2012 Air Toxics Summary

New Jersey Department of Environmental Protection

INTRODUCTION

Air pollutants can be divided into two categories: the criteria pollutants (ozone, sulfur dioxide, carbon monoxide, nitrogen dioxide, particulate matter, and lead); and air toxics. The criteria pollutants have been addressed at the national level since the 1970s. The United States Environmental Protection Agency (USEPA) has set National Ambient Air Quality Standards (NAAQS) for them, and they are subject to a standard planning process that includes monitoring, reporting, and control requirements. Each of these pollutants is discussed in its own section of this New Jersey Department of Environmental Protection (NJDEP) 2011 Air Quality Report.

Air toxics are basically all the other chemicals released into the air that have the potential to cause adverse health effects in humans. These effects cover a wide range of conditions, from lung irritation to birth defects to cancer. There are no NAAQS for these pollutants, but in 1990 the U.S. Congress directed the USEPA to begin addressing a list of almost 200 air toxics by developing control technology standards for specific categories of sources that emit them. These air toxics are known as the Clean Air Act Hazardous Air Pollutants (HAPs). You can get more information about HAPs at the USEPA Air Toxics web site at www.epa.gov/ttn/atw. NJDEP also has several web pages dedicated to air toxics. They can be accessed at www.state.nj.us/dep/airtoxics.

HEALTH EFFECTS

People exposed to significant amounts of air toxics may have an increased chance of getting cancer or experiencing other serious health effects. The noncancer health effects can range from respiratory, neurological, reproductive, developmental, or immune system damage, to irritation and effects on specific organs. In addition to inhalation exposure, there can be risks from the deposition of toxic pollutants onto soil or surface water. There, they can be taken up by plants and animals which are later consumed by humans.

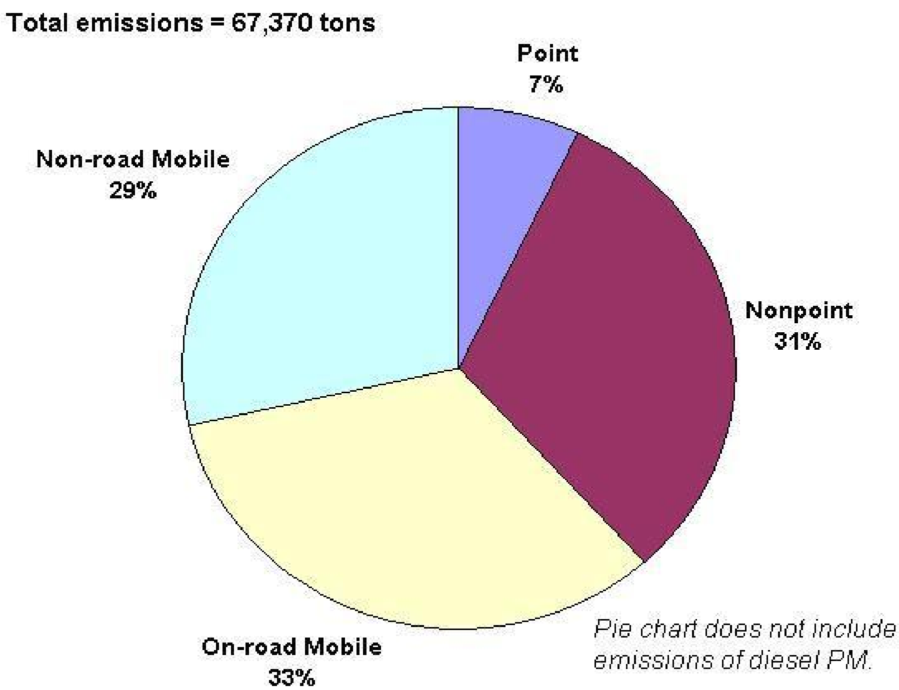
The effects on human health resulting from exposure to specific air toxics can be estimated by using chemical-specific health benchmarks. These are based on toxicity values developed by the USEPA and other agencies, using chemical-specific health studies. For carcinogens (chemicals suspected of causing cancer) the health benchmark is the concentration of the pollutant that corresponds to a one-in-a-million increase in the risk of getting cancer if a person was to breathe that concentration over his or her entire lifetime. The health benchmark for a noncarcinogen is the air concentration at which no adverse health effect is expected to occur, even if a person is exposed to that concentration on a daily basis for a lifetime (this is also known as a reference concentration). Not all air toxics have health benchmarks, because of a lack of toxicity studies. Available health benchmarks for the air toxics monitored in New Jersey are listed in Tables 6 through 8. If ambient air concentrations exceed the health benchmarks then some action, such as a reduction in emissions, should be considered.

SOURCES OF AIR TOXICS

A number of years ago, USEPA began the National-Scale Air Toxics Assessment (NATA). Starting with the year 1996, they set out on a three-year cycle to determine people's exposure to air toxics around the country. To do this, USEPA first prepares a comprehensive inventory of air toxics emissions from all man-made sources. The emissions inventory is reviewed and updated by each state. Although there are likely to be some errors in the details of such a massive undertaking, the emissions inventory still can give us a reasonable indication of the most important sources of air toxic emissions in our state. The pie chart in Figure 1, based on the most recent NATA (for 2005) emissions estimates, shows that mobile sources are the largest contributors of air toxics emissions in New Jersey.

On-road mobile sources (cars and trucks) account for 33% of the air toxics emissions, and non-road mobile sources (airplanes, trains, construction equipment, lawnmowers, boats, dirt bikes, etc.) contribute an additional 20%. Nonpoint sources (residential, commercial, and small industrial sources) represent 31% of the inventory, and point sources (such as factories and power plants) account for the remaining 7%.

Figure 1
2005 Air Toxics Emissions Source
Estimates for New Jersey

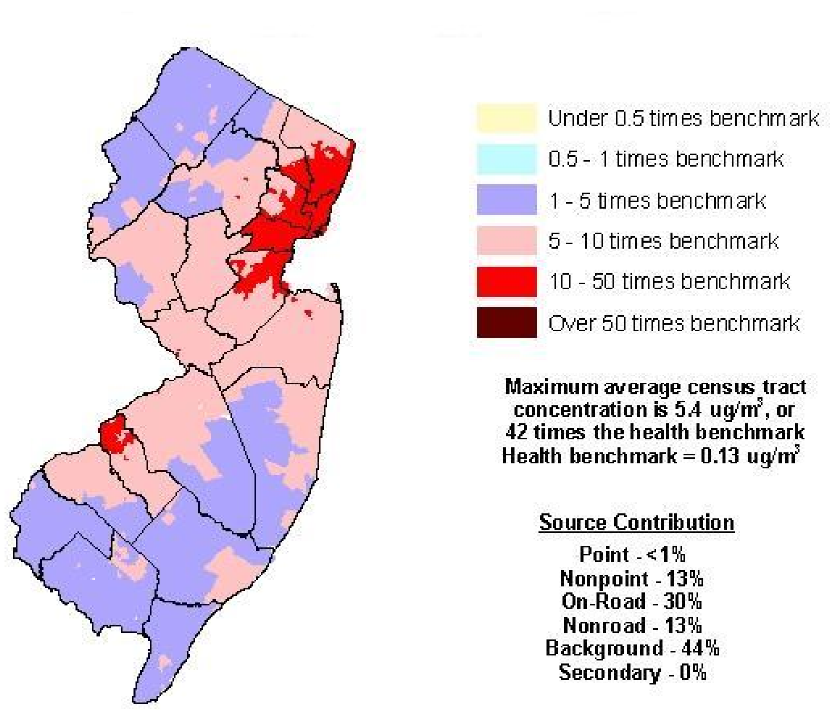


ESTIMATING AIR TOXICS EXPOSURE

There are a limited number of air toxics monitors located throughout the country, because of costs and logistics. In order to estimate air toxics concentrations in areas across the U.S., especially those areas with no monitors, USEPA's NATA project uses its emissions inventory in an air dispersion model that predicts ambient annual average concentrations. (A comparison of some the NATA results with monitoring results is presented in Figure 19).

The map in Figure 2 shows the predicted concentrations of benzene throughout New Jersey. The high concentration areas tend to overlap the more densely populated areas of the state, following the pattern of emissions. Not all air toxics follow this pattern, as some are more closely associated with individual point sources or transport, but in general, higher population densities result in greater emissions of, and exposure to, air toxics. Maps for other air toxics can be found at www.nj.gov/dep/airtoxics/nataest05.htm.

Figure 2
BENZENE - 2005 NATA Predicted
Concentrations for New Jersey



Analysis of the NATA state and county average air toxics concentrations indicates that twenty-three chemicals were predicted to exceed their health benchmarks, or level of concern, in one or more counties in 2005. Twenty-two of these are considered to be cancer-causing (carcinogenic) chemicals, and one (acrolein) is not. Estimated air concentrations of these 23 pollutants vary around the state, depending on the types of sources that emit them. This is summarized in Table 1.

