel Comb – Residential – Wood
Residential Heating; Firelog	res_wood_comb_epa_data.zip	Fuel Comb – Residential – Wood

EPA-estimated emissions source description	Supporting data file name (see also Section 8)	EIS Sector Name
Residential Heating; Kerosene	res_kerosene_rvsd090711.zip	Fuel Comb – Residential – Oil
Paved Roads	paved_roads_rvsd090711.zip	Dust – Paved Road Dust
Unpaved Roads	roads_unpaved_epa_data.zip	Dust – Unpaved Road Dust
Commercial Cooking	commercial_cooking_rvsd090711.zip	Commercial Cooking
Dust from Residential Construction	construction_road_res_nonres_rvsd090711.zip	Dust – Construction Dust
Dust from Commercial Institutional	construction_road_res_nonres_rvsd090711.zip	Dust – Construction Dust
Dust from Road Construction	construction_road_res_nonres_rvsd090711.zip	Dust – Construction Dust
Mining and Quarrying	mining_and_quarrying_2008v2.zip	Industrial Processes – Mining
Architectural Coatings	architectural_coatings_epa_data2.zip	Solvent – Non-Industrial Surface Coating
Traffic Markings	traffic_paints_eis_format.zip	Solvent – Industrial Surface Coating & Solvent Use
Consumer & Commercial – All personal care products	consumer_solvents_epa_data.zip	Solvent – Consumer & Commercial Solvent Use
Consumer & Commercial – All household products	consumer_solvents_epa_data.zip	Solvent – Consumer & Commercial Solvent Use
Consumer & Commercial – All coatings and related products	consumer_solvents_epa_data.zip	Solvent – Consumer & Commercial Solvent Use
Consumer & Commercial – All adhesives and sealants	consumer_solvents_epa_data.zip	Solvent – Consumer & Commercial Solvent Use
Consumer & Commercial – All FIFRA related products	consumer_solvents_epa_data.zip	Solvent – Consumer & Commercial Solvent Use
Cutback Asphalt Paving	asphalt_paving_cutback_epa_data.zip	Solvent – Consumer & Commercial Solvent Use
Emulsified Asphalt Paving	asphalt_paving_emulsified_epa_data.zip	Solvent – Consumer & Commercial Solvent Use
Consumer Pesticide Application	pesticides_consumer_epa_data.zip	Solvent – Consumer & Commercial Solvent Use
Commercial Pesticide Application	ag_pesticide_application_2008v2.zip	Solvent – Consumer & Commercial Solvent Use
Residential Portable Gas Cans	portable_fuel_containers_epa_data.zip	Miscellaneous Non-Industrial NEC
Commercial Portable Gas Cans	portable_fuel_containers_epa_data.zip	Miscellaneous Non-Industrial NEC
Aviation Gasoline Stage 1	aviation_gasoline_distribution_stage1_ epa_data.zip	Gas Stations
Aviation Gasoline Stage 2	av_gas_distrib_stage2_rsvd090711.zip	Gas Stations
Open Burning – Leaves	ob_leaf_brush_rvsd090711.zip	Waste Disposal
Open Burning – Brush	ob_leaf_brush_rvsd090711.zip	Waste Disposal
Open Burning – Residential Household Waste	ob_msw_doc_rvsd090711.zip	Waste Disposal

EPA-estimated emissions source description	Supporting data file name (see also Section 8)	EIS Sector Name
Open Burning – Land Clearing Debris	ob_land_clearing_debris_rvsd090711.zip	Waste Disposal
Publicly Owned Treatment Works	potw_epa_data.zip	Waste Disposal
Agricultural Tilling	ag_tilling_2008v2.zip	Agriculture – Crops & Livestock Dust
Fertilizer Application	fertilizer_application_epa_data.zip	Agriculture – Fertilizer Application
Animal Husbandry	animal_husbandry_epa_data.zip	Agriculture – Livestock Waste
Human Cremation	human_cremation_2810060100_emissions.zip	Miscellaneous Non-Industrial NEC

There are other sectors for which EPA expects that may overlap with the point source. In other words, some sources will be submitted as point sources and some sources are submitted as nonpoint, i.e., fuel combustion at commercial or institutional facilities. In these cases, EPA did not attempt to estimate the nonpoint emissions because these could cause double-counting with the state-supplied point sources. Rather, EPA required S/L/T agencies to prevent double-counting of emissions themselves. So, if a S/L/T agency submitted point sources, they were to also submit nonpoint emissions for which the emissions were reduced to account for the portion submitted as point sources. Table 19 lists these emissions sources.

Table 19: Emissions sources not estimated by EPA with potential nonpoint and point contribution

EPA-estimated emissions source description	Supporting data file name (see also Section 8)	EIS Sector Name
Industrial Fuel Combustion	fuel_comb_ici_epa_data.zip	Fuel Comb – Industrial Boilers, ICEs – All Fuels
Commercial/Institutional Fuel Combustion	fuel_comb_ici_epa_data.zip	Fuel Comb – Comm/Institutional – All Fuels
Industrial Surface Coating – Auto Refinishing	auto_refinishing_epa_data.zip	Solvent – Industrial Surface Coating & Solvent Use
Industrial Surface Coating – Factory Finished Wood	factory_epa_data.zip	Solvent – Industrial Surface Coating & Solvent Use
Industrial Surface Coating – Wood Furniture	wood_furniture_epa_data.zip	Solvent – Industrial Surface Coating & Solvent Use
Industrial Surface Coating – Metal Furniture	metal_furniture_epa_data.zip	Solvent – Industrial Surface Coating & Solvent Use
Industrial Surface Coating – Paper Foil and Film	paper_film_foil_epa_data.zip	Solvent – Industrial Surface Coating & Solvent Use
Industrial Surface Coating – Metal Can Coating	metal_cans_epa_data.zip	Solvent – Industrial Surface Coating & Solvent Use
Industrial Surface Coating – Sheet Strip and Coil	sheet_strip_coil_epa_data.zip	Solvent – Industrial Surface Coating & Solvent Use
Industrial Surface Coating – Machinery and Equipment	machinery_epa_data.zip	Solvent – Industrial Surface Coating & Solvent Use
Industrial Surface Coating – Large Appliances	large_appliance_epa_data2.zip	Solvent – Industrial Surface Coating & Solvent Use

EPA-estimated emissions source description	Supporting data file name (see also Section 8)	EIS Sector Name
Industrial Surface Coating – Electronic and other Electric Coatings	electronic_epa_data.zip	Solvent – Industrial Surface Coating & Solvent Use
Industrial Surface Coating – Motor Vehicles	motorvehicles_epa_data.zip	Solvent – Industrial Surface Coating & Solvent Use
Industrial Surface Coating – Aircraft	aircraft_epa_data.zip	Solvent – Industrial Surface Coating & Solvent Use
Industrial Surface Coating – Marine	marine_epa_data.zip	Solvent – Industrial Surface Coating & Solvent Use
Industrial Surface Coating – Railroad	railroads_epa_data.zip	Solvent – Industrial Surface Coating & Solvent Use
Industrial Surface Coating – Miscellaneous Manufacturing	misc_manufacturing_epa_data.zip	Solvent – Industrial Surface Coating & Solvent Use
Industrial Maintenance Coatings	56ndus_maintenance_epa_data.zip	Solvent – Industrial Surface Coating & Solvent Use
Other Special Purpose Coatings	other_special_epa_data.zip	Solvent – Industrial Surface Coating & Solvent Use
Degreasing	degreasing_epa_data.zip	Solvent – Degreasing
Graphic Arts	graphic_arts_epa_data.zip	Solvent – Graphic Arts
Dry Cleaning	dry_cleaning_epa_data.zip	Solvent – Dry Cleaning
Gasoline Distribution – Stage 1 Bulk Plants	gas_distrib_stage_1_bulk_plants_epa_data.zip	Bulk Gasoline Terminals
Gasoline Distribution – Stage 1 Bulk Terminals	gas_distrib_stage_1_bulk_terminals_epa_data.zip	Bulk Gasoline Terminals
Gasoline Distribution – Stage 1 Pipelines	gas_distrib_stage_1_pipelines_epa_data.zip	Industrial Processes – Storage and Transfer
Gasoline Distribution – Stage 1 Service Station Unloading	gas_distrib_serv_station_unloading_epa_data.zip	Gas Stations
Gasoline Distribution – Stage 1 Underground Storage Tanks	gas_distrib_stage_1_ust_breathing_and_ emptying_epa_data2.zip	Gas Stations
Gasoline Distribution – Stage 1 Trucks In Transit	gas_distrib_stage_1_tank_trucks_in_transit_ epa_format.zip	Industrial Processes – Storage and Transfer
Gasoline Distribution – Stage 2 Refueling at Pump	gas_distrib_stage2_epa_data.zip	Gas Stations

As part of the quality assurance, EPA examined whether some of these categories had VOC but not HAP VOC. Since many of these sectors are known and important emitters of HAP VOC, when VOC is provided without HAP VOC this is a clear case of missing emissions. For example, EIS sectors such as "Solvent - Consumer & Commercial Solvent Use" and "Solvent - Degreasing" are major emitters of HAP VOCs that are included in Table 19. Since we did not augment these sectors, the HAP VOC is missing in the released NEI data as well. To estimate the extent of the missing HAP VOC, we calculated ratios of HAP VOC to VOC for each SCC associated with these categories using data supplied by the states that did submit HAP VOC for those SCCs. We then applied those ratios by SCC to the VOC emissions from states and SCCs without associated HAP VOC. We

estimated that about 189,900 tons of HAP VOC are clearly missing from the inventory. We believe this to be a conservative estimate because it does not account for missing glycol ethers, missing PAH/POM or situations where states submitted only some of the VOC HAPs but not all of them. Note that this calculation of HAP VOC was made using a chemical definition of HAP VOC and not a regulatory definition, so that chemicals such as Tetrachloroethylene (a,k.a. PERC) that are not listed as VOCs for regulatory purposes were included in the mass estimate of missing emissions.

Table **20** below illustrates the breakout by EIS sector of the calculated missing HAP VOC. The largest estimated sources of missing HAP VOC are in the EIS sectors for consumer and commercial solvent use and industrial surface coating and solvent use, making up 68% of the total estimated missing HAP VOC.

Table 20: Solvent sectors nonpoint HAP-VOC and calculated missing HAP-VOC

EIS Sector	2008 NEI HAP-VOC	Missing HAP-VOC	Total
Solvent - Consumer & Commercial Solvent Use	172,443	78,151	250,594
Solvent - Degreasing	24,430	28,587	53,017
Solvent - Dry Cleaning	2,901	16,394	19,294
Solvent - Graphic Arts	18,032	13,606	31,638
Solvent - Industrial Surface Coating & Solvent Use	46,835	51,395	98,230
Solvent - Non-Industrial Surface Coating	58,929	1,793	60,721
Total	**323,569**	**189,926**	**513,495**

For a few emissions sources listed in Table 21, EPA did not create new 2008 estimates. Rather than have missing emissions where S/L/T agencies did not submit the data, EPA included data from past inventories. Where S/L/T agencies did submit emissions, these data are included rather than this fallback data. The 1999 NEI documentation referenced in the table is available at ftp://ftp.epa.gov/EmisInventory/finalnei99ver3/haps/documentation/nonpoint/nonpt99ver3_aug2003.pdf and the 2002 NEI documentation referenced in the table is available at ftp://ftp.epa.gov/EmisInventory/2002finalnei/documentation/nonpoint/2002nei_final_nonpoint_documentation0206version.pdf.

Table 21: Emissions sources using data from former EPA inventories

Emissions source	EIS Sector Name	Reference
Dental Preparation and Use	Miscellaneous Non-Industrial NEC	Documentation for the 1999 Base Year Nonpoint area source National Emission Inventory for HAPs, page A-30
General Laboratory Activities	Miscellaneous Non-Industrial NEC	Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and HAPs, page A-106
Lamp (fluorescent) Recycling	Miscellaneous Non-Industrial NEC	Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and HAPs, page A-109
Lamp (fluorescent) Breakage at Landfills	Miscellaneous Non-Industrial NEC	Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and HAPs, page A-107

Finally, there are some emissions sources for which we did not compute 2008 emissions nor use old inventories to fill in where states did not provide estimates. These sources are listed in Table 22 below. If a state within the NEI data does not include emissions for these emissions sources, then either that state does not have such sources or the state did not send EPA these emissions. The file "matrix_submittals for Version 2 Feb 13 2011.xlsx" has a list of submitting agencies and for what nonpoint sectors they submitted data (see Section 8.2 for access information).

Table 22: Emissions sources not included from EPA data sources

Emissions source	EIS Sector Name
Cotton Ginning	Agriculture – Crops
Grain Elevators	Agriculture – Crops & Livestock Dust
Commercial/Institutional Wood Combustion	Fuel Comb – Comm/Institutional – Biomass
Industrial Wood Combustion	Fuel Comb – Industrial Boilers, ICEs – Biomass
Oil and Gas Production	Industrial Processes – Oil & Gas Production
Animal Cremation	Miscellaneous Non-Industrial NEC
Drum and Barrel Reclamation	Miscellaneous Non-Industrial NEC
Hospital Sterilization	Miscellaneous Non-Industrial NEC
Structure Fires	Miscellaneous Non-Industrial NEC
Swimming Pools	Miscellaneous Non-Industrial NEC
Open Burning – Scrap Tires	Waste Disposal

Of this list, oil and gas production is the most significant source of emissions. EPA recommends that users of the NEI look to alternative data sources to fill in emissions from this emissions source, which was in a high growth pattern during calendar year 2008. For future inventories, EPA is developing a default method to ensure the oil and gas sector has emissions in future NEIs for all states that have this activity.

3.1.7 Additional Gap filling efforts targeted at high risk and specific mercury categories

EPA performed a targeted review with the help of S/L/T data submitters for facilities that had been identified as high risk in the 2005 NATA and for facilities in specific mercury source categories. The "high risk" facilities for our analysis were those that contributed greater than 100 in a million for cancer risk or produced a noncancer hazard index greater than 5 in the 2005 NATA. We provided to S/L/T agencies a "high risk" spreadsheet showing facility-level emissions of the risk driver pollutant(s) for these facilities. We excluded coke oven facilities from this list because they were covered under a separate review process. As part of the review spreadsheet, we included the emissions values from 2005NATA, 2008 TRI and 2008 S/L/T emissions (or blanks when not provided). Of the approximately 440 facilities included in the list, approximately 190 had 2008 S/L/T agency-submitted data for the risk driver pollutant. Where there were no S/L/T agency data, 140 had 2008 TRI data. We requested that the S/L/T agencies review the emissions, provide feedback, and provide data or their preferred approaches for gap filling where there was missing S/L/T values. We also requested that the S/L/T agencies provide the EIS process ID codes to allow us to assign any TRI facility-level emissions to the EIS/NEI processes. As a result of the review, we added additional data to the NEI through the datasets described in Table 8 by the following dataset short names: "2008TRI", "2008EPA_OTHER", and "2008EPA_05NATA_GAPFL". In some situations, states added emission or revised their own data through EIS, and so these revisions are reflected in the S/L/T datasets in EIS.

For the mercury review, we provided a review package for the following categories: Portland cement manufacturing, gold mining, electric arc furnaces, hazardous waste incineration, chemical manufacturing, mercury cell-chloralkali plants, municipal waste combustors, iron and steel foundries, and integrated iron and steel. In addition to 2005 NATA and 2008 TRI emissions values, we also included rule data that were available from the OAQPS rule developed. Unlike the high risk package, we only included facilities for which mercury emissions were missing from the 2008 S/L/T data or for which the S/L/T data were very different from TRI or the 2005 NATA. Similar to the high risk review, the mercury review resulted in the added emission data for the following datasets: "2008TRI", "2008EPA_OTHER", and "2008EPA_05NATA_GAPFL", as well as S/L/T agencies revising the data they provided EPA in EIS.

In most cases, the S/L/T agencies did not provide the allocation method to gap fill the facility emissions to the appropriate processes. As a result, we used our best judgment to do that, and some examples are as follows. For cement, we allocated all metal HAPs to the cement kilns. For electric arc furnaces, we allocated them to the melt shop or furnace. For a number of high risk facilities, it was not obvious how to allocate the emissions, so EPA used the S/L/T agency-reported CAP emissions (similar to the automated TRI approach) to allocate the HAPs to the processes. The allocation method is provided in the emissions comment field in the EIS results.

The review package results can be found in three separate spreadsheets (see Section 8.1 for access information): high_risk_nata2005_poll_forSLT_reviewed.xlsx (high risk), Hg_EAF_forSLT_reviewed.xlsx (EAF Hg), and HgFacilities_for_SLT_reviewed.xlsx (Hg other than EAFs).

In some cases, there was insufficient information to determine how to gap fill the emissions or whether the facility even operated in 2008. Those facilities are listed in Table 23 (for Hg) and Table 24 (for high risk). These facilities remain without emissions of Hg or the HAP risk driver pollutant in this version of the inventory.

Table 23: Hg-emitting Facilities in the S/L/T agency review process with insufficient information to gap fill

EIS FIPS	EIS State	EIS Facility ID	Category	EIS Facility Name	EIS company name	EIS Address	EIS City	NATA 2005 Hg (lbs) – facility total	NATA data source(s) | Year:
42101	PA	4950811	Hazardous Waste Incineration	Sunoco Chemicals (Former Allied Signal)	Na	4700 Bermuda Street	Philadelphia	5.569941	P | 2005
13245	GA	554311	Hazardous Waste Incineration	DSM Chemicals North America, Inc.	Na	1 Columbia Nitrogen Road	Augusta	2.257605	BOI-AUG | 2005, P | 2005
22019	LA	6425811	Hazardous Waste Incineration	Olin Corporation Lake Charles Plant	Olin Corporation	900-960 Interstate 10 West	Westlake	3.140196	P | 2005
49045	UT	7199411	Hazardous Waste Incineration	Tooele Army Depot	Tooele Army Depot	Environmental Management Division	Tooele	2.48208	BOI-AUG | 2005, P | 2005
22011	LA	7226211	Hazardous Waste Incineration	MeadWestvaco South Carolina LLC – Specialty Chemicals Division	MeadWestvaco South Carolina LLC	400 Crosby Rd	De Ridder	15.39388	P | 2005

EIS FIPS	EIS State	EIS Facility ID	Category	EIS Facility Name	EIS company name	EIS Address	EIS City	NATA 2005 Hg (lbs) – facility total	NATA data source(s) | Year:
22073	LA	7226711	Hazardous Waste Incineration	Angus Chemical Co	Angus Chemical Co	350 Hwy 2	Sterlington	1.023719	P | 2005
22005	LA	8465311	Hazardous Waste Incineration	Rubicon LLC – Geismar Plant	Rubicon LLC	9156 Hwy 75	Geismar	1.726265	P | 2005, S | 2005
22005	LA	8465611	Hazardous Waste Incineration	BASF Corp – Geismar Site	BASF Corp	8404 River Rd (Hwy 75)	Geismar	1.298019	P | 2005
***NATA data source code: T=TRI, S=State, L=Local, P is EPA data from rule development, BOI-AUG is boiler augmentation**									

Table 24: High Risk Facilities in the S/L/T agency review process with insufficient information to gap fill

EIS FIPS	EIS State	EIS Facility ID	EIS Facility Name	EIS Company Name	EIS Address	EIS City	High risk HAP	NATA Emissions (2005NATA) (lbs) – facility total	NATA data source(s) | Year*:
01047	AL	10553911	RENOSOL SEATING L.L.C		6 MEADOWCRAFT PKWY	SELMA	2,4-TOLUENE DIISOCYANATE	311.63	T | 2005
01015	AL	10569811	INDUSTRIAL PLATING CO. INC.		1300 CLYDESDALE AVE	ANNISTON	CHROMIUM (VI) COMPOUNDS	10	T | 2005
12031		4358511	APAC- SOUTHEAST, INC.	NA			ARSENIC COMPOUNDS	52.208	N | 2002
21093	KY	5345511	THE GATES CORP	NA	300 COLLEGE ST RD	ELIZABETHTOWN	2-CHLOROACETOPHENONE	437.184	N | 2002
22101	LA	5061311	COTE BLANCHE ISLAND TANK BATTERY #1	SWIFT ENERGY OPERATING LLC	10 MI E	CYPREMORT PT	BENZENE	14877.58	R | 2002, R | 2005
22005	LA	5985911	SCI FABRICATION SHOP	NA	36445 OLD PERKINS RD.	PRAIRIEVILLE	CHROMIUM (VI) COMPOUNDS	149	N | 2002
22017	LA	6116511	CADDO MANUFACTURING LLC	VIVIAN INDUSTRIAL PLASTICS INC	680 S PARDUE	VIVIAN	METHYLENE DIPHENYL DIISOCYANATE	4285	N | 2002, S | 2005
25025	MA	3959411	FEDERAL METAL FINISH	FEDERAL METAL FINISHING INC	18 DORRANCE ST	BOSTON	CHROMIC ACID (VI)	400	S | 2005
25025	MA	3959411	FEDERAL METAL FINISH	FEDERAL METAL FINISHING INC	18 DORRANCE ST	BOSTON	CHROMIC ACID (VI)	400	S | 2005
25025	MA	3959411	FEDERAL METAL FINISH	FEDERAL METAL FINISHING INC	18 DORRANCE ST	BOSTON	CHROMIC ACID (VI)	400	S | 2005
25025	MA	3959411	FEDERAL METAL FINISH	FEDERAL METAL FINISHING INC	18 DORRANCE ST	BOSTON	CHROMIC ACID (VI)	400	S | 2005
25013	MA	5922911	SUDDEKOR LLC	NA	240 BOWLES RD	AGAWAM	CHROMIUM (VI) COMPOUNDS	146	N | 2002
28035	MS	7071711	MISSISSIPPI TANK AND MANUFACTURING COMPANY	AI006151	3000 WEST SEVENTH STREET	HATTIESBURG	4,4'-METHYLENEDIANILINE	280	N | 2002
36103	NY	8535611	WEST BABYLON LANDFILL	NA	125 GLEAM ST	BABYLON	ACRYLONITRILE	1328.491	N | 1999
39155	OH	7330911	UNITED REFRACTORIES	NA	1929	WARREN	CHROMIUM (VI)	169	N | 2002

EIS FIPS	EIS State	EIS Facility ID	EIS Facility Name	EIS Company Name	EIS Address	EIS City	High risk HAP	NATA Emissions (2005NATA) (lbs) – facility total	NATA data source(s) | Year*:
			INC		LARCHMONT AVE.		COMPOUNDS		
39035	OH	7749211	A-BRITE PLATING CO	NA	3000 W. 121 ST.	CLEVELAND	CHROMIUM (VI) COMPOUNDS	255	T | 2005
39035	OH	7783011	ALCON INDS INC	NA	7990 BAKER AVE.	CLEVELAND	CHROMIUM (VI) COMPOUNDS	250	N | 2002
39035	OH	7783011	ALCON INDS INC	NA	7990 BAKER AVE.	CLEVELAND	NICKEL COMPOUNDS	250	N | 2002
39049	OH	7788911	CRANE PERFORMANCE SIDING L L C NORTH		1550 UNIVERSAL RD.	COLUMBUS	CHROMIUM (VI) COMPOUNDS	74.3	T | 2005
39169	OH	8425611	PREMIUM BUILDING PRODS CO	NA	13985 CONGRESS RD.	WEST SALEM	CHROMIUM (VI) COMPOUNDS	255	T | 2005
42029	PA	2983211	TEMTCO STEEL – PENNSYLVANIA DIV	NA	41 S. SECOND AVE.	PHOENIXVILLE	CHROMIUM (VI) COMPOUNDS	1574	T | 2005
42133	PA	3002111	ESAB GROUP INC	NA	801 WILSON AVENUE	HANOVER	CHROMIUM (VI) COMPOUNDS	250	T | 2005
42133	PA	3002811	PRECISION COMPONENTS CORP	NA	500 LINCOLN ST.	YORK	CHROMIUM (VI) COMPOUNDS	250	N | 2002
42071	PA	3059311	M H EBY INC	NA	1194 MAIN ST.	BLUE BALL	CHROMIUM (VI) COMPOUNDS	250	N | 2002
42095	PA	3744911	CHRIN BROS SANI LDFL/CHRIN LDFL	IESI PA BETHLEHEM LDFL CORP	635 INDUSTRIAL DR	EASTON	CADMIUM COMPOUNDS	691.8	N | 2002
42049	PA	3767111	STERIS CORP	NA	2424 W. 23RD ST.	ERIE	CHROMIUM (VI) COMPOUNDS	87	T | 2005
42091	PA	3848711	TUBE METHODS INC/BRIDGEPORT	GLOBAL PKG INC	RAMBO & DEPOT ST	BRIDGEPORT	TRICHLOROETHYLENE	33940	S | 2005
42121	PA	3893311	JOY TECH INC PLANT #1	NA	325 BUFFALO ST.	FRANKLIN	LEAD COMPOUNDS	1447	T | 2005
42013	PA	4701911	SKF USA INC ALTOONA PLANT	NA	1000 LOGAN BLVD.	ALTOONA	CHROMIUM (VI) COMPOUNDS	250	N | 2002
42081	PA	4952411	LYCOMING ENGINES/OLIVER ST PLT	TEXTRON LYCOMING	652 OLIVER ST	WILLIAMS PORT	CHROMIUM (VI) COMPOUNDS	304.8642	BOI-AUG | 2005, R | 2002, R | 2006
42041	PA	6464711	AMES TRUE TEMPER INC	NA	465 RAILROAD AVE.	CAMP HILL	NICKEL COMPOUNDS	500	N | 2002
42011	PA	7888811	SFS INTEC/WYOMISSING	SFS INTEC INC	SPRING ST & VAN REED RD	WYOMISSING	CHROMIUM (VI) COMPOUNDS	2480	N | 2002
42027	PA	7889111	GRAYMONT PA INC/PLEASANT GAP & BELLEFONTE PLTS	GRAYMONT PA INC	N THOMAS ST	BELLEFONTE	MANGANESE COMPOUNDS	1389.6002	BOI-AUG | 2005, S | 2005
42007	PA	8520511	TEGRANT DIVERSIFIED BRANDS INC/NEW BRIGHTON FAC	EATON CORP	BLOCKHOUSE RUN RD	NEW BRIGHTON	CHROMIUM (VI) COMPOUNDS	500	T | 2005
42007	PA	8520511	TEGRANT DIVERSIFIED BRANDS INC/NEW BRIGHTON FAC	EATON CORP	BLOCKHOUSE RUN RD	NEW BRIGHTON	MANGANESE COMPOUNDS	500	T | 2005
45045	SC	3965911	STEVENS AVIATION:DONALDSON PARK	NA	600 DELAWARE ST, DONALDSON RD	GREENVILLE	STRONTIUM CHROMATE	1061.464	R | 2006, R | 2002

***NATA data source code: T=TRI, S=State, L=Local, R,P is EPA data from rule development, BOI-AUG is boiler augmentation**

3.2 Agriculture – Crops & Livestock Dust

[Placeholder. See also Section 3.1 and Appendix B]

3.3 Agriculture – Fertilizer Application

[Placeholder. See also Section 3.1 and Appendix B]

3.4 Agriculture – Livestock Waste

3.4.1 Sector Description

Livestock refers to domesticated animals intentionally reared for the production of food, fiber, or other goods or for the use of their labor. The definition of livestock in this category includes beef cattle, dairy cattle, ducks, geese, goats, horses, poultry, sheep, and swine.

3.4.2 Sources of data overview and selection hierarchy

The agricultural livestock waste sector includes data from four components: 2 EPA overwrite datasets, the S/L/T agency submitted data, and the default EPA generated livestock emissions.

The agencies listed in Table 25 submitted emissions for this sector.

Table 25: Agencies that Submitted Livestock Waste Data

Agency	Type
Chattanooga Air Pollution Control Bureau	Local
Maricopa County Air Quality Department	Local
Arizona Department of Environmental Quality	State
California Air Resources Board	State
Delaware Deparment of Natural Resources and Environmental Control	State
Hawaii Department of Health Clean Air Branch	State
Idaho Department of Environmental Quality	State
Illinois Environmental Protection Agency	State
Kansas Department of Health and Environment	State
Louisiana Department of Environmental Quality	State
Maine Department of Environmental Protection	State
Maryland Department of the Environment	State
New Jersey Department of Environment Protection	State
North Carolina Department of Environment and Natural Resources	State
Ohio Environmental Protection Agency	State
Tennessee Department of Environmental Conservation	State
Utah Division of Air Quality	State
Kootenai Tribe of Idaho	Tribal
Little River Band of Ottawa Indians, Michigan	Tribal
Nez Perce Tribe of Idaho	Tribal
Omaha Tribe of Nebraska	Tribal
Prairie Band Potawatomi Nation	Tribal
Sac & Fox Nation of Missouri in Kansas and Nebraska	Tribal
Shoshone-Bannock Tribes of the Fort Hall Reservation of Idaho	Tribal

Agency	Type
Washoe Tribe of California and Nevada	Tribal

Table 26 shows the selection hierarchy for the agricultural livestock waste sector.

