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National Air Toxics Trends Sites Data Characterization, 2004-2007

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The Environmental Protection Agency welcomes public input on this document at any time. Comments should be sent to Barbara Driscoll (driscoll.barbara@epa.gov).

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1.0 Introduction

The purpose of this report is to summarize and present findings from ambient monitoring air toxics data collected from the U.S. Environmental Protection Agency's (EPA) National Air Toxics Trends Stations (NATTS) network. This network officially began sampling in 2004, and its primary objective is to successfully detect trends in hazardous air pollutants (HAPs) concentrations with uniform certainty across the national set of monitoring sites. Trends are ultimately to be assessed using two calculated, three-year period averages: 2004-2006 and 2007-2009. EPA's ultimate goal for the network is to be able to realize a 15% decrease of the pollutant concentrations between the three-year periods.

1.1 Background

The NATTS network was created to obtain long-term ambient air toxics concentration data at specific fixed sites across the country. Initial implementation of the NATTS network occurred during 2003 and 2004. Acquiring large quantities of high-quality data over an extended period may allow concentration trends (i.e., any substantial increase or decrease over a period of time) to be identified. The data obtained are also used for validating modeling results and emission inventories, assessing current regulatory benchmarks, and establishing policies for reducing the risk of developing cancerous and noncancerous health effects. The site locations were based on results from preliminary air toxics pilot programs such as the 1996 National Air Toxics Assessment (NATA), which used air toxics emissions data to model ambient monitoring concentrations across the nation. Both urban and rural locations were chosen as NATTS monitoring sites. Urban areas were chosen to measure population exposure, while rural areas were chosen to determine background levels of air pollution (EPA, 2007a). Although twenty-five NATTS sites are currently part of the NATTS network, 23 were in operation from 2004-2007.

1.2 Report

This report summarizes and interprets the 2004-07 NATTS monitoring efforts, which includes up to 12 months of 1-in-6 day measurements of ambient air samples at 23 monitoring sites in or near 22 urban/rural locations in 20 states, including 17 metropolitan statistical areas

(MSA). Much of the data analysis and interpretation in this report focuses on pollutant-specific risk potential.

The report provides both a qualitative overview of air toxics pollution at selected urban and rural locations, and a quantitative data analysis of the factors that appear to affect urban and rural air quality most significantly.

Policy-relevant questions that the NATTS data may help answer include the following:

- Which anthropogenic sources substantially affect air quality?
- Have pollutant concentrations decreased as a result of regulations?
- Which pollutants present the greatest health risk on a short-term, intermediate-term, and long-term basis?

The data analyses contained in this report are applied to every participating NATTS monitoring site, depending upon pollutants sampled in a given year. To facilitate examination of the 2004-2007 NATTS data, the complete set of measured concentrations is presented in electronic format from the Air Quality Subsystem (AQS) of EPA's Aerometric Information Retrieval System (AIRS) at http://www.epa.gov/ttn/airs/airsaqs/.

The report is organized into 9 sections. Table 1-1 presents the contents of each section.

Table 1-1. Organization of the 2004-2007 NATTS Report

Report Section	Section Title	Overview of Contents
1	Introduction	This section serves as an introduction to the background and scope of the NATTS Program.
2	The 2004-2007 NATTS Network	This section provides information on the 2004-2007 NATTS network: • Monitoring locations • Pollutants selected for monitoring • Sampling and analytical methods • Sampling schedules • Completeness of the air monitoring programs.

Table 1-1. Organization of the 2004-2007 NATTS Report (Continued)

Report Section	Section Title	Overview of Contents
3	Data Treatments and Methods	This section presents and discusses the data treatments used on the 2004-2007 NATTS data to determine significant trends and relationships in the data, characterize data based on how ambient air concentrations varied with monitoring location and with time, present an interpretation of the significance of the observed spatial and temporal variations, and evaluate risk.
4	Statistical Results of the 2004-2007 NATTS Data	This section presents and discusses the results of the data treatments from the 2004-2007 NATTS data.
5	NATTS Network Overview: Risk Evaluation	This section presents various evaluations of the NATTS data based on risk potential.
6	NATTS Network Evaluation: Trends	This section presents 3-year rolling average trends analyses of the NATTS data.
7	Data Quality	This section summarizes data quality issues of the NATTS data.
8	Conclusions and Recommendations	This section summarizes the most significant findings of the report and makes several recommendations.
9	References	This section lists the references cited throughout the report.

2.0 The 2004-2007 NATTS Network

Agencies operating NATTS sites that choose to participate in EPA's National Monitoring Programs contract have their samples analyzed by a centralized contract laboratory owned by Eastern Research Group, Inc., in Research Triangle Park, NC. However, agencies may wish to use their own laboratories provided they meet the method specific criteria and performance specifications presented in the NATTS Technical Assistance Document (TAD). Data from 23 monitoring sites that collected 24-hour integrated ambient air samples for up to 12 months, at 1-in-6 day sampling intervals are included in this report. Samples were analyzed for concentrations of volatile organic compounds (VOCs) from canister samples (TO-15), carbonyl compounds from sorbent cartridge samples (TO-11A), trace metals from filters (IO-3.5), and hexavalent chromium from sodium bicarbonate coated filters (EPA-approved method). Section 2.5 provides further details on each of the sampling methodologies used to collect and analyze samples.

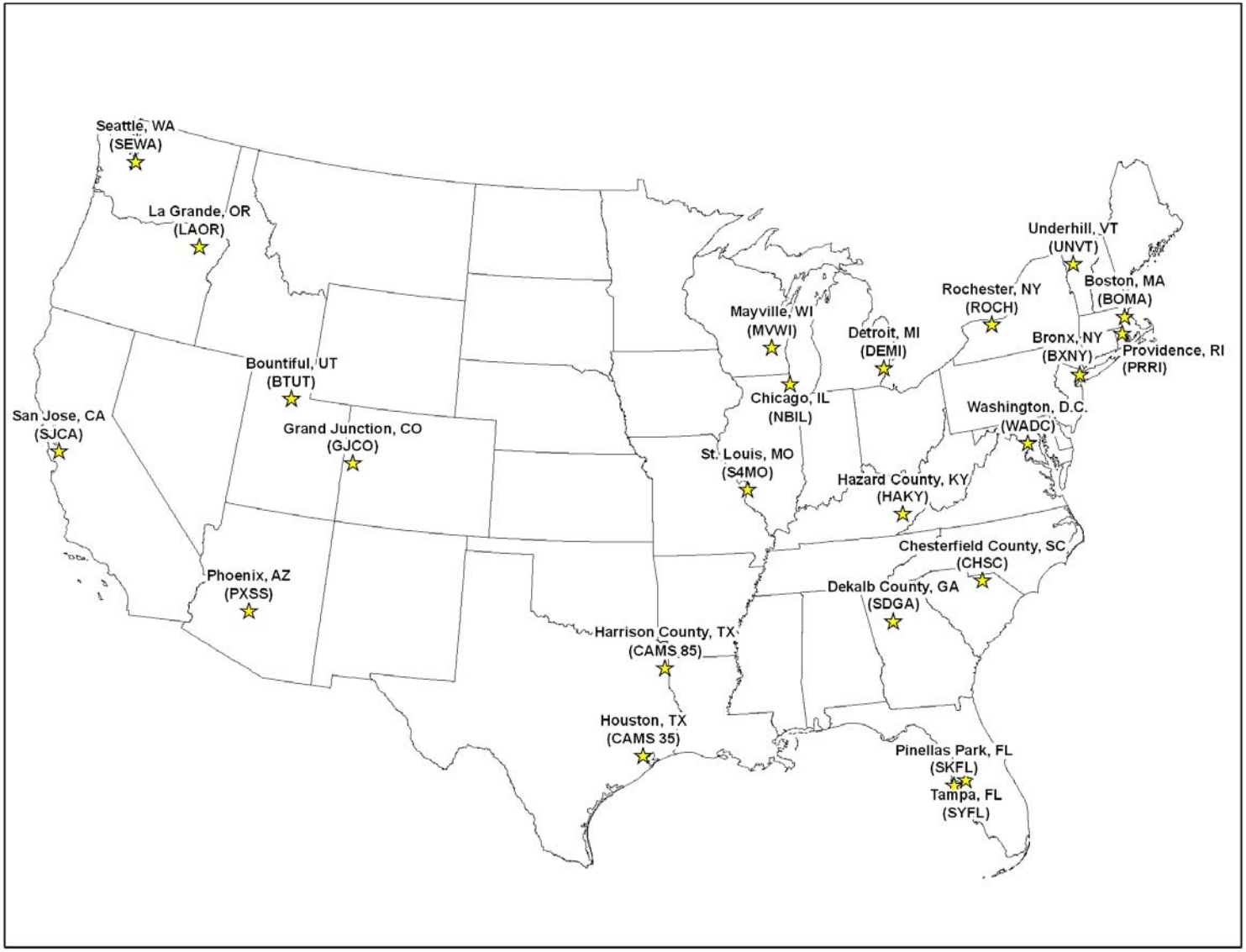
The following sections review the monitoring locations, pollutants selected for monitoring, collection schedules, sampling and analytical methods, and completeness of the 2004-2007 NATTS dataset.

2.1 Monitoring Locations

For the NATTS Program, monitor siting was based on the need to assess population exposure and background-level concentrations. Some monitors were placed in urban areas near the centers of heavily populated cities (e.g., Chicago, IL and Phoenix, AZ), while others were placed in moderately populated rural areas (e.g., Hazard County, KY, and Chesterfield, SC). Figure 2-1 shows the locations of the 23 monitoring sites participating in the 2004-2007 program, which encompass 22 different urban and rural areas. Outlined in Figure 2-1 are the associated core-based statistical areas (CBSA), as designated by the U.S. Census Bureau, where each site is located. A CBSA refers to either a micropolitan or metropolitan statistical area (MSA) (U.S. Census Bureau, 2007).

As Figure 2-1 shows, the 2004-2007 NATTS monitoring sites are widely distributed across the country. Detailed information on the surroundings near the monitoring sites is

Figure 2-1. Locations of the 2004-2007 NATTS Monitoring Sites



contained in Table 2-1. This table shows that the types of locations of the monitoring sites vary significantly, based on elevation, population, land use, climatology, and topography. A more detailed look at each monitoring site's surroundings is provided in the individual state sections. The monitoring data from these 23 sites may indicate certain air quality trends that are common to all urban environments, but may also show distinct geographic trends. The data analyses in this report differentiate the trends that appear to be site-specific from those that appear to be common to most urban environments.

For record keeping and reporting purposes, each site was assigned:

- A unique site code (4 or 6-digits) – used as a shortened format of the monitoring site name; and
- A unique nine-digit AQS site code – used to index monitoring results in the AQS database.

This report cites the site code when presenting selected monitoring results. For reference, each site's AQS site code is provided in Table 2-1.

The proximity of the monitoring locations to different emissions sources, especially industrial facilities and heavily traveled roadways, often explains the observed spatial variations in ambient air quality. Also included in Table 2-1 is the number of people living within 10 miles of each monitoring site location and an estimate of the county-level number of motor vehicles owned in each site's respective county, based on registration. Finally, the NATTS Location Setting (urban or rural) is presented in Table 2-1. Figures 2-2 through 2-24 present site location maps.

At every NATTS monitoring site, the sample collection equipment was installed either in a temperature-controlled enclosure (usually a trailer or a shed) with the sampling probe inlet exposed to the ambient air or as a stand-alone sampler. With this common setup, every NATTS monitoring site sampled ambient air at heights approximately 5 to 20 feet above local ground level.

Table 2-1. Descriptions of the 2004-2007 NATTS Monitoring Sites

Site Code	AQS Code	Location	Land Use	Location Setting	Estimated Daily Traffic (# vehicles)	Traffic Year Estimate	2007 Population Residing Within 10 Miles of the Monitoring Site[a]	2007 County-level Vehicle Registration	NATTS Location Setting[b]
BOMA	25-025-0042	Boston, MA	Commercial	Urban/City Center	23,800	2005	713,049	467,969	Urban
BTUT	49-011-0004	Bountiful, UT	Residential	Suburban	17,310	2006	288,146	230,868	Urban
BXNY	36-005-0110	Bronx, NY	Residential	Urban/City Center	101,475	2002	1,373,659	243,523	Urban
CAMS 35	48-201-1039	Deer Park, TX	Residential	Suburban	31,130	2001	3,935,855	3,192,222	Urban
CAMS 85	48-203-0002	Karnack, TX	Agricultural	Rural	2,380	2002	63,504	67,719	Rural
CHSC	45-025-0001	Chesterfield, SC	Forest	Rural	650	2006	42,761	42,726	Rural
DEMI	26-163-0033	Dearborn, MI	Industrial	Suburban	20,900	2006	1,985,101	1,400,461	Urban
GPCO[c]	08-077-0017/ 08-077-0018	Grand Junction, CO	Commercial	Urban/City Center	12,300	2006	139,082	163,539	Rural
HAKY	21-193-0003	Hazard, KY	Residential	Suburban	21,537	2005	29,213	47,549	Rural
LAOR	41-061-0119	La Grande, OR	Residential	Urban/City Center	55	2003	15,942	33,263	Rural
MVWI	55-027-0007	Mayville, WI	Agricultural	Rural	3,500	2004	87,786	92,255	Rural
NBIL	17-031-4201	Northbrook, IL	Residential	Suburban	35,700	2006	5,285,107	2,104,894	Urban
PRRI	44-007-0022	Providence, RI	Residential	Urban/City Center	212,100	2006	629,435	142,334	Urban
PXSS	04-013-9997	Phoenix, AZ	Residential	Urban/City Center	206,000	2006	3,880,181	3,793,646	Urban

[a] Reference: http://zipfind.net
[b] Reference: EPA, 2007a.
[c] GPCO's hexavalent chromium monitor is at a separate, but adjacent location; as such, this site has two AQS codes.

Table 2-1. Descriptions of the 2004-2007 NATTS Monitoring Sites (Continued)

Site Code	AQS Code	Location	Land Use	Location Setting	Estimated Daily Traffic (# vehicles)	Traffic Year Estimate	2007 Population Residing Within 10 Miles of the Monitoring Site[a]	2007 County-level Vehicle Registration	NATTS Location Setting[b]
ROCH	36-055-1007	Rochester, NY	Residential	Urban/City Center	111,600	2003	729,681	552,452	Urban
S4MO	29-510-0085	St. Louis, MO	Residential	Urban/City Center	84,821	2006	1,345,877	1,136,095	Urban
SDGA	13-089-0002	Decatur, GA	Residential	Suburban	9,100	2006	737,093	471,264	Urban
SEWA	53-033-0080	Seattle, WA	Industrial	Suburban	232,000	2006	1,859,284	1,766,228	Urban
SJCA	06-085-0005	San Jose, CA	Commercial	Urban/City Center	6,000	2005	1,433,158	1,506,810	Urban
SKFL	12-103-0026	Pinellas Park, FL	Residential	Suburban	48,000	2006	917,437	1,548,528	Urban
SYFL	12-057-3002	Plant City, FL	Residential	Rural	30,500	2006	1,174,727	1,203,440	Urban
UNVT	50-007-0007	Underhill, VT	Forest	Rural	1,200	2005	151,826	143,618	Rural
WADC	11-001-0043	Washington, D.C.	Commercial	Urban/City Center	36,800	2002	588,292	219,105	Urban

[a] Reference: http://zipfind.net
[b] Reference: EPA, 2007a.
[c] GPCO's hexavalent chromium monitor is at a separate, but adjacent location; as such, this site has two AQS cod

Figure 2-2. Boston, MA (BOMA) Site Location Map

Figure 2-3. Bountiful, UT (BTUT) Site Location Map

Figure 2-4. Bronx, NY (BXNY) Site Location Map

Figure 2-5. Houston, TX (CAMS 35) Site Location Map

Figure 2-6. Harrison County, TX (CAMS 85) Site Location Map

Figure 2-7. Chesterfield County, SC (CHSC) Site Location Map

Figure 2-8. Detroit, MI (DEMI) Site Location Map

Figure 2-9. Grand Junction (GPCO) Site Location Map

Figure 2-10. Hazard County, KY (HAKY) Site Location Map

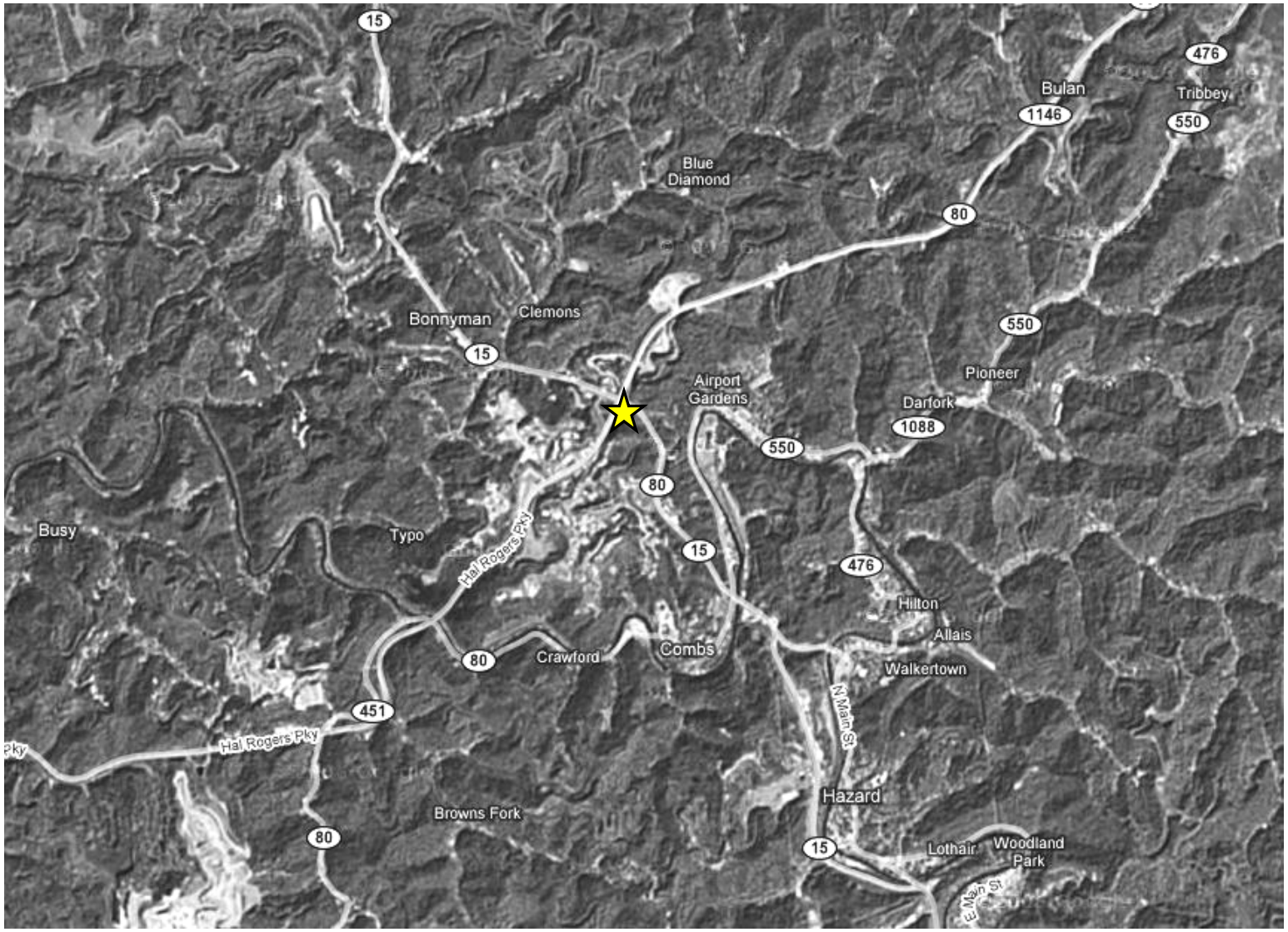


Figure 2-11. La Grande, OR (LAOR) Site Location Map

Figure 2-12. Mayville, WI (MVWI) Site Location Map

Figure 2-13. Chicago, IL (NBIL) Site Location Map

Figure 2-14. Providence, RI (PRRI) Site Location Map

Figure 2-15. Phoenix, AZ (PXSS) Site Location Map

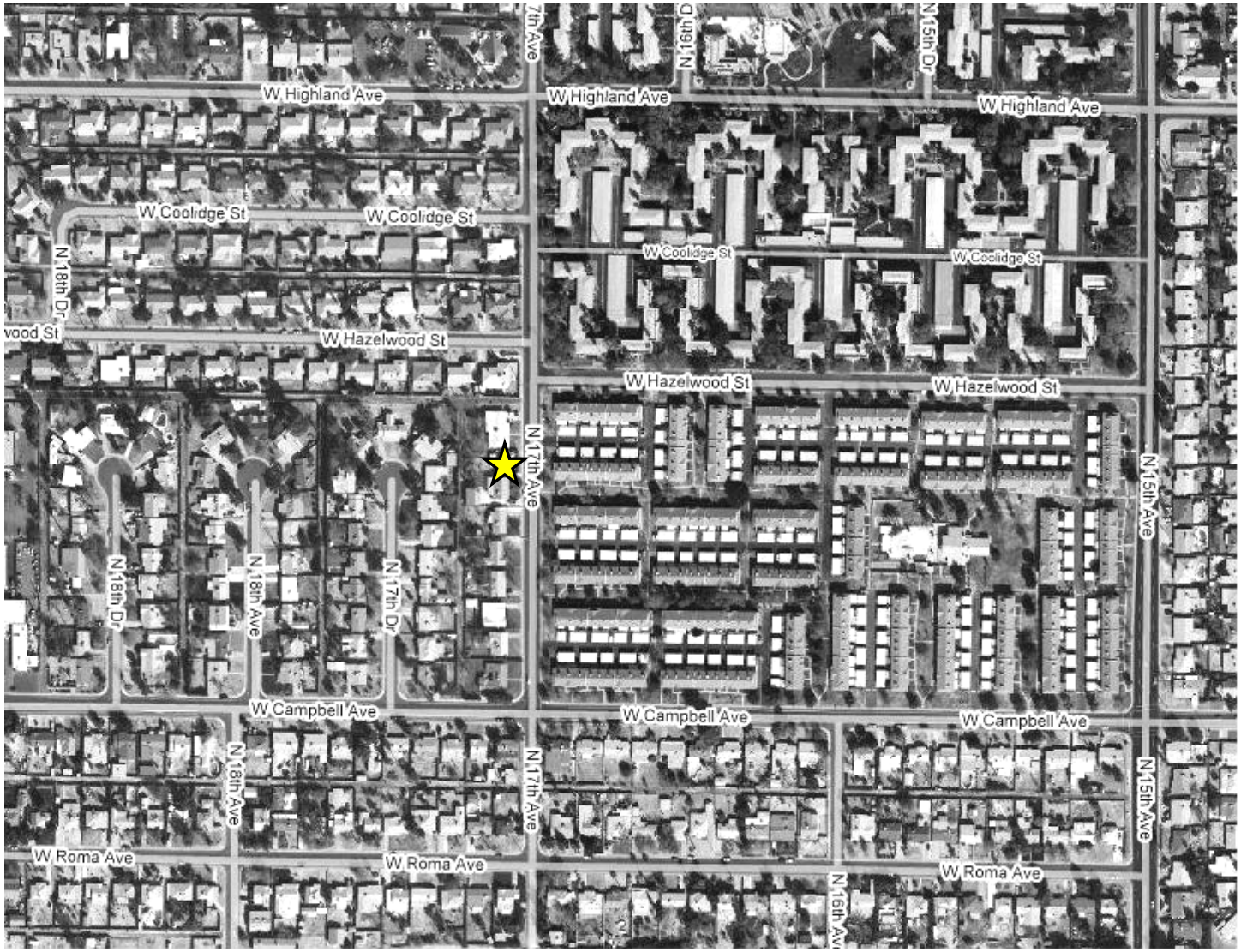


Figure 2-16. Rochester, NY (ROCH) Site Location Map

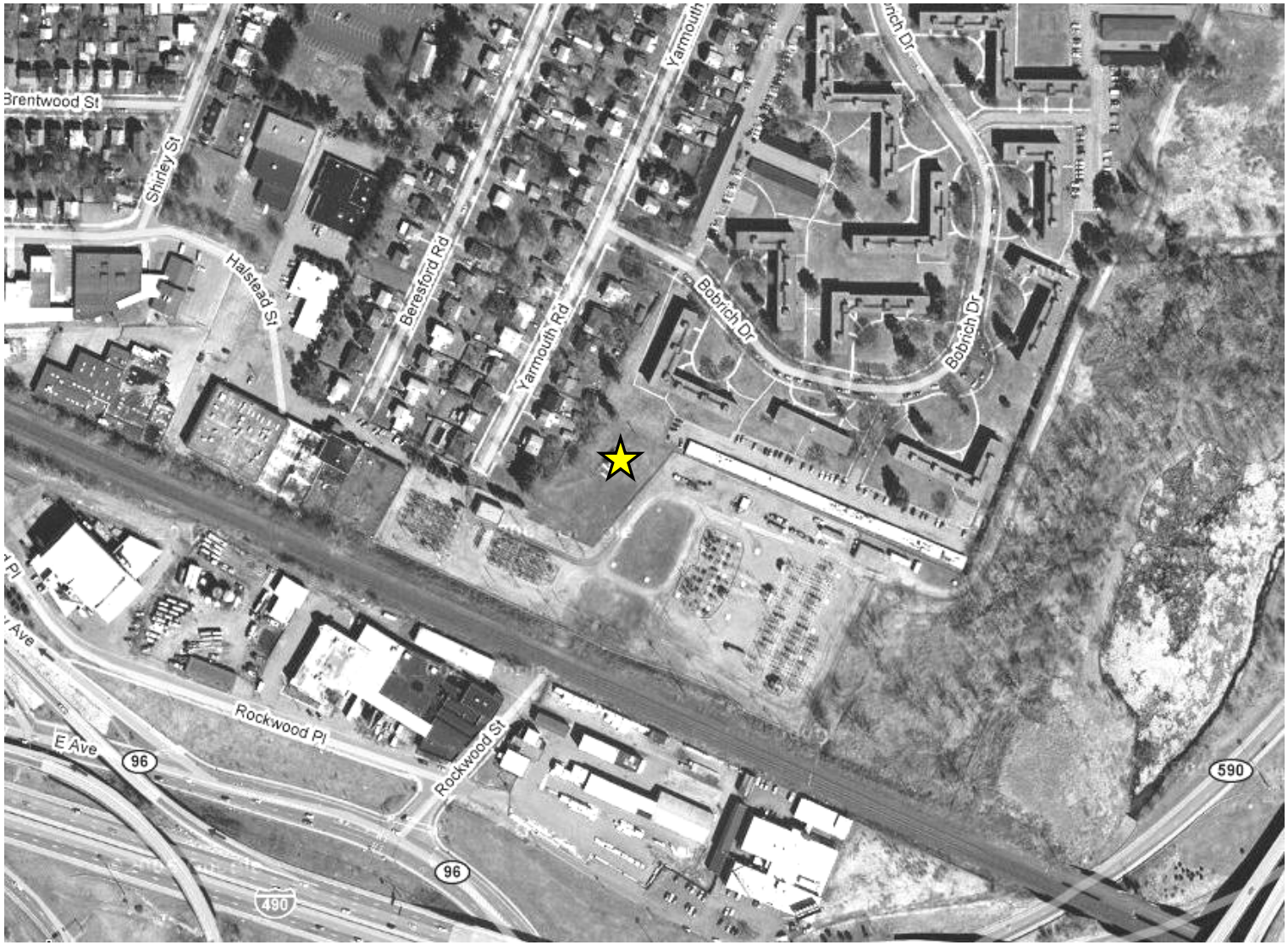


Figure 2-17. St. Louis, MO (S4MO) Site Location Map

Figure 2-18. DeKalb County, GA (SDGA) Site Location Map

Figure 2-19. Seattle, WA (SEWA) Site Location Map

Figure 2-20. San Jose, CA (SJCA) Site Location Map

Figure 2-21. Pinellas Park, FL (SKFL) Site Location Map

Figure 2-22. Tampa, FL (SYFL) Site Location Map

Figure 2-23. Underhill, VT (UNVT) Site Location Map

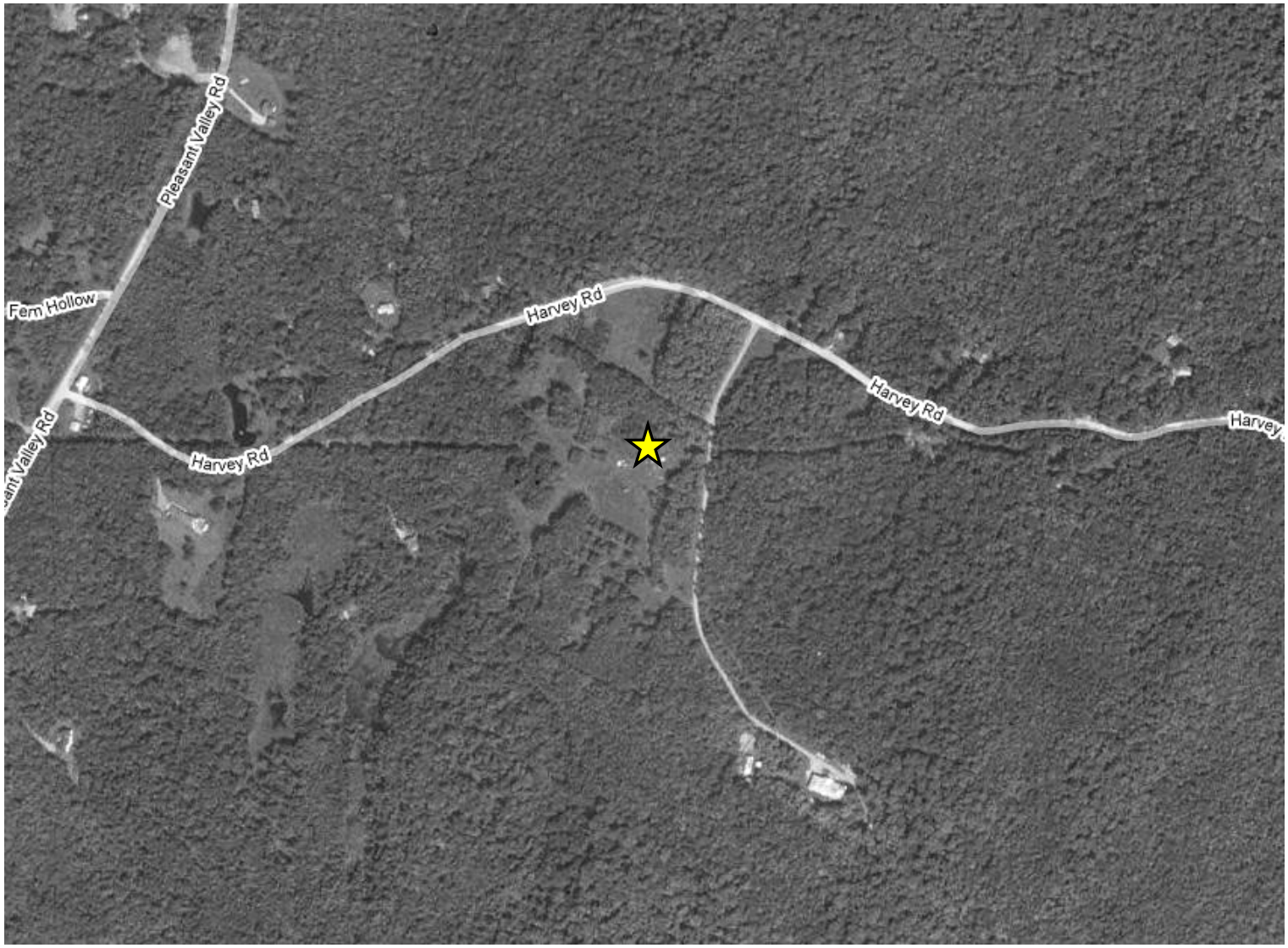


Figure 2-24. Washington, D.C. (WADC) Site Location Map

All data used in this report were retrieved from EPA's Air Quality Subsystem (AQS). It was required that all agencies submit their data within six months of the calendar year. Thus, NATTS data were retrieved in August 2008 to ensure enough time for data to be uploaded into AQS. It is important to note that non-NATTS sampling can occur at these 23 sites; thus it is critical to correctly identify the NATTS data using the proper parameter occurrence code (POC). The VOC POCs identified for this report are presented in Table 2-2.

Table 2-2. VOC HAP POCs

Site	2004	2005	2006	2007
BOMA	10	10	10	10
BTUT	6	6	6	6
BXNY	2	2	2	2
CAMS 35	2	2	2	2
CAMS 85	1	1	1	1
CHSC	1	1	1	1
DEMI	1	1	1	1
GPCO	6	6	6	6
HAKY	1	1	1	1
LAOR	7	7	7	7
MVWI	1	1	1	1
NBIL	6	6	6	6
PRRI	6	2	2	2
PXSS	20	20	20	6
ROCH	2	2	2	2
S4MO	6	6	6	6
SDGA	1,3	1,3	1,3	1,3
SEWA	1	1	1	6
SJCA	5	5	5	5
SKFL	1	1	1	1
SYFL	1	1	1	1
UNVT	1	1	1	1
WADC	2	1	2	2

Similarly, the carbonyl POCs identified for this report are presented in Table 2-3.

Table 2-3. Carbonyl HAP POCs

Site	2004	2005	2006	2007
BOMA	3	3	3	3
BTUT	6	6	6	6
BXNY	2	2	2	2
CAMS 35	3	3	3	3
CAMS 85	1	1	1	1

Table 2-3. Carbonyl HAP POCs (Continued)

Site	2004	2005	2006	2007
CHSC	1	1	1	1
DEMI	2	2	2	2
GPCO	6	6	6	6
HAKY	1	1	1	1
LAOR	7	7	7	7
MVWI	1	1	1	1
NBIL	2	2	6	6
PRRI	5	5	5	5
PXSS	1	1	1	2,30
ROCH	2	2	2	2
S4MO	6	6	6	6
SDGA	2	2	2	2
SEWA	1	1	1	6
SJCA	1	1	1	1
SKFL	6	6	6	6
SYFL	6	6	6	6
UNVT	1	1	1	1
WADC	3	3	3	3

Additionally, the metals POCs identified for this report are presented in Table 2-4.

Table 2-4. Metals HAP POCs

Site	2004	2005	2006	2007
BOMA	6	6	6	6
BTUT	1	1	1	1
BXNY	M	1	M	1
CAMS 35	1	1	1	1
CAMS 85	1	1	1	1
CHSC	1	1	1	1
DEMI	1	1	1	1
GPCO	1	3	3	3
HAKY	1	1	1	1
LAOR	7	7	7	7
MVWI	M	1	1	1
NBIL	M	6	6	6
PRRI	1	1	1	1
PXSS	M	M	1	1
ROCH	M	M	M	1
S4MO	6	6	6	6
SDGA	1	1	1	1
SEWA	1	1	1	6
SJCA	M	M	M	M
SKFL	5	5	5	5

Table 2-4. Metals HAP POCs (Continued)

Site	2004	2005	2006	2007
SYFL	5	5	5	5
UNVT	M	M	M	M
WADC	1	1	1	1

M = Data not in AQS

Finally, the hexavalent chromium POCs identified for this report are presented in Table 2-5.

Table 2-5. Hexavalent Chromium HAP POCs

Site	2004	2005	2006	2007
BOMA	NA	6	6	6
BTUT	NA	6	6	6
BXNY	NA	M	M	6
CAMS 35	NA	M	1	1
CAMS 85	NA	M	1	1
CHSC	NA	6	6	6
DEMI	NA	1	1	1
GPCO	NA	6	6	6
HAKY	NA	6	6	6
LAOR	NA	6	6, 7	7
MVWI	NA	6	6	6
NBIL	NA	6	6	6
PRRI	NA	6	6	6
PXSS	NA	M	6	6
ROCH	NA	M	M	6
S4MO	NA	6	6	6
SDGA	NA	6	6	6
SEWA	NA	6	6	6
SJCA	NA	M	M	M
SKFL	NA	NA	NA	NA
SYFL	NA	6	6	6
UNVT	NA	6	6	6
WADC	NA	1	1	1

M = Data not in AQS
NA = Not Applicable

2.2 Analytical Methods Used and Pollutants Targeted for Monitoring

Urban air pollution typically contains hundreds of components, including, but not limited to, volatile organic compounds (VOC), carbonyl compounds, metals, and particulate matter. Because the sampling and analysis required to monitor for every component of air pollution has been prohibitively expensive, the NATTS program primarily focuses on using sampling

methods, as listed below. The target pollutants varied significantly from monitoring site to monitoring site.

- VOC--*Compendium Method TO-15* was used to measure ambient air concentrations of 61 VOC.
- Carbonyls--*Compendium Method TO-11A* was used to measure ambient air concentrations of 15 carbonyl compounds.
- Trace Metals--*Compendium Method IO-3.5* was used to measure ambient air concentrations of 11 metals.
- Hexavalent Chromium--*EPA-approved hexavalent chromium method* was used to measure ambient air concentrations of hexavalent chromium.

The detection limits of the analytical methods must be considered carefully when interpreting the corresponding ambient air monitoring data. By definition, method detection limits (MDLs) represent the lowest concentrations at which laboratory equipment have been experimentally determined to reliably quantify concentrations of selected pollutants to a specific confidence level. If a chemical concentration in ambient air does not exceed the method sensitivity (as gauged by the detection limit), the analytical method might not differentiate the pollutant from other pollutants in the sample or from the random "noise" inherent in laboratory analyses. While quantification below the MDL is possible, the measurement reliability is lower. Therefore, when samples contain concentrations at levels below their respective detection limits, multiple analyses of the same sample may lead to a wide range of measurement results, including highly variable concentrations or "non-detect" observations. Data analysts should exercise caution when interpreting monitoring data with many reported concentrations at levels near or below the corresponding detection limits.

MDLs are determined using 40 CFR, Part 136 Appendix B procedures (EPA, 2005a) in accordance with the specifications presented in the NATTS TAD (EPA, 2007b). This procedure involves analyzing at least seven replicate standards prepared on/in the appropriate sampling media (per analytical method). Instrument detection limits are not determined (replicates of standards only) because sample contamination and preparation variability would not be considered. Tables 2-6 through 2-9 identify the specific target pollutants for each method and

their corresponding MDLs. For the VOC analyses, the experimentally-determined MDLs do not change unless the sample is diluted. For the rest of the analyses, the MDLs may vary due to the actual volume of sample gas pulled through the associated media.

Because non-detect results significantly limit the range of data interpretations for ambient air monitoring programs, participating agencies should note that the approach for treating non-detects may affect the magnitude of the calculated central tendency concentrations, especially for pollutants with a low detection rate. The non-detects were treated as valid data points. For purposes of risk analysis, non-detects were substituted using NATA-approved background concentrations where available; otherwise one-half MDL on a target pollutant basis was used to calculate time-period averages.

The following discussion presents an overview of the sampling and analytical methods. For detailed descriptions of the methods, readers should refer to the information provided in the EPA NATTS TAD (EPA, 2007b).

2.2.1 VOC Sampling and Analytical Methods

VOC sampling and analysis is performed in accordance with EPA Compendium Method TO-15 adjusted to the procedures presented in EPA's NATTS TAD. Ambient air samples for VOC analysis were collected in passivated stainless steel canisters. The respective NATTS laboratory distributed the prepared canisters (i.e., cleaned and evacuated) to the monitoring sites before each scheduled sample collection event, and site operators connected the canisters to air sampling equipment prior to each sampling day. Prior to field sampling, the passivated canisters had internal pressures much lower than atmospheric pressure. Using this pressure differential, ambient air naturally flowed into the canisters automatically once an associated system solenoid valve was actuated. A mass flow controller on the sampling device inlet ensured that ambient air entered the canister at an integrated constant rate across the collection period. At the end of the 24-hour sampling period, the solenoid valve automatically stopped ambient air from flowing into the canister. Site operators recovered and returned the canisters to the respective NATTS laboratory for analysis.

By analyzing each sample with gas chromatography incorporating mass spectrometry (GC/MS), laboratory staff determined ambient air concentrations of 61 VOC concentrations. Because *m*-xylene and *p*-xylene elute from the GC column at the same time, the VOC analytical method reports only the sum of the concentrations for these two compounds, and not the separate concentration for each compound.

Table 2-6 presents the MDLs for the laboratory analysis of the VOC samples in micrograms per cubic meter (µg/m^3).

Table 2-6. VOC HAPs Method Detection Limits, 2004-2007

Pollutant	Minimum MDL (µg/m^3)	Maximum MDL (µg/m^3)	Average MDL (µg/m^3)	Average Federal MDL (µg/m^3)
Acetonitrile	0.049	1.300	0.183	0.165
Acrolein	0.002	5.810	0.212	0.079
Acrylonitrile	0.007	1.100	0.156	0.096
Benzene	0.011	1.597	0.132	0.087
Bromomethane	0.039	1.942	0.254	0.328
Butadiene,1,3-	0.010	1.106	0.106	0.064
Carbon Disulfide	0.016	0.311	0.122	0.277
Carbon Tetrachloride	0.057	3.146	0.422	0.546
Chloro-1,3-butadiene, 2-	0.047	0.530	0.135	0.109
Chlorobenzene	0.015	2.302	0.148	0.069
Chloroethane	0.013	1.319	0.145	0.118
Chloroform	0.020	2.441	0.301	0.418
Chloromethane	0.029	1.033	0.144	0.193
Chlorotoluene, alpha-	0.010	2.589	0.214	0.094
Dibromoethane, 1,2-	0.077	3.842	0.438	0.516
Dichlorobenzene, p-	0.020	3.006	0.290	0.130
Dichloroethane, 1,1-	0.020	2.024	0.171	0.135
Dichloroethylene, 1,1-	0.032	3.965	0.231	1.300
Dichloropropane, 1,2-	0.031	2.311	0.229	0.194
Dichloropropene, *cis*-1,3-	0.045	2.269	0.214	0.183
Dichloropropene, *trans*-1,3-	0.040	2.269	0.219	0.193
Ethyl Acrylate	0.033	0.491	0.158	0.085
Ethylbenzene	0.011	2.377	0.153	0.083
Ethylene Dichloride	0.040	2.024	0.222	0.220
Hexachloro-1,3-butadiene	0.067	5.333	0.811	0.289
Methyl Methacrylate	0.020	0.901	0.202	0.082
Methyl *tert*-Butyl Ether	0.007	1.082	0.132	0.061
Methyl-2-pentanone, 4-	0.029	0.850	0.191	0.079

Table 2-6. VOC HAPs Method Detection Limits, 2004-2007 (Continued)

Pollutant	Minimum MDL (µg/m^3)	Maximum MDL (µg/m^3)	Average MDL (µg/m^3)	Average Federal MDL (µg/m^3)
Methylene Chloride	0.035	17.368	0.637	0.322
Styrene	0.011	2.130	0.136	0.066
Tetrachloroethane, 1,1,2,2-	0.014	3.433	0.351	0.232
Tetrachloroethylene	0.068	3.391	0.335	0.358
Toluene	0.011	1.884	0.123	0.076
Tribromomethane	0.103	3.340	0.543	0.928
Trichlorobenzene, 1,2,4-	0.020	7.421	0.574	0.231
Trichloroethane, 1,1,1-	0.016	2.728	0.243	0.251
Trichloroethane, 1,1,2-	0.030	2.728	0.281	0.212
Trichloroethylene	0.021	2.687	0.262	0.204
Vinyl Chloride	0.020	1.278	0.137	0.137
Xylenes, *m,p*-	0.011	2.171	0.175	0.092
Xylenes, *o*-	0.011	2.171	0.134	0.075

2.2.2 Carbonyl Sampling and Analytical Method

Following the specifications of EPA Compendium Method TO-11A adjusted to the procedures presented in EPA's NATTS TAD, ambient air samples for carbonyl analysis were collected by passing ambient air through cartridges containing silica gel coated with 2,4-dinitrophenylhydrazine (DNPH), a compound known to react selectively and reversibly with many aldehydes and ketones. Carbonyl compounds in ambient air are retained in the sampling cartridge, while other compounds pass through the cartridge without reacting with the DNPH-coated matrix. As with the VOC sampling, the respective NATTS laboratory distributed the DNPH cartridges to the monitoring sites and site operators connected the cartridges to the air sampling equipment. After each 24-hour sampling period, site operators recovered and returned the cartridges to the respective NATTS laboratory for chemical analysis.

To quantify concentrations of carbonyls in the sampled ambient air, laboratory analysts eluted the exposed DNPH cartridges with acetonitrile. High-performance liquid chromatography (HPLC) analysis and ultraviolet detection of these solutions determined the relative amounts of individual carbonyls present in the original air sample. Because butyraldehyde and isobutyraldehyde elute from the HPLC column at the same time, the carbonyl analytical method reports only the sum of the concentrations for these compounds, and not the separate

concentration for each compound. For the same reason, the analytical method reports only the sum of the concentrations for the three tolualdehydes isomers, as opposed to reporting the separate concentration for the three individual compounds.

Table 2-7 presents the MDLs for the laboratory analysis of the carbonyl samples in micrograms per cubic meter (µg/m^3).

Table 2-7. Carbonyl HAPs Method Detection Limits, 2004-2007

Pollutant	Minimum MDL (µg/m^3)	Maximum MDL (µg/m^3)	Average MDL (µg/m^3)	Average Federal MDL (µg/m^3)
Acetaldehyde	0.004	1.333	0.220	0.221
Formaldehyde	0.002	1.333	0.128	0.116
Propionaldehyde	0.002	1.333	0.119	0.082

2.2.3 Metals Sampling and Analytical Method

Sampling for the determination of metals in or on particulate matter was performed by the sites in accordance with EPA Compendium Method IO-3.5 adjusted to the procedures presented in EPA's NATTS TAD. Filters with Chain of Custody forms and all associated documentation were shipped to the respective NATTS laboratory from the field. Upon receipt, the filters were analyzed by the NATTS laboratory.

Table 2-8 presents the MDLs for the laboratory analysis of the metals samples in nanograms per cubic meter (ng/m^3).