Table 1
Air Toxics of Greatest Concern in New Jersey
Based on 2005 National-Scale Air Toxics Assessment

Pollutant of Concern	Number of Counties Above Health Benchmark	Primary Source of Emissions
Acetaldehyde	Statewide	Background, secondary
Acrolein	Statewide	Background, nonpoint
Acrylonitrile	2 (Bergen & Essex)	Point, nonpoint
Arsenic Compounds	19	Background, secondary
Benzene	Statewide	Background, mobile
1,3-Butadiene	Statewide	Background, mobile
Cadmium Compounds	1 (Warren)	Nonpoint, background
Carbon Tetrachloride	Statewide	Background
Chloroform	Statewide	Nonpoint, background
Chromium (hexavalent)	20	Background, point
Cobalt Compounds	7	Point
1,4-Dichlorobenzene	8	Nonpoint, background
1,3-Dichloropropene	1 (Hudson)	Nonpoint
Diesel Particulate Matter	Statewide	Mobile
Ethylbenzene	6	Mobile, nonpoint
Ethylene Oxide	6	Background, nonpoint
Formaldehyde	Statewide	Background, secondary
Methyl Chloride	Statewide	Background
Naphthalene	20	Nonpoint, mobile
Nickel compounds	1 (Hudson)	Nonpoint, point
PAH/POM	18	Nonpoint
Tetrachloroethylene	8	Nonpoint, background
1,1,2-Trichloroethane	1 (Salem)	Nonpoint

NEW JERSEY AIR TOXICS MONITORING PROGRAM RESULTS FOR 2012

NJDEP has three air toxics monitoring sites for **volatile organic compounds (VOCs)** around the state, located in Elizabeth, New Brunswick and Chester (see Figure 3). The Camden Lab site, which had been measuring several toxics since 1989, was shut down on September 29, 2008, because NJDEP lost access to the station. (A new site in Camden is expected to become operational in 2013.) The Elizabeth air toxics site (formally called the Elizabeth Lab site) began measuring VOCs in 2000, and the New Brunswick and Chester sites started in July 2001. Analysis of toxic metals at these sites also began in 2001, with Newark added in 2010. Data for some of the toxic metals will be discussed below. All samples are analyzed by a laboratory contracted through USEPA.
VOCs and carbonyls (a subset of VOCs that includes formaldehyde and acetaldehyde) are sampled every six days. 2012 air toxic monitoring results for VOCs are shown in Table 2. This table contains the annual average concentration for each air toxic measured at the three New Jersey monitoring sites. All values are in micrograms per cubic meter ($\mu g/m^3$). More detail can be found in Tables 6 through 8, including additional statistics, detection limit information, health benchmarks used by NJDEP, risk ratios, and concentrations in parts per billion by volume (ppbv). The ppbv units are more common for monitoring results, while $\mu g/m^3$ units are generally used in modeling and health studies. Many of the compounds that were analyzed were below the detection limit of the method used. These are listed separately in Table 9.

Chemicals with reported averages based on data with less than 50% of the samples above the detection limit should be viewed with extreme caution. Median values (the value of the middle sample value when the results are ranked) are reported in Tables 6 through 8 along with the mean (average) concentrations because for some compounds only a single or very few high values were recorded. These high values will tend to increase the average concentration significantly, but would have less effect on the median value. In such cases, the median value may be a better indicator of long-term exposures (the basis for the air toxics health benchmarks).

The Chester site had the lowest concentrations for the bulk of the prevalent air toxics. The highest concentrations for most compounds were split between Elizabeth and New Brunswick, with the majority occurring at Elizabeth.

USEPA has recently determined that the methods used to collect and analyze **acrolein** in ambient air are not producing reliable results. More information is available at www.epa.gov/schoolair/acrolein.html . Although we are including the 2012 New Jersey acrolein data in this report, the concentrations are highly uncertain and should be viewed with caution.

For **acrylonitrile** and **carbon disulfide**, some questionable results were reported after a new air sampler was installed in March. On average, concentrations increased more than twenty times. The analyzing lab has invalidated the data, and the sampler will be replaced. This report does not include any of the 2012 acrylonitrile and carbon disulfide data for New Brunswick.

This report includes results for toxic metals from the particulate speciation monitors in Chester, Elizabeth, New Brunswick, and Newark. The data is collected every three days. Monitoring data for other speciated particulate can be found in Appendix B (Fine Particulate Speciation Summary) of the annual Air Quality Report (www.njaqinow.net/Default.ltr.aspx). Table 3 presents the annual average concentrations for pollutants which have a health benchmark, along with estimated risk ratios. (For more information see the section on "Estimating Health Risk" below.) Chromium and nickel have health benchmarks that are based on carcinogenicity of specific compounds. Since the monitoring method only measures total chromium or nickel and cannot distinguish between different types of compounds, cancer risk ratios are not calculated with those benchmarks. However, risk ratios are calculated for nickel based on noncancer effects.

Table 2
2012 Summary of Toxic Volatile Organic Compounds Monitored in New Jersey

Annual Average Concentration
micrograms per cubic meter (μg/m³)

Pollutant	Synonym	HAP	CAS No.	Chester	Elizabeth	New Brunswick
Acetaldehyde		*	75-07-0	1.50	2.65	1.41
Acetone			67-64-1	2.14	2.98	2.62
Acetonitrile		*	75-05-8	1.28	0.42	0.56
Acetylene			74-86-2	0.52	1.18	0.87
Acrolein		*	107-02-8	0.85	1.78	1.61
Acrylonitrile		*	107-13-1	*0.03*	*0.03*	b
tert-Amyl Methyl Ether			994-05-8	*0.002*	*0.001*	*0.001*
Benzaldehyde			100-52-7	0.06	0.13	0.07
Benzene		*	71-43-2	0.64	1.04	0.86
Bromochloromethane			74-97-5	ND	ND	*0.002*
Bromodichloromethane			75-27-4	*0.01*	*0.009*	*0.004*
Bromoform		*	75-25-2	*0.02*	*0.01*	*0.02*
Bromomethane	Methyl bromide	*	74-83-9	0.05	0.05	0.04
1,3-Butadiene		*	106-99-0	0.04	0.14	0.09
Butyraldehyde			123-72-8	0.21	0.38	0.19
Carbon Disulfide		*	75-15-0	0.30	0.28	b
Carbon Tetrachloride		*	56-23-5	0.67	0.67	0.67
Chlorobenzene		*	108-90-7	*0.004*	*0.01*	*0.02*
Chloroethane	Ethyl chloride	*	75-00-3	*0.003*	*0.006*	*0.08*
Chloroform		*	67-66-3	0.08	0.12	0.12
Chloromethane	Methyl chloride	*	74-87-3	1.14	1.20	1.21
Chloroprene	2-Chloro-1,3-butadiene	*	126-99-8	*0.0004*	*0.001*	ND
Crotonaldehyde			123-73-9	0.34	0.34	0.28
Dibromochloromethane			594-18-3	0.03	*0.02*	*0.03*
1,2-Dibromoethane	Ethylene dibromide	*	106-93-4	*0.005*	*0.002*	*0.006*
m-Dichlorobenzene	1,3-Dichlorobenzene		541-73-1	*0.008*	*0.01*	*0.01*
o-Dichlorobenzene	1,2-Dichlorobenzene		95-50-1	*0.008*	*0.009*	*0.02*
p-Dichlorobenzene	1,4-Dichlorobenzene	*	106-46-7	0.03	0.07	0.05
Dichlorodifluoromethane			75-71-8	2.46	2.51	2.53
1,1-Dichloroethane	Ethylidene dichloride	*	75-34-3	ND	*0.0003*	ND
1,2-Dichloroethane	Ethylene dichloride	*	107-06-2	0.07	0.08	0.08
1,1-Dichloroethylene	Vinylidene chloride	*	75-35-4	*0.002*	*0.002*	*0.0005*
cis-1,2-Dichloroethylene	cis-1,2-Dichloroethene		156-59-2	*0.002*	*0.002*	ND
trans-1,2-Dichloroethylene	trans-1,2-Dichloroethene		156-60-5	ND	*0.0007*	*0.003*
Dichloromethane	Methylene chloride	*	75-09-2	0.45	0.53	0.59

- *Values in **italics** indicate averages based on less than 50% of samples above the detection limit.*
- **ND** indicates that all samples were below the detection limit.
- HAP = Hazardous air pollutant as listed in the Clean Air Act.

[a] Acrolein concentrations are highly uncertain because of problems with collection and analysis methods.

[b] Acrylonitrile and carbon disulfide data for New Brunswick have been invalidated because of technical problems.