Table 26: 2008 NEI agricultural livestock data selection hierarchy

Priority	Dataset Name	Dataset Content
1	EPA Overwrite Point v1.5	Overwrites NH3 data from this sector in California to replace with the EPA dataset (see also Section 3.4.5)
2	EPA PM Augmentation, V2	Augments small amounts of PM emissions in Colorado, Texas, and Wisconsin
3	State/Local/Tribal Data	Agency submitted emissions
4	EIAG all in NP	EPA-generated data, including livestock waste emissions (see Section 3.4.4)

3.4.3 Spatial coverage and data sources for the sector

[Placeholder for maps of CAP and HAP emissions]

3.4.4 EPA-developed livestock waste emissions data

EPA's approach to calculating emissions for this sector consisted of four general steps, as follows:

- Determine county-level activity data, i.e., the population of animals for 2007 (see Section 3.4.4.1).
- For beef, dairy, poultry, and swine, apportion animal populations to a manure management train (MMT) for each county (see Section 3.4.4.2). Animal populations for ducks, geese, goats, horses, and sheep were not apportioned to MMTs.
- Modify the emission factor files provided with the Carnegie Mellon University (CMU) Ammonia Model v. 3.6 (Davidson et al., 2004) to ensure that every county had an assigned emission factor (see Section 3.4.4.3).
- Use the CMU Ammonia Model v. 3.6 to calculate ammonia emissions based on the updated county-level animal populations and emission factors (see Sections 3.4.4.4 and 3.4.4.5).

For this source category, EPA computed emissions for the SCCs listed in Table 27. S/L/T submitted other SCCs in some cases.

Table 27: Source Classification Codes used in the agricultural livestock sector

SCC	SCC Description, level 3	SCC Descriptions, level 4
2805001100	Beef cattle - finishing operations on feedlots (drylots)	Confinement
2805001200	Beef cattle - finishing operations on feedlots (drylots)	Manure handling and storage
2805001300	Beef cattle - finishing operations on feedlots (drylots)	Land application of manure
2805002000	Beef cattle production composite	Not Elsewhere Classified
2805003100	Beef cattle - finishing operations on pasture/range	Confinement
2805007100	Poultry production – layers with dry manure management systems	Confinement
2805007300	Poultry production – layers with dry manure management systems	Land application of manure

SCC	SCC Description, level 3	SCC Descriptions, level 4
2805008100	Poultry production – layers with wet manure management systems	Confinement
2805008200	Poultry production – layers with wet manure management systems	Manure handling and storage
2805008300	Poultry production – layers with wet manure management systems	Land application of manure
2805009100	Poultry production – broilers	Confinement
2805009200	Poultry production – broilers	Manure handling and storage
2805009300	Poultry production – broilers	Land application of manure
2805010100	Poultry production – turkeys	Confinement
2805010200	Poultry production – turkeys	Manure handling and storage
2805010300	Poultry production – turkeys	Land application of manure
2805018000	Dairy cattle composite	Not Elsewhere Classified
2805019100	Dairy cattle – flush dairy	Confinement
2805019200	Dairy cattle – flush dairy	Manure handling and storage
2805019300	Dairy cattle – flush dairy	Land application of manure
2805021100	Dairy cattle – scrape dairy	Confinement
2805021200	Dairy cattle – scrape dairy	Manure handling and storage
2805021300	Dairy cattle – scrape dairy	Land application of manure
2805022100	Dairy cattle – deep pit dairy	Confinement
2805022200	Dairy cattle – deep pit dairy	Manure handling and storage
2805022300	Dairy cattle – deep pit dairy	Land application of manure
2805023100	Dairy cattle – drylot/pasture dairy	Confinement
2805023200	Dairy cattle – drylot/pasture dairy	Manure handling and storage
2805023300	Dairy cattle – drylot/pasture dairy	Land application of manure
2805025000	Swine production composite	Not Elsewhere Classified (see also 28-05-039, -047, -053)
2805030000	Poultry Waste Emissions	Not Elsewhere Classified (see also 28-05-007, -008, -009)
2805030007	Poultry Waste Emissions	Ducks
2805030008	Poultry Waste Emissions	Geese
2805035000	Horses and Ponies Waste Emissions	Not Elsewhere Classified
2805039100	Swine production – operations with lagoons (unspecified animal age)	Confinement
2805039200	Swine production – operations with lagoons (unspecified animal age)	Manure handling and storage
2805039300	Swine production – operations with lagoons (unspecified animal age)	Land application of manure
2805040000	Sheep and Lambs Waste Emissions	Total
2805045000	Goats Waste Emissions	Not Elsewhere Classified
2805047100	Swine production – deep-pit house operations (unspecified animal age)	Confinement
2805047300	Swine production – deep-pit house operations (unspecified animal age)	Land application of manure
2805053100	Swine production – outdoor operations (unspecified animal age)	Confinement

3.4.4.1 Activity Data

County-level animal population numbers for 2007 were obtained from the U.S. Department of Agriculture's 2007 Census of Agriculture report (http://www.agcensus.usda.gov/ accessed April 30, 2009). 2007 data were used because they were the most recent available at the time these estimates were prepared. For Virginia, the county-level census data includes animal populations from Virginia's 39 independent cities. For some counties

and states, census data were withheld to avoid disclosing data for individual farms. However, the total national-level animal numbers and most state-level animal numbers for each livestock type reported in the Census include those animal numbers not disclosed at the county-level. When available, state-level animal numbers from the United States Department of Agriculture (USDA) National Agriculture Statistical Service (NASS) online database (http://www.nass.usda.gov/Data_and_Statistics/Quick_Stats/, accessed 28 January 2010) were used for states with undisclosed animal numbers in the 2007 Census of Agriculture. To determine the total number of undisclosed animals, we summed and subtracted disclosed county-level animal numbers for each livestock type from the total state animal numbers. The total undisclosed animal population for a specific livestock type was then allocated to those counties reporting undisclosed data proportionally based on the number of farms raising that livestock in each county. If the state-level data were undisclosed and not available in the NASS database, then national animal numbers were used to determine undisclosed state numbers in a manner similar to the case where counties had undisclosed data. We then summed and subtracted the disclosed county-level data from the state-level data to determine animal numbers not disclosed at the county-level. We then allocated the difference to those counties with undisclosed data proportionally based on the number of farms raising that livestock in each county. States that had undisclosed data at the state level are as follows: for broilers, Massachusetts and Rhode Island; for layers, Arizona, Connecticut, Delaware, Idaho, Kansas, Maine and New Mexico; for turkeys, Colorado and Oklahoma; for pullets, Arizona, Connecticut, Delaware, Hawaii, Idaho, Kansas, Massachusetts, New Mexico, North Dakota, and South Dakota; and for ducks, New Jersey and Utah.

3.4.4.2 Apportion activity data to manure management trains

To run the model using 2007 animal population, it was necessary to match the 2007 animal information to the CMU model's (v3.6) input files, which were based on 2002 animal population and MMTs. We apportioned the 2007 county-level animal population data to MMTs based on data available in the model. A MMT consists of an animal confinement area (e.g., drylot, pasture, flush, scrape); components used to store, process, or stabilize the manure (e.g., anaerobic lagoons, deep pits); and a land application site where manure is used as a fertilizer source (US EPA, 2005). It is important to apportion the animal populations to MMTs because it has a large impact on the emissions estimates in the CMU model for the animals using that approach. Not all animals types were apportioned to MMTs. MMTs for ducks, geese, goats, horses, and sheep are not a part of the model. Also, some animal category names did not match the category names currently in the model. See the example of "Other Cattle" described below.

The apportionment was based on county-level MMT percentages derived from the CMU Ammonia Model v3.6, which was originally developed for a 2002 inventory year. For each livestock type, we divided the CMU Model's 2002 county-level number of animals in each MMT by the total county-level animal population for that livestock type to calculate the percentage of total animals managed by each MMT. In cases where the county-level numbers were zero in the CMU Ammonia Model and the county animal population in 2007 for that MMT was not zero, we assigned the county state-level MMT percentages. We then multiplied the county-level animal population for each livestock type by the MMT percentages to apportion the 2007 animal populations to each MMT. The result of this approach is that the proportion of animals in each MMT is unchanged from the CMU model's 2002-based approach to the 2008 NEI.

Cattle reported as "Other Cattle" in the 2007 Census of Agriculture were divided between dairy cattle and beef cattle at the county-level using percent allocations derived from county-level dairy and beef cattle reported in the 2007 Census of Agriculture and corrected for undisclosed data. The animal numbers from "Other Cattle"

apportioned to dairy and beef cattle were used to grow the "Dairy Cattle – Composite and Beef Cattle – Composite" activity input files from 2002 to 2007 for input to the CMU Ammonia Model.

County-level pullet numbers reported in the 2007 Census of Agriculture were used to grow the "Poultry – Composite" activity input file from 2002 to 2007 for input to the CMU Ammonia Model.

3.4.4.3 Emission Factors

Table 28 provides information on emission factors used in the EPA emissions estimate. The table lists "county" for county-specific emission factors, and "state" for state-specific emission factors. The emission factor for the poultry composite categories was obtained from an EPA report (US EPA, 2005). The county-level emission factors for the beef composite and dairy composite categories were developed using beef and dairy cattle emission factors provided with the CMU Model. Specifically, weighted average emission factors were calculated based on the number of beef or dairy cattle in each MMT from the CMU Model's 2002 activity files and the emission factor assigned to each MMT. The calculations made for the beef composite are available in the file "County-Level Emission Factors for Beef Composite.xls", and the calculations for the dairy composite are available in the file "County-level Emission factors for Diary Component.xls" (see Section 8.1 for access information, specifically the ReadMe.doc file listed in the ag_livestock_waste folder of Table 64). All other emission factors are consistent with those included in the CMU Ammonia Model v.3.6.

The emission factors for some counties in the CMU Ammonia Model files were zero. To ensure that all counties with animal populations were assigned emissions factors, the emission factor input files provided with the CMU Ammonia Model were modified. For all counties with an emission factor of zero, the emission factor was replaced with the state average emission factor. If all counties in the state had emission factors of zero, then the county emission factor was replaced with the national average emission factor.

The state average emission factor was calculated by summing the counties with non-zero emission factors in the state and dividing the total by the number of counties in that state with non-zero emission factors. The national average emission factors listed in the table were calculated by summing the counties with non-zero emission factors in the nation and dividing the total by the number of counties in the nation with non-zero emission factors. The final county-specific and state-specific emission factors are available in the file "Emission Factors for Ag animal husbandry 2008v2.xlsx" (see Section 8.1 for access information, specifically the ReadMe.doc file listed in the ag_livestock_waste folder of Table 64).

Table 28: Emission Factors for NH3 emissions used for EPA's agricultural livestock data

Description	Emission Factor	Emission Factor Unit	Emission Factor Reference (see footnotes)
Beef Cattle – Composite	county	kg NH_3/cow/month	2
Beef Cattle – Drylot Operation – Confinement	9.45E-01	kg NH_3/cow/month	1
Beef Cattle – Drylot Operation – Land Application	state	kg NH_3/cow/month	1
Beef Cattle – Drylot Operation – Manure Storage	3.78E-04	kg NH_3/cow/month	1
Beef Cattle – Pasture Operation – Confinement	county	kg NH_3/cow/month	1
Dairy Cattle – Composite	county	kg NH_3/cow/month	2
Dairy Cattle – Deep Pit Dairy Confinement	2.42E+00	kg NH_3/cow/month	1
Dairy Cattle – Deep Pit Dairy Land Application	state	kg NH_3/cow/month	1
Dairy Cattle – Deep Pit Dairy Manure Storage	1.13E-01	kg NH_3/cow/month	1
Dairy Cattle – Drylot Dairy Confinement	state	kg NH_3/cow/month	1
Dairy Cattle – Drylot Dairy Land Application	state	kg NH_3/cow/month	1

Description	Emission Factor	Emission Factor Unit	Emission Factor Reference (see footnotes)
Dairy Cattle – Drylot Dairy Manure Storage	state	kg NH_3/cow/month	1
Dairy Cattle – Flush Dairy Confinement	2.00E+00	kg NH_3/cow/month	1
Dairy Cattle – Flush Dairy Land Application	state	kg NH_3/cow/month	1
Dairy Cattle – Flush Dairy Manure Storage	state	kg NH_3/cow/month	1
Dairy Cattle – Scrape Dairy Confinement	state	kg NH_3/cow/month	1
Dairy Cattle – Scrape Dairy Land Application	state	kg NH_3/cow/month	1
Dairy Cattle – Scrape Dairy Manure Storage	state	kg NH_3/cow/month	1
Ducks	7.67E-02	kg NH_3/duck/month	1
Geese	7.67E-02	kg NH_3/goose/month	1
Goats	5.29E-01	kg NH_3/goat/month	1
Horses	1.02E+00	kg NH_3/horse/month	1
Poultry – Broiler Operation – Confinement	8.32E-03	kg NH_3/bird/month	1
Poultry – Broiler Operation – Land Application	6.80E-03	kg NH_3/bird/month	1
Poultry – Broiler Operation – Manure Storage	1.51E-03	kg NH_3/bird/month	1
Poultry – Composite	2.00E-02	kg NH_3/bird/month	3
Poultry – Layers – Dry Manure Operation – Confinement	3.36E-02	kg NH_3/bird/month	1
Poultry – Layers – Dry Manure Operation – Land Application	county	kg NH_3/bird/month	1
Poultry – Layers – Wet Manure Operation – Confinement	9.45E-03	kg NH_3/bird/month	1
Poultry – Layers – Wet Manure Operation – Land Application	county	kg NH_3/bird/month	1
Poultry – Layers – Wet Manure Operation – Manure Storage	county	kg NH_3/bird/month	1
Poultry – Turkey Operation – Confinement	3.78E-02	kg NH_3/bird/month	1
Poultry – Turkey Operation – Land Application	3.40E-02	kg NH_3/bird/month	1
Poultry – Turkey Operation – Storage	6.80E-03	kg NH_3/bird/month	1
Sheep	2.65E-01	kg NH_3/sheep/month	1
Swine – Composite	county	kg NH_3/pig/month	1
Swine – Deep Pit Operation – Confinement	2.65E-01	kg NH_3/pig/month	1
Swine – Deep Pit Operation – Land Application	county	kg NH_3/pig/month	1
Swine – Lagoon Operation – Confinement	2.27E-01	kg NH_3/pig/month	1
Swine – Lagoon Operation – Land Application	county	kg NH_3/pig/month	1
Swine – Lagoon Operation – Manure Storage	county	kg NH_3/pig/month	1
Swine – Outdoor Operation – Confinement	county	kg NH_3/pig/month	1

[1] Davidson, et al., 2004

[2] Dorn, 2009

[3] US EPA, 2005

3.4.4.4 Emissions

The livestock activity files provided with the CMU Ammonia Model v.3.6 were replaced with the updated county-level animal population files (Sections 3.4.4.1 and 3.4.4.2) and modified emission factors files. We then ran the CMU Ammonia Model v.3.6 to create county/SCC ammonia emissions. EPA's county-level emissions can be found in the supporting materials in the file "animal_husbandry_epa_data.zip" as listed in Table 18, Section 3.1.6. See also Section 8.1 for data access information.

3.4.4.5 Sample Calculations

Allocation of Undisclosed Data

From the 2007 Census of Agriculture, the total national number of beef cattle in Alabama is 678,949. The total number of beef cattle disclosed at the county-level is 388,827.

Total number of beef cattle undisclosed at the county-level = 678,949 – 338,827 = 340,122

From the 2007 Census of Agriculture, the total number of farms in Alabama not disclosing beef cattle numbers is 10,518.

Average beef cattle per farm not disclosing data = 340,122 / 10,518 = 32.3

For 2007, Baldwin County, Alabama beef cattle data were not disclosed. The total number of farms with beef cattle in Baldwin County is 343.

Estimated number of beef cattle in Baldwin County = 32.3 x 343 = 11,092

Manure Management Train

From the 2002 CMU Ammonia Model input files, Chilton County, Alabama had 79 beef cattle under drylot management and 18,900 beef cattle under pasture management in 2002.

Total beef cattle = 79 + 18,900 = 18,979

% of beef cattle under drylot management = 79 / 18,979 = 0.42

% of beef cattle under pasture management = 18,900 / 18,979 = 99.58

The total number of beef cattle for Chilton County reported in the 2007 Census of Agriculture is 7,939.

Number of beef cattle under drylot management in 2007 = 7,939 x 0.0042 = 33

Number of beef cattle under pasture management in 2007 = 7,939 x 0.9958 = 7,906

"Other Cattle"

For Clay County, Alabama, the 2007 Census of Agriculture reports the number of "Other Cattle" as 5,471, the number of dairy cattle as 216, and the number of beef cattle as 9,096.

Total beef and dairy cattle reported = 216 + 9,096 = 9,312

% of other cattle assigned to beef cattle = (9,096/9,312)*100 = 97.68

% of other cattle assigned to dairy cattle = (216/9,312)*100 = 2.32

Other cattle allocated to beef cattle = 5,471 x .9768 = 5,344

Other cattle allocated to dairy cattle = 5,471 x 0.0232 = 127

3.4.5 Summary of quality assurance methods

The EPA data for 2008 and 2005 were compared to the state-submitted data at the state-SCC level and in the case of local county agencies, at the county-SCC level. Findings are below.

- For Idaho, Illinois, Utah, Kansas, and Maricopa County, double-counting of EPA and state data occurred. This was corrected by removing the EPA data, thus allowing only agency data to be selected.

- California data were significantly higher than EPA's and all at one SCC. The state wanted to submit updated emissions but due to timing issues, was unable to accomplish. EPA chose to block the state data from being selected and therefore the EPA data were selected. CA agreed with this approach.
- North Carolina data were about 1/12 of the EPA data. Confirmed with NC staff that their submittal looked more like monthly data than annual. NC resubmitted correct annual data for 2008 NEI, version 2.

3.5 Bulk Gasoline Terminals

[Placeholder. See also Section 3.1 and Appendix B]

3.6 Commercial Cooking

[Placeholder. See also Section 3.1 and Appendix B]

3.7 Dust – Construction Dust

[Placeholder. See also Section 3.1 and Appendix B]

3.8 Dust – Paved Road Dust

[Placeholder. See also Section 3.1 and Appendix B]

3.9 Dust – Unpaved Road Dust

[Placeholder. See also Section 3.1 and Appendix B]

3.10 Fuel Combustion – Electric Generation

This section includes the description of five EIS sectors:

- Fuel Comb – Electric Generation – Coal
- Fuel Comb – Electric Generation – Oil
- Fuel Comb – Electric Generation – Natural Gas
- Fuel Comb – Electric Generation – Biomass
- Fuel Comb – Electric Generation – Other

They are treated here in a single section because the methods used are the same across all sectors.

3.10.1 Sector Description

These five sectors are defined by the point source SCCs beginning with 1-01 and 2-01. There are no nonpoint contributions to this sector. These SCCs include boilers, combustion gas turbines, combined cycle units, and reciprocating engines firing any type of fuel for the purpose of turning a generator connected to the electrical grid. The primary fuels used by the boilers are coal and natural gas. A much smaller number of oil and wood-fired boilers are also included in the oil and natural gas sectors. Various waste or by-products such as municipal waste, bagasse, petroleum coke, and tires are also used in some boilers. The primary fuel used by the combustion gas turbines and combined cycle units is natural gas, although some distillate oil is also used. The reciprocating engines are generally much smaller in terms of generating capacity and also much less efficient than either the boilers and steam turbines or the combustion gas turbines. The engines are primarily fired by natural gas or diesel oil, but there are some which use various available waste gases, such as landfill gas.

The SCC-based EIS sector definitions will cause a different universe of units to be included in these sectors than would other definitions of EGUs. For example, the EIS sector definitions do not include a heat input or generator

output size threshold. In contrast, some EPA regulatory applications define EGUs to include only units with capacity greater than 25 MW. Many of the engines and some of the combustion gas turbines in the EIS sectors for EGUs are well below 25 MW generating capacity. The boilers and steam turbine-generators, and particularly those fired on coal, are almost always greater than 25 MW capacity, except for some older units.

The use of SCCs in the NEI by S/L/T agencies impacts the units included in these EIS sectors. There are some boilers and gas turbines in industrial facilities which cogenerate both electricity for distribution to the public power grid and process steam for their internal use. Some S/L/T agencies reporting to the NEI use an SCC (1-01 or 2-01) that would include these units in one of the EGU sectors, while others use an Industrial (1-02 or 2-02) or a Commercial/Institutional (1-03 or 2-03) SCC. This can result in boilers or gas turbines not connected to the public power grid being included in these EGU sectors, with the SCC assigned based upon either strictly their large size (some EPA references to utility boilers have cited them as greater than 100 mmBTU/Hr heat input) or because they may generate electrical power for internal consumption.

3.10.2 Sources of data overview and selection hierarchy

The EGU sectors includes data from three EPA overwrite datasets, emissions based on data from the MATS rule development, the S/L/T agency submitted data, and four other EPA generated datasets that impact this sector.

The agencies listed in Table 29 submitted emissions for these sectors. A box with a “X” means that the agency submitted data for EGU units included in that EGU fuel group for the individual EIS Sectors.

Table 29: Agencies that Submitted EGU data

Agency	Type	Coal	Oil	Natural Gas	Biomass	Other
Alabama Department of Environmental Management	State	X	X	X	X	X
Alaska Department of Environmental Conservation	State	X	X	X		X
Allegheny County Health Department	Local	X	X	X	X	
Arizona Department of Environmental Quality	State	X	X	X	X	X
Arkansas Department of Environmental Quality	State	X	X	X	X	X
California Air Resources Board	State	X	X	X	X	X
Chattanooga Air Pollution Control Bureau	Local		X	X		
City of Albuquerque	Local		X	X		X
Clark County Department of Air Quality and Environmental Management	Local		X	X		
Colorado Department of Public Health and Environment	State	X	X	X		X
Connecticut Department Of Environmental Protection	State		X	X		X
DC Department of Health Air Quality Division	State		X			
Delaware Deparment of Natural Resources and Environmental Control	State	X	X	X		X
Florida Department of Environmental Protection	State	X	X	X	X	X
Forsyth County Environmental Affairs Department	Local		X			X
Georgia Department of Natural Resources	State	X	X	X	X	X
Hawaii Department of Health Clean Air Branch	State	X	X			X
Illinois Environmental Protection Agency	State	X	X	X	X	X
Indiana Department of Environmental Management	State	X	X	X		X
Iowa Department of Natural Resources	State	X	X	X	X	X
Jefferson County (AL) Department of Health	Local	X	X	X		
Kansas Department of Health and Environment	State	X	X	X		X
Kentucky Division for Air Quality	State	X	X	X	X	X
Lincoln/Lancaster County Health Department	Local	X				
Louisiana Department of Environmental Quality	State	X	X	X		X
Louisville Metro Air Pollution Control District	Local	X	X	X		
Maine Department of Environmental Protection	State		X	X	X	X
Maryland Department of the Environment	State	X	X	X		X
Massachusetts Department of Environmental Protection	State	X	X	X	X	X
Mecklenburg County Air Quality	Local		X			
Memphis and Shelby County Health Department – Pollution Control	Local	X	X	X		X
Metro Public Health of Nashville/Davidson County	Local		X	X		X
Michigan Department of Environmental Quality	State	X	X	X	X	X
Minnesota Pollution Control Agency	State	X	X	X	X	X
Mississippi Dept of Environmental Quality	State	X	X	X		
Missouri Department of Natural Resources	State	X	X	X	X	X
Montana Department of Environmental Quality	State	X	X	X		X
Navajo Nation	Tribal	X				

Agency	Type	Coal	Oil	Natural Gas	Biomass	Other
Nebraska Environmental Quality	State	X	X	X	X	X
Nevada Division of Environmental Protection	State	X	X	X		X
New Hampshire Department of Environmental Services	State	X	X	X	X	X
New Jersey Department of Environment Protection	State	X	X	X		X
New Mexico Environment Department Air Quality Bureau	State	X	X	X		
New York State Department of Environmental Conservation	State	X	X	X	X	X
North Carolina Department of Environment and Natural Resources	State	X	X	X	X	X
North Dakota Department of Health	State	X	X	X		
Ohio Environmental Protection Agency	State	X	X	X	X	X
Oklahoma Department of Environmental Quality	State	X	X	X		X
Olympic Region Clean Air Agency	Local		X	X		
Omaha Air Quality Control Division	Local	X				
Oregon Department of Environmental Quality	State	X	X	X	X	X
Pennsylvania Department of Environmental Protection	State	X	X	X	X	X
Philadelphia Air Management Services	Local	X	X	X		X
Pinal County	Local	X		X		
Puget Sound Clean Air Agency	Local		X	X		X
Rhode Island Department of Environmental Management	State		X	X		X
South Carolina Department of Health and Environmental Control	State	X	X	X	X	X
Southern Ute Indian Tribe	Tribal			X		X
Tennessee Department of Environmental Conservation	State	X	X	X	X	X
Texas Commission on Environmental Quality	State	X	X	X		X
Utah Division of Air Quality	State	X	X	X		
Vermont Department of Environmental Conservation	State		X			
Virginia Department of Environmental Quality	State	X	X	X	X	X
Washington State Department of Ecology	State	X	X	X	X	X
Washoe County Health District	Local		X			X
West Virginia Division of Air Quality	State	X	X	X	X	X
Western North Carolina Regional Air Quality Agency (Buncombe Co.)	Local	X	X	X		
Wisconsin Department of Natural Resources	State	X	X	X	X	X
Wyoming Department of Environmenal Quality	State	X	X	X		X

Table 30 shows the selection hierarchy for the EGU sectors. A box with a “X” means that the dataset contributed to the EGU sector for that fuel group.

Table 30: 2008 NEI EGU data selection hierarchy by EGU fuel groups from EIS Sectors

Priority	Dataset Name	Dataset Contents and Impact	Coal	Oil	Natural Gas	Biomass	Other
1	EPA Overwrite Point v1.5	Overwrites PM emissions from Pennsylvania. See also Table 8 and Appendix C.	X	X	X		
2	EPA PM Augmentation, V2	Augments PM data in 47 states and some tribes (see Section 3.1.2)	X	X	X	X	X
3	EPA Chromium Split v2	Splits total chromium into speciated chromium in 37 states (see Section 3.1.3)	X	X	X	X	X
4	2008 MATS-based EGU emissions (2008EPA_MATS)	Overwrites Hg, other metals, and acid gases to use data from the MATS rule in 49 states and some tribes (see Section 3.10.5)	X	X	X	X	X
5	State/Local/Tribal Data	Agency submitted emissions	X	X	X	X	X
6	EPA EGU v1.5	Augments CAP and HAP emissions in 46 states and some tribes (see Section 3.10.5).	X	X	X	X	X
7	2008 EPA Rule Data from OAQPS/SPPD	Adds Hg: 2 lbs in California, 130 lbs in Indiana, and 22 lbs in Missouri	X				X
8	EPA NV Gold Mines	Adds 41 lbs of Hg in Nevada		X			
9	EPA TRI Augmentation v2	Adds Pb and other HAP emissions in 26 states (see Section 3.1.4)	X	X	X	X	X
10	EPA HAP Augmentation v2	Adds Pb and other HAP emissions in 46 states (see Section 3.1.5)	X	X	X	X	X

3.10.3 Spatial coverage and data sources for the sector

[Placeholder for maps of CAP and HAP emissions]

3.10.4 Overwrite datasets used for EGUs

The three overwrite datasets listed in Table 30 include the main overwrite dataset "EPA Overwrite Point v1.5" used to eliminate problematic or conflicting records from the agency submissions, the "EPA PM Augmentation, V2" previously described in Section 3.1.2, and the "EPA Chromium Split v2", previously described in Section 3.1.3. Of these datasets, the first has very little impact, simply overwriting some erroneous Pennsylvania PM records. The chromium split only splits the mass of emissions provided by states rather than add mass, however, this split is important for uses of the inventory that estimate toxics risk, since the hexavalent portion of the chromium drives the risk.

The PM Augmentation dataset has the most impact on this sector, contributing 36% of the total PM10 mass and 40% of the total PM2.5 to these sectors. Table 31 provides the emissions contribution from all S/L/T agencies and from the EPA PM augmentation data for each of the EIS sectors associated with EGUs.

Table 31: Agency-submitted, PM Augmentation, and total PM10 and PM2.5 emissions for EGU sectors (short tons/year)

EIS Sector	PM10 Agency (tons)	PM10 Aug (tons)	PM10 Total (tons)	PM2.5 Agency (tons)	PM2.5 Aug (tons)	PM2.5 Total (tons)
Fuel Comb – Electric Generation – Biomass	1,244	546	1,789	429	1,041	1,469
Fuel Comb – Electric Generation – Coal	239,619	130,111	369,730	170,720	104,943	275,662
Fuel Comb – Electric Generation – Natural Gas	11,950	9,481	21,431	10,464	9,758	20,222
Fuel Comb – Electric Generation – Oil	4,983	6,312	11,295	4,033	5,416	9,449
Fuel Comb – Electric Generation – Other	1,379	1,106	2,485	890	1,046	1,935
Total	**259,174**	**147,556**	**406,730**	**186,534**	**122,203**	**308,738**

3.10.5 EPA-developed EGU emissions data

In addition to the S/L/T-reported data, EPA developed two separate emissions datasets specifically for EGUs. The first EPA dataset developed (EPA EGU v1.5 in EIS) made use of the hourly SO2 and NOx continuous emissions monitoring (CEM) data and hourly heat input values reported by facilities to EPA's Clean Air Market Division (CAMD). The annual sum of the reported heat input values for 2008 were used to estimate emissions for a set of CAP and HAP pollutants (dependent upon unit type and primary fuel), and the annual SO2 and NOx sums were used directly, for a set of 1984 emission units at 751 different facilities. These units included coal-fired boilers (74 pollutants, including the SO2 and NOx), oil-fired boilers (41 pollutants), gas-fired boilers (39 pollutants), gas-fired simple turbines and combined cycle units (18 pollutants), and petroleum coke-fired boilers (73 pollutants).