Table 2-8. Metals HAPs Method Detection Limits, 2004-2007

Pollutant	Minimum MDL (ng/m^3)	Maximum MDL (ng/m^3)	Average MDL (ng/m^3)	Federal MDL (ng/m^3)
Antimony Compounds	0.003	40.000	6.834	7.461
Arsenic Compounds	0.003	22.000	2.965	2.742
Beryllium Compounds	0.002	2.520	0.277	0.281
Cadmium Compounds	0.002	1.000	0.227	0.225
Chromium Compounds	0.010	10.000	0.762	0.527

Table 2-8. Metals HAPs Method Detection Limits, 2004-2007 (Continued)

Pollutant	Minimum MDL (ng/m^3)	Maximum MDL (ng/m^3)	Average MDL (ng/m^3)	Federal MDL (ng/m^3)
Cobalt Compounds	0.003	20.000	2.588	2.595
Lead Compounds	0.004	80.000	6.853	6.682
Manganese Compounds	0.004	1.200	0.358	0.295
Mercury Compounds	0.009	0.250	0.130	0.029
Nickel Compounds	0.009	4.000	0.950	0.814
Selenium Compounds	0.004	17.000	4.000	3.970

2.2.4 Hexavalent Chromium Sampling and Analytical Method

Hexavalent chromium was measured using an EPA-approved approach as presented in EPA's NATTS TAD. The MDL is experimentally determined at the respective NATTS laboratory for each site; the average MDL for the program, which is presented in Table 2-9, was 0.147 ng/m^3.

Table 2-9. Hexavalent Chromium Method Detection Limit, 2004-2007

Pollutant	Minimum MDL (ng/m^3)	Maximum MDL (ng/m^3)	Average MDL (ng/m^3)	Federal MDL (ng/m^3)
Hexavalent Chromium	0.006	0.110	0.020	11.092

2.3 Sample Collection Schedules

Table 2-10 presents the first and last date on which sample collection occurred for each monitoring location. The monitoring sites started sampling in January 2004 and ended sampling in December 2007, with a few exceptions. Three sites began sampling after January 2004:

- La Grande, OR (LAOR) started sampling in February 2004;
- Rochester, NY (ROCH) started sampling in April 2004; and
- Tampa, FL (SKFL) started sampling in July 2004.

One site ended sampling before December 2007:

- La Grande, OR (LAOR) ended sampling in November 2007.

According to the NATTS protocol, 24-hour integrated samples were to be collected at every monitoring site every 1-in-6 days and each sample collection began and ended at midnight,

local standard time. Although the NATTS network officially began in 2004, hexavalent chromium sampling officially began in the 2005 sampling season. Additionally, due to the close proximity of the SYFL and SKFL sites, hexavalent chromium sampling only occurred at the SYFL site.

Not all sites that measured all four pollutant types were uploaded into AQS, as evidenced by the "M" designator in Table 2-10. Despite these data "missing", overall completeness of the AQS-submitted data was very high. As a network, all four pollutant types measured completeness greater than 85 percent, which is also the desired completeness for each site. Data sets that were submitted to AQS, but not used due to being suspect were assigned an "I". Section 7 provides further detail on these invalidated data.

In Table 2-10, sites that did not meet this level for specific pollutant types and years are shaded. Column "A" represents the number of samples taken, while Column "B" represents expected number of samples. Finally, Column "C" represents the percentage of sampling completeness.

In cases where monitors failed to collect valid samples on a given scheduled sampling day, site operators were instructed to reschedule samples for other days. This practice explains why some monitoring locations periodically strayed from the 1-in-6 day sampling schedule.

The 1-in-6 day sampling schedule provides cost-effective approaches to data collection for trends characterization of toxic pollutants in ambient air and ensures that sampling days are evenly distributed among the seven days of the week to allow weekday/weekend comparison of air quality.

2.4 Completeness

Completeness refers to the number of valid samples collected and analyzed compared to the number of total samples attempted. Monitoring programs that consistently generate valid results have higher completeness than programs that consistently have invalid samples. The completeness of an air monitoring program, therefore, can be a qualitative measure of the

Table 2-10. Sampling Schedules and Completeness

Site	Year	Monitoring Period[a]		Carbonyl HAPs			VOC HAPs			Metal HAPs			Hexavalent Chromium		
		Starting Date	Ending Date	A	B	C	A	B	C	A	B	C	A	B	C
BOMA	2004	1/4/2004	12/29/2004	51	61	84	50	61	82	45	46	98	NA	NA	NA
	2005	1/4/2005	12/30/2005	58	61	95	57	61	93	61	61	100	59	59	100
	2006	1/5/2006	12/31/2006	61	61	100	59	61	97	56	56	100	61	61	100
	2007	1/6/2007	12/26/2007	59	60	98	57	60	95	59	59	100	60	61	98
BTUT	2004	1/4/2004	12/29/2004	59	63	94	60	63	95	63	63	100	NA	NA	NA
	2005	1/5/2005	12/30/2005	56	61	92	55	62	89	59	59	100	56	59	95
	2006	1/5/2006	12/31/2006	60	60	100	59	60	98	58	58	100	52	61	85
	2007	1/6/2007	12/26/2007	60	62	97	55	63	87	57	58	98	56	62	90
BXNY	2004	1/4/2004	12/29/2004	58	61	95	60	61	98	M	M	M	NA	NA	NA
	2005	1/4/2005	12/30/2005	61	61	100	60	62	97	I	I	I	ND	ND	ND
	2006	1/5/2006	12/31/2006	55	61	90	44	61	72	M	M	M	M	M	M
	2007	1/6/2007	12/27/2007	15	15	100	24	60	40	53	60	88	15	15	100
CAMS 35	2004	1/4/2004	12/29/2004	58	58	100	52	52	100	59	59	100	NA	NA	NA
	2005	1/4/2005	12/30/2005	58	58	100	59	59	100	53	54	98	M	M	M
	2006	1/5/2006	12/31/2006	53	53	100	51	51	100	55	61	90	16	18	89
	2007	1/6/2007	12/26/2007	56	56	100	60	60	100	55	59	93	54	60	90

M = Data not in AQS; I = Data invalidated due to atypically high concentrations; ND = no concentrations reported in AQS.
NA = Not Applicable
Shaded box = data set less than 85 percent sampling completeness
[a]Starting and ending dates represent the integrated first and last dates of the four sampling types.

Table 2-10. Sampling Schedules and Completeness (Continued)

Site	Year	Monitoring Period[a]		Carbonyl HAPs			VOC HAPs			Metal HAPs			Hexavalent Chromium		
		Starting Date	Ending Date	A	B	C	A	B	C	A	B	C	A	B	C
CAMS 85	2004	1/28/2004	12/29/2004	51	51	100	57	57	100	47	47	100	NA	NA	NA
	2005	1/4/2005	12/30/2005	56	56	100	61	61	100	57	57	100	M	M	M
	2006	1/5/2006	12/31/2006	59	59	100	61	61	100	60	61	98	18	19	95
	2007	1/6/2007	12/26/2007	55	55	100	55	61	90	59	60	98	52	60	87
CHSC	2004	1/4/2004	12/29/2004	50	61	82	3	31	10	45	61	74	NA	NA	NA
	2005	1/4/2005	12/30/2005	54	61	89	24	61	39	47	61	77	55	59	93
	2006	1/5/2006	12/31/2006	56	62	90	21	61	34	55	61	90	59	61	97
	2007	1/6/2007	12/26/2007	54	60	90	24	60	40	53	60	88	57	62	92
DEMI	2004	1/4/2004	12/29/2004	55	60	92	56	60	93	53	58	91	NA	NA	NA
	2005	1/4/2005	12/30/2005	55	59	93	51	58	88	60	63	95	53	60	88
	2006	1/5/2006	12/31/2006	56	61	92	58	61	95	58	60	97	59	61	97
	2007	1/6/2007	12/26/2007	11	58	19	59	60	98	72	76	95	61	62	98
GPCO	2004	1/4/2004	12/29/2004	57	60	95	55	60	92	60	63	95	NA	NA	NA
	2005	1/4/2005	12/30/2005	62	63	98	59	63	94	58	66	88	59	60	98
	2006	1/5/2006	12/31/2006	60	61	98	61	61	100	56	61	92	60	61	98
	2007	1/6/2007	12/26/2007	64	64	100	62	64	97	38	63	60	59	61	97

M = Data not in AQS; I = Data invalidated due to atypically high concentrations; ND = no concentrations reported in AQS.
NA = Not Applicable
Shaded box = data set less than 85 percent sampling completeness
[a]Starting and ending dates represent the integrated first and last dates of the four sampling types.

Table 2-10. Sampling Schedules and Completeness (Continued)

Site	Year	Monitoring Period[a]		Carbonyl HAPs			VOC HAPs			Metals HAPs			Hexavalent Chromium		
		Starting Date	Ending Date	A	B	C	A	B	C	A	B	C	A	B	C
HAKY	2004	1/4/2004	12/29/2004	53	61	87	I	I	I	I	I	I	NA	NA	NA
	2005	1/4/2005	12/30/2005	59	61	97	I	I	I	I	I	I	58	60	97
	2006	1/5/2006	12/31/2006	61	61	100	55	61	90	61	61	100	59	61	97
	2007	1/6/2007	12/26/2007	60	60	100	56	60	93	58	60	97	60	61	98
LAOR	2004	2/21/2004	12/29/2004	50	50	100	I	I	I	48	48	100	NA	NA	NA
	2005	1/4/2005	12/30/2005	56	56	100	I	I	I	60	60	100	55	59	93
	2006	1/5/2006	12/31/2006	53	53	100	I	I	I	58	58	100	56	56	100
	2007	1/6/2007	12/26/2007	49	49	100	20	54	37	56	56	100	38	38	100
MVWI	2004	1/4/2004	12/29/2004	61	61	100	49	59	83	M	M	M	NA	NA	NA
	2005	1/4/2005	12/30/2005	58	59	98	61	61	100	51	55	93	48	49	98
	2006	1/5/2006	12/31/2006	61	61	100	61	61	100	56	56	100	60	61	98
	2007	1/6/2007	12/26/2007	29	29	100	54	60	90	14	15	93	59	62	95
NBIL	2004	1/4/2004	11/17/2004	46	46	100	51	53	96	M	M	M	NA	NA	NA
	2005	1/4/2005	12/30/2005	49	54	91	53	59	90	61	61	100	54	59	92
	2006	1/5/2006	12/31/2006	61	61	100	60	61	98	62	62	100	59	61	97
	2007	1/6/2007	12/26/2007	58	60	97	59	60	98	58	59	98	60	61	98

M = Data not in AQS; I = Data invalidated due to atypically high concentrations; ND = no concentrations reported in AQS.
NA = Not Applicable
Shaded box = data set less than 85 percent sampling completeness
[a]Starting and ending dates represent the integrated first and last dates of the four sampling types.

Table 2-10. Sampling Schedules and Completeness (Continued)

Site	Year	Monitoring Period[a]		Carbonyl HAPs			VOC HAPs			Metals HAPs			Hexavalent Chromium		
		Starting Date	Ending Date	A	B	C	A	B	C	A	B	C	A	B	C
PRRI	2004	1/4/2004	12/29/2004	44	61	72	48	61	79	60	61	98	NA	NA	NA
	2005	1/4/2005	12/30/2005	39	61	64	56	61	92	57	61	93	58	59	98
	2006	1/5/2006	12/31/2006	43	61	70	53	61	87	59	61	97	61	61	100
	2007	1/6/2007	12/26/2007	49	60	82	55	60	92	60	60	100	60	61	98
PXSS	2004	1/4/2004	12/29/2004	56	61	92	52	61	85	M	M	M	NA	NA	NA
	2005	1/4/2005	12/30/2005	49	61	80	59	61	97	M	M	M	M	M	M
	2006	1/5/2006	12/31/2006	51	61	84	27	61	44	59	61	97	58	61	95
	2007	1/6/2007	12/26/2007	60	60	100	52	58	90	59	61	97	56	62	90
ROCH	2004	4/9/2004	12/29/2004	22	23	96	44	45	98	M	M	M	NA	NA	NA
	2005	1/4/2005	12/30/2005	50	61	82	54	61	89	M	M	M	M	M	M
	2006	1/5/2006	12/31/2006	55	61	90	54	56	96	M	M	M	M	M	M
	2007	1/6/2007	12/27/2007	13	15	87	21	60	35	49	53	92	13	15	87
S4MO	2004	1/4/2004	12/29/2004	63	68	93	65	66	98	61	61	100	NA	NA	NA
	2005	1/4/2005	12/30/2005	60	62	97	61	62	98	61	61	100	51	54	94
	2006	1/5/2006	12/31/2006	61	62	98	59	62	95	59	60	98	61	61	100
	2007	1/6/2007	12/26/2007	60	61	98	61	61	100	59	60	98	58	60	97

M = Data not in AQS; I = Data invalidated due to atypically high concentrations; ND = no concentrations reported in AQS.
NA = Not Applicable
Shaded box = data set less than 85 percent sampling completeness
[a]Starting and ending dates represent the integrated first and last dates of the four sampling types.

Table 2-10. Sampling Schedules and Completeness (Continued)

Site	Year	Monitoring Period[a]		Carbonyl HAPs			VOC HAPs			Metal HAPs			Hexavalent Chromium		
		Starting Date	Ending Date	A	B	C	A	B	C	A	B	C	A	B	C
SDGA	2004	1/4/2004	12/29/2004	59	60	98	66	75	88	57	61	93	NA	NA	NA
	2005	1/4/2005	12/30/2005	58	61	95	49	61	80	55	61	90	49	50	98
	2006	1/5/2006	12/31/2006	54	59	92	60	62	97	55	61	90	56	61	92
	2007	1/6/2007	12/26/2007	55	59	93	54	60	90	55	60	92	41	45	91
SEWA	2004	1/4/2004	12/29/2004	59	61	97	60	61	98	44	61	72	NA	NA	NA
	2005	1/4/2005	12/30/2005	56	61	92	60	61	98	60	61	98	59	60	98
	2006	1/5/2006	12/31/2006	27	30	90	25	30	83	27	30	90	13	17	76
	2007	1/6/2007	12/26/2007	59	60	98	60	60	100	60	60	100	60	61	98
SJCA	2004	1/10/2004	12/23/2004	29	30	97	3	30	10	M	M	M	NA	NA	NA
	2005	1/4/2005	12/30/2005	28	31	90	1	32	3	M	M	M	M	M	M
	2006	1/11/2006	12/31/2006	36	38	95	19	33	58	M	M	M	M	M	M
	2007	1/6/2007	12/26/2007	48	49	98	52	52	100	M	M	M	M	M	M
SKFL	2004	7/20/2004	12/29/2004	28	28	100	25	28	89	28	28	100	NA	NA	NA
	2005	1/4/2005	12/30/2005	61	61	100	61	61	100	61	61	100	NA	NA	NA
	2006	1/5/2006	12/31/2006	60	60	100	49	61	80	57	57	100	NA	NA	NA
	2007	1/6/2007	12/26/2007	60	62	97	56	60	93	58	58	100	NA	NA	NA

M = Data not in AQS; I = Data invalidated due to atypically high concentrations; ND = no concentrations reported in AQS.
NA = Not Applicable
Shaded box = data set less than 85 percent sampling completeness
[a]Starting and ending dates represent the integrated first and last dates of the four sampling types.

Table 2-10. Sampling Schedules and Completeness (Continued)

Site	Year	Monitoring Period[a]		Carbonyl HAPs			VOC HAPs			Metals HAPs			Hexavalent Chromium		
		Starting Date	Ending Date	A	B	C	A	B	C	A	B	C	A	B	C
SYFL	2004	1/4/2004	12/29/2004	60	63	95	55	61	90	59	60	98	NA	NA	NA
	2005	1/4/2005	12/30/2005	59	60	98	59	61	97	59	59	100	56	59	95
	2006	1/5/2006	12/31/2006	61	61	100	47	61	77	61	61	100	57	59	97
	2007	1/6/2007	12/26/2007	60	60	100	56	60	93	60	60	100	60	62	97
UNVT	2004	1/4/2004	12/29/2004	29	64	45	56	63	89	M	M	M	NA	NA	NA
	2005	1/4/2005	12/30/2005	60	64	94	53	63	84	M	M	M	56	60	93
	2006	1/5/2006	12/31/2006	57	61	93	52	61	85	M	M	M	59	61	97
	2007	1/6/2007	12/26/2007	58	58	100	57	60	95	M	M	M	60	62	97
WADC	2004	1/4/2004	12/29/2004	60	61	98	59	59	100	42	42	100	NA	NA	NA
	2005	1/4/2005	12/30/2005	61	61	100	60	60	100	61	61	100	48	49	98
	2006	1/5/2006	12/31/2006	61	61	100	61	61	100	57	60	95	59	61	97
	2007	1/6/2007	12/26/2007	M	M	M	59	59	100	42	45	93	60	62	97
Overall	2004			1,158	1,273	91	1,026	1,167	88	771	819	94	NA	NA	NA
	2005			1,263	1,354	93	1,113	1,251	89	981	1,022	96	874	915	96
	2006			1,262	1,329	95	1,096	1,269	86	1,069	1,106	97	983	1,023	96
	2007			1,092	1,172	93	1,168	1,372	85	1,134	1,202	94	1,099	1,155	95
	Overall			4,775	5,128	93	4,403	5,059	87	3,955	4,149	95	2,956	3,093	96

M = Data not in AQS; I = Data invalidated due to atypically high concentrations; ND = no concentrations reported in AQS.
NA = Not Applicable
Shaded box = data set less than 85 percent sampling completeness
[a]Starting and ending dates represent the integrated first and last dates of the four sampling types.

reliability of air sampling and laboratory analytical equipment and a measure of the efficiency with which the program was managed.

The following observations summarize the completeness of the monitoring data sets collected during the 2004-2007 NATTS, as shown in Table 2-10:

- For VOC sampling, the completeness ranged from 3 to 100 percent, with an overall completeness of 87 percent;
- For carbonyl sampling, the completeness ranged from 19 to 100 percent with an overall completeness of 93 percent;
- For metals sampling, the completeness ranged from 60 to 100 percent with an overall completeness was 95 percent; and
- For hexavalent chromium sampling, the completeness ranged from 76 to 100 percent, with an overall completeness was 96 percent.

The data quality objective (DQO) for completeness based on the EPA-approved Quality Assurance Project Plan (QAPP) specifies that 85-100 percent of samples collected at a given monitoring site must be analyzed successfully to be considered sufficient for data trends analysis (EPA, 2007b). The data in Table 2-10 shows that 35 data sets (from a total of 342 data sets) from the 2004-2007 NATTS monitoring sites did not meet this data quality objective (shaded in Table 2-10), while an additional eight data sets were voided by the state agency or by EPA due to suspiciously high values. Refer to Section 8 (Data Quality) for further discussion. Of the 43 data sets not used for this analysis report, only four data sets (2005 and 2006 PXSS CARBs, 2007 DEMI CARBs, and 2006 SEWA HEX) were under the NATTS contract laboratory. Additionally, all of the "missing" data sets in AQS were from independent contract laboratories. All data sets under the NATTS contract laboratory were uploaded into AQS.

It is important to note that this report does not evaluate other NATTS measurement quality objectives (MQOs), such as precision, laboratory bias, and MDL evaluations. EPA prepares a separate, annual report covering these MQOs, and they are posted at: http://www.epa.gov/ttn/amtic/airtoxqa.html.

3.0 Summary of the 2004-2007 NATTS Data Treatment and Methods

This section summarizes the data treatment and data analysis methods used to evaluate the data collected during the 2004-2007 NATTS sampling years. These data were analyzed on a program-wide basis as well as a site-specific basis. Results from the program-wide data analyses are presented in Sections 4 (Statistical Analysis), Section 5 (Risk Overview), and Section 6 (Trends).

A total of 262,898 air toxics HAP concentrations were obtained from AQS at 23 sites for the 2004-2007 NATTS reporting years.

3.1 Data Treatment

Section 3.0 examines the various statistical tools employed to characterize the data collected during the 2004-2007 sampling years. Certain data analyses were performed at the program-level, other data analyses were performed both at a program-level and site-specific basis, and still other approaches were reserved for site-specific data analyses only. Regardless of the data analysis employed, it is important to understand how the concentration data were treated. The following paragraphs describe techniques used to prepare this large quantity of data for data analysis.

Concentrations of *m,p*-xylene and *o*-xylene were summed together and are henceforth referred to as "total xylenes," "xylenes (total)," or simply "xylenes" throughout the remainder of this report, with a few exceptions.

In order to compare concentrations across multiple sampling methods, all concentrations have also been converted to a common unit of measure: microgram per cubic meter ($\mu g/m^3$). This is referred to as the *preprocessed daily measurement*. Section 4.1 examines the results of basic statistical calculations performed on the dataset. However, in Table 4-1 which is the method-specific statistics for VOC, the xylenes results are retained as *m,p*-xylene and *o*-xylene species.

3.2 Risk Characterizations: All Pollutants

Four data characterizations were applied to the 2004-2007 NATTS data set. The first is a preliminary screening approach published by EPA Region 4 and the second is a comparison of preprocessed concentrations against Agency for Toxic Substances and Disease Registry (ATSDR) health benchmarks. Cancer and noncancer risk approximations comprise the third data characterization, while the final is a risk-based emissions assessment.

3.2.1 Risk Screening Approach

EPA has published a guidance document outlining a risk screening approach that utilizes a risk-based methodology to perform an initial screen of ambient air toxics monitoring data sets (EPA, 2006a). This screening process provides a risk-based methodology for analysts and interested parties to identify which pollutants may pose a health risk in their area. Not all NATTS pollutants have screening values; of the 172 pollutants sampled under these programs, 106 pollutants have screening values.

Preprocessed daily measurements of the target pollutants were compared to these risk screening values in order to identify pollutants of interest across the program. The following risk screening process was completed to identify pollutants of interest:

1. Each 24-hour speciated measurement was compared against the screening value. Concentrations that were greater than the screening value are described as "failing the screen."

2. The number of failed screens was summed for each applicable pollutant.

3. The percent contribution of the number of failed screens to the total number of failed screens program-wide was calculated for each applicable pollutant.

Results of the risk screening process are provided in Section 4.2.

3.2.2 Risk Screening Evaluation Using Minimum Risk Levels

In addition to the risk screening described above, a risk screening was also conducted using the ATSDR Minimal Risk Level (MRL) health benchmark factors (ATSDR, 2007a). An MRL is a concentration of a hazardous substance that is "without appreciable risk of adverse

noncancer health effects over a specified duration of exposure" (ATSDR, 2007b). MRLs are intended to be used as screening tools, similar to the risk screening approach discussed above. ATSDR defines MRLs for three durations of exposure: acute, intermediate, and chronic exposure. Acute risk results from exposures of one to 14 days; intermediate risk results from exposures of 15 to 364 days; and chronic risk results from exposures of one year or greater. For this risk screening evaluation, the daily measurements were compared to the acute MRLs; seasonal averages were compared to the intermediate MRL; and annual averages were compared to the chronic MRL.

The *daily* average of a particular pollutant is simply the average concentration of all measured detections. *Seasonal* averages were also calculated using daily measurement values. Under 1-in-12 day sampling, a potential of eight sampling concentrations may be possible for a given season. Thus, a season was subdivided in eight zones, with seven of the eight zones spanning 12 days, and one zone spanning 7 to 9 days depending upon the length of the season. For example, the Spring Season (March 20-June 20) is broken into the following zones:

- Zone 1: March 21 – March 31;
- Zone 2: April 1 – April 12;
- Zone 3: April 13 – April 24;
- Zone 4: April 25 – May 6;
- Zone 5: May 7 – May 18;
- Zone 6: May 19 – May 30;
- Zone 7: May 31 – June 11; and
- Zone 8: June 12 – June 20.

To calculate a valid seasonal average, a minimum of 6 zones are required to have measured concentration. If only 6 zones are present, then surrogate concentrations are used to populate the two missing subseason zones. The surrogate concentrations used are: 1) NATA02 background concentrations for 26 HAPs; and 2) ½ MDL of either the user-entered MDL or the Federal MDL, whichever equates to the lowest value.

An *annual* average is an average of at least three of four valid seasonal averages within the calendar year. Finally, the *three-year period* average is simply the average of the annual averages, where possible.

3.2.3 Cancer and Noncancer Surrogate Risk Approximations

In May 2009, EPA released the results of its national-scale air toxics assessment, NATA, for base year 2002 (EPA, 2009). NATA uses the NEI for HAPs as its starting point, but also incorporates ambient monitoring data, geographic information, and chemical/physical transformation information to model ambient concentrations at the census tract level. Cancer and noncancer risk factors are then applied to the modeled concentrations to yield census tract-level cancer and noncancer risk values.

Cancer risk is defined as the likelihood of developing cancer as a result of exposure over a 70-year period, and is presented as the number of people at risk for cancer per million people (EPA, 2006b). The cancer risks presented in this report estimate the cancer risk due to exposure at the modeled concentration over a 70-year period, not the risk resulting from exposure over the time period covered in this report. A cancer risk greater than 1.0 in-a-million is considered significant. Cancer risk approximations were calculated in the following manner:

$$\text{Cancer Risk Approximation} = \text{Annual Average} * \text{Cancer URE} * 10E^{-6}$$

Noncancer risk is presented as the Noncancer Hazard Quotient (HQ). Noncancer health effects include conditions such as asthma. If the HQ is calculated to be less than 1.0, then no adverse health effects are expected as a result of exposure, if the HQ is greater than 1.0 the adverse health effects are possible (EPA, 2006b). Noncancer risk approximations were calculated in the following manner:

$$\text{Noncancer Risk HQ Approximation} = \text{Annual Average} \div \text{Noncancer RfC} \div 1000$$

NATA is a useful resource that helps federal and state/local/tribal agencies identify potential areas of air quality concern. NATA risk factors applied to calculate cancer and

noncancer risks are typically cancer unit risk estimates (UREs) and noncancer reference concentrations (RfCs), which are developed by EPA. However, UREs and RfCs are not available for all pollutants. In the absence of EPA values, risk factors developed by agencies with credible methods and that are similar in scope and definition were used (EPA, 2005b).

Cancer URE and noncancer RfC factors can be applied to the annual averages to approximate surrogate chronic risk estimates based on ambient monitoring data. While these risk approximations do not incorporate human activity patterns and therefore do not reflect true human inhalation exposure, they may allow analysts to further refine their focus by 1) identifying concentrations of specific pollutants that may present health risks and 2) determining if the approximations are similar or dissimilar to the results from NATA. Cancer UREs and/or noncancer RfCs, site-specific annual averages, and corresponding annual average-based surrogate chronic risk approximations are presented in Section 5.3.

3.2.4 Risk-Based Emissions Assessment

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 has allowed analysts to apply weight to the emissions of pollutants based on toxicity rather than mass emissions. This approach incorporates both a pollutant's toxicity potential and the quantity emitted.

This assessment compares county-level emissions to toxicity-weighted emissions based on the EPA-approved approach described below (EPA, 2008). The 10 pollutants with the highest total mass emissions and the associated toxicity-weighted emissions for pollutants with cancer and noncancer toxicity factors are presented in each state section. 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 for air quality managers. Higher values suggest greater priority; however, even the highest values may not reflect potential cancer effects greater than a level of concern (one in-a-million) or potential noncancer effects above levels of concern (e.g., HQ = 1). The pollutants exhibiting

the 10 highest annual average-based surrogate chronic cancer and noncancer risk approximations are also presented in each state section. The results of this data analysis may help state, local, and tribal agencies better understand which pollutants emitted, from a toxicity basis, are of the greatest concern.

The toxicity-weighted emissions approach consists of the following steps:

1. Obtain HAP emissions data for all anthropogenic sectors from the NEI. For point sources, sum the process-level emissions to the county-level.

2. Apply the mass extraction speciation profiles to extract metal and cyanide mass. The only exception is for two chromium species: chromium and chromium compounds.

3. For chromium and chromium compounds, trivalent chromium (non-toxic) must be separated from hexavalent chromium (toxic). To do this, apply the chromium speciation profile to extract the hexavalent chromium mass by industry group.

4. 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 URE.

    b. To apply weight based on noncancer toxicity, divide the emissions of each pollutant by its noncancer RfC.

3.3 Data Characterizations: Method Quality Objective Core HAPs

Three-year period average trends data characterizations are performed on the Method Quality Objective (MQO) HAPs. Site-specific trends analyses for each of the MQO Core HAPs are presented, based on the availability of data. MQO Core HAPs are those that the program has chosen to focus on due to their ability to adversely affect human health. The nineteen MQO Core HAPs are as follows:

- Acetaldehyde (measured by Method TO-11A);
- Acrolein (measured by Method TO-15);
- Arsenic (as measured by Method IO-3.5);
- Benzene (as measured by Method TO-15);
- Benzo(a)pyrene (as measured by Method TO-13)
- Beryllium (as measured by Method IO-3.5);
- 1,3-Butadiene (measured by Method TO-15 method);
- Cadmium (as measured by Method IO-3.5);

- Carbon tetrachloride (measured by Method TO-15);
- Chloroform (measured by Method TO-15);
- Formaldehyde (measured by Method TO-11A method); and
- Hexavalent chromium (as measured by the EPA-approved method developed by ERG);
- Lead (as measured by Method IO-3.5);
- Manganese (as measured by Method IO-3.5);
- Naphthalene (as measured by Method TO-13);
- Nickel (as measured by Method IO-3.5);
- Tetrachloroethylene (measured by Method TO-15);
- Trichloroethylene (measured by Method TO-15); and
- Vinyl chloride (measured by Method TO-15).

Because SVOCs (Method TO-13) are not included in the scope of this report, benzo(a) pyrene and naphthalene are not included in this analysis. The trends analyses for the 2004-2007 report are presented as three-year period statistical metrics.

4.0 Overall Statistical Results of the 2004-2007 NATTS Data

This section summarizes the results of the statistical data analyses performed on the dataset, which include: 1) number of measured detections, 2) concentration ranges and data distribution, and 3) central tendency statistics. Sections 4.1 through 4.3 review the basic findings of these statistical calculations.

4.1 Detections

Every pollutant has an MDL as described in Section 2.2. Quantification below the MDL is possible, although the measurement's reliability is lower. If a concentration does not exceed the MDL, it does not mean that the pollutant is not present in the air. If the method does not produce a concentration, the measurement is marked as ND, or "non-detect." As explained in Section 2.2, data analysts must exercise caution when interpreting monitoring data with many reported concentrations at levels near or below the corresponding MDLs. Therefore, a thorough review of the number of measured detections, the number of non-detects, and the total number of samples is beneficial to understanding the representativeness of the interpretations made.

Tables 4-1 through 4-4 summarizes the number of times the target pollutants were detected out of the number of valid samples collected and analyzed. Several HAPs were detected consistently throughout the four-year sampling period.

Some pollutants are always detected while others are infrequently detected. Formaldehyde and acetaldehyde had the greatest number of measured detections (4,741 and 4,733, respectively). Five other HAPs had more than 4,000 detects from 2004 through 2007: benzene (4,482 detects), toluene (4,221), *m,p*-xylenes (4,175); carbon tetrachloride (4,060); and chloromethane (4,059). Tribromomethane, ethyl acrylate, methyl methacrylate, and *alpha*-chlorotoluene measured less than 150 detects.

Table 4-1. Central Tendency and Data Distribution Statistics of the VOC HAP Concentrations, 2004-2007

Pollutant	# of Measured Detections	Minimum (µg/m^3)	Maximum (µg/m^3)	Arithmetic Mean (µg/m^3)	Mode (µg/m^3)	Median (µg/m^3)	Geometric Mean (µg/m^3)	First Quartile (µg/m^3)	Third Quartile (µg/m^3)	Standard Deviation (µg/m^3)	Coefficient of Variation
Acetonitrile	781	0.04	542.30	6.01	0.25	0.60	0.87	0.27	1.78	31.17	5.19
Acrolein	1,471	<0.01	7.27	0.63	0.34	0.44	0.45	0.29	0.75	0.63	1.00
Acrylonitrile	789	0.01	1.98	0.21	0.33	0.17	0.13	0.06	0.33	0.21	1.00
Benzene	4,482	0.01	10.19	1.13	0.45	0.86	0.86	0.54	1.39	0.94	0.83
Bromomethane	2,441	<0.01	120.76	0.19	0.04	0.04	0.05	0.04	0.08	2.63	13.94
Butadiene, 1,3-	3,282	0.01	15.55	0.16	0.01	0.10	0.09	0.05	0.18	0.35	2.17
Carbon disulfide	1,140	<0.01	27.37	2.57	0.03	0.10	0.22	0.03	2.34	5.10	1.99
Carbon tetrachloride	4,060	0.03	1.53	0.59	0.57	0.57	0.57	0.50	0.66	0.15	0.25
Chloro-1,3-butadiene, 2-	248	0.02	0.13	0.04	0.02	0.02	0.03	0.02	0.04	0.03	0.85
Chlorobenzene	1,243	<0.01	1.10	0.07	0.02	0.03	0.04	0.02	0.07	0.11	1.49
Chloroethane	1,226	0.01	0.42	0.05	0.05	0.05	0.04	0.03	0.05	0.04	0.80
Chloroform	3,462	0.02	48.05	0.24	0.10	0.14	0.14	0.10	0.24	0.92	3.87
Chloromethane	4,059	0.03	19.70	1.21	1.24	1.18	1.18	1.04	1.34	0.41	0.34
Chlorotoluene, *alpha*-	113	0.01	2.49	0.10	0.05	0.05	0.05	0.03	0.06	0.25	2.53
Dibromoethane, 1,2-	796	0.01	4.15	0.07	0.04	0.04	0.05	0.04	0.05	0.16	2.36
Dichlorobenzene,*p*-	2,436	0.01	13.65	0.34	0.12	0.14	0.18	0.07	0.40	0.58	1.69
Dichloroethane, 1,1-	553	<0.01	0.30	0.03	0.02	0.02	0.03	0.02	0.03	0.03	1.01
Dichloroethylene, 1,1-	703	0.01	0.44	0.03	0.02	0.02	0.03	0.02	0.03	0.03	0.94
Dichloropropane, 1,2-	698	0.01	1.25	0.05	0.02	0.02	0.03	0.02	0.04	0.10	1.94
Dichloropropylene, *cis*-1,3-	808	<0.01	0.80	0.07	0.02	0.02	0.04	0.02	0.11	0.09	1.21
Dichloropropylene, *trans*-1,3-	839	0.01	1.13	0.08	0.02	0.02	0.04	0.02	0.11	0.10	1.29
Ethyl acrylate	15	0.04	0.08	0.05	0.04	0.04	0.04	0.04	0.04	0.01	0.31
Ethylbenzene	3,907	0.01	8.84	0.52	0.24	0.36	0.32	0.19	0.62	0.59	1.14
Ethylene dichloride	1,674	0.01	4.49	0.08	0.02	0.04	0.05	0.02	0.08	0.26	3.12
Hexachloro-1,3-butadiene	541	0.01	0.61	0.13	0.21	0.11	0.11	0.06	0.21	0.09	0.69
Methyl methacrylate	107	0.02	14.05	2.01	0.57	1.23	0.94	0.49	2.38	2.59	1.29
Methyl *tert*-butyl ether	1,403	<0.01	20.50	0.86	0.02	0.16	0.18	0.03	0.90	1.84	2.15
Methyl-2-pentanone, 4-	1,236	<0.01	2.95	0.17	0.02	0.08	0.08	0.02	0.20	0.28	1.66
Methylene chloride	3,712	0.01	37.20	0.44	0.02	0.31	0.29	0.21	0.49	0.78	1.77
Styrene	3,212	<0.01	19.98	0.25	0.02	0.11	0.12	0.05	0.23	0.62	2.49

Table 4-1. Central Tendency and Data Distribution Statistics of the VOC HAP Concentrations, 2004-2007 (Continued)

Pollutant	# of Measured Detections	Minimum (µg/m^3)	Maximum (µg/m^3)	Arithmetic Mean (µg/m^3)	Mode (µg/m^3)	Median (µg/m^3)	Geometric Mean (µg/m^3)	First Quartile (µg/m^3)	Third Quartile (µg/m^3)	Standard Deviation (µg/m^3)	Coefficient of Variation
Tetrachloroethane, 1,1,2,2-	871	0.01	2.47	0.09	0.03	0.03	0.25	0.03	0.07	0.23	2.52
Tetrachloroethylene	3,401	0.01	42.12	0.43	0.14	0.20	0.61	0.12	0.41	1.46	3.35
Toluene	4,221	0.01	482.53	2.71	0.57	1.66	3.92	0.83	3.26	8.18	3.02
Tribromomethane	83	0.01	1.18	0.24	0.10	0.21	0.38	0.09	0.31	0.23	0.99
Trichlorobenzene, 1,2,4-	662	0.01	45.27	0.39	0.15	0.09	0.26	0.05	0.17	2.44	6.30
Trichloroethane, 1,1,1-	3,290	0.02	3.17	0.12	0.11	0.11	0.24	0.08	0.15	0.12	0.99
Trichloroethane, 1,1,2-	765	0.01	5.89	0.06	0.03	0.03	0.09	0.03	0.04	0.23	3.98
Trichloroethylene	2,219	0.01	6.50	0.12	0.03	0.06	0.21	0.03	0.13	0.22	1.81
Vinyl chloride	736	0.01	1.61	0.03	0.01	0.01	0.08	0.01	0.03	0.08	2.63
Xylene, *m/p*-	4,175	0.02	21.41	1.29	0.02	0.78	2.33	0.39	1.56	1.61	1.25
Xylene, *o*-	3,832	0.02	9.21	0.51	0.22	0.30	0.78	0.17	0.61	0.63	1.24

Table 4-2. Central Tendency and Data Distribution Statistics of the Carbonyl HAP Concentrations, 2004-2007

Pollutant	# of Measured Detections	Minimum (µg/m^3)	Maximum (µg/m^3)	Arithmetic Mean (µg/m^3)	Mode (µg/m^3)	Median (µg/m^3)	Geometric Mean (µg/m^3)	First Quartile (µg/m^3)	Third Quartile (µg/m^3)	Standard Deviation (µg/m^3)	Coefficient of Variation
Acetaldehyde	4,733	0.01	92.78	1.94	0.72	1.44	1.41	0.88	2.36	2.47	1.28
Formaldehyde	4,741	0.01	91.50	3.15	2.09	2.33	2.22	1.34	3.97	3.62	1.15
Propionaldehyde	2,957	0.00	5.53	0.32	0.27	0.23	0.23	0.14	0.37	0.36	1.12

Table 4-3. Central Tendency and Data Distribution Statistics of the Metal HAP Concentrations, 2004-2007

Pollutant	# of Measured Detections	Minimum (ng/m^3)	Maximum (ng/m^3)	Arithmetic Mean (ng/m^3)	Mode (ng/m^3)	Median (ng/m^3)	Geometric Mean (ng/m^3)	First Quartile (ng/m^3)	Third Quartile (ng/m^3)	Standard Deviation (ng/m^3)	Coefficient of Variation
Antimony Compounds	2,328	0.01	43.30	1.86	2.17	1.24	1.23	0.72	2.17	2.29	1.23
Arsenic Compounds	3,365	0.01	47.70	1.14	0.69	0.69	0.74	0.48	1.13	1.88	1.65
Beryllium Compounds	2,312	0.00	1.97	0.09	0.50	0.02	0.02	0.01	0.05	0.20	2.23
Cadmium Compounds	3,125	0.00	15.30	0.32	0.50	0.17	0.18	0.09	0.40	0.56	1.73
Chromium Compounds	3,493	0.00	172.06	3.22	2.00	2.05	1.82	1.37	3.15	7.42	2.30
Cobalt Compounds	2,478	0.00	20.30	0.32	1.00	0.17	0.18	0.09	0.31	0.60	1.91
Lead Compounds	3,722	0.02	751.30	5.65	1.00	3.45	3.59	2.07	5.98	14.25	2.52
Manganese Compounds	3,684	0.03	412.00	10.92	2.00	4.79	5.41	2.54	10.37	23.08	2.11
Mercury Compounds	647	0.00	2.07	0.07	0.02	0.02	0.03	0.01	0.06	0.13	2.03
Nickel Compounds	3,397	0.01	110.10	2.61	2.00	1.83	1.63	0.97	3.02	3.95	1.51
Selenium Compounds	2,381	0.01	13.00	1.14	0.55	0.53	0.53	0.27	1.12	1.74	1.53

Table 4-4. Central Tendency and Data Distribution Statistics of the Hexavalent Chromium Concentrations, 2005-2007

Pollutant	# of Measured Detections	Minimum (ng/m^3)	Maximum (ng/m^3)	Arithmetic Mean (ng/m^3)	Mode (ng/m^3)	Median (ng/m^3)	Geometric Mean (ng/m^3)	First Quartile (ng/m^3)	Third Quartile (ng/m^3)	Standard Deviation (ng/m^3)	Coefficient of Variation
Hexavalent Chromium	2,062	<0.01	2.97	0.05	0.02	0.03	0.03	0.02	0.05	0.09	1.86

4.2 Concentration Range

The concentrations measured during the 2004-2007 NATTS show a wide range of variability. The following observations were made in regards to the measured detections at the program level:

- Nearly 83 percent of the measured detections had concentration values less than 1 $\mu g/m^3$, while less than 2 percent had concentrations greater than 5 $\mu g/m^3$.
- VOC had the highest number of detects with concentrations greater than 5 $\mu g/m^3$ (1,508), while hexavalent chromium and the metal HAPs had none.
- Concentrations of 18 pollutants never exceeded 1 $\mu g/m^3$.

The minimum and maximum concentration measured for each target pollutant is also presented in Tables 4-1 through 4-4. Some pollutants, such as acetonitrile, had a large range of concentrations measured, while other pollutants, such as carbon tetrachloride, did not, even though they were both detected frequently. The pollutant for each method-specific pollutant group with the largest range in measured concentrations is as follows:

- For VOC, acetonitrile (0.04 to 542.26 $\mu g/m^3$)
- For carbonyl compounds, acetaldehyde (0.01 to 92.78 $\mu g/m^3$)
- For metals, lead (0.08 to 751.22 ng/m^3)
- For hexavalent chromium, the range was <0.01 to 2.97 ng/m^3

4.3 Central Tendency and Data Distribution

In addition to the number of measured detections and the concentration ranges, Tables 4-1 through 4-4 also present a number of central tendency and data distribution statistics (arithmetic mean, geometric mean, median, mode, first and third quartiles, standard deviation, and coefficient of variation) for each of the pollutants sampled during the 2004-2007 NATTS program by respective pollutant group units.

As presented in Tables 4-1 through 4-4, the top 5 average daily concentrations for pollutants with at least 3,000 detections were: formaldehyde (3.15 $\mu g/m^3$); toluene (2.71 $\mu g/m^3$);

acetaldehyde (1.94 µg/m^3); *m,p*-xylenes (1.29 µg/m^3); and, chloromethane (1.21 µg/m^3). Other HAPs with at least 3,000 detections (and daily average) include:

- Benzene (1.13 µg/m^3);
- Carbon tetrachloride (0.59 µg/m^3);
- Ethylbenzene (0.52 µg/m^3);
- *o*-Xylene (0.51 µg/m^3);
- Methylene chloride (0.44 µg/m^3);
- Tetrachloroethylene (0.43 µg/m^3);
- Manganese Compounds (0.011 µg/m^3); and
- Lead (0.0057 µg/m^3).

A measure of the quality of the data is the relative closeness of the central tendency measurements, specifically the arithmetic mean to the median, mode, and geometric mean. In most situations, the mode, median, and geometric mean were generally close to each other and similar to the arithmetic mean, as shown in Table 4-1. This observation would suggest that VOC data measurements were fairly representative of typical conditions. A few notable exceptions include acetonitrile and carbon disulfide. The range of concentrations measured for these pollutants, as shown by the minimum and maximum concentrations, indicates that these statistics may be influenced by a few outliers. For example, the arithmetic mean, mode, median, and geometric mean for acetonitrile were calculated as 6.01 µg/m^3, 0.25 µg/m^3, 0.60 µg/m^3, and 1.66 µg/m^3, respectively. This observation suggests that outliers may be driving the average acetonitrile concentration. This is also shown with the large discrepancies when comparing the standard deviation, 1st and 3rd quartiles, and coefficient of variation statistics for acetonitrile and other pollutants. The closer these two parameters are, the more representative the calculations are of the dataset.

5.0 Risk Evaluation: Network Overview

Risk evaluations of the NATTS Network are presented in this section. They include: 1) risk screening; 2) health benchmark MRL evaluation; 3) cancer/noncancer risk approximations; and 4) risk-based emissions comparison.

5.1 Risk Screening

Section 3.2.1 described the process for using the risk screening approach. Table 5-1 identifies the HAPs that failed at least one screen; summarizes each pollutant's total number of measured detections, percentage failed, and cumulative percentage of failed screens; and highlights those pollutants that are EPA NATTS MQO Core HAPs.

A total of 40 HAPs with screening values, failed at least one screen. Of these, a total of 40,237 of 93,671 detected concentrations (42.96 percent) failed screens, as shown in Table 5-1. Acetaldehyde failed the largest number of screens (4,461), while formaldehyde had the highest number of measured detections (4,741). A 100 percent failure rate was observed for 1,2-dibromoethane, when detected (796 failures out of 796 measured detections). Pollutants in bold italics typeface in Table 5-1 indicate the designation of an EPA NATTS required MQO Core HAPs, as described in Section 3.3.

Table 5-1. Program–Level Risk Screening Summary, 2004-2007

Pollutant	# of Failed Screens	# of Measured Detections	% of Failed Screens	% of Total Failures	Cumulative % Contribution
Acetaldehyde	4,461	4,733	94.25%	11.09%	11.09%
Benzene	4,421	4,482	98.64%	10.99%	22.07%
Carbon Tetrachloride	4,056	4,060	99.90%	10.08%	32.15%
Formaldehyde	3,977	4,741	83.89%	9.88%	42.04%
Chromium Compounds	3,423	3,493	98.00%	8.51%	50.55%
Arsenic Compounds	3,133	3,365	93.11%	7.79%	58.33%
Butadiene, 1,3-	2,852	3,282	86.90%	7.09%	65.42%
Tetrachloroethylene	1,894	3,401	55.69%	4.71%	70.13%
Manganese Compounds	1,769	3,684	48.02%	4.40%	74.52%

BOLD ITALICS = EPA NATTS required MQO Core HAPs.