Table 2 (continued)
2012 Summary of Toxic Volatile Organic Compounds Monitored in New Jersey

Annual Average Concentration
micrograms per cubic meter (μg/m³)

Pollutant	Synonym	HAP	CAS No.	Chester	Elizabeth	New Brunswick
1,2-Dichloropropane	Propylene dichloride	*	78-87-5	ND	ND	ND
cis-1,3-Dichloropropene	cis-1,3-Dichloropropylene	*	542-75-6	ND	ND	ND
trans-1,3-Dichloropropene	trans-1,3-Dichloropropylene	*	542-75-6	ND	ND	ND
Dichlorotetrafluoroethane	Freon 114		76-14-2	0.12	0.12	0.12
2,5-Dimethylbenzaldehyde			5799-94-2	ND	ND	ND
Ethyl Acrylate		*	140-88-5	*0.0004*	*0.0003*	*0.0005*
Ethyl tert-Butyl Ether	tert-Butyl ethyl ether		637-92-3	0.41	0.22	0.28
Ethylbenzene		*	100-41-4	0.16	0.41	0.25
Formaldehyde		*	50-00-0	2.45	3.88	1.83
Hexachloro-1,3-butadiene	Hexachlorobutadiene	*	87-68-3	*0.02*	*0.009*	*0.02*
Hexaldehyde	Hexanaldehyde		66-25-1	0.06	0.15	0.08
Isovaleraldehyde			590-86-3	ND	ND	ND
Methyl Ethyl Ketone	MEK		78-93-3	0.30	0.53	0.39
Methyl Isobutyl Ketone	MIBK	*	108-10-1	0.12	0.15	0.14
Methyl Methacrylate		*	80-62-6	*0.001*	*0.06*	*0.005*
Methyl tert-Butyl Ether	MTBE	*	1634-04-4	0.12	0.08	0.09
n-Octane			111-65-9	0.21	0.43	0.22
Propionaldehyde		*	123-38-6	0.26	0.52	0.24
Propylene			115-07-1	0.64	5.92	0.84
Styrene		*	100-42-5	0.11	0.15	0.18
1,1,2,2-Tetrachloroethane		*	79-34-5	*0.008*	*0.003*	*0.009*
Tetrachloroethylene	Perchloroethylene	*	127-18-4	0.09	0.19	0.15
Tolualdehydes				0.10	0.15	0.10
Toluene		*	108-88-3	5.24	2.09	3.58
1,2,4-Trichlorobenzene		*	102-82-1	*0.005*	*0.003*	*0.01*
1,1,1-Trichloroethane	Methyl chloroform	*	71-55-6	0.05	0.05	0.05
1,1,2-Trichloroethane		*	79-00-5	*0.001*	ND	*0.0005*
Trichloroethylene		*	79-01-6	*0.007*	*0.04*	*0.03*
Trichlorofluoromethane			75-69-4	1.47	1.54	1.54
Trichlorotrifluoroethane	1,1,2-Trichloro-1,2,2-trifluoroethane		76-13-1	0.65	ND	0.67
1,2,4-Trimethylbenzene			95-63-6	0.18	0.47	0.28
1,3,5-Trimethylbenzene			108-67-8	0.09	0.17	0.12
Valeraldehyde			110-62-3	0.06	0.14	0.06
Vinyl chloride		*	75-01-4	*0.001*	*0.0002*	*0.001*
m,p-Xylene		*	1330-20-7	0.33	1.08	0.61
o-Xylene		*	95-47-6	0.16	0.46	0.26

- *Values in italics indicate averages based on less than 50% of samples above the detection limit.*
- ND indicates that all samples were below the detection limit.
- HAP = Hazardous air pollutant as listed in the Clean Air Act.

Table 3
2012 New Jersey Toxic Metals Summary & Risk Ratios

Pollutant	HAP[a]	Annual average concentration ($\mu g/m^3$)[b]				Health Benchmark ($\mu g/m^3$)[c]	Risk Ratio[d]			
		Chester	Elizabeth	New Brunswick	Newark		Chester	Elizabeth	New Brunswick	Newark
Antimony	*	0.0218	0.0209	0.0214	0.0212	0.2	0.1	0.1	0.1	0.1
Arsenic	*	*0.0005*	*0.0004*	*0.0005*	*0.0005*	*2.3E-04*	**2**	**1.7**	**2**	**2**
Cadmium	*	*0.0010*	*0.0023*	*0.0017*	*0.0011*	*2.4E-04*	**4**	**10**	**7**	**5**
Chlorine	*	0.0066	0.0267	0.0112	0.0152	0.2	0.03	0.1	0.06	0.08
Chromium[e]	*	0.0030	0.0040	0.0045	0.0100	*8.3E-05*	**36**	**48**	**54**	**120**
Cobalt	*	0.0007	0.0009	0.0008	0.0009	*1.1E-04*	**6**	**9**	**7**	**9**
Lead	*	*0.0009*	0.0019	0.0018	0.0018	0.15	0.01	0.01	0.01	0.01
Manganese	*	*0.0007*	0.0018	0.0019	0.0015	0.05	0.01	0.04	0.04	0.03
Nickel	*	0.0009	0.0028	0.0015	0.0038	0.05	0.02	0.06	0.03	0.08
Nickel[f]	*	0.0009	0.0028	0.0015	0.0038	*2.1E-03*	0.4	**1.3**	0.7	**1.8**
Phosphorus	*	0.0057	0.0055	0.0058	0.0057	0.07	0.08	0.08	0.08	0.08
Selenium	*	0.0011	0.0011	0.0011	0.0011	20	0.0001	0.0001	0.0001	0.0001
Silicon		0.0398	0.0678	0.0765	0.0572	3	0.01	0.02	0.03	0.02
Vanadium		0.0017	0.0046	0.0018	0.0027	0.1	0.02	0.05	0.02	0.03

[a] HAP = Hazardous air pollutant as listed in the Clean Air Act.

[b] Annual average concentrations in italics are based on less than 50% of the samples above the detection limit.

[c] The health benchmark is defined as the chemical-specific air concentration above which there may be human health concerns. Toxicity values are not available for all chemicals. For more information, go to www.nj.gov/dep/aqpp/risk.html.
Health benchmarks in italics have a cancer endpoint.
For a carcinogen (cancer-causing chemical), the health benchmark is set at the air concentration that would cause no more than a one-in-a-million increase in the likelihood of getting cancer, even after a lifetime of exposure.
For a non-carcinogen, the health benchmark is the maximum air concentration to which exposure is likely to cause no harm, even if that exposure occurs on a daily basis for a lifetime.

[d] The risk ratio for a chemical is a comparison of the annual mean air concentration to the health benchmark. A risk ratio greater than one may be of concern. If the annual mean is 0, then the risk ratio cannot be calculated.

[e] Chromium - The health benchmark is based on carcinogenicity of hexavalent chromium (Cr^{+6}).
It is not known how much of the chromium measured by the monitor is hexavalent.

[f] Nickel - The cancer-based health benchmark for nickel is based on specific nickel compounds.
It is not known how much of the nickel measured by the monitor is in that form.

More information on speciated fine particulate matter measured in New Jersey can be found in the NJDEP's 2012 Air Quality Report, Appendix B - Fine Particulate Speciation Summary at www.njaqinow.net/Default.ltr.aspx.

ESTIMATING HEALTH RISK

A simplified way to determine whether the ambient concentration of an air toxic could pose a potential human health risk is to compare the air concentration to a health benchmark. The number that we get when we divide the concentration by the benchmark is called a **risk ratio**. If the risk ratio is less than one, the air concentration should not pose a health risk. If it is greater than one, it may be of concern. The risk ratio also indicates how much higher or lower the estimated air concentration is compared to the health benchmark.

The pollutants with risk ratios greater than one for at least one monitoring site are summarized in Table 4. In addition to the toxic VOCs and carbonyls, speciated metals were also evaluated for risk. Elizabeth had fourteen pollutants with annual average concentrations that exceeded their health benchmarks, New Brunswick had twelve and Chester had fourteen. The toxic VOCs with risk ratios greater than one at all sites are acetaldehyde, benzene, 1,3-butadiene, carbon tetrachloride, chloroform, chloromethane (methyl chloride), 1,2-dichloroethane, and formaldehyde. Toxic metals that had risk ratios greater than one at the four monitoring sites (including Newark) were arsenic, cadmium, and cobalt. The noncancer risk ratio for nickel was slightly over one at Elizabeth and Newark.

Formaldehyde contributed the highest risks, but note that the risks varied substantially from site to site. Some pollutants were over the level of concern at some sites but not others. Although acrolein risk ratios at all sites were greater than one, they are not included here because of problems with the sampling method. More detail for each site, including health benchmarks used to calculate risk ratios, can be found in Tables 6 through 8.

Table 4 can be compared with the risk results predicted by NATA in Table 5. Chromium and nickel cancer risk cannot be estimated from monitoring data because the sampling method measures total chromium and total nickel concentrations; the amounts that are in the carcinogenic form cannot be determined. 1,3-Dichlopropylene and 1,1,2-trichloroethane samples were mostly below the detection limits, so no annual average concentration could be calculated. Ethylene oxide and naphthalene are not sampled at the New Jersey sites. PAH/POM are polycyclic aromatic hydrocarbons/polycyclic organic matter, a broad class of compounds that are not measured in New Jersey because of a lack of a reliable sampling method. On the other hand, acrylonitrile is measured in New Jersey at levels higher than estimated by NATA.