In some applications, the NEI is compared against future-year emissions estimated by the IPM model. This model predicts SO2, NOX, Hg, and HCl as part of its primary functions and uses emission factors for these pollutants that reflect the future-year controls associated with the individual units. Other pollutants such as VOC, PM2.5, PM10, and metal HAPs are estimated using IPM post-processing. The emission factors used for the EPA EGU v1.5 dataset were consistent with the factors used by the IPM post-processing. However, for many of the EGU units for HAPs (including Hg and HCl), the dataset based on MATS (described below) supersedes this dataset. The starting point for the EPA EGU v1.5 dataset from CAMD is "CAMD08annualallprg_103009.txt", and it is available with the other supporting materials (see Section 8.1 for access information). More information on the approach used is available in Rothschild (2010).

In the 2008 NEI v2 selection hierarchy, the EPA EGU v1.5 dataset was used after any S/L/T-reported emissions for these emission units, except for one State and one local agency. For Connecticut, the State-reported values for SO2 and NOx were noted to be significantly lower than the CEM values available from the original CAMD data and therefore lower than the EPA EGU v1.5 dataset. For Douglas County, Nebraska, the emissions had been reported by the local agency as single facility-wide totals for each facility, rather than the individual unit emissions available in the CEM and heat input derived dataset. For these two locations only, the S/L data were selected after the EPA EGU v1.5 dataset.

The second EPA EGU emissions dataset (2008EPA_MATS in EIS) was developed after v1.5 of the 2008 NEI had been released. This dataset was for a smaller subset of units than covered by the first dataset, and for only a portion of the HAPs, with no CAPs except for Pb. The emission units included in the 2008EPA_MATS dataset were those electric utility coal and oil-fired units greater than 25 MW expected to be regulated by the MATS rule finalized by EPA in December 2011. This included 1194 emission units at 491 facilities. The set of pollutants estimated in this dataset included hydrochloric and hydrofluoric acid gases and hydrogen cyanide, and twelve metal HAPs: antimony, arsenic, beryllium, cadmium, trivalent chromium, hexavalent chromium, cobalt, lead, manganese, mercury, nickel, and selenium.

The 2008 heat input data used for the MATS-based data were related to the MATS non-Hg case studies and the "current base" inventory development effort described in Houyoux and Strum (2011). The preferred source of unit-level annual heat input data were CAMD unit-level annual heat input data for 2008, which we downloaded from the CAMD website for all units that report these data. The units associated with the MATS non-Hg case studies that do not report to CAMD or were missing heat input for 2008 were contacted directly to obtain actual unit-specific annual heat input data. These plants included: Spruance Genco (ORIS 54081) Units 1, 2, 3, and 4 (2002 only); Wabash River (ORIS 1010) Unit PG7221FA; and HECO Waiau (ORIS 766) Units 3, 4, 5, 6, 7, and 8.

For the remaining non-CAMD, non-case study units, annual heat inputs had to be estimated. For many of these units, the MATS ICR data had obtained the unit-specific maximum hourly heat input capacity and the actual unit-specific three-year (2007-2009) average capacity factor. These unit-specific data were used in conjunction with nationwide trends from the CAMD units to estimate annual unit-level heat inputs for 2008. The specific methodology and an example calculation are available in the tab "Att_1_ICR_Data" of "2_Attachments_1_and_2_HTIP_Calcs.xls" (see Section 8.1 for access information). For some units, only the unit-specific maximum hourly heat input rating was available (no average capacity factor was available). The 2008 unit-level heat input was estimating using the maximum hourly heat input in conjunction with an assumed capacity factor of 1.0 and nationwide trends from the CAMD units. The specific methodology and an example calculation are provided the tab "Attach_2_No_Data" of the spreadsheet just listed.

Annual 2008 heat input values (as well as 2002-2010 values developed for MATS) for the final list of affected units (boilers) are available through the MATS supporting materials in the "2-Heat_Inputs" tab of the MATS emission inventory workbook (http://www.epa.gov/ttn/atw/utility/mats_final_current_base_hap_inven.xlsx).

The emission factors used were those unit-specific and updated average emission factors that had been developed to support the MATS rule (Houyoux et al., 2011). Because these factors were believed to be much more up-to-date and more reliable than what EPA had previously made available for S/L/T use, the 2008EPA_MATS emissions dataset was used ahead of S/L/T-reported values for these fifteen pollutants, with one area of exception. For mercury, there are some units that were already required by State or local regulations to monitor their emissions using mercury CEMs by 2008. Where EPA could determine that the S/L/T-reported mercury emissions were based on such CEMs or 2008-specific test data, EPA removed the emission factor based values from the 2008EPA_MATS dataset to allow the S/L/T-reported CEM values to be selected for the 2008 NEI.

In summary, the 2008 NEI v2 for EGUs is comprised of largely S/L/T-reported data for the CAPs and any HAPs that the S/L/T agencies reported other than the fifteen MATS-estimated pollutants. For those fifteen MATS-estimated pollutants, the 2008 NEI v2 is comprised largely of the EPA estimates, except S/L/T agency data were

used for mercury where it was believed to be based upon use of a CEM or unit-specific test. Other HAPs for the MATS-regulated units, and all HAPs for units not part of MATS, include S/L/T agency emissions values where they were reported (with PM and Chromium augmentation, if needed), or include the EPA EGU v1.5 emissions where no S/L/T agency emissions were reported. Appendix B provides a table summarizing the data sources used in the EGU sectors.

For both of the EPA-created datasets, the emissions were estimated at the unit level, because that is the level at which the CAMD heat input activity data are available. EPA assumed for both of the EPA datasets that all heat input came from the primary fuel, and the emission factors used reflected only that primary fuel. The resultant unit-level estimates had to be loaded into EIS at the process-level to meet the EIS requirement that emissions can only be associated with the most detailed (process) level, which includes fuel used. For the EGU sectors, the unit level represents the boiler or gas turbine unit as a whole, while the process level represents the individual fuels burned within the units. The EPA emissions were therefore loaded into EIS at the single process for the primary fuel that was used by the responsible S/L/T agency for reporting their emissions.

As part of our approach, we needed to match the EGU units from the EPA datasets to the process IDs used by the responsible agencies to ensure that the EIS selection software used only one emissions estimate for a process-pollutant combination, rather than one estimate from each data supplier. Using data at a process-pollutant from more than one data supplier would double-count emissions. Because the EPA EGU v1.5 dataset was only to be used where no S/L/T agency estimate was available for a given pollutant, it was only necessary to report the EPA estimate to any one of potentially multiple process IDs reported by the responsible agency for a unit and pollutant, as long as that process was likely one which would contain at least some of the responsible agency's estimate for the pollutant. If that primary process contained any portion of the responsible agency's reported emissions for a pollutant, the EPA estimate would not be selected. But because the 2008EPA_MATS estimates were to be chosen ahead of the responsible agency values, it was necessary to ensure that the MATS dataset would prevent all process IDs that were reported for a given unit from being selected. For this reason, in cases where the responsible agency reported a unit's emissions using two different coal processes and a small oil process, the MATS dataset contain one matching process ID with the actual EPA estimates for the entire unit, plus two other matching process IDs with zero emissions values for the fifteen pollutants. This approach prevented double counting. The approach for matching EIS units with the MATS data is documented in Johnson and Bullock (2012).

The matching of the EPA emissions sets to the responsible agency facility, unit and process IDs was done largely by using the Office of Regulatory Information Systems (ORIS) plant and CAMD boiler IDs as found in the original CAMD dataset described in the first paragraph of this section, and matching these to the same two IDs as had been previously stored in EIS. We also compared the facility names and counties for agreement, and we made manual revisions to the codes in EIS wherever discrepancies were noted. As a final confirmation that the correct emissions unit and a reasonable process ID in EIS had been matched to the EPA data, the magnitudes of the SO2 and NOx emissions for all preliminary matches were compared between the S/L/T agency-reported datasets and the EPA datasets. We identified and resolved several discrepancies from this emissions comparison.

EPA performed these ID matching confirmation step on the 2008 NEI v1 data and an EPA EGU v1 dataset, and we repeated the step using the 2008 NEI v1.5 data. Because a few S/L/T agencies had added new data or revised the unit or process IDs prior to creating the v1.5 data, an EPA EGU v1.5 dataset had to be created for the revised process ID matches. Several v1 matches were removed from the v1.5 dataset due to the uncertainty of

some of the matches for some of the smaller emitting units. If the responsible S/L/T agency did not report some emissions for some of these non-matched units and processes, no EPA estimates were available in the EPA EGU v1.5 dataset for gap filling. Finally, the comparison and discrepancy review process was repeated for the 2008EPA_MATS dataset prior to finalizing the 2008 NEI v2.

3.10.6 Alternative facility and unit IDs needed for matching with other databases

The 2008 NEI v2 data contains two sets of alternate unit identifiers related to the ORIS plant and CAMD boiler IDs (as found in the CAMD heat input activity dataset) for export to the SMOKE modeling file. The first set is stored in EIS with a Program System Code (PSC) of "EPACAMD". The alternate unit IDs are stored as a concatenation of the ORIS Plant ID and CAMD boiler ID with "CAMDUNIT" between the two IDs. These IDs are exported to the SMOKE file in the fields named ORIS_FACILITY_CODE and ORIS_BOILER_ID. These two fields are used by the SMOKE processing software to replace the annual NEI emissions values with the appropriate hourly CEM values at model run time. The second set of alternate unit IDs are stored in EIS with a PSC of "EPAIPM" and are exported to the SMOKE file as a field named "IPM_YN". The SMOKE processing software uses this field to determine if the unit is one that will have future year projections provided by the IPM model.

The storage format of these alternate unit IDs, in both EIS and in the exported SMOKE file, replicates the IDs as found in the NEEDS database used as input to the IPM model. The NEEDS IDs are a concatenation of the ORIS plant ID and the CAMD boiler ID, with either a "_B_" or a "_G_" between the two IDs, indicating "Boiler" or "Generator". Note that the ORIS Plant IDs and CAMD boiler IDs as stored in the CAMDBS dataset and in the NEEDS database are almost always the same, but that there are occasional differences for the same unit.

The "EPACAMD" alternate unit IDs available in EIS are believed to be a complete set of all those that can safely be used for the purpose of substituting hourly CEM values during SMOKE processing. The "EPAIPM" alternate unit IDs in EIS are not a complete listing of all the NEEDS/IPM units, although most of the larger emitters, including all of the EPACAMD CEM units, do have an EPAIPM alternate unit ID. The NEEDS database includes a larger set of smaller, non-CEM units.

3.10.7 Summary of quality assurance methods

A detailed description of the quality assurance steps used for creating the two EPA EGU emissions datasets can be found in Rothschild (2010) and for the matching of MATS data to EIS units in Johnson and Bullock (2012). The S/L/T agency-reported data were subject to the same overall emissions outlier analysis that was performed on the S/L/T point source emissions datasets as a whole. That outlier analysis included an initial comparison of the process-level reported emissions values to the established EIS warning level thresholds specified by SCC and pollutant. The individual values above the threshold were sorted for each of 30 key pollutants and the largest values were reviewed to identify any unusual patterns such as all of the largest values being from the same reporting agency or the largest two or three values being significantly larger than the subsequent values. As a second comparison, facility-level sums for each of the key pollutants were compared to each other in a similar fashion, and were also compared to the largest facility totals seen in the Toxics Release Inventory reports for 2008, by pollutant and by facility type. We identified and provided questionable emissions values for S/L/T agency review. All such flagged values for EGUs were either revised or confirmed as accurate by the responsible S/L/T agency.

3.11 Fuel Combustion – Industrial Boilers

This section includes the description of five EIS sectors:

- Fuel Comb - Industrial Boilers, ICEs - Coal
- Fuel Comb - Industrial Boilers, ICEs – Oil
- Fuel Comb - Industrial Boilers, ICEs - Natural Gas
- Fuel Comb - Industrial Boilers, ICEs – Biomass
- Fuel Comb - Industrial Boilers, ICEs – Other

They are treated here in a single section because the methods used are the same across all sectors.

3.11.1 Sector Description

These five sectors are defined by the point source SCCs beginning with 1-02, 2-02 and 2-040 and the nonpoint SCCs 2102 and 280152. These SCCs include boilers, internal combustion engines (ICE), including reciprocating and turbines, space heaters and orchard heaters firing any type of fuel. The primary fuels used by the boilers are coal, oil and natural gas. Other fuels used by industrial boilers include biomass, waste products and process gases. The primary fuels used by the ICE are natural gas and oil, but there are some which use various available process gases and liquified petroleum gas (LPG).

The SCC-based EIS sector definitions will cause a different universe of units to be included in these sectors than would other definitions of boilers, turbines or reciprocating internal combustion engines. For example, the Industrial/Commercial/Institutional Boilers and Process Heaters MACT include 25 MW and smaller boilers used to generate electricity; these boilers are not included in the sectors described here because they have SCCs beginning with 1-01. Thus the EIS sector definition would put these units, which are considered industrial boilers for the purpose of the MACT, in the Fuel Combustion – Electric Generation sector described in 3.10. In addition, while CO Boilers are in this sector, they are not included in the Industrial/Commercial/Institutional Boilers and Process Heaters MACT category.

Also as described above in 3.10 the use of SCCs in the NEI by S/L/T agencies impacts the units included in these EIS sectors. There are some boilers and gas turbines in industrial facilities which cogenerate electricity for distribution to the public power grid and process steam for their internal use. Some S/L/T agencies reporting to the NEI use an SCC (1-01 or 2-01) that would include these units in one of the EGU sectors, while others use an Industrial (1-02 or 2-02) or a Commercial/Institutional (1-03 or 2-03) SCC. This can result in boilers or gas turbines not connected to the public power grid being included in these EGU sectors and not the Industrial sectors.

In addition to the potential of ambiguity in assigning SCCs to industrial boiler units that may be used to generate electricity, there is also mis-assignment where the wrong SCC is applied to clearly defined units. For this reason, when looking at individual units, other description fields may be useful in accurately categorizing the unit.

3.11.2 Sources of data overview and selection hierarchy

The industrial fuel combustion sectors include data from S/L/T and 12 EPA datasets that cover both point and nonpoint datacategories. Table 32 shows the agencies that submitted data in each of the data categories for each of the fuel combustion – industrial boilers and ICE sectors. Where only 0 emissions were submitted (sum across all pollutants submitted), these are shown as zeroes in the table.

Table 32: Agencies that submitted data for the Fuel Combustion - Industrial Boilers, ICEs Sectors

		Nonpoint					Point				
Agenchy	Type	Bio-mass	Coal	Nat Gas	Oil	Other	Bio-mass	Coal	Nat Gas	Oil	Other
Alabama Department of Environmental Management	S		0	0	X	0	X	X	X	X	X
Alaska Department of Environmental Conservation	S			X	X			X	X	X	X
Allegheny County Health Department	L							X	X	X	X
Arizona Department of Environmental Quality	S		X	X	X	X		X	X	X	X
Arkansas Department of Environmental Quality	S						X	X	X	X	X
California Air Resources Board	S			X	X	X	X	X	X	X	X
Chattanooga Air Pollution Control Bureau (CHCAPCB)	L	0	0	X	X	X		X	X	X	
City of Albuquerque	L	X	0		X	X			X	X	X
Clark County Department of Air Quality and Environmental Management	L		X	0	X	X			X	X	X
Colorado Department of Public Health and Environment	S						X	X	X	X	X
Confederated Tribes of the Colville Reservation, Washington	T						X			X	
Connecticut Department Of Environmental Protection	S								X	X	X
DC Department of Health Air Quality Division	S		0	0	X	X			X	X	
Delaware Deparment of Natural Resources and Environmental Control	S		0	X	X	X		X	X	X	X
Eastern Band of Cherokee Indians	T				X						
Florida Department of Environmental Protection	S						X	X	X	X	X
Fond du Lac Band of the Minnesota Chippewa Tribe	T								X		
Forsyth County Environmental Affairs Department	L						X	X	X	X	X
Georgia Department of Natural Resources	S						X	X	X	X	X
Hawaii Department of Health Clean Air Branch	S		0	X	X	X				X	X
Idaho Department of Environmental Quality	S	0	0	X	X	X	X	X	X	X	X
Illinois Environmental Protection Agency	S	0	0	X	X	0	X	X	X	X	X
Indiana Department of Environmental Management	S			X	X	X	X	X	X	X	X
Iowa Department of Natural Resources	S						X	X	X	X	X
Jefferson County (AL) Department of Health	L							X	X	X	X
Kansas Department of Health and Environment	S		0	X	X	X		X	X	X	X
Kentucky Division for Air Quality	S						X	X	X	X	X
Kootenai Tribe of Idaho	T	0	0	X	X	X					
Lane Regional Air Pollution Authority	L						X		X	X	X
Leech Lake Band of Ojibwe Reservation	T								X		
Lincoln/Lancaster County Health Department	L							X	X		
Louisiana Department of Environmental Quality	S		X	X	X	X	X	X	X	X	X
Louisville Metro Air Pollution Control District	L			0			X	X	X	X	X
Maine Department of Environmental Protection	S						X	X	X	X	X
Maricopa County Air Quality Department	L			X	X				X	X	X
Maryland Department of the Environment	S							X	X	X	X
Massachusetts Department of Environmental Protection	S	X	0	X	X	X	X	X	X	X	X
Mecklenburg County Air Quality	L							X	X	X	X
Memphis and Shelby County Health Department - Pollution Control	L								X	X	X
Metro Public Health of Nashville/Davidson County	L						0	X	X	X	X
Michigan Department of Environmental Quality	S		X	X	X	X	X	X	X	X	X
Minnesota Pollution Control Agency	S	X	X	X	X	X	X	X	X	X	X
Mississippi Dept of Environmental Quality	S						X	X	X	X	X
Missouri Department of Natural Resources	S	X	X	X	X	0	X	X	X	X	X
Montana Department of Environmental Quality	S						X	X	X	X	X
Navajo Nation	T								X		
Nebraska Environmental Quality	S							X	X	X	X

		Nonpoint					Point				
Agenchy	Type	Bio-mass	Coal	Nat Gas	Oil	Other	Bio-mass	Coal	Nat Gas	Oil	Other
Nevada Division of Environmental Protection	S							X	X	X	X
New Hampshire Department of Environmental Services	S			X	X	X	X		X	X	X
New Jersey Department of Environment Protection	S		0	0	X	X		X	X	X	X
New Mexico Environment Department Air Quality Bureau	S						X		X	X	
New York State Department of Environmental Conservation	S	X	X	0	X	X	X	X	X	X	X
Nez Perce Tribe	T	0	0	X	X	X	X				
North Carolina Department of Environment and Natural Resources	S	X	0	X	X	X	X	X	X	X	X
North Dakota Department of Health	S							X	X	X	X
Ohio Environmental Protection Agency	S	X	0	X	X	X	X	X	X	X	X
Oklahoma Department of Environmental Quality	S	X	X	X	X	X	X	X	X	X	X
Olympic Region Clean Air Agency	L						X		X	X	X
Oregon Department of Environmental Quality	S						X	0	X	X	X
Pennsylvania Department of Environmental Protection	S	X	X	X	X	X	X	X	X	X	X
Philadelphia Air Management Services	L							0	X	X	X
Pinal County	L						X		X	X	
Puget Sound Clean Air Agency	L						X		X	X	X
Rhode Island Department of Environmental Management	S								X	X	X
Shoshone-Bannock Tribes of the Fort Hall Reservation of Idaho	T	0	0	X	X	X					
South Carolina Department of Health and Environmental Control	S	X	0	X	X	0	X	X	X	X	X
Southern Ute Indian Tribe	T								X		
Tennessee Department of Environmental Conservation	S	X	X	X	X	X	X	X	X	X	X
Texas Commission on Environmental Quality	S			X			X	X	X	X	X
Utah Division of Air Quality	S							X	X	X	X
Vermont Department of Environmental Conservation	S	X		X	X	X	X			X	
Virginia Department of Environmental Quality	S	X		X	X	X	X	X	X	X	X
Washington State Department of Ecology	S						X	X	X	X	X
West Virginia Division of Air Quality	S		X	X	X		X	X	X	X	X
Western North Carolina Regional Air Quality Agency (Buncombe Co.)	L								X	X	
Wisconsin Department of Natural Resources	S	X		X	X		X	X	X	X	X
Wyoming Department of Environmenal Quality	S							X	X	X	X

Table 33 shows the selection hierarchy for all datasets contributing emissions to the Fuel Comb - Industrial Boilers, ICEs Sectors. This selection hierarchy combines the S/L/T data with the EPA datasets. As can be seen, most of the datasets used for this selection have data for the point source data category only.

Table 33: 2008 NEI selection hierarchy for datasets used by the Fuel Comb - Industrial Boilers, ICEs Sectors

DataSetName	Description	Point	Non-point
EPA Overwrite Point v1.5	Overwrites PM emissions from Pennsylvania. See also Table 7 and Appendix C. Even though these are EGUs, some of the SCCs used by PA puts them in the Industrial sector.	1	
EPA PM Augmentation V2	PM species added to gap fill missing S/L/T agency data or make corrections where S/L/T agency have inconsistent PM species' emissions. See also Table 7	2	1
EPA PM Augmentation NP	Adds PM species to fill in missing S/L/T agency data or make corrections where S/L/T agency data have inconsistent emissions across PM species. See Table 8		2
EPA Chromium Split v2	Contains corrected and speciated hexavalent and trivalent chromium emissions derived from the S/L/T agency data for sources in which S/L/T agency reports the total (unspeciated) chromium pollutant. See also Table 7.	3	
EPA other data developed for using ahead of SLT for gapfilling	Data added to boiler and ICE SCCs resulting from from the high risk and Hg review and from the Region 2 Tonawanda facility for the boiler burning coke oven gas	4	
2008EPA_MATS	Emissions data for units identified as MATS units (based on ORIS Ids) but with SCCs (incorrect) that put these units in the industrial sector (I,e., first 3 digits are 102). Emissions for these are small compared to MATS units that have fuel combustion - electricity generation SCCs.	5	
S/L/T data		6	
2008EPA_MMS	Boiler engine and turbine emissions from Offshore oil platforms located in Federal Waters in the Gulf of Mexico . See also Table 7.	7	
EPA EGU v1.5	EPA non-MATS EGU data developed from CAMD heat input and EFs. See also Section 3.10.	8	
2008 EPA Rule Data from OAQPS/SPPD	19 units were gapfilled with Hg emissions using the Boiler MACT rule data. These 19 were among the highest emissions in the Boiler MACT database for which no emissions were provided by S/L/T.	9	
EPA TRI Augmentation v2	Toxics Release inventory data used for gap-filling. Some were assinged to industrial fuel combustion sector SCCs based on the proportion of CAPS at those SCCs. See Table 7 and Section 3.1.4.	10	
EPA HAP Augmentation v2	HAP data computed from S/L/T agency criteria pollutant data using HAP/CAP emission factor ratios . See Table 7 and in Section 3.1.5.	11	
EPA 2005NATA values pulled forward to gapfill	Emissions from the 2005 NATA inventory used as directed by states for facilities that were part of the NATA review described in Section 3.1.7. Done for one facility in WV burning liquid waste in an industrial boiler.3.1.7	12	

3.11.3 EPA-developed fuel combustion –Industrial Boilers, ICEs emissions data

EPA developed data for industrial nonpoint fuel combustion (see Table **19**) that was not used in the 2008 NEI v2. The purpose of the information was to assist S/L/T to develop their own nonpoint estimates by accounting for the point source contribution that they submitted, and the total fuel available for combustion tracked by the Energy Information Administration. For point sources, the EPA developed data from various data sets as listed in Table 33. The rule data (2008 EPA Rule Data from OAQPS/SPPD) consisted of Hg emissions from the Boiler MACT ICR data. While this database included emissions for thousands of units, we only used 19 units' emissions due to the difficulty in matching the rule data to the EIS facilities, units and processes. The 19 units we used were units where emissions were not provided by S/L/T, were easy to match to EIS based on unit descriptions, and were among the top Hg emitters.

3.11.4 Summary of quality assurance methods

Data analyses involving comparison of emissions between 2008 and 2005 showed large discrepancies in emissions from this sector between the two years. We determined that some states did not properly perform the point source reconciliation between nonpoint and point contributions to this sector. This issue was found early enough in the 2008 NEI development process to fix some data prior to the v2 release (e.g., for Georgia, Virginia and Pennsylvania, as shown by the entries in the issues list, ftp://ftp.epa.gov/EmisInventory/2008v2/doc/2008neiv2_issues.xlsx, categorized as "identified in v1_5 and resolved in v2"). However, there were other situations that did not allow sufficient time and remain as issues for v2 (e.g., Tennessee and potentially Missouri).

Another quality assurance method conducted for Hg was to look at boiler SCCs and check for Hg emissions. Other than for natural gas consumption, Hg is expected. As it turned out, some boilers even after gapfilling using TRI and HAP augmentation did not have Hg emitted. We computed that we were missing 0.5 tons of Hg. Note that this issue included all boilers, not just from the industrial sector.

3.12 Fuel Combustion – Commercial/Institutional

[Placeholder. See also Section 3.1 and Appendix B]

3.13 Fuel Combustion – Residential – Natural Gas, Oil, and Other

[Placeholder. See also Section 3.1 and Appendix B]

3.14 Fuel Combustion – Residential – Wood

[Placeholder. See also Section 3.1 and Appendix B]

3.15 Gas Stations

[Placeholder. See also Section 3.1 and Appendix B]

3.16 Industrial Processes – Cement Manufacturing

[Placeholder. See also Section 3.1 and Appendix B]

3.17 Industrial Processes – Chemical Manufacturing

[Placeholder. See also Section 3.1 and Appendix B]

3.18 Industrial Processes – Ferrous Metals

[Placeholder. See also Section 3.1 and Appendix B]

3.19 Industrial Processes – Mining

[Placeholder. See also Section 3.1 and Appendix B]

3.20 Industrial Processes – Non-ferrous Metals

[Placeholder. See also Section 3.1 and Appendix B]

3.21 Industrial Processes – Oil & Gas Production

[Placeholder. See also Section 3.1 and Appendix B]

3.22 Industrial Processes – Petroleum Refineries

[Placeholder. See also Section 3.1 and Appendix B]

3.23 Industrial Processes – Pulp & Paper

[Placeholder. See also Section 3.1 and Appendix B]

3.24 Industrial Processes – Storage and Transfer

[Placeholder. See also Section 3.1 and Appendix B]

3.25 Industrial Processes – NEC (Other)

[Placeholder. See also Section 3.1 and Appendix B]

3.26 Miscellaneous Non-industrial NEC (Other)

[Placeholder. See also Section 3.1 and Appendix B]

3.27 Solvent – Consumer & Commercial Solvent Use

[Placeholder. See also Section 3.1 and Appendix B]

3.28 Solvent – Degreasing, Dry Cleaning, and Graphic Arts

[Placeholder. See also Section 3.1 and Appendix B]

3.29 Solvent – Industrial and Non-Industrial Surface Coating

[Placeholder. See also Section 3.1 and Appendix B]

3.30 Waste Disposal

[Placeholder. See also Section 3.1 and Appendix B]

4 Mobile sources

4.1 Mobile sources overview

Mobile sources are sources of pollution caused by vehicles transporting goods or people (e.g., highway vehicles, aircraft, rail, and marine vessels) and other nonroad engines and equipment, such as lawn and garden equipment, construction equipment, engines used in recreational activities, and portable industrial, commercial, and agricultural engines.

EPA created a comprehensive set of mobile source emissions data for criteria and hazardous air pollutants for all states, Puerto Rico, and US Virgin Islands as a starting point for the NEI. EPA uses models to estimate emissions for most of the mobile sources categories. During training for their 2008 NEI cycle, EPA encouraged S/L/T/ agencies to submit model inputs, rather than emissions, so that EPA could use those inputs beyond the 2008 NEI for future year projections. Agencies had the option to accept EPA's estimates or submit new emissions or emission inputs to replace or enhance EPA's data.

For development and documentation purposes, the major groups of mobile sources are aircraft (Section 4.2), commercial marine vessels (Section 4.3), locomotives (Section 4.4), nonroad equipment (Section 4.5), and on-road vehicles (Section 4.6). In addition, EPA developed nationally consistent datasets for all of those sectors, though without the benefit of local-specific model inputs in all cases. The sections below explain how we created the initial estimates, which S/L/T agencies provided model inputs or emissions data for each sector, and how the EPA data and S/L/T agency data were blended to produce the NEI.

For on-road vehicles, EPA transitioned from the MOBILE6 model to the MOVES model, and this transition occurred during the 2008 NEI submission and development process. Thus, S/L/T agencies submitted inputs and emissions for the on-road sector based on MOBILE6, in the form of inputs to the NMIM system used to run the MOBILE6 model[14]. Where agencies submitted model inputs in the form of NMIM inputs, we used them to generate both nonroad and on-road emissions. For on-road, we converted the NMIM inputs for input to MOVES, which requires some assumptions and is not as robust as using state-supplied MOVES inputs. In a limited number of cases, states had and provided MOVES inputs that we used.

In general, EPA used the data submitted by S/L/T agencies unless EPA determined that the data caused double counting or invalid pollutant or pollutant/emission type combinations inclusion. For example, we excluded S/L/T agency-provided estimates for methyl tert-butyl ether, a gas additive no longer used in US fuel supply. More details are provided in the sections that follow.