Table 5-1. Program–Level Risk Screening Summary, 2004-07 (Continued)

Pollutant	# of Failed Screens	# of Measured Detections	% of Failed Screens	% of Total Failures	Cumulative % Contribution
Dichlorobenzene, *p*-	1,678	2,436	68.88%	4.17%	78.69%
Acrolein	1,470	1,471	99.93%	3.65%	82.35%
Nickel Compounds	1,374	3,397	40.45%	3.41%	85.76%
Ethylene Dichloride	1,108	1,674	66.19%	2.75%	88.52%
Tetrachloroethane, 1,1,2,2-	836	871	95.98%	2.08%	90.59%
Dibromoethane, 1,2-	796	796	100.00%	1.98%	92.57%
Acrylonitrile	775	789	98.23%	1.93%	94.50%
Hexachloro-1,3-butadiene	466	541	86.14%	1.16%	95.66%
Cadmium Compounds	393	3125	12.58%	0.98%	96.63%
Hexavalent Chromium	288	2062	13.97%	0.72%	97.35%
Beryllium Compounds	270	2312	11.68%	0.67%	98.02%
Trichloroethane, 1,1,2-	146	765	19.08%	0.36%	98.38%
Dichloropropane, 1,2-	128	698	18.34%	0.32%	98.70%
Chlorotoluene, *alpha*-	108	113	95.58%	0.27%	98.97%
Acetonitrile	97	781	12.42%	0.24%	99.21%
Methyl *tert*-Butyl Ether	68	1403	4.85%	0.17%	99.38%
Bromomethane	61	2441	2.50%	0.15%	99.53%
Methylene Chloride	52	3712	1.40%	0.13%	99.66%
Trichloroethylene	51	2219	2.30%	0.13%	99.79%
Dichloropropene, 1,3-	26	870	2.99%	0.06%	99.85%
Vinyl Chloride	23	736	3.13%	0.06%	99.91%
Xylenes (Mixed Isomers)	15	4188	0.36%	0.04%	99.95%
Antimony Compounds	6	2328	0.26%	0.01%	99.96%
Tribromomethane	4	83	4.82%	0.01%	99.97%
Chloroform	3	3462	0.09%	0.01%	99.98%
Toluene	2	4221	0.05%	0.00%	99.98%
Trichlorobenzene, 1,2,4-	2	662	0.30%	0.00%	99.99%
Ethyl Acrylate	2	15	13.33%	0.00%	99.99%
Chloromethane	1	4059	0.02%	0.00%	100.00%
Lead Compounds	1	3722	0.03%	0.00%	100.00%
Cobalt Compounds	1	2478	0.04%	0.00%	100.00%
Total (failed)	40,237	93,671	42.96%	100.00	--
Ethylbenzene	0	3907	0.00%	NA	NA
Trichloroethane, 1,1,1-	0	3290	0.00%	NA	NA

BOLD ITALICS = EPA NATTS required compound.

Table 5-1. Program–Level Risk Screening Summary, 2004-07 (Continued)

Pollutant	# of Failed Screens	# of Measured Detections	% of Failed Screens	% of Total Failures	Cumulative % Contribution
Styrene	0	3,212	0.00%	NA	NA
Selenium Compounds	0	2,381	0.00%	NA	NA
Chlorobenzene	0	1,243	0.00%	NA	NA
Methyl-2-pentanone, 4-	0	1,236	0.00%	NA	NA
Chloroethane	0	1,226	0.00%	NA	NA
Carbon Disulfide	0	1,140	0.00%	NA	NA
Dichloroethylene, 1,1-	0	703	0.00%	NA	NA
Mercury Compounds	0	647	0.00%	NA	NA
Dichloroethane, 1,1-	0	553	0.00%	NA	NA
Chloro-1,3-butadiene, 2-	0	248	0.00%	NA	NA
Methyl Methacrylate	0	107	0.00%	NA	NA

BOLD ITALICS = EPA NATTS required EPA NATTS MQO Core HAPs.

Thirteen HAPs with screening values did not fail any screens:

- Carbon disulfide (out of 1,140 detects);
- 2-Chloro-1,3-butadiene (out of 248 detects);
- Chlorobenzene (out of 1,243 detects);
- Chloroethane (out of 1,226 detects);
- 1,1-Dichloroethane (out of 553 detects);
- 1,1-Dichloroethylene (out of 703 detects);
- Ethylbenzene (out of 3,907 detects);
- Mercury (out of 647 detects);
- Methyl methacrylate (out of 107 detects);
- Methyl-2-Pentanone (out of 1,236 detects);
- Selenium (out of 2,381 detects);
- Styrene (out of 3,412 detects); and
- 1,1,1-Trichloroethane (out of 3,290 detects).

Table 5-2 presents the total number of failed screens per site as a means of comparing the results of the risk screening process across the sites. As shown, SYFL had the largest number of failed screens (2,666), followed by CAMS 35 (2,570) and SKFL (2,555). The failure rate, as a

percentage, was determined from the number of failed screens and the total number of screens conducted (applicable measured detections) and is also provided in Table 5-2.

Table 5-2. Site-Specific Risk Screening Comparison

Site	# of Failed Screens	Total # of Measured Detections[1]	% of Failed Screens
BOMA	2,379	6,760	35.19%
BTUT	2,068	5,938	34.83%
BXNY	2,053	5,535	37.09%
CAMS 35	2,570	8,564	30.01%
CAMS 85	1,967	7,157	27.48%
CHSC	999	2,559	39.04%
DEMI	2,229	5,513	40.43%
GPCO	1,955	5,022	38.93%
HAKY	736	1,165	63.18%
LAOR	653	2,465	26.49%
MVWI	1,047	2,566	40.80%
NBIL	1,591	5,612	28.35%
PRRI	2,042	5,236	39.00%
PXSS	1,935	5,153	37.55%
ROCH	1,422	4,669	30.46%
S4MO	2,306	6,680	34.52%
SDGA	1,294	3,366	38.44%
SEWA	1,646	4,047	40.67%
SJCA	858	2,348	36.54%
SKFL	2,555	6,678	38.26%
SYFL	2,666	7,404	36.01%
UNVT	1,049	3,581	29.29%
WADC	2,217	5,546	39.97%

[1]Total number of measured detections for all pollutants with screening values, not just those failing screens.

In general, the percentage of failed screens at each NATTS site ranged from 28 percent to 40 percent, with the exception of HAKY, which was greater than 60 percent.

5.2 Risk Screening Evaluation Using MRLs

A summary of the program-level MRL risk assessment is presented in Table 5-3. Section 3.2.2 described the approach for this comparison. Acrolein and formaldehyde were the only pollutants with at least one exceedance of an ATSDR risk factor. Out of 4,741 measured

detections of formaldehyde, only 3 exceeded the ATSDR acute MRL (50 $\mu g/m^3$). Only 1 measured detection of acrolein exceeded the ATSDR acute MRL.

No seasonal averages of formaldehyde exceeded the ATSDR intermediate MRL (40 $\mu g/m^3$). Conversely, 105 out of 108 seasonal averages for acrolein across the program exceeded the ATSDR intermediate MRL (0.09 $\mu g/m^3$). No annual averages exceeded ATSDR's chronic MRLs.

5.3 Cancer/Noncancer Risk Approximation

In this section, cancer and noncancer risk approximations are presented. Section 3.2.3 described the approach for this comparison. It is important to note that the values reported in this section do not take into account human activity patterns, such that they are not considered true risk calculations. Additionally, these approximations are only calculated for pollutants that satisfied the annual average criteria described in Section 3.

5.3.1 Cancer Risk Approximations

Tables 5-4 through 5-13 presents a breakdown of 1,246 cancer risk approximations calculated for 29 cancer-causing HAPs in which annual averages were able to be calculated. Over 43 percent of the risk approximations were less than or equal to 1-in-a-million risk, while less than 1 percent was greater than 100-in-a-million risk.

Table 5-3. Program-Level MRL Risk Assessment Summary

Sampling Method	Pollutant	Acute Risk		Intermediate Risk					Chronic Risk	
		ATSDR MRL[1] ($\mu g/m^3$)	# of Exceedances/ # of Measured Detections	ATSDR MRL[1] ($\mu g/m^3$)	# of Winter Exceedances/ # of Seasonal Averages	# of Spring Exceedances/ # of Seasonal Averages	# of Summer Exceedances/ # of Seasonal Averages	# of Autumn Exceedances/ # of Seasonal Averages	ATSDR Chronic MRL[1] ($\mu g/m^3$)	# of Exceedances/ # of Annual Averages
TO-11A	Formaldehyde	50	3/4,741	40	0/80	0/84	0/85	084/	10	0/83
TO-15	Acrolein	7	1/1,471	0.09	23/24	25/26	27/27	30/31	--	--

[1] Reflects the use of one significant digit for MRLs
-- = an MRL risk factor is not available

Table 5-4. Acetaldehyde, Acrylonitrile, and Arsenic Cancer Risk Approximations (in-a-million)

Site	Acetaldehyde				Acrylonitrile				Arsenic			
	2004	2005	2006	2007	2004	2005	2006	2007	2004	2005	2006	2007
BOMA	3.23	3.71	3.07	3.30	--	--	--	--	3.45	2.11	2.21	2.07
BTUT	8.69	8.23	7.43	4.83	--	--	--	--	14.23	4.47	3.22	4.22
BXNY	2.75	2.08	1.66	--	--	--	--	--	--	--	--	2.54
CAMS 35	5.84	4.81	3.67	3.41	--	--	--	--	24.62	5.34	4.78	6.97
CAMS 85	1.69	2.62	1.98	1.73	--	--	--	--	2.29	2.41	2.65	2.46
CHSC	8.66	3.00	11.65	5.61	--	--	--	--	--	2.57	2.70	2.92
DEMI	4.93	4.05	3.67	--	--	--	--	--	11.39	8.92	8.46	7.62
GPCO	14.15	6.57	5.21	6.08	--	--	--	--	--	--	--	--
HAKY	1.87	2.35	2.04	2.75	--	--	--	--	--	--	6.95	6.84
LAOR	--	4.01	4.02	3.36	--	--	--	--	1.60	1.48	1.04	--
MVWI	1.69	3.71	3.58	--	--	--	--	--	--	3.47	2.94	--
NBIL	1.25	2.92	2.10	1.55	--	--	--	--	--	2.81	3.70	3.96
PRRI	2.63	4.31	3.20	3.26	--	--	--	--	--	--	--	--
PXSS	7.03	6.44	6.08	7.16	--	--	--	--	--	--	2.43	2.99
ROCH	--	1.69	1.35	--	--	--	--	--	--	--	--	2.97
S4MO	7.39	5.88	6.32	8.83	--	--	--	--	7.04	9.70	4.48	4.91
SDGA	5.58	6.68	6.42	7.62	--	--	--	--	--	3.02	4.55	--
SEWA	3.04	3.07	--	2.09	--	--	--	--	3.99	4.46	--	3.97
SJCA	2.86	3.13	2.56	3.16	25.83	24.35	32.79	24.49	--	--	--	--
SKFL	--	3.57	2.91	4.30	--	21.44	17.09	12.59	--	5.73	5.65	4.70
SYFL	3.45	2.70	2.63	6.08	11.46	9.88	5.93	3.11	6.91	6.57	4.56	4.72
UNVT	--	1.43	1.30	1.33	--	--	--	--	--	--	--	--
WADC	1.62	2.02	2.52	--	--	3.69	--	--	2.67	2.68	2.34	2.83

Table 5-5. Benzene, Beryllium, and 1,3-Butadiene Cancer Risk Approximations (in-a-million)

Site	Benzene				Beryllium				1,3-Butadiene			
	2004	2005	2006	2007	2004	2005	2006	2007	2004	2005	2006	2007
BOMA	7.49	9.29	8.86	7.04	--	0.01	0.01	0.01	2.75	4.18	3.81	3.16
BTUT	13.86	12.53	10.80	9.06	--	0.04	0.04	0.05	--	--	4.33	3.11
BXNY	8.35	9.46	7.84	8.28	--	--	--	0.05	5.13	4.92	4.32	4.38
CAMS 35	13.68	16.68	14.04	13.98	1.16	1.16	1.13	1.20	14.32	7.31	6.78	17.13
CAMS 85	10.37	12.23	11.89	10.27	--	--	--	--	0.81	0.38	0.57	0.54
CHSC	--	--	--	3.10	--	--	--	--	--	--	--	--
DEMI	14.36	11.75	9.87	8.17	0.11	0.12	0.11	0.13	--	--	3.76	3.05
GPCO	16.90	15.04	14.67	11.57	--	--	--	--	6.92	7.67	6.14	4.87
HAKY	--	--	10.42	9.56	--	--	--	--	--	--	--	--
LAOR	--	--	--	--	0.01	0.01	0.02	--	--	--	--	--
MVWI	2.22	3.45	2.96	3.65	--	--	--	--	--	--	--	--
NBIL	7.07	7.36	5.00	4.40	--	0.03	0.02	0.02	--	--	2.05	1.48
PRRI	7.83	7.28	8.54	5.87	--	--	--	--	4.56	3.52	3.74	3.02
PXSS	18.93	17.74	17.20	--	--	--	--	0.05	--	12.86	11.31	--
ROCH	6.13	6.32	5.78	4.87	--	--	--	--	2.58	2.83	--	1.73
S4MO	9.74	9.01	7.14	6.60	--	0.02	0.02	0.02	--	--	3.11	2.80
SDGA	--	9.36	7.57	6.83	--	--	--	--	--	--	--	--
SEWA	9.48	4.85	--	6.52	--	0.02	--	0.01	3.65	2.37	--	2.78
SJCA	10.93	10.39	7.74	10.09	--	--	--	--	7.88	7.13	4.86	6.47
SKFL	--	7.27	8.80	6.22	--	0.06	0.12	0.06	--	5.61	5.56	2.54
SYFL	4.04	4.27	4.37	3.58	0.22	0.05	0.12	0.05	2.58	3.57	2.97	1.36
UNVT	2.86	3.84	2.18	2.41	--	--	--	--	--	--	--	--
WADC	5.97	7.09	6.07	7.39	--	--	--	--	4.19	5.53	3.97	--

Table 5-6. Cadmium, Carbon Tetrachloride, and Chloroethane Cancer Risk Approximations (in-a-million)

Site	Cadmium				Carbon Tetrachloride				Chloroethane			
	2004	2005	2006	2007	2004	2005	2006	2007	2004	2005	2006	2007
BOMA	0.81	0.75	0.44	0.28	9.21	8.44	7.34	8.49	--	--	--	--
BTUT	0.32	0.32	1.32	0.47	7.94	8.31	9.17	8.25	--	--	--	0.02
BXNY	--	--	--	0.22	10.22	9.90	8.70	9.98	--	--	--	--
CAMS 35	1.11	0.87	1.02	0.90	9.54	10.13	8.85	9.14	--	--	--	--
CAMS 85	--	--	--	--	9.12	9.46	9.23	9.02	--	--	--	--
CHSC	--	0.48	0.54	0.24	--	--	--	--	--	--	--	--
DEMI	1.69	1.33	1.05	0.95	12.21	9.26	9.88	9.44	--	--	0.03	0.03
GPCO	--	--	--	--	8.56	7.74	8.92	7.83	--	--	--	0.02
HAKY	--	--	--	--	--	--	--	--	--	--	--	--
LAOR	0.68	0.11	0.10	--	--	--	--	--	--	--	--	--
MVWI	--	0.34	0.29	--	7.18	9.27	7.62	8.11	--	--	--	--
NBIL	--	0.32	0.36	0.42	--	10.16	10.65	9.75	--	--	0.02	0.02
PRRI	--	--	--	--	8.59	7.81	7.54	8.31	--	--	--	--
PXSS	--	--	0.21	0.32	11.52	9.01	8.74	--	0.06	--	0.07	--
ROCH	--	--	--	0.21	11.01	9.52	8.80	9.33	--	--	--	--
S4MO	2.05	1.68	1.08	1.36	8.95	9.12	9.46	8.65	--	--	--	0.02
SDGA	--	0.19	0.33	0.17	--	8.50	7.33	7.55	--	--	--	--
SEWA	0.25	0.33	--	0.24	9.73	9.44	--	10.17	--	--	--	0.02
SJCA	--	--	--	--	--	--	--	--	--	--	--	--
SKFL	--	0.24	0.30	0.23	--	7.90	8.38	7.74	--	--	0.03	0.02
SYFL	0.32	0.38	0.40	0.29	7.99	8.42	8.51	8.25	--	--	0.03	0.01
UNVT	--	--	--	--	9.11	8.66	7.90	8.32	0.03	0.03	0.02	--
WADC	0.46	0.33	0.40	0.30	8.11	7.46	7.14	--	--	--	--	--

Table 5-7. Chloroform, Chloromethane, and 1,2-Dibromomethane Cancer Risk Approximations (in-a-million)

Site	Chloroform				Chloromethane				1,2-Dibromomethane			
	2004	2005	2006	2007	2004	2005	2006	2007	2004	2005	2006	2007
BOMA	8.74	8.89	6.63	7.07	1.80	1.88	1.88	2.04	--	--	--	--
BTUT	--	--	7.08	6.96	2.22	2.27	2.22	2.17	--	--	--	--
BXNY	16.38	15.53	11.95	16.55	2.07	2.21	1.92	2.09	11.36	--	--	--
CAMS 35	11.05	8.84	7.93	18.12	2.49	2.58	2.56	2.84	23.24	8.45	7.93	8.45
CAMS 85	4.73	2.47	2.38	3.91	2.40	2.24	2.23	2.47	19.25	9.38	8.45	8.32
CHSC	--	--	--	--	--	--	--	--	--	--	--	--
DEMI	--	--	65.89	72.32	2.48	2.58	2.15	2.19	--	--	--	--
GPCO	--	--	9.55	7.28	2.27	2.33	2.20	2.18	--	--	--	--
HAKY	--	--	--	--	--	--	--	--	--	--	--	--
LAOR	--	--	--	--	--	--	--	--	--	--	--	--
MVWI	--	--	--	--	1.47	1.66	1.82	1.98	--	--	--	--
NBIL	--	--	29.70	62.84	2.36	2.29	2.20	2.12	--	--	--	--
PRRI	7.63	7.98	8.55	7.77	1.98	1.83	1.90	2.05	--	--	--	--
PXSS	40.35	43.03	26.54	--	1.97	1.68	1.39	--	--	--	--	--
ROCH	11.32	9.25	7.38	8.35	2.01	1.94	2.12	1.79	10.46	11.54	--	--
S4MO	--	--	17.84	17.57	2.10	2.40	2.06	1.98	--	--	--	--
SDGA	--	--	--	--	1.96	1.80	1.76	1.95	--	--	--	--
SEWA	17.27	18.15	--	9.99	--	--	--	2.06	--	--	--	--
SJCA	10.26	9.17	7.59	8.22	--	--	--	--	--	--	--	--
SKFL	--	15.29	18.15	14.55	--	2.32	2.40	2.31	--	--	--	--
SYFL	11.67	11.39	12.40	9.90	1.97	2.45	2.51	2.39	--	--	--	--
UNVT	7.27	7.97	5.79	6.48	1.78	2.06	1.88	2.20	--	--	--	--
WADC	16.98	23.26	20.41	--	1.86	1.88	2.16	--	--	--	--	--

Table 5-8. *p*-Dichlorobenzene, 1,1-Dichloroethane, and 1,2-Dichloropropane Cancer Risk Approximations (in-a-million)

Site	*p*-Dichlorobenzene				1,1-Dichloroethane				1,2-Dichloropropane			
	2004	2005	2006	2007	2004	2005	2006	2007	2004	2005	2006	2007
BOMA	2.82	2.09	1.96	1.75	--	--	--	--	--	--	--	--
BTUT	--	--	--	2.47	--	--	--	--	--	--	--	--
BXNY	7.03	9.02	7.58	10.36	--	--	--	--	--	--	--	--
CAMS 35	--	--	--	--	--	0.03	0.04	0.03	0.82	0.44	0.41	0.44
CAMS 85	--	--	--	--	--	0.04	0.03	0.04	1.07	0.44	0.44	0.43
CHSC	--	--	--	--	--	--	--	--	--	--	--	--
DEMI	--	--	1.23	1.45	--	--	--	--	--	--	--	--
GPCO	--	--	--	0.78	--	--	--	--	--	--	--	--
HAKY	--	--	--	--	--	--	--	--	--	--	--	--
LAOR	--	--	--	--	--	--	--	--	--	--	--	--
MVWI	--	--	--	--	--	--	--	--	--	--	--	--
NBIL	--	--	--	3.66	--	--	--	--	--	--	--	--
PRRI	1.87	1.38	2.19	1.61	--	--	--	--	--	--	--	--
PXSS	11.10	11.54	7.53	--	--	--	--	--	--	--	--	--
ROCH	--	--	0.97	0.82	--	--	--	--	--	--	--	--
S4MO	--	--	2.77	2.77	--	--	--	--	--	--	--	--
SDGA	--	--	--	--	--	--	--	--	--	--	--	--
SEWA	--	--	--	0.43	--	--	--	--	--	--	--	--
SJCA	9.01	9.62	8.71	--	--	--	--	--	--	--	--	--
SKFL	--	3.60	2.68	1.44	--	--	--	--	--	--	--	--
SYFL	2.26	1.64	1.76	0.76	--	--	--	--	--	--	--	--
UNVT	--	--	--	--	--	--	--	--	--	--	--	--
WADC	1.65	2.61	2.36	--	--	--	--	--	--	--	--	--

Table 5-9. Ethylbenzene, Ethylene Dichloride, and Formaldehyde Cancer Risk Approximations (in-a-million)

Site	Ethylbenzene				Ethylene Dichloride				Formaldehyde			
	2004	2005	2006	2007	2004	2005	2006	2007	2004	2005	2006	2007
BOMA	0.27	0.35	0.28	0.23	--	--	0.42	0.64	0.01	0.02	0.02	0.02
BTUT	0.37	0.30	0.25	0.21	--	--	--	--	0.03	0.03	0.03	0.02
BXNY	0.24	0.27	0.24	0.27	1.38	1.28	--	1.61	0.01	0.01	0.01	--
CAMS 35	0.15	0.13	0.17	0.21	6.52	4.87	6.76	9.22	0.03	0.02	0.02	0.02
CAMS 85	0.03	0.04	0.02	0.06	1.25	0.53	0.55	0.81	0.01	0.01	0.01	0.01
CHSC	--	--	--	--	--	--	--	--	0.02	0.02	0.03	0.02
DEMI	0.41	0.34	0.21	0.18	--	--	--	--	0.02	0.02	0.02	--
GPCO	0.60	0.75	0.37	0.34	--	--	--	--	0.02	0.02	0.02	0.02
HAKY	--	--	--	--	--	--	--	--	0.01	0.01	0.01	0.01
LAOR	--	--	--	--	--	--	--	--	0.02	0.02	0.01	0.01
MVWI	--	0.14	--	--	--	--	--	--	0.01	--	0.02	--
NBIL	--	0.22	0.10	0.13	--	--	--	--	<0.01	0.01	0.02	<0.01
PRRI	0.24	0.27	0.35	0.18	--	--	--	0.69	0.01	0.01	0.02	0.02
PXSS	0.79	0.79	0.74	--	--	--	1.98	--	0.03	0.03	0.02	0.03
ROCH	0.19	0.15	0.15	0.12	1.26	1.39	--	1.25	--	0.01	0.01	--
S4MO	0.33	0.30	0.23	0.19	--	--	--	--	0.03	0.02	0.02	0.03
SDGA	--	0.16	0.21	--	--	--	--	--	0.03	0.04	0.05	0.04
SEWA	--	--	--	0.14	--	--	--	--	0.01	0.01	--	0.01
SJCA	0.51	0.43	0.34	0.45	--	--	--	--	0.01	0.01	0.01	0.01
SKFL	--	0.23	0.31	0.24	--	1.59	2.25	1.70	--	0.02	0.01	0.01
SYFL	0.07	0.09	0.13	0.08	--	--	2.01	1.42	0.01	0.01	0.01	0.02
UNVT	0.19	0.25	0.03	0.03	--	--	1.13	--	0.01	0.01	0.01	0.01
WADC	0.16	0.16	0.19	0.19	--	0.93	1.16	--	0.02	0.02	0.03	--

Table 5-10. Hexachloro-1,3-Butadiene, Hexavalent Chromium, and Methyl-*tert*-Butyl Ether Cancer Risk Approximations (in-a-million)

Site	Hexachloro-1,3-Butadiene				Hexavalent Chromium				Methyl-*tert*-Butyl Ether			
	2004	2005	2006	2007	2004	2005	2006	2007	2004	2005	2006	2007
BOMA	--	--	--	--	--	0.88	0.65	0.38	0.37	0.65	0.21	0.03
BTUT	--	--	--	--	--	0.36	0.46	0.40	--	--	--	--
BXNY	2.54	--	--	--	--	--	--	--	0.12	0.11	0.05	0.01
CAMS 35	--	--	--	--	--	--	--	2.17	0.36	0.31	0.15	0.09
CAMS 85	--	--	--	--	--	--	--	2.20	0.01	<0.01	<0.01	<0.01
CHSC	--	--	--	--	--	--	--	--	--	--	--	--
DEMI	--	--	--	--	--	0.83	0.93	0.47	--	--	--	--
GPCO	--	--	--	--	--	0.37	0.41	0.22	--	--	--	--
HAKY	--	--	--	--	--	--	0.24	--	--	--	--	--
LAOR	--	--	--	--	--	--	0.34	--	--	--	--	--
MVWI	--	--	--	--	--	--	--	0.21	--	--	--	--
NBIL	--	--	--	--	--	0.39	0.51	0.40	--	--	--	--
PRRI	--	--	--	--	--	--	0.41	0.30	0.35	0.30	0.21	0.01
PXSS	--	--	--	--	--	--	1.67	1.04	0.10	--	0.03	--
ROCH	2.51	2.39	--	--	--	--	--	--	--	--	--	--
S4MO	--	--	--	--	--	0.45	0.57	0.47	--	--	--	--
SDGA	--	--	--	--	--	0.47	0.64	0.26	--	--	--	--
SEWA	--	--	--	--	--	0.60		0.58	--	--	--	--
SJCA	--	--	--	--	--	--	--	--	--	--	--	--
SKFL	--	--	--	2.19	--	--	--	--	--	--	--	--
SYFL	--	--	--	2.17	--	0.46	--	--	--	--	--	--
UNVT	--	--	--	--	--	--	--	--	--	--	--	--
WADC	--	--	--	--	--	--	0.45	0.18	--	--	0.55	--

Table 5-11. Methylene Chloride, Nickel, and 1,1,2,2-Tetrachloroethane Cancer Risk Approximations (in-a-million)

Site	Methylene Chloride				Nickel				1,1,2,2-Tetrachloroethane			
	2004	2005	2006	2007	2004	2005	2006	2007	2004	2005	2006	2007
BOMA	0.21	0.19	0.15	0.17	1.06	0.73	0.54	0.55	--	--	--	--
BTUT	0.20	0.20	0.18	0.20	0.54	0.99	0.22	0.44	--	--	--	--
BXNY	0.30	0.31	0.25	0.36	--	--	--	2.69	--	--	--	6.14
CAMS 35	0.11	0.12	0.22	0.20	0.68	0.54	0.57	0.56	5.30	1.99	1.88	2.05
CAMS 85	0.02	0.02	0.01	0.04	--	--	--	--	4.87	2.21	1.99	2.06
CHSC	--	--	--	--	--	0.58	0.40	0.29	--	--	--	--
DEMI	--	--	0.26	0.17	0.77	0.97	0.61	0.56	--	--	--	--
GPCO	0.34	0.21	0.20	0.18	--	--	--	--	--	--	--	--
HAKY	--	--	--	--	--	--	--	0.10	--	--	--	--
LAOR	--	--	--	--	0.06	0.04	0.05	--	--	--	--	--
MVWI	0.10	--	--	0.13	--	0.18	0.35	--	--	--	--	--
NBIL	--	0.25	0.22	0.30	--	0.36	0.28	0.27	--	--	--	--
PRRI	0.18	0.14	0.16	0.13	1.25	1.56	0.82	0.64	--	--	--	--
PXSS	0.37	0.37	0.37	--	--	--	0.32	0.39	--	--	--	--
ROCH	0.22	0.17	0.15	0.09	--	--	--	0.20	--	--	--	--
S4MO	0.44	0.28	0.21	0.24	0.31	0.29	0.27	0.36	--	--	--	--
SDGA	--	--	--	--	--	0.56	0.77	0.23	--	--	--	--
SEWA	--	--	--	0.18	0.69	0.73	--	0.53	--	--	--	--
SJCA	0.24	0.21	0.19	0.26	--	--	--	--	--	--	--	--
SKFL	--	0.20	0.21	0.17	--	1.08	1.00	0.73	--	--	--	1.75
SYFL	0.42	0.14	0.14	0.12	0.94	1.09	0.95	0.74	--	--	--	1.61
UNVT	0.15	0.12	0.09	0.09	--	--	--	--	--	--	--	--
WADC	0.26	0.24	0.21	--	0.47	0.69	0.52	0.46	--	--	--	--

Table 5-12. Tetrachloroethylene, Tribromomethane, and 1,1,2-Trichloroethane Cancer Risk Approximations (in-a-million)

Site	Tetrachloroethylene				Tribromomethane				1,1,2-Trichloroethane			
	2004	2005	2006	2007	2004	2005	2006	2007	2004	2005	2006	2007
BOMA	2.10	1.38	1.32	1.11	--	--	--	--	--	--	--	--
BTUT	--	--	1.12	1.80	--	--	--	--	--	--	--	--
BXNY	4.49	4.28	3.34	4.03	--	--	--	--	--	--	--	--
CAMS 35	0.67	0.67	0.76	1.01	--	--	--	--	0.82	0.44	0.41	0.44
CAMS 85	0.58	0.28	0.20	0.23	--	--	--	--	1.07	0.44	0.44	0.45
CHSC	--	--	--	--	--	--	--	--	--	--	--	--
DEMI	26.61	20.96	5.44	1.94	--	--	--	--	--	--	--	--
GPCO	--	--	2.53	2.00	--	--	--	--	--	--	--	--
HAKY	--	--	--	--	--	--	--	--	--	--	--	--
LAOR	--	--	--	--	--	--	--	--	--	--	--	--
MVWI	--	--	--	--	--	--	--	--	--	--	--	--
NBIL	--	--	2.41	1.60	--	--	--	--	--	--	--	--
PRRI	1.67	1.37	1.95	1.37	--	--	--	--	--	--	--	--
PXSS	5.76	7.51	6.64		--	--	--	--	--	--	--	--
ROCH	1.55	1.28	1.11	0.71	--	--	--	--	--	--	--	--
S4MO	--	--	1.11	1.28	--	--	--	--	--	--	--	--
SDGA	--	--	--	--	--	--	--	--	--	--	--	--
SEWA	1.00	1.39	--	0.97	--	--	--	--	--	--	--	--
SJCA	1.32	1.26	0.99	1.19	--	--	--	--	--	--	--	--
SKFL	--	1.25	1.78	1.09	--	--	--	--	--	--	--	1.23
SYFL	0.97	0.81	0.88	0.53	--	--	--	--	--	--	--	0.65
UNVT	--	--	0.49	--	--	--	--	--	--	--	--	--
WADC	2.00	2.54	2.10	--	--	--	--	--	--	--	--	--

Table 5-13. Trichloroethylene and Vinyl Chloride Cancer Risk Approximations (in-a-million)

Site	Trichloroethylene				Vinyl Chloride			
	2004	2005	2006	2007	2004	2005	2006	2007
BOMA	0.13	0.10	0.09	--	--	--	--	--
BTUT	--	--	--	--	--	--	--	--
BXNY	0.26	0.24	0.23	0.22	--	--	--	--
CAMS 35	0.10	0.06	0.06	0.08	0.26	0.47	0.30	0.31
CAMS 85	0.13	0.06	0.05	0.06	0.27	0.11	0.15	0.12
CHSC	--	--	--	--	--	--	--	--
DEMI	--	--	--	--	--	--	--	--
GPCO	--	--	--	--	--	--	--	--
HAKY	--	--	--	--	--	--	--	--
LAOR	--	--	--	--	--	--	--	--
MVWI	--	--	--	--	--	--	--	--
NBIL	--	--	0.39	0.33	--	--	--	--
PRRI	0.43	0.37	0.42	0.18	--	--	--	--
PXSS	0.49	0.37	0.32		--	--	--	--
ROCH	0.23	0.21	0.12	0.12	--	--	--	--
S4MO	--	--	--	--	--	--	--	--
SDGA	--	--	--	--	--	--	--	--
SEWA	0.18	0.34	--	--	--	--	--	--
SJCA	0.13	0.12	0.10	0.12	--	--	--	--
SKFL	--	--	--	0.11	--	--	--	0.10
SYFL	--	--	--	--	--	--	--	0.10
UNVT	--	--	--	--	--	--	--	--
WADC	--	0.11	0.10	--	--	--	--	--

Individual pollutant cancer risk can be added together to calculate a cumulative cancer risk, which is presented in Table 5-14. Urban monitoring sites (e.g., BOMA, CAMS 35, DEMI, and PXSS) tended to have higher cancer risk approximations than rural sites (e.g., CHSC, MVWI, SDGA, UNVT).

Table 5-14. Cumulative Cancer Risk Approximations (in-a-million)

Site	Cumulative			
	2004	2005	2006	2007
BOMA	44.47	45.67	39.88	38.34
BTUT	48.40	38.04	47.86	44.66
BXNY	72.64	59.62	48.09	69.77
CAMS 35	122.91	76.27	70.42	98.96
CAMS 85	59.97	45.37	43.28	45.20
CHSC	8.69	6.65	15.32	12.18
DEMI	74.98	61.14	113.57	108.65
GPCO	49.77	40.70	50.24	43.37
HAKY	1.88	2.36	19.66	19.25
LAOR	2.38	5.67	5.59	3.37
MVWI	12.66	22.21	19.56	14.09
NBIL	10.67	27.12	59.73	93.23
PRRI	39.24	38.12	39.99	35.41
PXSS	98.50	111.36	93.58	11.98
ROCH	49.48	48.68	27.93	32.57
S4MO	38.38	39.14	56.68	58.09
SDGA	7.57	30.79	29.63	24.66
SEWA	49.27	45.77	--	40.68
SJCA	68.98	65.82	65.88	54.47
SKFL	--	77.41	77.61	66.02
SYFL	55.29	53.92	50.31	47.97
UNVT	21.40	24.36	20.82	20.87
WADC	46.39	61.23	52.69	11.35

Figures 5-1 through 5-28 visually present pollutant-specific graphs of cancer risk approximations by site and year. Please note that the scale for each figure is not consistent, but rather customized for the actual data ranges. Additionally, values that are atypically higher than the rest of the data are noted on the graph. Figure 5-29 presents the cumulative cancer risk by NATTS site.

