Evaluate 2008 NEI to Identify Areas of Improvement that Benefit Use in Residual Risk Assessments

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1.0 INTRODUCTION

The Office of the Inspector General (OIG) recommended that the U.S. Environmental Protection Agency (EPA) improve air toxics emissions data needed to conduct residual risk assessments. The original OIG report is available at http://www.epa.gov/oig/reports/2008/20071031-08-P-0020.pdf. In response to the OIG recommendation and to further continuous improvement activities for the EPA's National Air Emissions Inventory (NEI), ERG assessed the 2008 NEI for use by the residual risk program under EPA Contract No. EP-D-11-006, Work Assignment (WA) 2-08. The purpose/objectives of the work assignment are the following:

1) Evaluate the 2008 NEI v2 to identify areas of improvements in HAP emissions that would benefit the EPA Risk and Technology Review (RTR) and National Air Toxics Assessment (NATA) programs, the expected degree of benefit, and the recommended implementation priority (Task 2).
2) Establish the usefulness of the 2008 NEI in support of RTR recent activities. Specifically, EIAG would like to understand if these inventories were considered in recent RTR rulemakings (Task 3).
3) Perform analyses to assess the NEI for missing HAPs (Task 4).
4) Describe some next steps to accomplish suggested improvements during future NEI cycles, including if feasible the 2011 NEI development cycle that has already started.

This report summarizes the technical approach and focus for assessing the 2008 NEI, results from the analyses performed, and recommendations for improvement activities to implement for future NEI development cycles.

The following describes how the information in this report is organized:

Section 2 – background information on the 2008 NEI
Section 3 – priority of improvements with significant benefit to RTR and focus of this assessment
Section 4 – usefulness of the 2008 NEI for recent RTR work
Section 5 – analyses results from assessing the NEI for missing HAPs
Section 6 – recommendations for improvements based on these results for future NEI development cycles
Section 7 – references

2.0 BACKGROUND – 2008 NEI

The NEI was created to provide EPA, federal, state, local, tribal (SLT) agency decision makers, as well as the U.S. public and other countries, the best and most complete estimates of criteria and hazardous air pollutant (CAP and HAP) emissions for the United States. While EPA is not directly obligated to create the NEI under the Clean Air Act (CAA), the CAA authorizes the EPA Administrator to implement data collection efforts needed to properly administer the National Ambient Air Quality Standards (NAAQS) program. Therefore, the EPA Office of Air Quality Planning and Standards (OAQPS) implements the NEI program in support of the NAAQS. Furthermore, the CAA requires states to submit emissions to EPA as part of their State Implementations Plans (SIPs) that describe how they will meet the NAAQS, and the NEI is used as one mechanism for states to meet some of those emission requirements, particularly for 3-year reporting requirements.

While the NAAQS program is the basis on which EPA collects CAP emissions from the SLT air agencies, it does not require collection of HAP emissions. The HAP reporting requirements are voluntary. Nevertheless, compiling the HAP emissions are an essential part of the NEI program. These emission estimates allow EPA to assess progress in meeting HAP reduction goals described in the CAA Amendments of 1990 such as evaluation of risks remaining after EPA's application of specific industry standards, e.g., Maximum Achievable Control Technology (MACT) standards, and to determine whether additional standards are needed to reduce residual risks. The EPA also conducts a national-scale air toxics assessment (NATA). The purpose of NATA is to identify and prioritize air toxics, emission source types, and locations that are of greatest potential concern in terms of contributing to population risk. NATA is based on an inventory of air toxics emissions including data available in the NEI. NATA typically follows the 3-year cycle of available NEI data. Although the 2008 NEI is the most recent complete and comprehensive inventory available, NATA 2008 was not done due to resource limitations. Thus, 2005 is the most recent assessment. Results are located at http://www.epa.gov/ttn/atw/nata2005. The EPA plans to conduct NATA 2011 which will include use of the 2011 NEI.

For the 2008 NEI cycle, the Emission Inventory System (EIS), was used for the first time to collect, compile, and store the emissions data. This new system greatly improved the collection approach from less structured approaches used in the past. The numerous automated data checks in EIS have undoubtedly improved the data quality and allowed EPA more time to review the data prior to publication. Other data quality checks performed on the 2008 NEI have also improved the HAP emissions such as specific correction of location coordinates for emission releases, augmentation to complete apparent missing data, and priority review of specific facilities due to high-risk potential.

3.0 PRIORITIZE THE TYPE OF IMPROVEMENTS OF MOST SIGNIFICANT BENEFIT TO RTR AND ESTABLISH ASSESSMENT FOCUS

In Task 2 of the WA, EPA identifies and prioritizes the types of improvements that could be made to the NEI for point sources that are expected to provide the highest degree of benefit to the RTR program. That established the focus of the assessment and includes a recommended list of source categories and pollutants to assess for potentially missing HAPs.

3.1 Key Emission Inventory Data for RTR Sector Modeling

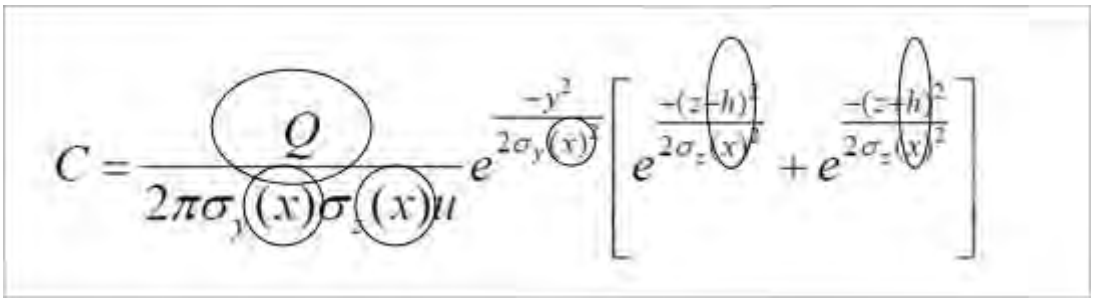
Performing a risk assessment for an RTR source category is a multi-step, collaborative process involving multiple stakeholders. Stakeholders can include EPA regulatory and inventory staff, risk assessors, SLT agencies, trade associations, and industry. This can be especially true of complicated RTR sources categories, such the Pulp and Paper Production and Chemical Sectors. Assessments generally include the following components (EPA, 2012a):

- Inhalation Assessment using the Human Exposure Model
- Multipathway Assessment using a tiered approach:
  - Tier 1: Compare facility emissions to risk-based thresholds
  - Tier 2: Refine Tier 1 results using site-specific meteorological and location of fishable lakes near the facility
  - Tier 3: Refine Tier 2 results using dietary distributions of dietary fractions
  - Tier 4: Model with Total Risk Integrated Methodology (TRIM)
    - Focus on Persistent Bioaccumulative and Toxic (PBT) HAPs
- Ecological HAP Assessment (still being developed)

For the inhalation assessment, the approach generally follows these steps:

1. Inhalation modeling file development
2. Model preprocessing
3. Air dispersion modeling using AERMOD
4. Model-generated ambient HAP concentrations
5. HEM inhalation exposure modeling
6. Develop exposure concentrations
7. Risk characterization, using dose-response values

SPPD is responsible for the inhalation modeling file development, which primarily includes the development of the emissions inventory. As such, the data elements that are important for risk modeling require additional scrutiny prior to finalizing the emissions inventory. EPA's HEM AERMOD equation is presented below:



Where:

C = model concentration
Q = emission rate
h = plume height release
x = downwind distance

As presented above, the most important emission inventory variables affecting the modeled concentration (and thereby risk), from a modeling sensitivity standpoint, are: 1) the emission rate; 2) plume height release; and 3) downwind distance. Table 1 further describes these and related variables, in addition to other emission inventory data that are important for risk modeling and which are components of the risk modeling file. Additionally, Table 1 sorts these variables by their relative importance and identifies which of them are data fields in the 2008 NEI.

Table 1. Key Emission Inventory Fields for RTR Emissions Modeling

Priority	Data Field(s)	Field(s) in NEI2008	Description
1	Emission Rate	Yes	Emissions (Q) are directly proportional to modeled concentrations (C), and thereby risk. The emission rate included used in RTR modeling files is in units of tons per year.
2	Emission Release Point Type, Stack Parameters, Fugitive Dimensions	Yes	Important for understanding the fate and transport of emitted pollutants. The emission release point type indicates whether a release is fugitive or stack. If the release is from a stack, the emission release point type code indicates the type of stack (vertical, horizontal, goose neck, vertical with rain cap, or downward-facing vent). All of these parameters affect the plume height release (h), which is inversely proportional to modeled concentrations (C), and thereby risk.
3	Geographical Coordinates	Yes	HAP *emission release points* are mapped to specific census tracts, and the impacts on the affected nearby population are estimated. The downwind distance (x) is inversely proportional to modeled concentration (C), and thereby risk.

Table 1. Key Emission Inventory Fields for RTR Emissions Modeling

Priority	Data Field(s)	Field(s) in NEI2008	Description
4	MACT Codes (or Regulatory Codes)	Yes	The identification of as many facilities as possible that are subject to a rule is the first step in the process. MACT codes must be assigned at the process-level and can also be pollutant-specific. Regulatory codes are used in the 2008 NEI. Regulatory codes can be mapped to MACT codes.
5	SCCs	Yes	MACT Standards are always process-level.
6	Pollutant Codes	Yes	Especially important for distinguishing high risk pollutants, such as hexavalent chromium (highly toxic) vs. trivalent chromium (non-toxic). Some metals such as mercury are not speciated in the 2008 NEI. Mercury is speciated for RTR modeling files.
7	Emission Process Group	No	Assigned by SPPD project lead to further identify the types of processes that are assigned to the MACT code; allows for review of risk results and evaluation of control options by groups of processes (e.g., storage tanks) rather than at the detailed SCC-level or broader facility-level.
8	Emissions Type	Yes	Actual, allowable, maximum, etc.
9	Facility Category Code	Yes	Code which describes if the facility is Major or Area.
10	Control Technology Information (e.g., device(s), control efficiency)	Yes	Important in understanding emissions and for technology option selection (i.e., technology review).
11	Facility Identification	Yes	NEI ID and/or State Facility ID used by SPPD Leads
12	NAICS Codes	Yes	In lieu of regulatory codes, the NAICS code assignment and/or facility type provides an indication of the type of the type of operations and processes at a facility.
13	Data Source	Yes	Indicates source of data, such as SLT, SPPD, TRI, augmented, or carried-forward from prior inventory.
14	Year Closed	Yes	Year in which the facility closed; primarily for landfills or facilities maintained in the 2005 NEI for historical purposes. Included in 2008 NEI as Facility Site Status Code and Facility Site Status Code Year.

RTR emissions inventories are developed using data from a variety of sources including Information Collection Requests (ICR), Section 114 letters, voluntary surveys, emissions tests, site visits, stakeholder meetings, Trade Associations, air permits, 2005 NEI, 2008 NEI, and TRI for current and prior years. After the information from these variety of sources are compiled, the data are reviewed in detail in order to identify the range of differences, incorrect codes, or other inconsistencies between these data sources. Significant errors observed in the RTR emissions inventory development process can skew risk results. These differences are examined for potential error, with examples listed below:

- Incorrect entry of emissions data, such as entering emissions in pounds instead of tons;
- Unreasonable stack parameters, such as stack temperature entered in °C rather than °F;
- Stack coordinates at the center of a facility or outside of the fenceline, rather than at specific release points;
- Improper designation of MACT processes, SCCs, and Emission Process Groups due to miscoding and/or misunderstanding of processes;
- Incomplete or over-estimation of emissions inventory data due to misunderstanding of facility configuration (i.e., is the neighboring facility part or separate);
- Maximum allowable emissions entered rather than actual emissions;
- Improper use of pollutant codes by entering total pollutant rather than speciated pollutant;
- Incorrectly designating a facility as "Area" when it's "Major"; and
- Identifying facilities (or processes) as active, when they are actually closed or inactive.

3.2 Improvements Made in the 2008 NEI Cycle With Expected Benefit for the RTR Program

As stated before, for the 2008 NEI cycle, the EIS was used for the first time to collect, compile, and store the emissions data submitted by SLT agencies. Some of the improvements made during the 2008 NEI development process for both stationary and mobile sources are described in the EPA's 2008 NEI v2 Technical Support Document (TSD) (http://www.epa.gov/ttn/chief/net/2008neiv2/2008_neiv2_tsd_draft.pdf) and are presented in Table 2. Improvements for stationary sources expected to have direct benefit to the RTR program are noted.

Table 2. Improvements in the 2008 NEI Cycle

#	Improvement	RTR Benefit
1	More structured, automated collection of data, including automated data audit.	✓
2	Numerous data checks of submitted data prior to acceptance in EIS.	✓
3	Less time formatting data into common data structure allowing more time for QA.	✓
4	Provides a framework for point sources which standardized non-varying information, such as geographical coordinates at the facility- and release point-level.	✓
5	Priority and enhanced review of NATA05 high risk facilities, such as locational data of the emission release points.	✓
6	Scrutiny and correction of locational coordinates for emission releases.	✓
7	Augmentation of missing pollutant emissions data.	✓

Table 2. Improvements in the 2008 NEI Cycle

#	Improvement	RTR Benefit
8	EIS is more dynamic in nature than previous NEIs. As SLT agencies correct data and are approved by EPA, data pulls will reflect current information.	✓
9	The 2008 NEI v2 uses updated emissions factors for several metal HAPs and acid gases from coal-fired utility boilers.	✓
10	In EIS, another category called "event" has been added and is used to compile day-specific data from fires.	
11	Consolidated the number of HAP compounds significantly for metals and cyanides and provided conversion factors to enable SLT agencies to provide them as the metal or cyanide that is important for risk.	✓
12	For all data categories only speciated chromium and specific allowable chromium species by speciating agency-reported total chromium are reported. This was done to allow easier toxicity weighting of the inventories and more streamlined risk modeling.	✓
13	EIS allows the NEI to have both facility latitude/longitude coordinates as well as release point (e.g., stack) coordinates. Previous NEI databases could store only coordinates at release points. The 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 SLT agencies.	✓
14	Data were not carried forward from previous NEIs, in response to SLTs comments about potential double-counting and facility closures (however, this may lead to incomplete source categories if facilities were not reported).	✓
15	For onroad mobile sources, the 2008 NEI v2 used the MOVES model for the first time. 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.	
16	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.	
17	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.	
18	The in-flight lead emissions have been included in the 2008 NEI for the first time and are reflected in the totals for the "Mobile Sources – Aircraft" sector.	
19	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.	

Table 2. Improvements in the 2008 NEI Cycle

#	Improvement	RTR Benefit
20	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.	
21	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.	
22	EPA developed emissions estimates associated with an aircrafts' landing and takeoff (LTO) cycle. 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.	
23	The approach for matching EIS units with the Mercury Air Toxics Standard (MATS) data so that the EIS software used only one emissions estimate for a process-pollutant combination, rather than one estimate from each data supplier prevented double-count emissions.	
24	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. ORIS IDs typically are assigned to electric generating units (EGUs).	
25	EPA developed data for industrial nonpoint fuel combustion as a means of assisting SLT 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.	
26	In addition, the "Where you live" feature of the Air Emissions website allows users to select states and EIS sectors to create KMZ files used by Google Earth.	✓
27	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.	
28	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.	✓
29	SLT agency submission of particulate matter (PM) emissions to the NEI are required to include primary PM_{10} (called PM_{10}-PRI in EIS and NEI outputs) and primary $PM_{2.5}$ (PM_{25}-PRI). In addition, EPA requests states provide filterable PM (PM_{10}-FIL and PM_{25}-FIL) along with condensable PM (PM-CON).	

Table 2. Improvements in the 2008 NEI Cycle

#	Improvement	RTR Benefit
30	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.	✓
31	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.	
32	Another quality assurance method conducted for mercury (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. EPA computed that the 2008 NEI were missing 0.5 tons of Hg. Note that this issue included all boilers, not just from the industrial sector.	✓
33	If a state reported a zero value for any of the HAPs, that zero was retained in the 2008 NEI.	✓

3.3 Priority Source Categories

The next stage of this task establishes assessment focus through prioritization of key HAPs and/or sectors. Key HAPs may include recent regulatory actions, such as for mercury, lead, and/or the NATA priority pollutants (e.g., benzene, formaldehyde, acrolein, naphthalene, and manganese). Key sectors may focus on RTR sectors, such as:

- Boilers;
- Coke Ovens;
- Portland Cement;
- Polymers and Resins;
- Secondary Aluminum;
- Phosphoric Acid/Phosphate Fertilizers;
- Mercury-cell Chlor-alkali Plants;
- Secondary Lead; and
- Oil and Natural Gas Activities.

An example of a non-RTR sector is Municipal Solid Waste Landfills.

3.3.1 RTR and MACT Source Categories

One practical approach to prioritizing key HAPs/key sectors is to identify those that have gone through recent or are undergoing RTR rulemaking activities (e.g., Oil and Natural Gas) and non-RTR rulemaking activities (e.g., Mercury Air Toxics Standards or Lead NAAQS). The priority may be the sectors which may have more immediate impact on the 2011 NEI cycle. Table 3 presents the RTR source categories that have been published (EPA, 2012b). Of the 34 published rules, eighteen have been published since 2008.