4.2 Aircraft

EPA estimated emissions related to aircraft activity for all known airports, including seaplane ports and heliports, in the 50 states, Puerto Rico, and US Virgin Islands. All of the approximately 20,000 individual airports are geographically located by latitude/longitude and stored in the NEI as point sources. As part of the development process, S/L/T agencies had the opportunity to provide both activity data as well emissions to the NEI. When activity data were provided, EPA used that data to calculate EPA's emissions estimates.

[14] except for California, which provided emissions from the EMFAC model

4.2.1 Sector Description

The aircraft sector includes all aircraft types used for public, private, and military purposes. This includes four types of aircraft: (1) Commercial, (2) Air Taxis, (3) General Aviation, and (4) Military. A critical detail about the aircraft is whether each aircraft is turbine- or piston-driven, which allows the emissions estimation model to assign the fuel used, jet fuel or aviation gas, respectively. The fraction of turbine- and piston-driven aircraft is either collected or assumed for all aircraft types.

Commercial aircraft include those used for transporting passengers, freight, or both. Commercial aircraft tend to be larger aircraft powered with jet engines. Air Taxis carry passengers, freight, or both, but usually are smaller aircraft and operate on a more limited basis than the commercial aircraft. General Aviation includes most other aircraft used for recreational flying and personal transportation. Finally, military aircraft are associated with military purposes, and they sometimes have activity at non-military airports.

The national AT and GA fleet includes both jet and piston-powered aircraft. Most of the Air Taxi and General Aviation fleet are made up of larger piston-powered aircraft, though smaller business jets can also be found in these categories. Military aircraft cover a wide range of aircraft types such as training aircraft, fighter jets, helicopters, and jet-powered and piston-powered planes of varying sizes.

The 2008 NEI also includes emission estimates for aircraft auxiliary power units (APUs) and aircraft ground support equipment (GSE) typically found at airports, such as aircraft refueling vehicles, baggage handling vehicles, and equipment, aircraft towing vehicles, and passenger buses. These APUs and GSE are located at the airport facilities as point sources along with the aircraft exhaust emissions. However, these emissions are included in the EIS Sectors for Non-road equipment (gasoline, diesel, and other), described in Section 4.5.

This sector includes the SCCs listed in Table 34 below:

Table 34: Source classification codes for the aircraft sector in the 2008 NEI

SCC	SCC Description
2275001000	Mobile Sources; Aircraft; Military Aircraft; Total
2275020000	Mobile Sources; Aircraft; Commercial Aircraft; Total: All Types
2275050011	Mobile Sources; Aircraft; General Aviation; Piston
2275050012	Mobile Sources; Aircraft; General Aviation; Turbine
2275085000	Mobile Sources; Aircraft; Unpaved Airstrips; Total
27501014	Internal Combustion Engines; Fixed Wing Aircraft L & TO Exhaust; Military; Jet Engine: JP-4
27601014	Internal Combustion Engines; Rotary Wing Aircraft L & TO Exhaust; Military; Jet Engine: JP-4
27601015	Internal Combustion Engines; Rotary Wing Aircraft L & TO Exhaust; Military; Jet Engine: JP-5
27602011	Internal Combustion Engines; Rotary Wing Aircraft L & TO Exhaust; Commercial; Jet Engine: Jet A

4.2.2 Sources of data overview and selection hierarchy

The aircraft sector includes data from three data components: a corrections dataset, S/L/T agency-provided emissions data, and an EPA dataset that is enhanced with state- and local-provided model inputs.

The S/L/T agency data were received from agencies listed in Table 35. As described in Section 4.2.4, all aircraft process emissions submitted by Georgia, Illinois, and Washoe County, NV were excluded by overwrites in the EPA Overwrite Point v1.5 dataset to prevent double counting with the EPA data.

Table 35: Agencies that submitted aircraft emissions data

Agency	Agency Type
Alabama Department of Environmental Management	State
City of Huntsville Division of Natural Resources and Environmental Mgmt	Local
California Air Resources Board	State
Illinois Environmental Protection Agency	State
North Carolina Department of Environment and Natural Resources	State
Washoe County Health District	Local
Pinal County	Local
Pennsylvania Department of Environmental Protection	State
Texas Commission on Environmental Quality	State
Wisconsin Department of Natural Resources	State
Fond du Lac Band of the Minnesota Chippewa Tribe	Tribal

The selection hierarchy used for aircraft is shown below in Table 36. This hierarchy pulls the relevant datasets for this sector from the overall point sources hierarchy listed in Table 8.

Table 36: 2008 NEI aircraft data selection hierarchy

Priority	Dataset Name	Dataset Content
1	EPA Overwrite Point v1.5	Overwrites some S/L/T emissions data with zeros to prevent use of invalid acenaphthylene emission factors and to prevent double counting in the final dataset (Section 4.2.4)
2	State/Local/Tribal Data	Submitted aircraft emissions
3	EPAAirports1109	EPA data (Section 4.2.5)

4.2.3 Spatial coverage and data sources for the sector

The aircraft sector includes emissions in every state, Puerto Rico, and the US Virgin Islands as well as six tribes.

[Placeholder for CAP and HAP maps and associated observations]

4.2.4 Overwrite dataset used for aircraft sector

This dataset has two purposes for airport emissions. First, all acenaphthylene emissions for the airport SCC of 2275050012 (general aviation turbine) are set to zero with this dataset to prevent use of an incorrect emission factor used in the state-supplied data. The submitted S/L/T estimates appeared almost identical to EPA's, which were subsequently found to be in error and removed. The states with records for this correction are Alabama, California, Illinois, North Carolina, and Wisconsin.

Second, some states added airport emissions to new "units" and "processes" at the EPA airport facilities. If these data had been merged with the EPA data without this overwrite dataset, the emissions at the new "units"

and "processes" would have been added to the units at the EPA "units" and "processes" at these airports. This situation occurred for all airports in Georgia and Washoe County, NV for CAP emissions and Illinois for CAP and HAP emissions. To avoid double counting, this corrections dataset overwrites the all of the state aircraft data with zero values. The NEI selection then includes the EPA emissions data instead, which are located at the valid units and processes defined by EPA at the start of the NEI development cycle.

4.2.5 EPA-developed aircraft emissions estimates

EPA developed emissions estimates associated with an aircrafts' landing and takeoff (LTO) cycle. The cycle begins when the aircraft approaches the airport on its descent from cruising altitude, lands, taxis to the gate, and idles during passenger deplaning. It continues as the aircraft idles during passenger boarding, taxis back out onto the runway for subsequent takeoff, and ascent (climbout) to cruising altitude. Thus, the five specific operating modes in an LTO are (1) Approach, (2) Taxi/idle-in, (3) Taxi/idle-out, (4) Takeoff, and (5) Climbout.

The LTO cycle provides a basis for calculating aircraft emissions. During each mode of operation, an aircraft engine operates at a fairly standard power setting for a given aircraft category. Emissions for one complete cycle are calculated using emission factors for each operating mode for each specific aircraft engine combined with the typical period of time the aircraft is in the operating mode.

In spring 2009, the EPA posted preliminary LTO data for review prior to developing the aircraft inventory. EPA encouraged the S/L/T agencies to review the materials and provide comments on any necessary corrections to:

1. Airport names and locations for airports to be included in the EIS facility inventory;
2. LTO information that will be used to estimate emissions for each airport;
3. Aircraft/engine combinations to link to FAA LTO data including default assumptions and AircraftEngineCodeTypes for EIS submittals; and
4. Lead estimates and the lead estimation methodology.

The following S/L/T agencies submitted aircraft activity data that EPA incorporated as inputs to the final EPA dataset model run.

Table 37: Agencies that submitted aircraft activity data for EPA's emissions calculation

Agency	Agency Type
Connecticut Department of Environmental Protection	State
Minnesota Pollution Control Agency	State
New Jersey Department of Environmental Protection	State
Wisconsin Department of Natural Resources	State
Mecklenburg County North Carolina	Local
Ventura County California Air Pollution Control District	Local
Regional Air Pollution Control Agency (Dayton and Montgomery County Ohio)	Local

4.2.5.1 Emissions for aircraft with detailed aircraft-specific activity data

For airports where the available LTO, from agencies or FAA data bases, included detailed aircraft-specific make and model information (e.g., Boeing 747-200 series), EPA used the FAA's EDMS, Version 5.1 (FAA, 2008a). This

type of detail is available for most LTOs at 3410 larger airports that have commercial air traffic. Smaller, and most general aviation only, airports would not have aircraft specific activity detail available.

Emissions for GSE and APUs associated with aircraft-specific activity were also estimated by EDMS, using the assumptions and defaults incorporated in the model. This is significant change from the previous NEI emissions where GSE estimates came from the NONROAD model and APUs were not included in EPA's estimates. These emissions are mapped to the EIS Sectors for Non-road equipment (gasoline, diesel, and other), described in Section 4.5.

EPA estimated aircraft-related emissions for the SCCs identified in Table 38 and associated EIS Sector, where available.

Table 38: SCCs included in the EPA-created aircraft emissions dataset

SCC	Description	Data Category	EIS Sector
2265008005	Airport Ground Support Equipment, 4-Stroke Gasoline	Point	Mobile – Non-Road Equipment – Gasoline
2267008005	Airport Ground Support Equipment, LPG	Point	Mobile – Non-Road Equipment – Other
2268008005	Airport Ground Support Equipment, CNG	Point	
2270008005	Airport Ground Support Equipment, Diesel	Point	Mobile – Non-Road Equipment – Diesel
2275001000	Aircraft /Military Aircraft /Total	Point	Mobile – Aircraft
2275020000	Aircraft /Commercial Aircraft /Total: All Types	Point	Mobile – Aircraft
2275050011	Aircraft /General Aviation /Piston	Point	Mobile – Aircraft
2275050012	Aircraft /General Aviation /Turbine	Point	Mobile – Aircraft
2275060011	Aircraft /Air Taxi /Piston	Point	Mobile – Aircraft
2275060012	Aircraft /Air Taxi /Turbine	Point	Mobile – Aircraft
2275070000	Aircraft /Aircraft Auxiliary Power Units /Total	Point	Mobile – Non-Road Equipment – Other
2275087000	Aircraft/In-flight (non-Landing-Takeoff cycle)	Nonpoint	Mobile – Aircraft

4.2.5.2 Emissions for airports without detailed aircraft-specific activity data

EPA estimated emissions for aircraft where detailed aircraft-specific activity data were not available by combining aircraft operations data from FAA's Terminal Area Forecasts (TAF) and 5010 forms (See http://www.faa.gov/airports/airport_safety/airportdata_5010/). These sources provide LTO estimates for general aviation airports. Because the aircraft make and models were not available, EPA used assumptions regarding the percent of these LTOs that were associated with piston-driven (using aviation gas) versus turbine-driven (using jet fuel) aircraft. Specifically, EPA assumed that at airports, 72.5% of all General Aviation and 23.1% of all Air Taxi activity were powered by piston-powered aircraft, with the remainder powered by turbine aircraft. At heliports, EPA assumed that 36.1% of all General Aviation and 2% of all Air Taxi activity were powered by piston-powered, with the remainder powered by turbine engines. These fractions were developed based on FAA's General Aviation and Part 135 Activity Surveys – CY 2008 (FAA, 2008b). Then EPA estimated emissions based on the percent of each aircraft type, LTOs, and emission factors.

Pb emission estimates were handled differently from the other pollutants. Lead emissions are associated with leaded aviation fuel used in piston driven aircraft associated with general aviation. EDMS has a limited number of piston engine aircraft in its aircraft data and is currently not set up to calculate metal emissions; therefore, we did not use it to estimate aircraft lead emissions. Lead emissions are instead based on per-LTO emissions factors, assumptions about lead content in the fuel, and lead retention rates in the piston engines and oil. The general equation is:

$$\text{LTO Pb (tons)} = \frac{\text{(piston – engine LTO)(avgas Pb g/LTO)(1-Pb retention)}}{\text{907,180 g/ton}}$$

The LTO estimate requires assumptions about the number of piston engines per plane, and number of LTOs necessary to account for US average fuel usage. The assumptions are detailed in a project report (ERG, 2011a). In addition, a summary of the EPA-only airport lead emissions "airportlead_20110406.xlsx" is available (see Section 8.2). This summary is not the same as any summaries of the 2008 NEI, which include about 21 tons of Pb emissions data from S/L/T agencies. Texas submitted an additional 24.3 tons of Pb at airports for SCC 2275050011. This addition and lower Pb emissions submitted by other states for some airports result in the 2008 NEI being 21 tons higher than the EPA-only data for emissions at airports.

In-flight lead emissions, which have not been previously included in the NEI, were calculated based on national aviation gasoline consumption and similar assumptions noted above about lead fuel content and retention rates. Lead emissions associated with airport LTO activities were subtracted from the national fuel based lead emissions to approximate in-flight lead emissions which were allocated to individual states and noted with the county code 777. This county code is not used to identify any actual counties across the US, and thus provides a way of uniquely finding all in-flight emissions in the NEI database. A summary of the EPA in-flight lead emissions "out_of_lto_pb_summary_120211.xlsx" is available (see Section 8.2). This summary is the same as summaries of the 2008 NEI, which do not include data from S/L/T/ agencies for in-flight Pb emissions.

4.2.6 Summary of quality assurance methods

The Documentation for Aircraft Component of the National Emissions Inventory Methodology addresses the QA for the EPA estimates. The agency-submitted aircraft emission estimates were compared to EPA's estimates by pollutant and SCC at the unit (e.g. commercial, general aviation, military, air taxi) and process (SCC).

- Findings and impacts
    - Illinois submitted 35654 records with zero emissions for processes that were not already populated with EPA data. The result of submitting a zero emissions process where there is no competing data is the same as no submittal. There is no effect in the 2008 NEI since Illinois records were overwritten because of the units/process duplication discussed in section 4.2.4
    - 5 agencies (California, Huntsville, Illinois, North Carolina, Wisconsin) reported pollutants not reported for airports by EPA (PM-CON, PM10-FIL, and Dibenzo[a,h]Anthracene). The data were not adjusted, thus in the 2008 NEI selection, only these airports will have emissions from these pollutants.
    - 4 agencies reported non-aircraft related SCCs to airport facilities, as shown in Table 39. Of these, Cloquet Carlton County Airport (EIS Facility ID = 8263311) had no aircraft-related SCCs

reported. No changes were made to these by EPA. However, typically facilities that are identified as “airport” contain only aircraft-related SCC emissions.

Table 39: Non-aircraft related SCCs reported by S/L/T agencies to airports

EIS Facility Identifier	Agency Facility Identifier	Agency PSC	Site Name	SCC	Sector
8263311	05	TR405	Cloquet Carlton County Airport	10300603	Fuel Comb – Comm/Institutional – Natural Gas
10581911	A141	COHDNREM	Huntsville – Madison County Airport Authority	39999999	Industrial Processes – NEC
12342611	10046	Pinal	Arizona Soaring	40600307	Gas Stations
10026511	401131395	CARB	COUNTY OF SAN LUIS OBISPO-OCEANO AIRPORT	20200102	Fuel Comb – Industrial Boilers, ICEs – Oil

- Alabama, California, Illinois, North Carolina, and Wisconsin submitted acenaphthalene from SCC 2275050012 (general aviation turbine). The state estimates were almost identical to EPA's, which were subsequently found to be in error, since there should be no acenaphthalene from this SCC. EPA removed these estimates from the EPA data and the S/L/T agency estimates were overwritten in the EPA Overwrite Point dataset as described in Section 4.2.4.
- Washoe, Illinois, and Georgia submitted 100% of their aircraft emissions to units and processes that duplicated ones already present in the airport facility inventory, rather than using existing units and processes. Using those records in the 2008 NEI would cause the agency records to add to (instead of replace) EPA estimates. This finding resulted in the EPA corrections described as part of the "EPA Overwrite Point v1.5" dataset as described in Section 4.2.4.

4.3 Commercial Marine Vessels

The 2008 NEI includes emissions from CMV activity in the 50 states, Puerto Rico, and US Virgin Isles, out to 200 nautical miles from the US coastline.

4.3.1 Sector Description

The CMV sector includes boats and ships used either directly or indirectly in the conduct of commerce or military activity. The majority of vessels in this category are powered by diesel engines that are either fueled with distillate or residual fuel oil blends. For the purpose of this inventory, we assume that Category 3 (C3) vessels primarily use residual blends while Category 1 and 2 (C1 and C2) vessels typically used distillate fuels.

The C3 inventory includes vessels which use C3 engines for propulsion. C3 engines are defined as having displacement above 30 liters per cylinder. The resulting inventory includes emissions from both propulsion and auxiliary engines used on these vessels, as well as those on gas and steam turbine vessels. Geographically, the inventories include port and interport emissions that occur within the area that extends 200 nautical miles (nm) from the official U.S. baseline, which is roughly equivalent to the border of the U.S. Exclusive Economic Zone. Only some of these emissions are allocated to states based on official state boundaries that typically extend 3 miles offshore (see Section 4.3.5).

The C1 and C2 vessels tend to be smaller ships that operate closer to shore, and along inland and intercoastal waterways. Naval vessels are not included in this inventory, though Coast Guard vessels are included as part of the C1 and C2 vessels.

The CMV source category does not include recreational marine vessels, which are generally less than 100 feet in length, most being less than 30 feet, and powered by either inboard or outboard. These emissions are included in those calculated by the NONROAD model in the nonroad category and EIS sectors of the 2008 NEI.

Each of the commercial marine SCCs requires an appropriate emissions type (M=maneuvering, H=hotelling, C=cruise, Z=reduced speed zone) because emission factors vary by emission type. Each SCC and emissions type combination was allocated to a shape file identifier in the nonpoint inventory. The allowed combinations are shown in Table 40. The default values are those assumed when the actual emission type may be unknown; for example, emissions that occur in shipping lanes are assumed to be 'cruising' and cannot be 'hotelling', which only occurs at ports.

Table 40: Commercial Marine SCCs and Emission Types

SCC	SCC Description	Allowed	Default
2280002100	Marine Vessels, Commercial Diesel Port	M	M
2280002200	Marine Vessels, Commercial Diesel Underway	C	C
2280003100	Marine Vessels, Commercial Residual Port	H	H
2280003100	Marine Vessels, Commercial Residual Port	M	H
2280003200	Marine Vessels, Commercial Residual Underway	C	C
2280003200	Marine Vessels, Commercial Residual Underway	Z	C

In addition, the additional SCCs in Table 41 were submitted by California and Kentucky (as denoted) and included in the NEI. We suspect but could not confirm that these emissions double-count emissions from the EPA shapefile-based datasets.

Table 41: Additional Commercial Marine SCCs used by California and Kentucky

SCC	SCC Description	States
28000211	Internal Combustion Engines; Marine Vessels, Commercial; Diesel; Crew Boats: Main Engine Exhaust: Idling	CA
28000212	Internal Combustion Engines; Marine Vessels, Commercial; Diesel; Crew Boats: Main Engine Exhaust: Maneuvering	CA, KY
28000213	Internal Combustion Engines; Marine Vessels, Commercial; Diesel; Crew Boats: Auxiliary Generator Exhaust: Hotelling	CA
28000216	Internal Combustion Engines; Marine Vessels, Commercial; Diesel; Supply Boats: Main Engine Exhaust: Idling	CA
28000217	Internal Combustion Engines; Marine Vessels, Commercial; Diesel; Supply Boats: Main Engine Exhaust: Maneuvering	CA, KY
28000218	Internal Combustion Engines; Marine Vessels, Commercial; Diesel; Supply Boats: Auxiliary Generator Exhaust: Hotelling	CA

4.3.2 Sources of data overview and selection hierarchy

The commercial marine vessels sector includes data from four data components: two corrections datasets, S/L/T agency-provided emissions data, and an EPA dataset of CMV emissions.

EPA received emissions data from the agencies identified in Table 42.

Table 42: Agencies that Submitted Commercial Marine Emissions Data

Agency	Agency Type	Notes
California Air Resources Board	State	Removed from EIS see Section 4.3.6
Delaware Department of Natural Resources and Environmental Control	State	
Idaho Department of Environmental Quality	State	Removed from EIS see section 4.3.6
Illinois Environmental Protection Agency	State	Removed from EIS see section 4.3.6
Kansas Department of Health and Environment	State	Removed from EIS see section 4.3.6
Kootenai Tribe of Idaho	Tribal	All emissions records are zero
Louisville Metro Air Pollution Control District	Local	
Maryland Department of the Environment	State	Removed from EIS see section 4.3.6
New Hampshire Department of Environmental Services	State	Removed from EIS see section 4.3.6
New Jersey Department of Environment Protection	State	
Nez Perce Tribe	Tribal	
Pennsylvania Department of Environmental Protection	State	
Shoshone-Bannock Tribes of the Fort Hall Reservation of Idaho	Tribal	
South Carolina Department of Health and Environmental Control	State	
Texas Commission on Environmental Quality	State	

Table 43 shows the selection hierarchy for the CMV sector.

Table 43: 2008 NEI commercial marine vehicle selection hierarchy

Priority	Dataset Name	Dataset Content
1	EPA Overwrite Nonpoint v1.5	Overwrites submitted unspeciated chromium with zero value to prevent unspeciated chromium from being included in the 2008 NEI (Section 4.3.4)
2	EPA Chromium Split v2	Speciates total chromium in California for SCCs 28000212 and 28000217 (Section 4.3.4).
3	State/Local/Tribal Data	Submitted commercial marine vessel emissions
4	EPA CMV	EPA data (Section 4.3.5)

4.3.3 Spatial coverage and data sources for the sector

The commercial marine vessel sector includes emissions in every state except Arizona, Colorado, Montana, Nevada, New Mexico, North Dakota, South Dakota, Utah, Vermont, and Wyoming. It also includes emissions for Puerto Rico and US Virgin Islands, three tribes, as well as emissions in federal waters.

[Placeholder for CAP and HAP maps and associated observations]

4.3.4 Overwrite datasets used for commercial marine vessel sector

For commercial marine vessels, the "EPA Overwrite Nonpoint v1.5" dataset contained only records that zeroed out Texas's unspeciated chromium from this sector. The amount of chromium was not replaced with speciated chromium data because the amount was trivial and this was a late-breaking finding of our quality assurance efforts.

4.3.5 EPA-developed commercial marine vessel emissions data

EPA estimated CMV emission estimates[15] as a collaborative effort between the Office of Transportation and Air Quality (OTAQ) and OAQPS. EPA developed the Category 3 commercial marine inventories for a base year of 2002 and then projected to 2008 by applying regional adjustment factors to account for growth. In addition, EPA developed and applied NOX adjustment factors to account for implementation of the NOX Tier 1 standard. The C3 growth factors, NOX adjustment factors by tier and calendar year, and NOX adjustment factors by engine type and speed are defined in Appendix A of the 2008 NEI CMV documentation (ERG, 2010). For Category 1 and 2 marine diesel engines, the emission estimates were consistent with the 2008 Locomotive and Marine federal rule making (US EPA, 2003). EPA derived HAP estimates by applying toxic fractions to VOC or PM estimates.

EPA then allocated these emissions to individual GIS polygons (see Sections 4.3.5.1 and 4.3.5.2) using appropriate methods that varied by operating mode (i.e., hotelling, maneuvering, reduced speed zone, and underway). For example, port emissions appear only in port polygons, federal water emissions in federal waters. HAP emissions were estimated by applying speciation profiles to each polygon's VOC and PM estimates; see also Appendix B of the 2008 NEI CMV documentation (ERG, 2010).

EPA allocated emissions estimates based on activity to GIS polygons representing port and waterway. GIS polygons allowed the estimation/allocation of emissions to defined port, waterway, and coastal areas, leading to improved spatial resolution compared to previous county-level emissions.

Agencies also submitted emissions to this sector. The SCCs for which EPA developed estimates are in Table 44.

Table 44: Commercial Marine SCCs for which EPA Provided Estimates

SCC	Description	Data Category
2280002100	Marine Vessels, Commercial Diesel Port	Nonpoint
2280002200	Marine Vessels, Commercial Diesel Underway	Nonpoint
2280003100	Marine Vessels, Commercial Residual Port	Nonpoint
2280003200	Marine Vessels, Commercial Residual Underway	Nonpoint

[15] While CO2 estimates were also developed, the 2008 NEI does not include GHG and so these are not available except through the EPA-developed dataset included in EIS.

4.3.5.1 Allocation of Port Emissions

EPA developed port boundaries using a variety of resources to identify the most accurate port boundaries. First, GIS data or maps provided directly from the port were used. Next, maps or port descriptions from local port authorities, port districts, etc. were used in combination with existing GIS data to identify port boundaries. Finally, satellite imagery from tools such as Google Earth and street layers from StreetMap USA were used to delineate port areas. We placed primary emphasis on mapping the 117 ports with Category 3 vessel activity using available shape files of the port area. The Port of Huntington was developed differently given its large extent and limited available map data. The state of West Virginia provided a revised shape file of US Army Corps of Engineers port terminals reported to be part of the Port of Huntington-Tristate area. The revised shape that includes a 200 meter buffer of the water features near these port terminals was created to identify the port area.

In all cases, polygons were created on land, bordering waterways and coastal areas, and were split by county boundary, such that no shape file crosses county lines and county total emission can be easily summed. Each polygon was identified by the port name and state and county FIPS in addition to a unique ShapeID. Smaller ports with Category 1 and 2 activities were mapped as small circles, such that the port is much like a point source, but without the complication of emissions appearing in both point and nonpoint inventories. Note that no Category 3 emissions were mapped to small circles. The final shapefile contained 159 ports and 196 polygons, considering that a single port can cross county boundaries and thus include multiple polygons. The final shapefile is listed as "port_032310.zip" in Section 8.1.

To develop emissions for the Category 1 and 2 part of the inventory, EPA started with criteria emissions and activity as a single national number. We allocated the emissions and activity data to ports based on total commodity tonnage data obtained from the U.S. Army Corps of Engineers Principal Ports file for 2007 (U.S. Army Corps of Engineers, 2009; see also data file "pport07.xls" listed in Section 8.1). Emissions were then assigned to polygons within a port based on fraction of the port's area within each shape.

For the Category 3 activity, EPA developed port-level criteria and CO2 emissions for 117 of the largest U.S. from port activity (maneuvering and hotelling modes) in megawatt hours. We then assigned emissions to shape file polygons within a port based on fraction of port area. HAP emissions were then speciated from VOC and PM estimates for each mode, using emission factors for C3 vessels; see also Appendix A of the 2008 NEI CMV documentation (ERG, 2010).

4.3.5.2 Allocation of Underway Emissions

Category 1 and 2 criteria emissions were allocated to underway polygons in state waters based on total commodity movements (in tons) data obtained from USACE (US ACE, 2001). These data were waterway-specific, so waterways that crossed into multiple FIPs had emissions assigned by waterway length in each polygon. HAP emissions were then speciated from VOC and PM estimates using the methodology described in Section 2.3 of ERG (2010) for each polygon.

For Category 3, EPA/OTAQ developed line shapefiles indicating port-specific approach segment length and related emissions and activity in the reduced speed zones, the mode when the ship slows to improve vessel handling near land, on a per-port basis. HAP emissions were then speciated from VOC and PM estimates using

the methodology described in for each polygon as described above. The shapefiles used for the underway emissions are available in the file "shipping_lanes_111309.zip" as listed in Section 8.1.

For Category 3 Interport emissions, EPA created 4km gridded emissions for interport-only emissions for CO, CO2, HC, NOx, SOx, and PM10, as described in Section 4.3.5. EPA used GIS to overlay the 4-km grid with county boundaries including state waters to allocate to counties, and the rest of the 4-km data were allocated to federal waters and labeled with state/county codes starting with 85 in EIS. County boundaries in the NEI extend to the transition from state to federal waters, typically three miles off shore. HAP emissions were then speciated from VOC and PM estimates using the methodology discussed above.

4.3.6 Summary of quality assurance methods

EPA compared shape-, state-, and county-level sums in (1) EPA default data, (2) S/L/T agency submittals and (3) the resultant 2008 NEI selection by

- Included pollutants, SCCs, SCC-Emission Types
- Emissions summed to agency and SCC level

Findings prior to corrections and release

- For a given county, the 2008 NEI includes agency emissions only where the reporting/identification codes used by the state exactly matched the codes used by EPA (i.e., the shape, SCC, emission type, and pollutant) or where emissions occur in counties with no shape IDs (i.e., submitted as county totals). When the same codes are used, EIS can replace EPA data. Several agencies that submitted using shape files included more or fewer shapes (or counties with no shape files) than the EPA dataset. The result would have been a merging of the agency and EPA data, which needed to be prevented to avoid double counting. EPA contacted submitting agencies and provided assistance to those willing to resubmit their data in shape files or agree to accept EPA's default data. Because the remaining agency data could not be included in EIS without double counting, it had to be deleted from EIS. This occurred for California, Idaho, Illinois, Kansas, Maryland. Of these, only Kansas agreed to EPA's data, the others did not respond to request for resubmittal.
- Most agencies included the same or fewer SCCs than the EPA dataset. However, California, DC, Delaware, New Hampshire, Texas, and Maricopa included additional SCCs.
    - Examples:
        - California and Louisville Metro Air Pollution Control District included CMV point source SCCs. These may result in emissions double counting with EPA shapefile-based data.
- The 2008 NEI uses EPA data for any County/ShapeID/pollutant/SCC/emission type combination that is present in EPA's dataset and not in the agency's. This automated merging of EPA and S/L/T data can result in overestimates where processes are incongruent. For instance, in NJ diesel CMV emissions are likely overestimated due to process mismatch in EPA and NJ estimates.