Figure 5-1. Acetaldehyde Cancer Risk Approximations by Site and Year

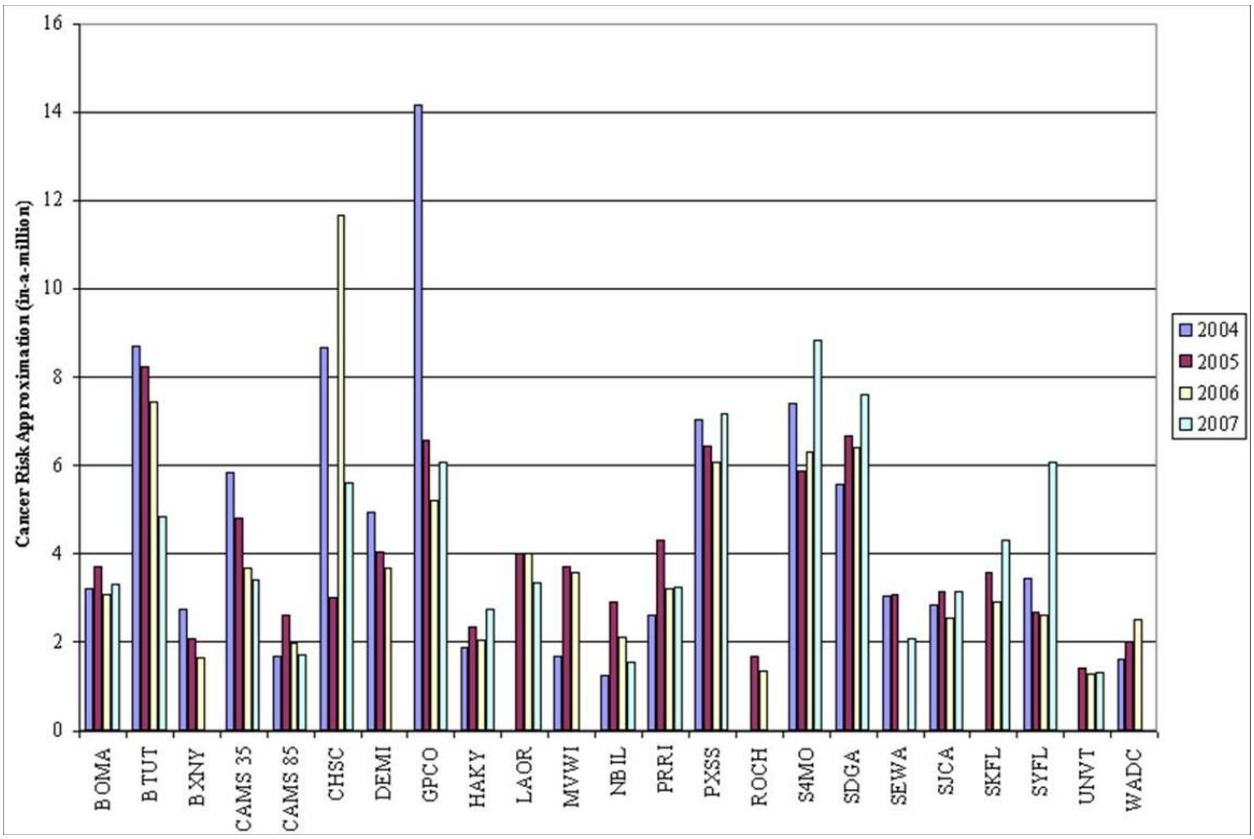


Figure 5-2. Acrylonitrile Cancer Risk Approximations by Site and Year

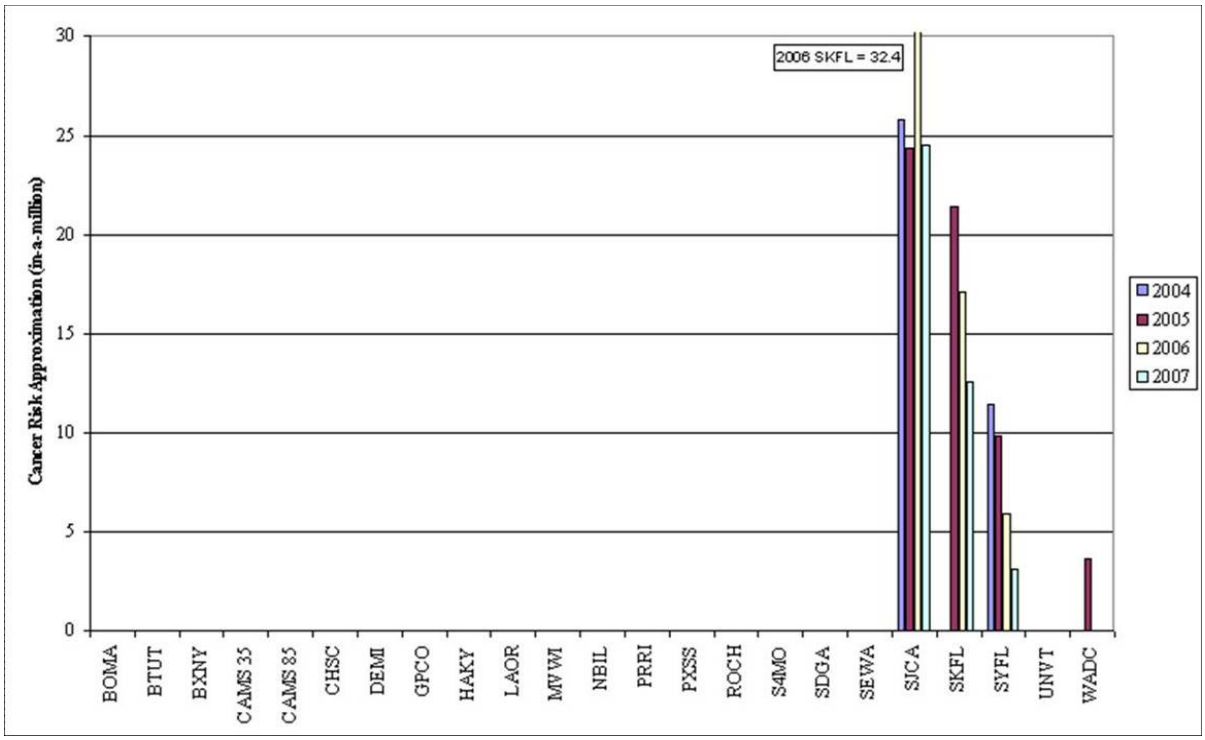


Figure 5-3. Arsenic Cancer Risk Approximations by Site and Year

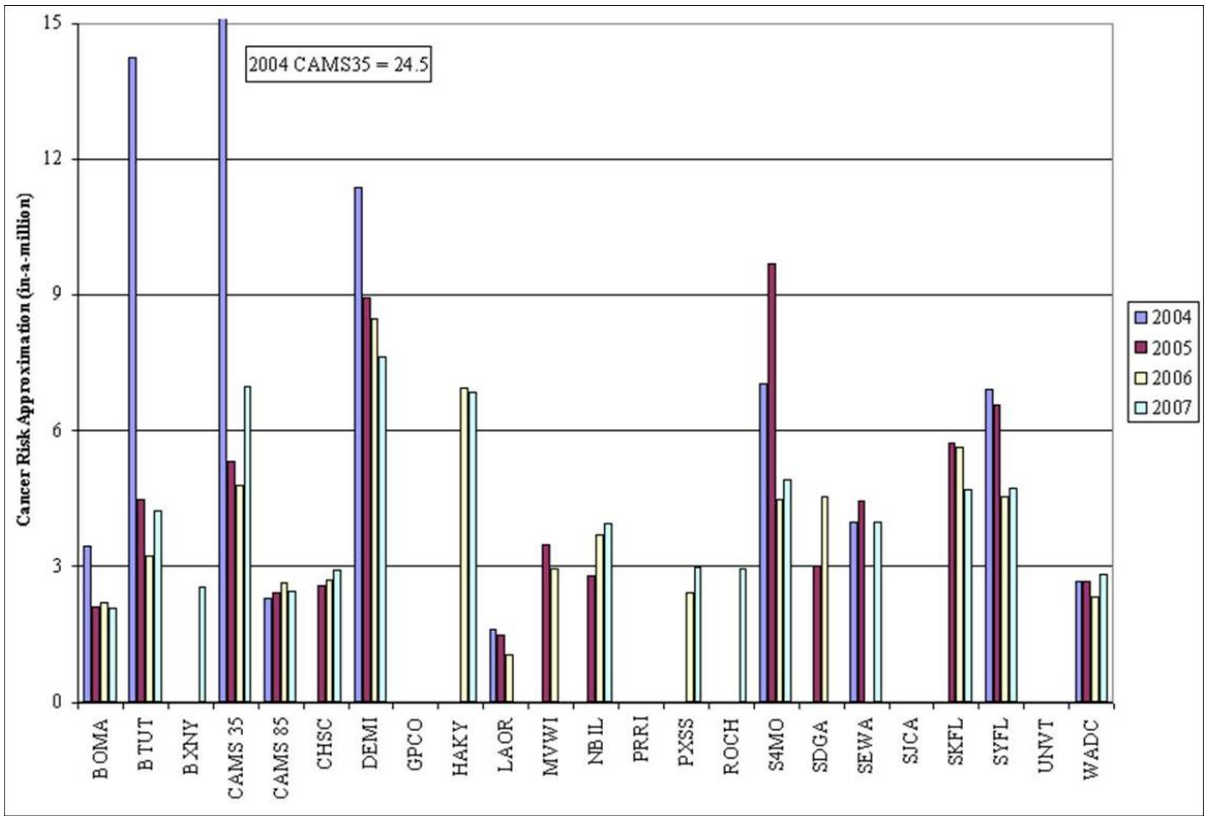


Figure 5-4. Benzene Cancer Risk Approximations by Site and Year

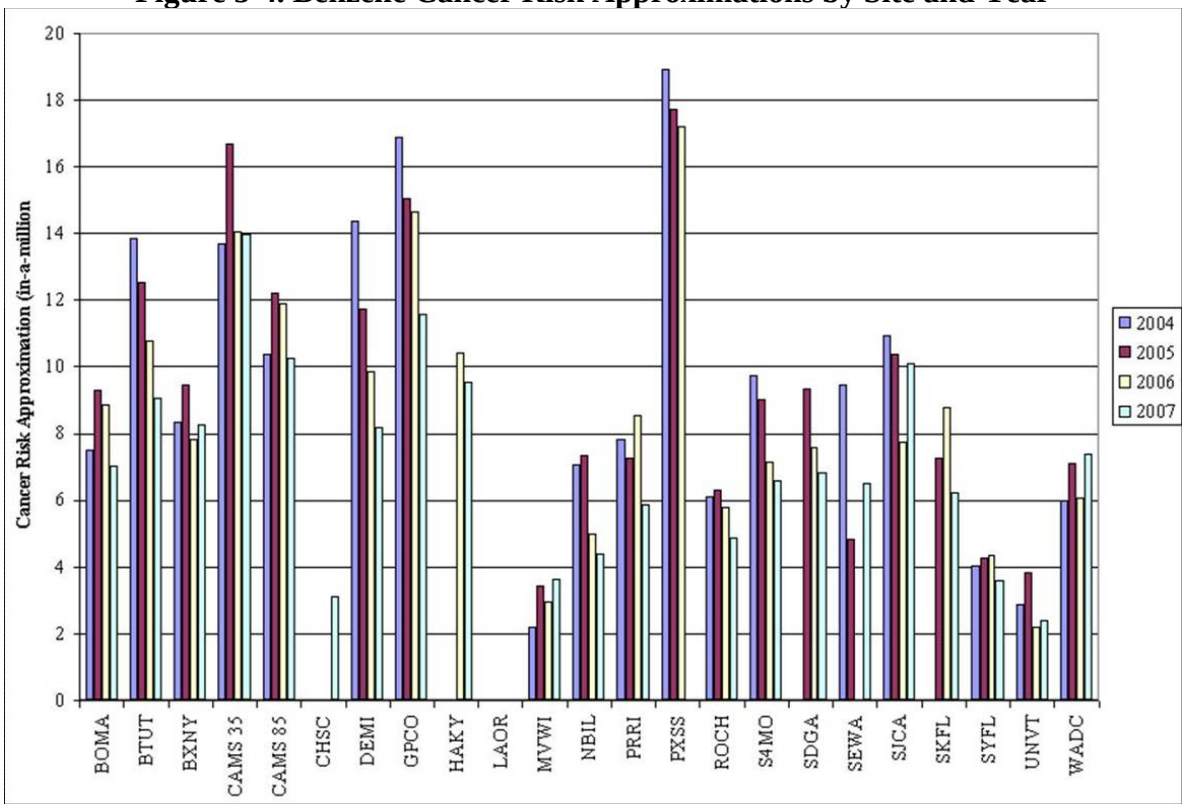


Figure 5-5. Beryllium Cancer Risk Approximations by Site and Year

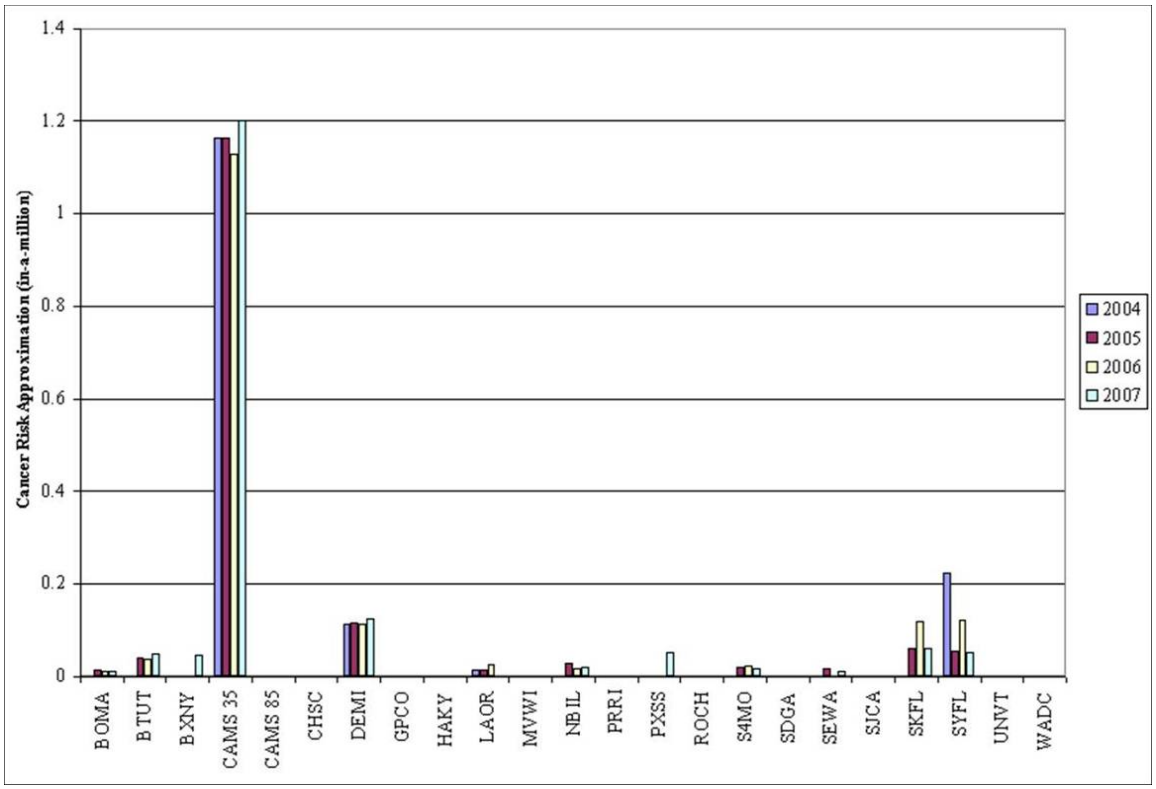


Figure 5-6. 1,3-Butadiene Cancer Risk Approximations by Site and Year

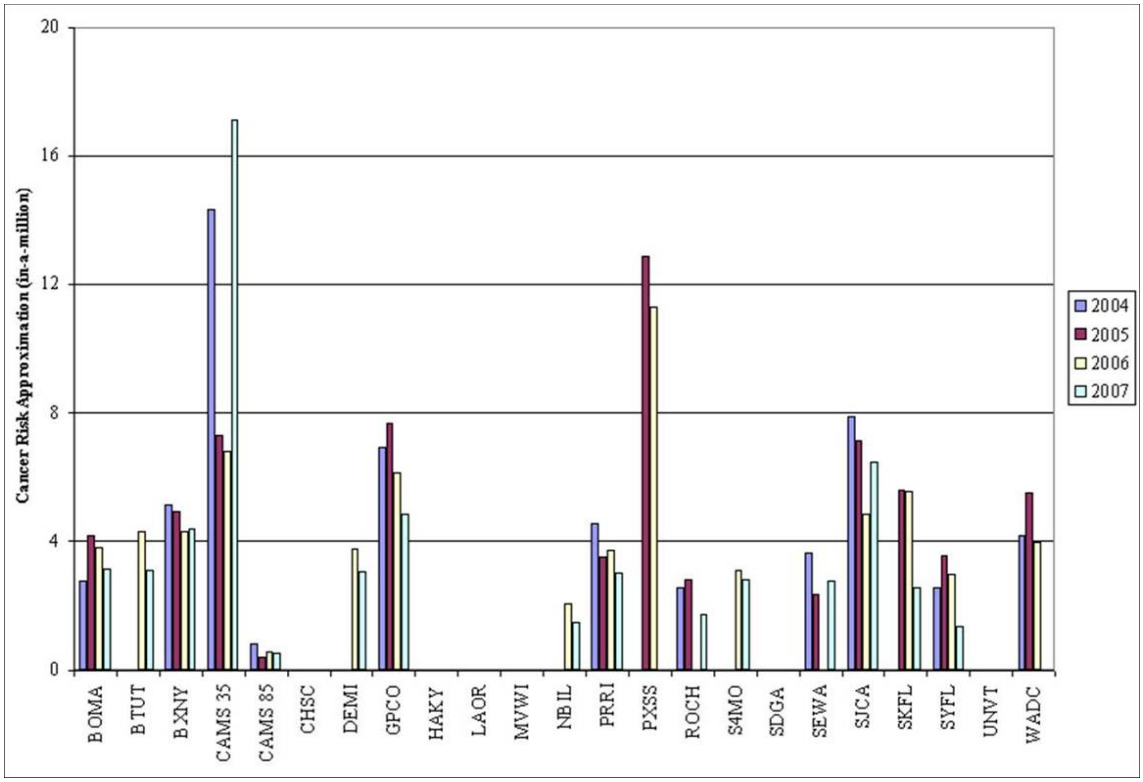


Figure 5-7. Cadmium Cancer Risk Approximations by Site and Year

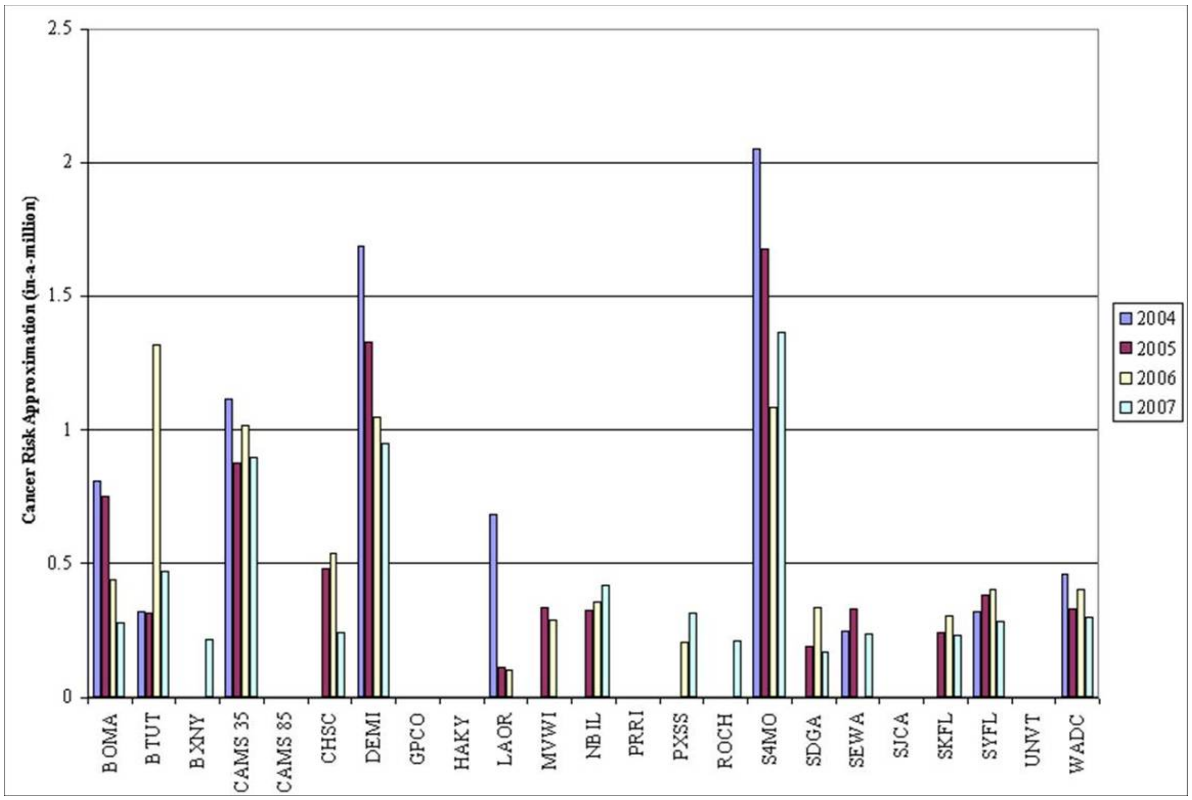


Figure 5-8. Carbon Tetrachloride Cancer Risk Approximations by Site and Year

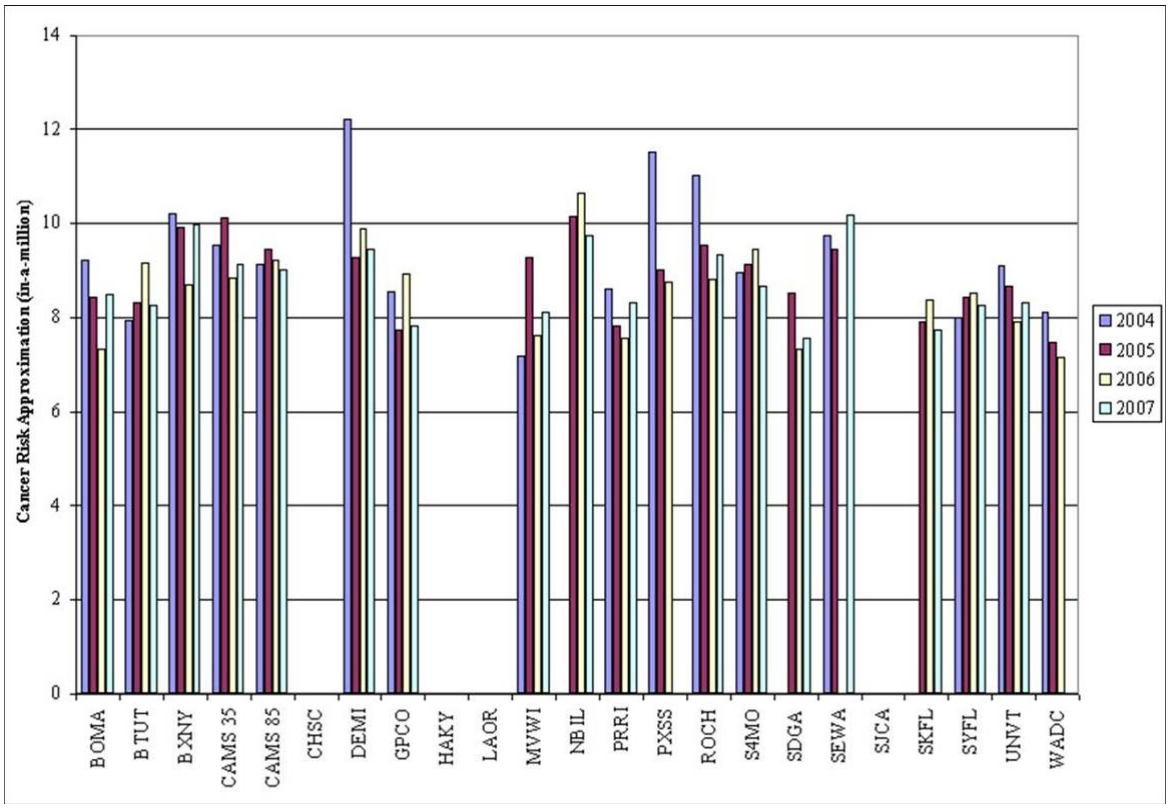


Figure 5-9. Chloroethane Cancer Risk Approximations by Site and Year

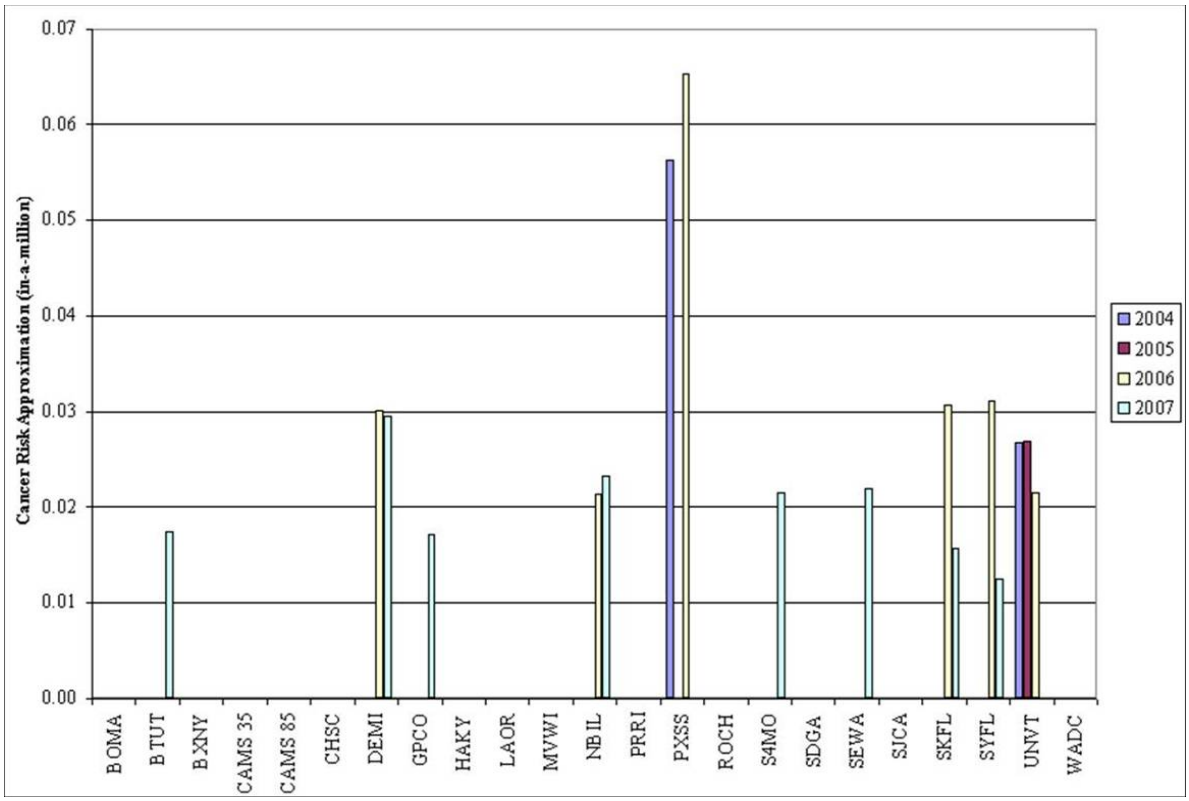


Figure 5-10. Chloroform Cancer Risk Approximations by Site and Year

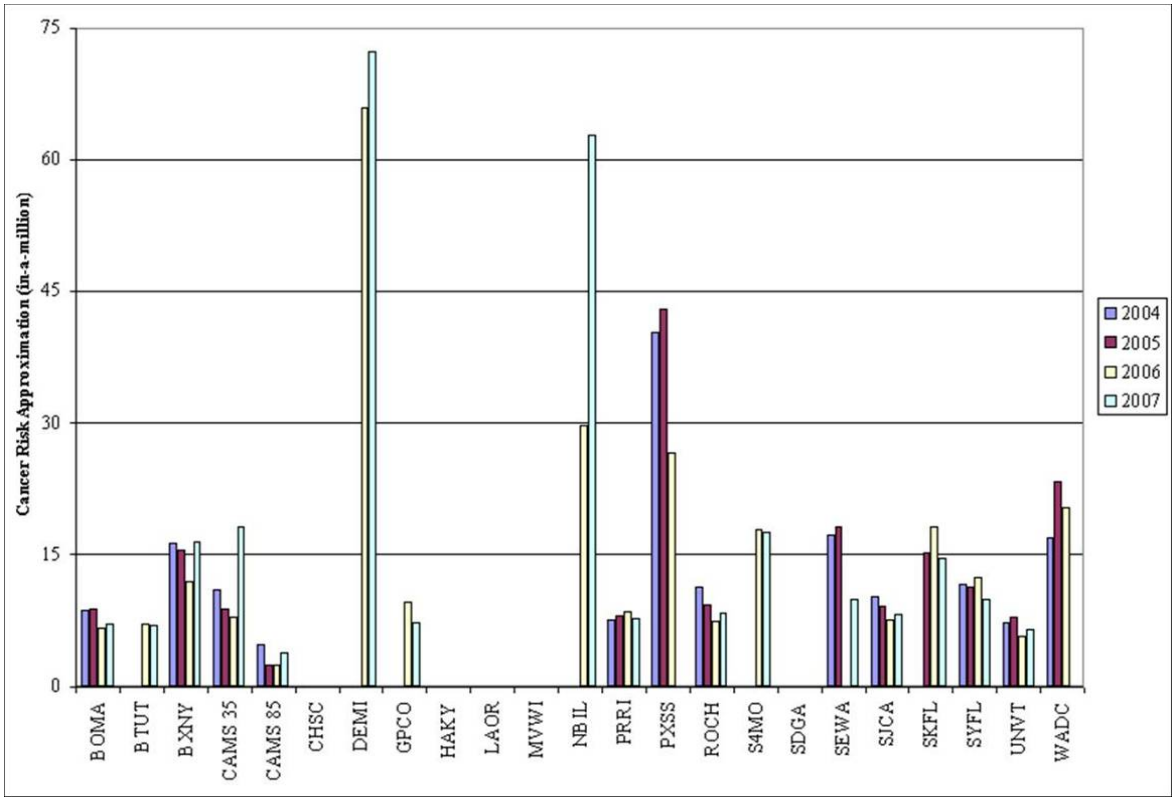


Figure 5-11. Chloromethane Cancer Risk Approximations by Site and Year

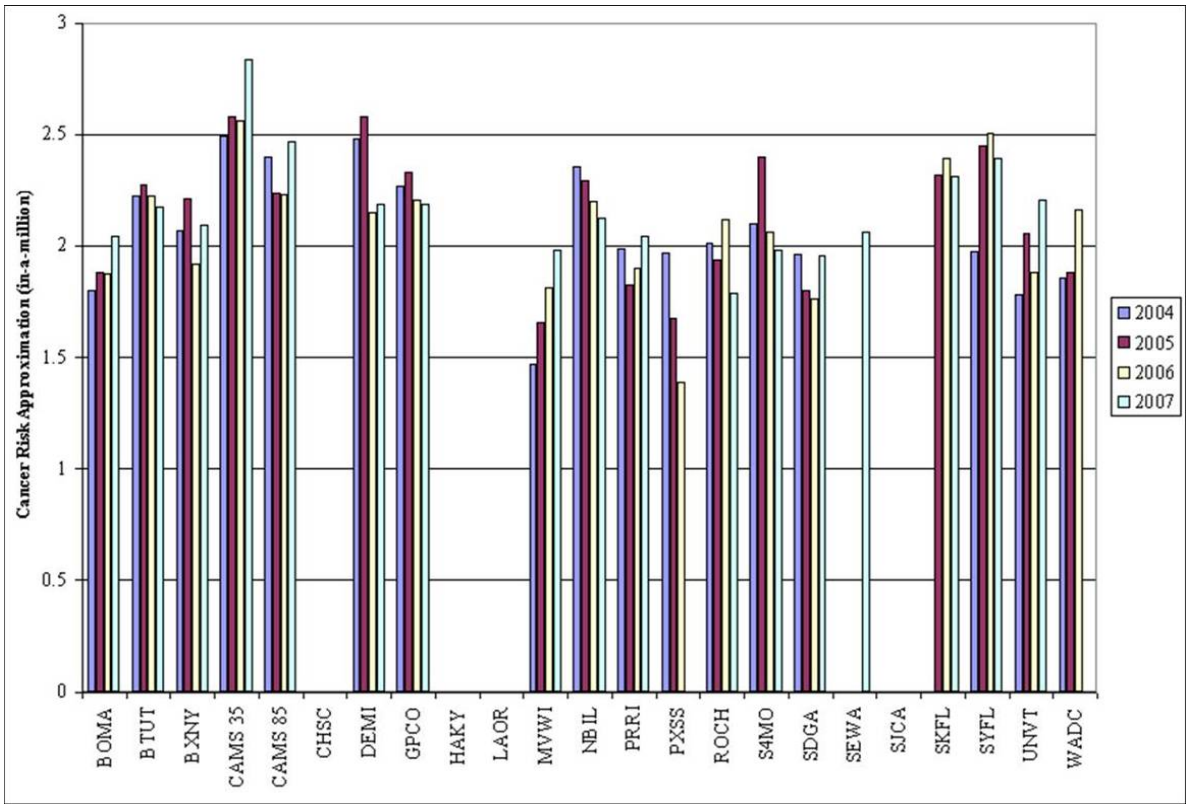


Figure 5-12. 1,2-Dibromomethane Cancer Risk Approximations by Site and Year

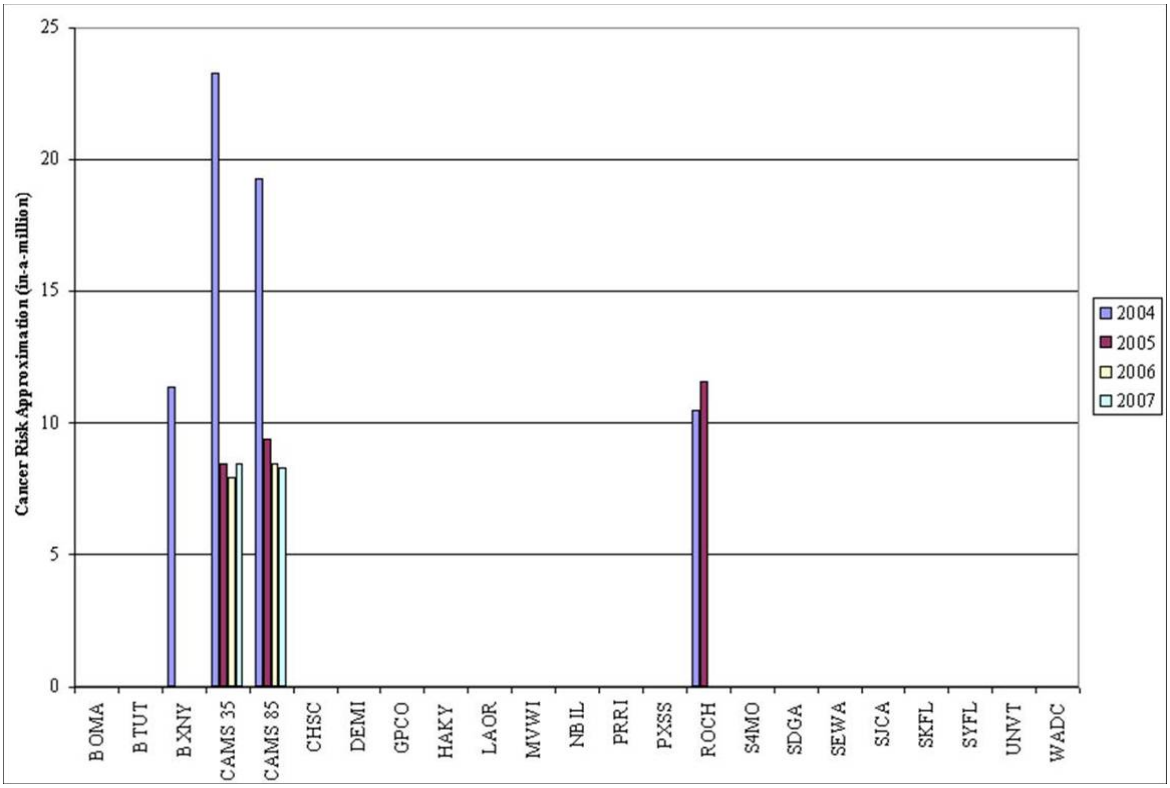


Figure 5-13. *p*-Dichlorobenzene Cancer Risk Approximations by Site and Year

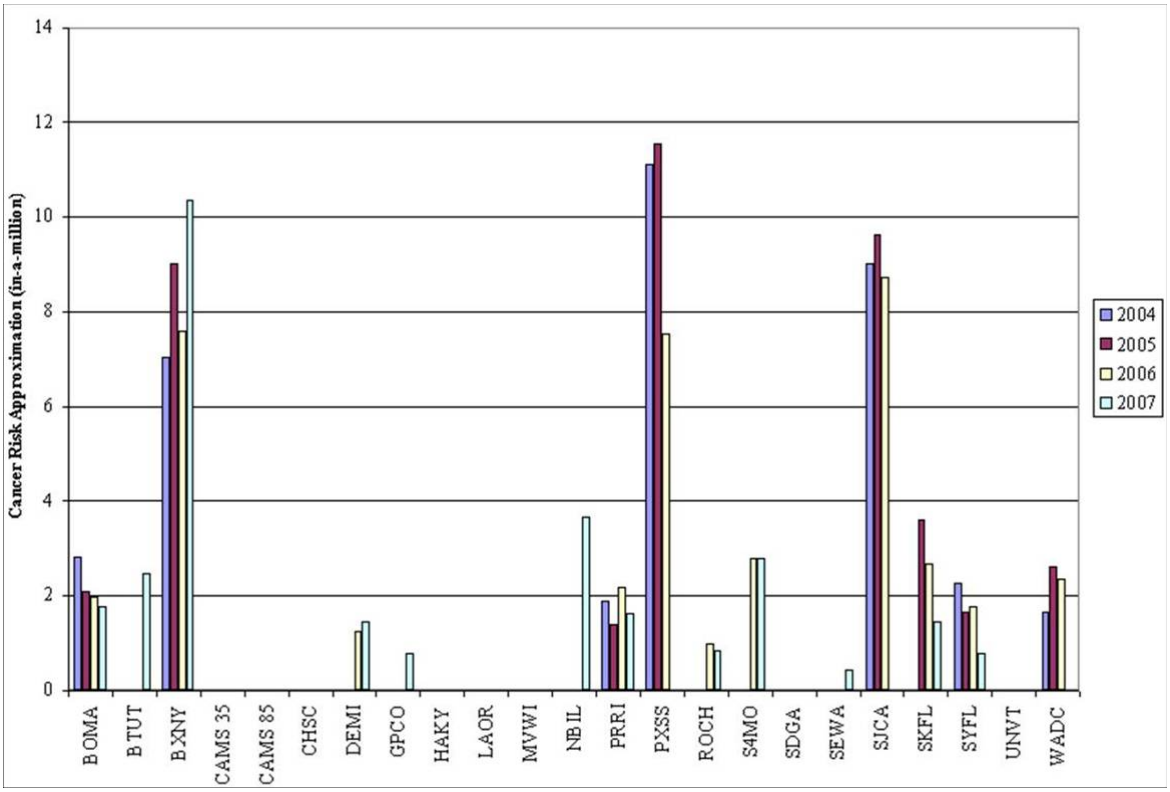


Figure 5-14. 1,1-Dichloroethane Cancer Risk Approximations by Site and Year

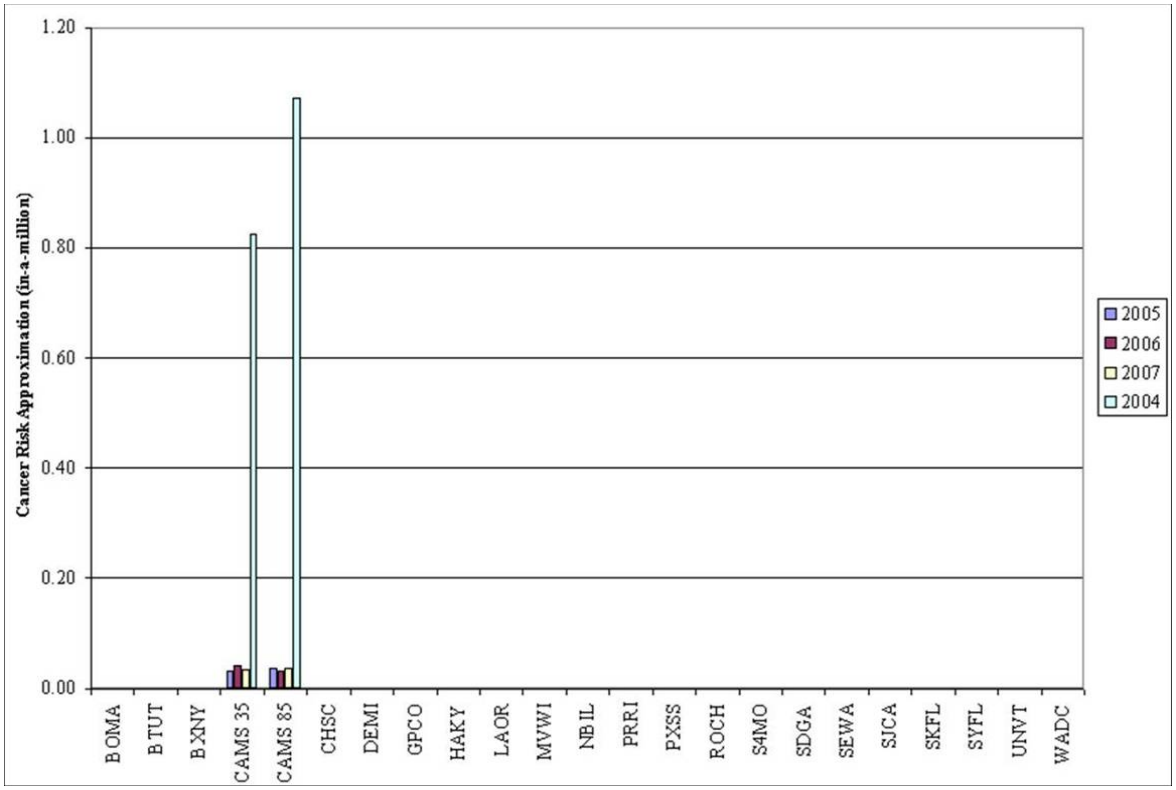


Figure 5-15. 1,2-Dichloropropane Cancer Risk Approximations by Site and Year

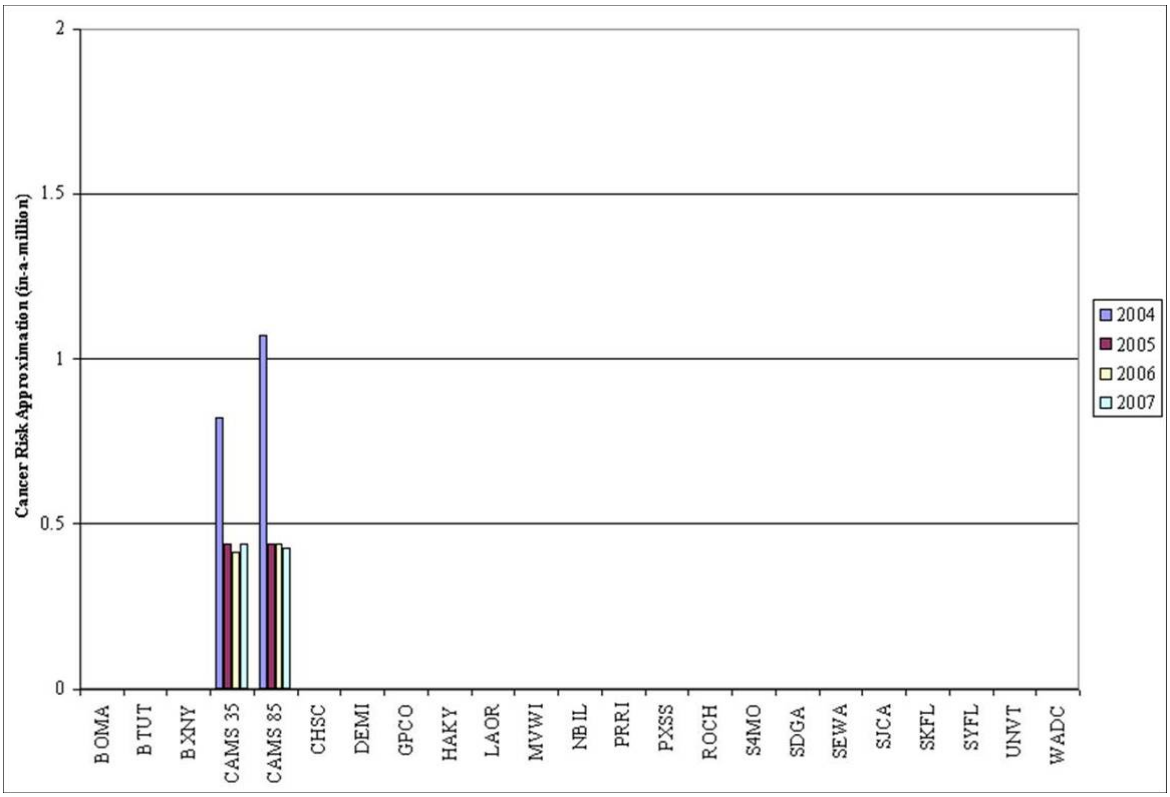


Figure 5-16. Ethylbenzene Cancer Risk Approximations by Site and Year

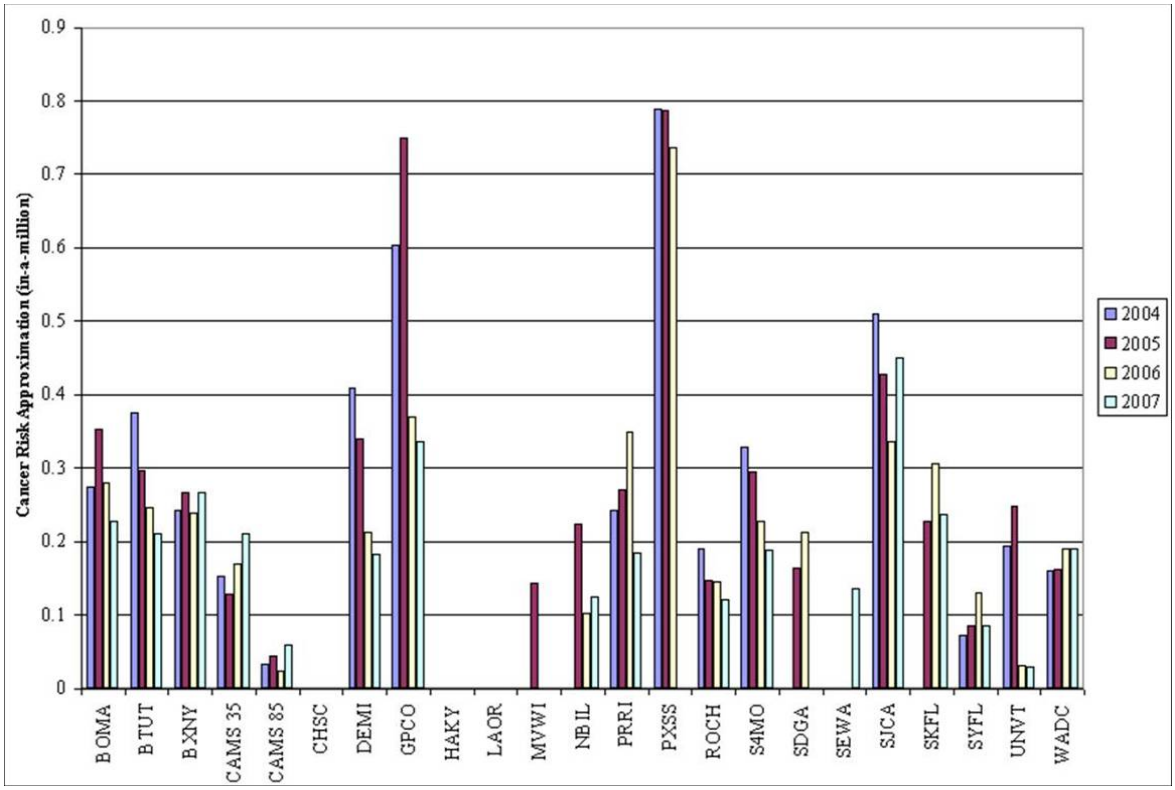


Figure 5-17. Ethylene Dichloride Cancer Risk Approximations by Site and Year

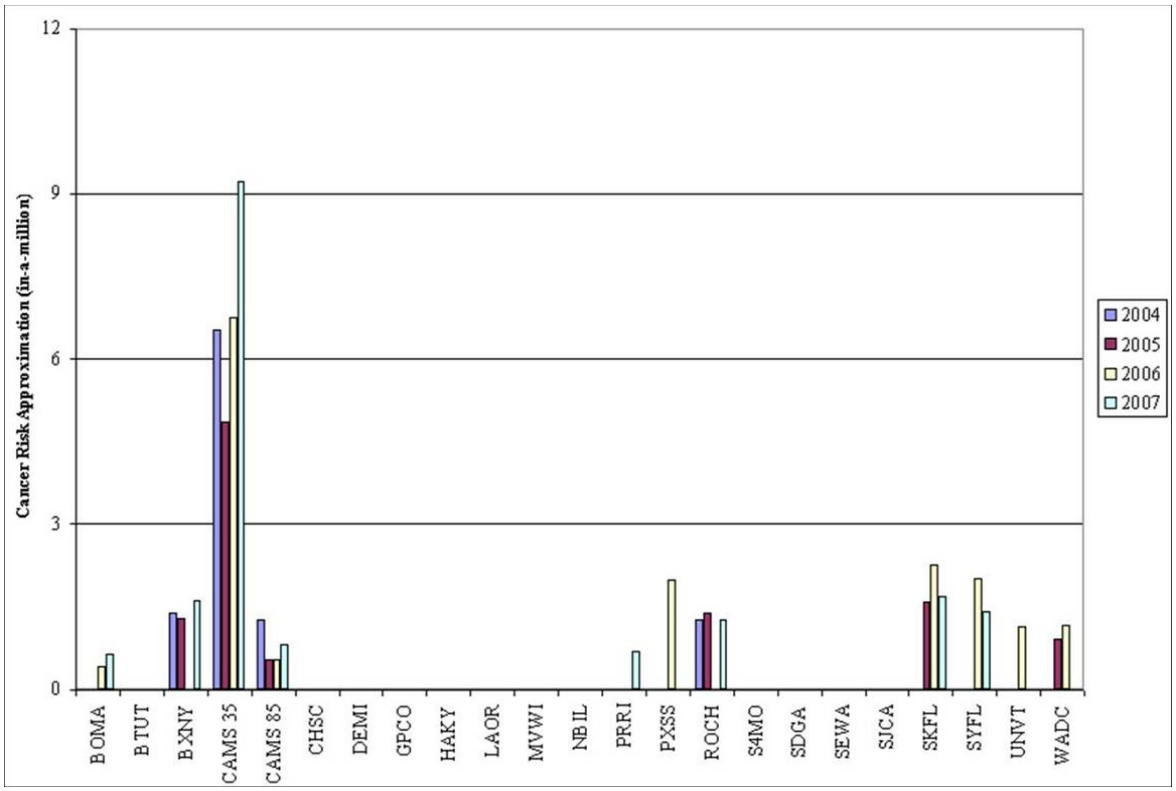


Figure 5-18. Formaldehyde Cancer Risk Approximations by Site and Year

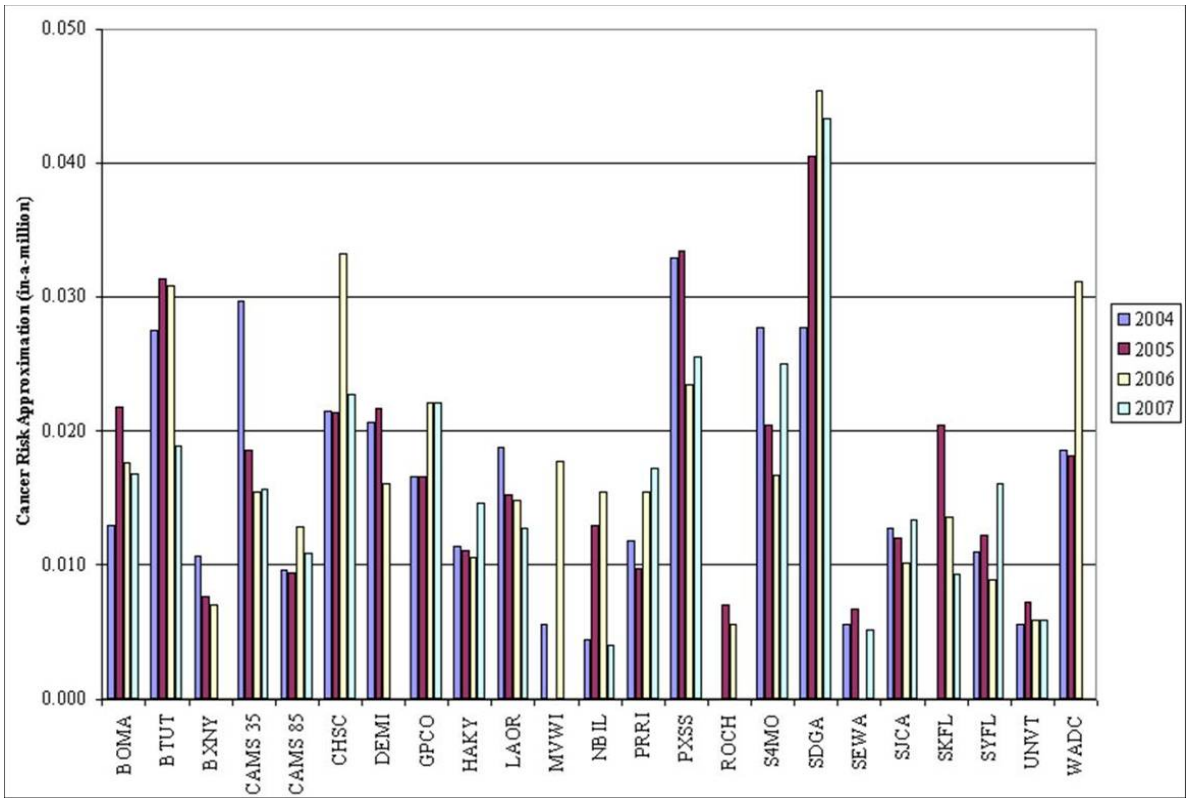


Figure 5-19. Hexachloro-1,3-Butadiene Cancer Risk Approximations by Site and Year