NATA estimates show concentrations of diesel particulate matter (DPM) in New Jersey that are at levels that potentially pose a higher cancer risk than the other air toxics combined. However, actually measuring diesel in the ambient air is problematic. It is difficult to distinguish particulate matter emitted by diesel engines from other types of particulate matter. Diesel emissions consist of agglomerated and condensed fine particles and gases, onto which are adsorbed potentially hundreds of compounds formed by incomplete combustion, such as polycyclic aromatic hydrocarbons (PAHs) and nitrated PAHs. Some of these very specific compounds have been suggested as indicators for DPM, but sampling technologies and costs continue to be obstacles. Elemental carbon is sometimes assumed to be an indicator for diesel emissions. See Figure 3 for a comparison of DPM concentrations from NATA with monitored concentrations of elemental carbon. For more information about diesel, see www.nj.gov/dep/airtoxics/diesemis.htm.

Table 4
Monitored Toxic Air Pollutants with Risk Ratios Greater Than One in NJ for 2012

POLLUTANT	RISK RATIO			
	Chester	**Elizabeth**	**New Brunswick**	**Newark**
Acetaldehyde	**3**	**6**	**3**	
Acrylonitrile	**2**[a]	**2**[a]	No data	
Arsenic	**2**	**2**	**2**	**2**
Benzene	**5**	**8**	**7**	
1,3-Butadiene	**1.3**	**4**	**3**	
Cadmium	**4**	**10**	**7**	**5**
Carbon Tetrachloride	**4**	**4**	**4**	
Chloroform	**2**	**3**	**3**	
Chloromethane	**2**	**2**	**2**	
Cobalt	**3**	**7**	**4**	**6**
1,2-Dibromoethane[a]	**3**	0.96	**4**	
1,2-Dichloroethane	**2**	**2**	**2**	
Formaldehyde	**32**	**50**	**24**	
Nickel[b]	0.4	**1.3**	0.8	**2**
Tetrachloroethylene	0.5	**1.1**	0.9	

[a] Based on less than 50% of samples above the detection limit.
[b] The cancer-based health benchmark for nickel is based on specific nickel compounds.

Figure 3. Comparison of Elemental Carbon Monitoring Data with NATA 2005 Predicted Concentrations for Diesel PM

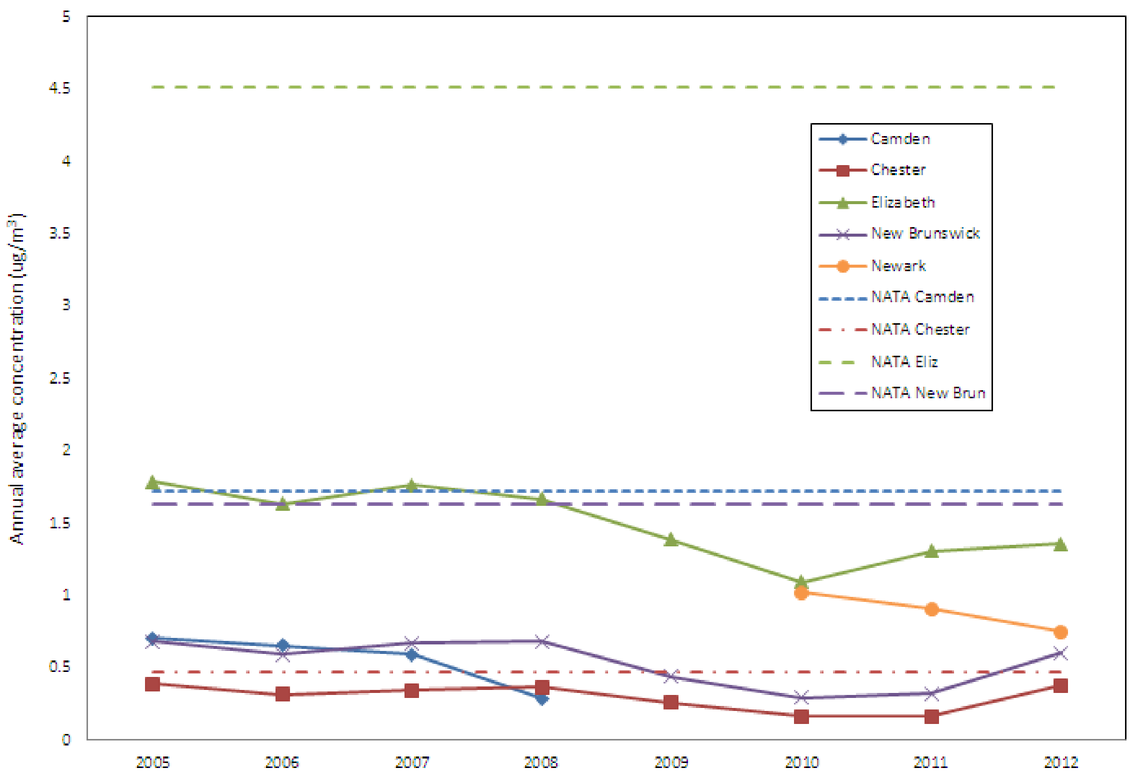


Table 5
2005 NATA Modeled Air Concentrations Compared to Health Benchmarks
New Jersey Statewide Averages

Pollutant	**Modeled Air Concentration (μg/m^3)**	**Health Benchmark (μg/m^3)**	**Risk Ratio**	**% Contribution from**				
				Major Sources	Area Sources	On-Road Mobile Sources	Nonroad Mobile Sources	Background & Secondary Formation
Acetaldehyde	1.9	0.45	**4.3**	<1%	4%	6%	3%	87%*
Acrolein	0.062	*0.020*	**3.1**	<1%	22%	14%	9%	55%*
Arsenic compounds	0.00053	0.00023	**2.3**	3%	13%	5%	5%	74%
Benzene	1.3	0.13	**10**	<1%	13%	30%	13%	44%
1,3-Butadiene	0.095	0.033	**2.9**	<1%	<1%	40%	17%	43%
Cadmium compounds	0.00011	0.00024	0.5	12%	44%	0%	1%	43%
Carbon tetrachloride	0.61	0.17	**3.6**	0%	<1%	0%	0%	100%
Chloroform	0.13	0.043	**3.1**	<1%	54%	0%	0%	46%
Chromium (hexavalent form)	0.00024	0.000083	**2.9**	29%	10%	4%	1%	56%
Cobalt Compounds	0.000093	0.00011	0.8	93%	7%	0%	0%	0%
1,4-Dichlorobenzene	0.12	0.091	**1.3**	<1%	58%	0%	0%	42%
1,3-Dichloropropene	0.14	0.25	0.5	0%	100%	0%	0%	0%
Diesel particulate matter	1.1	0.0033	**327**	0%	0%	47%	53%	0%
Ethylbenzene	0.34	0.40	0.9	1%	30%	45%	24%	0%
Ethylene oxide	0.011	0.011	**1.0**	12%	18%	0%	0%	70%
Formaldehyde	2.2	0.077	**28**	<1%	3%	9%	6%	82%*
Methyl chloride	1.2	0.56	**2.2**	<1%	1%	0%	0%	99%
Naphthalene	0.13	0.029	**4.6**	1%	48%	26%	4%	21%
Nickel Compounds	0.0012	0.0021	0.6	36%	37%	2%	10%	15%
PAH/POM**	0.012	0.0072*	**1.6**	1%	79%	8%	12%	0%
Tetrachloroethylene	0.25	0.17	**1.4**	<1%	61%	0%	0%	39%
1,1,2-Trichloroethane	0.0066	0.063	0.1	<1%	100%	0%	0%	0%

- For information on risk ratios see section on “Estimating Health Risk” above.
- Chemicals with risk ratios greater than or equal to 1 are in bold.
- Risk ratios based on noncarcinogenic effects are in *italics*.
- For diesel particulate matter, onroad and nonroad concentrations include a model-estimated background concentration.
- *Acetaldehyde, acrolein and formaldehyde concentration estimates include secondary formation, which is the process by which chemicals in the air are transformed into other chemicals.
- **PAH/POM is "polycyclic aromatic hydrocarbons/polycyclic organic matter." These define a broad class of compounds. The chemicals making up this class were broken up into 8 groups based on toxicity, and each group was assigned a cancer-weighted toxicity estimate. 0.0072 μg/m^3 is the health benchmark average across the 8 groups.

TRENDS AND COMPARISONS

Monitoring of air toxics in New Jersey has been going on for over a decade, although it continues to evolve, with improvements in the ability to detect given chemicals at lower concentrations. Figures 4 through 13 show data for some of the VOCs that have been sampled over the past decade. For many of the chemicals of concern in New Jersey we have been able to see a downward trend, although not in all cases.

According to USEPA's National Air Toxics Assessment (NATA), acetaldehyde concentrations in New Jersey (Figure 4) are primarily influenced by secondary formation, a process in which chemicals in the air are transformed by chemical reactions into other chemicals. Mobile sources also contribute to ambient levels. In 2003, no data was collected in Camden after September, which could have had an influence on the low annual average for that year. In 2004 in both Camden and New Brunswick, high levels of acetaldehyde were measured over a number of weeks. Note the similarity with the formaldehyde graph (Figure 12).