Table 45: Example of Potential Error in NJ County Diesel CMV Emissions Due to Merge of Inconsistent County/Shape/SCC/EmissionType/Pollutant combinations

FIPS	ShapeID	SCC	EmissionsTypeCode	Pollutant Code	EPA	NJ_Submittal	2008NEIv2
34017	10085	2280002100	M	NOX	17,616.90		17,616.90
34017	2827	2280002200	C	NOX	236.50	751.88	751.88
34017	2832	2280002200	C	NOX	144.19	458.40	458.40
34017	2829	2280002200	C	NOX	79.82	253.77	253.77
34017	2828	2280002200	C	NOX	43.25	137.49	137.49
34017	2834	2280002200	C	NOX	26.58	84.49	84.49
34017	2831	2280002200	C	NOX	8.88	28.24	28.24
34017	2830	2280002200	C	NOX	6.04	19.20	19.20
			Total		18,162.16	1,733.47	19,350.37

- Most agencies either did not submit HAPs or did not submit all the HAPs that EPA estimated. In this case, EPA data will appear in the 2008 NEI for any HAPs not in the S/L/T agency data. This can cause problems when the resultant 2008 NEI may have VOC and PM emissions less than the EPA VOC or PM, and there may be a mathematical inconsistency between VOC HAPs and PM HAPs with the criteria pollutants. There will also be an inconsistency because of the different approaches used to compute CAPs and HAPs.
    - Example:
        - New Hampshire submitted CAPs only. For SCC 2280002200, the New Hampshire total VOC and PM are used in the NEI and are much less than EPA's VOC and PM estimates, Since the NEI uses EPA's VOC HAPs and PM HAPs, the sum of these could be greater than the criteria VOC and PM also in the NEI. This phenomenon occurs for the Rockingham County, NH (FIP= 33015) sum for VOC, primary PM10 and primary PM2.5, and may occur elsewhere at a shape ID level.
- The 2008 NEI uses EPA data for any pollutant/SCC/emission type combination that is present in EPA's dataset and not in the agency's.
- Most agencies either did not submit HAPs or did not submit all the HAPs that EPA estimated. In this case, EPA data will appear in the 2008 NEI for any HAPs not in the S/L/T agency data. This can cause problems when the resultant 2008 NEI may have VOC and PM emissions less than the EPA VOC or PM, and there may be a mathematical inconsistency between VOC HAPs and PM HAPs with the criteria pollutants. There will also be an inconsistency because of the different approaches used to compute CAPs and HAPs.
    - Example:
        - New Hampshire submitted CAPs only. For SCC 2280002200, the New Hampshire total VOC and PM are used in the NEI and are much less than EPA's VOC and PM estimates. Since the NEI uses EPA's VOC HAPs and PM HAPs, the sum of these could be greater than the criteria VOC and PM also in the NEI. This phenomenon occurs for the

Rockingham County, NH (FIP= 33015) sum for VOC, PM10-PRI and PM25-PRI, and may occur elsewhere at a shape ID level.

- 2008 NEI emissions can be greater than both the EPA and the agency estimates when:
  - Either the agency or EPA dataset has populated sets of counties or shapes or has different SCC/emission type, such that the 2008 NEI has more SCCs or SCC/emission types than either the EPA or agency datasets.
    - Example: In the following Agency/SCC/CAP combinations, the 2008 NEI selection total is greater than both the EPA and agency emissions:

Table 46: SCC/Pollutant combinations where State total 2008 NEI is greater than agency or EPA estimates

State	SCC	Allowed
TX	2280003100	NH3
TX	2280003100	PM10-PRI
TX	2280003100	PM25-PRI
TX	2280003100	SO2
TX	2280003200	VOC
TX	2280003200	NOX
TX	2280003100	CO
TX	2280003200	SO2
TX	2280003200	NOX
SC	2280003200	PM25-PRI
SC	2280003200	PM10-PRI
SC	2280003200	NH3
SC	2280003200	NOX
SC	2280003200	CO
SC	2280003200	VOC
NH	2280002200	SO2

- EPA estimates for Louisiana diesel CMV emissions (SCC=2280002*) were challenged in similar previous NEI data as too high (http://www.dnr.mo.gov/env/apcp/docs/appendixh-7.pdf). There is also a conference paper from the 2005 EI conference: http://www.epa.gov/ttnchie1/conference/ei14/session8/sullivan.pdf). The state was contacted 12/2011 and had no other dataset alternatives and agreed users should be cautioned on this potential over estimate.
- The EPA dataset does not include tribal areas. Therefore the 2008 NEI is equal to the tribal submission in the three tribal regions that provided data. These tribes used only SCCs 2280002100 and 2280002200.
- All emission records submitted by Kootenai Tribe of Idaho contained zero emission records. They are included in 2008 NEI, but since they are zero, have no effect.

4.4 Locomotives

4.4.1 Sector Description

The locomotive sector includes railroad locomotives powered by diesel-electric engines. A diesel-electric locomotive uses 2-stroke or 4-stroke diesel engines and an alternator or a generator to produce the electricity required to power its traction motors. The locomotive source category is further divided up into categories: Class I line haul, Class II/III line haul, Passenger, Commuter, and Yard. Table 47 below indicates locomotive SCCs and whether EPA estimated emissions. If EPA did not estimate the emissions, then all emissions from that SCC that appear in the inventory are from S/L/T agencies.

Table 47: Locomotive SCCs, descriptions, and EPA estimation status

SCC	Description	EPA /ERTAC Estimated?	Data Category
2285002006	Mobile Sources Railroad Equipment Diesel Line Haul Locomotives: Class I Operations	Yes – in shape files	Nonpoint
2285002007	Mobile Sources Railroad Equipment Diesel Line Haul Locomotives: Class II / III Operations	Yes-in shape files	Nonpoint
2285002008	Mobile Sources Railroad Equipment Diesel Line Haul Locomotives: Passenger	no	Nonpoint
2285002009	Mobile Sources Railroad Equipment Diesel Line Haul Locomotives: Commuter Lines	no	Nonpoint
2285002010	Railroad Equipment Diesel Yard Locomotives	no	Nonpoint
28500201	Internal Combustion Engines Railroad Equipment Diesel Yard	Yes – as point sources	Point

4.4.2 Sources of data overview and selection hierarchy

The locomotives sector includes data from five data components: three corrections datasets, S/L/T agency-provided emissions data, and an EPA dataset of locomotive emissions.

EPA estimated emissions from select locomotive SCCs. The agencies listed in Table 48 also submitted emissions to the same or other locomotive SCCs.

Table 48: Agencies that submitted Rail Emissions to the 2008 NEI

Agency Organization	Agency Type
Alaska Department of Environmental Conservation	State
California Air Resources Board	State
Connecticut Department Of Environmental Protection	State
DC-District Department of the Environment	Local
Delaware Department of Natural Resources and Environmental Control	State
Idaho Department of Environmental Quality	State
Illinois Environmental Protection Agency	State
Kansas Department of Health and Environment	State
Louisville Metro Air Pollution Control District	Local
Maricopa County Air Quality Department	Local
Maryland Department of the Environment	State
New Hampshire Department of Environmental Services	State

Nez Perce Tribe	Tribal
North Carolina Department of Environment and Natural Resources	State
Omaha Tribe of Nebraska	Tribal
Oregon Department of Environmental Quality	State
Pennsylvania Department of Environmental Protection	State
Sac and Fox Nation of Missouri in Kansas and Nebraska Reservation	Tribal
Shoshone-Bannock Tribes of the Fort Hall Reservation of Idaho	Tribal
Texas Commission on Environmental Quality	State
Utah Division of Air Quality	State
Washoe County Health District	Local

Table 49 shows the selection hierarchy for the locomotive sector.

Table 49: 2008 NEI locomotives selection hierarchy

Priority	Dataset Name	Dataset Content
1	EPA PM Augmentation, V2 (point)	Zeros out PM species in Texas and Kansas
2	EPA Chromium Split v2 (point)	Zeros out submitted locomotive chromium in Texas and Kansas.
3	Rail_EPACorrections (nonpoint)	Also overwrites county submittals for counties/SCCs where EPA data exists in shape files (see Section 4.4.4)
4	Responsible Agency Dataset (point and nonpoint)	Submitted locomotive emissions
5	EPA Rail (point and nonpoint)	EPA data (see Section 4.4.5)

4.4.3 Spatial coverage and data sources for the sector

The locomotives sector includes emissions in all states, DC, Puerto Rice, and some tribes.

[Placeholder for CAP and HAP maps and associated observations]

4.4.4 Overwrite datasets used for locomotives sector

EPA used three overwrite datasets to make changes to the data provided by S/L/T agencies. The “EPA PM Augmentation, V2” and “EPA Chromium Split v2” datasets zeroed out small amounts of PM and unspeciated chromium. The “Rail_EPACorrections” dataset zeros out agency submissions to prevent double counting with EPA data. Since EPA’s dataset used shapefiles, when agencies submitted without shapefiles but rather as a county total, EIS was unable to blend the two datasets properly. This limitation would have resulted in double-counting of the data. Since we knew that EPA data were complete but we did not know whether the S/L/T agency data were complete, we overwrote the S/L/T data with zeros and selected the EPA data for the 2008 NEI. This approach was needed in California, Connecticut, DC, Idaho, Illinois, Maricopa County, Maryland, North Carolina, Oregon, Louisville and the Washoe County Health District. In most of these regions, some state data are still used.

4.4.5 EPA-developed locomotive emissions data

EPA's national rail estimates were developed by the Eastern Regional Technical Advisory Committee hereafter referenced as ERTAC Rail. This group is comprised of eastern states' regulatory agencies in collaboration with the rail industry. ERTAC Rail developed emissions estimates based on fuel data obtained from the American Association of Railroads for each subcategory. California locomotive emission estimates were handled separately from the rest of the United States because of their use of low sulfur locomotive diesel fuels.

ERTAC Rail used confidential railroad-provided data to generate railroad-specific criteria emission estimates for line haul and rail yards at the rail segment and rail yard level, respectively. In addition to the sections below, additional information is available in the project report (ERG, 2011b).

4.4.5.1 Line Haul Criteria Emissions Estimates

Criteria pollutant emissions were estimated by applying emission factors to the total amount of distillate fuel oil used by line haul locomotives. Fuel usage was obtained from publically available Class I Railroad Annual Reports (Form R-1). The R-1 reports are submitted to the Surface Transportation Board annually and include financial and operations data to be used in monitoring rail industry health and identifying changes that may affect national transportation policy. Additionally, each railroad provided fleet mix information that allowed ERTAC Rail to calculate railroad-specific emission factors. Weighted Efs per pollutant for each gallon of fuel used (gm/gal or lbs/gal) were calculated for each Class I railroad fleet based on its fraction of line haul locomotives at each regulated Tier level. EPA emission factors were used for PM2.5, SO2, and NH3.

The weighted emission factors were then applied to the link-specific fuel consumption to obtain emissions for each rail segment. Given the confidentiality of the activity data, emissions for criteria pollutants were provided to EPA by ERTAC Rail by county for Class I line haul. Class II/III rail was provided by railroad company and county.

4.4.5.2 Rail Yard Criteria Emissions Estimates

Rail yard locations were identified using a database from the Federal Railroad Administration. Criteria pollutant emissions were estimated by applying emission factors to the total amount of distillate fuel used by locomotives. Each railroad provided fleet mix information that allowed ERTAC to calculate railroad-specific emission factors. The company-specific, system wide fleet mix was used to calculate weighted average emissions factors for switchers operated by each Class I railroad. EPA emission factors were used for PM2.5, SO2, and NH3.

R-1 report-derived fuel use was allocated to rail yards using an approximation of line haul activity data within the yard. These fuel consumption values were further revised by direct input from the Class I railroads. The weighted emission factors were then applied to the yard-specific fuel consumption to obtain emissions for each yard. Since the rail yard inventory was based on publically-available data, the final criteria emission estimates were provided per rail yard.

4.4.5.3 Hazardous Air Pollutant Emissions Estimates

HAP emissions were estimated by applying speciation profiles to the VOC or PM estimates. Since California uses low sulfur diesel fuel and emission factors specific for California railroad fuels were available, calculations of California's emissions were done separately from the other states. HAP estimates were calculated at the yard and link level, after the criteria emissions had been allocated.

4.4.5.4 Allocation to Rail Segments and Yards

Class I line haul emissions were allocated to rail segments (GIS line shapes) based on segment-specific railroad traffic data (ton miles) obtained from the Department of Transportation. Because Class II/III railroads are less likely to use rail segments that are heavily traveled by Class I railroads, the activity-based approach used for Class I lines was not appropriate. Instead, Class II/III line haul emissions were allocated to rail segments using segment length as a proxy. The dataset "railway_20110921.zip" contains the shapefiles used (see Section 8.1 for access information).

Rail yard point source emissions were developed based on yard name and ownership properties. As a result, unique yards needed to be identified and emissions summed. 753 unique yards were identified nationwide. This is known to be an underestimate of the total number of yards due to limited available data. Once the unique yards were identified and criteria emissions were summed at the yard, the PM and VOC-based HAP speciation profile was applied to estimate HAP emissions at each yard.

4.4.6 Summary of quality assurance methods

EPA and Agency submitted emissions were compared at shape, state, and county to EPA default values. All of the EPA rail emissions were allocated to shape files in the EPA dataset. Where agencies submitted as county-level records in the same counties as the shapes, EIS could not correctly merge the EPA and agency data. Therefore, agencies were asked to resubmit rail emissions in shapes.

Findings

- The 2008 NEI uses only agency emissions in counties where the agency submissions matched to the same shape/SCC/pollutant combinations such that they had priority over EPA data, or where emissions occur in counties with no shape IDs. Several agencies that submitted in shape files included more or fewer shapes (or counties with no shape files) than the EPA dataset. When fewer shapes were submitted, the EPA data were still used for those shapes and the state data were used for the shapes submitted.
- Most agencies included the same or fewer SCCs than the EPA dataset. Several agencies included passenger and commuter (SCC =2285002008 and 2285002009, respectively), a known omission in the EPA dataset, but thought to be a far smaller contributor to emissions than line haul. Where states submitted passenger and commuter rail emissions, they were included in the final NEI.
- New Hampshire submitted CAPs only. For SCC 2285002007, the Sullivan County, NH (FIP= 33019) sum for primary PM10 and primary PM2.5 are about 50% less than EPA's. Since the NEI uses EPA's PM HAPs, the HAP sum will be greater than the PM also in the NEI. This phenomenon may occur elsewhere at a shape ID level.
- EPA put rail yards in point format for SCC=28500201. However EPA acknowledges that the coverage is not complete due to limited activity data available. EPA did not attempt to reconcile with agency submissions for nonpoint rail yards (SCC= 2285002010). Where agencies submitted nonpoint rail yards in the same counties as EPA point rail yards, there is a potential for double counting. This happens in California, DC, Maryland and Oregon. In the counties where this occurs it is not known if the nonpoint county emissions reported by the States have been adjusted to exclude the point sources reported by EPA.

- Most agencies either did not submit HAPs or did not submit all the HAPs EPA used, and therefore EPA data will appear in the NEI for any HAPs in the EPA dataset and not in agency data.
- Agency rail emissions that were not in shape files but occur in counties with EPA shape estimates were overwritten with 0 emissions records if the agencies did not resubmit, to avoid duplication. Submitted rail emission were removed or overwritten for the following agencies: California, Connecticut, DC, Idaho, Illinois, Maricopa County, Maryland, Oregon, Louisville and Washoe.
- An EPA correction file overwrites agency data to 0 tons emissions where unspeciated chromium (pollutant code = 7440473) were submitted in Texas and Kansas.
- Where agencies submitted CAPs only, EPA data fills in the missing HAP. This is problematic when the resultant 2008NEI selection may have VOC and PM is less than the EPA VOC or PM, and there may be a mathematical inconsistency between VOC HAPs and PM HAPs with the criteria pollutants. There will also be an inconsistency because of the different approaches used to compute CAPs and HAPs.
- 2008 NEI emissions can be greater than both the EPA and the agency estimates when either the agency or EPA dataset has populated sets of counties or shapes or has different SCCs, such that the 2008 NEI has more SCCs or shapes than either the EPA or agency datasets.
- Review of Texas rail data (SCC=2285002006) shows that emissions of all pollutants in all but the most industrial counties is suspiciously low. Texas was notified 12/2011 and did not choose to update the data, though they acknowledged the emissions values are low.
- The EPA dataset does not include tribal areas. Therefore the 2008 NEI is equal to the tribal submission only, and therefore will not have consistent SCCs and pollutants as are present in counties.

4.5 Nonroad Equipment – Diesel, Gasoline, and other

Although "nonroad" is used to refer to all transportation sources that are not on-highway, these EIS sectors and this section address nonroad equipment other than locomotives, aircraft, or commercial marine vehicles.

4.5.1 Sector Description

This section deals specifically with emissions processes calculated by the EPA's NONROAD model (http://www.epa.gov/otaq/nonrdmdl.htm) and the OFFROAD model (http://www.arb.ca.gov/msei/offroad/offroad.htm) approved for use by California. They include nonroad engines and equipment, such as: lawn and garden equipment, construction equipment, engines used in recreational activities, portable industrial, commercial, and agricultural engines.

The NMIM (http://www.epa.gov/otaq/nmim.htm) is EPA's consolidated mobile emissions estimation system that allows EPA to produce nonroad mobile emissions in a consistent and automated way for the entire country. EPA encouraged agencies to submit NMIM inputs to the EIS for the 2008 NEI for inclusion in the National County Database (NCD) . The NCD contains all the county-specific information needed to run NONROAD. It also contains the ratios that are applied to NONROAD outputs to estimate emissions of HAPs, dioxins/furans, and some metals. NMIM was run for both on-road and nonroad emissions for the 2008 NEI, but on-road emissions were subsequently replaced by the newer MOVES model estimates described in section 4.6.

4.5.2 Sources of data overview and selection hierarchy

EPA ran NMIM for nonroad sources twice for estimates used in the final 2008 NEI. EPA developed a default NCD and replaced its tables and external files with agency data that were submitted by June 1, 2010. Then EPA ran

NMIM again to include additional submittals that arrived by December 1, 2010. For more information on what information agencies submitted in their NCD files and how EPA ran the NONROAD model, see Section 4.5.4 and the more detailed EPA documentation (E.H. Pechan, 2011).

Agencies also submitted nonroad emissions. In addition to EPA's estimates, the agencies included in Table 50 submitted inputs and/or emissions to the 2008 NEI.

Table 50: Agency Submittals of NONROAD inputs and nonroad smissions

Agency	NONROAD inputs submitted by	Submitted CAP or HAP emissions
Arkansas Department of Environmental Quality	June	
DC-District Department of the Environment	June, December	
California Air Resources Board		CAP_HAP
Delaware Department of Natural Resources and Environmental Control		CAP
Eastern Band of Cherokee Indians	December	CAP_HAP
Georgia Department of Natural Resources	June	
Hawaii Department of Health Clean Air Branch	June	
Idaho Department of Environmental Quality		CAP_HAP
Illinois Environmental Protection Agency		CAP
Kansas Department of Health and Environment		CAP
Kootenai Tribe of Idaho		CAP
Little River Band of Ottawa Indians, Michigan		CAP
Louisville Metro Air Pollution Control District		CAP
Louisiana Department of Environmental Quality	November	
Maine Department of Environmental Protection	June	
Makah Indian Tribe of the Makah Indian Reservation		CAP
Maricopa County Air Quality Department		CAP
Maryland Department of the Environment	June	
Massachusetts Department of Environmental Protection	December	
Metro Public Health of Nashville/Davidson County		CAP_HAP
Michigan Department of Environmental Quality	December	
Minnesota Pollution Control Agency	December	
Missouri Department of Natural Resources	June, December	
Nevada Division of Environmental Protection	December	
New Hampshire Department of Environmental Services	June	
Nez Perce Tribe		CAP
New York State Department of Environmental Conservation		CAP
North Carolina Department of Environment and Natural Resources	June	
Ohio Environmental Protection Agency	December	
Omaha Tribe of Nebraska		CAP
Pennsylvania Department of Environmental Protection	June	CAP
Shoshone-Bannock Tribes of the Fort Hall Reservation of Idaho		CAP
South Carolina Department of Health and Environmental Control	December	
Tennessee Department of Environmental Conservation	December	
Texas Commission on Environmental Quality		CAP_HAP
Utah Division of Air Quality		CAP
Vermont Department of Environmental Conservation	June	
Virginia Department of Environmental Quality	June	

Agency	NONROAD inputs submitted by	Submitted CAP or HAP emissions
Wisconsin Department of Natural Resources	December	

The 2008 NEI merged EPA and agency data according to the hierarchy described by Table 51. Agency emissions were used except where they were determined to result in double counting or suspect pollutant inclusion. More detail on this in the sections that follow.

Table 51: 2008 NEI Non-road equipment selection hierarchy

Priority	Dataset Name	Dataset Content
1	EPA Correction Dataset – Nonroad	Overwrites submitted emissions that do not conform to pollutant and emission types expected
2	Responsible Agency Dataset	Submitted nonroad emissions
3	EPA Nonroad using NCD20101201	Includes NMIM NONROAD inputs received after June 1 and before November 30, 2010
4	EPA Nonroad using NCD20100602	Includes NMIM NONROAD inputs received before June 1, 2010 and EPA default inputs for remaining counties
Exception: California		
1	EPA Correction Dataset – Nonroad	Overwrites submitted emissions that do not conform to pollutant and emission types expected
2	Responsible Agency Dataset	CA Submitted nonroad emissions

4.5.3 Spatial coverage and data sources for the sector

Nonroad equipment emissions are included in every state, DC, Puerto Rice, and the Virgin Islands.

[Placeholder for CAP and HAP maps]

4.5.4 EPA-developed NMIM-based nonroad emissions data

For nonroad equipment, EPA requested that S/L/T agencies submit model inputs for use in running NMIM to produce NONROAD model emissions for 2008. After EPA completed the NMIM runs for areas that submitted data, EPA then loaded the resulting data into the EIS for S/L/T agency review. More information on these emissions is provided below and the full documentation (E.H. Pechan, 2011).

The EPA developed the EPA 2008 nonroad data in multiple phases. In the first phase, EPA ran NMIM for year 2008 for the entire country. This NMIM run used EPA default modeling inputs incorporated into "NCD20090327" (the naming convention reflects the NCD's lock-down date). These default inputs represented EPA's initial assumptions concerning key modeling parameters such as fuel blends, ambient temperatures, and on-road VMT. The 2008 nonroad source emission estimates from this phase were listed in the EIS under the dataset descriptions "EPA Nonroad using NCD20090327". The EPA then discovered a need to update some of the fuel parameter values from the assumptions used in NCD20090327. Consequently, EPA developed an updated NCD

reflecting the revised values, which was posted in EIS as "EPA NMIM Activity NCD20090531." This NCD was then posted for review/update by S/L/T agencies.

For the second phase, EPA set a deadline of June 1, 2010 for agencies to submit changes to the NCD20090531 values for their areas. After obtaining any necessary clarification on these changes from S/L/T agencies, EPA modified the NCD to reflect S/L/T updates, ran NMIM for 2008 for the entire country, and processed annual NMIM emissions output for loading into the EIS. This 2008 nonroad source NEI development phase resulted in the EIS emissions dataset "EPA Nonroad using NCD20100602".

In the third and final phase, agencies were afforded the opportunity to review EPA's emission estimates and provide additional revisions to NMIM inputs. After updating the NCD to reflect these revisions, EPA ran NMIM a final time and produced the EIS emissions dataset "EPA Nonroad using NCD20101201". This dataset only covers the geographical areas that submitted changes between July 2010 and November 2010.[16] The resulting NMIM county database that includes all of the data used to produce all of the final EPA data used is available in the file "ncd20101201.zip" (see Section 8.1 for access information).

4.5.5 Summary of quality assurance methods

Quality assurance steps performed on EPA's estimates are described in the documentation (E.H. Pechan, 2011).

EPA also performed QA steps on the agency-submitted data. We compared state and county EPA defaults, agency submittals and selection results by (1) included pollutants, SCCs, SCC-Emission Types (nonroad emission types are R=refueling, E=evap, X=exhaust), and (2) emissions summed to agency level.

Findings

- Although the agency data are assumed to better reflect state- or county-specific inputs, results can be significantly different for key pollutants, such as NOx, that will have an impact on ozone and PM formation in and around the state.
- Several agencies had only 1 or 2 of the 3 emission types: X (exhaust), E (evaporative), or R (refueling). The 2008 NEI selection results in higher emissions than EPA or agency estimates where SCC/emission type combinations are not congruent, because the remaining EPA estimates are included for any combinations not already in agency data. This is particularly the case for VOC and volatile HAPs where all agency emissions are reported as X (exhaust) and EPA estimates for R (refueling) and E (evaporative) values are added in the 2008 NEI.
    - Examples:
        - VOC in Utah is 3% greater in the 2008 NEI than in the agency submittal, 34% greater in Texas, and 30% greater in Jefferson Co, Kentucky; due in part to addition of remaining emission types in EPA dataset.
    - Based on EPA analysis of the emissions level, EPA changed every record submitted by Pennsylvania from emission type "E" (evaporative) to "X" (exhaust).

[16] Although Lincoln County Nebraska data were provided in time for the June submittal deadline, EPA uploaded the NMIM results in the NCD20101201 dataset rather than the NCD20100602 dataset.

    - The dataset "EPA Correction Dataset – Nonroad" zeroes out agency data where pollutant code/emission type combinations do not exist in EPA's dataset (e.g., evaporative PM) because they are not valid combinations in the NONROAD model.
- Some agencies may have overwritten a previous submittal with the resubmission of a single pollutant.
    - Examples
        - Idaho submittal includes nonzero records only for primary PM10
        - Louisville Metro submittal only includes SO2
    - In these cases, the agency-submitted data has been included only for the pollutants submitted in the last submission, and EPA data were used for the other pollutants
- When either the agency and EPA datasets have different SCCs or more SCC/ emission type combinations than the other, the 2008 NEI will have more SCCs or SCC/emission types than either the EPA or agency datasets does alone. This was only the case in Texas and Idaho. The possible adverse impacts of adding emissions to these two states due to this issue do not outweigh the benefits of using the state data, which is often significantly different from EPA data. The SCCs that EPA's dataset included and the agency did not are shown in Table 52.
    - Example:
        - NOx in Texas is 4% higher than the agency submittal, primary PM2.5 is 19% higher; due to 10 additional SCCs in EPA and not in agency submittal. This can be avoided by agencies in future submissions by submitting zero values for emissions from these SCCs if that is the agency's intent.

Table 52: Nonroad SCCs included in 2008 NEI that were not in S/L/T agency submittals

State	SCC	Description
ID	2268010010	CNG Industrial Equipment Other Oil Field Equipment
ID	2265007015	Off-highway Vehicle Gasoline, 4-Stroke Logging Equipment Forest Eqp – Feller/Bunch/Skidder
ID	2270010010	Off-highway Vehicle Diesel Industrial EquipmentOther Oil Field Equipment
ID	2265010010	Off-highway Vehicle Gasoline, 4-Stroke Industrial Equipment Other Oil Field Equipment
ID	2265007010	Off-highway Vehicle Gasoline, 4-Stroke Logging Equipment Shredders : 6 HP
ID	2270007015	Off –highway Vehicle Diesel Logging Equipment Forest Eqp – Feller/Bunch/Skidder
ID	2260007005	Off-highway Vehicle Gasoline, 2-Stroke Logging Equipment Chain Saws : 6 HP
TX	2270004036	Off-highway Vehicle Diesel Lawn and Garden EquipmentSnowblowers (Commercial)
TX	2260004071	Off-highway Vehicle Gasoline, 2-Stroke Lawn and Garden Equipment Turf Equipment (Commercial)
TX	2265004036	Off-highway Vehicle Gasoline, 4-Stroke Lawn and Garden Equipment Snowblowers (Commercial)
TX	2260004036	Off-highway Vehicle Gasoline, 2-Stroke Lawn and Garden Equipment Snowblowers (Commercial)
TX	2267004066	LPG Lawn and Garden Equipment Chippers/Stump Grinders (Commercial)
TX	2270004056	Off-highway Vehicle Diesel Lawn and Garden EquipmentLawn and Garden Tractors Commercial)
TX	2268010010	CNG Industrial Equipment Other Oil Field Equipment
TX	2270010010	Off-highway Vehicle Diesel Industrial Equipment Other Oil Field Equipment
TX	2265010010	Off-highway Vehicle Gasoline, 4-Stroke Industrial Equipment Other Oil Field Equipment
TX	2265004056	Off-highway Vehicle Gasoline, 4-Stroke Lawn and Garden Equipment Lawn and Garden Tractors (Commercial)

- Most agencies did not submit HAPs, and therefore the data in the2008 NEI came from the EPA-created data. We considered whether including EPA data for HAPs but state and/or state plus EPA data for CAPs could cause any problems. Since the 2008 NEI for criteria VOC and PM is always larger than the EPA VOC or PM for any state, we can be assured that the 2008 NEI criteria VOC will always be larger than the sum of the 2008 NEI VOC HAPs, and that the 2008 NEI criteria PM will always be larger than the sum of the 2008 NEI PM HAPs. Nevertheless, there is still an inconsistency between CAPs and HAPs because of the different approaches used to compute each of them.
- The California submittal differed dramatically from EPA dataset in SCC and pollutant coverage due to being estimated with a different model. The two data sources could not be merged without numerous double counts. Only California data were used in this case. The 2008 NEI in California does not agree well with the rest of the country.
    - Example:
        - California nonroad data does not include NH3, and therefore it is missing from the 2008 NEI as well
- The EPA dataset does not include tribal areas. Therefore the 2008 NEI contains only tribal submission data and includes only the SCCs and pollutants submitted by tribes, which can be different from the county data.