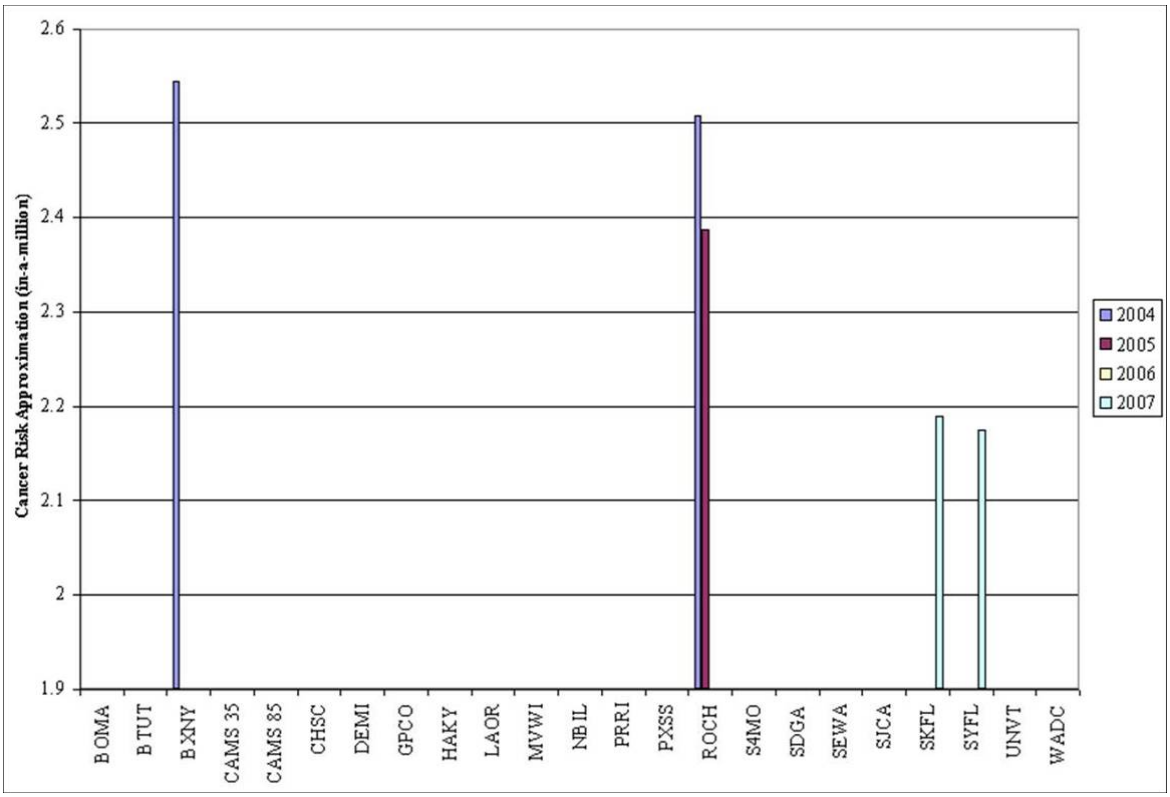


Figure 5-20. Hexavalent Chromium Cancer Risk Approximations by Site and Year

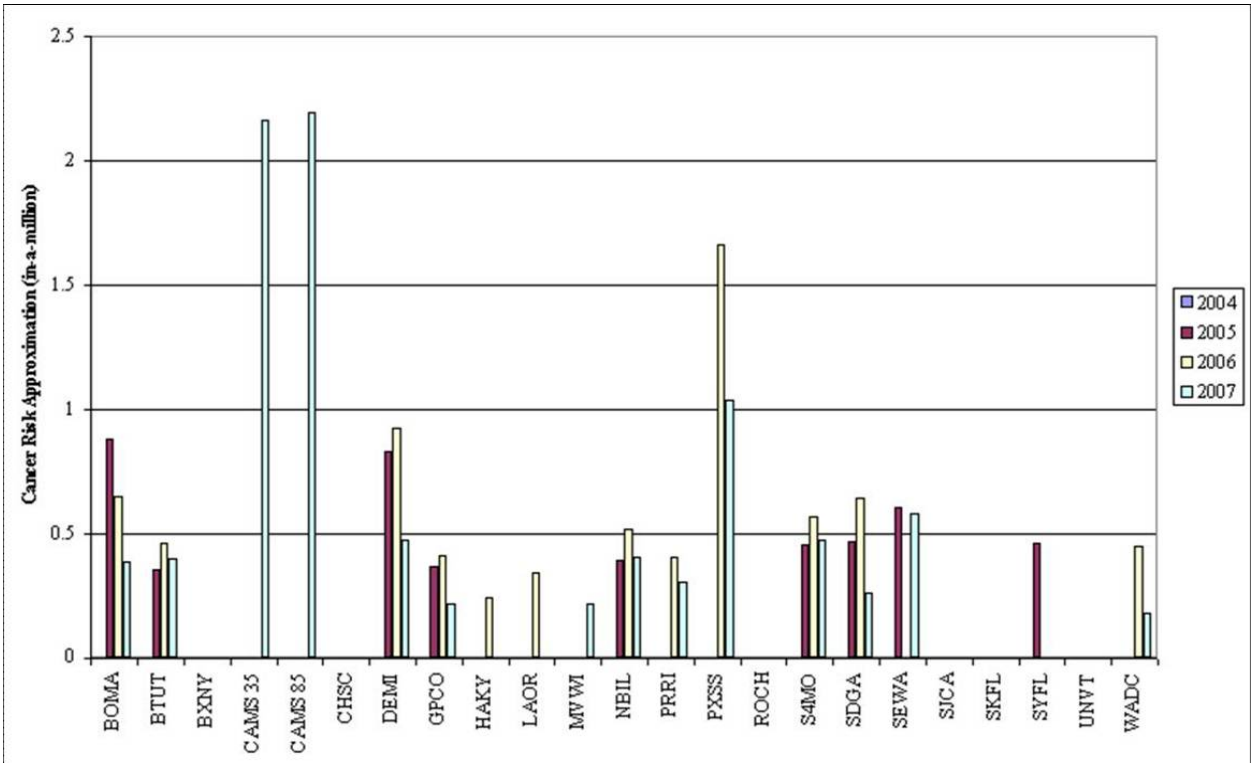


Figure 5-21. Methyl-*tert*-Butyl Ether Cancer Risk Approximations by Site and Year

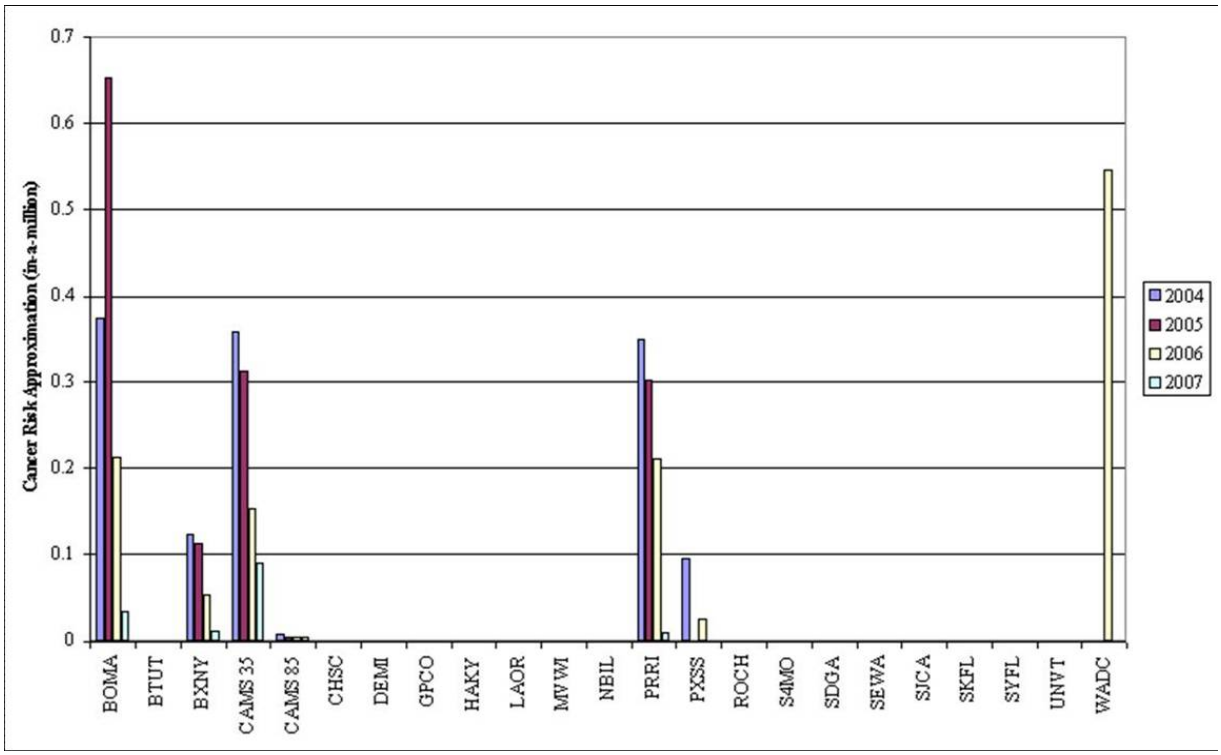


Figure 5-22. Methylene Chloride Cancer Risk Approximations by Site and Year

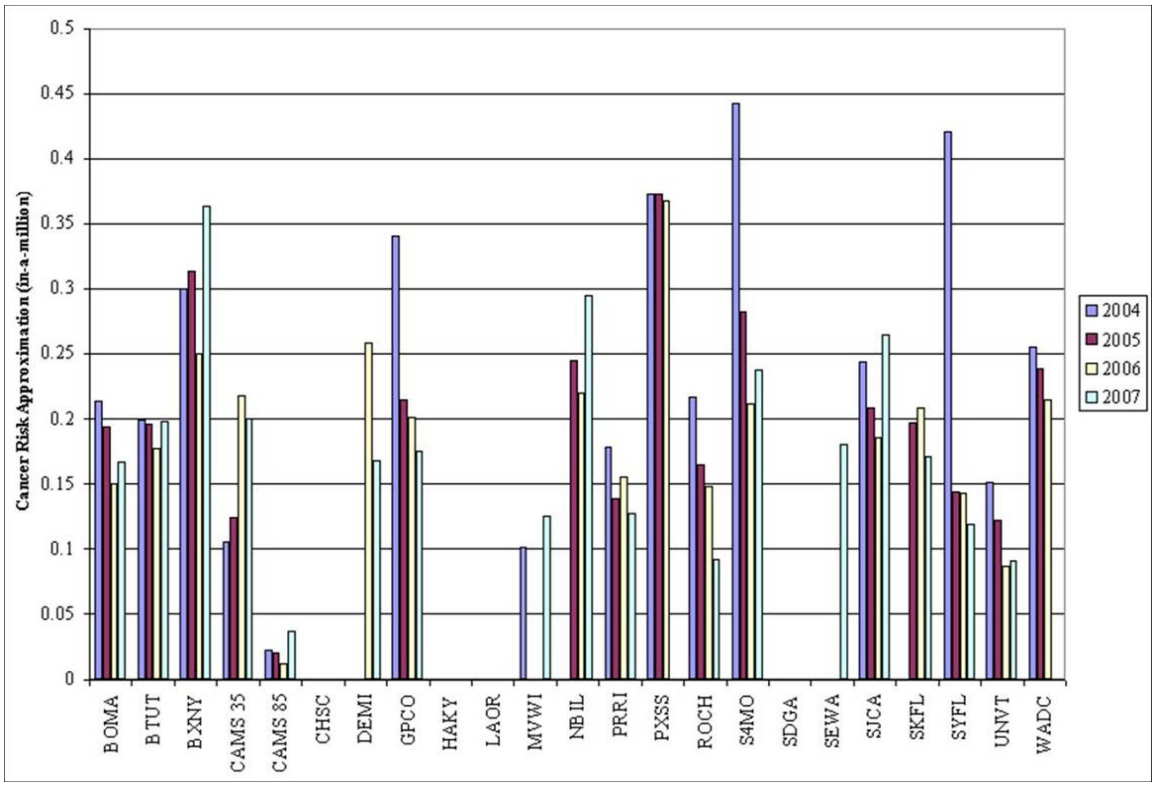


Figure 5-23. Nickel Cancer Risk Approximations by Site and Year

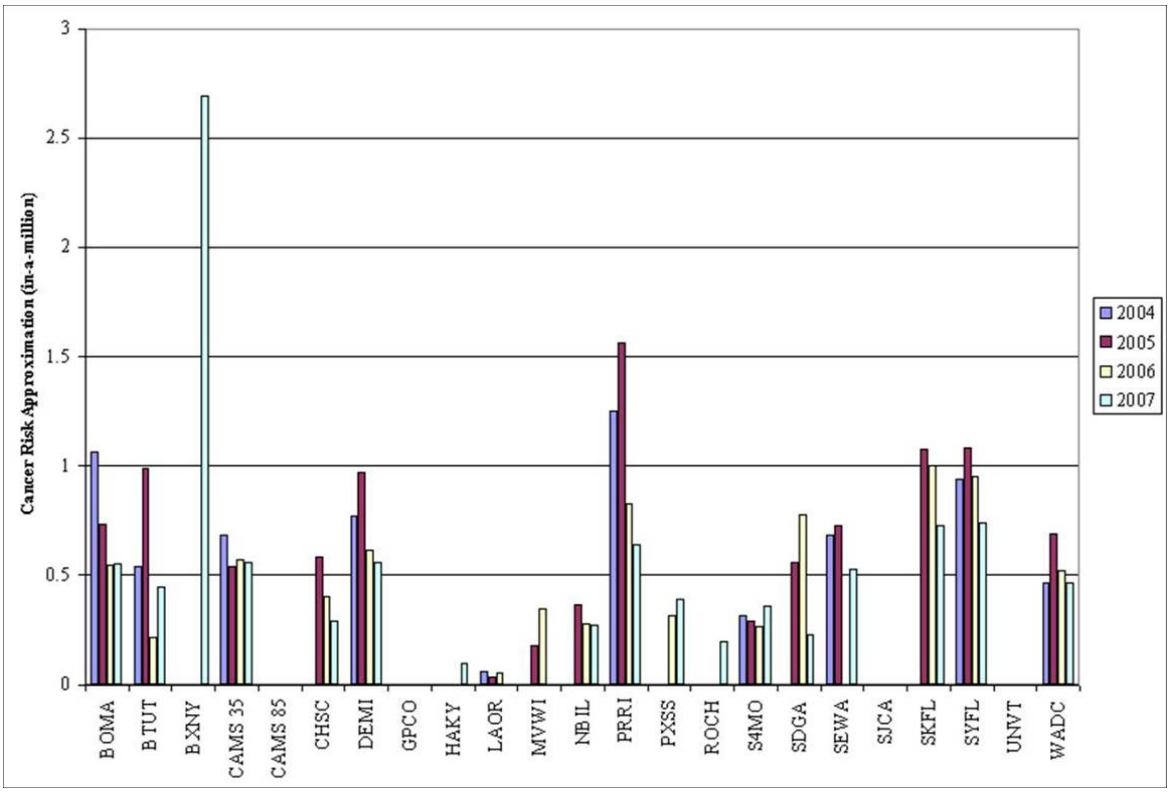


Figure 5-24. 1,1,2,2-Tetrachloroethane Cancer Risk Approximations by Site and Year

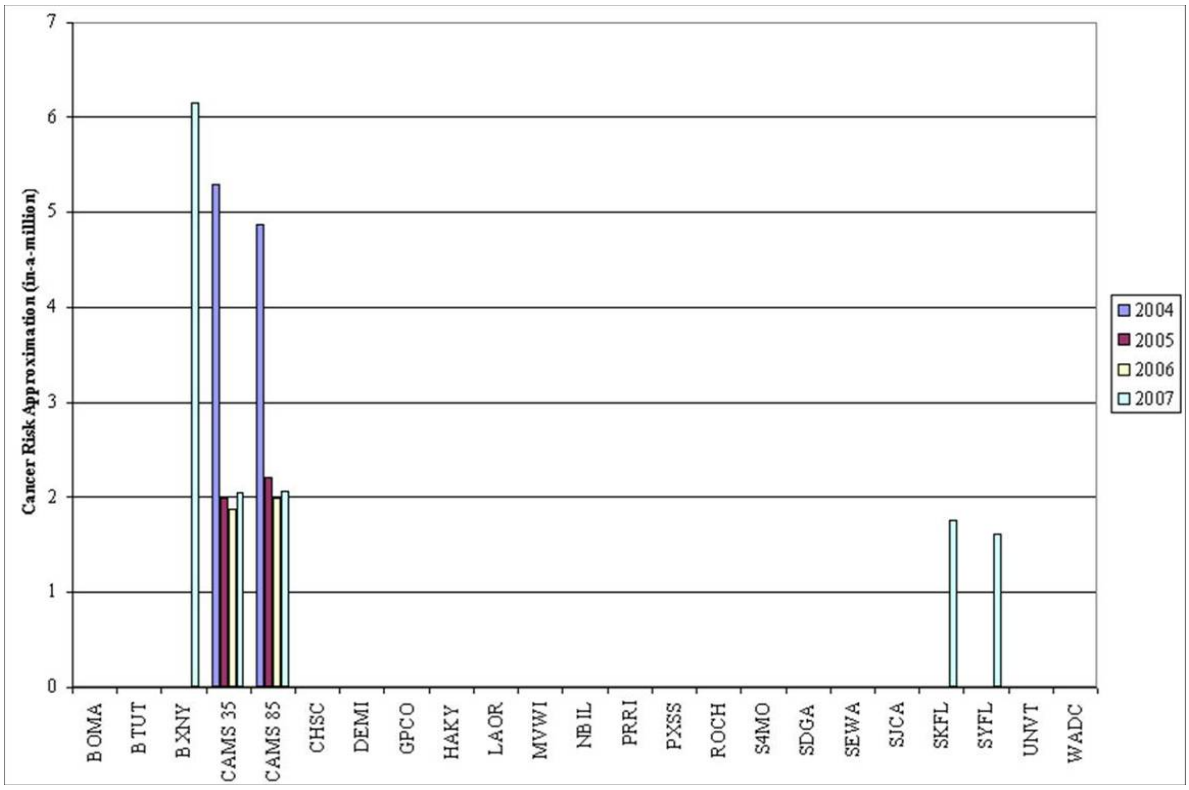


Figure 5-25. Tetrachloroethylene Cancer Risk Approximations by Site and Year

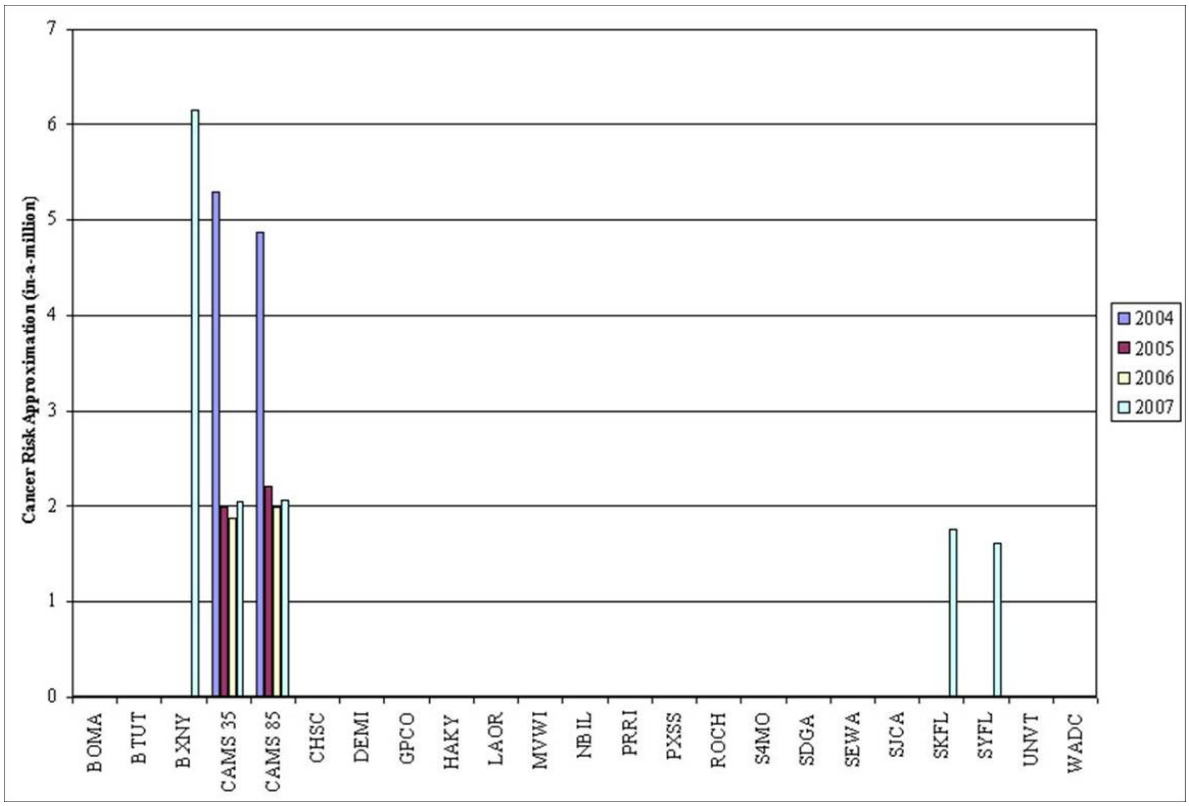


Figure 5-26. 1,1,2-Trichloroethane Cancer Risk Approximations by Site and Year

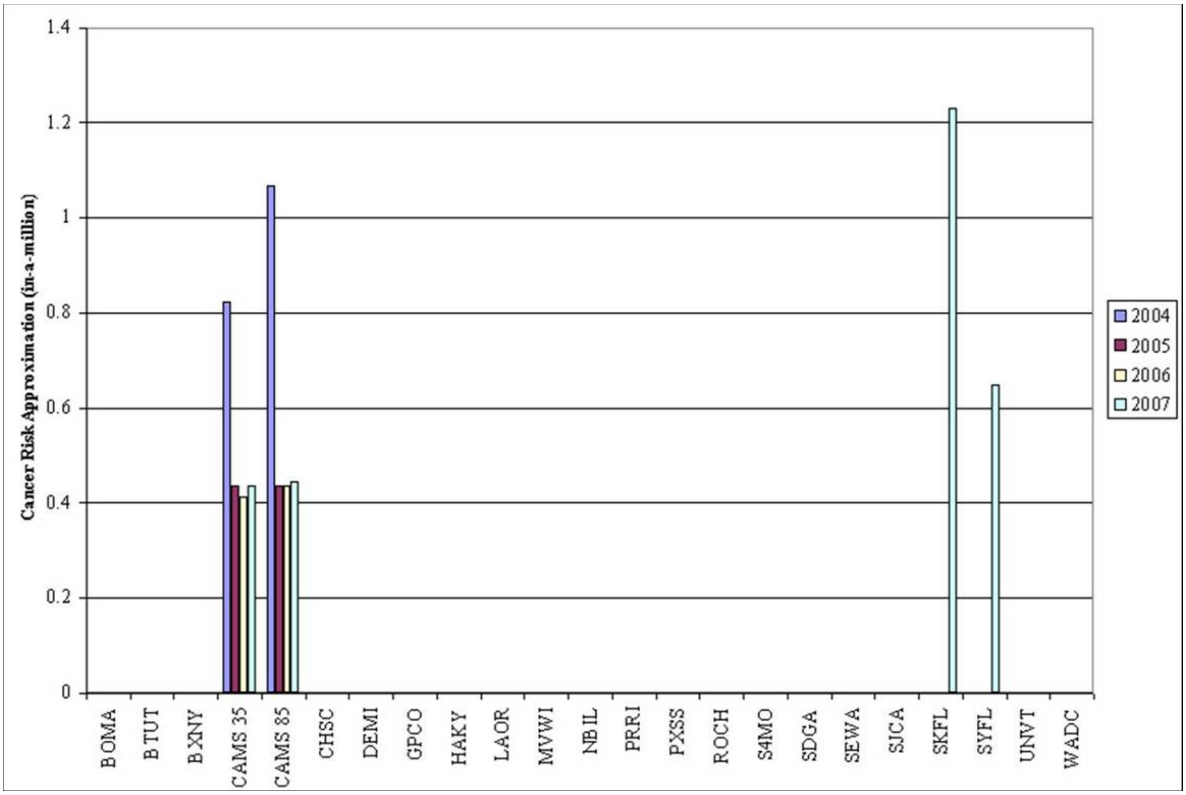


Figure 5-27. Trichloroethylene Cancer Risk Approximations by Site and Year

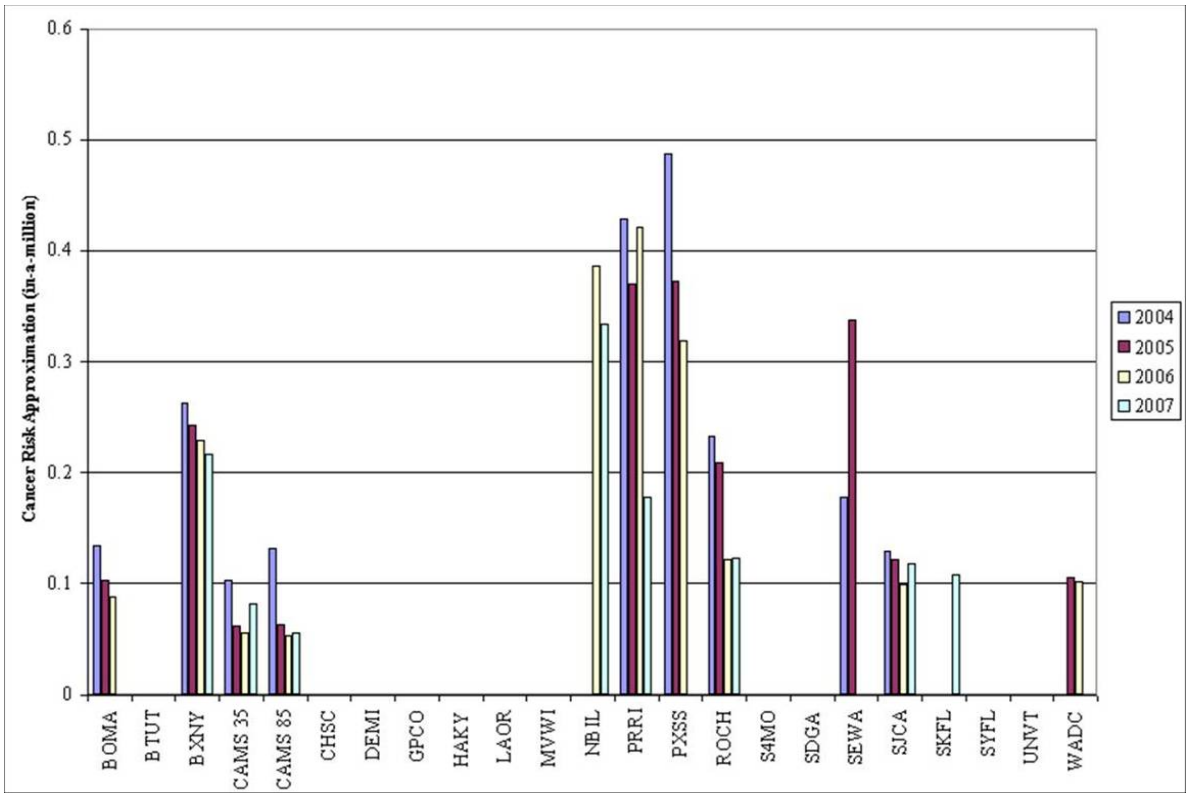


Figure 5-28. Vinyl Chloride Cancer Risk Approximations by Site and Year

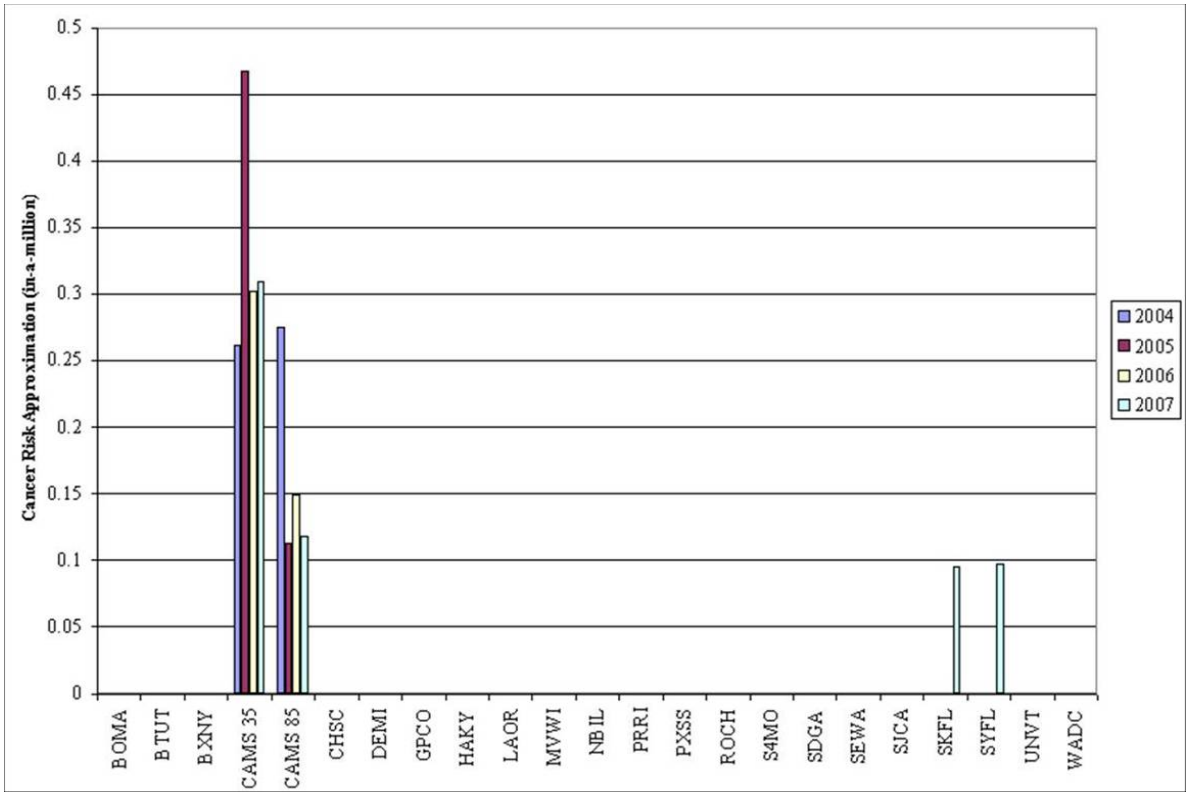
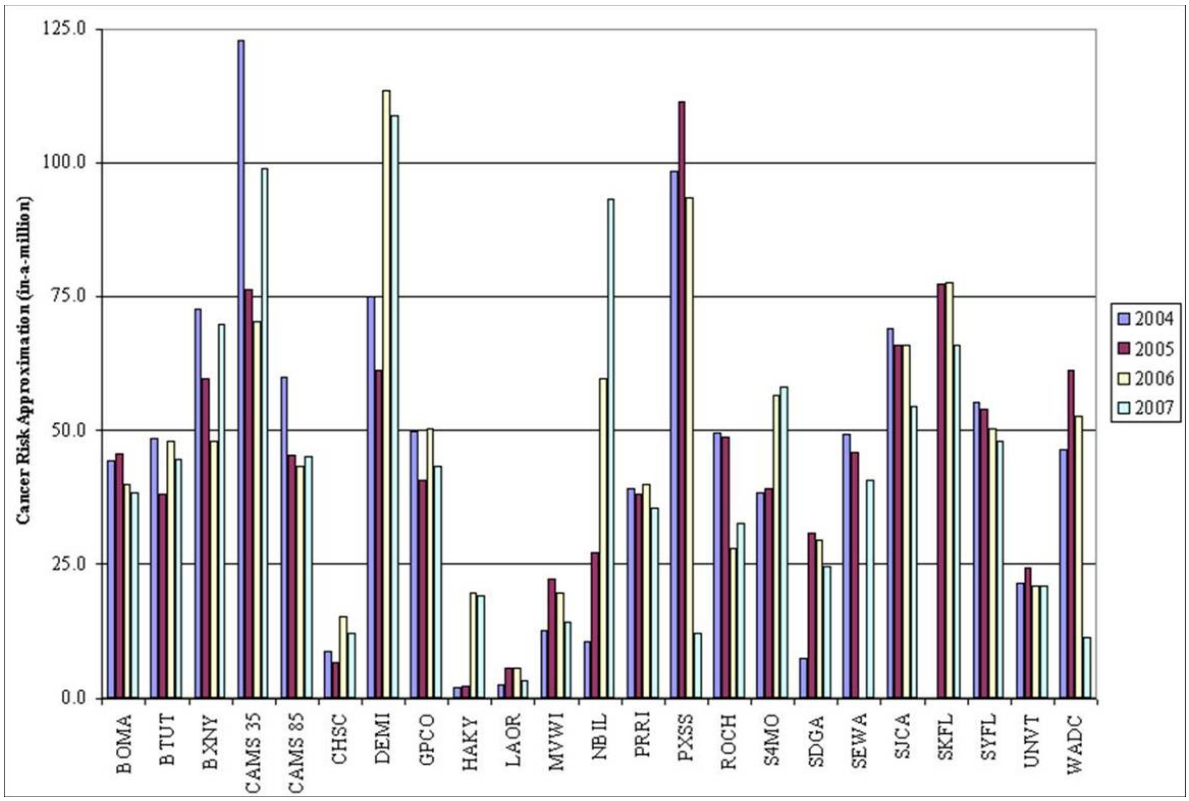


Figure 5-29. Cumulative Cancer Risk Approximations by Site and Year



5.3.2 Noncancer Risk Approximations

Tables 5-15 through 5-18 presents a breakdown of the noncancer risk hazard index (HI) approximations summed by target system. It is important to note that a single pollutant can target multiple organs, such as chlorobenzene (reproductive, kidney, and liver systems). Pollutants grouped by specific target systems include:

- Developmental: arsenic, chloroethane, ethylbenzene, lead, 4-methyl-2-pentanone;
- Hematological: selenium and styrene;
- Immunological: benzene and nickel;
- Kidney: cadmium, 1,1-dichloroethane, chlorobenzene, and methyl-*tert*-butyl ether;
- Liver: carbon tetrachloride, chlorobenzene, chloroform, *p*-dichlorobenzene, 1,1-dichloroethylene, ethylene dichloride, methyl-*tert*-butyl ether, methylene chloride, selenium, styrene, 1,2,4-trichlorobenzene, 1,1,2-trichlorethane, and vinyl chloride;
- Neurological: carbon disulfide, chloromethane, manganese, mercury, tetrachloroethylene, toluene, 1,1,1-trichloroethane, and xylenes (total);

Table 5-15. Developmental, Hematological, and Immunological Noncancer Hazard Index (HI) Approximations

Site	Developmental				Hematological				Immunological			
	2004	2005	2006	2007	2004	2005	2006	2007	2004	2005	2006	2007
BOMA	0.03	0.02	0.02	0.02	<0.01	<0.01	<0.01	<0.01	0.05	0.06	0.05	0.04
BTUT	0.12	0.04	0.03	0.04	<0.01	<0.01	<0.01	<0.01	0.07	0.07	0.05	0.05
BXNY	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	0.04	0.04	0.03	0.09
CAMS 35	0.19	0.04	0.04	0.06	<0.01	<0.01	<0.01	<0.01	0.07	0.08	0.07	0.07
CAMS 85	0.02	0.02	0.02	0.02	<0.01	<0.01	<0.01	<0.01	0.04	0.05	0.05	0.04
CHSC	<0.01	0.02	0.02	0.02		<0.01	<0.01	<0.01		0.01	0.01	0.02
DEMI	0.10	0.08	0.08	0.07			<0.01	<0.01	0.08	0.07	0.06	0.05
GPCO	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.07	0.06	0.06	0.05
HAKY			0.06	0.06							0.04	0.04
LAOR	0.01	0.01	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
MVWI		0.03	0.03						0.01	0.02	0.02	0.02
NBIL		0.03	0.03	0.03		<0.01	<0.01	<0.01	0.03	0.04	0.03	0.02
PRRI	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.06	0.06	0.05	0.04
PXSS	<0.01	<0.01	0.02	0.03	<0.01	<0.01	<0.01	<0.01	0.08	0.08	0.08	0.01
ROCH	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	0.03	0.03	0.02	0.02
S4MO	0.06	0.08	0.04	0.05	<0.01	<0.01	<0.01	<0.01	0.05	0.04	0.04	0.04
SDGA	<0.01	0.03	0.04	<0.01		<0.01	<0.01	<0.01		0.05	0.05	0.03
SEWA	0.03	0.04		0.03				<0.01	0.05	0.04		0.04
SJCA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	0.04	0.03	0.04
SKFL		0.05	0.05	0.04		<0.01	<0.01	<0.01		0.05	0.06	0.04
SYFL	0.06	0.05	0.04	0.04	<0.01	<0.01	<0.01	<0.01	0.04	0.04	0.04	0.03
UNVT	<0.01	<0.01	<0.01	<0.01		<0.01			0.01	0.02	0.01	0.01
WADC	0.02	0.02	0.02	0.03	<0.01	<0.01	<0.01	<0.01	0.04	0.04	0.04	0.04

Table 5-16. Kidney, Liver, and Neurological Noncancer Hazard Index (HI) Approximations

Site	Kidney				Liver				Neurological			
	2004	2005	2006	2007	2004	2005	2006	2007	2004	2005	2006	2007
BOMA	0.02	0.02	0.01	0.01	0.02	0.02	0.01	0.02	0.15	0.14	0.11	0.11
BTUT	0.01	0.01	0.04	0.01	0.01	0.01	0.02	0.02	0.24	0.19	0.22	0.26
BXNY	<0.01	<0.01	<0.01	0.01	0.02	0.02	0.02	0.02	0.04	0.05	0.04	0.20
CAMS 35	0.03	0.02	0.03	0.03	0.02	0.02	0.02	0.02	0.14	0.11	0.15	0.12
CAMS 85	<0.01	<0.01	<0.01	<0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
CHSC	--	0.01	0.02	0.01	--	<0.01	<0.01	<0.01	0.08	0.06	0.07	0.07
DEMI	0.05	0.04	0.03	0.03	0.02	0.02	0.03	0.03	1.68	1.52	1.37	1.04
GPCO	--	--	--	--	0.02	0.01	0.02	0.02	0.33	0.32	0.36	0.35
HAKY	--	--	--	--	--	--	--	--	--	--	0.09	0.10
LAOR	0.02	<0.01	<0.01	--	<0.01	<0.01	<0.01	<0.01	0.14	0.13	0.21	0.01
MVWI	--	0.01	0.01	--	0.01	0.02	0.01	0.01	0.01	0.13	0.12	0.01
NBIL	--	0.01	0.01	0.01	--	0.02	0.02	0.03	0.02	0.28	0.15	0.19
PRRI	<0.01	<0.01	<0.01	<0.01	0.02	0.02	0.01	0.02	0.11	0.12	0.12	0.10
PXSS	<0.01	--	0.01	0.01	0.03	0.02	0.02	<0.01	0.09	0.09	0.44	0.37
ROCH	<0.01	<0.01	--	0.01	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.11
S4MO	0.06	0.05	0.03	0.04	0.02	0.02	0.02	0.02	0.40	0.31	0.32	0.28
SDGA	--	0.01	0.01	<0.01	--	0.01	0.01	0.01	0.08	0.11	0.11	0.06
SEWA	0.01	0.01	--	0.01	0.02	0.02	--	0.02	0.16	0.21	--	0.28
SJCA	--	--	--	--	<0.01	<0.01	<0.01	<0.01	0.06	0.05	0.03	0.05
SKFL	--	0.01	0.01	0.01	--	0.02	0.02	0.02	--	0.09	0.11	0.09
SYFL	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.08	0.08	0.10	0.07
UNVT	--	--	--	--	0.02	0.02	0.01	0.01	0.01	0.02	0.01	0.02
WADC	0.01	0.01	0.01	0.01	0.02	0.02	0.02	<0.01	0.11	0.16	0.12	0.13

Shaded cells indicate HI >1; A noncancer effect is possible for lifetime exposure

Table 5-17. Ocular and Reproductive Noncancer Hazard Index (HI) Approximations

Site	Ocular				Reproductive			
	2004	2005	2006	2007	2004	2005	2006	2007
BOMA	<0.01	<0.01	<0.01	<0.01	0.05	0.07	0.06	0.05
BTUT	--	--	--	--	--	--	0.07	0.05
BXNY	<0.01	<0.01	<0.01	<0.01	0.15	0.08	0.07	0.07
CAMS 35	<0.01	<0.01	<0.01	<0.01	0.37	0.17	0.16	0.33
CAMS 85	<0.01	<0.01	<0.01	<0.01	0.12	0.06	0.06	0.06
CHSC	--	--	--	--	--	--	--	--
DEMI	--	--	--	--	--	--	0.06	0.05
GPCO	--	--	--	--	0.12	0.13	0.10	0.08
HAKY	--	--	--	--	--	--	--	--
LAOR	--	--	--	--	--	--	--	--
MVWI	--	--	--	--	--	--	--	--
NBIL	--	--	<0.01	<0.01	--	--	0.03	0.02
PRRI	<0.01	<0.01	<0.01	<0.01	0.08	0.06	0.06	0.05
PXSS	<0.01	<0.01	<0.01	--	--	0.21	0.19	--
ROCH	<0.01	<0.01	<0.01	<0.01	0.10	0.11	--	0.03
S4MO	--	--	--	--	--	--	0.05	0.05
SDGA	--	--	--	--	--	--	--	--
SEWA	<0.01	<0.01	--	--	0.06	0.04	--	0.05
SJCA	<0.01	<0.01	<0.01	<0.01	0.13	0.12	0.08	0.11
SKFL	--	--	--	<0.01	--	0.09	0.09	0.04
SYFL	--	--	--	--	0.04	0.06	0.05	0.02
UNVT	--	--	--	--	--	--	--	--
WADC	--	<0.01	<0.01	--	0.07	0.09	0.07	--

[a] Measurements at HAKY during the 2004 and 2005 sampling seasons are believed to be questionable.

Table 5-18. Respiratory and Whole Body Noncancer Hazard Index (HI) Approximations

Site	Respiratory				Whole Body			
	2004	2005	2006	2007	2004	2005	2006	2007
BOMA	23.91	25.09	17.99	19.65	--	--	--	--
BTUT	0.98	1.03	36.76	29.17	--	--	--	0.14
BXNY	0.37	0.28	0.22	0.10	--	--	--	--
CAMS 35	0.98	0.67	0.57	0.54	--	--	--	--
CAMS 85	0.29	0.32	0.35	3.39	--	--	--	--
CHSC	0.84	0.56	1.22	0.71	--	--	--	--
DEMI	0.67	0.64	27.00	25.41	--	--	0.16	0.02
GPCO	1.04	0.66	36.05	33.35	--	--	0.02	0.03
HAKY	0.31	0.32	0.30	0.41	--	--	--	--
LAOR	0.35	0.49	0.48	0.41	--	--	--	--
MVWI	0.19	0.19	0.52	<0.01	--	--	--	--
NBIL	0.15	0.41	0.80	27.14	--	--	--	0.01
PRRI	18.34	20.12	20.49	18.77	--	--	--	--
PXSS	0.98	0.96	0.78	0.87	--	--	--	--
ROCH	0.02	0.24	0.18	0.04	--	--	--	--
S4MO	0.91	0.70	33.80	37.58	--	--	--	0.02
SDGA	0.80	1.12	1.20	1.20	--	--	--	--
SEWA	0.27	0.30		18.85	--	--	--	--
SJCA	62.00	64.62	53.86	63.46	0.01	0.01	0.01	0.01
SKFL		0.80	0.60	27.47	--	--	--	--
SYFL	0.63	0.54	0.70	21.66	--	--	--	--
UNVT	0.10	0.23	0.19	0.20	--	--	--	--
WADC	0.44	0.50	0.74	0.02	--	--	--	--

Shaded cells indicate HI >1; A noncancer effect is possible for lifetime exposure

- Ocular: methyl-*tert*-butyl ether and trichloroethylene;

- Reproductive: 1,3-butadiene, chlorobenzene, 1,2-dibromoethane, and hexachloro-1,3-butadiene;

- Respiratory: acetaldehyde, acrolein, acrylonitrile, antimony, beryllium, bromomethane, 2-chloro-1,3-butadiene, cobalt, 1,2-dichloropropane, formaldehyde, hexavalent chromium, methyl methacrylate, nickel, and toluene;

- Whole Body: acetonitrile.

The respiratory target system was the highest noncancer hazard index (HI) approximation calculated across the NATTS sites, with a median HI approximation of 3.40. Similar to cancer risk approximations, urban sites tended to have higher HI approximations than rural. Acrolein is the primary driver pollutant for the respiratory target system, and this observation is consistent with the contributions of mobile sources in urban areas emitting acrolein. Aside from the respiratory target system, the only HI approximations greater than 1 occurred for the neurological target system at DEMI. Although greater than 1 each year, a decreasing trend is being realized (1.68 in 2004 to 1.04 in 2007).

With the exception of the respiratory target system and the DEMI neurological HI approximations, noncancer HI approximations were very low. Figures 5-30 through 5-39 visually present target system-specific graphs of noncancer HI approximations by site and year. Please note that the scale for each figure is not consistent, but rather customized for the actual data ranges. Additionally, values that are atypically higher than the rest of the data are noted on the graph.