Table 3. RTR Priority Source Categories With Final Rule Publication Date

Source Category	Proposal Signature Date/Consent Decree Date	Proposal Publication Date	Final Rule Signature Date/Consent Decree Date	Final Rule Publication Date
Hard Chromium Electroplating	1/27/2012	2/8/2012	8/15/2012	9/19/2012
Decorative Chromium Electroplating	1/27/2012	2/8/2012	8/15/2012	9/19/2012
Chromium Anodizing Tanks	1/27/2012	2/8/2012	8/15/2012	9/19/2012
Steel Pickling-HCL Process	1/27/2012	2/8/2012	8/15/2012	9/19/2012
Pulp and Paper I & III	12/15/2011	12/27/2011	7/31/2012	9/11/2012
Oil and Natural Gas Production	7/28/2011	8/23/2011	4/3/2012	8/16/2012
Natural Gas Transmission and Storage	7/28/2011	8/23/2011	4/3/2012	8/16/2012
Secondary Lead Smelters	4/29/2011	5/19/2011	12/16/2011	1/5/2012
Shipbuilding and Ship Repair	12/3/2010	12/21/2010	11/4/2011	11/21/2011
Wood Furniture	12/3/2010	12/21/2010	11/4/2011	11/21/2011
Primary Lead Smelting	1/31/2011	2/17/2011	11/4/2011	11/15/2011
Marine Vessel Loading	9/14/2010	10/21/2010	3/31/2011	4/21/2011
Pharmaceuticals	9/14/2010	10/21/2010	3/31/2011	4/21/2011
Printing and Publishing	9/14/2010	10/21/2010	3/31/2011	4/21/2011
Epichlorohydrin Elastomers Production, *P&R I*	9/14/2010	10/21/2010	3/31/2011	4/21/2011
Nitrile Butadiene Rubber Production, *P&R I*	9/14/2010	10/21/2010	3/31/2011	4/21/2011
Polybutadiene Rubber Production, *P&R I*	9/14/2010	10/21/2010	3/31/2011	4/21/2011
Styrene Butadiene Rubber and Latex Production, *P&R I*	9/14/2010	10/21/2010	3/31/2011	4/21/2011
Polysulfide Rubber-*P&R I*	12/6/2007	12/12/2007	12/10/2008	12/16/2008
Ethylene Propylene-Rubber *P&R I*	12/6/2007	12/12/2007	12/10/2008	12/16/2008
Butyl Rubber- *P&R I*	12/6/2007	12/12/2007	12/10/2008	12/16/2008
Neoprene-*P&R I*	12/6/2007	12/12/2007	12/10/2008	12/16/2008

Table 3. RTR Priority Source Categories With Final Rule Publication Date

Source Category	Proposal Signature Date/Consent Decree Date	Proposal Publication Date	Final Rule Signature Date/Consent Decree Date	Final Rule Publication Date
Epoxy Resins- *P&R II*	12/6/2007	12/12/2007	12/10/2008	12/16/2008
Non-Nylon Polyamides- *P&R II*	12/6/2007	12/12/2007	12/10/2008	12/16/2008
Acetal Resins *GMACT I*	12/6/2007	12/12/2007	12/10/2008	12/16/2008
Hydrogen Fluoride *GMACT I*	12/6/2007	12/12/2007	12/10/2008	12/16/2008
Halogenated Solvent Cleaners	8/9/2006	8/17/2006	4/16/2007	5/3/2007
Hazardous Organics NESHAP (HON)	6/1/2006	6/14/2006	12/15/2006	12/21/2006
Dry Cleaners	12/9/2005	12/21/2005	7/13/2006	7/27/2006
Industrial Process Cooling Towers	10/18/2005	10/24/2005	3/31/2006	4/7/2006
Hospital Sterilizers	10/18/2005	10/24/2005	3/31/2006	4/7/2006
Magnetic Tape	10/18/2005	10/24/2005	3/31/2006	4/7/2006
Gasoline Distribution	8/4/2005	8/10/2005	3/31/2006	4/6/2006
Coke Ovens	7/29/2004	8/9/2004	3/31/2005	4/15/2005

Table 4 presents the seventeen RTR source categories that have upcoming consent decree dates (Pope, 2012).

Table 4. RTR Priority Source Categories With Final Rule Signature or Consent Decree (Not Published)

Source Category	Proposal Signature Date/Consent Decree Date	Proposal Publication Date	Final Rule Signature Date/Consent Decree Date	Final Rule Publication Date
Portland Cement	6/15/2017	NA	6/15/2018	--
Aerospace	3/15/2014	NA	1/15/2015	--
Acrylic/ Modacrylic Fibers	12/11/2013	NA	9/15/2014	--
Polycarbonates Production	12/11/2013	NA	9/15/2014	--
Polymers and Resins III	12/11/2013	NA	9/15/2014	--
Off-Site Waste Recovery Operations	12/11/2013	NA	9/15/2014	--
Phosphoric Acid	11/14/2013	NA	8/15/2014	--
Phosphate Fertilizers	11/14/2013	NA	8/15/2014	--
Flexible Polyurethane Foam Production	10/30/2013	NA	7/30/2014	--
Secondary Aluminum	1/30/2012	2/14/2012	3/14/2014	--
Primary Aluminum	11/4/2011	12/6/2011	3/14/2014	--

Table 4. RTR Priority Source Categories With Final Rule Signature or Consent Decree (Not Published)

Source Category	Proposal Signature Date/Consent Decree Date	Proposal Publication Date	Final Rule Signature Date/Consent Decree Date	Final Rule Publication Date
Pesticide Active Ingredient Production	11/30/2011	1/9/2012	1/31/2014	--
Polyether Polyols Production	11/30/2011	1/9/2012	1/31/2014	--
Polymers and Resins IV	11/30/2011	1/9/2012	1/31/2014	--
Ferroalloys Production	11/4/2011	11/23/2011	12/10/12[a]	--
Mineral Wool	11/4/2011	11/25/2011	12/10/12[a]	--
Wool Fiberglass	11/4/2011	11/25/2011	12/10/12[a]	--

[a] To be determined, but currently scheduled for this date.

Table 5 presents one RTR source category that does not yet have a consent decree, but is on-going due to a settlement agreement.

Table 5. RTR Priority Source Category With No Consent Decree

Source Category	Proposal Signature Date/Consent Decree Date	Proposal Publication Date	Final Rule Signature Date/Consent Decree Date	Final Rule Publication Date
Petroleum Refineries	No consent decree			

Finally Table 6 presents seventy-nine MACT source categories that are not on the RTR Schedule and have no consent decree or proposal date.

Table 6. Non-RTR MACT Source Categories

MACT Source Category	MACT Code
Ammonium Sulfate - Caprolactam By-Product Plants	1401
Asphalt Processing and Asphalt Roofing Manufacturing	0418
Asphalt/Coal Tar Application - Metal Pipes	0402
Auto & Light Duty Truck (Surface Coating)	0702
Boat Manufacturing	1305
Brick and Structural Clay Products Manufacturing	0414
Carbon Black Production	1415
Carbonyl Sulfide (COS) Production	1604
Cellulose Products Manufacturing	1349

Table 6. Non-RTR MACT Source Categories

MACT Source Category	MACT Code
Clay Ceramics Manufacturing	0415
Commercial and Industrial Solid Waste Incineration	1807-1
Commercial Sterilization Facilities	1609
Cyanide Chemicals Manufacturing	1405
Engine Test Facilities	0101-1
Ethylene Processes	1635
Flexible Polyurethane Foam Fabrication Operations	1341
Friction Materials Manufacturing	1636
Hazardous Waste Incineration: Cement Kilns	0801-3
Hazardous Waste Incineration: Commercial	0801-1
Hazardous Waste Incineration: HCl Production Furnaces	0801-7
Hazardous Waste Incineration: Lightweight Aggregate Kilns	0801-4
Hazardous Waste Incineration: Liquid Fuel Boilers	0801-6
Hazardous Waste Incineration: On-Site	0801-2
Hazardous Waste Incineration: Solid Fuel Boilers	0801-5
Hydrochloric Acid Production	1407
Industrial/Commercial/Institutional Boilers & Process Heaters - coal	0107-1
Industrial/Commercial/Institutional Boilers & Process Heaters - gas	0107-2
Industrial/Commercial/Institutional Boilers & Process Heaters - oil	0107-3
Industrial/Commercial/Institutional Boilers & Process Heaters - wood or waste	0107-4
Integrated Iron & Steel Manufacturing	0305
Iron and Steel Foundries	0308
Large Appliance (Surface Coating)	0704
Leather Tanning & Finishing Operations	1634
Lime Manufacturing	0408
Manufacture of Nutritional Yeast	1101
Medical Waste Incinerators	1801
Mercury Cell Chlor-Alkali Plants	1403
Metal Can (Surface Coating)	0707
Metal Coil (Surface Coating)	0708
Metal Furniture (Surface Coating)	0709
Miscellaneous Coating Manufacturing	1642
Miscellaneous Metal Parts & Products (Surface Coating)	0710
Miscellaneous Organic Chemical Manufacturing	1641
Municipal Landfills	0802
Municipal Waste Combustors: Large	1802-2
Municipal Waste Combustors: Small	1802-1
Organic Liquids Distribution (Non-Gasoline)	0602
Other Solid Waste Incineration	1807-2
Paint Stripping Operations	1621
Paper & Other Webs (Surface Coating)	0711

Table 6. Non-RTR MACT Source Categories

MACT Source Category	MACT Code
Plastic Parts & Products (Surface Coating)	0712
Plywood and Composite Wood Products	1624
Polyvinyl Chloride & Copolymers Production	1336
Primary Copper Smelting	0203
Primary Magnesium Refining	0207
Printing, Coating & Dyeing Of Fabrics	0713
Publicly Owned Treatment Works (POTWs)	0803
Pulp & Paper Production II	1626-2
Refractory Products Manufacturing	0406
Reinforced Plastic Composites Production	1337
Rocket Engine Test Firing	0101-2
Rubber Tire Production	1631
Semiconductor Manufacturing	1629
Site Remediation	0805
Solvent Extraction for Vegetable Oil Production	1103
Spandex Production	1003
Stationary Combustion Turbines - Natural Gas	0108-1
Stationary Combustion Turbines - Oil	0108-2
Stationary Reciprocating Internal Combustion Engines - Natural Gas	0105-1
Stationary Reciprocating Internal Combustion Engines - Oil	0105-2
Taconite Iron Ore Processing	0411
Uranium Hexafluoride Production	1414
Utility Boilers: Coal	1808-1
Utility Boilers: Natural Gas	1808-2
Utility Boilers: Oil	1808-3
Utility Boilers: Wood or Waste	1808-4
Viscose Process Manufacturing	1348
Wet-Formed Fiberglass Mat Production	0413
Wood Building Products (Surface Coating)	0703

Based on the above tables, it is recommended that priority focus of source categories be for the 18 source categories with final rules published since 2008, the 17 source categories with signature/consent decree dates established, and the RTR category identified in Tables 4 and 5. Table 7 presents a composite list of these priority categories. Those with rules published since 2008 provide the more recent RTR data that will be used to develop the matrix of expected HAPs. Those with established consent decrees are recognized as 'soon to start' and for which RTR data are not yet available to help develop the matrix of expected HAPs but for which NEI improvements are also desired as the NEI will be consulted as one of many data sources.

Table 7. Initial Recommendation of Priority Source Categories

Source Category	Rule Published Since 2008	Consent Decree, Soon to Start
Acrylic/Modacrylic Fibers		✓
Aerospace		✓
Chromium Anodizing Tanks	✓	
Decorative Chromium Electroplating	✓	
Epichlorohydrin Elastomers Production, *P&R I*	✓	
Ferroalloys Production		✓
Flexible Polyurethane Foam Production		✓
Hard Chromium Electroplating	✓	
Marine Vessel Loading	✓	
Mineral Wool		✓
Natural Gas Transmission and Storage	✓	
Nitrile Butadiene Rubber Production, *P&R I*	✓	
Off-Site Waste Recovery Operations		✓
Oil and Natural Gas Production	✓	
Pesticide Active Ingredient Production		✓
Petroleum Refineries		✓[a]
Pharmaceuticals	✓	
Phosphate Fertilizers		✓
Phosphoric Acid		✓
Polybutadiene Rubber Production, *P&R I*	✓	
Polycarbonates Production		✓
Polyether Polyols Production		✓
Polymers and Resins III		✓
Polymers and Resins IV		✓
Portland Cement		✓
Primary Aluminum		✓
Primary Lead Smelting	✓	
Printing and Publishing	✓	
Pulp and Paper I & III	✓	
Secondary Aluminum		✓
Secondary Lead Smelters	✓	
Shipbuilding and Ship Repair	✓	
Steel Pickling-HCL Process	✓	

Table 7. Initial Recommendation of Priority Source Categories

Source Category	Rule Published Since 2008	Consent Decree, Soon to Start
Styrene Butadiene Rubber and Latex Production, *P&R I*	✓	
Wood Furniture	✓	
Wool Fiberglass		✓

[a] No consent decree issued yet, but work background work is on-going.

3.3.2 Source Categories Identified by 2008 NEI Toxicity Weighted Emissions

A pollutant emitted in high quantities does not necessarily present a higher risk to human health than a pollutant emitted in very low quantities. The more toxic the pollutant, the more risk associated with its emissions in ambient air. The development of various health-based risk factors is used to apply weight to the emissions of pollutants based on toxicity rather than mass emissions.

The toxicity-weighted emissions approach developed by EPA (EPA, 2007) consists of the following steps:

1. Obtain HAP emissions data from the 2008 NEI for point sources.

2. Apply the mass extraction speciation profiles to extract metal and cyanide mass.

3. Apply weight to the emissions derived from the steps above based on their toxicity.

    a. To apply weight based on cancer toxicity, multiply the emissions of each pollutant by its cancer unit risk estimate (URE). The URE is an upper bound estimate of an individual's probability of contracting cancer over a lifetime of exposure to a concentration of one microgram of the pollutant per cubic meter of air.

    b. To apply weight based on noncancer toxicity, divide the emissions of each pollutant by its noncancer reference concentration (RfC). The RfC is a concentration of the compound in air thought to be without adverse effects even if a person is exposed continuously.

While the absolute magnitude of the pollutant-specific toxicity-weighted emissions is not meaningful, the relevant magnitude of toxicity-weighted emissions is useful in identifying the order of potential priority. Higher values suggest greater priority; however, even the highest values may not reflect potential cancer effects greater than the level of concern (100 in-a-million) or potential noncancer effects above the level of concern (e.g., HQ = 1.0).

In support of an EPA Enforcement project, the 2008 NEI for point sources was recently toxicity-weighted for each HAP-emitting facility. Additionally, for EPA's 2010 Urban Air Toxics Monitoring

Program (UATMP) Final Report, a source category for each NEI facility was assigned based on its SCC, Regulatory Code, or NAICS Code. Together, this information can be used to prioritize the top pollutants by toxicity and by source category. The tables below use results from those two EPA projects.

Table 8 presents the source categories ranked by percent (%) contribution of the nationwide cancer-toxicity weighting. Cancer weightings can be summed across pollutants. Rank order is based on categories with the higher toxicity-weighted emission values – both in terms of the cumulative toxicity weight across all HAPs analyzed and the amount of those toxicity weighted emissions. The source categories which contribute to the cumulative Top 90% are listed. The bottom two entries in the table summarize that 105 categories are in the remaining 10% of which 80 are potential RTR categories and 25 are not.

Table 8. Top Source Categories Ranked by Cumulative Cancer Toxicity Weighting

Source Category	Potential MACT or RTR Sources	Cancer Toxicity-Weighting (unitless)	% Contribution to Total Tox-Weighted Emissions	Cumulative % Contribution
Electricity Generation via Combustion	Y	0.859	30%	30%
Coke Batteries	Y	0.254	9%	39%
Steel Mills	Y	0.245	9%	47%
Pulp and Paper Production	Y	0.129	5%	52%
Oil and/or Gas Production	Y	0.119	4%	56%
Electrical and Electronics Equipment: Finishing Operations	Y	0.083	3%	59%
Aircrafts	N	0.083	3%	62%
Miscellaneous Manufacturing Industries	N	0.068	2%	64%
Rubber and Miscellaneous Plastics Products	Y	0.065	2%	66%
Petroleum Refineries	Y	0.051	2%	68%
Iron and Steel Foundries	Y	0.051	2%	70%
Pipeline Compressor Stations	N	0.050	2%	72%
Electroplating, Plating, Polishing, Anodizing, and Coloring	Y	0.049	2%	74%
Bulk Terminals/Bulk Plants	Y	0.046	2%	75%
Surface Coating Facility (Other)	N	0.043	2%	77%
Chemical Manufacturing	Y	0.037	1%	78%
Tank Batteries	Y	0.037	1%	79%
Primary Metal Production (Other)	N	0.034	1%	80%
Secondary Metal (Other) Processing	N	0.033	1%	82%
Aerospace Industries	Y	0.033	1%	83%

Table 8. Top Source Categories Ranked by Cumulative Cancer Toxicity Weighting

Source Category	Potential MACT or RTR Sources	Cancer Toxicity-Weighting (unitless)	% Contribution to Total Tox-Weighted Emissions	Cumulative % Contribution
Synthetic Organic Chemical Manufacturing (HON)	Y	0.030	1%	84%
Industrial/Commercial/Institutional Boilers & Process Heaters	Y	0.027	1%	85%
Plywood, Particleboard, OSB Manufacturing	Y	0.027	1%	86%
Organic Chemical Storage/Transportation	Y	0.026	1%	87%
Portland Cement Manufacturing	Y	0.020	1%	87%
Secondary Aluminum Production	Y	0.018	1%	88%
Lime Manufacturing	Y	0.017	1%	88%
Waste Solvent Recovery Operations	Y	0.017	1%	89%
Wood Products/Manufacturing	Y	0.017	1%	90%
Miscellaneous Metal Parts & Products (Surface Coating)	Y	0.016	1%	90%
Remaining 80 Other Potential MACT source categories	Y	0.215	8%	98%
Remaining 25 Non-Potential MACT source categories	N	0.066	2%	100%
	Nationwide	2.865		

Noncancer weightings can only be summed within a noncancer Target System, such as neurological, respiratory, or developmental. There are 12 total Target Systems considered for NATA risk modeling. NATA05 establishes a priority for specific national and regional driver and contributor pollutants and for noncancer risks, involve 6 of the 12 target systems (http://www.epa.gov/ttn/atw/nata2005/05pdf/sum_results.pdf). Table 9 presents the NATA05 national and regional driver and contributor pollutants and their associated Target System, if applicable.