Acrylonitrile concentrations (Figure 5) are impacted by nonpoint sources and background. The high concentration in 2008 in Elizabeth is the result of a number of high sample values that year. Although there has been improvement in analysis, most of the samples are still below the minimum detection limit (MDL). Data for New Brunswick for 2012 were invalidated because of problems with the sampler.

Benzene concentrations have decreased over the past two decades, as can be seen with the Camden site data in Figure 6. Most benzene now comes from mobile and area sources, and is also transported from other regions (background). Sources of 1,3-butadiene (Figure 7) are similar to those of benzene.

Some of the increase in chloroform concentrations shown in Figure 8 is believed to be from improvements in the detection limit. Nonpoint sources and background are the major contributors to ambient chloroform levels.

Chloromethane (also known as methyl chloride) levels are influenced primarily by background. Figure 9 shows that concentrations have remained relatively stable from year to year, and that all sites show similar levels.

1,4-Dichlorobenzene (Figure 10) is emitted primarily from nonpoint sources. It is used in products such as pesticides, disinfectant, mothballs and toilet deodorizer blocks. There is also a significant background level. The high annual average for New Brunswick in 2005 is attributable to an exceptionally high reading on July 27th that may be a lab error.

Ethylbenzene is associated with mobile sources, which is probably why it is higher at the Elizabeth monitoring site and lower at Chester (Figure 11). 2001 data for Chester and New Brunswick have been omitted from the graph because of problems encountered when sampling was begun that May.

Formaldehyde (Figure 12) is a ubiquitous pollutant that is often found at higher concentrations indoors rather than outdoors because of its use in many consumer goods. It is used in the production of fertilizer, paper, plywood, urea-formaldehyde resins, and many other products. In New Jersey the primary emitters of formaldehyde are on-road mobile sources, although secondary formation and transport contribute significantly to high outdoor concentrations. As with acetaldehyde, a number of very high samples were measured at Camden and New Brunswick, in 2004.

Tetrachloroethylene (also known as perchloroethylene) (Figure 13) is used as an industrial solvent and in dry cleaning. It is a common contaminant of hazardous waste sites because of a tendency in the 20th century to dispose of it improperly. Production and demand for it by industry has been declining.