Figure 5-30. Developmental Noncancer Hazard Index (HI) Approximations by Site and Year

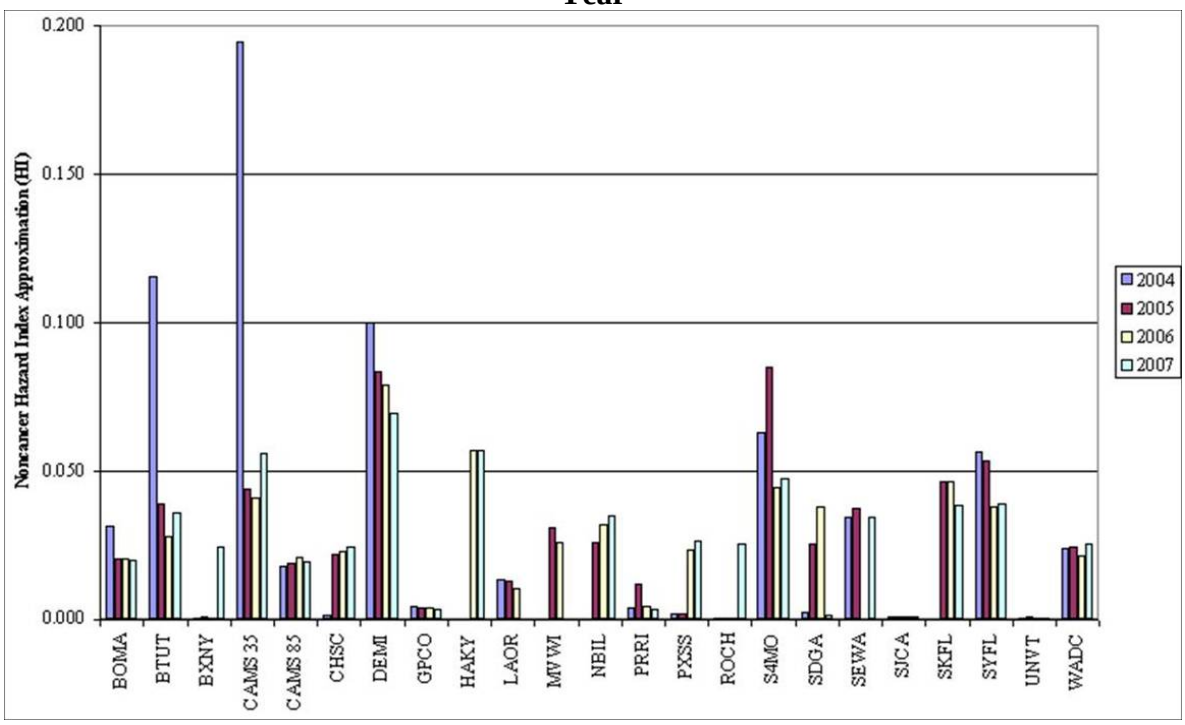


Figure 5-31. Hematological Noncancer Hazard Index (HI) Approximations by Site and Year

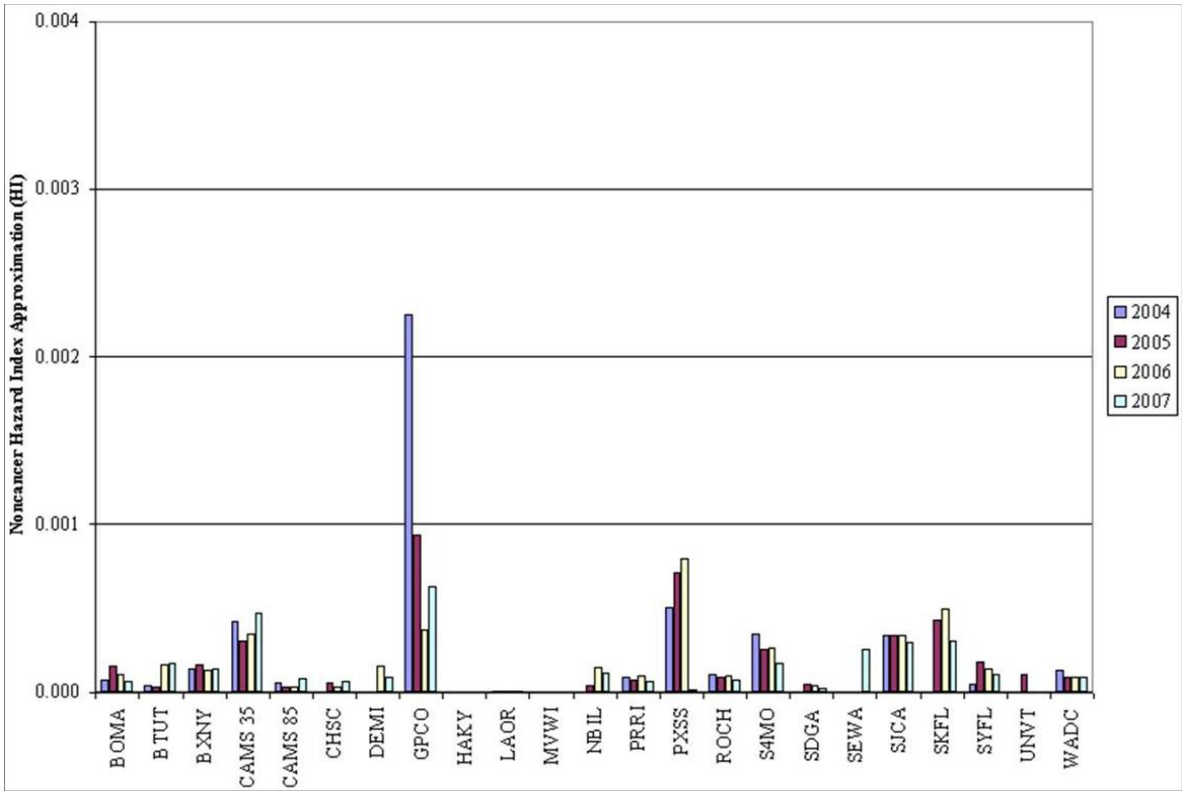


Figure 5-32. Immunological Noncancer Hazard Index (HI) Approximations by Site and Year

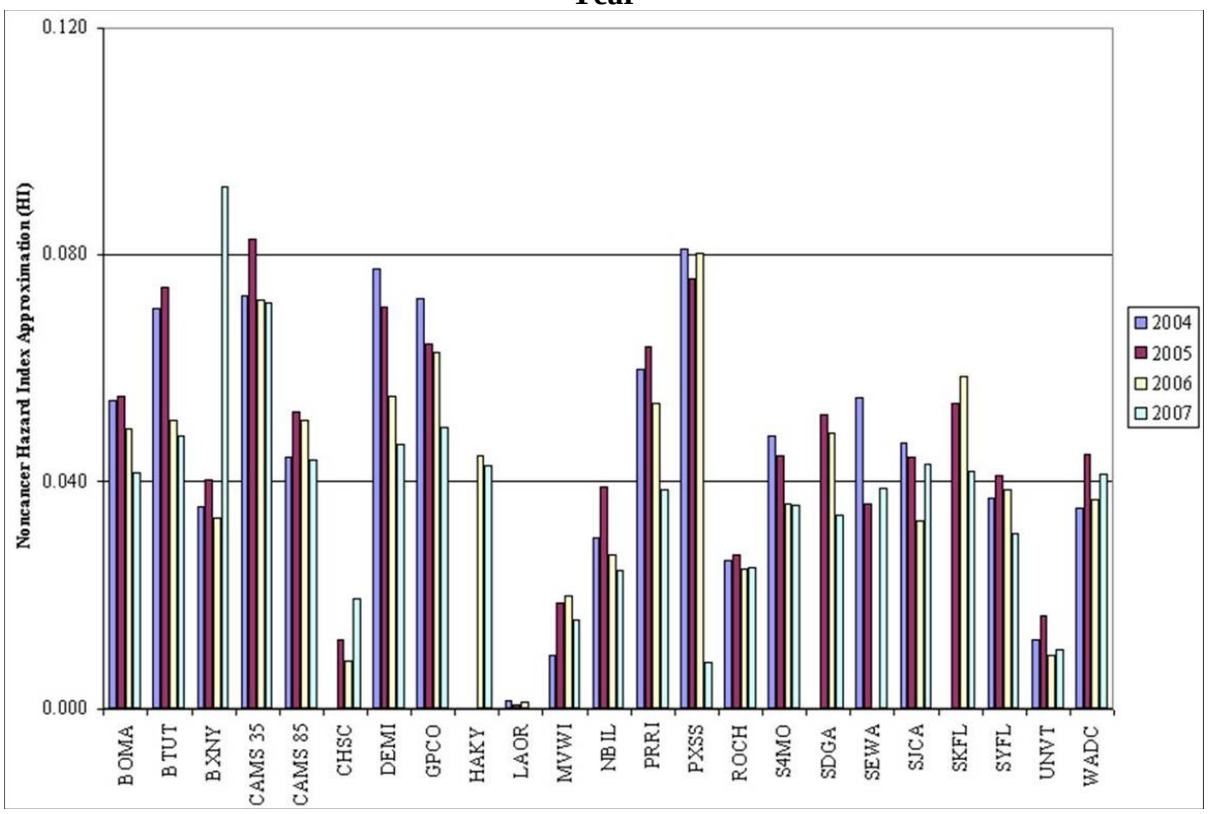


Figure 5-33. Kidney Noncancer Hazard Index (HI) Approximations by Site and Year

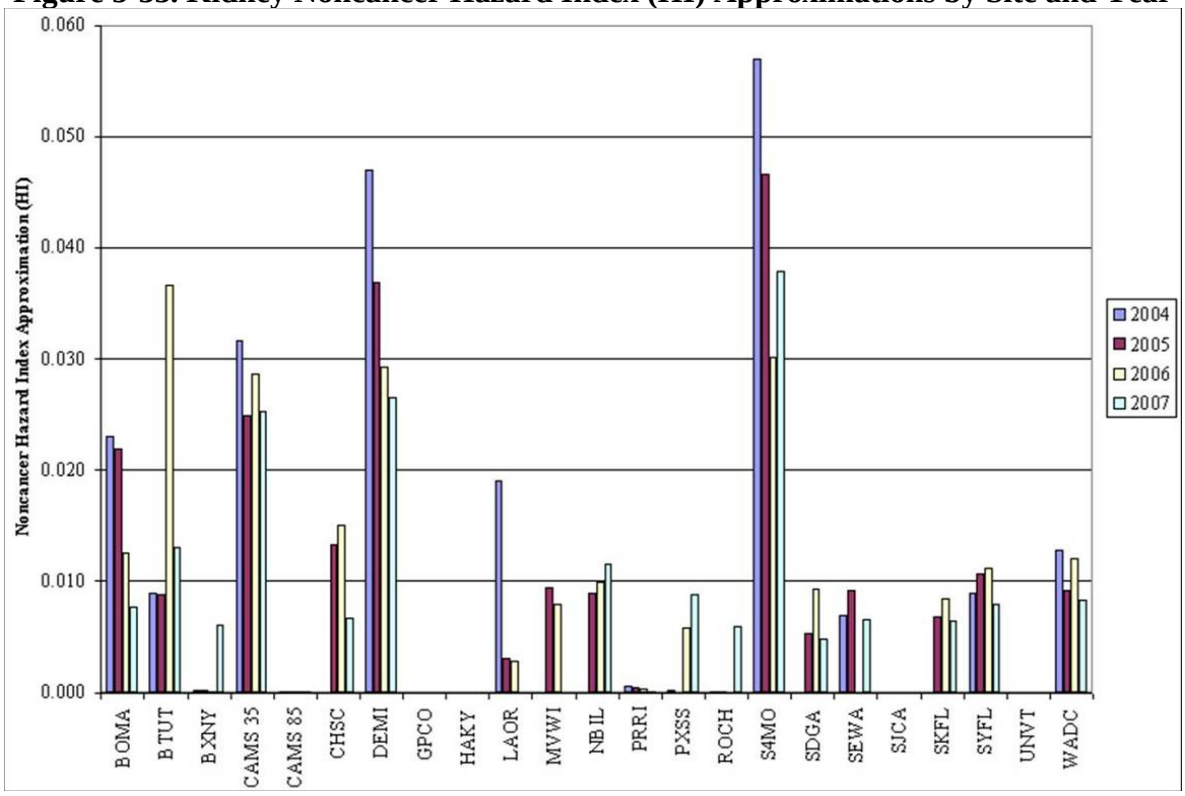


Figure 5-34. Liver Noncancer Hazard Index (HI) Approximations by Site and Year

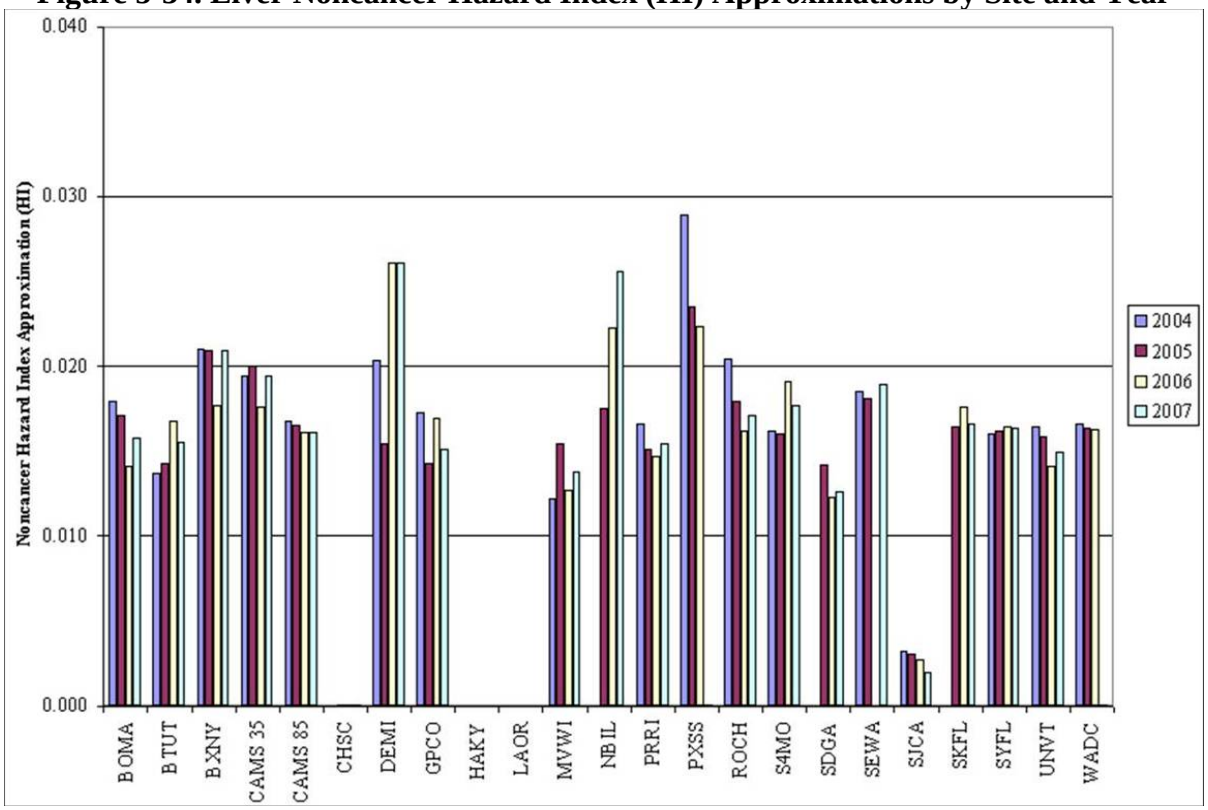


Figure 5-35. Neurological Noncancer Hazard Index (HI) Approximations by Site and Year

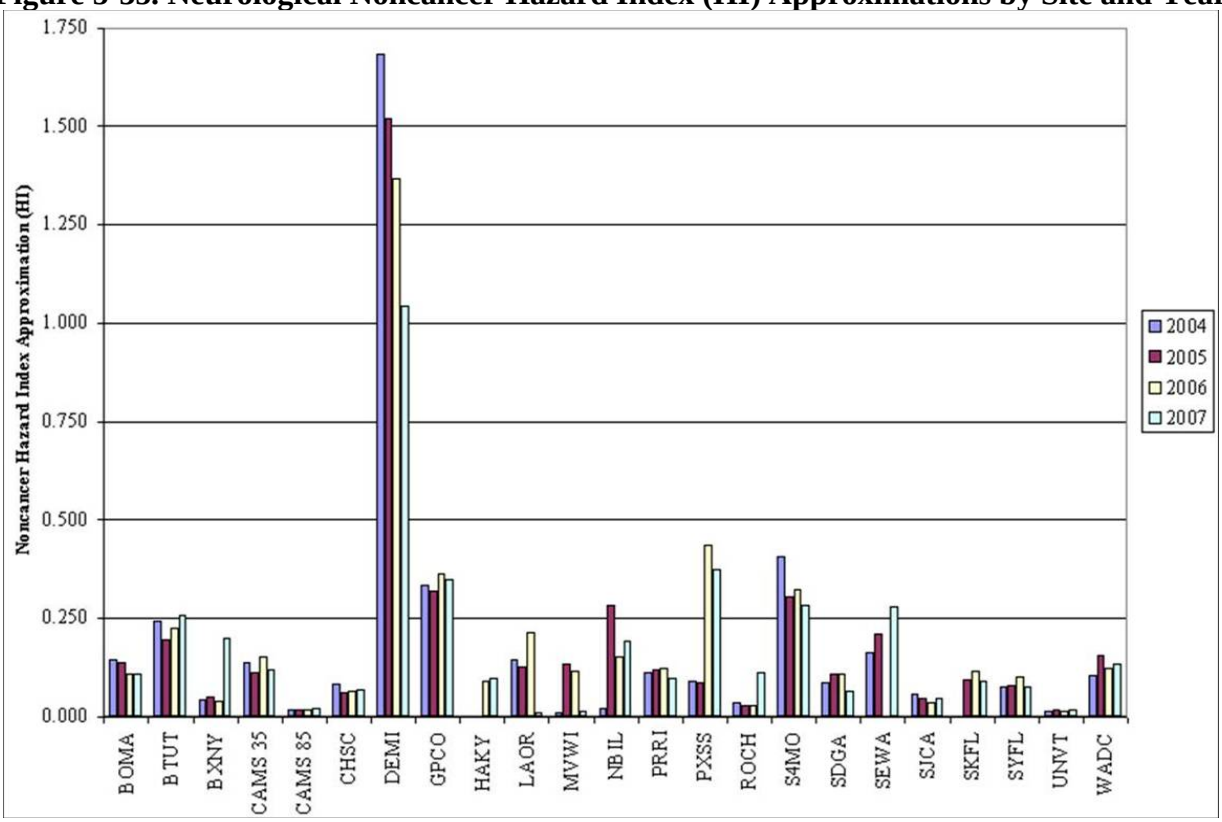


Figure 5-36. Ocular Noncancer Hazard Index (HI) Approximations by Site and Year

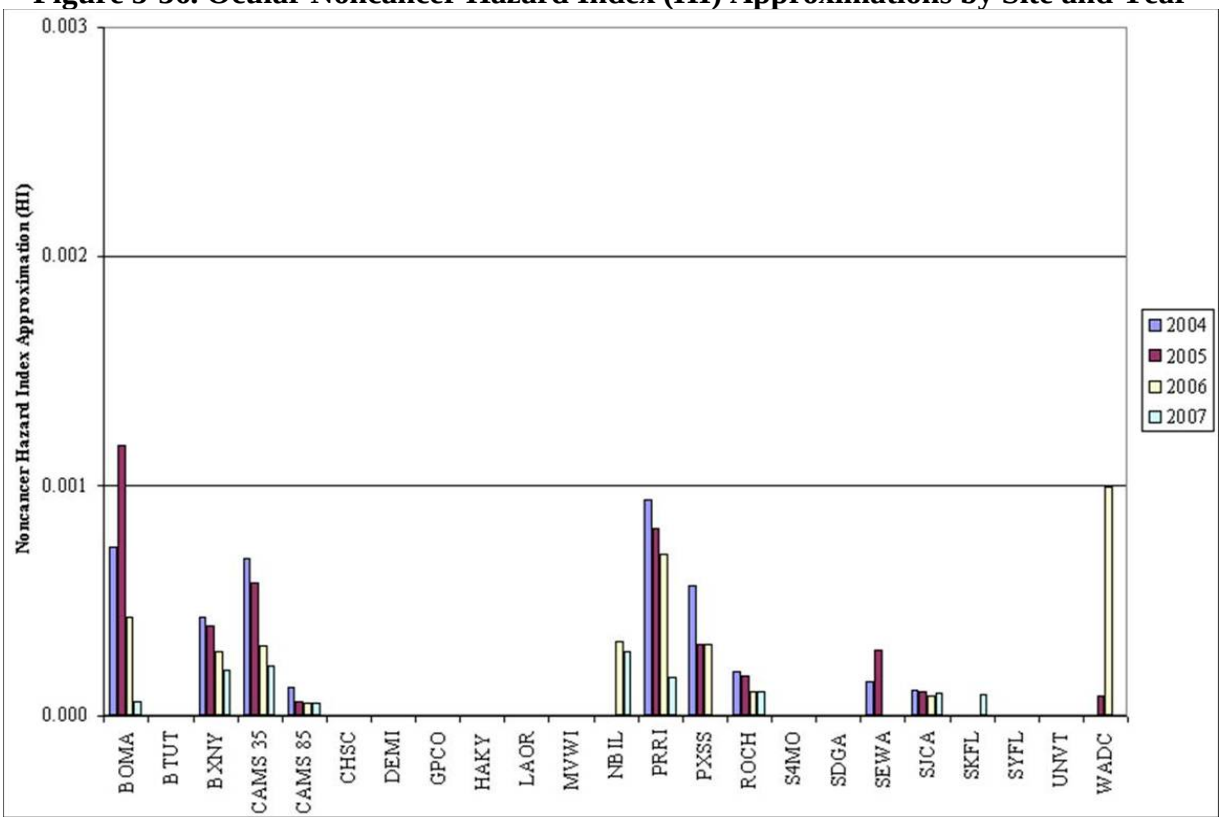


Figure 5-37. Reproductive Noncancer Hazard Index (HI) Approximations by Site and Year

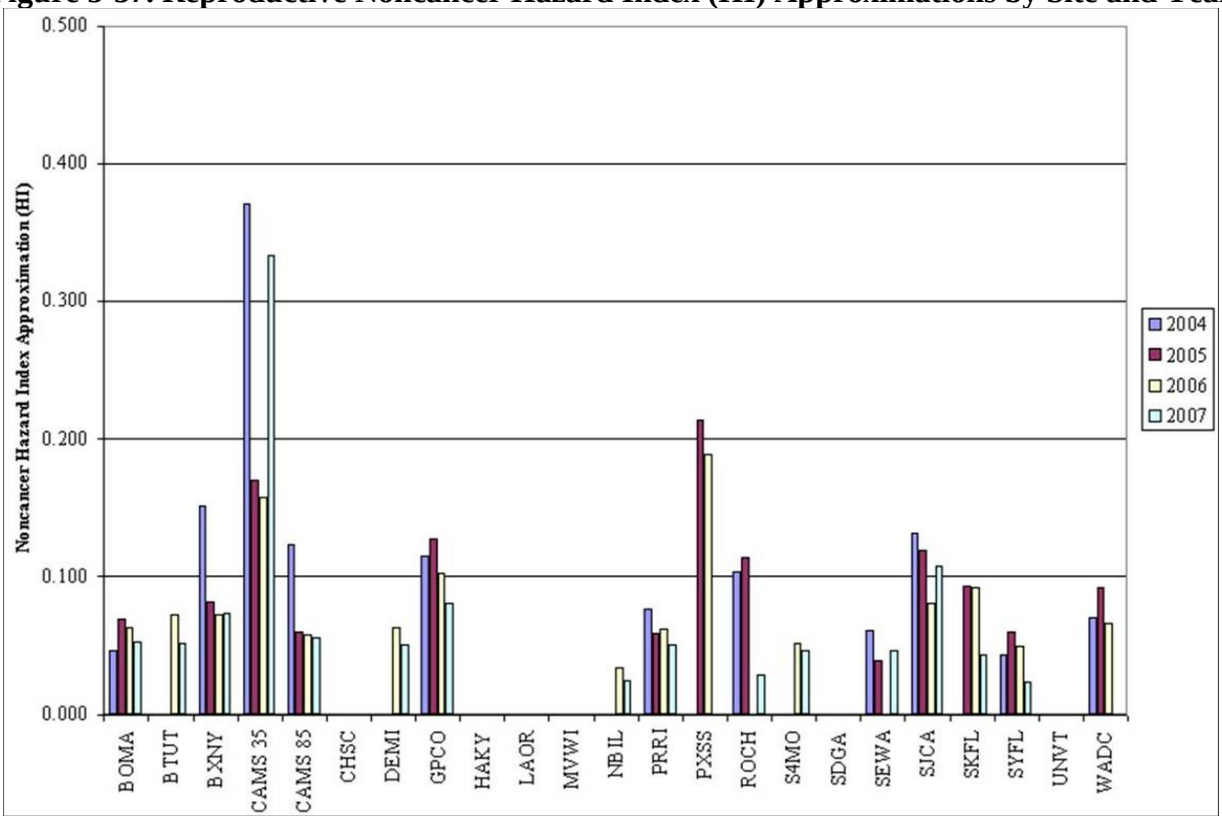


Figure 5-38. Respiratory Noncancer Hazard Index (HI) Approximations by Site and Year

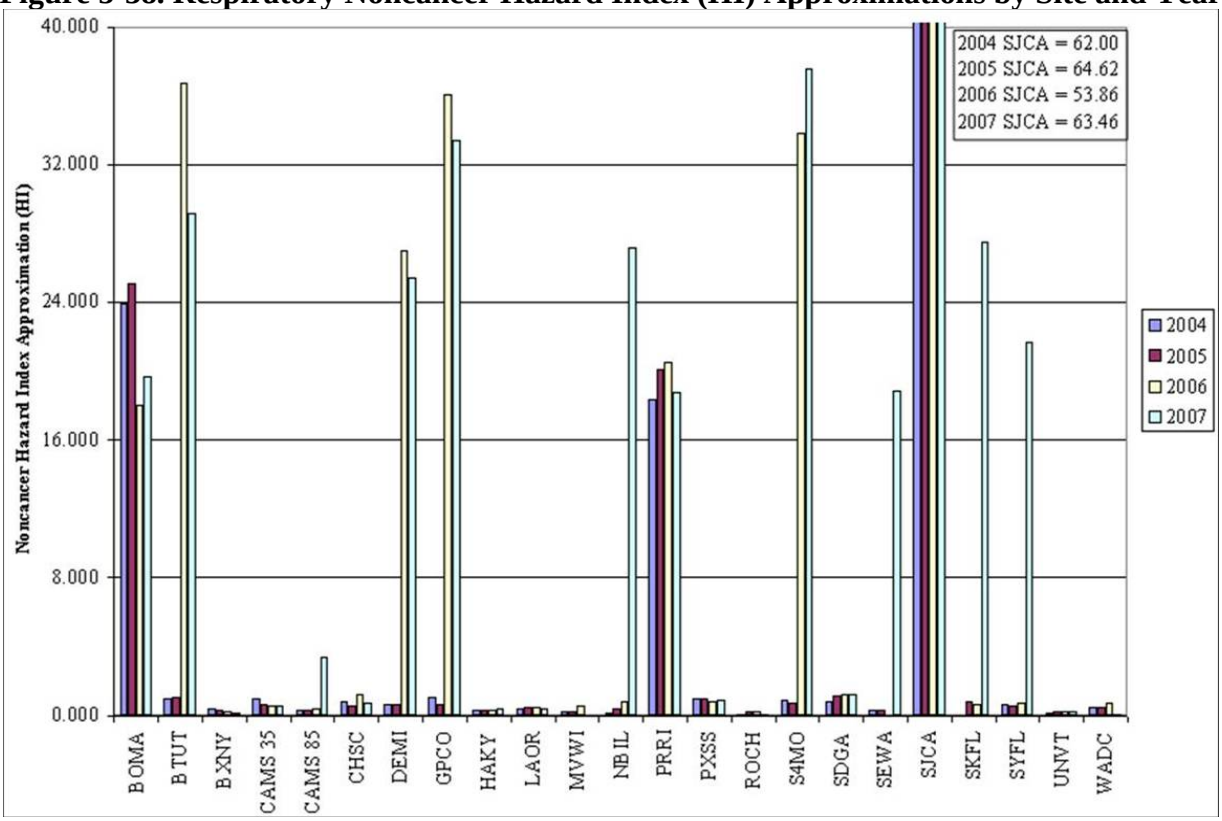
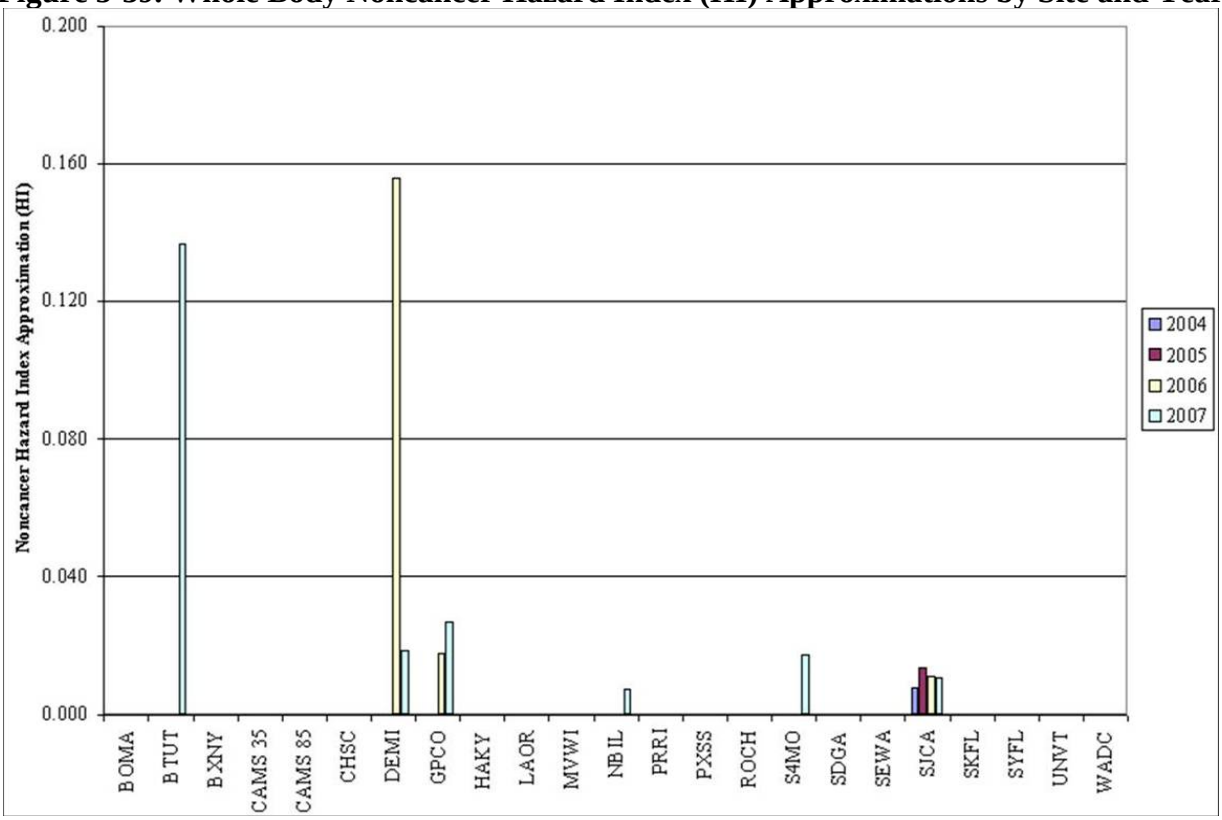


Figure 5-39. Whole Body Noncancer Hazard Index (HI) Approximations by Site and Year



5.4 Risk-Based Emissions Comparison

The final data analysis in this section compares toxicity-weighted emissions and cancer and noncancer risk approximations. This type of comparison can help state/local agencies prioritize pollutants based on toxicity. Tables 5-19 through 5-41 present the Top 10 cancer toxicity weightings at a county in which a NATTS site resides. For comparison, the Top 10 cancer risk approximations are also ranked for each year and each site. Among the cancer-causing pollutants, benzene consistently is among the Top 10 for toxicity-weighted emissions among all 23 NATTS sites. Other consistent pollutants include acetaldehyde, arsenic, and 1,3-butadiene. While most NATTS sites matched three or less pollutants, BOMA, SEWA, and SJCA each prioritized five of the same Top 10 pollutants.

Tables 5-42 through 5-64 present the Top 10 noncancer toxicity weightings at a county in which a NATTS site resides. Among the noncancer-causing pollutants, acrolein typically has the highest toxicity-weighted emissions, often an order or two higher than the next highest pollutant. While most NATTS sites matched five or less pollutants, GPCO and PRRI each prioritized seven of the same Top 10 pollutants.

Other observations from this analysis include:

- Although carbon tetrachloride cancer toxicity-weighted emissions are extremely low, cancer risk approximations are generally in the Top 10. This is primarily due to the long lifetime of carbon tetrachloride residing in the atmosphere.

- Cancer risk approximations at HAKY for 2004 and 2005 are extremely high, and are not very similar to the toxicity-weighted emissions profile for the county. This may further support the questionable nature of the data.

- The first full year of acrolein sampling was 2006. Less than half of the NATTS sites successfully detected enough acrolein concentrations to develop valid annual averages in 2006 and/or 2007. Given the importance of this pollutant being designated as a national driver from the 1999 NATA, it would be expected that most sites would make it a priority to increase acrolein's detection rate through improved sampling and analytical techniques.

- Naphthalene and other POM toxicity-weighted emissions are typically in the Top 10 among cancer-causing pollutants. Beginning in 2008, these pollutants will be sampled for at all NATTS sites.

Table 5-19. Comparison of Toxicity-Weighted Emissions and Cancer Risk Approximations at BOMA

Suffolk County, MA		Cancer Risk Approximations (in-a-million)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk
Benzene	2.01E-03	Carbon Tet.	9.21	Benzene	9.29	Benzene	8.86	Carbon Tet.	8.49
Chromium (6+)	1.19E-03	Chloroform	8.74	Chloroform	8.89	Carbon Tet.	7.34	Chloroform	7.07
1,3-Butadiene	9.74E-04	Benzene	7.49	Carbon Tet.	8.44	Chloroform	6.63	Benzene	7.04
POM	9.22E-04	Arsenic Comp.	3.45	Butadiene,1,3-	4.18	Butadiene,1,3-	3.81	Acetaldehyde	3.30
Naphthalene	4.06E-04	Acetaldehyde	3.23	Acetaldehyde	3.71	Acetaldehyde	3.07	Butadiene,1,3-	3.16
Arsenic Comp.	2.22E-04	Dichlorobenzene, *p*-	2.82	Arsenic Comp.	2.11	Arsenic Comp.	2.21	Arsenic Comp.	2.07
Tetrachloroethylene	1.83E-04	Butadiene,1,3-	2.75	Dichlorobenzene, *p*-	2.09	Dichlorobenzene, *p*-	1.96	Chloromethane	2.04
Acetaldehyde	1.41E-04	Tetrachloroethylene	2.10	Chloromethane	1.88	Chloromethane	1.88	Dichlorobenzene, *p*-	1.75
MTBE	1.25E-04	Chloromethane	1.80	Tetrachloroethylene	1.38	Tetrachloroethylene	1.32	Tetrachloroethylene	1.11
Cadmium Comp.	4.01E-05	Nickel Comp.	1.06	Chromium (6+)	0.88	Chromium (6+)	0.65	Ethylene Dichloride	0.64

Table 5-20. Comparison of Toxicity-Weighted Emissions and Cancer Risk Approximations at BTUT

Davis County, UT		Cancer Risk Approximations (in-a-million)							
	2005	2004		2005		2006		2007	
Pollutant	**Toxicity-Weighted Emissions**	**Pollutant**	**Cancer Risk**	**Pollutant**	**Cancer Risk**	**Pollutant**	**Cancer Risk**	**Pollutant**	**Cancer Risk**
Benzene	1.89E-03	Arsenic Comp.	14.23	Benzene	12.53	Benzene	10.80	Benzene	9.06
1,3-Butadiene	6.44E-04	Benzene	13.86	Carbon Tet.	8.31	Carbon Tet.	9.17	Carbon Tet.	8.25
Chromium (6+)	2.52E-04	Acetaldehyde	8.69	Acetaldehyde	8.23	Acetaldehyde	7.43	Chloroform	6.96
Naphthalene	1.22E-04	Carbon Tet.	7.94	Arsenic Comp.	4.47	Chloroform	7.08	Acetaldehyde	4.83
POM	9.92E-05	Chloromethane	2.22	Chloromethane	2.27	Butadiene,1,3-	4.33	Arsenic Comp.	4.22
Tetrachloroethylene	7.66E-05	Nickel Comp.	0.54	Nickel Comp.	0.99	Arsenic Comp.	3.22	Butadiene,1,3-	3.11
Acetaldehyde	6.18E-05	Ethylbenzene	0.37	Chromium (6+)	0.36	Chloromethane	2.22	Dichlorobenzene, *p*-	2.47
p-Dichlorobenzene	5.88E-05	Cadmium Comp.	0.32	Cadmium Comp.	0.32	Cadmium Comp.	1.32	Chloromethane	2.17
Arsenic Comp.	5.00E-05	Methylene Chloride	0.20	Ethylbenzene	0.30	Tetrachloroethylene	1.12	Tetrachloroethylene	1.80
Cadmium Comp.	4.85E-05	Formaldehyde	0.03	Methylene Chloride	0.20	Chromium (6+)	0.46	Cadmium Comp.	0.47

Table 5-21. Comparison of Toxicity-Weighted Emissions and Cancer Risk Approximations at BXNY

Bronx County, NY		Cancer Risk Approximations (in-a-million)							
	2005	2004		2005		2006		2007	
Pollutant	**Toxicity-Weighted Emissions**	**Pollutant**	**Cancer Risk**	**Pollutant**	**Cancer Risk**	**Pollutant**	**Cancer Risk**	**Pollutant**	**Cancer Risk**
Benzene	2.31E-03	Chloroform	16.38	Chloroform	15.53	Chloroform	11.95	Chloroform	16.55
Naphthalene	2.23E-03	Dibromoethane, 1,2-	11.36	Carbon Tet.	9.90	Carbon Tet.	8.70	Dichlorobenzene, *p*-	10.36
Tetrachloroethylene	1.79E-03	Carbon Tet.	10.22	Benzene	9.46	Benzene	7.84	Carbon Tet.	9.98
1,3-Butadiene	9.12E-04	Benzene	8.35	Dichlorobenzene, *p*-	9.02	Dichlorobenzene, *p*-	7.58	Benzene	8.28
Chromium (6+)	6.83E-04	Dichlorobenzene, *p*-	7.03	Butadiene,1,3-	4.92	Butadiene,1,3-	4.32	Tetrachloroethane, 1,1,2,2-	6.14
1,3-Dichloropropene	4.33E-04	Butadiene,1,3-	5.13	Tetrachloroethylene	4.28	Tetrachloroethylene	3.34	Butadiene,1,3-	4.38
Arsenic Comp.	3.49E-04	Tetrachloroethylene	4.49	Chloromethane	2.21	Chloromethane	1.92	Tetrachloroethylene	4.03
p-Dichlorobenzene	2.63E-04	Acetaldehyde	2.75	Acetaldehyde	2.08	Acetaldehyde	1.66	Nickel Comp.	2.69
Acetaldehyde	1.35E-04	Hexachloro-1,3-butadiene	2.54	Ethylene Dichloride	1.28	Methylene Chloride	0.25	Arsenic Comp.	2.54
Nickel Comp.	1.34E-04	Chloromethane	2.07	Methylene Chloride	0.31	Ethylbenzene	0.24	Chloromethane	2.09

Table 5-22. Comparison of Toxicity-Weighted Emissions and Cancer Risk Approximations at CAMS 35

Harris County, TX		Cancer Risk Approximations (in-a-million)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk
1,3-Butadiene	1.90E-02	Arsenic Comp.	24.62	Benzene	16.68	Benzene	14.04	Chloroform	18.12
Benzene	1.77E-02	Dibromoethane, 1,2-	23.24	Carbon Tet.	10.13	Carbon Tet.	8.85	Butadiene,1,3-	17.13
Chromium (6+)	8.56E-03	Butadiene,1,3-	14.32	Chloroform	8.84	Chloroform	7.93	Benzene	13.98
Benzidine	6.98E-03	Benzene	13.68	Dibromoethane, 1,2-	8.45	Dibromoethane, 1,2-	7.93	Ethylene Dichloride	9.22
Nickel Comp.	5.45E-03	Chloroform	11.05	Butadiene,1,3-	7.31	Butadiene,1,3-	6.78	Carbon Tet.	9.14
Arsenic Comp.	4.41E-03	Carbon Tet.	9.54	Arsenic Comp.	5.34	Ethylene Dichloride	6.76	Dibromoethane, 1,2-	8.45
Naphthalene	4.40E-03	Ethylene Dichloride	6.52	Ethylene Dichloride	4.87	Arsenic Comp.	4.78	Arsenic Comp.	6.97
Tetrachloroethylene	2.59E-03	Acetaldehyde	5.84	Acetaldehyde	4.81	Acetaldehyde	3.67	Acetaldehyde	3.41
POM	2.05E-03	Tetrachloroethane, 1,1,2,2-	5.30	Chloromethane	2.58	Chloromethane	2.56	Chloromethane	2.84
Ethylene Oxide	1.78E-03	Chloromethane	2.49	Tetrachloroethane, 1,1,2,2-	1.99	Tetrachloroethane, 1,1,2,2-	1.88	Chromium (6+)	2.17

Table 5-23. Comparison of Toxicity-Weighted Emissions and Cancer Risk Approximations at CAMS 85

Harrison County, TX		Cancer Risk Approximations (in-a-million)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk
Benzene	1.95E-03	Dibromoethane, 1,2-	19.25	Benzene	12.23	Benzene	11.89	Benzene	10.27
1,3-Butadiene	1.57E-03	Benzene	10.37	Carbon Tet.	9.46	Carbon Tet.	9.23	Carbon Tet.	9.02
POM	1.52E-03	Carbon Tet.	9.12	Dibromoethane, 1,2-	9.38	Dibromoethane, 1,2-	8.45	Dibromoethane, 1,2-	8.32
Asbestos	1.16E-03	Tetrachloroethane, 1,1,2,2-	4.87	Acetaldehyde	2.62	Arsenic Comp.	2.65	Chloroform	3.91
Ethylene Oxide	8.77E-04	Chloroform	4.73	Chloroform	2.47	Chloroform	2.38	Chloromethane	2.47
Chromium (6+)	4.48E-04	Chloromethane	2.40	Arsenic Comp.	2.41	Chloromethane	2.23	Arsenic Comp.	2.46
Arsenic Comp.	4.02E-04	Arsenic Comp.	2.29	Chloromethane	2.24	Tetrachloroethane, 1,1,2,2-	1.99	Chromium (6+)	2.20
Naphthalene	2.78E-04	Acetaldehyde	1.69	Tetrachloroethane, 1,1,2,2-	2.21	Acetaldehyde	1.98	Tetrachloroethane, 1,1,2,2-	2.06
Cadmium Comp.	2.23E-04	Ethylene Dichloride	1.25	Ethylene Dichloride	0.53	Butadiene,1,3-	0.57	Acetaldehyde	1.73
Acetaldehyde	1.40E-04	Dichloropropane, 1,2-	1.07	Dichloropropane, 1,2-	0.44	Ethylene Dichloride	0.55	Ethylene Dichloride	0.81

Table 5-24. Comparison of Toxicity-Weighted Emissions and Cancer Risk Approximations at CHSC

Chesterfield County, SC		Cancer Risk Approximations (in-a-million)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk
Benzene	6.50E-04	Acetaldehyde	8.66	Acetaldehyde	3.00	Acetaldehyde	11.65	Acetaldehyde	5.61
POM	5.13E-04	Formaldehyde	0.02	Arsenic Comp.	2.57	Arsenic Comp.	2.70	Benzene	3.10
1,3-Butadiene	4.95E-04			Nickel Comp.	0.58	Cadmium Comp.	0.54	Arsenic Comp.	2.92
Chromium (6+)	1.47E-04			Cadmium Comp.	0.48	Nickel Comp.	0.40	Nickel Comp.	0.29
Naphthalene	6.11E-05			Formaldehyde	0.02	Formaldehyde	0.03	Cadmium Comp.	0.24
Acetaldehyde	3.93E-05							Formaldehyde	0.02
Arsenic Comp.	2.50E-05								
p-Dichlorobenzene	1.02E-05								
Tetrachloroethylene	9.80E-06								
Nickel Comp.	9.68E-06								

Table 5-25. Comparison of Toxicity-Weighted Emissions and Cancer Risk Approximations at DEMI

Wayne County, MI		Cancer Risk Approximations (in-a-million)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk
Coke Oven Emissions	2.58E-02	Tetrachloroethylene	26.61	Tetrachloroethylene	20.96	Chloroform	65.89	Chloroform	72.32
Benzene	1.48E-02	Benzene	14.36	Benzene	11.75	Carbon Tet.	9.88	Carbon Tet.	9.44
1,3-Butadiene	5.63E-03	Carbon Tet.	12.21	Carbon Tet.	9.26	Benzene	9.87	Benzene	8.17
POM	5.30E-03	Arsenic Comp.	11.39	Arsenic Comp.	8.92	Arsenic Comp.	8.46	Arsenic Comp.	7.62
Naphthalene	2.93E-03	Acetaldehyde	4.93	Acetaldehyde	4.05	Tetrachloroethylene	5.44	Butadiene,1,3-	3.05
Cadmium Comp.	2.78E-03	Chloromethane	2.48	Chloromethane	2.58	Butadiene,1,3-	3.76	Chloromethane	2.19
Tetrachloroethylene	2.29E-03	Cadmium Comp.	1.69	Cadmium Comp.	1.33	Acetaldehyde	3.67	Tetrachloroethylene	1.94
Chromium (6+)	1.21E-03	Nickel Comp.	0.77	Nickel Comp.	0.97	Chloromethane	2.15	Dichlorobenzene, *p*-	1.45
Arsenic Comp.	8.58E-04	Ethylbenzene	0.41	Chromium (6+)	0.83	Dichlorobenzene, *p*-	1.23	Cadmium Comp.	0.95
p-Dichlorobenzene	8.43E-04	Beryllium Comp.	0.11	Ethylbenzene	0.34	Cadmium Comp.	1.05	Nickel Comp.	0.56

Table 5-26. Comparison of Toxicity-Weighted Emissions and Cancer Risk Approximations at GPCO

Mesa County, CO		Cancer Risk Approximations (in-a-million)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk
Benzene	1.41E-03	Benzene	16.90	Benzene	15.04	Benzene	14.67	Benzene	11.57
1,3-Butadiene	6.67E-04	Acetaldehyde	14.15	Carbon Tet.	7.74	Chloroform	9.55	Carbon Tet.	7.83
POM	2.70E-04	Carbon Tet.	8.56	Butadiene,1,3-	7.67	Carbon Tet.	8.92	Chloroform	7.28
Arsenic Comp.	2.10E-04	Butadiene,1,3-	6.92	Acetaldehyde	6.57	Butadiene,1,3-	6.14	Acetaldehyde	6.08
Naphthalene	1.32E-04	Chloromethane	2.27	Chloromethane	2.33	Acetaldehyde	5.21	Butadiene,1,3-	4.87
Chromium (6+)	1.27E-04	Ethylbenzene	0.60	Ethylbenzene	0.75	Tetrachloroethylene	2.53	Chloromethane	2.18
Acetaldehyde	6.05E-05	Methylene Chloride	0.34	Chromium (6+)	0.37	Chloromethane	2.20	Tetrachloroethylene	2.00
Acrylonitrile	5.94E-05	Formaldehyde	0.02	Methylene Chloride	0.21	Chromium (6+)	0.41	Dichlorobenzene, *p*-	0.78
1,1,2,2-Tetrachloroethane	2.81E-05			Formaldehyde	0.02	Ethylbenzene	0.37	Ethylbenzene	0.34
Tetrachloroethylene	1.72E-05					Methylene Chloride	0.20	Chromium (6+)	0.22

Table 5-27. Comparison of Toxicity-Weighted Emissions and Cancer Risk Approximations at HAKY

Hazard County, KY		Cancer Risk Approximations (in-a-million)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk
POM	6.15E-04	Acetaldehyde	1.87	Acetaldehyde	2.35	Benzene	10.42	Benzene	9.56
Benzene	6.02E-04	Formaldehyde	0.01	Formaldehyde	0.01	Arsenic Comp.	6.95	Arsenic Comp.	6.84
1,3-Butadiene	5.46E-04					Acetaldehyde	2.04	Acetaldehyde	2.75
Acetaldehyde	4.88E-05					Chromium (6+)	0.24	Nickel Comp.	0.10
Naphthalene	3.47E-05					Formaldehyde	0.01	Formaldehyde	0.01
Tetrachloroethylene	2.28E-05								
Arsenic Comp.	1.17E-05								
Chromium (6+)	9.96E-06								
p-Dichlorobenzene	6.85E-06								
Ethylene Oxide	2.79E-06								