Table 9. NATA05 National and Regional Pollutant Drivers and Contributors

Pollutant	Target System
National Cancer Risk Driver	
Formaldehyde	Respiratory

Table 9. NATA05 National and Regional Pollutant Drivers and Contributors

Pollutant	Target System
Regional Cancer Risk Driver	
Benzene	Immunological
PAHs	NA
Naphthalene	Respiratory
National Cancer Risk Contributors	
1,3-Butadiene	Reproductive
Arsenic compounds	Respiratory
Hexavalent chromium	Respiratory
Coke oven emissions	NA
Acetaldehyde	Respiratory
Acrylonitrile	Respiratory
Carbon tetrachloride	Liver
Ethylene Oxide	Neurological
Tetrachloroethylene	Neurological
1,4-Dichlorobenzene	Liver
Ethylbenzene	Developmental
Regional Cancer Risk Contributors	
Nickel compounds	Respiratory/Immunological[1]
1,3-dichloropropene	Respiratory
Methylene chloride	Liver
National Noncancer Hazard Driver	
Acrolein	Respiratory
Regional Noncancer Hazard Drivers[2]	
2,4-Toluene Diisocyanate	Respiratory
Chlorine	Respiratory
Hexamethylene diisocyanate	Respiratory
Hydrochloric acid	Respiratory
Manganese compounds	Neurological

NA: Not applicable. Pollutant only has a cancer effect.

[1] Nickel affects multiple target systems.

[2] Diesel PM is listed as a Regional Noncancer Hazard Driver, $PM_{2.5}$ from diesel engines is included the 2008 NEI.

The six Target Systems that guide the noncancer risk review priorities in NATA05 are identified in Table 9 and are used here to help establish a category/ pollutant focus for this project. It is appropriate to sum across all pollutants which affect the same Target System, and the results presented in Table 10 include all available noncancer pollutants (i.e., those that have noncancer RfC values) in the 2008 NEI for point sources. Table 10 presents 47 source categories which contributed to the top 90% for the select noncancer target systems identified in Table 9. The percent contribution values are shaded where equal to or greater than 10% of the national noncancer toxicity weighted emissions for the noted target system.

3.3.3 Recommended Priority Source Category List

Using the above analyses, a compiled priority source category list is presented in Table 11. There are 75 source categories and they are prioritized based on RTR analysis status and the toxicity weight of HAP emissions. While these source categories are regulatory categories for the MACT program, the emissions processes that contribute to these categories may be aggregated in different ways for different sector descriptions. It is important to note that for the source categories presented in Table 11, the RTR program does not have a definitive mapping of corresponding SCCs. Rather, it is likely from the RTR perspective that the applicable SCCs will be developed after reviewing the available data. Nevertheless, assessment of the 2008 NEI and beyond based on this priority list can provide significant benefit in harmonizing efforts between the regulatory categories and the NEI.

The categories are grouped and prioritized for assessment in this project based on the following criteria:

Priority Group	Recent RTR Final Date Since 2008 or Soon to be Analyzed Based on Consent Decree Date	Contributes to Top 90% of National Cancer Toxicity Weighted Emissions	Contributes to Top 90% of the National Noncancer Toxicity Weighted Emissions
1	✓	✓	✓
2	✓	✓	
3	✓		✓
4	✓		
5		✓	✓
6		✓	
7			✓

Table 10. Listing of Source Categories Contributing to 90% of Noncancer Toxicity Weighting By Select Target System

Source Category	Developmental[a]	Immunological[a]	Liver[a]	Neurological[a]	Reproductive[a]	Respiratory[a]
Aircrafts	43%	10%	1%		30%	10%
Bulk Terminals/Bulk Plants		4%	32%			1%
Chemical Manufacturing		1%	3%	1%	2%	1%
Coke Batteries	1%	3%		1%		
Electrical and Electronics Equipment: Finishing Operations				2%	2%	
Electricity Generation via Combustion	9%	11%	2%	40%		15%
Ethanol Biorefineries	1%					1%
Ethylene Processes					1%	
Ferroalloys Production				9%		
Fiberglass Manufacturing			1%			
Gasoline/Diesel Service Stations		3%				
Glass Manufacturing	1%					
Industrial/Commercial/Institutional Boilers & Process Heaters	1%	2%	1%			2%
Iron and Steel Foundries	3%	2%		4%		
Landfill			1%			
Lime Manufacturing			1%			
Lumber/sawmill		1%				1%
Marine Vessel: Loading Rack		1%				
Metal Can (Surface Coating)					1%	
Military Base/National Security	2%					
Miscellaneous Manufacturing Industries	2%	1%	4%	2%	2%	1%
Miscellaneous Metal Parts & Products (Surface Coating)				1%	1%	

Table 10. Listing of Source Categories Contributing to 90% of Noncancer Toxicity Weighting By Select Target System

Source Category	Developmental[a]	Immunological[a]	Liver[a]	Neurological[a]	Reproductive[a]	Respiratory[a]
Natural Gas Processing		1%				1%
Natural Gas Transmission and Storage					1%	3%
Oil and/or Gas Production	1%	13%			8%	25%
Organic Chemical Storage/Transportation	2%	3%	8%		9%	
Petroleum Refineries		13%		1%	5%	
Pharmaceutical Manufacturing			1%			
Pipeline Compressor Stations		3%			3%	12%
Plastic Parts & Products (Surface Coating)			4%			
Plywood, Particleboard, OSB Manufacturing	1%	1%	2%	3%		6%
Portland Cement Manufacturing	1%	5%		1%	2%	
Primary Lead Smelting	3%					
Primary Metal Production (Other) Production	2%					
Printing, Coating & Dyeing of Fabrics			1%			
Printing/Publishing Facilities			1%		2%	
Pulp and Paper Production	3%	6%	20%	6%		8%
Secondary Metal (Other) Processing	5%			6%		
Solid Waste Disposal – Industrial					1%	
Steel Mills	8%			11%		
Surface Coating Facilities (Other)	1%	1%	1%	2%	2%	1%
Synthetic Organic Chemical Manufacturing (HON)		4%	4%		19%	
Tank Batteries	2%	2%	1%			1%
Waste Solvent Recovery Operations					1%	

Table 10. Listing of Source Categories Contributing to 90% of Noncancer Toxicity Weighting By Select Target System

Source Category	Developmental[a]	Immunological[a]	Liver[a]	Neurological[a]	Reproductive[a]	Respiratory[a]
Wastewater Treatment			1%			
Wood Building Products (Surface Coating)			1%			1%
Wool Fiberglass Manufacturing			2%			
Cumulative % Contribution	**90%**	**90%**	**90%**	**90%**	**90%**	**90%**
Remaining Source Categories	10%	10%	10%	10%	10%	10%
Total Noncancer Toxicity Weighting (unitless)	**4,321,924**	**225,969**	**78,378**	**32,264,356**	**808,009**	**202,316,234**

[a] Percent contribution value equal to or greater than 10% of the national noncancer toxicity weighted emissions for an analyzed target system are shaded.

Table 11. Recommended Assessment Priority for Source Categories Based on RTR Analysis Schedule and Toxicity-weighting Results

Source Category	Priority Grouping	RTR Dates	Cancer Toxicity	Noncancer Toxicity
Oil and/or Gas Production	1	✓[a]	✓[d]	✓[e]
Petroleum Refineries	1	✓[b]	✓[d]	✓[e]
Portland Cement Manufacturing	1	✓[c]	✓	✓
Pulp and Paper Production	1	✓[a]	✓[d]	✓[e]
Aerospace Industries	2	✓[c]	✓	
Secondary Aluminum Production	2	✓[c]	✓	
Ferroalloys Production	3	✓[c]		✓
Marine Vessel Loading	3	✓[a]		✓
Natural Gas Transmission and Storage	3	✓[a]		✓
Pharmaceuticals	3	✓[a]		✓
Primary Lead Smelting	3	✓[a]		✓
Wool Fiberglass Manufacturing	3	✓[c]		✓
Acrylic/Modacrylic Fibers	4	✓[c]		
Chromium Anodizing Tanks	4	✓[a]		
Decorative Chromium Electroplating	4	✓[a]		
Epichlorohydrin Elastomers Production, *P&R I*	4	✓[a]		
Flexible Polyurethane Foam Production	4	✓[c]		
Hard Chromium Electroplating	4	✓[a]		
Mineral Wool Production	4	✓[c]		
Nitrile Butadiene Rubber Production, *P&R I*	4	✓[a]		
Off-Site Waste Recovery Operations	4	✓[c]		
Pesticide Active Ingredient Production	4	✓[c]		
Phosphate Fertilizers Manufacturing	4	✓[c]		
Phosphoric Acid Manufacturing	4	✓[c]		
Polybutadiene Rubber Production, *P&R I*	4	✓[a]		
Polycarbonates Production	4	✓[c]		
Polyether Polyols Production	4	✓[c]		
Polymers and Resins III	4	✓[c]		
Polymers and Resins IV	4	✓[c]		
Primary Aluminum Production	4	✓[c]		
Printing and Publishing Production	4	✓[a]		
Secondary Lead Smelters	4	✓[a]		
Shipbuilding and Ship Repair	4	✓[a]		
Steel Pickling-HCL Process	4	✓[a]		
Styrene Butadiene Rubber and Latex Production, *P&R I*	4	✓[a]		

Table 11. Recommended Assessment Priority for Source Categories Based on RTR Analysis Schedule and Toxicity-weighting Results

Source Category	Priority Grouping	RTR Dates	Cancer Toxicity	Noncancer Toxicity
Wood Furniture Production	4	✓[a]		
Aircrafts	5		✓[d]	✓[e]
Bulk Terminals/Bulk Plants	5		✓[d]	✓[e]
Chemical Manufacturing Facility	5		✓[d]	✓
Coke Batteries	5		✓[d]	✓
Electrical and Electronics Equipment: Finishing Operations	5		✓[d]	✓
Electricity Generation via Combustion	5		✓[d]	✓[e]
Industrial/Commercial/Institutional Boilers & Process Heaters	5		✓	✓
Iron and Steel Foundries	5		✓[d]	✓
Lime Manufacturing	5		✓	✓
Miscellaneous Manufacturing Industries	5		✓[d]	✓
Miscellaneous Metal Parts & Products (Surface Coating)	5		✓	✓
Organic Chemical Storage/Transportation	5		✓	✓
Pipeline Compressor Stations	5		✓[d]	✓[e]
Plywood, Particleboard, OSB Manufacturing	5		✓	✓
Primary Metal Production (Other)	5		✓[d]	✓
Secondary Metal (Other) Processing	5		✓	✓
Steel Mills	5		✓[d]	✓[e]
Surface Coating Facilities (Other)	5		✓[d]	✓
Synthetic Organic Chemical Manufacturing (HON)	5		✓	✓[e]
Tank Battery Facilities	5		✓[d]	✓
Waste Solvent Recovery Operations	5		✓	✓
Wood Building Products Manufacturing (Surface Coating)	5		✓	✓
Electroplating, Plating, Polishing, Anodizing, and Coloring	6		✓[d]	
Rubber and Miscellaneous Plastics Products Manufacturing	6		✓[d]	
Ethanol Biorefineries	7			✓
Ethylene Processes	7			✓
Fiberglass Manufacturing	7			✓
Gasoline/Diesel Service Stations	7			✓
Glass Manufacturing	7			✓
Landfills	7			✓

Table 11. Recommended Assessment Priority for Source Categories Based on RTR Analysis Schedule and Toxicity-weighting Results

Source Category	Priority Grouping	RTR Dates	Cancer Toxicity	Noncancer Toxicity
Lumber/sawmills	7			✓
Metal Can (Surface Coating)	7			✓
Military Base/National Security Facilities	7			✓
Natural Gas Processing	7			✓
Plastic Parts & Products (Surface Coating)	7			✓
Printing, Coating & Dyeing of Fabrics	7			✓
Printing/Publishing Facilities	7			✓
Solid Waste Disposal – Industrial	7			✓
Wastewater Treatment	7			✓

[a] Consent decree date for final within 2-6 years.

[b] No consent decree issued, but RTR being conducted through settlement agreement.

[c] RTR final date since 2008.

[d] Categories that are included in top 80% of national cancer toxicity weighted emissions.

[e] Categories with a percent contribution value equal to or greater than 10% of the national noncancer toxicity weighted emissions for an analyzed target system.

4.0 USEFULNESS OF THE 2008 NEI FOR RECENT RTR WORK

In support of Task 3 of the WA, EPA staff from the EIAG and SPPD met to discuss the usefulness of the 2008 NEI in recent RTR activities. In the past, RTR rulemaking relied on emissions inventory data from previous NEIs (2002 and 2005), Toxics Release Inventory (TRI), and/or industry data. With the release of 2008 NEI Version 1.5 in Spring 2011 and Version 2 in Spring 2012, EIAG wanted to understand if these inventories were being considered in recent RTR rulemaking. An evaluation of key data elements needed for RTR modeling is presented above in Section 3.

On October 25, 2012, EPA staff met to discuss the usefulness of the 2008 NEI in recent RTR activities. Specific attendees were:

- Ms. Lee Tooly, EPA EIAG/Work Assignment Manager, meeting facilitator
- Ms. Anne Pope, EPA SPPD
- Mr. Brian Shrager, EPA SPPD
- Ms. Andrea Siefers, EPA SPPD
- Ms. Darcy Wilson, ERG, EPA contractor
- Mr. Regi Oommen, ERG, EPA contractor

Anne Pope facilitates emissions data gathering for the SPPD staff conducting the RTR analysis. **Andrea Siefers** worked on the previous chemical sector review which included as many as ten MACT categories, and used the available emissions data from the 2005 National Air Toxics Assessment (NATA) to develop an initial emissions information form for industry group(s) to review. **Brian Shrager** is the SPPD RTR Coordinator, and was invited to describe the general expectations of the NEI for the RTR work. His thoughts include the following:

- NEI is one tool among several to consider using as a starting point and especially if no other data sources are readily available and if the expected emission magnitude for the sector of interest is small, i.e., not likely to pose a large risk.
- NEI is particularly useful when conducting scoping exercises for one or multiple categories to investigate the potential extent of risk due to hazardous air pollutant (HAP) emissions. Other emission data sources consulted for such initial scoping exercises include the EPA's NATA and the Toxic Release Inventory (TRI).
- It is expected that for some of the upcoming RTR work, the 2008 NEI will be considered as a starting point to develop an initial dataset to invite industry groups to review. A review mechanism includes referring the interested industry group to available NEI point source data posted on the Web.

For discussion during the meeting, Ms. Tooly prepared and distributed a list of charge questions. They are presented in Table 12.

Table 12. Charge Questions Evaluating Usefulness of 2008 NEI in RTR Activities

#	Question
1	What RTR sectors have recently or are presently using the 2008 NEI?
2	What version(s) of 2008 NEI is used?
3	How were the data accessed?
4	What data access method is working well?
5	What are you trying to do? The NEI is intended to help you do what?
6	What are your expectations for the NEI data?
7	How good or reliable do the data have to be?
8	What measures determine reliability
9	Based on what you were trying to do, specifically what 2008 NEI data were helpful to satisfy your objective(s)?
10	What specific NEI data fell short of being useful for your purpose?
11	Overall, how useful was the 2008 NEI for your RTR work?
12	Are there specific data that needs to improve for future NEI data to be more useful for RTR work?

The above questions were discussed and the responses are summarized below and reflect additional review and comments provided by attendees. Additional information is included by the meeting facilitator to support responses where considered helpful to clarify current or anticipated operating conditions.

Question 1: What RTR sectors have recently or are presently using the 2008 NEI?

Response: 2008 v1.5 NEI data were used in the RTR Prioritization Task to help to inform management in the selection of the next categories for analysis. That scoping exercise included more than 50 MACT categories. 2008 v1.5 NEI data were also used to gap fill missing facility HAP data for some of the facilities in the Flexible Polyurethane Foam Production (PUF) RTR category. The 2008 v2 NEI data are currently being used to support some initial scoping work for three chemical sector source categories (Ethylene Processes, Miscellaneous Organic NESHAP (MON), and Organic Liquids Distribution). While these source categories are not currently part of any RTR package, data are being reviewed in preparation for potential future RTR or other rulemakings.

Question 2: What version(s) of the 2008 NEI is used?

Response: The RTR program started before 2008 NEI data were available, and initially used the 2002 NEI and then the 2005 NATA NEI. As 2008 became available, early category work included review of 2008v1.5. For current RTR projects, the 2008 NEI v2 are being reviewed. See the above question/ response for specific examples.

Question 3: How was/ is the (2008 NEI) data accessed? e.g., CHIEF website – large file downloads, EIS reports, EIAG-assisted EIS data extractions

Response: Initially, SPPD requested data from EIAG on a facility-by-facility basis. SPPD staff can also access the 2008 NEI data via the EIS Gateway, but the reports in the EIS Gateway do not allow for large (batch) facility-specific extractions. RTR source categories may be applicable to several hundred facilities, and query by the individual facility is not often feasible. Detailed facility emissions data from the EIS Gateway are provided as relational data tables and are too cumbersome for SPPD staff to use in a timely manner. A supporting contractor was engaged to extract the entire 2008v1.5, and translate the data format to a "one record per line" (flat) format which is commonly used for emissions modeling. The flat-file format is similar to the ORL format utilized by the SMOKE emissions model to import HAP data. The flat file format used for the RTR risk modeling is prepared by extracting key data elements from the EIS facility relational tables (e.g., facility, unit, process, release point, etc.) and adding descriptions for coded elements (e.g., pollutant codes, MACT codes, FIPS codes, etc.). Currently, the contractor is working to download the entire 2008v2 to support RTR data requests.

Additional supporting information: EIAG with the assistance of the Information Transfer Group (EIS administrators) delivered to SPPD the 2008 v2 NEI point sources data from EIS that contains both the facility emissions and physical configuration information. The data were provided in the relational table format. Facilities that are not of interest may be filtered out to greatly reduce the number of records in the data set. EIS report enhancement requests for 2013 include attaching all of the facility emissions information to the current facility configuration reports which would allow one extraction from the EIS Gateway for both facility emissions and configuration information and result in a much reduced number of relational tables to manage. Report enhancement requests also include allowing EIS Gateway users to build a large list of specific facilities for data extraction.