Figure 4
ACETALDEHYDE – New Jersey Monitored Concentrations

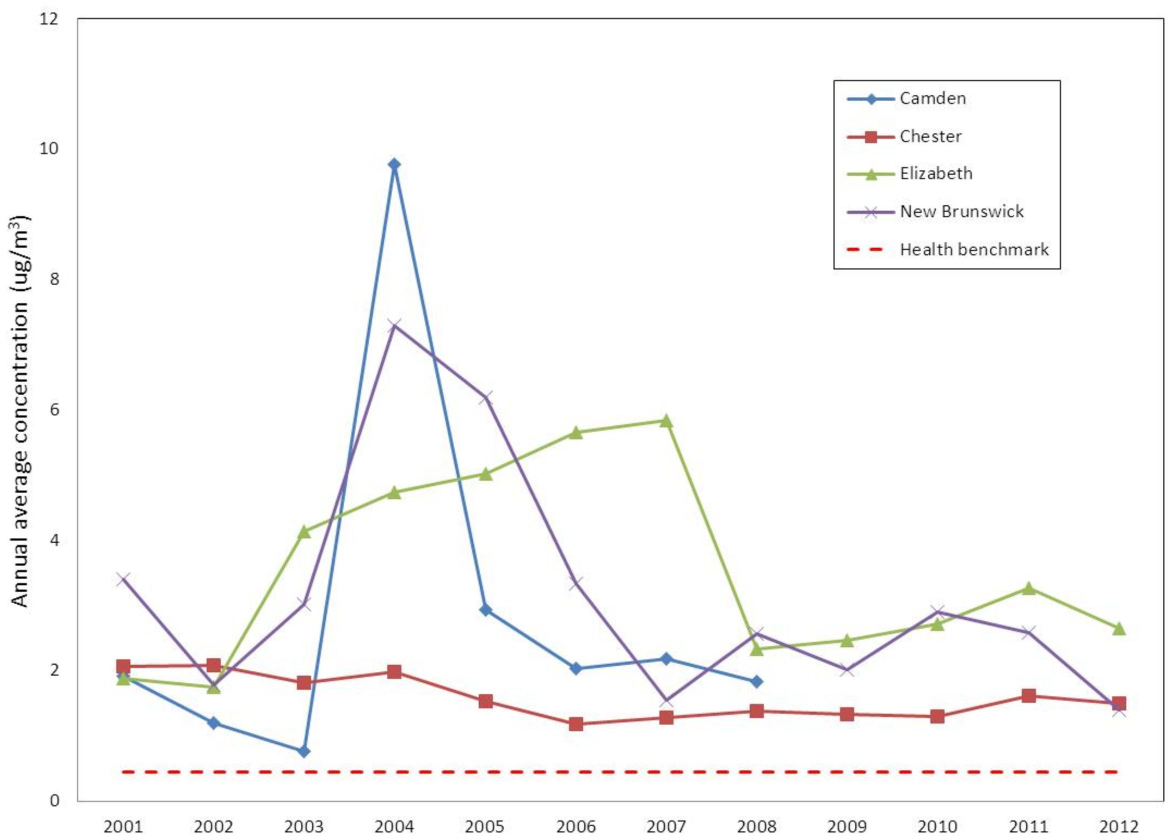


Figure 5
ACRYLONITRILE – New Jersey Monitored Concentrations

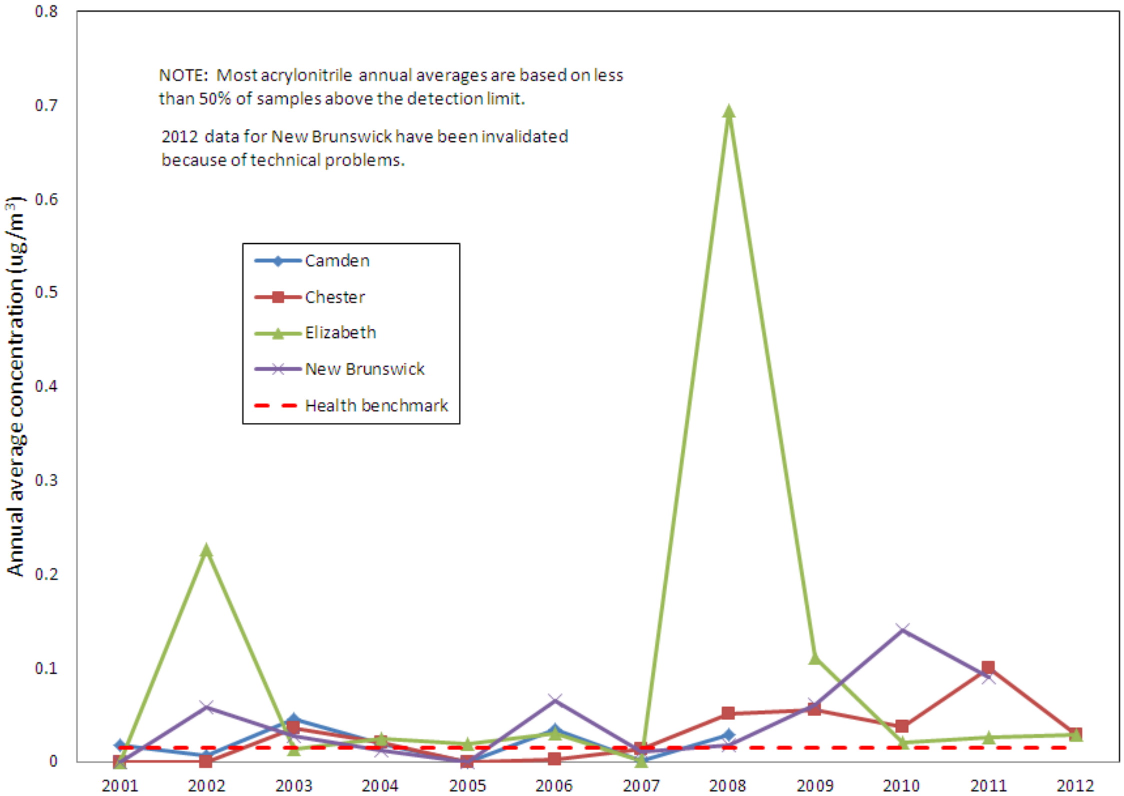


Figure 6
BENZENE – New Jersey Monitored Concentrations

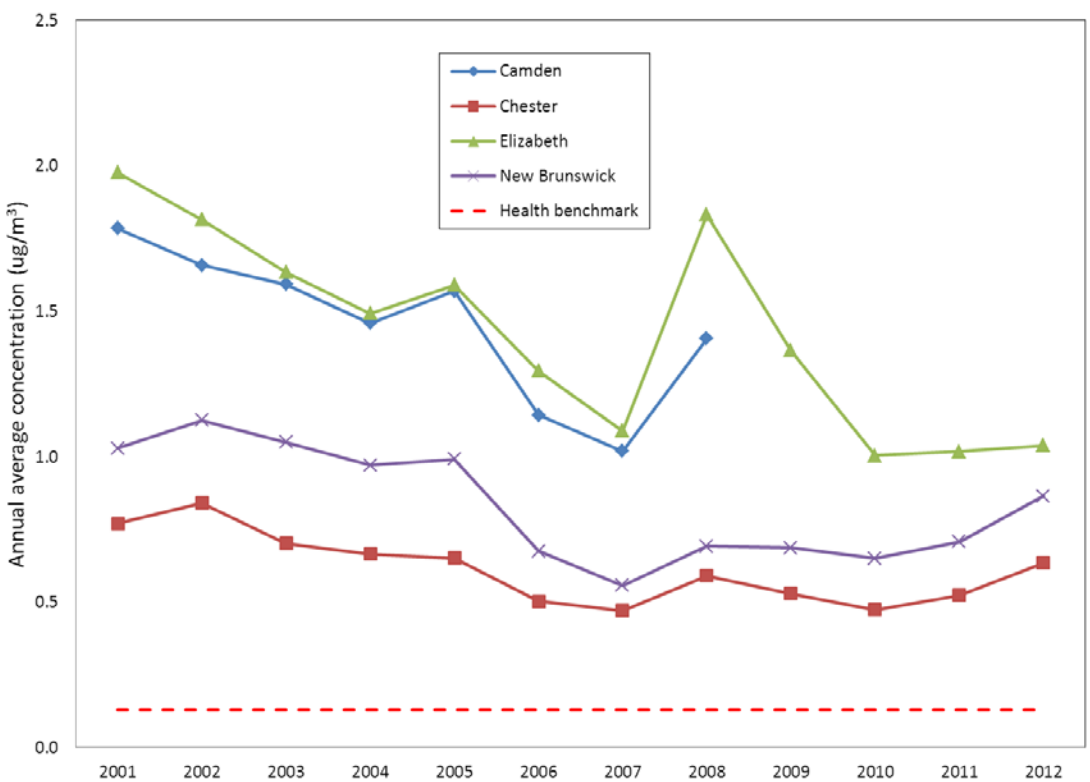


Figure 7

1,3-BUTADIENE – New Jersey Monitored Concentrations

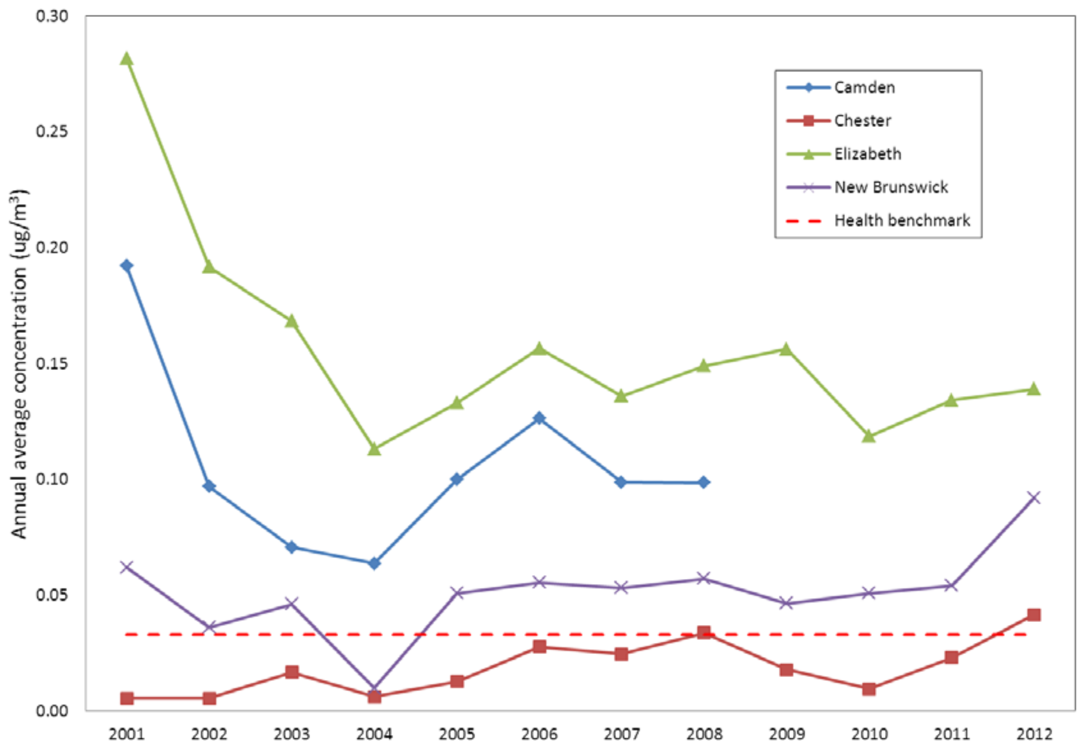


Figure 8

CHLOROFORM – New Jersey Monitored Concentrations

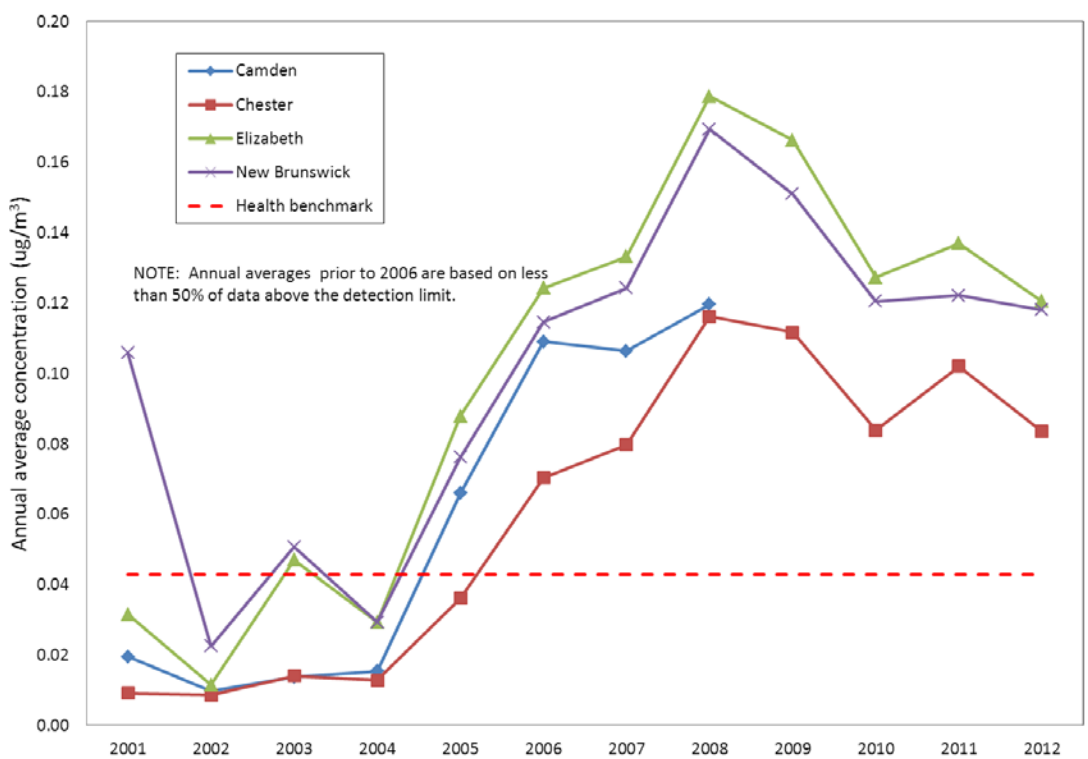


Figure 9

CHLOROMETHANE (Methyl chloride) – New Jersey Monitored Concentrations

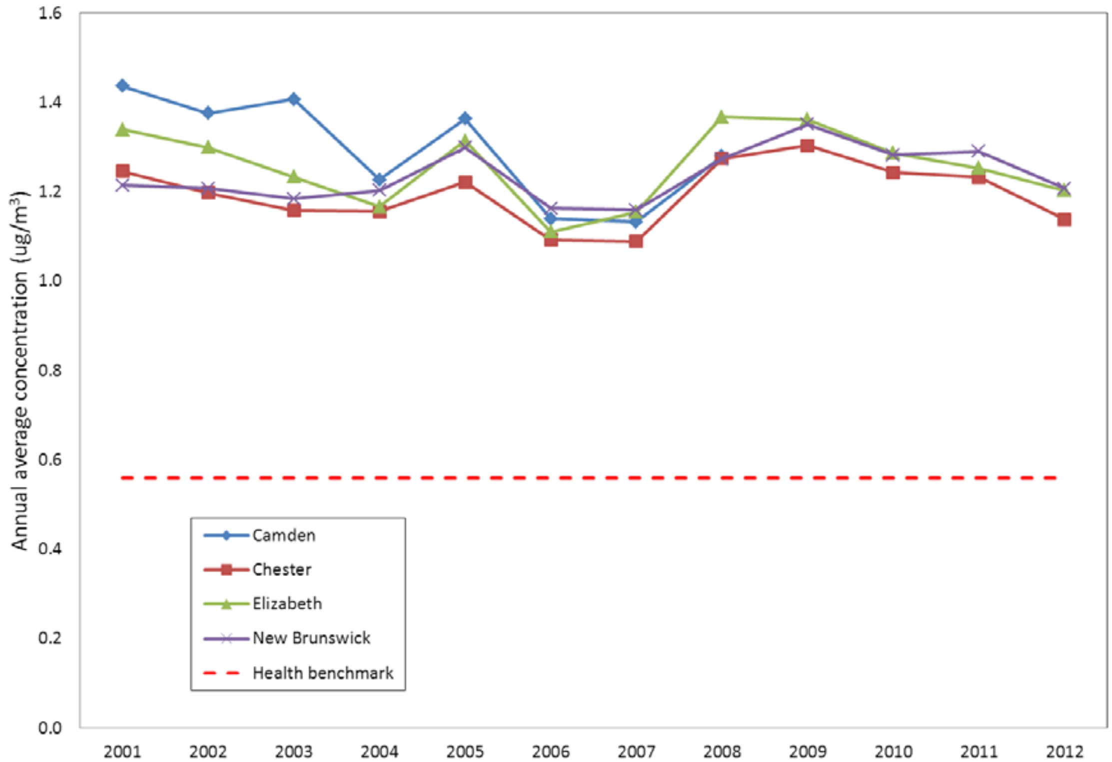


Figure 10

1,4-DICHLOROBENZENE – New Jersey Monitored Concentrations