- Agencies emissions are likely to capture local scale details that EPA data may not, particularly because most the agencies submitting emissions did not submit input data. Some agency data differ significantly from EPA's.
    - Examples:
        - Texas NOx is 20% higher than EPA
        - Delaware and New York SO2 are each about 300% higher than EPA, perhaps indicating higher sulfur fuel usage than EPA assumed.

4.6 On-road – all Diesel and Gasoline vehicles

This section includes the description of four EIS sectors:

- Mobile – On-road – Diesel Heavy Duty Vehicles
- Mobile – On-road – Diesel Light Duty Vehicles
- Mobile – On-road – Gasoline Heavy Duty Vehicles
- Mobile – On-road – Gasoline Light Duty Vehicles

They are treated here in a single section because the methods used are the same across all sectors.

4.6.1 Sector Description

The four sectors for on-road mobile sources include emissions from motorized vehicles that are normally operated on public roadways. This includes passenger cars, motorcycles, minivans, sport-utility vehicles, light-duty trucks, heavy-duty trucks, and buses. The sectors include emissions from parking areas as well as emissions while the vehicles are moving.

SCCs starting with 22010 define the light duty gasoline vehicles including motorcycles, with the exception of SCCs starting with 220107, which define the heavy duty gasoline vehicles. SCCs starting with 22300 define the light duty diesel vehicles, with the exception of SCCs starting with 223007 that define the heavy duty diesel vehicles.

Prior versions of the 2008 NEI and past NEIs included emissions from the MOBILE6 model. The 2008 NEI v2 is the first NEI to include emissions from the MOVES model.

4.6.2 Sources of data overview and selection hierarchy

All 2008 NEI on-road estimates were calculated by EPA using MOVES, except in California. Table 53 shows the selection hierarchy

Table 53: 2008 NEI on-road mobile selection hierarchy

Priority	Dataset Name	Dataset Content
1	2008_EPA_MOBILE	EPA's draft MOVES2010b-based estimates
Exception: California and tribes		
1	EPA Correction Dataset – Onroad	Overwrites submitted emissions that do not conform to pollutant and emissions types expected
2	Responsible Agency Dataset	Submitted on-road emissions

California submitted emissions to the NEI based on the EMFAC model, which is a separately EPA-approved model to be used only in California. Because California's emissions were calculated with a different model, the emissions are not congruent with the rest of the country in terms of SCCs used, pollutants present, and emission type coverage.

During the 2008 NEI development cycle for on-road mobile emissions, EPA requested that S/L/T agencies submit NMIM inputs for use in an EPA 2008 NEI NMIM run to generate MOBILE6-based emissions. At the start of the 2008 NEI cycle, the MOVES model had not yet been released for criteria pollutants and the input formats were not stable, and so it was not possible for EPA to collect the MOVES input formats or MOVES-based emissions. A summary of the NMIM input submittals and EPA's conversion of VMT to inputs is described in Section 3.2.3 of the project documentation for EPA's mobile data (E.H. Pechan, 2011). EPA used the NMIM inputs to update the EPA NMIM input database. If an agency submitted on-road emissions (which includes VMT data) rather than NMIM inputs, then EPA compiled the VMT from this submittal for use in EPA's NMIM run. EPA used the NMIM database to create 2008 on-road emissions using NMIM, which were used in version 1 and 1.5 of the 2008 NEI along with any emissions submitted by agencies that did not provide NMIM inputs.

After the formal 2008 NEI submission period had ended, EPA provided S/L/T agencies the opportunity to provide MOVES inputs. A few states provided these data, which were used in subsequent data development steps described below. No agencies submitted MOVES-based emissions estimates. EPA converted the NMIM database for input to MOVES and then overlaid these data with the MOVES inputs provided by some states. The resulting database was the starting point for the MOVES-based emissions described below, and as described, EPA continued to make changes to the database prior to running MOVES for the NEI.

Several tribes submitted data based on the MOBILE6 model, but these data were not included in the NEI selection because of the switch to a MOVES-based inventory. The tribal data is available in EIS. These tribes were: the Kootenai Tribe of Idaho, the Eastern Band of Cherokee Indians, the Nez Perce Tribe, the Northern Cheyenne Tribe, the Pueblo of Laguna, New Mexico, and the Shoshone-Bannock Tribes of the Fort Hall Reservation of Idaho.

4.6.3 Spatial coverage and data sources for the sector

The on-road mobile sectors include emissions in every state, Puerto Rico, and the US Virgin Islands.

[Placeholder for CAP and HAP maps and associated observations]

4.6.4 EPA-developed on-road mobile emissions data for the continental U.S.

For the 2008 NEI, EPA estimated emissions for every county in the U.S. except for California. For the continental U.S., we used county-specific inputs and tools that integrated the MOVES model with the SMOKE[17] emission inventory model to take advantage of the gridded hourly temperature information available from meteorology modeling used for air quality modeling. This integrated "SMOKE-MOVES" tool was developed by EPA in 2010 and is in use by states and regional planning organizations for regional air quality modeling. SMOKE-MOVES

[17] A beta version of SMOKE v3.0 was used for the 2008 NEI v2. The current version is available at: http://www.smoke-model.org/index.cfm

requires emission rate "lookup" tables generated by MOVES that differentiate emissions by process (running, start, vapor venting, etc.), vehicle type, temperature, speed, hour of day, etc. To generate the MOVES emission rates that could be applied across the U.S., EPA used an automated process to run MOVES to produce emission factors by temperature and speed for 167 "representative counties," to which every other county could be mapped, as detailed below. Using the MOVES emission rates, SMOKE selected appropriate emissions rates for each county, hourly temperature, SCC, and speed bin and multiplied the emission rate by activity (VMT or vehicle population) to produce emissions. These calculations were done for every county, grid cell, and hour in the continental U.S. and aggregated to produce continental U.S. emissions. The MOVES "RunSpec" files (that tells MOVES what to run for each representative county) are available in the file "RepCounty_Runspecs.zip" (see Section 8.1 for access information). A full listing of datasets available as supporting information for the on-road MOVES runs is available in Section 8.1 and these are referenced in the subsections below.

EPA used a different approach for states and territories outside the lower 48 states. For Alaska, Hawaii, Puerto Rico and the Virgin Islands, EPA ran MOVES in "inventory mode" for each county and month, using county-specific inputs. More information is provided Section 4.6.5.

SMOKE-MOVES can be used with different versions of the MOVES model. For the 2008 NEI, EPA used a modified version of MOVES2010a (http://www.epa.gov/otaq/models/moves/index.htm). Since the release of MOVES2010a, EPA has continued to improve MOVES. The NEI was modeled between the release of MOVES2010a (September 2010) and the release of MOVES2010b (April 2012), and used an intermediate draft version of the MOVES2010b model. This version of the model included improvements to handling of refueling and extended idle emissions, addressed errors in the MOVES2010a emission rates for ammonia (NH3), nitrous oxide (NO) and nitrogen dioxide (NO2), and included the capability to model additional hazardous air pollutants. EPA made other changes to the MOVES2010a model to facilitate the large number of parallel runs that needed to be done to complete the NEI. Details on the changes to air toxics are detailed in a separate technical report (US EPA, 2012). Full documentation for MOVES2010b will be available when the model is released.

Using SMOKE-MOVES for creating the NEI requires numerous steps, as described in the sections below:

- Determine which counties will be used to represent other counties in the MOVES runs (see Section 4.6.4.1)
- Determine which months will be used to represent other month's fuel characteristics (see Section 4.6.4.2)
- Create MOVES inputs needed only for MOVES runs (see Sections 4.6.4.3 and 4.6.4.4). MOVES requires county-specific information on vehicle populations, age distributions, and inspection-maintenance programs for each of the representative counties.
- Create inputs needed both by MOVES and by SMOKE, including a list of temperatures needed by running the SMOKE-MOVES "Met4moves" tool (see Sections 4.6.4.5 and 4.6.4.6).
- Run MOVES to create emission factor tables (see Section 4.6.4.7)
- Run SMOKE to apply the emission factors to activities to calculate emissions (see Section 4.6.4.8)
- Aggregate the results at the county-SCC level for the NEI (see Section 4.6.4.9)

4.6.4.1 Representative counties

Although EPA compiles county-specific databases for all counties in the nation, actual county-specific data are rare. Instead, much of our "county" data are based on state-wide estimates or national defaults. For the NEI, rather than explicitly model every county in the nation, we have done detailed modeling for some counties and less detailed estimates for the other counties. This approach dramatically reduces the number of modeling runs required to generate inventories and still takes into account important differences between counties.

In this approach, we group counties that have similar properties that would result in similar emission rates. We explicitly model only one county in the group (the "representative" county) to determine emission rates. These rates are then used in combination with county specific activity and meteorology data, to generate inventories for all of the counties in the group. The grouping of counties was based on several characteristics as summarized in Table 54 below.

Table 54: Characteristics for Representative County Groupings

County Grouping Characteristic	Description
PADD	Petroleum Administration for Defense Districts (PADDs). PADD 1 is divided into three sub-PADD groupings and each sub-group is treated as a separate PADD (1a, 1b and 1c). Each state belongs to a PADD and all counties in any state are within the same PADD.
Fuel Parameters	Weighted average gasoline fuel properties for January and July 2008, including RVP, sulfur level, ethanol fraction and percent benzene
Emission Standards	Some states have adopted California highway vehicle emission standards or plan to adopt them. Since implementation of the standards varies, each state with California standards is treated separately.
Inspection/Maintenance Programs	Counties were grouped within a state according to whether or not they had an inspection/maintenance (I/M) program. All I/M programs within a state were considered as a single program, even though each county may be administered separately and have a different program design.
Altitude	Counties were categorized as high or low altitude based on the criteria set forth by EPA certification procedures (4,000 feet above sea level).
Fleet Age	The weighted average age of passenger cars.
Total VMT	County total vehicle miles traveled.

The result is a set of 167 county groups with similar fuel, emission standards, altitude, I/M programs and fleet age. For each group, the county with the highest total VMT was chosen as the representative county for the group (this VMT is not used to calculate the emissions however). A summary of the representative counties is available in the spreadsheet included in "MCXREF_2008_summary.zip" and the MOVES County Database Manager databases are available in the file "RepCounty_Counties.zip" (see Section 8.1 for access information).

For each county group, SMOKE-MOVES generated a set of emission rates that varied by SCC (vehicle type and road type), fuel, speed, temperature, and humidity; thus, we did not need to consider the fleet mix, fuel, speed, temperature range, or humidity in our grouping characteristics. This greatly increased the number of counties that can be grouped, and reduced the number of MOVES runs required.

4.6.4.2 Fuel months

The concept of a fuel month is used to indicate when a particular set of fuel properties should be used in a MOVES simulation. Similar to the reference county, the fuel month reduces the computational time of MOVES by using a single month to represent a set of months. For the 2008 NEI runs, EPA used January or July to represent other months. For example, if the grams/mile exhaust emission rates in January were identical to February's rates for a given reference county, temperature, and other factors, then we used a single fuel month to represent January and February. In other words, only one of the months was modeled through MOVES. The hour-specific VMT, temperature and other factors for February were still used to calculate emissions in February, but the emission factors themselves were not recreated since one month could represent the other month sufficiently. The fuel months used for each representative county are available in the spreadsheet included in "MFMREF_2008.zip" (see Section 8.1 for access information).

4.6.4.3 Fuels

Although state-submitted NMIM and MOVES input data may have included information about fuel properties, the MOVES runs for the 2008 NEI were run using a set of fuel properties for each county in 2008 generated by EPA. We developed these data using a combination of purchased fuel survey data, proprietary fuel refinery information and known federal and local regulatory constraints.

The 2008 fuels generated by EPA were developed by interpolating between a 2005 reference fuel supply and a 2017 fuel supply that had been developed for use in EPA regulation development, using year-by-year gasoline fuel property regulations (such as sulfur and benzene control) and projected national ethanol penetration levels per year based on the 2011 Ethanol Industry Outlook (Renewable Fuels Association, 2011). EPA made adjustments to align 10% ethanol (E10) fuel properties in interpolated years.

The following list provides a step-by-step outline of the interpolation steps applied to create the 2008 fuel supply database.

1) Methyl tertiary butyl ether, ethyl tert-butyl ether, and teriary amyl methyl ether fuel blends were removed from the 2005 fuel supply and replaced with appropriate E10 (a mixture of 10% ethanol and 90% gasoline) levels and properties found from refinery modeling.

2) Reformulated Gasoline (RFG) areas were adjusted to contain only E10 blends and associated fuel properties.

3) Ethanol blends from 2005 were removed and replaced with appropriate properties found from the updated refinery modeling used to generate the 2017 fuel supply.

4) Gasoline sulfur levels were reduced to 30 ppm for all counties outside of the Geographic Phase-in Area (GPA). Counties within the GPA remain at the sulfur levels found in the 2005 reference case. The counties in the GPA are defined in the Code of Federal Regulations (CFR Title 40 Section 80.215).

5) E10 market share was adjusted by county to a minimum market share of 45%. Counties with market share above 45%, including RFG counties, remain at the higher market share.

6) Diesel fuel was carried over from the 2005 fuel supply.

4.6.4.4 Other local MOVES inputs

In addition to fuels and the information also needed by SMOKE (in the following sections), MOVES also required inputs such as age distribution and I/M program descriptions for each of the representative counties. At the county level, these inputs provide an opportunity to assure that the model properly accounts for the most recent available local data. When these data were available from the state-supplied NMIM inputs, we converted the NMIM data (version NCD20101201) for use in MOVES. EPA manually imported the 2008 data from Delaware and Utah into a MOVES format. Only data related to VMT, vehicle populations, speed distributions and age distributions were imported. Fuel data submitted by states was not used for the 2008 NEI in order to use the latest EPA estimates and make selecting representing counties easier. Similarly, meteorological data from states were not used, since the NEI calculations used the SMOKE generated meteorological data instead. Other state data from the NMIM data format were not used because of the project schedule and resource constraints.

In the few cases where MOVES input data were provided, we used that data. At their request, we converted 2007 data (already in MOVES format) submitted by Florida and Shelby County, Tennessee for use in calendar year 2008, augmenting with 2008 calendar year VMT, population and average speed estimates. Extensive 2008 data were provided by Texas, but these data were not easily converted to MOVES format, so EPA did not have time to include these data. EPA also received additional data from Connecticut, but the data were received too late to be included. When state-supplied data were not available, we used MOVES defaults.

When state-supplied data were not available, we used MOVES defaults. In the state-provided data, EPA identified errors in age distributions provided for two counties in Arkansas (FIPS codes 05015, 05143) which resulted in anomalous results. Those age distributions were replaced with default distributions prior to the final run of MOVES for the NEI.

For the continental U.S., all of these MOVES inputs were organized by representative counties. This means that only the counties used to represent other counties had specific information for the MOVES runs. As listed in Section 8.1, the MOVES input data for the representative counties are available in several sets of files provided with the supporting data for this documentation.

4.6.4.5 Temperature and humidity

Ambient temperature can have a large impact on emissions. Low temperatures are associated with high start emissions for many pollutants. High temperatures are associated with greater running emissions due to the higher engine load of air conditioning. High temperatures also are associated with higher evaporative emissions.

The 12-km gridded meteorological input data for the entire year of 2008 covering the continental United States were derived from simulations of version 3.1 of the Weather Research and Forecasting Model (WRF, http://wrf-model.org), Advanced Research WRF core (Skamarock, et al., 2008). The WRF Model is a mesoscale

numerical weather prediction system developed for both operational forecasting and atmospheric research applications. The Meteorology-Chemistry Interface Processor (MCIP) version 3.6 (http://www.cmascenter.org/help/model_docs/mcip/3.6/ReleaseNotes) was used as the software for maintaining dynamic consistency between the meteorological model, the emissions model, and air quality chemistry model. The hourly gridded meteorological data were post-processed by met4moves to determine the maximum temperature ranges, average relative humidity, and a series of diurnal temperature profiles. The hourly gridded meteorological data (output from MCIP) was also used directly by SMOKE (Section 4.6.4.7).

EPA applied the SMOKE-MOVES tool Met4moves to the WRF-based gridded, hourly temperatures to generate a list of all the possible temperatures and temperature profiles that are needed for MOVES to create the emission-factor lookup tables. "Temperature profiles" are arrays of 24 temperatures that describe how temperatures change over a day, and they are used by MOVES to estimate vapor venting emissions. In SMOKE-MOVES, the vapor venting emissions are called "rate-per-profile" processing.

The temperature lists were organized based on the representative counties and fuel months as described in Sections 4.6.4.1 and 4.6.4.2, respectively. Temperatures were analyzed for all of the counties that are mapped to the representative counties, i.e., for the county groups, and for all the months that were mapped to the fuel months. EPA used Met4moves to determine the minimum and maximum temperatures in a county group for the January fuel month and for the July fuel month, and the minimum and maximum temperatures for each hour of the day. Met4moves also generated temperature profiles using the minimum and maximum temperatures and 10 degree intervals.

The treatment of humidity was simpler. Met4moves calculated an average day-time (6 am to 6 pm) relative humidity for the county group for the months mapped to July and for the months mapped to January. When the emission factors are applied by SMOKE (Section 4.6.4.7), the appropriate (July or January) humidity was used for all runs of the county group.

Met4moves can be run in daily or monthly mode for producing SMOKE input. In monthly mode, the temperature range is determined by looking at the range of temperatures over the whole month for that specific county. Therefore, there is one temperature range per county per month. While in daily mode, the temperature range is determined by evaluating the range of temperatures in that county for that day. The output for the daily mode is one temperature range per county per day and is a more detailed approach for modeling the vapor venting emissions. EPA ran Met4moves in daily mode for 2008 NEI.

The resulting temperatures provided to the representative counties are available in the file "RepCounty_temperatures.zip" (see Section 8.1 for access information). The gridded, hourly temperature data used are publicly available only upon request and with provision of a disk media to copy these very large datasets (contact info.chief@epa.gov).

4.6.4.6 VMT, vehicle population, and speed

SMOKE requires county-specific VMT, population, and average speed by SCC to calculate the gridded or county emissions. Unlike the other inputs that are needed just for the representative counties, these inputs are needed for every county. When available, VMT and vehicle population estimates were obtained from data submitted by states. The state submitted input data are discussed in Section 4.6.4.4. As described above, most of the VMT information used was converted to a MOVES format from data originally supplied to EPA as NMIM input data.

Data obtained from the NCD did not contain vehicle population data. When population data were not available, the vehicle population data were derived from the state supplied VMT data using methodologies provided in MOVES guidance for that purpose.

The average speeds provided to SMOKE for each county were derived from the default national average speed distributions found in the default MOVES2010a database AvgSpeedDistribution table. These average speeds are the average speeds developed for the previous EPA highway vehicle emission factor model, MOBILE6. EPA used the MOVES distribution of average speeds for each hour of the day for each road type to calculate an overall average speed for each hour of the day. These hourly average speeds were weighted together using the default national average hourly VMT distribution found in the MOVES default database HourlyVMTFraction table, to calculate an average speed for each road type. This average speed by road type was provided to SMOKE for each county.

SMOKE requires VMT by county and SCC, but MOVES is not based on the traditional NEI SCCs. Because the VMT in each MOVES county database is by the broader category of "HPMSVtype", it was necessary to allocate this VMT to the SCCs. We did this by running MOVES at the national level for 2008 with MOVES defaults. Then we used the activity output to determine default ratio of sourcetype VMT to HPMSVtype VMT. We also used this output to determine ratios of sourcetype/fueltype to sourcetype VMT. We used the NCD20110908.baseyearvmt to determine "roadtype ratios" i.e., allocation from MOVES roadtypes to SCCroadtypes by county and SCCvtype (same as P5vclass). Because some ratios were missing, we used ratios for cars (vtype=1) to fill in any missing ratios . Next we applied these ratios and the MOVES2010a (MOVESdb20100830) sccvtypedistribution for model year 2008 to allocate VMT to SCCVtype. And we used roadtype ratios previously derived from NCD to allocate countyroadtype VMT to SCC roadtypes. Finally, we used county-specific monthvmtfractions to allocate VMT to each month.

Vehicle populations also had to be allocated to SCC. We started with state-provided (or default) MOVES inputs on vehicle populations by county. These were provided by vehicle sourcetype. We had to allocate this population by fueltype and to the various SCC categories. To do this, we ran MOVES at the national level for 2008 with default inputs. This generated activity by sourcetype and fuel type, so we could determine the default split of each sourcetype between gasoline and diesel fueled- vehicles. Using this ratio and the MOVES2010a (MOVESdb20100830) sccvtypedistribution for model year 2008, we allocated the MOVES default population to SCC.

The MOVES MySQL databases that include the VMT and vehicle population used for the representative counties are listed in Section 8.1. The SMOKE input VMT, vehicle population, speed data, and hourly speed profiles used to estimate emissions for every county are available in the files "VMT_NEI_2008_updated2_18jan2012_v3.zip", "VPOP_NEI_2008_18jan2012_v3.zip", "SPEED_2008NEI_18nov2011_v0.zip", and "spdpro_2008nei_18nov2011_v0.zip" (see Section 8.1 for access information).

4.6.4.7 Run MOVES to create emission factors

EPA used the SMOKE-MOVES driver scripts to run MOVES for each of the representative counties, fuel-months, and the listed temperatures and temperature profiles. This step resulted in three EF tables created for each representative county and fuel month: Rate per Distance (RPD), rate per vehicle (RPV), and rate per profile (RPP).

4.6.4.8 Run SMOKE to create emissions

The SMOKE-MOVES program that combines activity data and emission factors is "Movesmrg". EPA ran Movesmrg for each of the three sets of emission factor tables (RPD, RPV, and RPP). During the Movesmrg run, the program uses the hourly, gridded temperature (for RPD and RPV) or daily temperature profile (for RPP) to select the proper emissions rates and compute emissions. These calculations were done for all counties and SCCs in the SMOKE inputs, covering the continental U.S.

The emissions process RPD is for modeling the on-network emissions. This includes the following modes: vehicle exhaust, evaporation, evaporative permeation, brake wear, and tire wear. For RPD, the activity data are monthly VMT, average monthly speed, and hourly speed profiles for weekday versus weekend (SMOKE "SPDPRO" file)[18]. The SMOKE program temporal takes vehicle and roadtype specific temporal profiles and distributes the monthly VMT to day of the week and hour. Movesmrg reads the speed data for that county and SCC and the temperature from the gridded hourly data and uses these values to look-up the appropriate EF from the representative county's EF table. It then multiplies this EF by temporalized VMT to calculate the emissions for that grid cell and hour. This is repeated for each pollutant and SCC in that grid cell.

The emission process RPV is for modeling the off-network emissions. This includes the following modes: vehicle exhaust, evaporative, and evaporative permeation. For RPV, the activity is vehicle population. Movesmrg reads the temperature from the gridded hourly data and uses the temperature plus SCC and the hour of the day to look up the appropriate EF from the representative county's EF table. It then multiplies this EF by the vehicle population for that SCC and FIPS to calculate the emissions for that grid cell and hour. This repeats for each pollutant and SCC in that grid cell.

The emission process RPP is for modeling the off-network emissions for parked vehicles. This includes the mode vehicle evaporative (fuel vapor venting). For RPP, the activity is vehicle population. Movesmrg reads the county based diurnal temperature range from met4moves' output for SMOKE. It uses this temperature range to determine the most similar idealized diurnal profile from the EF table using the temperature min and max, SCC, and hour of the day. It then multiplies this EF by the vehicle population for that SCC and FIPS to calculate the emissions for that grid cell and hour. This repeats for each pollutant and SCC within the county.

The result of the Movesmrg processing is hourly, gridded data suitable for use in air quality modeling as well as daily reports for the three processing streams (RPD, RPV, and RPP). The results include emissions for each county, rather than just for the representative counties, because Movesmrg has taken the county-specific activity and combined it with the representative county emission rates to produce emissions.

4.6.4.9 Post-Processing to Generate Annual Inventory

For the purposes of the NEI, EPA needed emissions data by county, SCC, pollutant, and emission type (exhaust, evaporative, brake wear, and tire wear). EPA developed and used a set of scripts to combine the emissions from the three sets of reports and from all days to create the annual inventory.

Metals and dioxins were generated through a separate process. Instead of having county, process, and temperature specific emission factors, a national EF for each pollutant/SCC combination was multiplied by the

[18] If the SPDPRO file is available, the hourly speed takes precedence over the average monthly speed.

appropriate VMT for a specific county to create annual emissions for that pollutant. Table 55 lists the pollutants that we estimated using national Efs.

Table 55: Pollutants estimated through national emission factors

NEI pollutant	Description
16065831	Chromium III
1746016	2,3,7,8-Tetrachlorodibenzo-p-Dioxin
18540299	Chromium (VI)
19408743	1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin
3268879	Octachlorodibenzo-p-Dioxin
35822469	1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin
39001020	Octachlorodibenzofuran
39227286	1,2,3,4,7,8-Hexachlorodibenzo-p-Dioxin
40321764	1,2,3,7,8-Pentachlorodibenzo-p-Dioxin
51207319	2,3,7,8-Tetrachlorodibenzofuran
55673897	1,2,3,4,7,8,9-Heptachlorodibenzofuran
57117314	2,3,4,7,8-Pentachlorodibenzofuran
57117416	1,2,3,7,8-Pentachlorodibenzofuran
57117449	1,2,3,6,7,8-Hexachlorodibenzofuran
57653857	1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin
60851345	2,3,4,6,7,8-Hexachlorodibenzofuran
67562394	1,2,3,4,6,7,8-Heptachlorodibenzofuran
70648269	1,2,3,4,7,8-Hexachlorodibenzofuran
72918219	1,2,3,7,8,9-Hexachlorodibenzofuran
7439965	Manganese
7439976	Mercury
7440020	Nickel
7440382	Arsenic
N2O	Nitrous Oxide

The on-road emissions for Alaska, Hawaii, Puerto Rico and the Virgin Islands, which EPA generated via MOVES in inventory mode (see Section 4.6.5) were appended to the on-road inventory generated from SMOKE-MOVES. The emissions for metals and dioxins were also appended to the on-road inventory to create the final emissions. This complete inventory was submitted to the EIS as the EPA estimates for the on-road sector. The resulting EIS dataset is named “2008_EPA_MOBILE”.

4.6.5 EPA-developed on-road mobile emissions data for Alaska, Hawaii, Puerto Rico and the Virgin Islands

Since the meteorology domain used by EPA for running SMOKE-MOVES covered only the continental U.S., EPA used the MOVES “inventory mode” to create emissions for Alaska, Hawaii, Puerto Rico and the Virgin Islands. These runs used the average monthly hourly temperatures and humidity values available in the MOVES database as derived from the NMIM database described above (see Section 4.6.4.4).

The MOVES inputs used for these emissions are available as described in Section 8.1. The file "AKHIPRVI_Counties.zip" contains the MOVES county database manager databases, and the file "AKHIPRVI_Runspecs.zip" contains the run specifications used to run MOVES. Lastly, the file "akhiprvi_temperatures.zip" contains the MySQL database containing the tables that describe the temperatures and relative humidity values used for these states and territories.

4.6.6 Summary of quality assurance methods

EPA did a series of checks and comparisons against both the inputs and the resulting emissions to quality assure the on-road inventory. The following is a list of the more significant checks and resulting corrections:

- Checked the VMT data by comparing the 2008 with a 2005 based activity data. Also analyzed the ratio VMT to vehicle population to look for extreme values. Identified widespread errors in ID and NV. Found additional problems in two counties in CA and 10 counties in VA. Updated the VMT in consultation with OTAQ. Reran RPD (the processes that are dependent on VMT) for the above counties.
- Checked the consistency of VMT with vehicle population and identified counties in which there was VMT but no vehicle population. Updated the vehicle population in consultation with OTAQ for the following FIPS (16061, 30069, 31005, 51610, and 51685). Reran RPP and RPV (processes that are dependent on vehicle population) for these counties.
- Many counties in Texas had identical extremely high populations and VMT. We reran all 254 Texas counties using older data.
- Three counties in Florida and one in Tennessee were missing monthvmt and roadtypedistribution tables and had to be re-run using MOVES default values.
- The county databases for Norton City VA (51720) listed zero VMT and zero population. We substituted county data from the 2005 NEI.
- Cottonwood, MN (27033) had an unreasonably low vehicle population of only 82 vehicles. Instead, we used VMT from NCD 20101201 and Population/VMT ratios from the 2005 NEI.
- Three counties in Florida (12086, 12033, 12057) had populations and VMT that were inconsistent with independent sources. We substitute more consistent county inputs provided in spring 2011.
- Identified a large number of missing SCCs in the activity data for Georgia. Determined that there was a truncation problem in the conversion of the MOBILE6 activity data submitted by the states into MOVES activity data. Returned to the original state submitted VMT data and reprocessed it for SMOKE-MOVES.
- Identified errors in age distributions in two counties in Arkansas (FIPS codes 05015, 05143) which resulted in anomalous results. The state supplied age distributions were replaced with default distributions prior to the final run of MOVES for the NEI. Generated new Efs for these two reference counties and reran RPD, RPP, and RPV for all of Arkansas and Louisiana.
- Identified a problem with the toluene and xylenes HAP emissions for diesel vehicles. Recalculated these emissions by using a fixed ratio of toluene to VOC (0.00433) and xylenes to VOC (0.003784). Applied these factors to whole inventory (both portion generated by SMOKE-MOVES and MOVES directly) to generated new toluene and xylene emissions for diesel SCCs.
- Compared the on-road results to similar results from the previous version of the 2008 NEI. The previous version was prepared using MOBILE6. We found numerous differences between the two sets of results. Detailed comparisons by state, county and SCC vehicle type showed that most of the differences were due to updated input data from the states, or to differences between the two emission models. In

particular, based on an updated understanding of vehicle emissions, the MOVES model generally predicts much higher NOx, PM and ammonia emissions compared to the MOBILE6 model. And, the MOVES model generally predicts lower emissions of hydrocarbons and carbon monoxide (Beardsley, 2010). These trends were evident in the comparisons of the two NEI versions.