Question 4: What data access method is working well?

Response: It is better for SPPD leads to be able to request data in large batches for specific facilities, in an ORL (flat) format rather than relational tables. See above question/ response regarding future EIS report enhancement to allow extraction at the Gateway for large list of specific facilities.

Question 5: What are you trying to do? The NEI is intended to help you do what?

Response: The NEI data are one of several tools for initiating RTR category projects. Specifically:

1. The NEI is the starting point for data review. SPPD in the past sent 2005 NATA emissions data to industry for review and revision ("voluntary QA"); and
2. The NEI is used in completeness checks for HAPs emitted from facilities in a given category, and to assess historical trends.

To accomplish this, it is desired that the NEI have complete and accurate data, and not over-report HAP emissions.

Question 6: What are your expectations for the NEI data?

Response: Ideally, the NEI data would be used as-is for risk modeling with little or no revisions. SPPD staff experience observes the need for more accurate and complete data for rulemaking activities. This recognizes the complexity of preparing nationwide inventories, the "voluntary" and potentially inconsistent or incomplete HAP reporting to the NEI, and the associated lag time from the end of the base year and the release of data (in the past usually 2-3 years). Thus, SPPD views the highest quality data to be those collected from facilities with Information Collection Requests (ICRs), and quality assured by RTR leads. For some RTR categories, EPA implements ICRs for all facilities. In the absence of ICR, or prior to conducting an ICR, the NEI data are reviewed, along with the most recent Toxics Release Inventory (TRI) data. However, for scoping studies, the NEI emission levels for particular categories are reviewed - if they appear to be representative and emissions are "low," the rule is given lower priority and effort for rule development. In reality, the NEI data (any version) as well as TRI data are just the starting point for developing an emission profile for specific facilities— the end point is often very different.

Question 7: How good or reliable do the data have to be?

Response: Litigation outcomes have indicated that ICR data provided by facilities are viewed as accurate data and may be considered to have the most reliability. The data need to be complete and model-ready, not just "representative." That being said, SPPD sees value in using the NEI for scoping tasks to determine program priorities. SPPD quality assures the important parameters needed for risk modeling, including the emission release point (ERP) coordinates. For example, for risk modeling, facility-level coordinates are not accurate enough, and thus the coordinates need to be accurate within 10 feet for risk assessments (e.g., emission release point coordinates need to be reported to the fifth decimal point). Some facilities are near Environmental Justice communities, and the difference in under-reporting of decimal points may inaccurately place estimated concentrations in the wrong census block. Accurately representing emission releases for fugitive sources, such as the dimensions of length, width, release height, and release angle, is also critical.

Additional supporting information: A list of the important parameters for risk modeling that is prioritized by SPPD for review and QA is in the Task 2 memo - "Prioritize the Type of Improvements of Most Significant Benefit to RTR and Establish Assessment Focus". EIAG also prioritizes review and QA of both the facility and the emission release point coordinates in EIS with a goal to verify and improve the accuracy of the release point location. Possible errors in release point coordinates are determined by investigating reasonable proximity to the facility center. Possible errors in the facility center coordinates reported are determined based on relative county boundaries and comparing to facility reported data in other EPA data systems – the Facility Registry System (FRS) and TRI. Data corrections are made through geo-addressing confirmations assisted by use of Google Maps. The typical outcome of EIAG's QA of facility and emission release point coordinates is at least 4 digits after decimal, and is usually 5 or

6 digits. For emission release points where large deltas from the facility center are identified, and it is confirmed that the facility is not actually that large, the release point coordinates are set equal to facility center.

Question 8: What measures determine reliability?

Response: The most important measure is EPA and industry acceptance of the emissions data. Facilities often don't recognize the data in the NEI that state and local agencies provide to EPA. Detailed emissions data may be available, but not in the NEI. For example, SPPD data verification steps for the Boiler MACT rule necessitated their review of available facility test report from which data were used in calculating MACT floor emission limits. Other measures include: the availability of expected pollutants in a consistent manner across applicable facilities and processes; use of actual data instead of surrogate default data in stack parameters (i.e., when stack parameter data are reported incomplete or determined in error, average default data may be used); correct identification of processes subject to certain regulations, e.g., assignment of regulatory codes; and use of the appropriate source classification codes (SCCs) to describe the process. For example, emissions associated with Portland Cement Manufacturing MACT processes should be coded as 30500606 (dry kilns), 30500706 (wet kilns), 30500622 (preheater kiln), or precalciner kiln (30500623). In preparation of the emission inventory file for this category, many processes were miscoded, and had to be corrected prior to emissions modeling.

Question 9: Based on what you were trying to do, specifically what 2008 NEI data were helpful to satisfy your objective(s)?

Response: The NEI was useful in prioritizing specific RTR source categories for program review based on toxicity-weighting the emissions inventory.

Question 10: What specific NEI data fell short of being useful for your purpose?

Response: A few items were noted:

1. Timeliness has been an issue – between request and receipt of data from EIAG;
2. The data format of the relational data tables are not easy to work with;
3. Completeness issues in terms of facility and units, source category, and HAP coverage;
4. Lack of specificity in certain cases of source category (e.g., generic SCCs vs. specific SCCs) and pollutant (e.g., strontium chromate is not an EIS applicable pollutant though it may be noted in industry provided data);
5. Facility configuration sometimes not consistent between NEI and the industry-provided ICR data (e.g., number of units/ processes, stack parameters and locational coordinates);
6. Lack of detailed and complete control information such as control devices, control efficiencies, and capture efficiencies;
7. Lack of coordinates for individual release point and QA of individual emission release point coordinates to insure coordinates are correctly located on stacks and fugitive releases;
8. Fugitive releases are not often reported with fugitive length, width and angle;

9. Lack of information at process level on units/processes subject to regulation; and
10. Source of data not available for a number of data fields including the basis of emission estimates, coordinates, permit IDs, and stack parameters.

Additional supporting information: See the supporting information included for Questions 7 and 12.

Question 11: Overall, how useful was the 2008 NEI for your RTR work?

Response: Useful as one tool among other data sources; especially useful in prioritizing review for a number of RTR source categories.

Question 12: Are there specific data that need to improve for future NEI data to be more useful for RTR work?

Response: Some data and coordination issues were noted. Issues relevant for the data quality nature of the review and corrective action are listed first in items 1-7 and coordination issues are listed in 8-10.

1. Having the Facility Registry System (FRS) identifier populated and accurate;
2. SPPD needs to be able to identify stack parameters that are defaults;
3. SPPD needs to be able to identify the basis for the emissions estimate (i.e., calculated, continuous measurement, engineering judgment); If calculated , SPPD needs to be able to review emission factors, the source of the factors used, and the process activity data for applicable year(s);
4. Need for more detailed control information;
5. Need to be able to assign regulatory codes based on specific SCCs (rather than generic SCCs), unit descriptions, etc. For example, some rules such as Cooling Towers are process- and HAP-specific;
6. In some cases, rolled-up HAPs are not accurate for use in risk assessments. The Aerospace category is an example where coatings contain many different types of chromium combinations. SPPD also needs dioxins reported in terms of congeners preferably or as 2005 WHO TEQs;
7. SPPD needs to assign "Emission Process Group" to RTR source category processes to better characterize risk modeling results and evaluate control technologies;
8. Having the data come in a more usable format;
9. Being able to get the data in a timely manner from EIS or EIAG; and
10. More of a coordinated effort between EIAG, the EPA Regional Office Emission Inventory leads, and the SLT agencies about the need for high quality HAP emissions and ancillary data needed for RTR activities.

Additional supporting information: Stack parameters reported by the agencies to EIS are checked to determine if reasonable. If the QA check results in possible error, the data are rejected. The state and local agencies are correcting a lot of stack parameter data. EIAG no longer defaults stack parameters. Stack parameters that have not been verified by agencies may be legacy data from initial load to the EIS. As of November 2012, automated data checks in EIS include more stringent consistency requirements and data rejection rules for stack parameter data. The emission calculation method is required when reporting emissions and is available in EIS Gateway reports - Facility Emissions Snapshot, see Emissions table; and Facility Emissions Summary report for process-level.

5.0 ASSESS 2008 NEI FOR MISSING HAPS

In Task 4 of the WA, EPA assessed the 2008 NEI v2 for missing or under-reported HAPs. The findings from this task were initially intended to focus on the priority source categories, and their associated SCCs, identified in Table 11 in Section 3. However, the majority of these priority source categories are scheduled for analysis within the next 2-6 years and will not typically be defined until the beginning of rulemaking activities. Thus, assignment of SCCs for each of the priority source categories presented in Table 11 was not available at the time of this project. Nevertheless, assessment of the 2008 NEI and beyond based on this priority list can provide significant benefit in harmonizing efforts between the regulatory categories and the NEI.

Prior to performing the analyses, a memorandum was prepared outlining the proposed approach, the readily available references that would be consulted, external support and data needs, timeline, and the expected outcomes. EPA conducted the following analyses to accomplish this task:

- Develop a matrix of expected HAPs by SCC after reviewing selected data references;
- Estimate potentially missing HAP-VOC and HAP-PM for nonpoint sectors; and
- Evaluate for point sources the TRI Data usage in RTR.

5.1 Matrix of Expected HAPs

Several data references were consulted to understand what HAPs were reasonable to expect may be present for SCC process emissions. The SCCs listed in the matrix are those that were referenced by the different data sources consulted. As a result, both point and nonpoint SCCs are represented in the matrix. As noted above, the SCCs in the matrix do not have a corresponding mapping at this time to the priority regulatory source categories listed in Table 11, but are mapped to the EIS source sectors which will benefit these regulatory source categories due to overlapping information. For example, while the universe of applicable facilities and processes may not be defined yet for the Oil and Gas RTR, the matrix presents expected HAPs for 114 point and nonpoint SCCs which may be evaluated for Oil & Gas rulemaking activities.

As this task was unfolding, it became evident that extracting information was more efficient from certain data references that are available via a large download file. For example, while it is possible to search WebFIRE by entering SCCs online, the more efficient option was to download the entire database that was available on the WebFIRE website. This type of efficiency, where available, is described below for the data references used. Additionally noted are some data references that were proposed in the Work Plan but were not reviewed due to time and resource constraints. Some of those are discussed in terms of pilot-level exercises to further explore and plan improved procedures for future compilation cycles of the NEI.

5.1.1 Data References

Expected HAPs described by SCC will be the most useful to EPA's NEI data QC and estimation efforts. The data resources listed below were reviewed to derive expected HAPs by SCC or NAICS-level. For each data source below, the level of data detail is identified. The first order priority for data gathering was placed on data sources with ready available SCC-level HAP information.

Data Reference 1 – EPA Regulatory Websites

For this data reference, EPA reviewed the SPPD MACT, Area Source, Solid Waste, and Special promulgated rules relating to air emissions, such as for Municipal Waste Combustors, Electric Arc Furnaces, and Coke Ovens. The regulatory websites for these promulgated source categories are presented in the Table 13 below, with the corresponding website address.

Table 13. SPPD MACT/Regulatory Websites

Type	Website
MACT Standards	http://www.epa.gov/ttn/atw/mactfnlalph.html
Area Source Standards	http://www.epa.gov/ttn/atw/area/arearules.html
Solid Waste Rules (these rules cover 9 specific HAPs)	http://www.epa.gov/ttn/atw/129/ssi/ssipg.html http://www.epa.gov/ttn/atw/129/hmiwi/rihmiwi.html http://www.epa.gov/ttn/atw/129/mwc/rimwc.html http://www.epa.gov/ttn/atw/129/mwc/rimwc2.html http://www.epa.gov/ttn/atw/129/ciwi/ciwipg.html http://www.epa.gov/ttn/atw/129/oswi/oswipg.html
Mercury Air Toxics Standards	http://www.epa.gov/airtoxics/utility/utilitypg.html
Lead NAAQS	http://www.epa.gov/airquality/lead/kitinventory.html

In total, over 130 regulatory webpages were reviewed to generate a matrix of regulatory codes and pollutants. The regulatory codes were then translated to applicable SCCs based on the 2005 NATA NEI and RTR inventory.

Data Reference 2 - RTR Database for Modeling Files

The RTR is a combined effort to evaluate both risk and technology as required by the Clean Air Act (CAA) after the application of maximum achievable control technology (MACT) standards. Section 112(f) of the CAA requires EPA to complete a Report to Congress that includes a discussion of methods the EPA would use to evaluate the risks remaining after the application of MACT standards. These are known as residual risks. EPA published the Residual Risk Report to Congress in March 1999. Section 112(f)(2) directs EPA to conduct risk assessments on each source category subject to MACT standards, and to determine if additional standards are needed to reduce residual risks. Section 112(d)(6) of the CAA requires EPA to review and revise the MACT standards, as necessary, taking into account developments in practices, processes and control technologies.

Although the RTR emissions modeling files are available with its associated rulemaking documents (http://www.epa.gov/ttn/atw/rrisk/rtrpg.html), EPA utilized the master RTR emissions database to extract the information needed. RTR emissions data are available at the SCC-level by facility, and thus a matrix of SCCs and pollutants was generated.

Data Reference 3 - WebFIRE Database

WebFIRE is EPA's online emissions factor repository, retrieval, and development tool (http://cfpub.epa.gov/webfire/). The WebFIRE database contains EPA's recommended emissions factors for criteria and hazardous air pollutants (HAP) for industrial and non-industrial processes. In addition, WebFIRE contains the individual data values used to develop the recommended factors and other data submitted to EPA by federal, state, tribal, and local agencies; consultants; and industries. For each recommended emissions factor and individual data value, WebFIRE contains descriptive information such as industry and source category type, control device information, the pollutants emitted and supporting documentation. Emission factors from EPA's AP-42 are also housed in WebFIRE.

EPA is currently re-engineering WebFIRE to be more user-friendly. On-line searches of the WebFIRE database can be done through querying; however, the database behind WebFIRE is also available and that file was extracted and imported into a database for this analysis. Since WebFIRE data are at the SCC-level, a matrix of SCCs and pollutants were generated.

Data Reference 4 - SPECIATE

SPECIATE is EPA's repository of volatile organic gas and particulate matter (PM) speciation profiles of air pollution sources. These emissions source profiles can be used to identify HAPs from specific source categories. EPA recently finalized SPECIATE Version 4.3, located at: http://www.epa.gov/ttn/chief/software/speciate/index.html.

The SPECIATE 4.3 database includes a total of 5,592 PM, volatile organic gases, and other gases profiles. Instead of searching through the on-line SPECIATE website the database behind SPECIATE was extracted and imported into a database for this analysis. SPECIATE

profiles are available at the source category and pollutant level. As such, a crosswalk of SPECIATE source categories to SCC was developed, and a matrix of SCCs and pollutants was generated.

Data Reference 5 - Toxic Release Inventory (TRI)

EPA's Toxics Release Inventory (TRI) is a database containing data on disposal or other releases of over 650 toxic chemicals from thousands of U.S. facilities, and information about how facilities manage those chemicals through recycling, energy recovery, and treatment. One of TRI's primary purposes is to inform communities about toxic chemical releases to the environment. TRI data are released annually, with the most recent year available being the 2011 preliminary dataset (http://www.epa.gov/tri/tridata/preliminarydataset/index.html). TRI data can go back many years, and are typically based on threshold usage of chemicals. As such, it may be possible that HAPs are reported in one TRI year, but not another. Thus, EPA reviewed multiple years of TRI data 2008-2011 for this analysis.

Searches can be made on the TRI website (http://www.epa.gov/tri/), however, the database behind TRI for the years of interest is available and those files were extracted and imported into a database for this analysis. TRI data are available by facility name and the North American Industrial Classification System (NAICS) code and pollutant level. As such, EPA developed a matrix of NAICS codes and pollutants.

Data Reference 6 - Special Studies - CenSARA

EPA also reviewed two nonpoint inventories recently prepared by the Central States Air Resource Agencies (CenSARA). CenSARA encompasses nine states: Arkansas, Iowa, Kansas, Louisiana, Minnesota, Missouri, Nebraska, Oklahoma, and Texas. In 2012, CenSARA developed two nonpoint source emissions inventories on behalf of its member states. The first inventory focused on 2011 area source combustion emissions from the institutional/commercial/industrial and residential sectors. The second inventory was for 2011 oil and gas emissions.

The pollutant focus for each inventory was different. While the combustion emissions inventory developed emission estimates for all possible HAPs, the oil and natural gas emissions inventory focused on 18 priority HAPs. Regardless, a matrix was developed for each inventory by SCC and pollutant. These results are presented by nonpoint SCC.

Data Reference 7 – Special Studies – Barnett Shale Emissions Inventory

EPA also reviewed an emissions inventory developed by the Texas Commission on Environmental Quality (TCEQ) for the Barnett Shale oil and natural gas activities (http://www.tceq.texas.gov/airquality/point-source-ei/psei.html). The Barnett Shale is a 23-county geographical area located in North-Central Texas. As part of this inventory, TCEQ prepared a calculator of expected pollutants for 14 source categories. After analysis of this calculator, there were five priority pollutants that were estimated for each of the

14 source categories, and those same pollutants were also in the CenSARA emissions inventory. However, the wellhead compressor engines contained additional HAPs not in the CenSARA emissions inventory, and were included for this analysis. A matrix of wellhead compressor types (2-stroke lean, 4-stroke lean, and 4-stroke rich burn) and pollutant were generated. These results are presented by nonpoint SCC.