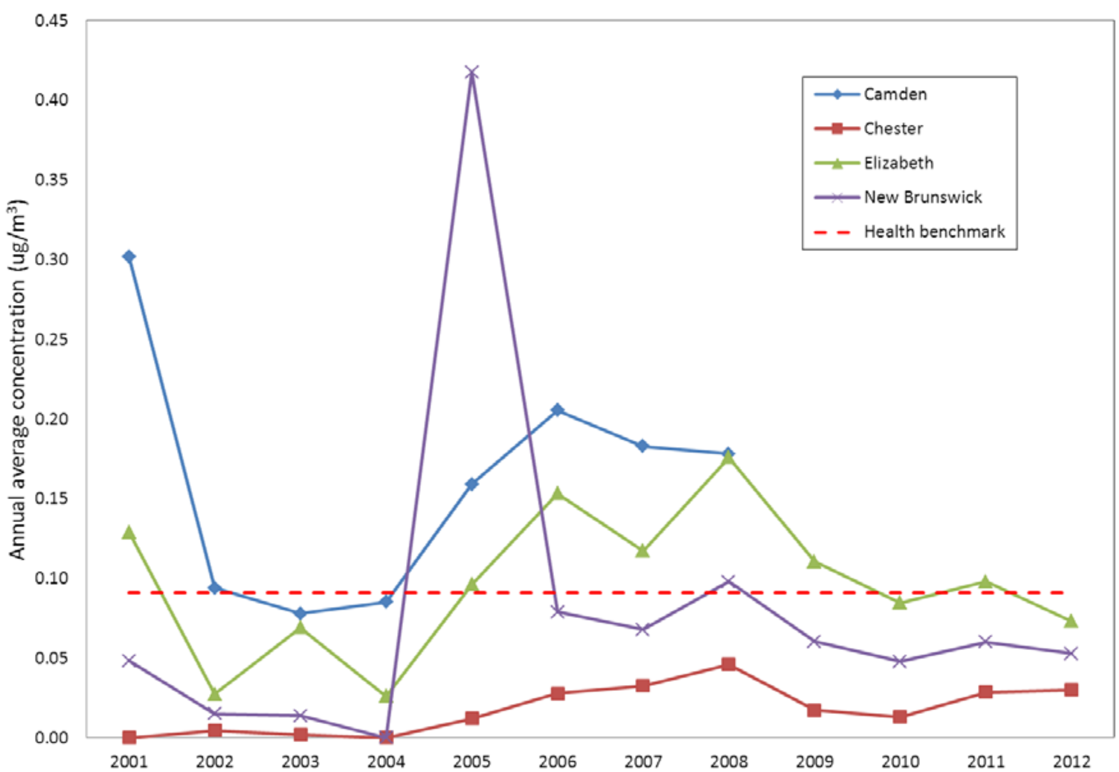


Figure 11

ETHYLBENZENE – New Jersey Monitored Concentrations

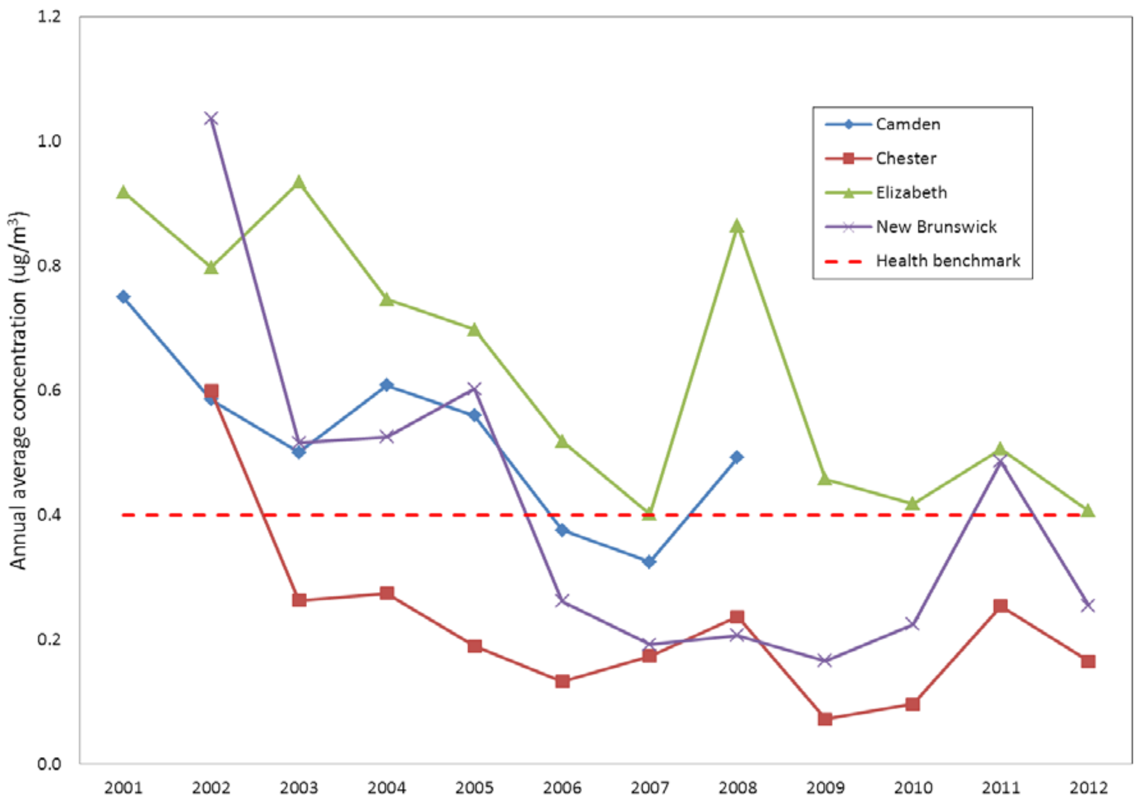


Figure 12

FORMALDEHYDE – New Jersey Monitored Concentrations

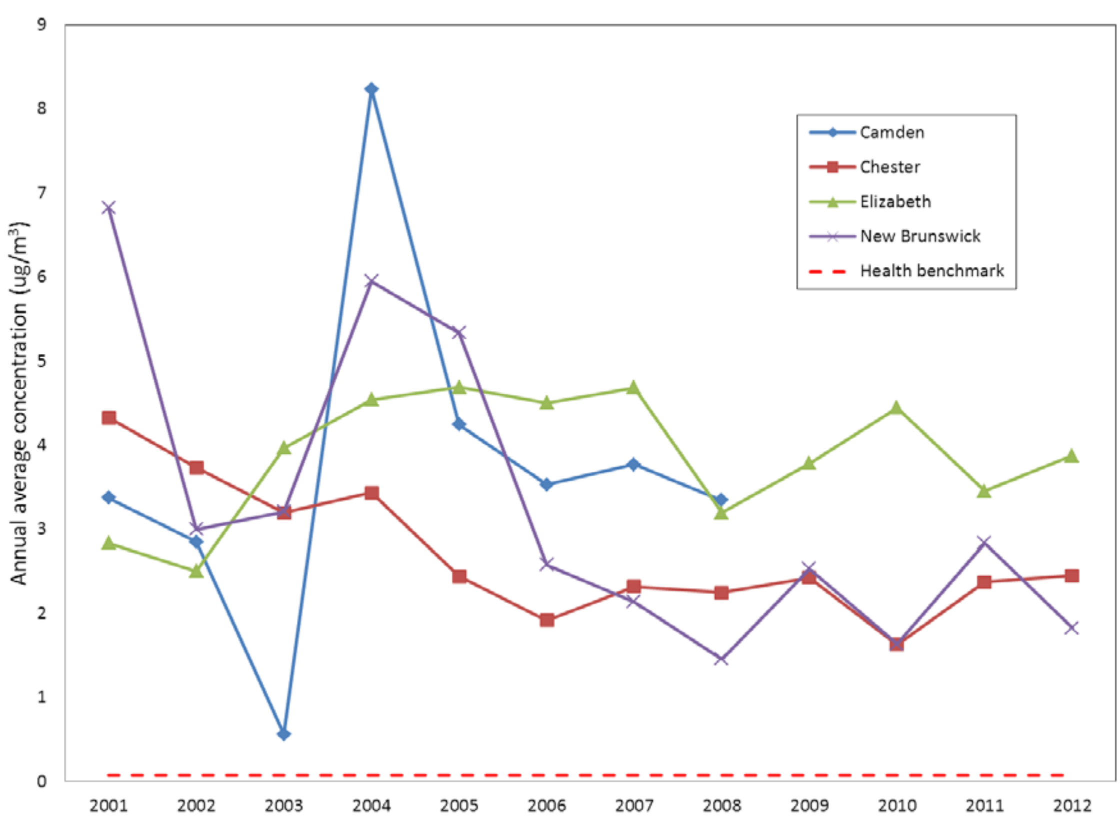
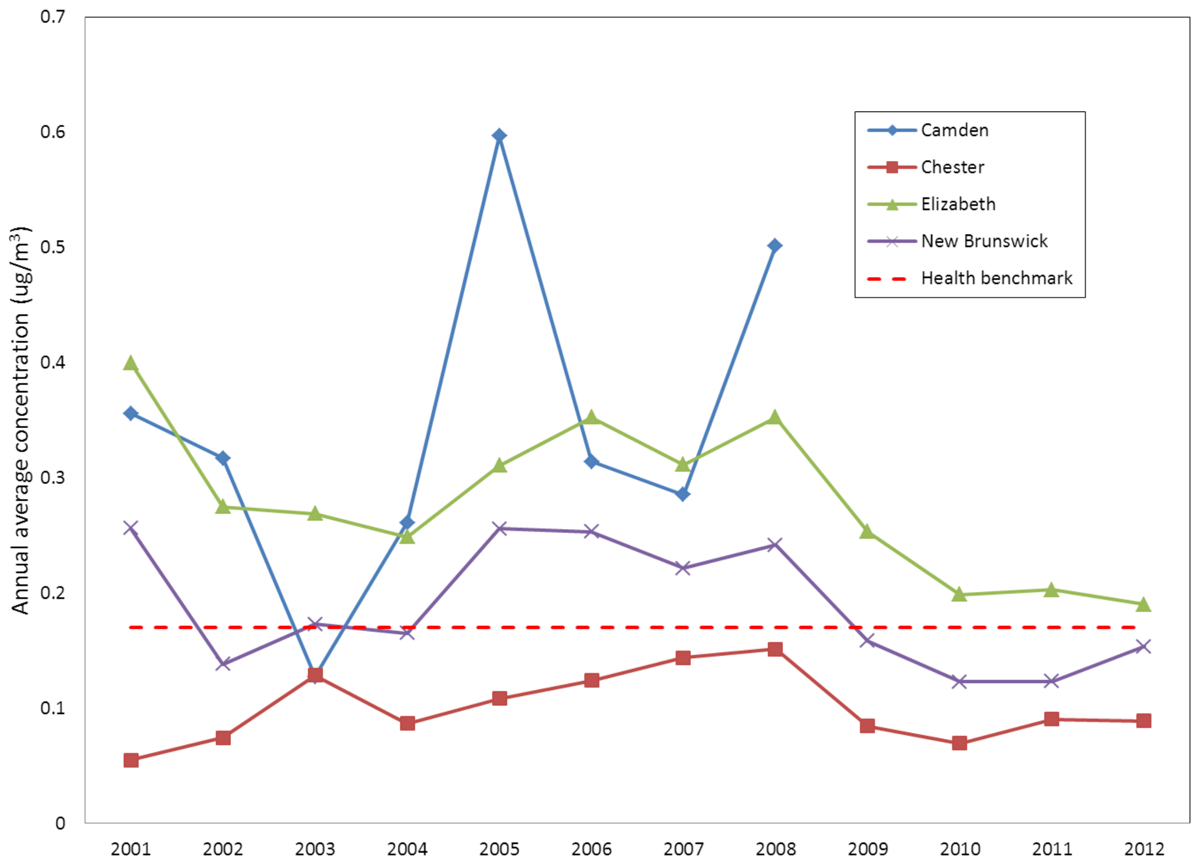


Figure 13

TETRACHLOROETHYLENE – New Jersey Monitored Concentrations



Toxic metals data are presented in Figures 14 through 18, taken from the $PM_{2.5}$ speciation monitors around the state. The Newark site became operational in 2010.

Chromium and nickel are shown here because NATA 2005 indicated that there are levels of their carcinogenic forms in the air above the one-in-a-million