Table 5-28. Comparison of Toxicity-Weighted Emissions and Cancer Risk Approximations at LAOR

Union County, OR		Cancer Risk Approximations (in-a-million)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk
POM	3.24E-03	Arsenic Comp.	1.60	Acetaldehyde	4.01	Acetaldehyde	4.02	Acetaldehyde	3.36
1,3-Butadiene	1.46E-03	Cadmium Comp.	0.68	Arsenic Comp.	1.48	Arsenic Comp.	1.04	Formaldehyde	0.01
Benzene	1.40E-03	Nickel Comp.	0.06	Cadmium Comp.	0.11	Chromium (6+)	0.34		
Naphthalene	1.34E-04	Formaldehyde	0.02	Nickel Comp.	0.04	Cadmium Comp.	0.10		
Acetaldehyde	1.27E-04	Beryllium Comp.	0.01	Formaldehyde	0.02	Nickel Comp.	0.05		
Tetrachloroethylene	3.48E-05			Beryllium Comp.	0.01	Beryllium Comp.	0.02		
Arsenic Comp.	1.50E-05					Formaldehyde	0.01		
p-Dichlorobenzene	1.05E-05								
1,3-Dichloropropene	7.84E-06								
Chromium (6+)	6.40E-06								

Table 5-29. Comparison of Toxicity-Weighted Emissions and Cancer Risk Approximations at MVWI

Dodge County, WI		Cancer Risk Approximations (in-a-million)							
	2005	2004		2005		2006		2007	
Pollutant	**Toxicity-Weighted Emissions**	**Pollutant**	**Cancer Risk**	**Pollutant**	**Cancer Risk**	**Pollutant**	**Cancer Risk**	**Pollutant**	**Cancer Risk**
Benzene	1.32E-03	Carbon Tet.	7.18	Carbon Tet.	9.27	Carbon Tet.	7.62	Carbon Tet.	8.11
POM	4.72E-04	Benzene	2.22	Acetaldehyde	3.71	Acetaldehyde	3.58	Benzene	3.65
1,3-Butadiene	3.55E-04	Acetaldehyde	1.69	Arsenic Comp.	3.47	Benzene	2.96	Chloromethane	1.98
Chromium (6+)	1.77E-04	Chloromethane	1.47	Benzene	3.45	Arsenic Comp.	2.94	Chromium (6+)	0.21
Naphthalene	1.52E-04	Methylene Chloride	0.10	Chloromethane	1.66	Chloromethane	1.82	Methylene Chloride	0.13
Tetrachloroethylene	8.77E-05	Formaldehyde	0.01	Cadmium Comp.	0.34	Nickel Comp.	0.35		
Arsenic Comp.	6.50E-05			Nickel Comp.	0.18	Cadmium Comp.	0.29		
Acetaldehyde	5.45E-05			Ethylbenzene	0.14	Formaldehyde	0.02		
p-Dichlorobenzene	3.61E-05								
Beryllium Comp.	3.45E-05								

Table 5-30. Comparison of Toxicity-Weighted Emissions and Cancer Risk Approximations at NBIL

Cook County, IL		Cancer Risk Approximations (in-a-million)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk
Benzene	1.60E-02	Benzene	7.07	Carbon Tet.	10.16	Chloroform	29.70	Chloroform	62.84
Chromium (6+)	9.18E-03	Chloromethane	2.36	Benzene	7.36	Carbon Tet.	10.65	Carbon Tet.	9.75
Cadmium Comp.	7.49E-03	Acetaldehyde	1.25	Acetaldehyde	2.92	Benzene	5.00	Benzene	4.40
1,3-Butadiene	7.32E-03	Formaldehyde	<0.01	Arsenic Comp.	2.81	Arsenic Comp.	3.70	Arsenic Comp.	3.96
Naphthalene	7.29E-03			Chloromethane	2.29	Tetrachloroethylene	2.41	Dichlorobenzene, *p*-	3.66
Tetrachloroethylene	6.93E-03			Chromium (6+)	0.39	Chloromethane	2.20	Chloromethane	2.12
p-Dichlorobenzene	5.76E-03			Nickel Comp.	0.36	Acetaldehyde	2.10	Tetrachloroethylene	1.60
Arsenic Comp.	2.95E-03			Cadmium Comp.	0.32	Butadiene,1,3-	2.05	Acetaldehyde	1.55
Acetaldehyde	1.44E-03			Methylene Chloride	0.25	Chromium (6+)	0.51	Butadiene,1,3-	1.48
POM	1.43E-03			Ethylbenzene	0.22	Trichloroethylene	0.39	Cadmium Comp.	0.42

Table 5-31. Comparison of Toxicity-Weighted Emissions and Cancer Risk Approximations at PRRI

Providence County, RI		Cancer Risk Approximations (in-a-million)							
	2005	2004		2005		2006		2007	
Pollutant	**Toxicity-Weighted Emissions**	**Pollutant**	**Cancer Risk**	**Pollutant**	**Cancer Risk**	**Pollutant**	**Cancer Risk**	**Pollutant**	**Cancer Risk**
Benzene	2.69E-03	Carbon Tet.	8.59	Chloroform	7.98	Chloroform	8.55	Carbon Tet.	8.31
1,3-Butadiene	1.21E-03	Benzene	7.83	Carbon Tet.	7.81	Benzene	8.54	Chloroform	7.77
Chromium (6+)	1.20E-03	Chloroform	7.63	Benzene	7.28	Carbon Tet.	7.54	Benzene	5.87
Nickel Comp.	5.44E-04	Butadiene,1,3-	4.56	Acetaldehyde	4.31	Butadiene,1,3-	3.74	Acetaldehyde	3.26
Tetrachloroethylene	5.17E-04	Acetaldehyde	2.63	Butadiene,1,3-	3.52	Acetaldehyde	3.20	Butadiene,1,3-	3.02
Cadmium Comp.	2.89E-04	Chloromethane	1.98	Chloromethane	1.83	Dichlorobenzene, *p*-	2.19	Chloromethane	2.05
Naphthalene	2.61E-04	Dichlorobenzene, *p*-	1.87	Nickel Comp.	1.56	Tetrachloroethylene	1.95	Dichlorobenzene, *p*-	1.61
POM	2.42E-04	Tetrachloroethylene	1.67	Dichlorobenzene, *p*-	1.38	Chloromethane	1.90	Tetrachloroethylene	1.37
Arsenic Comp.	2.36E-04	Nickel Comp.	1.25	Tetrachloroethylene	1.37	Nickel Comp.	0.82	Ethylene Dichloride	0.69
MTBE	1.65E-04	Trichloroethylene	0.43	Trichloroethylene	0.37	Trichloroethylene	0.42	Nickel Comp.	0.64

Table 5-32. Comparison of Toxicity-Weighted Emissions and Cancer Risk Approximations at PXSS

Maricopa County, AZ		Cancer Risk Approximations (in-a-million)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk
Benzene	1.51E-02	Chloroform	40.35	Chloroform	43.03	Chloroform	26.54	Acetaldehyde	7.16
1,3-Butadiene	7.78E-03	Benzene	18.93	Benzene	17.74	Benzene	17.20	Arsenic Comp.	2.99
Naphthalene	4.58E-03	Carbon Tet.	11.52	Butadiene,1,3-	12.86	Butadiene,1,3-	11.31	Chromium (6+)	1.04
POM	2.79E-03	Dichlorobenzene, *p*-	11.10	Dichlorobenzene, *p*-	11.54	Carbon Tet.	8.74	Nickel Comp.	0.39
Arsenic Comp.	2.42E-03	Acetaldehyde	7.03	Carbon Tet.	9.01	Dichlorobenzene, *p*-	7.53	Cadmium Comp.	0.32
Tetrachloroethylene	1.70E-03	Tetrachloroethylene	5.76	Tetrachloroethylene	7.51	Tetrachloroethylene	6.64	Beryllium Comp.	0.05
Chromium (6+)	1.47E-03	Chloromethane	1.97	Acetaldehyde	6.44	Acetaldehyde	6.08	Formaldehyde	0.03
p-Dichlorobenzene	1.36E-03	Ethylbenzene	0.79	Chloromethane	1.68	Arsenic Comp.	2.43		
1,3-Dichloropropene	9.54E-04	Trichloroethylene	0.49	Ethylbenzene	0.79	Ethylene Dichloride	1.98		
Acetaldehyde	9.11E-04	Methylene Chloride	0.37	Methylene Chloride	0.37	Chromium (6+)	1.67		

Table 5-33. Comparison of Toxicity-Weighted Emissions and Cancer Risk Approximations at ROCH

Rochester County, NY		Cancer Risk Approximations (in-a-million)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk
Benzene	5.30E-03	Chloroform	11.32	Dibromoethane, 1,2-	11.54	Carbon Tet.	8.80	Carbon Tet.	9.33
1,3-Butadiene	2.06E-03	Carbon Tet.	11.01	Carbon Tet.	9.52	Chloroform	7.38	Chloroform	8.35
Naphthalene	2.05E-03	Dibromoethane, 1,2-	10.46	Chloroform	9.25	Benzene	5.78	Benzene	4.87
Arsenic Comp.	1.98E-03	Benzene	6.13	Benzene	6.32	Chloromethane	2.12	Arsenic Comp.	2.97
Chromium (6+)	1.65E-03	Butadiene,1,3-	2.58	Butadiene,1,3-	2.83	Acetaldehyde	1.35	Chloromethane	1.79
Tetrachloroethylene	8.83E-04	Hexachloro-1,3-butadiene	2.51	Hexachloro-1,3-butadiene	2.39	Tetrachloroethylene	1.11	Butadiene,1,3-	1.73
Cadmium Comp.	4.07E-04	Chloromethane	2.01	Chloromethane	1.94	Dichlorobenzene, *p*-	0.97	Ethylene Dichloride	1.25
POM	3.93E-04	Tetrachloroethylene	1.55	Acetaldehyde	1.69	Methylene Chloride	0.15	Dichlorobenzene, *p*-	0.82
Acrylonitrile	2.49E-04	Ethylene Dichloride	1.26	Ethylene Dichloride	1.39	Ethylbenzene	0.15	Tetrachloroethylene	0.71
1,3-Dichloropropene	2.36E-04	Trichloroethylene	0.23	Tetrachloroethylene	1.28	Trichloroethylene	0.12	Cadmium Comp.	0.21

Table 5-34. Comparison of Toxicity-Weighted Emissions and Cancer Risk Approximations at S4MO

St. Louis City, MO		Cancer Risk Approximations (in-a-million)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk
Benzene	1.85E-03	Benzene	9.74	Arsenic Comp.	9.70	Chloroform	17.84	Chloroform	17.57
1,3-Butadiene	6.89E-04	Carbon Tet.	8.95	Carbon Tet.	9.12	Carbon Tet.	9.46	Acetaldehyde	8.83
Chromium (6+)	6.51E-04	Acetaldehyde	7.39	Benzene	9.01	Benzene	7.14	Carbon Tet.	8.65
Arsenic Comp.	4.55E-04	Arsenic Comp.	7.04	Acetaldehyde	5.88	Acetaldehyde	6.32	Benzene	6.60
Naphthalene	2.00E-04	Chloromethane	2.10	Chloromethane	2.40	Arsenic Comp.	4.48	Arsenic Comp.	4.91
Acetaldehyde	1.69E-04	Cadmium Comp.	2.05	Cadmium Comp.	1.68	Butadiene,1,3-	3.11	Butadiene,1,3-	2.80
Tetrachloroethylene	1.08E-04	Methylene Chloride	0.44	Chromium (6+)	0.45	Dichlorobenzene, *p*-	2.77	Dichlorobenzene, *p*-	2.77
Trichloroethylene	8.85E-05	Ethylbenzene	0.33	Ethylbenzene	0.30	Chloromethane	2.06	Chloromethane	1.98
POM	8.08E-05	Nickel Comp.	0.31	Nickel Comp.	0.29	Tetrachloroethylene	1.11	Cadmium Comp.	1.36
Hydrazine	3.43E-05	Formaldehyde	0.03	Methylene Chloride	0.28	Cadmium Comp.	1.08	Tetrachloroethylene	1.28

Table 5-35. Comparison of Toxicity-Weighted Emissions and Cancer Risk Approximations at SDGA

DeKalb County, GA		Cancer Risk Approximations (in-a-million)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk
Benzene	5.37E-03	Acetaldehyde	5.58	Benzene	9.36	Benzene	7.57	Acetaldehyde	7.62
Arsenic Comp.	2.55E-03	Chloromethane	1.96	Carbon Tet.	8.50	Carbon Tet.	7.33	Carbon Tet.	7.55
1,3-Butadiene	1.67E-03	Formaldehyde	0.03	Acetaldehyde	6.68	Acetaldehyde	6.42	Benzene	6.83
Chromium (6+)	6.82E-04			Arsenic Comp.	3.02	Arsenic Comp.	4.55	Chloromethane	1.95
Naphthalene	4.85E-04			Chloromethane	1.80	Chloromethane	1.76	Chromium (6+)	0.26
POM	3.67E-04			Nickel Comp.	0.56	Nickel Comp.	0.77	Nickel Comp.	0.23
Tetrachloroethylene	3.11E-04			Chromium (6+)	0.47	Chromium (6+)	0.64	Cadmium Comp.	0.17
Acetaldehyde	1.60E-04			Cadmium Comp.	0.19	Cadmium Comp.	0.33	Formaldehyde	0.04
Cadmium Comp.	1.18E-04			Ethylbenzene	0.16	Ethylbenzene	0.21		
Nickel Comp.	5.77E-05			Formaldehyde	0.04	Formaldehyde	0.05		

Table 5-36. Comparison of Toxicity-Weighted Emissions and Cancer Risk Approximations at SEWA

King County, WA		Cancer Risk Approximations (in-a-million)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk
Benzene	2.02E-02	Chloroform	17.27	Chloroform	18.15	No Data Reported		Carbon Tet.	10.17
1,3-Butadiene	6.78E-03	Carbon Tet.	9.73	Carbon Tet.	9.44			Chloroform	9.99
POM	3.00E-03	Benzene	9.48	Benzene	4.85			Benzene	6.52
Naphthalene	2.04E-03	Arsenic Comp.	3.99	Arsenic Comp.	4.46			Arsenic Comp.	3.97
Chromium (6+)	1.82E-03	Butadiene,1,3-	3.65	Acetaldehyde	3.07			Butadiene,1,3-	2.78
Tetrachloroethylene	8.12E-04	Acetaldehyde	3.04	Butadiene,1,3-	2.37			Acetaldehyde	2.09
Acetaldehyde	7.48E-04	Tetrachloroethylene	1.00	Tetrachloroethylene	1.39			Chloromethane	2.06
Arsenic Comp.	6.11E-04	Nickel Comp.	0.69	Nickel Comp.	0.73			Tetrachloroethylene	0.97
p-Dichlorobenzene	4.15E-04	Cadmium Comp.	0.25	Chromium (6+)	0.60			Chromium (6+)	0.58
Ethylene Oxide	1.14E-04	Trichloroethylene	0.18	Trichloroethylene	0.34			Nickel Comp.	0.53

Table 5-37. Comparison of Toxicity-Weighted Emissions and Cancer Risk Approximations at SJCA

Santa Clara, CA		Cancer Risk Approximations (in-a-million)							
	2005	2004		2005		2006		2007	
Pollutant	**Toxicity-Weighted Emissions**	**Pollutant**	**Cancer Risk**	**Pollutant**	**Cancer Risk**	**Pollutant**	**Cancer Risk**	**Pollutant**	**Cancer Risk**
Benzene	4.19E-03	Acrylonitrile	25.83	Acrylonitrile	24.35	Acrylonitrile	32.79	Acrylonitrile	24.49
Chromium (6+)	2.80E-03	Benzene	10.93	Benzene	10.39	Dichlorobenzene, *p*-	8.71	Benzene	10.09
1,3-Butadiene	2.61E-03	Chloroform	10.26	Dichlorobenzene, *p*-	9.62	Benzene	7.74	Chloroform	8.22
Naphthalene	2.31E-03	Dichlorobenzene, *p*-	9.01	Chloroform	9.17	Chloroform	7.59	Butadiene,1,3-	6.47
Arsenic Comp.	1.35E-03	Butadiene,1,3-	7.88	Butadiene,1,3-	7.13	Butadiene,1,3-	4.86	Acetaldehyde	3.16
Tetrachloroethylene	1.32E-03	Acetaldehyde	2.86	Acetaldehyde	3.13	Acetaldehyde	2.56	Tetrachloroethylene	1.19
p-Dichlorobenzene	1.00E-03	Tetrachloroethylene	1.32	Tetrachloroethylene	1.26	Tetrachloroethylene	0.99	Ethylbenzene	0.45
POM	7.37E-04	Ethylbenzene	0.51	Ethylbenzene	0.43	Ethylbenzene	0.34	Methylene Chloride	0.26
Acetaldehyde	6.29E-04	Methylene Chloride	0.24	Methylene Chloride	0.21	Methylene Chloride	0.19	Trichloroethylene	0.12
Acrylonitrile	4.40E-04	Trichloroethylene	0.13	Trichloroethylene	0.12	Trichloroethylene	0.10	Formaldehyde	0.01

Table 5-38. Comparison of Toxicity-Weighted Emissions and Cancer Risk Approximations at SKFL

Pinellas County, FL		Cancer Risk Approximations (in-a-million)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk
Benzene	5.28E-03	No Data Reported		Acrylonitrile	21.44	Chloroform	18.15	Chloroform	14.55
1,3-Butadiene	2.35E-03			Chloroform	15.29	Acrylonitrile	17.09	Acrylonitrile	12.59
Chromium (6+)	1.34E-03			Carbon Tet.	7.90	Benzene	8.80	Carbon Tet.	7.74
Nickel Comp.	7.98E-04			Benzene	7.27	Carbon Tet.	8.38	Benzene	6.22
Naphthalene	6.45E-04			Arsenic Comp.	5.73	Arsenic Comp.	5.65	Arsenic Comp.	4.70
Arsenic Comp.	6.18E-04			Butadiene,1,3-	5.61	Butadiene,1,3-	5.56	Acetaldehyde	4.30
POM	1.96E-04			Dichlorobenzene, *p*-	3.60	Acetaldehyde	2.91	Butadiene,1,3-	2.54
Acetaldehyde	1.91E-04			Acetaldehyde	3.57	Dichlorobenzene, *p*-	2.68	Chloromethane	2.31
MTBE	5.91E-05			Chloromethane	2.32	Chloromethane	2.40	Hexachloro-1,3-butadiene	2.19
Ethylene Oxide	5.01E-05			Ethylene Dichloride	1.59	Ethylene Dichloride	2.25	Tetrachloroethane, 1,1,2,2-	1.75

Table 5-39. Comparison of Toxicity-Weighted Emissions and Cancer Risk Approximations at SYFL

Hillsborough County, FL		Cancer Risk Approximations (in-a-million)							
	2005	2004		2005		2006		2007	
Pollutant	**Toxicity-Weighted Emissions**	**Pollutant**	**Cancer Risk**	**Pollutant**	**Cancer Risk**	**Pollutant**	**Cancer Risk**	**Pollutant**	**Cancer Risk**
Benzene	6.78E-03	Chloroform	11.67	Chloroform	11.39	Chloroform	12.40	Chloroform	9.90
1,3-Butadiene	3.04E-03	Acrylonitrile	11.46	Acrylonitrile	9.88	Carbon Tet.	8.51	Carbon Tet.	8.25
Chromium (6+)	1.51E-03	Carbon Tet.	7.99	Carbon Tet.	8.42	Acrylonitrile	5.93	Acetaldehyde	6.08
Naphthalene	9.47E-04	Arsenic Comp.	6.91	Arsenic Comp.	6.57	Arsenic Comp.	4.56	Arsenic Comp.	4.72
POM	7.26E-04	Benzene	4.04	Benzene	4.27	Benzene	4.37	Benzene	3.58
Arsenic Comp.	4.82E-04	Acetaldehyde	3.45	Butadiene,1,3-	3.57	Butadiene,1,3-	2.97	Acrylonitrile	3.11
Tetrachloroethylene	3.48E-04	Butadiene,1,3-	2.58	Acetaldehyde	2.70	Acetaldehyde	2.63	Chloromethane	2.39
Acetaldehyde	3.35E-04	Dichlorobenzene, *p*-	2.26	Chloromethane	2.45	Chloromethane	2.51	Hexachloro-1,3-butadiene	2.17
Cadmium Comp.	2.98E-04	Chloromethane	1.97	Dichlorobenzene, *p*-	1.64	Ethylene Dichloride	2.01	Tetrachloroethane, 1,1,2,2-	1.61
Nickel Comp.	1.85E-04	Tetrachloroethylene	0.97	Nickel Comp.	1.09	Dichlorobenzene, *p*-	1.76	Ethylene Dichloride	1.42

Table 5-40. Comparison of Toxicity-Weighted Emissions and Cancer Risk Approximations at UNVT

Chittenden County, VT		Cancer Risk Approximations (in-a-million)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk
Benzene	1.55E-03	Carbon Tet.	9.11	Carbon Tet.	8.66	Carbon Tet.	7.90	Carbon Tet.	8.32
1,3-Butadiene	6.70E-04	Chloroform	7.27	Chloroform	7.97	Chloroform	5.79	Chloroform	6.48
POM	2.50E-04	Benzene	2.86	Benzene	3.84	Benzene	2.18	Benzene	2.41
Arsenic Comp.	2.31E-04	Chloromethane	1.78	Chloromethane	2.06	Chloromethane	1.88	Chloromethane	2.20
Naphthalene	1.27E-04	Ethylbenzene	0.19	Acetaldehyde	1.43	Acetaldehyde	1.30	Acetaldehyde	1.33
Chromium (6+)	1.04E-04	Methylene Chloride	0.15	Ethylbenzene	0.25	Ethylene Dichloride	1.13	Methylene Chloride	0.09
Acetaldehyde	6.74E-05	Chloroethane	0.03	Methylene Chloride	0.12	Tetrachloroethylene	0.49	Ethylbenzene	0.03
Tetrachloroethylene	4.45E-05	Formaldehyde	0.01	Chloroethane	0.03	Methylene Chloride	0.09	Formaldehyde	0.01
p-Dichlorobenzene	3.50E-05			Formaldehyde	0.01	Ethylbenzene	0.03		
Cadmium Comp.	2.69E-05					Chloroethane	0.02		

Table 5-41. Comparison of Toxicity-Weighted Emissions and Cancer Risk Approximations at WADC

District of Columbia		Cancer Risk Approximations (in-a-million)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk	Pollutant	Cancer Risk
Benzene	1.84E-03	Chloroform	16.98	Chloroform	23.26	Chloroform	20.41	Benzene	7.39
1,3-Butadiene	8.37E-04	Carbon Tet.	8.11	Carbon Tet.	7.46	Carbon Tet.	7.14	Arsenic Comp.	2.83
Tetrachloroethylene	2.07E-04	Benzene	5.97	Benzene	7.09	Benzene	6.07	Nickel Comp.	0.46
Naphthalene	1.74E-04	Butadiene,1,3-	4.19	Butadiene,1,3-	5.53	Butadiene,1,3-	3.97	Cadmium Comp.	0.30
POM	1.52E-04	Arsenic Comp.	2.67	Acrylonitrile	3.69	Acetaldehyde	2.52	Ethylbenzene	0.19
Arsenic Comp.	1.45E-04	Tetrachloroethylene	2.00	Arsenic Comp.	2.68	Dichlorobenzene, *p*-	2.36	Chromium (6+)	0.18
p-Dichlorobenzene	1.34E-04	Chloromethane	1.86	Dichlorobenzene, *p*-	2.61	Arsenic Comp.	2.34		
MTBE	1.09E-04	Dichlorobenzene, *p*-	1.65	Tetrachloroethylene	2.54	Chloromethane	2.16		
Acetaldehyde	9.68E-05	Acetaldehyde	1.62	Acetaldehyde	2.02	Tetrachloroethylene	2.10		
Chromium (6+)	7.68E-05	Nickel Comp.	0.47	Chloromethane	1.88	Ethylene Dichloride	1.16		

Table 5-42. Comparison of Toxicity-Weighted Emissions and Noncancer Risk Approximations at BOMA

Suffolk County, MA		Noncancer Risk Approximations (HQ)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ
Acrolein	491,898	Acrolein	23.46	Acrolein	24.46	Acrolein	17.48	Acrolein	19.15
Formaldehyde	16,317	Formaldehyde	0.24	Formaldehyde	0.40	Formaldehyde	0.33	Formaldehyde	0.31
1,3-Butadiene	16,237	Acetaldehyde	0.16	Acetaldehyde	0.19	Acetaldehyde	0.15	Acetaldehyde	0.17
Cyanide Comp.	8,738	Manganese comp.	0.11	Manganese comp.	0.09	Manganese comp.	0.07	Manganese comp.	0.07
Benzene	8,610	Butadiene,1,3-	0.05	Butadiene,1,3-	0.07	Butadiene,1,3-	0.06	Butadiene,1,3-	0.05
Acetaldehyde	7,102	Nickel comp.	0.04	Benzene	0.04	Benzene	0.04	Benzene	0.03
Xylenes (Total)	4,811	Benzene	0.03	Nickel comp.	0.03	Nickel comp.	0.02	Nickel comp.	0.02
Naphthalene	3,981	Arsenic comp.	0.03	Xylenes (total)	0.03	Xylenes (total)	0.02	Toluene	0.02
Nickel Comp.	3,198	Cadmium comp.	0.02	Toluene	0.02	Arsenic comp.	0.02	Xylenes (total)	0.02
Glycol Ethers	2,608	Xylenes (total)	0.02	Cadmium comp.	0.02	Toluene	0.01	Arsenic comp.	0.02

Table 5-43. Comparison of Toxicity-Weighted Emissions and Noncancer Risk Approximations at BTUT

Davis County, UT		Noncancer Risk Approximations (HQ)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ
Acrolein	243,105	Formaldehyde	0.51	Formaldehyde	0.58	Acrolein	35.78	Acrolein	28.53
Hexamethylene Diisocyanate	12,765	Acetaldehyde	0.44	Acetaldehyde	0.42	Formaldehyde	0.57	Formaldehyde	0.35
1,3-Butadiene	10,738	Manganese comp.	0.19	Manganese comp.	0.15	Acetaldehyde	0.38	Acetaldehyde	0.24
Manganese Comp.	9,740	Arsenic comp.	0.11	Benzene	0.05	Manganese comp.	0.16	Manganese comp.	0.20
Benzene	8,061	Benzene	0.06	Nickel comp.	0.04	Butadiene,1,3-	0.07	Acetonitrile	0.14
Formaldehyde	7,283	Xylenes (total)	0.03	Arsenic comp.	0.03	Benzene	0.05	Butadiene,1,3-	0.05
Chlorine	4,710	Nickel comp.	0.02	Xylenes (total)	0.02	Cadmium comp.	0.04	Benzene	0.04
Xylenes (Total)	4,546	Toluene	0.02	Toluene	0.02	Arsenic comp.	0.02	Arsenic comp.	0.03
Cyanide Comp.	3,913	Chloromethane	0.01	Chloromethane	0.01	Carbon Disulfide	0.02	Toluene	0.03
Acetaldehyde	3,121	Carbon Tet.	0.01	Carbon Tet.	0.01	Xylenes (total)	0.02	Nickel comp.	0.02

Table 5-44. Comparison of Toxicity-Weighted Emissions and Noncancer Risk Approximations at BXNY

Bronx County, NY		Noncancer Risk Approximations (HQ)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ
Acrolein	963,779	Formaldehyde	0.20	Formaldehyde	0.14	Formaldehyde	0.13	Manganese comp.	0.16
Bromomethane	30,060	Acetaldehyde	0.14	Acetaldehyde	0.11	Acetaldehyde	0.08	Nickel comp.	0.11
Naphthalene	21,840	Butadiene,1,3-	0.09	Butadiene,1,3-	0.08	Butadiene,1,3-	0.07	Butadiene,1,3-	0.07
Cyanide Comp.	16,845	Dibromoethane, 1,2-	0.06	Benzene	0.04	Benzene	0.03	Benzene	0.04
1,3-Butadiene	15,197	Benzene	0.04	Xylenes (total)	0.02	Xylenes (total)	0.02	Arsenic comp.	0.02
Nickel Comp.	12,449	Bromomethane	0.02	Bromomethane	0.02	Toluene	0.02	Xylenes (total)	0.02
Formaldehyde	12,380	Xylenes (total)	0.02	Toluene	0.02	Carbon Tet.	0.01	Antimony comp.	0.02
Manganese Comp.	10,681	Carbon Tet.	0.02	Carbon Tet.	0.02	Chloromethane	0.01	Carbon Tet.	0.02
Benzene	9,863	Toluene	0.02	Chloromethane	0.01	Tetrachloroethylene	<0.01	Toluene	0.02
Xylenes (Total)	7,167	Chloromethane	0.01	Tetrachloroethylene	<0.01	Chloroform	<0.01	Chloromethane	0.01

Table 5-45. Comparison of Toxicity-Weighted Emissions and Noncancer Risk Approximations at CAMS 35

Harris County, TX		Noncancer Risk Approximations (HQ)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ
Acrolein	2,706,206	Formaldehyde	0.55	Formaldehyde	0.34	Formaldehyde	0.29	Formaldehyde	0.29
Chlorine	1,198,105	Acetaldehyde	0.29	Acetaldehyde	0.24	Acetaldehyde	0.19	Butadiene,1,3-	0.29
Hexamethylene Diisocyanate	519,704	Butadiene,1,3-	0.24	Butadiene,1,3-	0.12	Manganese comp.	0.12	Acetaldehyde	0.17
Nickel Comp.	505,006	Arsenic comp.	0.19	Manganese comp.	0.08	Butadiene,1,3-	0.11	Manganese comp.	0.08
Manganese Comp.	338,038	Dibromoethane, 1,2-	0.13	Benzene	0.07	Benzene	0.06	Benzene	0.06
1,3-Butadiene	315,889	Manganese comp.	0.09	Dibromoethane, 1,2-	0.05	Dibromoethane, 1,2-	0.05	Arsenic comp.	0.05
Formaldehyde	120,496	Benzene	0.06	Arsenic comp.	0.04	Arsenic comp.	0.04	Dibromoethane, 1,2-	0.05
Benzene	75,663	Toluene	0.04	Cadmium comp.	0.02	Cadmium comp.	0.03	Cadmium comp.	0.03
Hydrochloric Acid	67,814	Antimony comp.	0.03	Beryllium comp.	0.02	Nickel comp.	0.02	Beryllium comp.	0.03
Acetaldehyde	49,158	Cadmium comp.	0.03	Nickel comp.	0.02	Beryllium comp.	0.02	Nickel comp.	0.02

Table 5-46. Comparison of Toxicity-Weighted Emissions and Noncancer Risk Approximations at CAMS 85

Harrison County, TX		Noncancer Risk Approximations (HQ)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ
Acrolein	2,329,771	Formaldehyde	0.18	Formaldehyde	0.17	Formaldehyde	0.24	Acrolein	3.08
Manganese Comp.	60,099	Dibromoethane, 1,2-	0.11	Acetaldehyde	0.13	Acetaldehyde	0.10	Formaldehyde	0.20
Formaldehyde	31,572	Acetaldehyde	0.09	Dibromoethane, 1,2-	0.05	Benzene	0.05	Acetaldehyde	0.09
Chlorine	29,279	Benzene	0.04	Benzene	0.05	Dibromoethane, 1,2-	0.05	Dibromoethane, 1,2-	0.05
1,3-Butadiene	26,205	Arsenic comp.	0.02	Arsenic comp.	0.02	Arsenic comp.	0.02	Benzene	0.04
Hexamethylene Diisocyanate	8,941	Carbon Tet.	0.02	Carbon Tet.	0.02	Carbon Tet.	0.02	Arsenic comp.	0.02
Benzene	8,322	Chloromethane	0.01	Chloromethane	0.01	Chloromethane	0.01	Chloromethane	0.02
Acetaldehyde	7,053	Dichloropropane, 1,2-	0.01	Butadiene,1,3-	0.01	Butadiene,1,3-	0.01	Carbon Tet.	0.02
Cadmium Comp.	6,196	Butadiene,1,3-	0.01	Bromomethane	0.01	Bromomethane	0.01	Bromomethane	0.01
Maleic Anhydride	6,024	Bromomethane	0.01	Dichloropropane, 1,2-	0.01	Dichloropropane, 1,2-	0.01	Butadiene,1,3-	0.01

Table 5-47. Comparison of Toxicity-Weighted Emissions and Noncancer Risk Approximations at CHSC

Chesterfield County, SC		Noncancer Risk Approximations (HQ)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ
Acrolein	655,392	Acetaldehyde	0.44	Formaldehyde	0.40	Formaldehyde	0.62	Formaldehyde	0.42
Formaldehyde	9,090	Formaldehyde	0.40	Acetaldehyde	0.15	Acetaldehyde	0.59	Acetaldehyde	0.28
1,3-Butadiene	8,247	Manganese comp.	0.08	Manganese comp.	0.06	Manganese comp.	0.07	Manganese comp.	0.07
Benzene	2,779	Lead comp.	<0.01	Nickel comp.	0.02	Arsenic comp.	0.02	Arsenic comp.	0.02
Acetaldehyde	1,986			Arsenic comp.	0.02	Nickel comp.	0.02	Benzene	0.01
Cyanide Comp.	1,384			Cadmium comp.	0.01	Cadmium comp.	0.02	Nickel comp.	0.01
Xylenes (Total)	994			Lead comp.	<0.01	Antimony comp.	<0.01	Cadmium comp.	0.01
Nickel Comp.	896			Antimony comp.	<0.01	Lead comp.	<0.01	Antimony comp.	<0.01
Glycol Ethers	796			Cobalt comp.	<0.01	Cobalt comp.	<0.01	Lead comp.	<0.01
Manganese Comp.	792			Selenium comp.	<0.01	Selenium comp.	<0.01	Cobalt comp.	<0.01

Table 5-48. Comparison of Toxicity-Weighted Emissions and Noncancer Risk Approximations at DEMI

Wayne County, MI		Noncancer Risk Approximations (HQ)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ
Acrolein	1,863,713	Manganese comp.	1.61	Manganese comp.	1.46	Acrolein	26.47	Acrolein	25.37
Manganese Comp.	265,522	Formaldehyde	0.38	Formaldehyde	0.40	Manganese comp.	1.33	Manganese comp.	1.01
1,3-Butadiene	93,888	Acetaldehyde	0.25	Acetaldehyde	0.20	Formaldehyde	0.30	Arsenic comp.	0.06
Cadmium Comp.	77,106	Arsenic comp.	0.09	Arsenic comp.	0.07	Acetaldehyde	0.19	Butadiene,1,3-	0.05
Formaldehyde	67,639	Benzene	0.06	Benzene	0.05	Acetonitrile	0.16	Benzene	0.03
Benzene	63,050	Cadmium comp.	0.05	Nickel comp.	0.04	Arsenic comp.	0.07	Cadmium comp.	0.03
Hydrochloric Acid	59,765	Nickel comp.	0.03	Cadmium comp.	0.04	Butadiene,1,3-	0.06	Nickel comp.	0.02
Bromomethane	41,210	Xylenes (total)	0.03	Xylenes (total)	0.02	Benzene	0.04	Acetonitrile	0.02
Xylenes (Total)	30,683	Carbon Tet.	0.02	Toluene	0.02	Cadmium comp.	0.03	Carbon Tet.	0.02
Naphthalene	28,760	Toluene	0.02	Chloromethane	0.02	Nickel comp.	0.03	Chloromethane	0.01

Table 5-49. Comparison of Toxicity-Weighted Emissions and Noncancer Risk Approximations at GPCO

Mesa County, CO		Noncancer Risk Approximations (HQ)							
	2005 Toxicity-Weighted Emissions	2004		2005		2006		2007	
Pollutant		Pollutant	HQ	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ
Acrolein	288,286	Acetaldehyde	0.71	Acetaldehyde	0.33	Acrolein	35.35	Acrolein	32.61
1,3-Butadiene	11,120	Formaldehyde	0.31	Formaldehyde	0.31	Formaldehyde	0.41	Formaldehyde	0.41
Formaldehyde	7,876	Manganese comp.	0.26	Manganese comp.	0.22	Manganese comp.	0.29	Acetaldehyde	0.31
Benzene	6,036	Butadiene,1,3-	0.12	Butadiene,1,3-	0.13	Acetaldehyde	0.26	Manganese comp.	0.28
Manganese Comp.	3,611	Benzene	0.07	Xylenes (total)	0.07	Butadiene,1,3-	0.10	Butadiene,1,3-	0.08
Acetaldehyde	3,054	Xylenes (total)	0.05	Benzene	0.06	Benzene	0.06	Benzene	0.05
Hydrogen Fluoride	2,540	Toluene	0.03	Toluene	0.03	Xylenes (total)	0.03	Xylenes (total)	0.03
Xylenes (Total)	2,334	Carbon Tet.	0.01	Chloromethane	0.01	Toluene	0.02	Acetonitrile	0.03
Arsenic Comp.	1,630	Chloromethane	0.01	Carbon Tet.	0.01	Acetonitrile	0.02	Toluene	0.02
Cyanide Comp.	1,551	Styrene	0.01	Antimony comp.	0.01	Carbon Tet.	0.01	Chloromethane	0.01

Table 5-50. Comparison of Toxicity-Weighted Emissions and Noncancer Risk Approximations at HAKY

Hazard County, KY		Noncancer Risk Approximations (HQ)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ
Acrolein	906,795	Formaldehyde	0.21	Formaldehyde	0.21	Formaldehyde	0.20	Formaldehyde	0.27
Formaldehyde	11,770	Acetaldehyde	0.09	Acetaldehyde	0.12	Acetaldehyde	0.10	Acetaldehyde	0.14
1,3-Butadiene	9,108			=		Manganese comp.	0.09	Manganese comp.	0.10
Benzene	2,573					Arsenic comp.	0.05	Arsenic comp.	0.05
Acetaldehyde	2,462					Benzene	0.04	Benzene	0.04
4,4'-Methylenediphenyl Diisocyanate	1,796					Lead comp.	<0.01	Nickel comp.	<0.01
Cyanide Comp.	985					Chromium (6+)	<0.01	Lead comp.	<0.01
Xylenes (Total)	488								
Manganese Comp.	482								
Hydrochloric Acid	412								

Table 5-51. Comparison of Toxicity-Weighted Emissions and Noncancer Risk Approximations at LAOR

Union County, OR		Noncancer Risk Approximations (HQ)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ
Acrolein	2,116,236	Formaldehyde	0.35	Formaldehyde	0.28	Formaldehyde	0.28	Formaldehyde	0.24
Formaldehyde	28,414	Manganese comp.	0.14	Acetaldehyde	0.20	Manganese comp.	0.21	Acetaldehyde	0.17
1,3-Butadiene	24,377	Cadmium comp.	0.02	Manganese comp.	0.12	Acetaldehyde	0.20	Xylenes (total)	0.01
Hexamethylene Diisocyanate	15,000	Arsenic comp.	0.01	Arsenic comp.	0.01	Arsenic comp.	0.01	Cobalt comp.	<0.01
Acetaldehyde	6,400	Xylenes (total)	0.01	Xylenes (total)	0.01	Xylenes (total)	<0.01	Selenium comp.	<0.01
Benzene	5,987	Nickel comp.	<0.01	Cadmium comp.	<0.01	Cadmium comp.	<0.01	Mercury comp.	
4,4'-Methylenediphenyl Diisocyanate (MDI)	2,917	Cobalt comp.	<0.01	Nickel comp.	<0.01	Nickel comp.	<0.01	Manganese comp.	
Naphthalene	1,316	Lead comp.	<0.01	Lead comp.	<0.01	Lead comp.	<0.01	Lead comp.	
Cyanide Comp.	1,160	Beryllium comp.	<0.01	Cobalt comp.	<0.01	Cobalt comp.	<0.01	Chromium (6+)	
Xylenes (Total)	1,055	Selenium comp.	<0.01	Beryllium comp.	<0.01	Beryllium comp.	<0.01	Methyl Methacrylate	

Table 5-52. Comparison of Toxicity-Weighted Emissions and Noncancer Risk Approximations at MVWI

Dodge County, WI		Noncancer Risk Approximations (HQ)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ
Acrolein	189,736	Formaldehyde	0.10	Acetaldehyde	0.19	Formaldehyde	0.33	Benzene	0.02
1,3-Butadiene	5,918	Acetaldehyde	0.09	Manganese comp.	0.12	Acetaldehyde	0.18	Carbon Tet.	0.01
Benzene	5,654	Carbon Tet.	0.01	Arsenic comp.	0.03	Manganese comp.	0.10	Chloromethane	0.01
Formaldehyde	5,469	Benzene	0.01	Carbon Tet.	0.02	Arsenic comp.	0.02	Toluene	<0.01
Manganese Comp.	5,083	Chloromethane	0.01	Benzene	0.01	Nickel comp.	0.01	Methylene Chloride	<0.01
Acetaldehyde	2,755	Toluene	<0.01	Chloromethane	0.01	Carbon Tet.	0.01	Chromium (6+)	<0.01
Xylenes (Total)	1,768	Methylene Chloride	<0.01	Cadmium comp.	0.01	Benzene	0.01		
Bromomethane	1,761	Trichloroethane, 1,1,1-	<0.01	Nickel comp.	0.01	Chloromethane	0.01		
Naphthalene	1,493			Xylenes (total)	0.01	Cadmium comp.	0.01		
Cyanide Comp.	1,384			Lead comp.	<0.01	Lead comp.	<0.01		

Table 5-53. Comparison of Toxicity-Weighted Emissions and Noncancer Risk Approximations at NBIL

Cook County, IL		Noncancer Risk Approximations (HQ)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ
Acrolein	3,013,826	Formaldehyde	0.08	Manganese comp.	0.25	Bromomethane	0.39	Acrolein	26.96
Manganese Comp.	318,062	Acetaldehyde	0.06	Formaldehyde	0.24	Formaldehyde	0.29	Manganese comp.	0.17
Cadmium Comp.	208,163	Benzene	0.03	Acetaldehyde	0.15	Manganese comp.	0.12	Acetaldehyde	0.08
1,3-Butadiene	122,032	Chloromethane	0.01	Benzene	0.03	Acetaldehyde	0.11	Formaldehyde	0.07
Formaldehyde	115,448	Toluene	0.01	Arsenic comp.	0.02	Butadiene,1,3-	0.03	Arsenic comp.	0.03
Bromomethane	113,706			Carbon Tet.	0.02	Arsenic comp.	0.03	Butadiene,1,3-	0.02
Nickel Comp.	82,514			Nickel comp.	0.02	Benzene	0.02	Benzene	0.02
Acetaldehyde	72,814			Chloromethane	0.01	Carbon Tet.	0.02	Carbon Tet.	0.02
Naphthalene	71,437			Xylenes (total)	0.01	Chloromethane	0.01	Chloromethane	0.01
Benzene	68,185			Cadmium comp.	0.01	Nickel comp.	0.01	Cadmium comp.	0.01

Table 5-54. Comparison of Toxicity-Weighted Emissions and Noncancer Risk Approximations at PRRI

Providence County, RI		Noncancer Risk Approximations (HQ)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ
Acrolein	424,236	Acrolein	17.95	Acrolein	19.68	Acrolein	20.02	Acrolein	18.27
Nickel Comp.	50,358	Formaldehyde	0.22	Acetaldehyde	0.22	Formaldehyde	0.29	Formaldehyde	0.32
1,3-Butadiene	20,141	Acetaldehyde	0.13	Formaldehyde	0.18	Acetaldehyde	0.16	Acetaldehyde	0.16
Formaldehyde	15,653	Butadiene,1,3-	0.08	Manganese comp.	0.09	Manganese comp.	0.08	Manganese comp.	0.07
Benzene	11,505	Manganese comp.	0.07	Nickel comp.	0.07	Butadiene,1,3-	0.06	Butadiene,1,3-	0.05
Cadmium Comp.	8,026	Nickel comp.	0.05	Butadiene,1,3-	0.06	Benzene	0.04	Nickel comp.	0.03
Cyanide Comp.	7,863	Benzene	0.03	Benzene	0.03	Nickel comp.	0.03	Benzene	0.03
Acetaldehyde	5,685	Xylenes (total)	0.02	Xylenes (total)	0.02	Xylenes (total)	0.02	Carbon Tet.	0.01
Xylenes (Total)	5,338	Carbon Tet.	0.01	Carbon Tet.	0.01	Toluene	0.02	Chloromethane	0.01
Chlorine	3,888	Toluene	0.01	Toluene	0.01	Carbon Tet.	0.01	Xylenes (total)	0.01

Table 5-55. Comparison of Toxicity-Weighted Emissions and Noncancer Risk Approximations at PXSS

Maricopa County, AZ		Noncancer Risk Approximations (HQ)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ
Acrolein	4,817,268	Formaldehyde	0.61	Formaldehyde	0.62	Formaldehyde	0.44	Formaldehyde	0.47
1,3-Butadiene	129,656	Acetaldehyde	0.36	Acetaldehyde	0.33	Manganese comp.	0.36	Manganese comp.	0.37
Formaldehyde	120,510	Benzene	0.08	Butadiene,1,3-	0.21	Acetaldehyde	0.31	Acetaldehyde	0.36
Bromomethane	66,526	Xylenes (total)	0.06	Benzene	0.08	Butadiene,1,3-	0.19	Arsenic comp.	0.02
Benzene	64,491	Toluene	0.03	Xylenes (total)	0.05	Benzene	0.07	Nickel comp.	0.02
Acetaldehyde	45,996	Carbon Tet.	0.02	Toluene	0.03	Xylenes (total)	0.05	Antimony comp.	0.02
Naphthalene	44,910	Chloromethane	0.01	Carbon Tet.	0.02	Toluene	0.03	Cadmium comp.	0.01
Cyanide Comp.	38,837	Chloroform	0.01	Chloromethane	0.01	Arsenic comp.	0.02	Cobalt comp.	<0.01
Xylenes (Total)	38,293	Tetrachloroethylene	<0.01	Chloroform	0.01	Carbon Tet.	0.01	Lead comp.	<0.01
Arsenic Comp.	18,773	Trichlorobenzene, 1,2,4-	<0.01	Tetrachloroethylene	<0.01	Nickel comp.	0.01	Beryllium comp.	<0.01