5.1.2 Master Matrix Results

All of the information from the above data references is compiled in a master matrix of expected HAPs. The HAPs are grouped by HAP category name according to EPA's EIS master pollutant dictionary. The compiled version is presented in Appendix A-1 as a MS Access database. Based on the data sources consulted, 180 HAPs are listed as expected for 3,529 specific SCCs. Those source category (represented by EIS Sector), SCC, pollutant combinations are represented in the "Expected HAPs by SCC" table matrix. Over 500 NAICS codes for 159 pollutants are represented in the "Expected HAPs by NAICS" matrix. Each data table matrix in the MS Access database is in the format presented in Table 14. Summaries of the results are discussed and presented in the Appendix A-1.

Table 14. Example Format for Expected HAPs Matrix – NEI Point Sources

EIS Sector	SCC or NAICS	Data Reference	HAP Reported							
			Acetaldehyde	Acetamide	Acetontrile	Antimony	Benzene	….	Vinylidene Chloride	Xylenes
Industrial Processes - Petroleum Refineries	30601001	MACT Rule	✓			✓	✓			✓
	30601001	RTR Database					✓	✓		✓
	30601001	SPECIATE					✓	✓		✓
	30601101	MACT Rule	✓			✓	✓	✓		✓
	30601101	WebFIRE	✓					✓		
	30601101	RTR Database					✓	✓		✓
	30601101	SPECIATE								

5.1.3 Other Data References Not Considered

Three data references that were previously identified in the Work Plan as possible sources of information were not reviewed due to time constraints. They are presented here as possible data references which can be evaluated in the future.

EPA Oil and Natural Gas Emission Inventory Tool

EPA's EIAG is currently developing a 2011 oil and natural gas emissions inventory for the U.S. A consistent set of methods will be used to estimate pollutant emissions for each oil and natural gas source category (SCC) evaluated. This emissions inventory can be used to identify missing, under-reported, or incorrectly reported HAPs for this sector. For example, in conversations with the State of Wyoming, it is believed that only a limited number of HAPs are reported for their emission sources, and HAPs may be missing that can otherwise be estimated. Expected level of detail from this emission inventory would include: source category information, pollutants, and emissions/emission factors. Unfortunately, the oil and gas emissions inventory has not been completed in time for this report.

Permitting Databases

Another data reference resource that may be useful to review is permit data for facilities that are identified as sources of interest. At a minimum, a "pilot" approach could be developed by comparing sources and pollutants within the permit to inventory data submitted to the 2008 NEI v2. The results of the approach could identify additional HAPs to be expected from emission sources. Additionally, the results can be shared with state/local agencies in preparation for their 2011 emission inventory submittals. It is recommended that priority be placed on reviewing Title V permits that are located within each EPA Regional Office's website, as presented in Table 15 below.

Table 15. EPA Regional Office Permitting Websites

EPA Region	Website
1	http://www.epa.gov/region1/eco/permits/title5/where.html
2	http://www.epa.gov/region2/air/permit/title_v_database.htm
3	http://www.epa.gov/reg3artd/permitting/petitions3.htm
4	http://www.epa.gov/region4/air/permits/index.htm
5	http://www.epa.gov/region5/air/permits/index.html
6	http://yosemite.epa.gov/r6/Apermit.nsf/AirP
7	http://www.epa.gov/region7/air/title5/titlevhp.htm
8	http://www.epa.gov/region8/air/permitting/index.html
9	http://www.epa.gov/region9/air/permit/title-v-permits.html
10	http://yosemite.epa.gov/R10/AIRPAGE.NSF/Permits/tvop/

Expected level of detail from permits would include: site-level information (e.g., facility name, AFS ID, address, etc.), SCCs, pollutants, and actual/potential emissions. Due to time constraints, it was not feasible to query permitting files from every state permitting program. Conversely, the matrix of expected HAPs from this analysis could be distributed to EPA regional offices as a resource to consider when reviewing Title 5 or New Source Review permits.

Compare Ambient Monitoring Results to Emission Inventory Data

A final alternative approach to identify missing HAPs is to utilize ambient monitoring data. EPA is currently developing Phase VII air toxics monitoring archives ("Archive"), which houses HAP concentrations from 1973 to 2010. In theory, ambient concentrations at monitoring sites near emission sources can serve as a validation check on emission inventories by comparing pollutant species. For example, if ambient monitoring data near an emissions source is detecting vinyl chloride, then the emission inventory for that source would be expected to emit vinyl chloride. However, this type of analysis is not a perfect indicator of missing HAPs, as ambient measurements can reflect the transport of air parcels that are not located near the source. Additionally, pollutants that are ubiquitous, such as carbon tetrachloride, are not directly emitted by stationary sources, but remain present in the atmosphere. Yet, this analysis may potentially identify missing HAPs.

Recently, EPA's Office of Compliance Assurance (OECA) developed a database of potential excess emitters by comparing ambient monitoring results, NATA 2005 results, and emission inventory data from the 2008 NEI v2. If this approach is to be used, EPA would propose to further synthesize the results by possibly targeting a subset of monitoring sites that are more source-oriented, and/or examine HAPs that are non-mobile. To accomplish this, geographic information system (GIS) technology would be used first to identify ambient monitors in the OECA results that are within 1 to 2 miles of each point source. Next, EPA would summarize the pollutants that are typically detected, including frequency of detection. For facilities that are nearby, EPA would compare the monitored pollutant list to the pollutants included in the emissions inventory, and note any differences.

The expected outcome from this may be a list of missing HAPs by targeted facility. Additionally, an approach can be developed for application to the large OECA dataset. Expected level of detail from this analysis would include: site-level information (e.g., facility name, EIS ID, NEI ID, address, etc), SCCs, pollutants, and emissions. Due to time constraints, it was not feasible to conduct this analysis.

5.2 Estimate Potentially Missing HAP-VOC and HAP-PM in 2008 NEI

For this analysis, EPA examined the 2011 Nonpoint Sources NEI v1 augmentation datasets (ftp://ftp.epa.gov/EmisInventory/2011nei/doc/), and compared those data to the 2008 Nonpoint Sources NEI V2. The RTR program does not routinely evaluate nonpoint sources at this time but this evaluation does provide useful insight on use of NEI data for NATA. The 62 source category files prepared by EPA for the 2011 Nonpoint Sources NEI

v1, use consistent estimation methods, emission factors, and control information. However, this type of pollutant consistency may not be the same for the final 2008 Nonpoint Sources NEI v2. For example, although a state/local/tribal (SLT) agency may have submitted its own nonpoint sources inventory, it may have included only a limited number of HAPs. Additionally, a SLT agency may have submitted VOC emissions, but not corresponding HAP emissions. Thus, the ratios between the VOC emissions and the VOC-HAP emissions are not necessarily consistent in the 2008 Nonpoint Sources NEI v2.

To examine potential missing HAPs in the 2008 Nonpoint Sources NEI v2, EPA computed and applied the following ratios based on pollutant consistency between the:

- VOC HAP emissions and total VOC emissions;
- PM_{10} HAPs and the total PM_{10} emissions; and
- $PM_{2.5}$ HAPs and the total $PM_{2.5}$ emissions.

Table B-1 presents a crosswalk of individual HAPs that are either VOCs or PM. The pollutant codes listed in the crosswalk are valid codes in EPA's EIS master pollutant dictionary, which can be downloaded as a MS Access database from EPA's CHIEF website (http://www.epa.gov/ttn/chief/net/neip/appendix_6.mdb). It was decided for completeness that both PM_{10}-PRI and $PM_{2.5}$-PRI be evaluated. EPA did the following to complete this analysis:

1) Compiled all 2011 emission inventory files, i.e., the nonpoint augmentation data sets, that have PM, VOC, and associated HAP data, into a 2011 master database;
2) From the 2011 master database, developed a list of targeted SCCs and related emission factors for VOC and PM and associated VOC- and PM-HAPs;
3) From the 2011 Nonpoint Sources NEI v1 master database, extracted the VOC, PM_{10}-PRI, and $PM_{2.5}$-PRI emission factors; and the corresponding HAP emission factors associated with VOC, PM_{10}-PRI, and $PM_{2.5}$-PRI;
4) Using the emission factors extracted from the 2011 Nonpoint Source NEI v1, calculated HAP to VOC ratios; HAP to PM10-PRI ratios; and HAP to PM2.5-PRI ratios –by county, SCC;
5) Matched the 2011 Nonpoint Sources NEI v1 emission records by county, SCC, and HAP to the 2008 Nonpoint Sources NEI v2 obtained from http://www.epa.gov/ttn/chief/net/2008inventory.html;
6) For the target SCCs above, extracted from the 2008 Nonpoint Sources NEI v2 the VOC, PM_{10}-PRI, and $PM_{2.5}$-PRI emissions; and the corresponding HAP emissions associated with VOC, PM_{10}-PRI, and $PM_{2.5}$-PRI;
7) Applied the 2011 Nonpoint Sources NEI ratios, as follows:
    a. 2011 HAP to VOC ratios to the 2008 VOC emissions
    b. 2011 HAP to PM_{10} ratios to the 2008 PM_{10}-PRI emissions
    c. 2011 HAP to $PM_{2.5}$ ratios to the 2008 $PM_{2.5}$-PRI emissions
8) Calculated the emissions difference between 2008 v2 HAP emissions and the "ratio-applied" estimate for 2008 HAP emissions;

9) Calculated percent difference between the 2008 v2 HAP emissions and the "ratio-applied" estimate for 2008 HAP emissions.

An example of the above approach is presented in Appendix B-2, with reference to the MS Access database of analysis results. The MS Access database of results includes the record matches between SCC and HAP, as well as records that are in 2008 NEI inventory but not in the 2011 nonpoint NEI augmentation datasets, and records that are in the 2011 nonpoint datasets that are not in the 2008 NEI. In total, over 750,000 county-level, SCC, HAP records are directly matched records, i.e., found in both the 2011 dataset and in the 2008 NEI. Of these, approximately 78% of the records have emission percent differences of less than ±10%, while approximately 17% of the data records have differences in emission amounts greater than 50%. Table 16 presents HAP nonpoint emissions estimated by the ratio method for select SCCs that contribute to over 99% of the missing emissions in the 2008 NEI, i.e., SCC /HAPs identified by the 2011 datasets that are not present in the 2008 NEI. Table 16 shows that the 2008 NEI amount estimated as potentially missing using the 2011 ratio method is quite small compared to the national total amount for that HAP and select SCCs in the 2008 NEI. The potentially missing amounts may also be viewed by county to understand degree of significance at the local level. The database presents the results by state, county, and SCC. While Table 16 describes the amount of difference for select SCCs when target HAPs are missing in the 2008 NEI, county, county/SCC- level differences may also exist indicating values in the 2008 NEI much larger or much smaller than the emissions estimate derived from using the 2011 ratio method. Appendix B-2 which refers to the full database of results includes summaries of such differences. The default nonpoint ratio may be different for a certain state/county/SCC/HAP emissions value in 2008 for several reasons including because the state-reported value may or may not relate to their VOC emissions or EPA completed the HAP value and that HAP value was not related to the VOC emission factor value in the 2011 nonpoint augmentation dataset.

Table 16. Non-Point Stationary Sources - Top 5 HAP Emissions By 2011 Ratio Method For Select SCCs Not Included in 2008 NEI

Pollutant Category Name	EIS Sector(s)	Emissions Estimate via Ratio Method (tpy)	% Contribution of Total Missing Emissions	Emissions in 2008 NEI for Select SCCs (tpy)
Xylenes (Mixed Isomers)	Solvent – Consumer & Commercial Solvent Use; Gas Stations	58.70	56%	6,033.72
Toluene	Solvent – Consumer & Commercial Solvent Use; Gas Stations	30.79	29%	3,218.61
Ethylbenzene	Solvent – Consumer & Commercial Solvent Use; Gas	11.07	11%	1,144.20

Table 16. Non-Point Stationary Sources - Top 5 HAP Emissions By 2011 Ratio Method For Select SCCs Not Included in 2008 NEI

Pollutant Category Name	EIS Sector(s)	Emissions Estimate via Ratio Method (tpy)	% Contribution of Total Missing Emissions	Emissions in 2008 NEI for Select SCCs (tpy)
	Stations			
Methyl Chloroform	Solvent –Industrial Surface Coating & Solvent Use	2.51	2%	122.15
Methanol	Solvent –Industrial Surface Coating & Solvent Use	0.98	1%	17.13
	Remaining 21 HAPs	0.40	1%	651.80
	Total	**104.45**	**100%**	**11,187.61**

5.3 Evaluate TRI Data Usage in RTR

For the 2008 NEI v2, limited TRI data were incorporated into the final inventory. As a way to potentially add more data from TRI, EPA reviewed the RTR emissions database to identify TRI data that were used for RTR rulemaking, and assessed this data for potential usage for the 2011 NEI cycle. TRI data that were available for the 2008 NEI v2, but were not used, is evaluated to determine if the data judged "sound" should be used as a screening mechanism for the 2011 NEI cycle. That data judged sound which was available in TRI and not used in the 2008 NEI will be identified as additional data to consider for the 2011 NEI. For this analysis, EPA used the SMOKE-formatted version of the 2008 NEI, which is publically available. SMOKE stands for Sparse-Matrix Operator Kernel Emissions, which is a model used to convert emission inventories to the formats needed by air quality modeling and which has its own input formats for the NEI.

EPA used the following steps to identify additional TRI data that could be investigated for potential use in the 2011 NEI cycle:

1) From the RTR master database, pulled all facilities that had a MACT code assignment.
2) Pulled all the emission inventory data for the facilities identified in Step 1.
3) Using the Data Source field, identified all TRI emission inventory records.
4) Mapped the TRI facilities to the 2008 NEI EIS ID using existing crosswalks developed for the RTR inventory.
5) Compared the extracted TRI records for the RTR facilities with the 2008 NEI v2 facility emissions available in the SMOKE file format. The comparison was performed for the Facility and Pollutant Category Name, for both the RTR and 2008 NEI emissions. Use of the pollutant category name allows summary for

pollutant compounds groups where applicable, e.g., Chromium, Chromium VI, and Chromium III are summarized as "Chromium Compounds."

6) Identified TRI emission records (by facility and pollutant category name) in the RTR data set that were absent in the 2008 NEI v2. Prepared the "Missing_RTR_TRI_IN_2008NEI" data table.

Some data considerations are presented below:

- The matching between TRI ID and EIS ID can be further examined. It is possible that additional matches may be determined;
- It is possible that TRI data used for RTR source categories may not have reported 2008 emissions due to reporting threshold requirements;
- This analysis used the 2008 NEI v2 SMOKE emissions file dated June 2012. If additional emissions data were entered into EIS after release date of the SMOKE file, those data were not considered; and
- TRI dioxins were included in the TRI emissions, but not in the 2008 NEI v2 SMOKE emissions file.

The results of this analysis are presented in Appendix C as referenced in a separate MS Access database. The description of the data fields are included in a separate table of the database and also listed here:

- REPORTING YEAR: year of TRI data used for the RTR source category
- NTI_SITE_ID: NEI Site identifier used to match facility in master RTR database
- TRIFID: Unique TRI facility identifier
- FACILITY NAME: TRI facility name
- FACILITY STREET: TRI facility street address
- FACILITY CITY: TRI facility city
- FACILITY STATE: TRI facility state postal code
- FACILITY ZIP CODE: TRI facility zip code
- PRIMARY SIC CODE: TRI facility Standard Industrial Classification (SIC)
- LATITUDE: TRI facility latitude (decimal degrees)
- LONGITUDE: TRI facility longitude (decimal degrees)
- CAS NUMBER: TRI chemical abstract services identifier
- CHEMICAL NAME: TRI pollutant name
- UNIT OF MEASURE: TRI unit of measure for the emissions
- ERP_TYPE: TRI emission release point type (01 = fugitive; 02 = stack)
- EMISS_VALUE: TRI air emissions [convert to tons]
- Facility_IDs 1-4: From FRS crosswalk, potential EIS IDs which the TRIFID can be mapped to
- MACT_0101-1 to 1808-4: Flag to indicate the MACT Code in which the TRI data was used for in the RTR master database

Table 17 presents the Top 10 emissions of HAPs that could have been potentially added to the 2008 NEI, and which may warrant investigation during future NEI development cycles. The Top 10 HAPs contribute 83% of the total TRI emissions not included in the 2008 NEI. The resident county emissions in the 2008 NEI for the specific TRI facilities are also shown. For chlorine, the negative difference between the TRI facility emissions and the total emissions for the resident counties indicates more emissions in TRI for the facilities than are in the 2008 NEI. The large positive differences in emissions indicate that the amount in TRI for the facilities are small compared to the total sum in the counties where they reside. Comparisons to specific county totals are available in the full database and may be investigated to understand significance for individual counties.

Table 17. Top 10 TRI HAP Emissions Not Included in 2008 NEI Point Sources

Pollutant Category Name	TRI Facility Emissions (tpy)	# of TRI Facilities	2008 NEI County-Level Emissions of TRI Facilities (tpy)	Emissions Difference (County – TRI facilities)
Chlorine	1,554.21	65	268.18	- 1,286
Hydrochloric Acid	1,514.59	70	12,807.62	11,293
Styrene	1,141.87	82	1,595.06	453
Xylenes (Mixed Isomers)	868.44	148	2,049.99	1,182
Methanol	823.33	160	4,473.67	3,651
Hexane	810.50	70	1,430.46	621
Toluene	332.17	104	1946.53	1,615
Methyl Isobutyl Ketone	268.15	74	360.63	93
Benzene	210.04	24	639.34	429
Ethylbenzene	209.61	108	390.09	180
Remaining 116 HAPs	1,702.89	1,696	4,408.88	2,706
Total	**9,435.78**	**2,013**	**30,370.45**	**20,934**

5.4 Missing HAP Results

The analyses conducted in Sections 5.1 through 5.3 highlight HAP emissions that are potentially missing or under-reported from the 2008 NEI stationary sources inventories (point and nonpoint sources). Specifically:

- **Matrix of Expected HAPs**: Appendix A-1 presents a matrix of expected HAPs by SCC which was compiled from multiple data references, and a matrix by NAICS code which pertains solely to the TRI data reference. EPA also compiled a unique list of SCCs from the matrix, and queried the 2008 NEI using those SCCs to identify missing HAPs, which are presented in Appendix A-2. Table A-1 presents a list of missing HAPs from the 2008 NEI to the Expected HAPs matrix by SCC. As noted in Section 5.0, the SCCs in the matrix do not directly relate to the priority source categories presented in Table 11.