- The comparisons between Version 1.5 and Version 2 of the 2008 NEI did identify one problem with Version 2. Sulfur dioxide emissions and sulfate emissions are incorrectly inflated. This also overestimates emissions of total PM2.5 and total PM10 (since those totals include sulfates). This overestimate was due to a mistake in the default values for sulfur levels in 2008 diesel fuels. The magnitude of the error varies by county, depending on the ratio of the modeled and the actual diesel sulfur levels. Diesel fuel levels should have been closer to 15ppm sulfur because of the Ultra Low Sulfur Diesel rulemaking phase-in, rather than the average of ~100ppm actually included. This error did not significantly affect total emissions from diesel vehicles, but it caused the calculated values for SO2 and SO4 emissions for diesel vehicles to be too high.
- Compared the 2008 NEI v2 with a similar run done for 2005 using 2005 inputs. In general, this comparison indicated the expected growth of emissions over those three years. It also identified an error in two county-specific age distributions that were fixed before the 2008 NEI was finalized, and identified errors in county VMT and populations that we were able to repair before finalizing the inventory.
- Air toxic results were quality assured by back-calculating toxics ratios from inventory outputs to ensure they were consistent with inventory inputs.

5 Fires

Fire sources in this section are sources of pollution caused by the inadvertent or intentional burning of biomass including forest, rangeland (e.g., grasses and shrubs), and agricultural vegetative residue. This section describes the 2008 NEI wildfires (Section 5.1), prescribed burning (also Section 5.1), and agricultural burning (Section 5.1.4). Other types of fires are included in other EIS sectors, such as "Fuel Combustion – Residential – Wood" (Section 0), the "Waste Disposal" (Section 0), which includes fires from burning yard waste, land clearing, residential household waste, logging debris, and commercial, institutional, industrial, and "open dump" burning of biomass and other refuse; and "Miscellaneous Non-Industrial NEC" (Section 0), which includes structure fires, firefighting as part of waste disposal, firefighting training fires, motor vehicle fires, and other open fires.

5.1 Wildfires and Prescribed burning

This section describes the 2008 NEI approach for wildfires, prescribed burning, and wild land fire use, collectively called "wild land" fires (WLFs). Precise definitions of these types of fires are provided below in Section 5.1.1. These are included in the same section because the approach used is generally the same, except with slight differences for the blending of EPA data with data supplied by S/L/T agencies.

For the 2008 NEI, the EIS database contains wildfires and prescribed fires as both event-based (point source, day-specific) data and nonpoint data. The EPA dataset for wildfires and prescribed fires used the event structure, some S/L/T agencies also used this structure, and other S/L/T agencies used the nonpoint structure (for prescribed fires). Because some EIS features have not yet been built, EPA was unable to combine these data sources into a single selection for the wildfire and prescribed burning sectors, and so we combined the data outside of EIS. The 2008 NEI website (see Section 1.3.2) provides the combined wildfire and prescribed fire data at the county-SCC resolution, but this same information is not yet available directly through EIS reports.

5.1.1 Sector Description

WLFs are generally defined as any non-structural fire that occurs in wild lands. Included in WLFs are the following types of fires:

- Prescribed (Rx) fire: Any fire ignited by management actions to meet specific objectives, generally related to the reduction of the biomass potentially available for wildfires.
- Wildfire (WF): An unplanned, unwanted WLF including unauthorized human-caused fires, escaped prescribed fire projects, or other inadvertent fire situation where objective is to put the fire out.
- Wildland Fire Use (WFU): The application of appropriate management response to naturally-ignited WLFs to accomplish specific resource mgmt objective in pre-designated areas outlined in fire management plans. In other words, an unplanned fire that is subsequently controlled and used as a Rx fire to meet specific objectives.

A significant improvement to the 2008 NEI over the 2005 NEI and previous data released for 2008 is that we have eliminated the "unclassified" fires in the EPA dataset as a result of advancements in the Satellite Mapping Automated Reanalysis Tool for Fire Incident Reconciliation (SMARTFIRE) approach by using SMARTFIRE version 2 (SFv2), as described in Section 5.1.4. The unclassified fires had previously been caused by the satellite-based SMARTFIRE version 1 (SFv1) approach, where no methods had been implemented to assign a wildfire or

prescribed fire status when ground-based (observational) data were not available for a particular fire. In SFv1, these fires were assigned to an unclassified status, but that is no longer the case.

Table 56 lists the SCCs that define these three different types of WLFs in the 2008 NEI, both for EPA data and for S/L/T data. Note that EPA data has only one unique SCC for each of these types of fires. Data submitted by S/L/T agencies can have several different SCCs that define prescribed fires. As described below, EPA's approach to combine EPA data with S/L/T data for the 2008 NEI considers all SCCs that define any one type of fire and appropriately combines emissions from those SCCs.

Table 56: Source classification codes for wildland fires

Data Origin	Wildfires	Prescribed Burns	Wildland Fire Use
EPA	2810001000	2810015000	2810001001
States/Locals/Tribes	2810001000	2811015000 2810015000 2810020000	2810001001

5.1.2 Sources of data overview and selection hierarchy

The wildfire and Rx fire EIS sectors include data from three components: S/L/T agency-provided emissions data (event-based and nonpoint county totals), an EPA dataset created from SFv2 (see Section 5.1.4), and a HAP augmentation effort to estimate HAPs from CAP emissions where state data were used (see Section 5.1.5). The combination of these data are only available as summary information on the 2008 NEI website and not in EIS, as mentioned above. Summaries of the agency-supplied data are available in the spreadsheets "StateData_wildlandFires.xlsx" for the state data and "TribalData_wildlandFires.xlsx" for the tribal data (see Section 8.2).

The S/L/T agency data were received from agencies listed in Table 57. The table notes when the data were provided as events or as nonpoint data.

Table 57: Agencies that submitted wildfire and prescribed burning emissions data

Agency	Agency Type	Rx provided	Wildfire provided
Arizona	State/Local	as nonpoint	as event
California	State	as nonpoint	
Delaware	State	as nonpoint	
Georgia	State	as nonpoint	as event
Idaho	State	as nonpoint	
Illinois	State	as nonpoint	
Louisiana	State	as nonpoint	
Maine	State	as nonpoint	as event
Maryland	State	as nonpoint[1]	
New Mexico	State	as nonpoint[1]	
New York	State	as nonpoint[1]	
Nevada	State	as nonpoint	
New Jersey	State	as nonpoint	
North Carolina	State/Local	as nonpoint	as event

Agency	Agency Type	Rx provided	Wildfire provided
Utah	State	as nonpoint	
Washington	State	as nonpoint	
Alaska	State	as event WFU	as event
Citizen Potawatami Nation, Oklahoma	Tribe		as event
Eastern Band of Cherokee Indians	Tribe	as nonpoint	
Fond du Lac Band of the Minnesota Chippewa Tribe	Tribe	as nonpoint	
Kootenai Tribe of Idaho	Tribe	as nonpoint	
Leech Lake Band of Ojibwe	Tribe	as nonpoint	
Nez Perce Tribe of Idaho	Tribe	as nonpoint	
Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation, Montana	Tribe	as nonpoint	
Omaha Tribe of Nebraska	Tribe	as nonpoint	
Prairie Band Potawatomi Nation	Tribe	as nonpoint	
Shoshone-Bannock Tribes of the Fort Hall Reservation of Idaho	Tribe	as nonpoint	

[1] Submitted HAP emissions only

As shown in the table above, several tribes submitted both prescribed and wildfire data to the NEI using the SCCs shown above in Table 56. These data are summarized and reported in the 2008 NEI as received. EPA did not resolve any double counting that may occur because EPA and State data may already cover the same areas that these Tribal data encompass. EPA did not augment the tribal fires with HAP emissions. Updated shapefiles were not available to accurately represent tribal lands to enable EPA to try and extract out the fires from the NEI estimated by EPA and the states that are coincident with the fires reported by Tribes. Table 58 summarizes the small amounts emissions included in the NEI from tribal submissions. These are only double-counted if these emissions were large enough to have been picked-up by the satellite-based approach with SFv2, and we have not been able to assess that possibility.

Table 58: Fire emissions submitted by tribal agencies (short tons/year)

Tribe	Within State	CO	NOx	VOC	SO2	PM2.5	PM10	NH3	Acetalde-hyde	Formalde-hyde	Toluene
Kootenai Tribe of Idaho	ID	1,032	35	67		134	149	7	4	4	1
Nez Perce Tribe of Idaho	ID										
Shoshone-Bannock Tribes of the Fort Hall Reservation of Idaho	ID										
Prairie Band Potawatomi Nation	KS	159	3	7	1	13	15	1			
Fond du Lac Band of the Minnesota Chippewa Tribe	MN	923		3		6	120	4			
Leech Lake Band of Ojibwe	MN										
Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation, Montana	MT	15,608		312		1,070	1,159				
Eastern Band of Cherokee Indians	NC	59	2	10							
Omaha Tribe of Nebraska	NE	196					26	2			
Citizen Potawatami Nation, Oklahoma	OK	2917	83	500		354	354				
All tribes		**20,894**	**123**	**899**	**1**	**1,577**	**1,823**	**14**	**4**	**4**	**1**

For tribes that did not submit data, EPA did not assign the fires based on the tribal land boundaries. These fires were assigned to the states within which the tribal lands fall.

Table 59 shows the selection hierarchy for the wildfire and Rx burning sectors.

Table 59: 2008 NEI wildfire and prescribed fires selection hierarchy

Priority	Dataset Name	Dataset Content	Is Dataset in EIS?
1	State/Local/Tribal Data	Submitted data as listed above. Null values were filled in with EPA data in the subsequent datasets, whereas zero estimates were left as zeros.	Yes
2	EPA event data based on SFv2	CAP and HAP emissions	No
3	EPA HAP augmentation	HAP augmentation for wildfires and prescribed fires (Section 5.1.5)	No

If a S/L/T agency submitted any type of fire emissions data, it was used as first choice. If a state submitted data only for some counties, then the counties for which there were null values were filled in using the EPA data. If any zero values were submitted by states, they were used as zero in contrast to what was done when a null value was submitted by the state. Several states reported prescribed fire data to the non point inventory. These data were shifted to the Events inventory and summarized along with wildfires in the EPA summaries. It should be noted that when states submitted prescribed fire data to the nonpoint inventory, they were submitted as a county total for the year 2008. The Event inventory, on the other hand, is a day- and location-specific inventory. When the prescribed fire data submitted as non-point were "shifted" to the events inventory for summary purposes, the summaries were all done at a county level, and as a sum for the total year, so that no attempts were made to assign the county-based prescribed fires to day-specific events.

Alaska submitted fire emissions, and those were used as reported. There was no backfilling of missing fires in Alaska, because EPA only estimated fire emissions for the contiguous 48 states for 2008. Since Hawaii, Puerto Rico, and US Virgin Islands did not report any fire emissions, these regions have no WLF emissions in the final 2008 NEI.

5.1.3 Spatial coverage and data sources for the sector

The 2008 NEI includes wildfire and Rx fire emissions for all continental US states and Alaska. These emissions represent a combination of state-submitted information and EPA-estimated emissions from these fires. The EPA methods are described in Section 5.1.4 below. The way we blended these emissions to arrive at state totals is summarized in above. Table 57 above shows which states submitted wildfire, Rx, and WFU emissions to the NEI. A positive entry in this table only indicates that an agency submitted some data to the NEI; these data were used as supplied as the hierarchy in Table 59 indicates. In most cases, many counties were null and were therefore filled in using EPA data.

Table 57 shows that the States of AZ, CA, ID, NY, NM, and UT submitted some wildfire, Rx, and WFU data. Here, counties that had null CAP values were backfilled using EPA data for those counties. For the States of DE, IL, MD, and NY, only prescribed fire data were received from the States. For these states, all wildfire data were filled in using the EPA-created data. In addition, prescribed fires that were null for any counties were also filled in using

EPA data for counties that EPA methods found emissions from prescribed fires. HAP augmentation was also done to fill in HAP emissions for states that submitted only CAP emissions, as described in Section 5.1.5. For all the other 35 states, no state data were received, and we used only the EPA data.

As described above, Tribal data were summarized directly from their reporting to the EIS.

5.1.4 EPA-developed fire emissions estimates

For the dataset developed by EPA for the 2008 NEI, we used the following general equation to estimate wildfires and prescribed fires. Accurate estimates of fire emissions rely on accurate estimates of the terms in the Equation below.

*Emissions = Area burned * Fuel Load Available * Fuel Consumed (Burn Efficiency) * Emission Factors*

Daily CAP emission estimates were prepared using the software SFv2 (Pollard et al., 2011a)**,** which include fire estimation algorithms and is built within a database. Additional information on the approaches specific to the NEI are available in Raffuse (2012). SFv2 estimates the "Area burned" term in the above equation, in conjunction with the Bluesky framework model that estimates the last three terms in the above equation. The "fuel load available" term is estimated using the Fuel Characteristic Classification System (FCCS) maps in the Bluesky model. The "fuel consumed" term is estimated from Bluesky using the CONSUME3 model, which predicts the fraction of fuel that burns based on many parameters including fuel moisture. Finally, the "Emission Factors" term is estimated in Bluesky using the Fire Emissions Prediction Simulator which relies on Efs from the literature apportioned by flaming and smoldering combustion. Since SFv2 was recently developed, direct references to its development in conjunction with updated Bluesky methods are not yet available; however, the following reference can be used in general for past applications of these process models in the SF/Bluesky process: http://getbluesky.org/smartfire/

The EPA data estimate emissions for 38 pollutants. These pollutants are listed in Table 60 below. CAPs were estimated via SFv2 as just described, while HAPs were estimated using emission factors also shown in the table, with further information available in (Pace, 2007).

Table 60: Pollutants estimated by EPA for wildland fires and HAP emission factors

Pollutant	**HAP Emission factor (lb/ton fuel consumed)**
PM2.5	N/A
PM10	
CO	
CO2	
CH4	
NOx	
NH3	
SO2	
VOC	
1,3-butadiene	0.405
Acrolein	0.424
Toluene	0.56825
n-hexane	0.0164025
Anthracene	0.005
Pyrene	0.00929
o,m,p-xylene	0.242
benzo(ghi)perlyene	0.00508
benzo(e)pyrene	0.00266
indeno(1,2,3-cd)pyrene	0.00341
benzo©phenanthrene	0.0039
Perylene	0.000856
benzo(a)fluoranthene	0.0026
Fluoranthene	0.00673
benzo(k)fluoranthene	0.0026
Chrysene	0.0062
methylpyrene,-fluoranthene	0.00905
methylbenzopyrenes	0.00296
Methylchrysene	0.0079
Methylanthracene	0.00823
Carbonylsulfide	0.000534
Formaldehyde	2.575
benzo(a)pyrene	0.00148
benz(a)anthracene	0.0062
Benzofluoranthenes	0.00514
Benzene	1.125
Methylchloride	0.128325
Acetaldehyde	0.40825
Phenanthrene	0.005

SFv2 uses both satellite-detected and ground-reported fires to produce daily fire information (locations and area burned). Previous versions of the NEI relied on SFv1, which reconciled ICS-209 ground reports and hot spots

from the NOAA Hazard Mapping System (HMS). This reconciliation was performed using a single algorithm that relies primarily on the HMS data to provide the information critical for emissions inventories—fire location, daily growth, and final size. In contrast, SFv2, is not a single algorithm; rather, it is a modular framework for collecting, processing, and reconciling fire information from a variety of satellite, ground-based, and other sources. Many key updates were made to the overall SFv2 process, including improvements in (1) identification and sizing of fires needed for the "Area Burned" term and (2) the burn characteristics needed for the "Fuel Load Available" and "Fuel Consumed" terms. The key updates include:

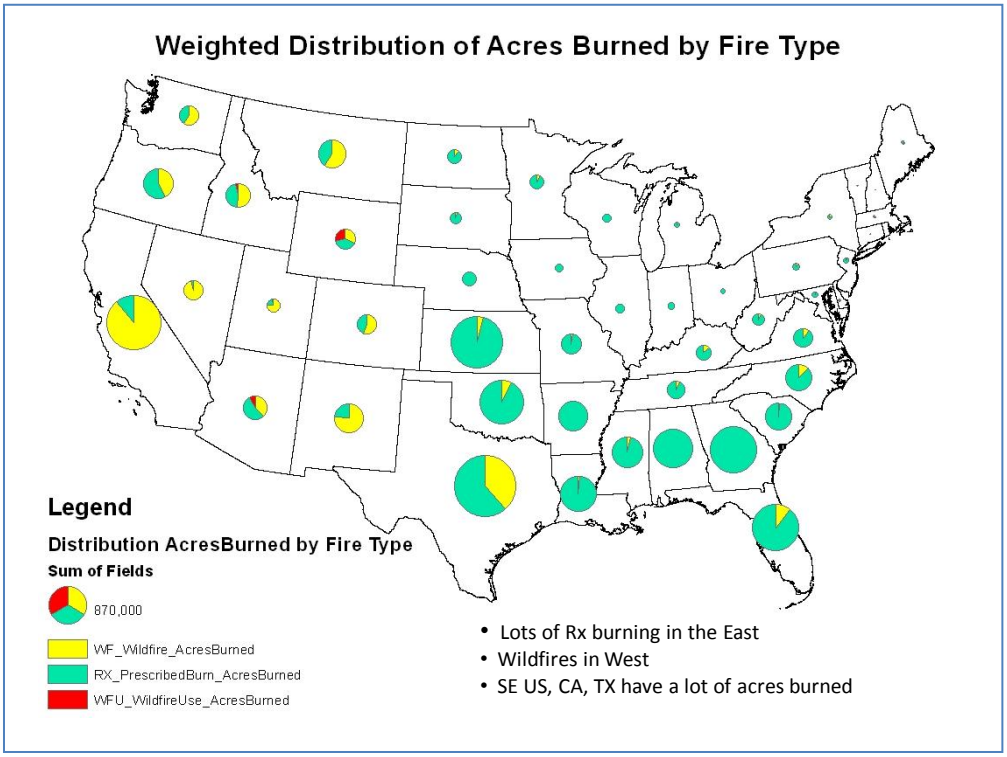
- Ability to combine data from many types of fire information sources, including satellite-derived fire detections, satellite- or helicopter-derived burn scar polygons, and ground-based reports from federal and state agencies.
- Support for more than one reconciliation algorithm, or "stream."
- Improved and (currently) up-to-date methodologies for determining fire type, fire size, and fire date.
- Assignment of all fires into one of the three fire types discussed above. This is a significant improvement from past versions of SMARTFIRE in which many fires in the NEI were left as "unclassified".
- Use of monitoring trends in burn severity burn scar perimeters in place of the more operational helicopter-flown perimeters from GeoMac that were used in previous versions of SMARTFIRE to identify fire sizes.
- An updated fuel bed map, specifically the most recent (at this time) 1-km FCCS fuel bed map[19]
- Updated Consume 3 Python code for fuel consumption calculations

Thus, SFv2 represents a significant step forward in the use of multiple fire information data sources for the development of fire emissions inventory activity data. More extensive details can be found in the project documentation (Pollard et al., 2011a and Raffuse, 2012).

Using the SFv2 approach, some of EPA's 2008 emissions data are shown in several summary maps below. First shown is the proportion of each type of fire by state in Figure 11. In the West, there are more wildfires than in the East, where most of the burning is seen to be from prescribed burning.

[19] Fuel bed information is available at http://www.fs.fed.us/pnw/fera/fccs/.

Figure 11: Proportion of Fires by Type using EPA Methods



Then, Figure 12 shows the total acres burned on a county-by-county basis. Active areas are seen in northern California and in some southeastern parts of the US. Shown immediately below the "acres burned" map is Figure 13, which shows PM2.5 emissions. For emissions, the pattern is based on not only on acres burned, but also on fuel consumption, fuel loading, and how emission factors vary by fire type and other dynamics that occur in a given type of fire. Certain areas in the country (eastern NC, northern MN, northern CA) stand out for emissions but not necessarily for acres burned. This is likely due to the relationship between fire characteristics and emission factors: prescribed fires likely have lower amounts of emissions due to flame being cooler compared to wildfires; extensive smoldering causing emissions to accumulate over time; peat type fires burning extensive duff; wildfires burning very hot and for a long duration causing higher emissions. For example, in eastern NC, there is seen to be a 'hotspot' of PM2.5 emissions though the acres burned do not stand out. This is due to the Evans road fires, which was a peat fire, and which lasted over a month in June 2008, and caused extensive smoldering and burning of duff. More information on this fire can be found at (WITN, 2008). All of EPA's data using the SFv2 approach on a daily basis by county and fire type can be found in the access database named Emissions.mdb (see Section 8.1 for access information and for supporting files that describe database fields).

Figure 12: Acres Burned using EPA Methods

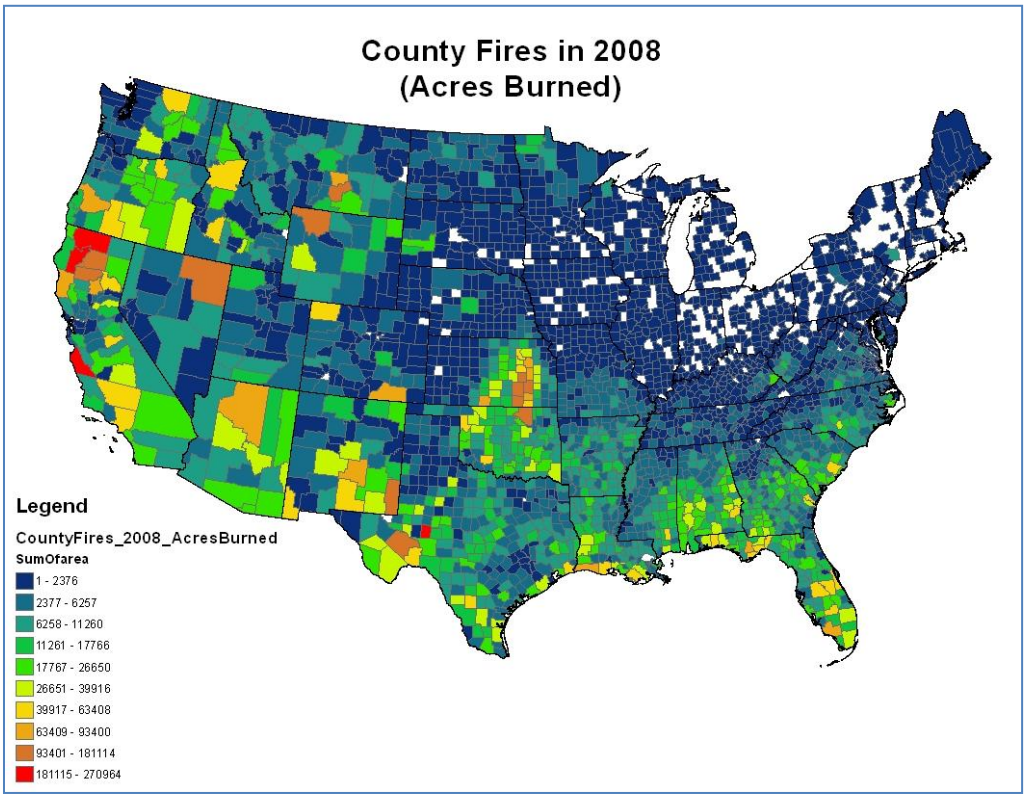
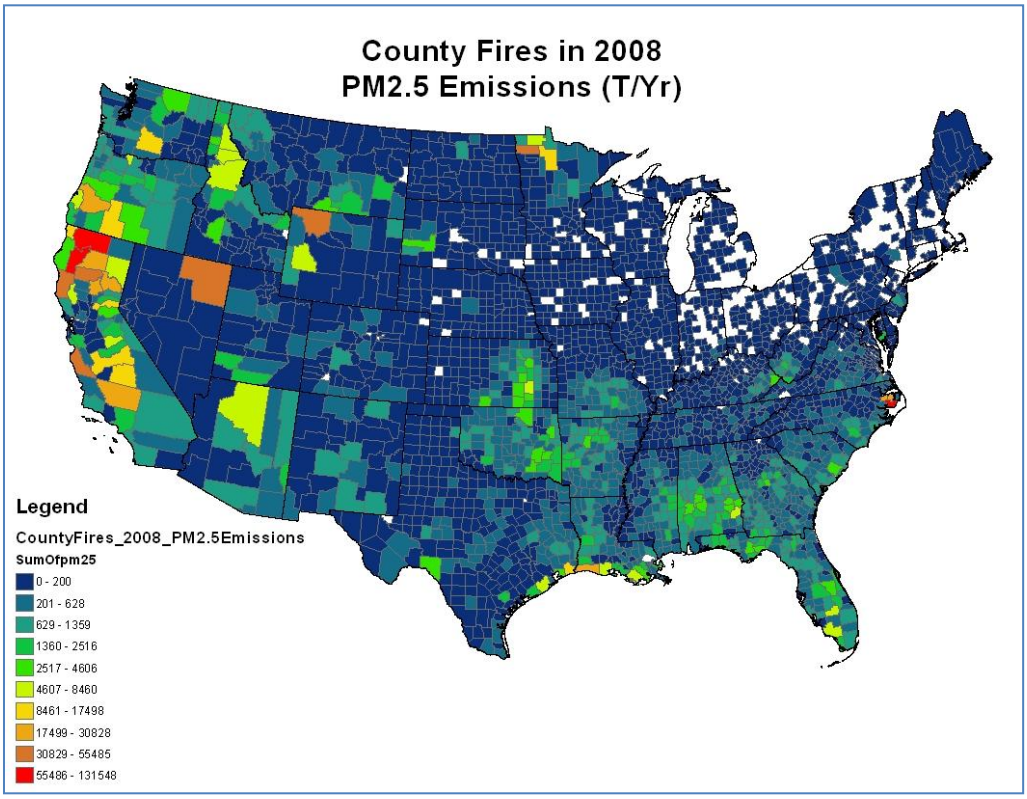


Figure 13: 2008 $PM_{2.5}$ Emissions using EPA methods



5.1.5 Wildland Fire HAP Augmentation

For WLFs, all CAPs and CAP precursor emissions are estimated via the SFv2 approach as described above. In addition, a set of 29 HAPs are estimated by applying the activity levels estimated from the methods above with the emission factors in Table 60. These same 29 HAPs have been estimated for fires over the past 10 years or so for the NEI by EPA.

State data always took precedent over EPA data. However, most states did not submit HAP data, and some submitted HAPs that are not a part of the list in Table 49. We used the following rules to augment HAP emissions to give a consistent list of HAPs included for fires.

- Only State data were augmented using the approach below, Tribal data were not. Tribal data are summarized as reported, with the caveat that there may be some double counting with already State and EPA data.
- If a state reported any of the HAPs in the list above, it was carried through to the 2008 NEI.
- If a state reported any HAPs outside of what is shown in the list of 29 above, it is retained in EIS, but not released in the 2008 NEI. This approach provides for a nationally consistent dataset with respect to the pollutants that are included.
- If a state reported a zero value for any of the HAPs, that zero was retained in the 2008 NEI.
- If a state did not report any of the 29 HAPs above, EPA augmented the data estimate each of the 29 HAPs. This was the case for most of the states. This was done as follows:
    - Using summaries of the EPA dataset based on SFv2, we computed a state-by-state ratio of each of the HAPs to CO emissions. This was done because most states reported CO emissions. These ratios are available in "hap_augmenatation_2008neiv2_Wlfires.xls" (see Section 8.1 for access information). EPA had used PM2.5 emissions in the past, but more S/L/T agencies did not report PM2.5 from fires than CO.
    - We applied these state-specific ratios (regardless of fire type) to county-summed estimates of CO emissions supplied by the state (the ratios will be constant across all counties in a state) to estimate each of the HAPs. These HAPs were then included in the 2008 NEI (via the website only) as EPA based information.