Table 5-56. Comparison of Toxicity-Weighted Emissions and Noncancer Risk Approximations at ROCH

Rochester County, NY		Noncancer Risk Approximations (HQ)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ
Acrolein	620,167	Dibromoethane, 1,2-	0.06	Formaldehyde	0.13	Formaldehyde	0.10	Manganese comp.	0.09
Hydrochloric Acid	36,546	Butadiene,1,3-	0.04	Acetaldehyde	0.09	Acetaldehyde	0.07	Butadiene,1,3-	0.03
1,3-Butadiene	34,259	Benzene	0.03	Dibromoethane, 1,2-	0.07	Benzene	0.02	Arsenic comp.	0.02
Benzene	22,650	Carbon Tet.	0.02	Butadiene,1,3-	0.05	Carbon Tet.	0.01	Benzene	0.02
Formaldehyde	20,323	Bromomethane	0.02	Benzene	0.03	Chloromethane	0.01	Bromomethane	0.02
Naphthalene	20,136	Xylenes (total)	0.01	Bromomethane	0.02	Xylenes (total)	0.01	Carbon Tet.	0.02
Nickel Comp.	19,023	Chloromethane	0.01	Carbon Tet.	0.02	Toluene	0.01	Chloromethane	0.01
Bromomethane	16,476	Toluene	0.01	Xylenes (total)	0.01	Chloroform	<0.01	Xylenes (total)	0.01
Arsenic Comp.	15,364	Chloroform	<0.01	Chloromethane	0.01	Tetrachloroethylene	<0.01	Nickel comp.	0.01
Manganese Comp.	15,167	Hexachloro-1,3-butadiene	<0.01	Toluene	0.01	Methylene Chloride	<0.01	Antimony comp.	0.01

Table 5-57. Comparison of Toxicity-Weighted Emissions and Noncancer Risk Approximations at S4MO

St. Louis City, MO		Noncancer Risk Approximations (HQ)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ
Acrolein	324,162	Formaldehyde	0.51	Formaldehyde	0.38	Acrolein	33.13	Acrolein	36.63
Chlorine	35,898	Acetaldehyde	0.37	Acetaldehyde	0.30	Acetaldehyde	0.32	Formaldehyde	0.46
Hydrochloric Acid	18,088	Manganese comp.	0.36	Manganese comp.	0.26	Formaldehyde	0.31	Acetaldehyde	0.45
Formaldehyde	12,972	Cadmium comp.	0.06	Arsenic comp.	0.08	Manganese comp.	0.29	Manganese comp.	0.25
1,3-Butadiene	11,480	Arsenic comp.	0.05	Cadmium comp.	0.05	Butadiene,1,3-	0.05	Butadiene,1,3-	0.05
Acetaldehyde	8,553	Benzene	0.04	Benzene	0.04	Arsenic comp.	0.03	Arsenic comp.	0.04
Benzene	7,925	Xylenes (total)	0.02	Xylenes (total)	0.02	Benzene	0.03	Cadmium comp.	0.04
Manganese Comp.	7,911	Toluene	0.02	Toluene	0.02	Cadmium comp.	0.03	Benzene	0.03
Cyanide Comp.	4,402	Carbon Tet.	0.01	Carbon Tet.	0.02	Bromomethane	0.02	Acetonitrile	0.02
Xylenes (Total)	3,847	Nickel comp.	0.01	Chloromethane	0.01	Carbon Tet.	0.02	Nickel comp.	0.02

Table 5-58. Comparison of Toxicity-Weighted Emissions and Noncancer Risk Approximations at SDGA

DeKalb County, GA		Noncancer Risk Approximations (HQ)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ
Acrolein	654,311	Formaldehyde	0.51	Formaldehyde	0.75	Formaldehyde	0.84	Formaldehyde	0.80
1,3-Butadiene	27,779	Acetaldehyde	0.28	Acetaldehyde	0.34	Acetaldehyde	0.32	Acetaldehyde	0.38
Benzene	22,927	Manganese comp.	0.06	Manganese comp.	0.08	Manganese comp.	0.08	Manganese comp.	0.05
Formaldehyde	19,844	Toluene	0.02	Benzene	0.04	Arsenic comp.	0.04	Benzene	0.03
Arsenic Comp.	19,743	Chloromethane	0.01	Nickel comp.	0.02	Nickel comp.	0.03	Carbon Tet.	0.01
Hydrogen Fluoride	14,459	Lead comp.	<0.01	Arsenic comp.	0.02	Benzene	0.03	Chloromethane	0.01
Xylenes (Total)	12,648			Toluene	0.02	Xylenes (total)	0.02	Nickel comp.	0.01
Cyanide Comp.	8,420			Carbon Tet.	0.01	Toluene	0.01	Toluene	0.01
Acetaldehyde	8,094			Xylenes (total)	0.01	Carbon Tet.	0.01	Antimony comp.	0.01
Glycol Ethers	6,520			Chloromethane	0.01	Chloromethane	0.01	Cadmium comp.	<0.01

Table 5-59. Comparison of Toxicity-Weighted Emissions and Noncancer Risk Approximations at SEWA

King County, WA		Noncancer Risk Approximations (HQ)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ
Acrolein	2,741,280	Manganese comp.	0.16	Manganese comp.	0.21	No Data Reported		Acrolein	18.61
1,3-Butadiene	112,994	Acetaldehyde	0.15	Acetaldehyde	0.16			Manganese comp.	0.25
Formaldehyde	89,013	Formaldehyde	0.10	Formaldehyde	0.13			Acetaldehyde	0.11
Benzene	86,256	Butadiene,1,3-	0.06	Butadiene,1,3-	0.04			Formaldehyde	0.10
Acetaldehyde	37,774	Benzene	0.04	Arsenic comp.	0.03			Butadiene,1,3-	0.05
Xylenes (Total)	32,707	Arsenic comp.	0.03	Nickel comp.	0.03			Arsenic comp.	0.03
Naphthalene	19,961	Nickel comp.	0.03	Benzene	0.02			Benzene	0.03
Manganese Comp.	16,653	Carbon Tet.	0.02	Carbon Tet.	0.02			Nickel comp.	0.02
Hexamethylene Diisocyanate	13,200	Cadmium comp.	0.01	Cadmium comp.	0.01			Carbon Tet.	0.02
Glycol Ethers	7,373	Lead comp.	<0.01	Lead comp.	<0.01			Chloromethane	0.01

Table 5-60. Comparison of Toxicity-Weighted Emissions and Noncancer Risk Approximations at SJCA

Santa Clara, CA		Noncancer Risk Approximations (HQ)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ
Acrolein	1,093,678	Acrolein	61.39	Acrolein	64.02	Acrolein	53.27	Acrolein	62.84
Chlorine	83,801	Formaldehyde	0.24	Formaldehyde	0.22	Acrylonitrile	0.24	Formaldehyde	0.25
Formaldehyde	70,297	Acrylonitrile	0.19	Acrylonitrile	0.18	Formaldehyde	0.19	Acrylonitrile	0.18
1,3-Butadiene	43,500	Acetaldehyde	0.14	Acetaldehyde	0.16	Acetaldehyde	0.13	Acetaldehyde	0.16
Acetaldehyde	31,760	Butadiene,1,3-	0.13	Butadiene,1,3-	0.12	Butadiene,1,3-	0.08	Butadiene,1,3-	0.11
Naphthalene	22,686	Benzene	0.05	Benzene	0.04	Benzene	0.03	Benzene	0.04
Benzene	17,915	Xylenes (total)	0.04	Xylenes (total)	0.03	Bromomethane	0.03	Xylenes (total)	0.04
Manganese Comp.	14,091	Bromomethane	0.03	Bromomethane	0.03	Xylenes (total)	0.02	Bromomethane	0.02
Xylenes (Total)	10,699	Toluene	0.02	Toluene	0.02	Toluene	0.02	Toluene	0.02
Arsenic Comp.	10,485	Acetonitrile	0.01	Acetonitrile	0.01	Acetonitrile	0.01	Acetonitrile	0.01

Table 5-61. Comparison of Toxicity-Weighted Emissions and Noncancer Risk Approximations at SKFL

Pinellas County, FL		Noncancer Risk Approximations (HQ)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ
Acrolein	547,306	No Data Reported		Formaldehyde	0.38	Formaldehyde	0.25	Acrolein	26.93
Nickel Comp.	73,910			Acetaldehyde	0.18	Acetaldehyde	0.15	Acetaldehyde	0.22
1,3-Butadiene	39,121			Acrylonitrile	0.16	Acrylonitrile	0.13	Formaldehyde	0.17
Formaldehyde	23,345			Butadiene,1,3-	0.09	Butadiene,1,3-	0.09	Acrylonitrile	0.09
Benzene	22,568			Manganese comp.	0.05	Manganese comp.	0.06	Manganese comp.	0.05
Manganese Comp.	17,952			Nickel comp.	0.05	Arsenic comp.	0.04	Butadiene,1,3-	0.04
Xylenes (Total)	11,828			Arsenic comp.	0.04	Nickel comp.	0.04	Arsenic comp.	0.04
Acetaldehyde	9,668			Bromomethane	0.04	Benzene	0.04	Nickel comp.	0.03
Naphthalene	6,319			Benzene	0.03	Bromomethane	0.03	Benzene	0.03
Hydrochloric Acid	5,018			Xylenes (total)	0.02	Xylenes (total)	0.02	Bromomethane	0.02

Table 5-62. Comparison of Toxicity-Weighted Emissions and Noncancer Risk Approximations at SYFL

Hillsbororough County, FL		Noncancer Risk Approximations (HQ)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ
Acrolein	1,475,768	Formaldehyde	0.20	Formaldehyde	0.23	Bromomethane	0.32	Acrolein	20.86
Hydrochloric Acid	157,349	Acetaldehyde	0.17	Acetaldehyde	0.14	Formaldehyde	0.17	Acetaldehyde	0.31
Hydrogen Fluoride	75,641	Bromomethane	0.12	Acrylonitrile	0.07	Acetaldehyde	0.13	Formaldehyde	0.30
1,3-Butadiene	50,746	Acrylonitrile	0.08	Bromomethane	0.06	Manganese comp.	0.07	Bromomethane	0.13
Formaldehyde	42,031	Manganese comp.	0.06	Butadiene,1,3-	0.06	Butadiene,1,3-	0.05	Manganese comp.	0.05
Manganese Comp.	35,226	Arsenic comp.	0.05	Manganese comp.	0.05	Acrylonitrile	0.04	Arsenic comp.	0.04
Benzene	28,983	Butadiene,1,3-	0.04	Arsenic comp.	0.05	Nickel comp.	0.04	Nickel comp.	0.03
Nickel Comp.	17,140	Nickel comp.	0.04	Nickel comp.	0.05	Arsenic comp.	0.04	Acrylonitrile	0.02
Acetaldehyde	16,898	Antimony comp.	0.02	Benzene	0.02	Benzene	0.02	Butadiene,1,3-	0.02
Cyanide Comp.	16,407	Benzene	0.02	Chloromethane	0.02	Chloromethane	0.02	Benzene	0.02

Table 5-63. Comparison of Toxicity-Weighted Emissions and Noncancer Risk Approximations at UNVT

Chittenden County, VT		Noncancer Risk Approximations (HQ)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ
Acrolein	584,810	Formaldehyde	0.10	Formaldehyde	0.14	Formaldehyde	0.11	Formaldehyde	0.11
Manganese Comp.	51,923	Carbon Tet.	0.02	Acetaldehyde	0.07	Acetaldehyde	0.07	Acetaldehyde	0.07
1,3-Butadiene	11,163	Benzene	0.01	Bromomethane	0.02	Bromomethane	0.02	Bromomethane	0.02
Formaldehyde	8,180	Chloromethane	0.01	Benzene	0.02	Carbon Tet.	0.01	Carbon Tet.	0.01
Benzene	6,617	Xylenes (total)	<0.01	Carbon Tet.	0.01	Chloromethane	0.01	Chloromethane	0.01
Chlorine	6,352	Toluene	<0.01	Chloromethane	0.01	Benzene	0.01	Benzene	0.01
Acetaldehyde	3,403	Chloroform	<0.01	Xylenes (total)	<0.01	Xylenes (total)	<0.01	Toluene	<0.01
Xylenes (Total)	3,301	Ethylbenzene	<0.01	Toluene	<0.01	Toluene	<0.01	Xylenes (total)	<0.01
Arsenic Comp.	1,787	Methylene Chloride	<0.01	Chloroform	<0.01	Chloroform	<0.01	Chloroform	<0.01
Hydrochloric Acid	1,614	Chloroethane	<0.01	Ethylbenzene	<0.01	Tetrachloroethylene	<0.01	Methylene Chloride	<0.01

Table 5-64. Comparison of Toxicity-Weighted Emissions and Noncancer Risk Approximations at WADC

District of Columbia		Noncancer Risk Approximations (HQ)							
	2005	2004		2005		2006		2007	
Pollutant	Toxicity-Weighted Emissions	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ	Pollutant	HQ
Acrolein	354,129	Formaldehyde	0.35	Formaldehyde	0.34	Formaldehyde	0.58	Manganese comp.	0.11
1,3-Butadiene	13,944	Acetaldehyde	0.08	Manganese comp.	0.13	Acetaldehyde	0.13	Benzene	0.03
Formaldehyde	12,170	Manganese comp.	0.08	Acetaldehyde	0.10	Manganese comp.	0.09	Arsenic comp.	0.02
Benzene	7,851	Butadiene,1,3-	0.07	Butadiene,1,3-	0.09	Butadiene,1,3-	0.07	Nickel comp.	0.02
Cyanide Comp.	7,313	Benzene	0.03	Benzene	0.03	Benzene	0.03	Xylenes (total)	0.01
Acetaldehyde	4,890	Arsenic comp.	0.02	Nickel comp.	0.03	Nickel comp.	0.02	Toluene	0.01
Xylenes (Total)	3,375	Nickel comp.	0.02	Acrylonitrile	0.03	Arsenic comp.	0.02	Cadmium comp.	0.01
Chlorine	2,655	Carbon Tet.	0.01	Arsenic comp.	0.02	Bromomethane	0.01	Lead comp.	<0.01
Naphthalene	1,709	Cadmium comp.	0.01	Bromomethane	0.02	Chloromethane	0.01	Ethylbenzene	<0.01
Arsenic Comp.	1,124	Chloromethane	0.01	Carbon Tet.	0.01	Xylenes (total)	0.01	Styrene	<0.01

6.0 NATTS Data Trends

In this section, data trends are presented for the MQO Core HAPs, as listed in Section 3. Annual Averages that were calculated in Section 5 for risk evaluation are used to generate three-year period averages; a three-year period average is simply the average of each valid Annual Average within a three-year period. No surrogate annual averages were used for pollutant-site combinations where a valid Annual Average could not be calculated. Since this report only covers NATTS concentrations from 2004-2007, only one 3-year time period could be averaged, which is 2004-2006. As such, percent difference between the 2007 Annual Average concentration and the 2004-2006 three-year period average is calculated as a preliminary assessment towards EPA goals of a 15% reduction between time periods.

6.1 Acetaldehyde Trends

Three-year period averages for acetaldehyde were calculated for 18 NATTS sites, and are presented in Table 6-1.

Table 6-1. Acetaldehyde Trends Analyses

Site	2004-2006 Average ($\mu g/m^3$)	2007 Average ($\mu g/m^3$)	% Difference
BOMA	1.52	1.50	-0.94%
BTUT	3.69	2.20	-40.45%
CAMS 35	2.17	1.55	-28.56%
CAMS 85	0.95	0.79	-17.34%
CHSC	3.53	2.55	-27.84%
GPCO	3.93	2.77	-29.60%
HAKY	0.95	1.25	31.64%
LAOR	1.82	1.53	-16.37%
NBIL	0.95	0.70	-26.01%
PRRI	1.54	1.48	-3.45%
PXSS	2.96	3.25	9.86%
S4MO	2.97	4.02	35.27%
SDGA	2.83	3.46	22.35%
SEWA	1.39	0.95	-31.66%
SJCA	1.30	1.44	11.06%
SKFL	1.47	1.96	32.77%
SYFL	1.33	2.77	107.89%
UNVT	0.62	0.60	-2.80%

For the 2004-2006 time period, the average range was 0.62 µg/m^3 (UNVT) to 3.69 µg/m^3 (BTUT). By comparison, the 2007 annual average range was 0.60 µg/m^3 (UNVT) to 4.02 µg/m^3 (S4MO). Eleven of the eighteen sites realized decreases when comparing the 2004-2006 time period average to the 2007 Annual Average. The largest percentage decreases for acetaldehyde were preliminarily realized at: BTUT (-40.45%); SEWA (-31.66%); and GPCO (-29.60%).

6.2 Acrolein Trends

Three-year period averages for acrolein were calculated for three NATTS sites, and are presented in Table 6-2. It is important to note that the acrolein sampling methodology via canister was approved in Summer 2005; thus the first year of complete monitoring data for acrolein was 2006. However, certain sites reported acrolein concentrations for all of 2004 and 2005 through canister sampling; as such, valid Annual Averages could be calculated for these sites.

Table 6-2. Acrolein Trends Analyses

Site	2004-2006 Average (µg/m^3)	2007 Average (µg/m^3)	% Difference
BOMA	0.44	0.38	-12.18%
PRRI	0.38	0.37	-4.92%
SJCA	1.19	1.26	5.51%

For the 2004-2006 time period, the average range was 0.38 µg/m^3 (PRRI) to 1.19µg/m^3 (SJCA). By comparison, the 2007 annual average range was 0.37 µg/m^3 (PRRI) to 1.26 µg/m^3 (SJCA). Two of the three sites realized decreases when comparing the 2004-2006 time period average to the 2007 Annual Average. Percentage decreases for acrolein were preliminarily realized at: BOMA (-12.18%) and PRRI (-4.92%).

6.3 Arsenic Trends

Three-year period averages for arsenic were calculated for 12 NATTS sites, and are presented in Table 6-3.

Table 6-3. Arsenic Trends Analyses

Site	2004-2006 Average (ng/m^3)	2007 Average (ng/m^3)	% Difference
BOMA	0.60	0.48	-19.93%
BTUT	1.70	0.98	-42.29%
CAMS 35	2.69	1.62	-39.83%
CAMS 85	0.57	0.57	0.57%
CHSC	0.61	0.68	11.09%
DEMI	2.23	1.77	-20.53%
NBIL	0.76	0.92	21.57%
S4MO	1.65	1.14	-30.59%
SEWA	0.98	0.92	-5.93%
SKFL	1.32	1.09	-17.41%
SYFL	1.40	1.10	-21.42%
WADC	0.60	0.66	10.41%

For the 2004-2006 time period, the average range was 0.60 ng/m^3 (BOMA and WADC) to 2.69 ng/m^3 (CAMS 35). By comparison, the 2007 annual average range was 0.48 ng/m^3 (BOMA) to 1.77 ng/m^3 (DEMI). Eight of the twelve sites realized decreases when comparing the 2004-2006 time period average to the 2007 Annual Average. The largest percentage decreases for arsenic were preliminarily realized at: BTUT (-42.29%); CAMS 35 (-39.83%); and S4MO (-30.59%).

6.4 Benzene Trends

Three-year period averages for benzene were calculated for 19 NATTS sites, and are presented in Table 6-4.

Table 6-4. Benzene Trends Analyses

Site	2004-2006 Average (µg/m^3)	2007 Average (µg/m^3)	% Difference
BOMA	1.10	0.90	-17.69%
BTUT	1.59	1.16	-26.93%
BXNY	1.10	1.06	-3.16%
CAMS 35	1.90	1.79	-5.54%
CAMS 85	1.47	1.32	-10.71%
DEMI	1.54	1.05	-31.90%
GPCO	1.99	1.48	-25.53%
MVWI	0.37	0.47	27.18%
NBIL	0.83	0.56	-32.11%

Table 6-4. Benzene Trends Analyses (Continued)

Site	2004-2006 Average (µg/m^3)	2007 Average (µg/m^3)	% Difference
PRRI	1.01	0.75	-25.55%
ROCH	0.78	0.62	-19.85%
S4MO	1.11	0.85	-23.46%
SDGA	1.09	0.88	-19.26%
SEWA	0.92	0.84	-9.00%
SJCA	1.24	1.29	4.17%
SKFL	1.03	0.80	-22.55%
SYFL	0.54	0.46	-15.38%
UNVT	0.38	0.31	-18.63%
WADC	0.82	0.95	15.82%

For the 2004-2006 time period, the average range was 0.37 µg/m^3 (MVWI) to 1.99 µg/m^3 (GPCO). By comparison, the 2007 annual average range was 0.31 µg/m^3 (UNVT) to 1.79 µg/m^3 (CAMS 35). Seventeen of the nineteen sites realized decreases when comparing the 2004-2006 time period average to the 2007 Annual Average. The largest percentage decreases for benzene were preliminarily realized at: NBIL (-32.11%); DEMI (-31.90%); and BTUT (-26.93%).

6.5 Beryllium Trends

Three-year period averages for beryllium were calculated for eight NATTS sites, and are presented in Table 6-5.

Table 6-5. Beryllium Trends Analyses

Site	2004-2006 Average (ng/m^3)	2007 Average (ng/m^3)	% Difference
BOMA	0.01	<0.01	-20.80%
BTUT	0.02	0.02	23.91%
CAMS 35	0.48	0.50	4.18%
DEMI	0.05	0.05	10.15%
NBIL	0.01	0.01	-17.00%
S4MO	0.01	0.01	-20.83%
SKFL	0.04	0.03	-31.21%
SYFL	0.06	0.02	-60.87%

For the 2004-2006 time period, the average range was 0.01 ng/m^3 (BOMA, NBIL, and S4MO) to 0.48 ng/m^3 (CAMS 35). By comparison, the 2007 annual average range was

<0.01 ng/m^3 (BOMA) to 0.50 ng/m^3 (CAMS 35). Five of the eight sites realized decreases when comparing the 2004-2006 time period average to the 2007 Annual Average. The largest percentage decreases for beryllium were preliminarily realized at: SYFL (-60.87%); SKFL (-31.21%); and S4MO (-20.83%).

6.6 1,3-Butadiene Trends

Three-year period averages for 1,3-butadiene were calculated for 11 NATTS sites, and are presented in Table 6-6.

Table 6-6. 1,3-Butadiene Trends Analyses

Site	2004-2006 Average (µg/m^3)	2007 Average (µg/m^3)	% Difference
BOMA	0.12	0.11	-11.69%
BXNY	0.16	0.15	-8.62%
CAMS 35	0.32	0.57	80.82%
CAMS 85	0.02	0.02	-8.09%
GPCO	0.23	0.16	-29.61%
PRRI	0.13	0.10	-23.42%
ROCH	0.09	0.06	-35.81%
SEWA	0.10	0.09	-7.79%
SJCA	0.22	0.22	-2.35%
SKFL	0.19	0.08	-54.44%
SYFL	0.10	0.05	-55.22%

For the 2004-2006 time period, the average range was 0.02 µg/m^3 (CAMS 85) to 0.32 µg/m^3 (CAMS 35). These two sites were also the lowest and highest concentrations for the 2007 annual average (0.02 µg/m^3 for CAMS 85 and 0.57 µg/m^3 at CAMS 85). Ten of the eleven sites realized decreases when comparing the 2004-2006 time period average to the 2007 Annual Average. The largest percentage decreases for 1,3-butadiene were preliminarily realized at: SYFL (-55.22%); SKFL (-54.44%); and ROCH (-35.81%).

6.7 Cadmium Trends

Three-year period averages for cadmium were calculated for 12 NATTS sites, and are presented in Table 6-7.

Table 6-7. Cadmium Trends Analyses

Site	2004-2006 Average (ng/m^3)	2007 Average (ng/m^3)	% Difference
BOMA	0.37	0.15	-58.33%
BTUT	0.36	0.26	-28.17%
CAMS 35	0.56	0.50	-10.11%
CHSC	0.28	0.13	-53.02%
DEMI	0.75	0.53	-30.05%
NBIL	0.19	0.23	22.64%
S4MO	0.89	0.76	-15.03%
SDGA	0.15	0.10	-34.50%
SEWA	0.16	0.13	-18.58%
SKFL	0.15	0.13	-15.50%
SYFL	0.21	0.16	-22.51%
WADC	0.22	0.17	-24.36%

For the 2004-2006 time period, the average range was 0.15 ng/m^3 (SDGA and SKFL) to 0.89 ng/m^3 (S4MO). These two sites were also the lowest and highest concentrations for the 2007 annual average (0.11 ng/m^3 at SDGA) and 0.76 ng/m^3 at S4MO). Eleven of the eighteen sites realized decreases when comparing the 2004-2006 time period average to the 2007 Annual Average. The largest percentage decreases for acetaldehyde were preliminarily realized at: BOMA (-58.33%); CHSC (-53.02%); and SDGA (-34.50%).

6.8 Carbon Tetrachloride Trends

Three-year period averages for carbon tetrachloride were calculated for 17 NATTS sites, and are presented in Table 6-8.

Table 6-8. Carbon Tetrachloride Trends Analyses

Site	2004-2006 Average ($\mu g/m^3$)	2007 Average ($\mu g/m^3$)	% Difference
BOMA	0.56	0.57	1.90%
BTUT	0.57	0.55	-2.69%
BXNY	0.64	0.67	3.88%
CAMS 35	0.63	0.61	-3.81%
CAMS 85	0.62	0.60	-2.65%
DEMI	0.70	0.63	-9.61%
GPCO	0.56	0.52	-6.85%
MVWI	0.53	0.54	1.15%
NBIL	0.69	0.65	-6.31%

Table 6-8. Carbon Tetrachloride Trends Analyses (Continued)

Site	2004-2006 Average (µg/m^3)	2007 Average (µg/m^3)	% Difference
PRRI	0.53	0.55	4.12%
ROCH	0.65	0.62	-4.55%
S4MO	0.61	0.58	-5.73%
SDGA	0.53	0.50	-4.66%
SEWA	0.64	0.68	6.13%
SKFL	0.54	0.52	-4.86%
SYFL	0.55	0.55	-0.64%
UNVT	0.57	0.55	-2.72%

For the 2004-2006 time period, the average range was 0.53 µg/m^3 (MVWI and SDGA) to 0.70 µg/m^3 (DEMI). By comparison, the 2007 annual average range was 0.50 µg/m^3 (SDGA) to 0.67 µg/m^3 (BXNY). Twelve of the seventeen sites realized decreases when comparing the 2004-2006 time period average to the 2007 Annual Average. These fairly consistent concentrations are typical for carbon tetrachloride, which is considered a background pollutant. The largest percentage decreases for carbon tetrachloride were preliminarily realized at: DEMI (-9.61%); GPCO (-6.85%); and NBIL (-6.13%).

6.9 Chloroform Trends

Three-year period averages for chloroform were calculated for 11 NATTS sites, and are presented in Table 6-9.

Table 6-9. Chloroform Trends Analyses

Site	2004-2006 Average (µg/m^3)	2007 Average (µg/m^3)	% Difference
BOMA	0.10	0.09	-12.64%
BXNY	0.19	0.21	13.24%
CAMS 35	0.12	0.23	95.39%
CAMS 85	0.04	0.05	22.25%
PRRI	0.10	0.10	-3.55%
ROCH	0.12	0.11	-10.34%
SEWA	0.23	0.13	-43.58%
SJCA	0.12	0.11	-8.73%
SKFL	0.21	0.19	-12.97%
SYFL	0.15	0.13	-16.26%
UNVT	0.09	0.08	-7.63%

For the 2004-2006 time period, the average range was 0.04 µg/m^3 (CAMS 85) to 0.23 µg/m^3 (SEWA). By comparison, the 2007 annual average range was 0.05 µg/m^3 (CAMS 85) to 0.23 µg/m^3 (CAMS 35). Eight of the eleven sites realized decreases when comparing the 2004-2006 time period average to the 2007 Annual Average. The largest percentage decreases for chloroform were preliminarily realized at: SEWA (-43.58%); SYFL (-16.26%); and SKFL (-12.97%).

6.10 Formaldehyde Trends

Three-year period averages for formaldehyde were calculated for 18 NATTS sites, and are presented in Table 6-10.

Table 6-10. Formaldehyde Trends Analyses

Site	2004-2006 Average (µg/m^3)	2007 Average (µg/m^3)	% Difference
BOMA	3.17	3.05	-3.86%
BTUT	5.44	3.44	-36.71%
CAMS 35	3.86	2.85	-26.29%
CAMS 85	1.93	1.99	2.81%
CHSC	4.61	4.14	-10.17%
GPCO	3.35	4.02	20.02%
HAKY	2.00	2.67	33.10%
LAOR	2.96	2.33	-21.45%
NBIL	1.99	0.73	-63.51%
PRRI	2.25	3.12	38.94%
PXSS	5.44	4.65	-14.52%
S4MO	3.93	4.55	15.75%
SDGA	6.89	7.88	14.40%
SEWA	1.12	0.95	-15.89%
SJCA	2.12	2.43	14.71%
SKFL	3.09	1.69	-45.27%
SYFL	1.94	2.93	50.93%
UNVT	1.14	1.08	-5.14%

For the 2004-2006 time period, the average range was 1.12 µg/m^3 (SEWA) to 6.89 µg/m^3 (SDGA). By comparison, the 2007 annual average range was 0.73 µg/m^3 (NBIL) to 7.88 µg/m^3 (SDGA). Ten of the eighteen sites realized decreases when comparing the 2004-2006 time period average to the 2007 Annual Average. The largest percentage decreases for formaldehyde were preliminarily realized at: NBIL (-63.51%); SKFL (-45.27%); and BTUT (-36.71%).

6.11 Hexavalent Chromium Trends

Three-year period averages for hexavalent chromium were calculated for seven NATTS sites, and are presented in Table 6-11.

Table 6-11. Hexavalent Chromium Trends Analyses

Site	2004-2006 Average (ng/m^3)	2007 Average (ng/m^3)	% Difference
BOMA	0.06	0.03	-49.83%
BTUT	0.03	0.03	-3.32%
DEMI	0.07	0.04	-46.47%
GPCO	0.03	0.02	-44.07%
NBIL	0.04	0.03	-11.23%
S4MO	0.04	0.04	-6.96%
SDGA	0.05	0.02	-53.48%

For the 2004-2006 time period, the average range was 0.03 ng/m^3 (BTUT and GPCO) to 0.07 ng/m^3 (DEMI). By comparison, the 2007 annual average range was 0.02 ng/m^3 (GPCO and SDGA) to 0.04 ng/m^3 (DEMI and S4MO). All seven sites realized decreases when comparing the 2004-2006 time period average to the 2007 Annual Average. The largest percentage decreases for hexavalent chromium were preliminarily realized at: SDGA (-53.48%); BOMA (-49.83%); and DEMI (-46.47%).

6.12 Lead Trends

Three-year period averages for lead were calculated for 14 NATTS sites, and are presented in Table 6-12.

Table 6-12. Lead Trends Analyses

Site	2004-2006 Average (ng/m^3)	2007 Average (ng/m^3)	% Difference
BOMA	4.75	4.58	-3.61%
BTUT	5.38	3.81	-29.06%
CAMS 35	4.82	2.52	-47.84%
CHSC	2.74	2.35	-13.96%
DEMI	18.59	15.11	-18.76%
GPCO	4.29	4.01	-6.58%
NBIL	5.04	5.49	8.98%
PRRI	9.03	4.10	-54.58%

Table 6-12. Lead Trends Analyses (Continued)

Site	2004-2006 Average (ng/m^3)	2007 Average (ng/m^3)	% Difference
S4MO	12.87	13.53	5.16%
SDGA	2.93	1.70	-42.17%
SEWA	4.87	4.74	-2.72%
SKFL	2.65	2.28	-13.95%
SYFL	3.52	3.44	-2.35%
WADC	4.25	4.44	4.62%

For the 2004-2006 time period, the average range was 2.65 ng/m^3 (SKFL) to 18.59 ng/m^3 (DEMI). By comparison, the 2007 annual average range was 1.70 ng/m^3 (SDGA) to 15.11 ng/m^3 (DEMI). Eleven of the fourteen sites realized decreases when comparing the 2004-2006 time period average to the 2007 Annual Average. The largest percentage decreases for lead were preliminarily realized at: PRRI (-54.58%); CAMS 35 (-47.84%); and SDGA (-42.17%).

6.13 Manganese Trends

Three-year period averages for manganese were calculated for 14 NATTS sites, and are presented in Table 6-13.

Table 6-13. Manganese Trends Analyses

Site	2004-2006 Average (ng/m^3)	2007 Average (ng/m^3)	% Difference
BOMA	4.35	3.43	-21.21%
BTUT	8.17	9.91	21.21%
CAMS 35	4.87	4.17	-14.29%
CHSC	3.47	3.43	-1.36%
DEMI	73.35	50.39	-31.30%
GPCO	12.92	14.10	9.10%
NBIL	9.38	8.30	-11.51%
PRRI	4.00	3.34	-16.49%
S4MO	15.34	12.49	-18.61%
SDGA	3.61	2.45	-32.22%
SEWA	9.23	12.56	36.01%
SKFL	2.91	2.53	-13.23%
SYFL	3.09	2.53	-18.07%
WADC	4.94	5.64	14.25%

For the 2004-2006 time period, the average range was 2.91 ng/m^3 (SKFL) to 73.35 ng/m^3 (DEMI). By comparison, the 2007 annual average range was 2.45 ng/m^3 (SDGA) to 50.39 ng/m^3 (DEMI). Ten of the fourteen sites realized decreases when comparing the 2004-2006 time period average to the 2007 Annual Average. The largest percentage decreases for manganese were preliminarily realized at: SDGA (-32.22%); DEMI (-31.30%); and BOMA (-21.21%).

6.14 Nickel Trends

Three-year period averages for nickel were calculated for 13 NATTS sites, and are presented in Table 6-14.

Table 6-14. Nickel Trends Analyses

Site	2004-2006 Average (ng/m^3)	2007 Average (ng/m^3)	% Difference
BOMA	3.28	2.32	-29.18%
BTUT	2.45	1.87	-23.76%
CAMS 35	2.51	2.35	-6.33%
CHSC	2.07	1.21	-41.69%
DEMI	3.30	2.34	-29.28%
NBIL	1.34	1.14	-15.14%
PRRI	5.09	2.69	-47.21%
S4MO	1.23	1.51	23.33%
SDGA	2.81	0.96	-65.93%
SEWA	2.97	2.21	-25.63%
SKFL	4.37	3.06	-29.82%
SYFL	4.17	3.12	-25.23%
WADC	2.35	1.95	-17.10%

For the 2004-2006 time period, the average range was 1.23 ng/m^3 (S4MO) to 5.09 ng/m^3 (PRRI). By comparison, the 2007 annual average range was 0.96 ng/m^3 (SDGA) to 3.12 ng/m^3 (SYFL). Twelve of the thirteen sites realized decreases when comparing the 2004-2006 time period average to the 2007 Annual Average. The largest percentage decreases for nickel were preliminarily realized at: SDGA (-65.93%); PRRI (-47.21%); and CHSC (-41.69%).

6.15 Tetrachloroethylene Trends

Three-year period averages for tetrachloroethylene were calculated for 11 NATTS sites, and are presented in Table 6-15.

Table 6-15. Tetrachloroethylene Trends Analyses

Site	2004-2006 Average (µg/m^3)	2007 Average (µg/m^3)	% Difference
BOMA	0.27	0.19	-30.52%
BXNY	0.68	0.68	-0.15%
CAMS 35	0.12	0.17	43.94%
CAMS 85	0.06	0.04	-34.84%
DEMI	3.00	0.33	-89.05%
PRRI	0.28	0.23	-17.46%
ROCH	0.22	0.12	-46.20%
SEWA	0.20	0.16	-19.24%
SJCA	0.20	0.20	0.31%
SKFL	0.26	0.18	-28.02%
SYFL	0.15	0.09	-39.72%

For the 2004-2006 time period, the average range was 0.06 µg/m^3 (CAMS 85) to 3.00 µg/m^3 (DEMI). By comparison, the 2007 annual average range was 0.04 µg/m^3 (CAMS 85) to 0.68 µg/m^3 (BXNY). Nine of the eleven sites realized decreases when comparing the 2004-2006 time period average to the 2007 Annual Average. The largest percentage decreases for tetrachloroethylene were preliminarily realized at: DEMI (-89.05%); ROCH (-46.20%); and SYFL (-39.72%).

6.16 Trichloroethylene Trends

Three-year period averages for trichloroethylene were calculated for six NATTS sites, and are presented in Table 6-16.

Table 6-16. Trichloroethylene Trends Analyses

Site	2004-2006 Average (µg/m^3)	2007 Average (µg/m^3)	% Difference
BXNY	0.12	0.11	-11.46%
CAMS 35	0.04	0.04	11.85%
CAMS 85	0.04	0.03	-32.51%
PRRI	0.20	0.09	-56.15%
ROCH	0.09	0.06	-34.43%
SJCA	0.06	0.06	1.37%

For the 2004-2006 time period, the average range was 0.04 µg/m^3 (CAMS 35 and CAMS 85) to 0.20 µg/m^3 (PRRI). By comparison, the 2007 annual average range was

0.03 µg/m^3 (CAMS 35) to 0.11 µg/m^3 (BXNY). Four of the six sites realized decreases when comparing the 2004-2006 time period average to the 2007 Annual Average. The largest percentage decreases for acetaldehyde were preliminarily realized at: PRRI (-56.15%); ROCH (-34.43%); and CAMS 85 (-32.11%).

6.17 Vinyl Chloride Trends

Three-year period averages for vinyl chloride were calculated for just two NATTS sites, and are presented in Table 6-17.

Table 6-17. Vinyl Chloride Trends Analyses

Site	2004-2006 Average (µg/m^3)	2007 Average (µg/m^3)	% Difference
CAMS 35	0.04	0.04	-10.08%
CAMS 85	0.02	0.01	-34.16%

For the 2004-2006 time period, the average range was 0.02 µg/m3 (CAMS 85) to 0.04 µg/m3 (CAMS 35). By comparison, the 2007 annual averages for these two sites were 0.01 µg/m3 at CAMS 85 and 0.04 at CAMS 35. Both of these sites realized decreases when comparing the 2004-2006 time period average to the 2007 Annual Average (-10.08% at CAMS 35 and -34.16% at CAMS 85).

7.0 Data Quality

This section summarizes data quality considerations for the NATTS data set, from 2004 through 2007. The following observations are made concerning the 2004-2007 NATTS data set:

- A total of 28 data sets appear to be missing or not identifiable in AQS. These data sets are identified with a "M" in Table 2-10. Many of the "missing" data sets are for metals and hexavalent chromium. It is recommended that state/local agencies review the sample completeness and parameter occurrence code (POC) tables to ensure data were extracted correctly for this report. Additionally, if data are missing, it is recommended that the data be uploaded into AQS.

- Quality Assurance**:** Based on initial review of the data, it appears that the validity of certain data sets are suspect. Accordingly, these data sets are not include in this report for analyses, and were marked as "invalidated" in Table 2-10. They include:
    - HAKY: All of the VOC and metals data for the 2004 and 2005 sampling seasons appear to be artificially high. Many of the detected concentrations are several orders higher than any of the other NATTS sites. The pollutants and concentrations being detected are also not indicative of a rural site, which HAKY is supposed to be. It is recommended that the State of Kentucky review the validity of this data
    - LAOR: All of the VOC data for 2004, 2005, and 2006 sampling seasons appear to be artificially high. Many of the detected concentrations are several orders higher than any of the other NATTS sites. The pollutants and concentrations being detected are also not indicative of a rural site, which LAOR is supposed to be. It is recommended that the State of Oregon review the validity of this data.
    - CHSC: A significant portion of the VOC data for 2004, 2005, 2006, and 2007 sampling seasons appear to be artificially high. Many of the detected concentrations are several orders higher than any of the other NATTS sites. The pollutants and concentrations being detected are also not indicative of a rural site, which CHSC is supposed to be. It is recommended that the State of South Carolina review the validity of this data.

- Measurement Quality: Data generated from the NATTS contract laboratory appear to be of better quality and more complete than independent laboratories. Of the 35 data

sets which are below the 85 percent completeness MQO, only four are from the NATTS contract laboratory. Additionally, all of the missing data in AQS are data from independent laboratories. It appears as if all of the NATTS contract laboratory data have been completely uploaded.

- MDL Reporting: Over 42% of the MDL values used in this analysis report were not populated in AQS; thus, the federal MDL was used as a surrogate. Nearly 90% of the data reported by the NATTS contract laboratory contained a non-Federal MDL, compared to just 42% from the independent laboratories.

8.0 Conclusions and Recommendations

This report characterizes monitoring data from the 23 urban and rural monitoring sites that comprise EPA's NATTS Program network. The time period of the monitoring data is from 2004 through 2007. EPA intends to use these data to evaluate air toxics ambient monitoring trends and risk potential.

8.1 Conclusions

A number of conclusions are made based on the results of this report. They include:

- Completeness: A total of 262,898 HAP measurements were extracted from AQS for the NATTS monitoring sites. The number of possible data sets (combination of sampling year, NATTS site, and pollutant type) is 342. The NATTS Data Quality Objective (DQO) for completeness is 85 percent or greater. Nearly 89 percent of the NATTS data sets achieved the completeness DQO for the different pollutant types. Fourteen data sets did not achieve this DQO.

- Missing Data: A total of 28 data sets appear to be missing or not identifiable in AQS. These data sets are identified with a "M" in Table 2-10. Many of the "missing" data sets are for metals and hexavalent chromium.

- Detections: Approximately 75 percent of the detected concentrations were measured above their method detection limits (MDLs). Formaldehyde, acetaldehyde, benzene, toluene, *m.p*-xylenes, carbon tetrachloride, chloromethane each had at least 4,000 detects. Tribromomethane, ethyl acrylate, methyl methacrylate, and *alpha*-chlorotoluene measured less than 150 detects.

- Concentration Range: Over 83 percent of the measured detections had concentrations greater than 1 $\mu g/m^3$, while less than 2 percent never exceeded 5 $\mu g/m^3$.

- Central Tendency: Across the NATTS network, formaldehyde (3.15 $\mu g/m^3$), toluene (2.71 $\mu g/m^3$), and acetaldehyde (1.94 $\mu g/m^3$) were the Top 3 HAPs by average mass concentration with at least 3,000 detects. Nearly all of the average, geometric mean, median, and mode values for each of the pollutants were within an order of magnitude of each other, suggesting relative closeness of the measurements across the network and very few outliers.

- Risk Screening Approach: In total, nearly 43 percent of detected HAP concentrations failed their Risk Screens. Acetaldehyde failed the highest number of Risk Screens (4,461 out of 4,741 measurements). Benzene and carbon tetrachloride also failed greater than 4,000 Risk Screens. By site, SYFL failed the most Risk Screens at 2,666.

- ATSDR MRL Evaluation: Only 3 daily measurements of formaldehyde and 1 daily measurement of acrolein exceeded their ATSDR short-term MRLs. Conversely, 105 out of 108 seasonal averages for acrolein exceeded its ATSDR intermediate-term MRL. No pollutant annual averages by site and year exceeded their chronic-term MRLs.

- Cancer Risk Approximations**:** Annual average concentrations were applied to cancer UREs to calculate an approximation of cancer risk. Nearly 45 percent of the cancer risk approximations were less than or equal to 1-in-a-million cancer risk, while less than eight percent were greater than 10 in-a-million. No cancer risk approximations were greater than 100 in-a-million.

- Noncancer Risk Approximations**:** Annual average concentrations were applied to noncancer RfCs to calculate an approximation of noncancer risk. The noncancer risks were summed together by target system (respiratory, neurological, etc.). The respiratory target system, due to acrolein, consistently measured a hazard index greater than 1, indicating the likelihood of respiratory problems for lifetime exposure. Most target system hazard indices were extremely low, meaning very low risk of noncancer effects if exposed consistently during a lifetime.

- Risk-Based Emissions Comparison: A risk-based emissions comparison was performed using toxicity-weighted emissions and the cancer/noncancer risk approximations. Benzene and acrolein consistently ranked in the Top 10 for cancer and noncancer at all sites.

- Three-Year Rolling Average Trends (Site-Level): The MQO Core HAPs were preliminarily evaluated for trends using the 2004-2006 time period average and the 2007 Annual Average. Percentage reductions between the two metrics were realized for more than 75% of site-pollutant combinations.

8.2 Recommendations

The following recommendations are made after evaluating the NATTS data:

- Missing Data in AQS: A large number of data sets appear to be missing from AQS. It is recommended that state/local agencies review the sample completeness and parameter occurrence code (POC) tables to ensure data were extracted correctly for this report. Additionally, if data are missing, it is recommended that the data be uploaded into AQS.

- Measurement Quality: Data generated from the NATTS contract laboratory appear to be of better quality and more complete than independent laboratories. Of the 35 data sets which are below the 85 percent completeness MQO, only four are from the NATTS contract laboratory. Additionally, all of the missing data in AQS are data from independent laboratories. It appears as if all of the NATTS contract laboratory data have been completely uploaded.

- Increase Acrolein Detections**:** The results of the risk-based emissions assessment identified several NATTS sites not detecting acrolein enough to develop a valid annual average. Sites that did not have enough acrolein detects to calculate an Annual Average include: BXNY, CAMS 35, CHSC, HAKY, LAOR, MVWI, ROCH, SDGA, UNVT, and WADC. This is problematic, considering the noncancer toxicity of this pollutant at low concentration levels. It is recommended that acrolein MDLs be lowered further for laboratories supporting sites in which an annual average for acrolein be calculated. Although PXSS did not have enough acrolein detects to calculate a valid Annual Average in 2007, the VOC sampling completeness met its MQO at 87 percent, and acrolein was detected consistently. The reason an Annual Average could not be calculated is because VOC sampling did not begin until July 2007. Accordingly, no VOC measurements were uploaded into AQS prior to July 2007 at this site.

9.0 References

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