Finally, Appendix A-3 presents a comparison of expected HAPs by EIS Sector and SCC to the actual number of HAPs that were reported to the 2008 v2 point sources NEI. Table 18 summarizes these results. Of the 3,475 SCCs listed in this table, less than 9% are reporting the same number of HAPs between expected and actual found in the 2008 NEI. Approximately 64% of the SCCs are showing under-reporting of HAPs (i.e., the actual number of HAPs reported was less than the expected number of HAPs).

Table 18. Comparison of Expected HAPs to Actual HAPs in 2008 NEI

Expected HAPs…	# SCCs	% SCCs to Total
…equal Actual HAPs found in 2008 v2 point sources NEI	313	9%
…greater than Actual HAPs found in 2008 v2 point sources NEI	2,230	64%
…less than Actual HAP found in 2008 v2 point sources NEI	932	27%
Total	3,475	100%

- **Missing HAPs via Ratios**: For this analysis, an approach was developed to check for pollutant consistency of nonpoint emissions for select SCCs between the 2008 Nonpoint NEI V2 and the EPA's 2011 Nonpoint NEI V1 augmentation data. The RTR program does not routinely evaluate nonpoint sources but this evaluation does provide useful insight on use of NEI data for NATA. Table 16 shows that the 2008 NEI amount estimated as potentially missing using the 2011 ratio method is quite small compared to the national total amount for that HAP and select SCCs that are in the 2008 NEI. The potentially missing amounts may also be viewed by county to understand degree of significance at the local level. EPA also identified potentially under-reported or over-reported HAP emissions for select SCCs in the 2008 Nonpoint NEI. In both cases, the amount of potentially over or under-reported emissions could be significant, especially in terms of NATA risk modeling. Summaries of the Direct Matches and Missing HAPs are also included in the Appendix B database as well as summaries for the potentially under or over-reported HAPs in 2008 NEI (Tables B-2 and B-3).

- **RTR TRI Evaluation**: For RTR rulemaking, multiple sources of emissions information are evaluated and compiled into developing an emissions modeling inventory. Some of these data may include emissions data from TRI. For this analysis, EPA reviewed TRI data that were used in RTR rulemaking and compiled a list of TRI facilities and their reported HAPs. The TRI facilities were then mapped to EPA's EIS Facility ID. Once matched, EPA compared the pollutant emissions from the TRI dataset to what was reported in the 2008 Point Sources NEI V2. Summaries of these comparisons are in the Appendix C database. In general, the amount in TRI for the facilities not included in the 2008 NEI are small compared to the total sum in the counties where they reside. Comparisons to specific county totals are available in the full database and may be

investigated to understand significance for individual counties. For chlorine, the total emissions for counties where the TRI facilities reside indicate more emissions in TRI for the facilities than are in the 2008 NEI. These TRI facilities are being investigated for the 2011 NEI.

6.0 RECOMMENDED IMPROVEMENT ACTIVITIES FOR FUTURE NEI DEVELOPMENT USING THESE RESULTS

The Office of the Inspector General (OIG) recommended that EPA improve air toxics emissions data needed to conduct residual risk assessments. Every development cycle of the National Emissions Inventory (NEI) continues to improve the emissions information. Many improvements for stationary sources that resulted in the 2008 NEI are expected to have direct benefit to the RTR program. In an effort to improve the National Emissions Inventory (NEI), EPA developed the Emissions Inventory System (EIS) to collect, compile, and store emissions data. EIS contains numerous automated quality-assurance checks which can provide greater confidence in the development of the NEI, and can also improve its use as a data source for RTR rulemaking activities.

EPA evaluated the RTR program needs for emissions information and the most recent inventory – the 2008 NEI, to gauge the degree of improvement in air toxics data needed to conduct residual risk assessments. This evaluation indicates that the NEI is becoming increasingly more effective in providing the emissions data needed for successful use by the RTR program. RTR analysis to date has involved review and use of the 2005 NEI primarily, though the timing of some more recent sector analysis allowed the use of early versions of the current 2008 NEI. The development of the 2011 NEI is now underway. Many of the evaluation techniques used in this project are operational as QA techniques for the 2011 NEI. For instance, TRI facility data is being reviewed for more complete inclusion point source HAP data in the 2011 NEI. Also the EPA's use of a consistent set of emission factor ratios for VOC and PM to HAP when adding nonpoint HAP data where not reported by the SLTs, will improve the nonpoint data to be more consistent and complete. Such improvements in completion of HAPs for the nonpoint sources will initially be more beneficial to the NATA 2011 as the RTR program continues to have predominant focus on facility point source data.

As a result of this evaluation, the following recommended improvements are presented for the current and/or future NEI development cycles:

- ***Continued coordination between EPA's RTR and NEI programs will mutually benefit data improvements and uses.*** As indicated in Section 4.0, Usefulness of the 2008 NEI for Recent RTR Work - there are technical and procedural activities that warrant continued coordination across these programs.

- ***Improve ease of access and use of the detailed NEI data needed for review by the RTR program.*** Section 4 of this report summarized information provided by several RTR program staff regarding the use of the 2008 NEI. Given the complex structure of the EIS, they found it difficult to use the 2008 NEI data. Difficulties include: 1) too many data tables to link (i.e., a "flattened" data file containing all the necessary elements for RTR emissions modeling); 2) inability to batch download data (i.e., data can be searched one at a time through the EIS Gateway); and 3) timeliness of the data (lag time from the end of a base year to release of the data can be 3-4 year, which may be not be representative for rulemaking

activities. EPA has implemented access improvements since releasing earlier versions of the 2008 NEI and should discuss those techniques with the RTR staff regarding whether that has helped to alleviate their data access issues.

- ***Consolidating the RTR sector-specific emissions information in EIS can benefit the NEI.*** In Section 3.3 of this report, EPA summarized RTR source categories that were developed after the 2008 NEI cycle or are currently underway. As discussed in Section 4.0, the RTR source sector inventories are generated from a review of various data sources, including the facility specific information requested and collected by EPA, i.e., the ICR data. The facility emissions and physical configurations are verified by RTR program staff through the ICR process and GIS technologies. This information can be a valuable resource in the development of the NEI to alert the SLTs to review their facility configurations and emissions. The EPA has initiated an effort to consolidate information collected from industry by the RTR program into the EIS. That will facilitate further consideration of that data for the NEI and specific SCCs.

- ***Future RTR source categories can use the 2011 NEI as a priority data tool.*** Table 11 in Section 3.3 of this report, indicates a number of RTR source categories scheduled to begin within the next 2 to 6 years. Therefore, a quality-assured, complete 2011 NEI can be a valuable resource in developing and compiling the baseline emissions inventory needed for the RTR program.

- ***The Priority Source Categories List (Table 11) can guide the development of the 2011 NEI.*** In Section 3.3, EPA developed a list of priority source categories based on RTR activity dates and cancer/noncancer toxicity weighting. This approach further categorized source categories into "priority groups" which can help EPA focus on more critical source categories if there are time and resource constraints.

- ***Integrate matrix of expected HAPs into NEI QA activities and encourage enhanced review by state/local/tribal (SLT) agencies to ensure complete pollutant coverage.*** In Section 5.1, EPA reviewed numerous data sources (RTR, WebFIRE, SPECIATE, etc.) to generate a master matrix of expected HAPs by SCC. Approximately 64% of the SCCs are showing under-reporting of HAPs (i.e., the actual number of HAPs reported was less than the expected number of HAPs). Multiple years of TRI data were also reviewed to generate a similar master matrix of expected HAPs by Facility ID and NAICS. This information can be used by SLTs to ensure complete pollutant coverage prior to submission into EIS and by EPA to facilitate completion of emissions data when not provided by the SLTs.

- ***Investigate potentially missing HAP emissions for the 2011 NEI development cycle.*** EPA computed VOC and PM to HAP emission factor ratios for many nonpoint source categories that EPA will use for consistent data completion in the 2011 NEI when HAP data is not reported by S/L/Ts. Section 4.0 describes the result of applying those ratios to the 2008 NEI data to estimate potentially missing HAP emissions in the 2008 NEI. EPA can use those results as a QA mechanism to engage the SLT agencies during the development of the 2011 NEI to review for potentially missing or under-reported HAPs. Such improvements in completion of HAPs for the nonpoint sources will initially be more beneficial to the NATA 2011 as the RTR program continues to have predominant focus on facility point source data. The 2008 NEI amount estimated as potentially missing using the 2011 ratio method is quite small compared to the national total amount for that HAP and select SCCs that are in the 2008 NEI. The potentially missing amounts may also be viewed by county to understand degree of significance at the local level. EPA also identified potentially under-reported or over-reported HAP emissions for select SCCs in the 2008 Nonpoint NEI. In both cases, the amount of potentially over or under-reported emissions could be significant, especially in terms of NATA risk modeling.

- ***Review and consider additional TRI data for the 2011 NEI.*** As the 2011 point sources inventory is developed in EIS, EPA may want to consider incorporating TRI data used for recent RTR rulemaking activities, yet did not get integrated into the 2008 point sources inventory. As presented in Section 5.3, the missing emissions may be significant for specific facilities and can be investigated for inclusion in the 2011 NEI.

- ***Continue examination of the EIS Facility Table for multiple and active facility IDs and work with the SLT agencies to merge as appropriate and to discourage multiple active IDs for one facility.*** In preparing the missing TRI data, it was noted that for select facilities, the TRI facility identifier (TRIFID) could be mapped to multiple EIS Facility IDs, based on crosswalks available on Envirofacts. For example, a Monsanto plant in Iowa has a TRIFID 52761MNSNTWIGGI. According to Envirofacts, this TRI ID is mapped to EIS Facility IDs 12807711, 12807611, 12807511, and 8121511. Based on additional investigation, the State of Iowa requested that the original EIS Facility ID (8121511) be made inactive and three EIS Facility IDs be generated to coincide with the three Title V permits currently at that facility. The current NEI data development process does include a seek and merge process for these situations and involves the SLTs in problem identification and resolution.

7.0 REFERENCES

U.S. EPA, 2012a. RTR Updated Schedule and Historical Dates. Email sent from Ms. Anne Pope, U.S. EPA to Mr. Regi Oommen, Eastern Research Group, Inc. October 23, 2012.

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APPENDIX A – EXPECTED HAPS MATRIX (FOUND IN THE "EXPECTED_HAPS" MICROSOFT ACCESS DATABASE)

APPENDIX A-1. EXPECTED HAPS MATRIX (FOUND IN THE "EXPECTED_HAPS BY SCC" AND "EXPECTED HAPS BY NAICS" DATA TABLES IN THE MICROSOFT ACCESS DATABASE)

APPENDIX A-2. SUMMARY OF SCC AND HAP COUNTS BY EIS SECTOR

EIS Sector	Number of SCCs	Number of Expected HAPs
Agriculture - Livestock Waste	1	4
Bulk Gasoline Terminals	349	75
Dust - Construction Dust	5	13
Fuel Comb - Comm/Institutional - Biomass	31	60
Fuel Comb - Comm/Institutional - Coal	101	58
Fuel Comb - Comm/Institutional - Natural Gas	35	63
Fuel Comb - Comm/Institutional - Oil	52	62
Fuel Comb - Comm/Institutional - Other	73	75
Fuel Comb - Electric Generation - Biomass	21	54
Fuel Comb - Electric Generation - Coal	107	91
Fuel Comb - Electric Generation - Natural Gas	24	71
Fuel Comb - Electric Generation - Oil	52	67
Fuel Comb - Electric Generation - Other	65	77
Fuel Comb - Industrial Boilers, ICEs - Biomass	52	86
Fuel Comb - Industrial Boilers, ICEs - Coal	118	82
Fuel Comb - Industrial Boilers, ICEs - Natural Gas	52	109
Fuel Comb - Industrial Boilers, ICEs - Oil	111	78
Fuel Comb - Industrial Boilers, ICEs - Other	156	102
Fuel Comb - Residential - Natural Gas	1	5
Fuel Comb - Residential - Oil	3	15
Fuel Comb - Residential - Other	3	38
Gas Stations	51	25
Industrial Processes - Cement Manuf	4	11
Industrial Processes - Chemical Manuf	1198	145
Industrial Processes - Ferrous Metals	75	15
Industrial Processes - Mining	3	6
Industrial Processes - NEC	738	123
Industrial Processes - Non-ferrous Metals	167	43
Industrial Processes - Oil & Gas Production	245	64
Industrial Processes - Petroleum Refineries	215	87
Industrial Processes - Pulp & Paper	193	89
Industrial Processes - Storage and Transfer	1052	134
Miscellaneous Non-Industrial NEC	3	34
Mobile - Non-Road Equipment - Diesel	3	15
Mobile - Non-Road Equipment - Gasoline	1	16
Mobile - Non-Road Equipment - Other	9	19
Solvent - Degreasing	46	88
Solvent - Dry Cleaning	22	7
Solvent - Graphic Arts	125	70
Solvent - Industrial Surface Coating & Solvent Use	300	136
Waste Disposal	372	130

APPENDIX A-3. COMPARISON OF EXPECTED HAPS TO HAPS REPORTED TO THE 2008 V2 POINT SOURCES NEI (FOUND IN THE "APPENDIX A-3_COMPARISON_OF_EXPECTED_HAPS_2008NEI_HAPS" DATA TABLE IN THE MICROSOFT ACCESS DATABASE)

APPENDIX B.1 – CROSSWALK OF VOC HAPS AND PM HAPS BASED ON EPA'S EIS (EMISSIONS INVENTORY SYSTEM)

TABLE B-1. CROSSWALK OF VOC AND PM HAPS TO EPA EIS POLLUTANT CODES

EPA's EIS Pollutant Category Name	EPA's EIS Pollutant Name	EPA's EIS Pollutant Code	PM	VOC
1,1,2,2-Tetrachloroethane	1,1,2,2-Tetrachloroethane	79345		✓
1,1,2-Trichloroethane	1,1,2-Trichloroethane	79005		✓
1,2,4-Trichlorobenzene	1,2,4-Trichlorobenzene	120821		✓
1,2-Epoxybutane	1,2-Epoxybutane	106887		✓
1,3-Butadiene	1,3-Butadiene	106990		✓
1,3-Dichloropropene	1,3-Dichloropropene	542756		✓
1,4-Dichlorobenzene	1,4-Dichlorobenzene	106467		✓
2,2,4-Trimethylpentane	2,2,4-Trimethylpentane	540841		✓
2,4,6-Trichlorophenol	2,4,6-Trichlorophenol	88062		✓
2,4-Dichlorophenoxy Acetic Acid	2,4-Dichlorophenoxy Acetic Acid	94757		✓
2,4-Dinitrophenol	2,4-Dinitrophenol	51285		✓
2,4-Dinitrotoluene	2,4-Dinitrotoluene	121142		✓
2,4-Toluene Diisocyanate	2,4-Toluene Diisocyanate	584849		✓
2-Chloroacetophenone	2-Chloroacetophenone	532274		✓
2-Nitropropane	2-Nitropropane	79469		✓
4,4'-Methylenediphenyl Diisocyanate	4,4'-Methylenediphenyl Diisocyanate	101688		✓
4-Nitrophenol	4-Nitrophenol	100027		✓
Acetaldehyde	Acetaldehyde	75070		✓
Acetamide	Acetamide	60355		✓
Acetonitrile	Acetonitrile	75058		✓
Acetophenone	Acetophenone	98862		✓
Acrolein	Acrolein	107028		✓
Acrylic Acid	Acrylic Acid	79107		✓
Acrylonitrile	Acrylonitrile	107131		✓
Allyl Chloride	Allyl Chloride	107051		✓
Antimony Compounds	Antimony	7440360	✓	
Arsenic Compounds	Arsenic	7440382	✓	
Benzene	Benzene	71432		✓
Benzyl Chloride	Benzyl Chloride	100447		✓
Beryllium Compounds	Beryllium	7440417	✓	
Biphenyl	Biphenyl	92524		✓
Bis(2-Ethylhexyl)Phthalate	Bis(2-Ethylhexyl)Phthalate	117817		✓
Bromoform	Bromoform	75252		✓

TABLE B-1. CROSSWALK OF VOC AND PM HAPS TO EPA EIS POLLUTANT CODES

EPA's EIS Pollutant Category Name	EPA's EIS Pollutant Name	EPA's EIS Pollutant Code	PM	VOC
Cadmium Compounds	Cadmium	7440439	✓	
Calcium Cyanamide	Calcium Cyanamide	156627		✓
Captan	Captan	133062		✓
Carbaryl	Carbaryl	63252		✓
Carbon Tetrachloride	Carbon Tetrachloride	56235		✓
Chlorobenzene	Chlorobenzene	108907		✓
Chloroform	Chloroform	67663		✓
Chloroprene	Chloroprene	126998		✓
Chromium Compounds	Chromium	7440473	✓	
Chromium Compounds	Chromium (VI)	18540299	✓	
Chromium Compounds	Chromium III	16065831	✓	
Cobalt Compounds	Cobalt	7440484	✓	
Cresol/Cresylic Acid (Mixed Isomers)	Cresol/Cresylic Acid (Mixed Isomers)	1319773		✓
Cresol/Cresylic Acid (Mixed Isomers)	*m*-Cresol	108394		✓
Cresol/Cresylic Acid (Mixed Isomers)	*o*-Cresol	95487		✓
Cresol/Cresylic Acid (Mixed Isomers)	*p*-Cresol	106445		✓
Cumene	Cumene	98828		✓
Cyanide Compounds	Cyanide	57125	✓	
Cyanide Compounds	Hydrogen Cyanide	74908	✓	
Dibenzofuran	Dibenzofuran	132649		✓
Dibutyl Phthalate	Dibutyl Phthalate	84742		✓
Diethanolamine	Diethanolamine	111422		✓
Dimethyl Phthalate	Dimethyl Phthalate	131113		✓
Dimethyl Sulfate	Dimethyl Sulfate	77781		✓
Epichlorohydrin	Epichlorohydrin	106898		✓
Ethyl Acrylate	Ethyl Acrylate	140885		✓
Ethyl Chloride	Ethyl Chloride	75003		✓
Ethylbenzene	Ethyl Benzene	100414		✓
Ethylene Dibromide	Ethylene Dibromide	106934		✓
Ethylene Dichloride	Ethylene Dichloride	107062		✓
Ethylene Glycol	Ethylene Glycol	107211		✓