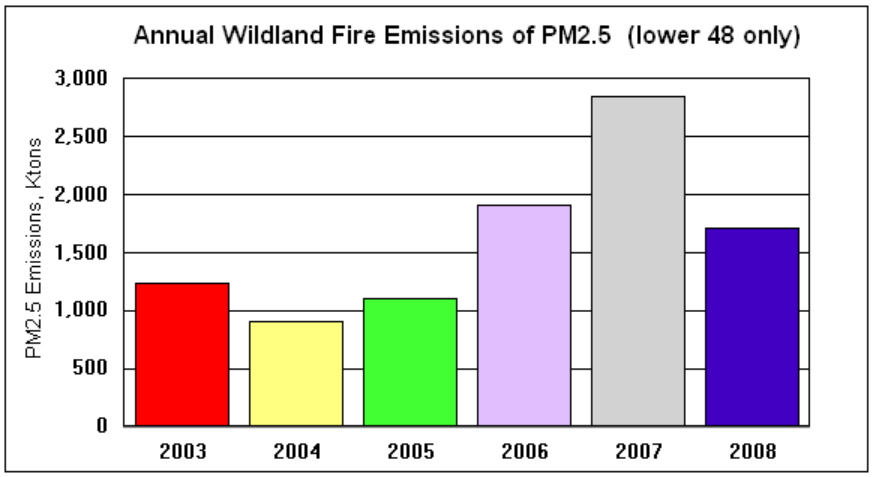
5.1.6 Summary of quality assurance methods

- WLFs' emissions developed using the methods above were compared to past EPA efforts to estimate emissions from these same categories. Some of the spatial patterns were similar, but since wild fires exhibit great inter-annual variability, it was difficult to make emissions-output or "area burned" comparisons year-to year. In addition, in the recent past EPA inventories (2003 through an earlier version of 2008) using SFv1, much of the area burned could not be classified into a type of fires and as such they were labeled as "unclassified" fires. In the 2008 NEI, SFv2 is used, and thus, all fires are classified, which made comparisons of prescribed burning especially more difficult with previous EPA inventories. For the Eastern states, if the assumption is made that most of the previously "unclassified" fires were prescribed burns (which is logical based on the patterns shown in Figure 11 above), then the PM2.5 emission estimates for those states compare well to the 2008 emissions developed here.
- Where states submitted data, we compared them to EPA estimates in those same counties. Some matches were good (e.g., Georgia, Arizona were within 10%), while some were from 15% less than EPA

to 75% more than EPA estimates depending on the state and pollutant. The state agencies were not required to provide (and did not provide) documentation of their methods for identification, classification, and quantification of emissions from fires, which makes comparisons more difficult.

- We compared total mass of emissions (the sum of all WLFs) to past EPA inventories, which generally showed that all pollutants were in a reasonable range given the year to year variability that would be expected from these types of fires. This is shown in Figure 14 below, which shows SF-based PM2.5 emissions from 2003 to 2008. As mentioned previously the estimates for 2003-2007 reflect use of SFv1, whereas our 2008NEI relies on use of SFv2 for EPA-based data, so that caveat should be considered when looking at this time series. However, the overall model is the same and, as such, the agreement across years for total emissions is still relevant. As shown in the figure, the total of 1.7 million tons of PM2.5 estimated in 2008 is in line with past estimates.

Figure 14: 2008 $PM_{2.5}$ wild land fire emissions using EPA methods



5.2 Fires – Agricultural field burning

EPA's approach to estimate agricultural fire emissions was done for the very first time in the 2008 NEI. In addition to the data submitted by S/L/T agencies, EPA developed a nationally consistent agricultural fires estimate that relies on SFv1 for fire and activity level identification (acres burned). Then, EPA converted these activity levels into emissions using emission factors and crop-usage patterns on a state-by-state basis. These annual agricultural fire estimates reside in the EPA's non-point inventory, which are county based totals for 2008. They are also available outside of EIS as monthly totals upon request.

5.2.1 Sector Description

Agricultural burning refers to fires that occur over lands used for cultivating crops and agriculture. The SCCs that pertain to this source in the NEI are listed below. EPA data are all put into one SCC, while state-submitted data are entered into one of 24 different SCCs as shown in Table 61.

Table 61: Source Classification Codes in the NEI for Agricultural Burning

Data Origin	Agricultural Fires – SCCs used
EPA	2801500000
States/Locals/Tribes	2801500000, 2801500100, 2801500111,2801500130, 2801500150,2801500170, 2801500181, 2801500191, 2801500220, 2801500250, 2801500261, 2801500262, 2801500300, 2801500320, 2801500330, 2801500350, 2801500350, 2801500390, 2801500410, 2801500420, 2801500430, 2801500500, 2801500600, 2801520000

5.2.2 Sources of data overview and selection hierarchy

The agricultural fire sector includes data from three components: S/L/T agency-provided emissions data, the EPA Chromium Split v2 dataset (see Section 3.1.3), and an EPA dataset created from SFv2 (see Section 5.1.4).

The chromium augmentation data were used only to 132peciated California total chromium to hexavalent and trivalent chromium. The EPA dataset includes emissions from the pollutants VOC, NOx, SO2, CO, PM2.5, CO2 and methane because we had emission factors available for these. The CO2 and methane emissions were not included in the final 2008 NEI, but are available upon request. The state data also includes HAP emissions (California, Delaware, Idaho, the Shoshone-Bannock Tribes of the Fort Hall Reservation of Idaho, the Kootenai Tribe of Idaho, and the Nez Perce Tribe), and in some cases NH3 emissions (California, Hawaii, Idaho, Louisiana, New Jersey, and the Washoe Tribe of California and Nevada).

Table 62 lists the state and tribal agencies that submitted agricultural fire emissions.

Table 62: Agencies that submitted agricultural fire emissions to the 2008 NEI

Agency	Agency Type
California Air Resources Board	State
Delaware Department of Natural Resources and Environmental Control	State
Georgia Department of Natural Resources	State
Hawaii Department of Health Clean Air Branch	State
Idaho Department of Environmental Quality	State
Kootenai Tribe of Idaho	Tribal
Louisiana Department of Environmental Quality	State
New Jersey Department of Environment Protection	State
Nez Perce Tribe	Tribal
Shoshone-Bannock Tribes of the Fort Hall Reservation of Idaho	Tribal
Utah Division of Air Quality	State
Washington State Department of Ecology	State
Washoe Tribe of California and Nevada	Tribal

When we created the 2008 NEI, these data are combined such that in any state that submitted data, only that data were used to represent that area in the final NEI for the pollutants submitted. As with WLFs, any counties or pollutants that were null were backfilled with EPA-based county estimates (of criteria pollutants that we estimated). EPA did not augment HAPs for agricultural fires. Any “zero” submissions were left as zero in the 2008 NEI for those counties and pollutants.

5.2.3 Spatial coverage and data sources for the sector

Using the methods described above, EPA developed county-by-county agriculture burning estimates for the contiguous United States. Table 63 summarizes the national EPA estimates for Ag burning for each State. Figure 15 summarizes, as an example, the PM2.5 emissions data at a state level based on these EPA data. Total PM2.5 emissions for the 48 contiguous states in the US based on EPA methods is about 50,000 tons.

Table 63: State Emission Estimates for Agricultural Burning using EPA methods (short tons/year)

State[1]	NOx	SO_2	VOC	CO	PM2.5	CO_2	CH_4
Alabama	129.6	17.28	259.2	2980.8	432	92577.6	129.6
Arizona	21.6	3.78	43.2	550.8	59.4	10179	16.2
Arkansas	3654.7	678.73	4698.9	55864.7	7309.4	1836226	1566.3
California	464	92.8	928	11484	1276	245340	348
Colorado	74.5	8.94	163.9	1564.5	268.2	47575.7	74.5
Delaware	8.5	1.02	18.7	178.5	30.6	5428.1	8.5
Florida	1685.6	231.77	3581.9	32658.5	3371.2	915912.9	1053.5
Georgia	836.4	111.52	1533.4	18819	2648.6	552024	697
Iowa	475.3	54.32	950.6	9709.7	1561.7	331487.8	475.3
Idaho	76.2	12.7	228.6	2565.4	279.4	44627.8	101.6
Illinois	468.3	53.52	869.7	9633.6	1471.8	324063.6	468.3
Indiana	213.5	24.4	396.5	4392	671	147376	213.5
Kansas	2065	330.4	3717	49560	6195	1221654	1652
Kentucky	155.4	20.72	310.8	3367	518	106267.7	155.4
Louisiana	1738.1	273.13	2979.6	33023.9	4469.4	1018527	1241.5
Maryland	18.6	2.48	37.2	421.6	58.9	12415.5	18.6
Michigan	15.6	1.82	31.2	322.4	49.4	9960.6	15.6
Minnesota	555	74	1110	12395	1850	387575	555
Missouri	1162.2	154.96	2324.4	25762.1	3680.3	800368.4	1162.2
Mississippi	1032.6	154.89	1893.1	22545.1	3269.9	703372.7	860.5
Montana	45.2	6.78	90.4	1175.2	113	20475.6	33.9
North Carolina	320.4	42.72	587.4	7315.8	1014.6	214935	320.4
North Dakota	568	99.4	1278	16898	1704	350172	568
Nebraska	390	52	780	8710	1300	276510	390
New Jersey	3.6	0.42	7.2	75.6	10.8	2265.6	3
New Mexico	7.6	1.14	15.2	180.5	24.7	3908.3	7.6
Nevada	1.8	0.27	8.1	47.7	9.9	900	2.7
New York	2	0.24	4.4	42	6.8	1226.4	2
Ohio	70.2	9.36	140.4	1579.5	234	49888.8	70.2
Oklahoma	637.6	127.52	1275.2	18171.6	1753.4	361997.4	478.2
Oregon	78.4	11.76	176.4	2077.6	235.2	39160.8	78.4
Pennsylvania	5.5	0.66	13.2	128.7	19.8	3822.5	5.5
South Carolina	121.8	16.24	243.6	2821.7	406	85706.6	121.8
South Dakota	102.5	14.35	205	2398.5	328	66030.5	102.5
Tennessee	207	27.6	414	4795.5	690	148729.5	207
Texas	453	81.54	815.4	10962.6	1540.2	282943.8	362.4
Utah	2.7	0.36	8.1	61.2	9.9	1168.2	2.7
Virginia	32	4.48	70.4	819.2	115.2	23225.6	32
Washington	152.8	26.74	305.6	4240.2	420.2	78042.6	114.6
Wisconsin	60.5	8.47	145.2	1415.7	229.9	43935.1	72.6
Wyoming	4.2	0.56	12.6	99.4	16.8	1961.4	5.6
US 2008 Totals	**18,118**	**2,836**	**32,672**	**381,815**	**49,653**	**10,869,964**	**13,794**

[1] No agricultural fires identified through satellite detection methods in Connecticut, West Virginia, or Rhode Island

As an example, the PM2.5 emissions data in Table 1 are summarized in Figure 15 below. It is apparent that EPA's methods for estimating emissions from Agricultural fires show higher levels in the Mississippi Valley States and some states in the West.

Figure 15: 2008 NEI state-total PM2.5 emissions from agricultural fires

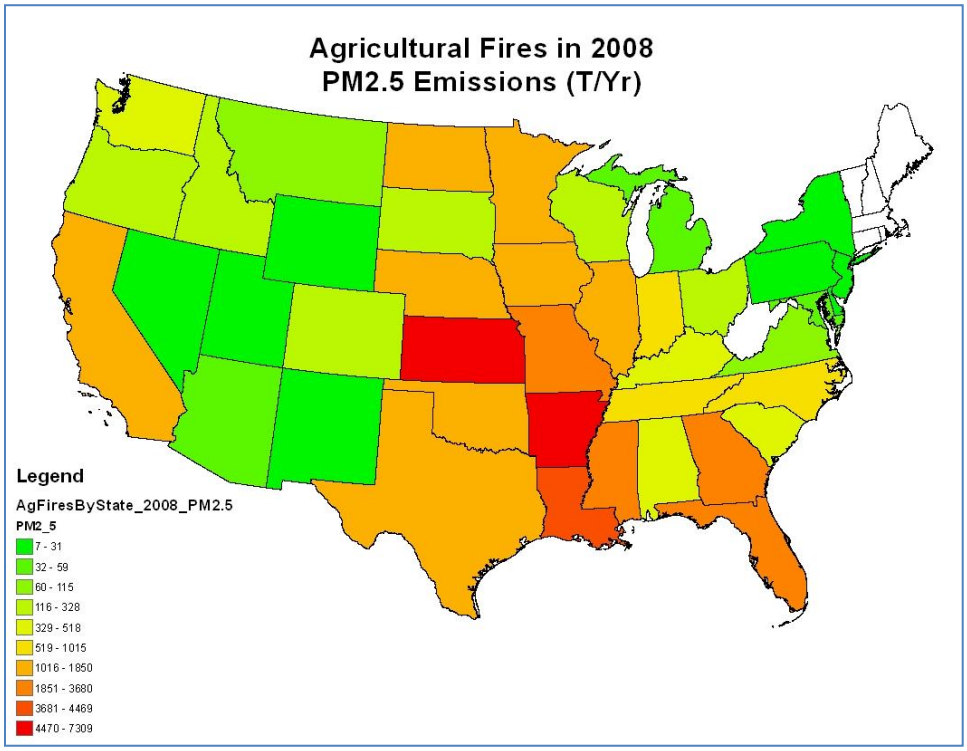
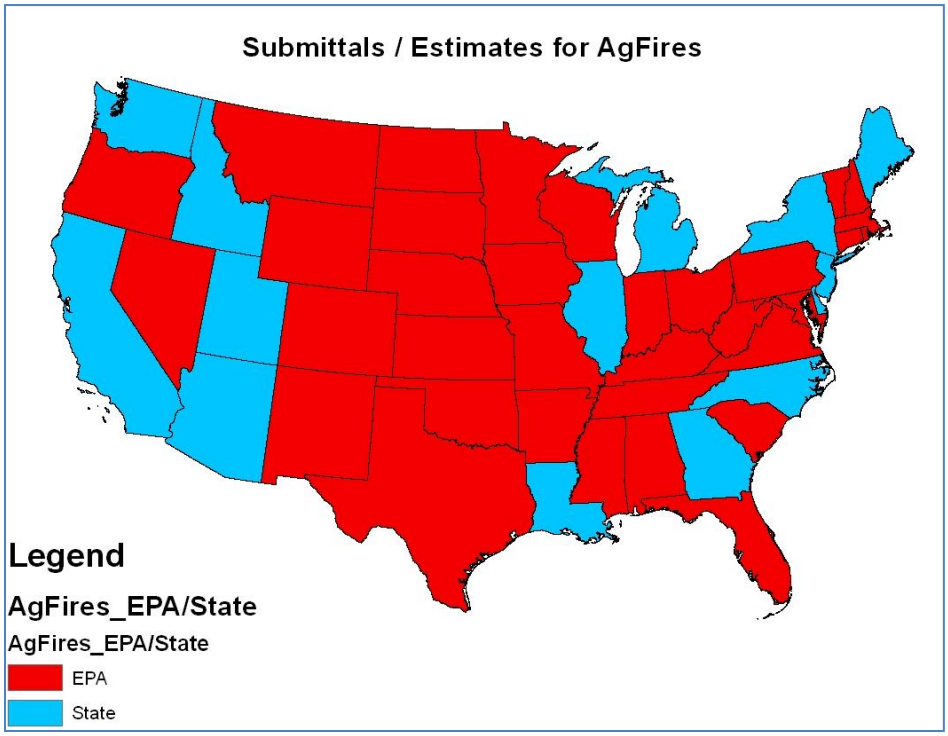


Figure 16 below shows states that submitted agricultural burning data to the NEI. As with other fire data, any state that submitted data, that data were used to represent that area in the final NEI. And as always for fires, any data that were null (missing counties) were backfilled with EPA-based county estimates. Any "zero" submissions were left as zero in the final NEI for those areas. Unlike with wild land fires, no efforts were made to augment pollutants. EPA's list of pollutants for agricultural fires is listed above in Table 63. States may or may not have submitted Ag fire data for those same pollutants, and the final NEI reflects only what the States have submitted.

Figure 16: Identification of states that submitted agricultural burning emissions to the NEI



5.2.4 EPA-developed agricultural emissions data

EPA's emission estimates for Agricultural Fires begin with SFv1, and are described more fully in the EPA project documentation (Pollard et al., 2011b). This is the older version of SMARTFIRE and we did not use this for the wildfires or prescribed fires as described in Section 5.1. We do not believe that using SFv1 for agricultural burning emissions caused significant uncertainties because the enhancements made to SFv2 are not expected to have significant changes for agricultural fires.

To compile the agricultural fire emissions, the fire locations from SFv1 were spatially overlaid with the fuel loading data from the FCCS module. The result is a FCCS code assigned to all fire records and locations from SFv1. We assumed that those prescribed and unclassified fires with a FCCS code of 0 were agricultural fires. These fires were extracted from the 2008 SFv1 result to make an agricultural fire database table. Then using ARCGIS, we further categorized fires as having occurred on "rangeland," "cropland," or "other" land use using the USGS 2006 National Land Cover database (http://www.mrlc.gov/nlcd2006.php). EPA only retained the "cropland" fires in its agricultural fire inventory, since the Emission Factors EPA had available reflect crop burning only. These raw "activity" for a count of cropland fires are available on a state-by-state basis from the spreadsheet "rawag_activity_bystate.xlsx" (see Section 8.1 for access information).

We next converted these activity levels to emission estimates. This is done using the equation below, which is very similar to the equation used for the Wild land fire emissions in the NEI.

Emissions = number of fire pixels identified x 100 x (state-specific, crop-specific, weighted) Emission Factors

We first assume that each fire pixel (from the satellite images used by SFv1) is equivalent to 100 acres. We next estimated emissions on a state-by-state basis using crop-burning based emission factors available in the

literature along with state burn-usage patterns (harvesting patterns) of these crops. The specific crops which are included here based on publically available Efs include: wheat, sorghum, sunflower, oats, corn, barley, rice, alfalfa hay, grass seed, and sugarcane. The Efs and usage factors (crop harvesting) for these crops by state are available in the spreadsheet "Ag Efs for Sat Detects.xlsx" (see Section 8.1 for access information). Emissions estimates for each county in the US result from multiplication of the number of pixels by a hundred acres/pixel and then by the appropriately weighted EF. Efs were available only for certain pollutants: VOC, NOx, SO2, CO, PM2.5, CO2 and CH4. PM10 was set equal to PM2.5, since agricultural burning is expected to produce PM that is mostly less than 2.5 microns. These 8 pollutants are the only ones inventoried by EPA for agricultural fires (though some states submitted HAP emissions for agricultural fires, which are included in the 2008 NEI).

5.2.5 Summary of quality assurance methods

- We compared state-by-state agricultural burning emissions to peer-reviewed estimates (McCarty, 2011) that do not include the year 2008. Spatial patterns of burning density (and the relative amounts of the various crops burned) were similar between the NEI and these other data. For example, the Mississippi Valley, California, Florida, and the Northwest areas showed higher level of emissions than many other states with both methods. Emissions levels varied due to the different emission factors and methods used. For example, averaging the years 2003-2007 presented in the McCarty work leads to an estimate of about 25,000 tons of PM2.5 emissions for the contiguous 48 states; whereas the EPA 2008 methods described here yields about 50,000 tons of PM2.5.
- For states that submitted agricultural burning data (see map in Figure 16), we compared those data to EPA estimates in the same counties. The matches between State and EPA data varied, with Eastern states generally matching better. It is difficult to arrive at major conclusions because we have limited information on the methods used by states in estimating agricultural burning emissions.

6 Biogenics – Vegetation and Soil

This section is a placeholder for future additional documentation.

7 Quality assessment

[This section will be included in future versions of this documentation]

7.1 What are the quality criteria used to assess the inventory?

7.2 How did the 2008 NEI compare to the quality criteria?

7.3 What EIS sectors seem to be incomplete and for which key pollutants?

7.4 How can the quality of the emissions data be further evaluated by users?

7.5 What improvements in the NEI and EIS submission process are planned for the future?

8 Supporting data and summaries

The previous sections provide number references to both supporting data and key output summaries. The following two subsections provide a map to that information. All supporting input data and summaries referenced in the sections above can be obtained through the CHIEF ftp site at:

ftp://ftp.epa.gov/EmisInventory/2008v2/doc/

8.1 Supporting data

Table 64 provides information on how to access the supporting data referenced in the preceding sections. The column at the far left lists the files that can be downloaded from the FTP site listed above. The "File names included" column of the table lists the file names included in each of the zip files – it is these file names that are referenced in the other sections of this document. The "Description" column of this table provides a summary of the purpose of the data file listed on that row.

Table 64: 2008 NEI supporting data access information

File name	File names included	Description
2008neiv2 issues.xlsx	Same	Latest caveats list. May be more up to date that the list provided in Appendix A.
scc_eissector_xwalk_ 2008neiv2.xlsx	Same	Cross-walk between source classification codes (SCCs) and EIS sectors.
2008nei_supdata_2.zip	section2-mercury epa_2008_nei_v2_hg.accdb	Assignments of mercury-specific categories used in Table 7 to the 2008 NEI v2 by process (point) and county (nonpoint, onroad and nonroad).
2008nei_supdata_3a.zip	section3-stationary/ag_livestock_waste/ ReadMe.doc *See other data files as explained in the* **ReadMe.doc** *file*	Supporting data for EPA agricultural livestock emissions estimates including input and output files from the emissions model used.
	Section3-stationary/nonpoint ERTAC_state_comparison.xlsx	For the nonpoint sectors included in the ERTAC process: provides the sectors, SCCs, emission factors and includes a brief description of the methodologies.
	Section3-stationary/point/ 2_Attachments_1_and_2_HTIP_Calcs. xls	Example calculations for calculating unit-level heat input when not available from CAMD.
	Section3-stationary/point/ CAMD08annualallprg_103009.txt	Annual 2008 emissions and heat input activity data for all units reporting to the CAMD data system as of Oct 30, 2009
	section3-stationary/point/ Chromium_speciation_factors.xls	Factors used to speciate total chromium (Section 3.1.3)
	section3-stationary/point/ EAF ICR Test Data Summary-area_major(EPA Rule Data).xls	Electric Arc Furnace test data summary
	section3-stationary/point/ HAP EF Ratios Derived from	Ratios used in the HAP augmentation process

File name	File names included	Description
	WebFIRE.xls	
	section3-stationary/point/ Hg_EAF_forSLT_reviewed.xlsx	Data sent to states for review of electric arc furnace emissions and results
	section3-stationary/point/ HgFacilities_for_SLT_reviewed.xlsx	Data sent to states for review of high Hg facilities and results
	section3-stationary/point/ high_risk_nata2005_poll_forSLT_ reviewed.xlsx	Data sent to states for reviewed of high risk facilities and results
	section3-stationary/point/ TRI to EIS crosswalk.accdb	TRI to EIS Facility ID crosswalk
2008nei_supdata_3b.zip (nonpoint emissions)	section3-np_emissions/ File names provided in Table 18 (Section 3.1.6)	Data files with EPA nonpoint emissions data and methods for some nonpoint categories
2008nei_supdata_3c.zip (nonpoint tools)	section3-np_tools/ File names provided in Table 19 (Section 3.1.6)	Tools with best methods for nonpoint categories without emissions estimated
2008nei_supdata_4a.zip	section4-mobile/air_loco_marine/ pport07.xls	US Army Corps of Engineers Principal Ports file for 2007.
	Section4-mobile/air_loco_marine/ port_032310.zip	Shapefile for allocation of commercial marine vessel port emissions
	section4-mobile/air_loco_marine/ shipping_lanes_111309.zip	Shapefile for allocation of commercial marine vessel shipping lane emissions
	section4-mobile/air_loco_marine/ railway_20110921.zip	Shapefile for locomotive emissions allocation
2008nei_supdata_4b.zip	section4-mobile/nonroad_equip/ ncd20101201.zip	NMIM county database for EPA nonroad emissions and earlier versions (prior to 2008 NEI v2) of on-road emissions.
2008nei_supdata_4c.zip	section4-mobile/onroad/ Onroad_Read_Me.docx	Description of contents of the folder
	section4-mobile/onroad/ VPOP_NEI_2008_18jan2012_v3.zip	Contains the estimated vehicle population data used in the SMOKE run. SMOKE FF10 format – see SMOKE user manual: www.smoke-model.org
	section4-mobile/onroad/ VMT_NEI_2008_updated2_ 18jan2012_v3.zip	Contains the estimated annual and monthly vehicle miles traveled used in the SMOKErun. SMOKE FF10 format – see SMOKE user manual: www.smoke-model.org
	section4-mobile/onroad/ AKHIPRVI_Counties.zip	Contains the individual MOVES County Data Manager databases (folders) in MySQL format for all of the counties in Alaska, Hawaii, Puerto Rico and the Virgin Islands.
	Section4-mobile/onroad/ AKHIPRVI_Runspecs.zip	Contains all of the MOVES run specifications (ASCII files, XML format) that were used to run MOVES to obtain the emission inventories for the Alaska,

File name	File names included	Description
		Hawaii, Puerto Rico and the Virgin Island counties.
	Section4-mobile/onroad/ akhiprvi_temperatures.zip	Contains the MySQL database (folder) containing the tables (in MySQL format) that describe the temperatures and relative humidity values used for the Alaska, Hawaii, Puerto Rico and the Virgin Island counties.
	Section4-mobile/onroad/ SPEED_2008NEI_18nov2011_v0.zip	Contains the estimated vehicle average speed data used in the SMOKErun. SMOKE FF10 format – see SMOKE user manual: www.smoke-model.org
	section4-mobile/onroad/ spdpro_2008nei_18nov2011_v0.zip	Contains the estimated vehicle average hourly speed data used in the SMOKE run.SMOKE SPDPRO format – see SMOKE user manual: www.smoke-model.org
	section4-mobile/onroad/ Lev_standards.zip	Contains the MySQL databases (folders) containing the tables (in MySQL format) that provide alternate vehicle emission rates for those states which have adopted California emission standards. The appropriate database is indicated in the run specification for each county.
	Section4-mobile/onroad/ MCXREF_2008_summary.zip	MS Excel spreadsheet: list of counties selected to be the representative counties for the 2008 NEI and associated counties represented.
	Section4-mobile/onroad/ MFMREF_2008.zip	MS Excel spreadsheet: list of the months that are represented by the January and July results from the representative counties.
	Section4-mobile/onroad/ RepCounty_Counties.zip	Contains the individual MOVES County Data Manager databases (folders) in MySQL format for just the representing counties.
	Section4-mobile/onroad/ RepCounty_Runspecs.zip	Contains all of the MOVES run specifications (ASCII files, XML format) that were used to run MOVES to obtain the emission inventories for the representing counties.
	Section4-mobile/onroad/ RepCounty_temperatures.zip	Contains the MySQL databases (folders) containing the tables (in MySQL format) that describe the temperatures and relative humidity values used for the representing counties. These temperature and humidity values correspond to the range of meteorology values needed for the emission rates

File name	File names included	Description
		used by SMOKE and do not represent daily average temperature values.
2008nei_supdata_5.zip	section5-fires/Ag Fires/ Ag Efs for Sat Detects.xlsx	Emission factors used for agricultural fires emission factors.
	Section5-fires/Ag Fires/ rawag_activity_bystate.xlsx	Agricultural fires activities by state based on Smartfire v1.
	Section5-fires/Smartfire2/ AgActivityFieldDescriptions.xlsx	Field descriptions for table "AgActivityClean" fields in "Emissions.mdb". This is included in the Wildland Fires folder because it goes with the database from Smartfire version2 processing.
	Section5-fires/Smartfire2/ Emissions.mdb	2008 daily wild land fire emission inventory and agriculture fire activity database based on Smartfire version 2 and Bluesky Framework v3.3.0. The agricultural fire activity from this database was not used for the NEI. Rather, the data from the Smartfire version 1 was used, as explained in Section 5.2.
	section5-fires/Smartfire2/ EmissionsFieldDescriptions2008.xls	Field descriptions for wild land fire and emissions-related fields in "Emissions.mdb"
	section5-fires/Smartfire2/ HAP_augmentation_2008neiv2_ Wlfires.xlsx	HAP/CO ratios for states that submitted wildfire and/or prescribed fires data. These ratios are based on EPA estimates and then used to "augment" and estimate HAPs for counties in which CO emissions were reported by the States.
	Section5-fires/Smartfire2/ SummaryTables2008.xls	Aggregated data for Smartfire2-based 2008 wild land fire emission inventory in 'Emissions.mdb'

8.2 Supporting summaries

All supporting summaries listed here are available in the file "2008neiv2_supsumm.zip" included with the documentation on the 2008 NEI website.

Table 65: 2008 NEI supporting summaries

Section No.	Summary file	Description
Section 1: Introduction		
Section 2: Overview		
Section 3: Stationary sources		

Section No.	Summary file	Description
	summaries/matrix_submittals for Version 2 Feb 13 2011.xls	Lists which reporting agencies submitted data for major subcategories of nonpoint emissions (not organized by EIS sector)
Section 4: Mobile sources		
	summaries/ out_of_lto_pb_summary_120211.xlsx	Summary of EPA-generated in-flight lead emissions
	summaries/ airportlead_20110406.xlsx	Summary of EPA-generated airport lead emissions (the NEI includes some EPA data and some S/L/T/ agency data)
Section 5: Fires		
	summaries/ StateData_wildlandFires.xls	All the State data reported for WLFs at the county level
	summaries/ TribalData_wildlandFires.xls	Summary of Tribal data (submitted by tribes)

9 References

All references cited in this documentation that have documents associated with them (rather than websites) are provided in the zipped file "2008nei_references.zip". All of the files not listed with a URL in the right hand column below are included in the "references" folder of this zipped file.

Section	Reference	File name or website
Section 1: Introduction		
Section 2: Overview		
Section 3: Stationary sources		
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