TABLE B-1. CROSSWALK OF VOC AND PM HAPS TO EPA EIS POLLUTANT CODES

EPA's EIS Pollutant Category Name	EPA's EIS Pollutant Name	EPA's EIS Pollutant Code	PM	VOC
Ethylene Oxide	Ethylene Oxide	75218		✓
Ethylidene Dichloride	Ethylidene Dichloride	75343		✓
Formaldehyde	Formaldehyde	50000		✓
Glycol Ethers	2-Butoxyethyl Acetate	112072		✓
Glycol Ethers	Butyl Carbitol Acetate	124174		✓
Glycol Ethers	Carbitol Acetate	112152		✓
Glycol Ethers	Cellosolve Acetate	111159		✓
Glycol Ethers	Cellosolve Solvent	110805		✓
Glycol Ethers	Diethylene Glycol Ethyl Methyl Ether	1002671		✓
Glycol Ethers	Diethylene Glycol Monobutyl Ether	112345		✓
Glycol Ethers	Diethylene Glycol Monoethyl Ether	111900		✓
Glycol Ethers	Diethylene Glycol Monomethyl Ether	111773		✓
Glycol Ethers	Glycol Ethers	171		✓
Glycol Ethers	N-Hexyl Carbitol	112594		✓
Glycol Ethers	Propyl Cellosolve	2807309		✓
Hexachlorobenzene	Hexachlorobenzene	118741		✓
Hexachlorobutadiene	Hexachlorobutadiene	87683		✓
Hexachlorocyclopentadiene	Hexachlorocyclopentadiene	77474		✓
Hexane	Hexane	110543		✓
Hydrazine	Hydrazine	302012		✓
Hydroquinone	Hydroquinone	123319		✓
Isophorone	Isophorone	78591		✓
Lead Compounds	Lead	7439921	✓	
Manganese Compounds	Manganese	7439965	✓	
Mercury Compounds	Mercury	7439976	✓	
Methanol	Methanol	67561		✓
Methyl Bromide	Methyl Bromide	74839		✓
Methyl Chloride	Methyl Chloride	74873		✓
Methyl Chloroform	Methyl Chloroform	71556		✓
Methyl Isobutyl Ketone	Methyl Isobutyl Ketone	108101		✓
Methyl Methacrylate	Methyl Methacrylate	80626		✓

TABLE B-1. CROSSWALK OF VOC AND PM HAPS TO EPA EIS POLLUTANT CODES

EPA's EIS Pollutant Category Name	EPA's EIS Pollutant Name	EPA's EIS Pollutant Code	PM	VOC
Methyl Tert-Butyl Ether	Methyl *tert*-Butyl Ether	1634044		✓
Methylene Chloride	Methylene Chloride	75092		✓
Methylhydrazine	Methylhydrazine	60344		✓
N,N-Dimethylaniline	N,N-Dimethylaniline	121697		✓
N,N-Dimethylformamide	N,N-Dimethylformamide	68122		✓
Naphthalene	Naphthalene	91203		✓
Nickel Compounds	Nickel	7440020	✓	
Nitrobenzene	Nitrobenzene	98953		✓
o-Toluidine	*o*-Toluidine	95534		✓
PAH/POM - Unspecified	PAH/POM - Unspecified	250	✓	
p-Dioxane	*p*-Dioxane	123911		✓
Pentachlorophenol	Pentachlorophenol	87865		✓
Phenol	Phenol	108952		✓
Phosphorus	Phosphorus	7723140	✓	
Phthalic Anhydride	Phthalic Anhydride	85449		✓
Polychlorinated Biphenyls	2,4,4'-Trichlorobiphenyl (PCB-28)	7012375		✓
Polychlorinated Biphenyls	2-Chlorobiphenyl (PCB-1)	2051607		✓
Polychlorinated Biphenyls	4,4'-Dichlorobiphenyl (PCB-15)	2050682		✓
Polychlorinated Biphenyls	Decachlorobiphenyl (PCB-209)	2051243		✓
Polychlorinated Biphenyls	Heptachlorobiphenyl	28655712		✓
Polychlorinated Biphenyls	Hexachlorobiphenyl	26601649		✓
Polychlorinated Biphenyls	Pentachlorobiphenyl	25429292		✓
Polychlorinated Biphenyls	Polychlorinated Biphenyls	1336363		✓
Polychlorinated Biphenyls	Tetrachlorobiphenyl	26914330		✓
Polycyclic Organic Matter	12-Methylbenz(a)Anthracene	2422799	✓	
Polycyclic Organic Matter	1-Methylphenanthrene	832699	✓	
Polycyclic Organic Matter	2-Chloronaphthalene	91587	✓	
Polycyclic Organic Matter	2-Methylnaphthalene	91576	✓	
Polycyclic Organic Matter	3-Methylcholanthrene	56495	✓	
Polycyclic Organic Matter	5-Methylchrysene	3697243	✓	
Polycyclic Organic Matter	7,12-Dimethylbenz[a]Anthracene	57976	✓	
Polycyclic Organic Matter	Acenaphthene	83329	✓	
Polycyclic Organic Matter	Acenaphthylene	208968	✓	
Polycyclic Organic Matter	Anthracene	120127	✓	

TABLE B-1. CROSSWALK OF VOC AND PM HAPS TO EPA EIS POLLUTANT CODES

EPA's EIS Pollutant Category Name	EPA's EIS Pollutant Name	EPA's EIS Pollutant Code	PM	VOC
Polycyclic Organic Matter	Benz[a]Anthracene	56553	✓	
Polycyclic Organic Matter	Benzo(g,h,i)Fluoranthene	203123	✓	
Polycyclic Organic Matter	Benzo[a]Pyrene	50328	✓	
Polycyclic Organic Matter	Benzo[b]Fluoranthene	205992	✓	
Polycyclic Organic Matter	Benzo[e]Pyrene	192972	✓	
Polycyclic Organic Matter	Benzo[g,h,i,]Perylene	191242	✓	
Polycyclic Organic Matter	Benzo[k]Fluoranthene	207089	✓	
Polycyclic Organic Matter	Benzofluoranthenes	56832736	✓	
Polycyclic Organic Matter	Carbazole	86748	✓	
Polycyclic Organic Matter	Chrysene	218019	✓	
Polycyclic Organic Matter	Dibenzo[a,h]Anthracene	53703	✓	
Polycyclic Organic Matter	Fluoranthene	206440	✓	
Polycyclic Organic Matter	Fluorene	86737	✓	
Polycyclic Organic Matter	Indeno[1,2,3-c,d]Pyrene	193395	✓	
Polycyclic Organic Matter	Methylanthracene	26914181	✓	
Polycyclic Organic Matter	PAH, total	130498292	✓	
Polycyclic Organic Matter	Perylene	198550	✓	
Polycyclic Organic Matter	Phenanthrene	85018	✓	
Polycyclic Organic Matter	Pyrene	129000	✓	
Propionaldehyde	Propionaldehyde	123386		✓
Propylene Dichloride	Propylene Dichloride	78875		✓
Propylene Oxide	Propylene Oxide	75569		✓
Quinoline	Quinoline	91225		✓
Selenium Compounds	Selenium	7782492	✓	
Styrene	Styrene	100425		✓
Tetrachloroethylene	Tetrachloroethylene	127184		✓
Titanium Tetrachloride	Titanium Tetrachloride	7550450		✓
Toluene	Toluene	108883		✓
Trichloroethylene	Trichloroethylene	79016		✓
Triethylamine	Triethylamine	121448		✓
Trifluralin	Trifluralin	1582098		✓
Vinyl Acetate	Vinyl Acetate	108054		✓
Vinyl Chloride	Vinyl Chloride	75014		✓
Vinylidene Chloride	Vinylidene Chloride	75354		✓

TABLE B-1. CROSSWALK OF VOC AND PM HAPS TO EPA EIS POLLUTANT CODES

EPA's EIS Pollutant Category Name	EPA's EIS Pollutant Name	EPA's EIS Pollutant Code	PM	VOC
Xylenes (Mixed Isomers)	*m*-Xylene	108383		✓
Xylenes (Mixed Isomers)	*o*-Xylene	95476		✓
Xylenes (Mixed Isomers)	*p*-Xylene	106423		✓
Xylenes (Mixed Isomers)	Xylenes (Mixed Isomers)	1330207		✓

APPENDIX B.1 – 2008 TO 2011 HAP-VOC AND HAP-PM RATIOS (FOUND IN THE "2008_2011_RATIOS" MICROSOFT ACCESS DATABASE)

Appendix B-2. Example Ratio Calculations

Example calculations are provided below as follows:

- Computation of the emission ratios based on the 2011 NEI v1 Nonpoint Sources augmentation datasets
- Application of the computed 2011 ratios to the 2008 NEI v2 Nonpoint Sources data to estimate the amount of potentially missing HAPs.

The example is for specific HAP(s), SCC, and county - for Chromium (VI) and Formaldehyde emissions, for SCC 2102011000 (Stationary Fuel Comb /Industrial /Kerosene /Total: All Boiler Types) in Greenlee County, AZ (FIPS = 04011). The pertinent data fields are indicated from the MS Access database of results.

To complete this analysis, EPA performed the following computations and comparisons:

1) Compiled all 2011 emission inventory files, i.e., the nonpoint augmentation datasets that have PM, VOC, and associated HAP data, into a 2011 master database;
2) From the 2011 master database, developed a list of target SCCs and related emission factors for VOC and PM and associated VOC- and PM-HAPs;
3) From the 2011 Nonpoint Sources NEI v1, extracted the 2011 VOC, PM_{10}-PRI, and $PM_{2.5}$-PRI emission factors; and the corresponding HAP emission factors associated with VOC, PM_{10}-PRI, and $PM_{2.5}$-PRI:
4) Using the emission factors extracted from the 2011 Nonpoint Source NEI v1, calculated HAP to VOC ratios; HAP to PM10-PRI ratios; and HAP to PM2.5-PRI ratios –by county, SCC:

FIPS State and County Code	2011 Target SCC	2011 Ref Poll	2011 Ref Poll EF	2011 Ref Poll EF UOM	2011 Target HAP Name	EIS Poll Code	HAP-VOC or HAP-PM	2011 Target HAP EF	2011 Target HAP EF UOM	2011 Ratio Target HAP-VOC/ref VOC	2011 Ratio Target HAP-PM/ref PM
04011	2102011000	PM10	2.21	LB/E3GAL	Chromium (VI)	18540299	HAP-PM	0.0000729	LB/E3GAL		*3.299E-05*
04011	2102011000	PM2.5	1.49	LB/E3GAL	Chromium (VI)	18540299	HAP-PM	0.0000729	LB/E3GAL		*4.893E-05*
04011	2102011000	VOC	0.19	LB/E3GAL	Formaldehyde	50000	HAP-VOC	0.0324	LB/E3GAL	0.1705	

Calculation of ratios, examples:

2011 HAP to VOC Ratio = 2011 HAP Emission Factor Numerator/2011 VOC Emission Factor Numerator
= 0.0324 (LB/E3GAL)/0.19 (LB/E3GAL)
= 0.1705

2011 HAP to PM_{10}-PRI Ratio = 2011 HAP Emission Factor Numerator/2011 PM_{10}-PRI Emission Factor Numerator
= 0.0000729 (LB/E3GAL)/2.21 (LB/E3GAL)
= 3.299E-05

2011 HAP to $PM_{2.5}$-PRI Ratio = 2011 HAP Emission Factor Numerator/2011 $PM_{2.5}$-PRI Emission Factor Numerator
= 0.0000729 (LB/E3GAL)/1.49 (LB/E3GAL)
= 4.893E-05

5) For the target SCCs, extracted from the 2008 Nonpoint Sources NEI v2, the VOC, PM10-PRI, PM2.5-PRI emissions, and the available target HAP emissions;

FIPS State and County Code	2011 Target SCC	2011 Ref Poll	2011 Target HAP Name	HAP-VOC or HAP-PM	2008 v2 VOC Emissions Tons	2008 v2 PM10-PRI Emissions Tons	2008 v2 PM25-PRI Emissions Tons	2008 v2 Target HAP Emissions Tons	2008 estimate Target HAP emiss per 2011 ratio calc Tons	(2008v2 emiss) - (2008 est by 2011 ratio)	% Diff wrt 2008v2 NEI
04011	2102011000	PM10	Chromium (VI)	HAP-PM		3.127E-06		1.028E-10	*1.032E-10*	*-3.662E-13*	-0.35
04011	2102011000	PM2.5	Chromium (VI)	HAP-PM			2.108E-06	1.028E-10	*1.031E-10*	*-3.229E-13*	-0.31
04011	2102011000	VOC	Formaldehyde	HAP-VOC	2.719E-07			4.568E-08	*4.637E-08*	*-6.867E-10*	-1.48

6) Applied the 2011 Nonpoint Sources NEI ratios to 2008 v2 emissions as follows:
   a. 2011 HAP to VOC ratios to the 2008 VOC emissions:

      *0.171 * 2.719E-07 = 4.637E-08 TPY estimated Formaldehyde emissions*

   b. 2011 HAP to PM_{10} ratios to the 2008 PM_{10}-PRI emissions:

      *3.299E-05 * 3.127E-06 = 1.032E-10 TPY estimated Chromium (VI) emissions*

   c. 2011 HAP to PM_{25} ratios to the 2008 PM_{25}-PRI emissions:

      *4.893E-05 * 2.108E-06 = 1.031E-10 TPY estimated Chromium (VI) emissions*

7) Calculated the emissions difference between 2008 v2 HAP emissions and the "ratio-applied" estimate of 2008 HAP emissions:

Formaldehyde Emissions Difference = 2008 v2 Emissions – Ratio-Applied 2008 Emissions
= 4.568E-08 TPY - 4.637E-08 TPY
= -6.867E-10 TPY

Chromium (VI) Emissions Difference = 2008 v2 Emissions – PM_{10} Ratio-Applied 2008 Emissions
= 1.028E-10 TPY - 1.032E-10 TPY
=-3.662E-13

Chromium (VI) Emissions Difference = 2008 v2 Emissions – $PM_{2.5}$ Ratio-Applied 2008 Emissions
= 1.028E-10 TPY - 1.031E-10 TPY
=-3.229E-13

8) Calculated percent difference between the 2008 v2 HAP emissions and the "ratio-applied" 2008 HAP emissions:

*Formaldehyde Emissions Percent Difference = ((2008 v2 Emissions TPY – Ratio-Applied 2008 Emissions TPY)/2008 v2 Emissions TPY)*100*

$$= \frac{\text{4.568E-08 TPY - 4.637E-08 TPY}}{\text{4.568E-08 TPY}} * 100$$

= -1.48%

*Chromium (VI) Emissions Percent Difference = ((2008 v2 Emissions TPY – PM_{10} Ratio-Applied 2008 Emissions TPY)/2008 v2 Emissions TPY)*100*

$$= \frac{\text{1.028E-10 TPY - 1.032E-10 TPY}}{\text{1.028E-10 TPY}} * 100$$

= -0.35%

*Chromium (VI) Emissions Percent Difference = ((2008 v2 Emissions TPY – $PM_{2.5}$ Ratio-Applied 2008 Emissions TPY)/2008 v2 Emissions TPY)*100*

$$= \frac{\text{1.028E-10 TPY - 1.031E-10 TPY}}{\text{1.028E-10 TPY}} * 100$$

= -0.31%

TABLE B-2. SUMMARY OF EMISSIONS BY EIS SECTORS AND POLLUTANT CATEGORY NAME FOR NEGATIVE RATIOS (POTENTIAL OVER-ESTIMATE IN 2008 NEI)

EIS Sector	Pollutant Category Name	SumOf(2008v2 emiss) - (2008 est by 2011 ratio)
Gas Stations	Hexane	-76,617.07
	Toluene	-62,247.79
	Benzene	-43,096.87
	2,2,4-Trimethylpentane	-38,308.53
	Xylenes (Mixed Isomers)	-23,942.83
	Ethylbenzene	-4,787.41
	Naphthalene	-2,394.21
	Cumene	-478.84
	Ethylene Dichloride	-0.55
	Total	**-251,874.11**
Solvent - Industrial Surface Coating & Solvent Use	Toluene	-1,233.38
	Xylenes (Mixed Isomers)	-1,122.50
	Methyl Isobutyl Ketone	-873.58
	Methyl Chloroform	-579.63
	Glycol Ethers	-125.10
	Ethylene Glycol	-41.33
	Ethylbenzene	-36.76
	Methanol	-9.08
	Cumene	-0.31
	Naphthalene	-0.01
	Total	**-4,021.68**
Solvent - Consumer & Commercial Solvent Use	Xylenes (Mixed Isomers)	-1,150.42
	Toluene	-219.72
	Ethylbenzene	-79.07
	Total	**-1,449.20**
Commercial Cooking	Benzene	-38.23
	Formaldehyde	-30.33
	Acetaldehyde	-21.74
	Styrene	-14.02
	Polycyclic Organic Matter	-11.56
	Toluene	-10.63
	Propionaldehyde	-5.52
	Ethylbenzene	-2.62
	Xylenes (Mixed Isomers)	-2.12
	Naphthalene	-1.71

TABLE B-2. SUMMARY OF EMISSIONS BY EIS SECTORS AND POLLUTANT CATEGORY NAME FOR NEGATIVE RATIOS (POTENTIAL OVER-ESTIMATE IN 2008 NEI)

EIS Sector	Pollutant Category Name	SumOf(2008v2 emiss) - (2008 est by 2011 ratio)
	Phenol	-1.49
	Ethylene Dichloride	-1.02
	4-Nitrophenol	-0.32
	Cresol/Cresylic Acid (Mixed Isomers)	-0.31
	Biphenyl	-0.17
	Acetophenone	-0.16
	Dibutyl Phthalate	-0.12
	Total	**-142.08**
Fuel Comb - Comm/Institutional - Natural Gas	Formaldehyde	-15.09
	Lead Compounds	-0.94
	Polycyclic Organic Matter	-0.06
	Naphthalene	-1.12E-03
	Benzene	-4.33E-05
	Acetaldehyde	-1.27E-06
	Total	**-16.10**
Fuel Comb - Industrial Boilers, ICEs - Natural Gas	Formaldehyde	-12.58
	Lead Compounds	-0.56
	Polycyclic Organic Matter	-0.03
	Benzene	-6.77E-03
	Naphthalene	-4.57E-04
	Acetaldehyde	-7.62E-07
	Total	**-13.18**
Fuel Comb - Residential - Natural Gas	Formaldehyde	-7.52
	Polycyclic Organic Matter	-0.23
	Benzene	-0.19
	Naphthalene	-0.06
	Acetaldehyde	-1.37E-03
	Total	**-8.00**
Fuel Comb - Industrial Boilers, ICEs - Oil	Formaldehyde	-2.89
	Acetaldehyde	-0.22
	Nickel Compounds	-0.15
	Naphthalene	-0.09
	Benzene	-7.84E-03
	Selenium Compounds	-7.34E-03

TABLE B-2. SUMMARY OF EMISSIONS BY EIS SECTORS AND POLLUTANT CATEGORY NAME FOR NEGATIVE RATIOS (POTENTIAL OVER-ESTIMATE IN 2008 NEI)

EIS Sector	Pollutant Category Name	SumOf(2008v2 emiss) - (2008 est by 2011 ratio)
	Manganese Compounds	-4.95E-03
	Lead Compounds	-3.83E-03
	Chromium Compounds	-2.98E-03
	Arsenic Compounds	-2.62E-03
	Mercury Compounds	-1.33E-03
	Cadmium Compounds	-7.59E-04
	Beryllium Compounds	-3.45E-04
	Polycyclic Organic Matter	-1.76E-04
	Total	**-3.39**
Fuel Comb - Comm/Institutional - Oil	Lead Compounds	-0.69
	Nickel Compounds	-0.37
	Formaldehyde	-0.08
	Acetaldehyde	-0.07
	Selenium Compounds	-0.03
	Manganese Compounds	-2.03E-03
	Chromium Compounds	-1.76E-03
	Beryllium Compounds	-1.68E-03
	Arsenic Compounds	-1.52E-03
	Cadmium Compounds	-9.39E-04
	Mercury Compounds	-9.18E-04
	Naphthalene	-8.12E-04
	Benzene	-6.17E-05
	Polycyclic Organic Matter	-4.50E-05
	Total	**-1.25**
Fuel Comb - Comm/Institutional - Coal	Formaldehyde	-0.74
	Naphthalene	-0.18
	Arsenic Compounds	-0.06
	Biphenyl	-0.02
	Polycyclic Organic Matter	-0.02
	Cyanide Compounds	-0.01
	Chromium Compounds	-1.73E-03
	Benzyl Chloride	-1.11E-03
	Cadmium Compounds	-2.83E-04
	Methylhydrazine	-2.69E-04
	Chloroform	-9.34E-05

TABLE B-2. SUMMARY OF EMISSIONS BY EIS SECTORS AND POLLUTANT CATEGORY NAME FOR NEGATIVE RATIOS (POTENTIAL OVER-ESTIMATE IN 2008 NEI)

EIS Sector	Pollutant Category Name	SumOf(2008v2 emiss) - (2008 est by 2011 ratio)
	Dimethyl Sulfate	-7.60E-05
	Ethyl Chloride	-6.65E-05
	Bromoform	-6.17E-05
	Xylenes (Mixed Isomers)	-5.86E-05
	Methyl Tert-Butyl Ether	-5.54E-05
	Methyl Chloroform	-3.17E-05
	Methyl Methacrylate	-3.17E-05
	Vinyl Acetate	-1.21E-05
	2-Chloroacetophenone	-1.11E-05
	Cumene	-8.46E-06
	Ethylene Dibromide	-1.93E-06
	2,4-Dinitrotoluene	-1.58E-09
	Lead Compounds	-4.97E-10
	Total	**-1.04**
Fuel Comb - Residential - Other	Formaldehyde	-0.81
	Benzene	-0.04
	Polycyclic Organic Matter	-0.03
	Naphthalene	-6.68E-03
	Acetaldehyde	-1.40E-04
	Total	**-0.88**
Fuel Comb - Residential - Oil	Selenium Compounds	-0.19
	Lead Compounds	-0.13
	Manganese Compounds	-0.08
	Formaldehyde	-0.07
	Arsenic Compounds	-0.05
	Chromium Compounds	-0.04
	Cadmium Compounds	-0.04
	Mercury Compounds	-0.04
	Nickel Compounds	-0.04
	Beryllium Compounds	-0.04
	Acetaldehyde	-0.01
	Polycyclic Organic Matter	-5.39E-03
	Naphthalene	-3.20E-03
	Benzene	-4.12E-04
	Total	**-0.74**

TABLE B-2. SUMMARY OF EMISSIONS BY EIS SECTORS AND POLLUTANT CATEGORY NAME FOR NEGATIVE RATIOS (POTENTIAL OVER-ESTIMATE IN 2008 NEI)

EIS Sector	Pollutant Category Name	SumOf(2008v2 emiss) - (2008 est by 2011 ratio)
Fuel Comb - Industrial Boilers, ICEs - Coal	Cyanide Compounds	-0.19
	Arsenic Compounds	-0.09
	Lead Compounds	-0.03
	Chromium Compounds	-0.03
	Cadmium Compounds	-0.02
	Formaldehyde	-5.52E-04
	Benzyl Chloride	-5.98E-05
	Methylhydrazine	-4.82E-05
	Naphthalene	-4.54E-05
	Ethyl Chloride	-3.93E-05
	Methyl Chloroform	-5.85E-06
	Methyl Methacrylate	-5.85E-06
	Chloroform	-2.83E-06
	Methyl Tert-Butyl Ether	-3.44E-07
	Bromoform	-3.03E-07
	Xylenes (Mixed Isomers)	-2.89E-07
	Dimethyl Sulfate	-2.87E-07
	Biphenyl	-1.84E-07
	Cumene	-1.66E-07
	2-Chloroacetophenone	-1.48E-07
	Polycyclic Organic Matter	-1.20E-07
	Vinyl Acetate	-1.13E-07
	Ethylene Dibromide	-9.06E-08
	2,4-Dinitrotoluene	-6.39E-08
	Total	**-0.35**
Miscellaneous Non-Industrial NEC	Chromium Compounds	-0.17
	Mercury Compounds	-0.04
	Lead Compounds	-0.03
	Cadmium Compounds	-0.02
	Nickel Compounds	-1.53E-03
	Arsenic Compounds	-1.20E-03
	Beryllium Compounds	-5.48E-05
	Total	**-0.26**
Fuel Comb - Comm/Institutional - Other	Lead Compounds	-0.04
	Formaldehyde	-0.02

TABLE B-2. SUMMARY OF EMISSIONS BY EIS SECTORS AND POLLUTANT CATEGORY NAME FOR NEGATIVE RATIOS (POTENTIAL OVER-ESTIMATE IN 2008 NEI)

EIS Sector	Pollutant Category Name	SumOf(2008v2 emiss) - (2008 est by 2011 ratio)
	Polycyclic Organic Matter	-3.14E-03
	Benzene	-8.29E-05
	Naphthalene	-2.92E-05
	Acetaldehyde	-6.50E-07
	Total	**-0.07**

TABLE B-3. SUMMARY OF EMISSIONS BY EIS SECTORS AND POLLUTANT CATEGORY NAME FOR POSITIVE RATIOS (POTENTIAL UNDER-ESTIMATE IN 2008 NEI)

EIS Sector	Pollutant Category Name	SumOf(2008v2 emiss) - (2008 est by 2011 ratio)
Solvent - Industrial Surface Coating & Solvent Use	Toluene	885.45
	Methyl Isobutyl Ketone	426.76
	Ethylene Glycol	88.44
	Xylenes (Mixed Isomers)	30.03
	Glycol Ethers	19.56
	Acetaldehyde	8.16
	Methyl Chloroform	1.33
	Dibutyl Phthalate	0.99
	Naphthalene	0.23
	Cumene	0.02
	Total	**1,460.97**
Solvent - Consumer & Commercial Solvent Use	Xylenes (Mixed Isomers)	877.58
	Toluene	224.98
	Ethylbenzene	80.99
	Total	**1,183.55**
Fuel Comb - Comm/Institutional - Natural Gas	Formaldehyde	147.64
	Benzene	87.38
	Acetaldehyde	0.94
	Naphthalene	2.39E-04
	Lead Compounds	1.65E-04
	Polycyclic Organic Matter	9.16E-07
	Total	**235.95**
Fuel Comb - Residential - Natural Gas	Formaldehyde	112.36
	Benzene	59.41
	Naphthalene	0.10
	Acetaldehyde	0.05
	Polycyclic Organic Matter	2.55E-03
	Total	**171.93**
Fuel Comb - Industrial Boilers, ICEs - Natural Gas	Formaldehyde	39.97
	Benzene	23.18
	Acetaldehyde	0.05
	Lead Compounds	5.00E-03
	Polycyclic Organic Matter	8.21E-05
	Naphthalene	1.43E-05

TABLE B-3. SUMMARY OF EMISSIONS BY EIS SECTORS AND POLLUTANT CATEGORY NAME FOR POSITIVE RATIOS (POTENTIAL UNDER-ESTIMATE IN 2008 NEI)

EIS Sector	Pollutant Category Name	SumOf(2008v2 emiss) - (2008 est by 2011 ratio)
	Total	**63.21**
Commercial Cooking	Polycyclic Organic Matter	6.73
	Xylenes (Mixed Isomers)	2.65
	Benzene	1.92
	Formaldehyde	1.53
	Acetaldehyde	1.11
	Styrene	0.72
	Toluene	0.66
	Propionaldehyde	0.29
	Ethylbenzene	0.14
	Naphthalene	0.13
	Phenol	0.08
	Ethylene Dichloride	0.06
	4-Nitrophenol	0.02
	Cresol/Cresylic Acid (Mixed Isomers)	0.02
	Biphenyl	9.27E-03
	Acetophenone	8.60E-03
	Dibutyl Phthalate	6.47E-03
	Total	**16.08**
Gas Stations	Ethylene Dichloride	5.56
	Hexane	1.29
	Toluene	1.05
	Benzene	0.72
	2,2,4-Trimethylpentane	0.64
	Xylenes (Mixed Isomers)	0.40
	Ethylbenzene	0.08
	Naphthalene	0.04
	Cumene	0.01
	Total	**9.79**
Fuel Comb - Industrial Boilers, ICEs - Coal	Chromium Compounds	3.34
	Lead Compounds	3.29
	Arsenic Compounds	1.04
	Formaldehyde	0.28
	Cadmium Compounds	0.08

TABLE B-3. SUMMARY OF EMISSIONS BY EIS SECTORS AND POLLUTANT CATEGORY NAME FOR POSITIVE RATIOS (POTENTIAL UNDER-ESTIMATE IN 2008 NEI)

EIS Sector	Pollutant Category Name	SumOf(2008v2 emiss) - (2008 est by 2011 ratio)
	Cyanide Compounds	0.02
	Polycyclic Organic Matter	7.85E-03
	Ethylene Dibromide	4.20E-03
	Beryllium Compounds	2.25E-03
	Selenium Compounds	1.49E-03
	Manganese Compounds	5.62E-04
	Nickel Compounds	3.21E-04
	Mercury Compounds	9.52E-05
	Cumene	6.32E-05
	Methyl Tert-Butyl Ether	5.93E-05
	2-Chloroacetophenone	3.94E-05
	Xylenes (Mixed Isomers)	3.16E-05
	Vinyl Acetate	3.10E-05
	Dimethyl Sulfate	1.47E-05
	Benzyl Chloride	7.79E-06
	Bromoform	3.53E-06
	Naphthalene	1.22E-06
	Methylhydrazine	1.04E-06
	Chloroform	6.24E-07
	Ethyl Chloride	5.09E-07
	Biphenyl	2.55E-07
	Methyl Methacrylate	2.34E-07
	Methyl Chloroform	2.34E-07
	2,4-Dinitrotoluene	8.04E-08
	Total	**8.07**
Fuel Comb - Residential - Other	Formaldehyde	6.72
	Benzene	0.04
	Naphthalene	0.01
	Polycyclic Organic Matter	4.08E-04
	Acetaldehyde	2.20E-04
	Total	**6.76**
Fuel Comb - Residential - Oil	Formaldehyde	2.39
	Chromium Compounds	2.25
	Acetaldehyde	0.24
	Selenium Compounds	0.10

TABLE B-3. SUMMARY OF EMISSIONS BY EIS SECTORS AND POLLUTANT CATEGORY NAME FOR POSITIVE RATIOS (POTENTIAL UNDER-ESTIMATE IN 2008 NEI)

EIS Sector	Pollutant Category Name	SumOf(2008v2 emiss) - (2008 est by 2011 ratio)
	Naphthalene	0.08
	Lead Compounds	0.05
	Manganese Compounds	0.04
	Arsenic Compounds	0.02
	Cadmium Compounds	0.02
	Beryllium Compounds	0.02
	Mercury Compounds	0.02
	Nickel Compounds	0.02
	Benzene	0.02
	Polycyclic Organic Matter	4.50E-03
	Total	**5.26**
Fuel Comb - Comm/Institutional - Other	Formaldehyde	3.95
	Acetaldehyde	0.41
	Benzene	0.12
	Naphthalene	7.07E-04
	Lead Compounds	9.22E-05
	Polycyclic Organic Matter	1.04E-05
	Total	**4.48**
Fuel Comb - Comm/Institutional - Oil	Formaldehyde	0.76
	Chromium Compounds	0.46
	Benzene	0.06
	Selenium Compounds	0.02
	Nickel Compounds	0.02
	Manganese Compounds	0.02
	Arsenic Compounds	0.01
	Naphthalene	8.11E-03
	Acetaldehyde	5.02E-04
	Lead Compounds	2.30E-04
	Cadmium Compounds	5.97E-05
	Mercury Compounds	3.67E-05
	Polycyclic Organic Matter	3.30E-05
	Beryllium Compounds	2.96E-05
	Total	**1.36**
Fuel Comb - Industrial Boilers, ICEs - Oil	Benzene	0.37
	Chromium Compounds	0.31

TABLE B-3. SUMMARY OF EMISSIONS BY EIS SECTORS AND POLLUTANT CATEGORY NAME FOR POSITIVE RATIOS (POTENTIAL UNDER-ESTIMATE IN 2008 NEI)

EIS Sector	Pollutant Category Name	SumOf(2008v2 emiss) - (2008 est by 2011 ratio)
	Nickel Compounds	0.08
	Formaldehyde	0.07
	Selenium Compounds	0.02
	Manganese Compounds	0.02
	Arsenic Compounds	0.02
	Lead Compounds	0.01
	Naphthalene	5.49E-04
	Acetaldehyde	2.12E-04
	Polycyclic Organic Matter	5.36E-05
	Cadmium Compounds	2.91E-07
	Mercury Compounds	1.93E-07
	Beryllium Compounds	1.66E-07
	Total	**0.90**
Fuel Comb - Comm/Institutional - Coal	Lead Compounds	0.75
	Chromium Compounds	0.01
	Arsenic Compounds	5.73E-03
	Cyanide Compounds	1.54E-03
	Formaldehyde	7.66E-04
	Cadmium Compounds	5.82E-04
	Polycyclic Organic Matter	1.11E-04
	Selenium Compounds	2.05E-05
	Manganese Compounds	7.74E-06
	Nickel Compounds	4.42E-06
	Mercury Compounds	1.31E-06
	Beryllium Compounds	3.32E-07
	Benzyl Chloride	1.45E-07
	Methyl Tert-Butyl Ether	1.23E-07
	2-Chloroacetophenone	1.19E-07
	Methylhydrazine	1.16E-07
	Naphthalene	1.15E-07
	Cumene	1.14E-07
	Bromoform	1.12E-07
	Vinyl Acetate	1.09E-07
	Methyl Methacrylate	1.04E-07
	Methyl Chloroform	1.04E-07

TABLE B-3. SUMMARY OF EMISSIONS BY EIS SECTORS AND POLLUTANT CATEGORY NAME FOR POSITIVE RATIOS (POTENTIAL UNDER-ESTIMATE IN 2008 NEI)

EIS Sector	Pollutant Category Name	SumOf(2008v2 emiss) - (2008 est by 2011 ratio)
	Ethyl Chloride	1.04E-07
	Xylenes (Mixed Isomers)	9.75E-08
	Chloroform	9.57E-08
	Dimethyl Sulfate	8.56E-08
	Ethylene Dibromide	7.58E-08
	Biphenyl	5.52E-08
	2,4-Dinitrotoluene	3.11E-08
	Total	**0.77**
Miscellaneous Non-Industrial NEC	Mercury Compounds	0.12
	Lead Compounds	0.03
	Nickel Compounds	5.57E-04
	Arsenic Compounds	4.38E-04
	Cadmium Compounds	2.87E-04
	Beryllium Compounds	2.05E-05
	Chromium Compounds	6.59E-06
	Total	**0.16**

APPENDIX C – RTR TRI DATA NOT USED IN 2008 NEI (FOUND IN THE "MISSING_RTR_TRI_IN_2008NEI" MICROSOFT ACCESS DATABASE)

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