cancer risk level. The data in Figures 16 and 18 are for total chromium and nickel. The specific carcinogenic compounds cannot be measured with available monitoring methods.

Arsenic, cadmium, and cobalt concentrations are all influenced by combustion, industrial processes, and transport.

Note that in a few of the graphs some of the years are marked with an asterisk, indicating that less than 50% of the samples used to calculate the annual average were above the detection limit. Values below the detection limit are considered to be zero.

Figure 14
ARSENIC – New Jersey Monitored Concentrations

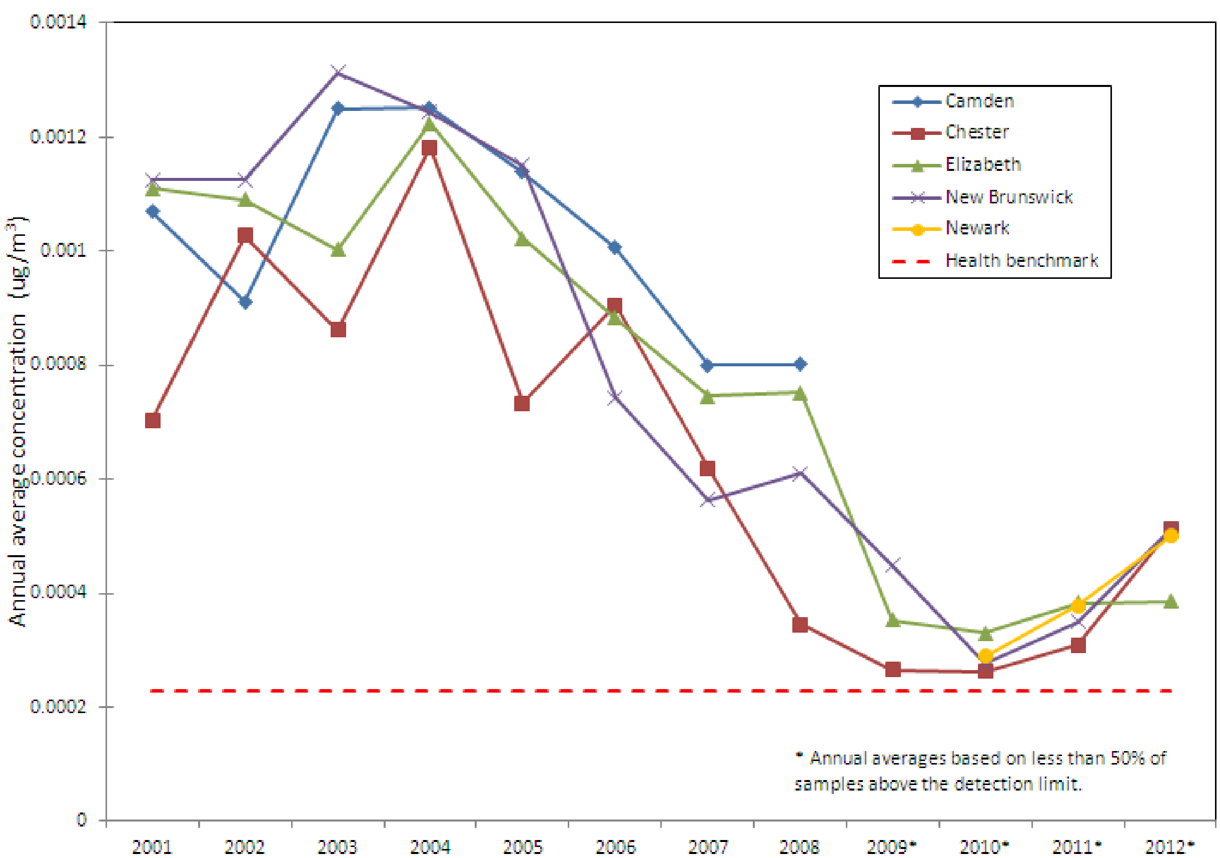


Figure 15
CADMIUM – New Jersey Monitored Concentrations

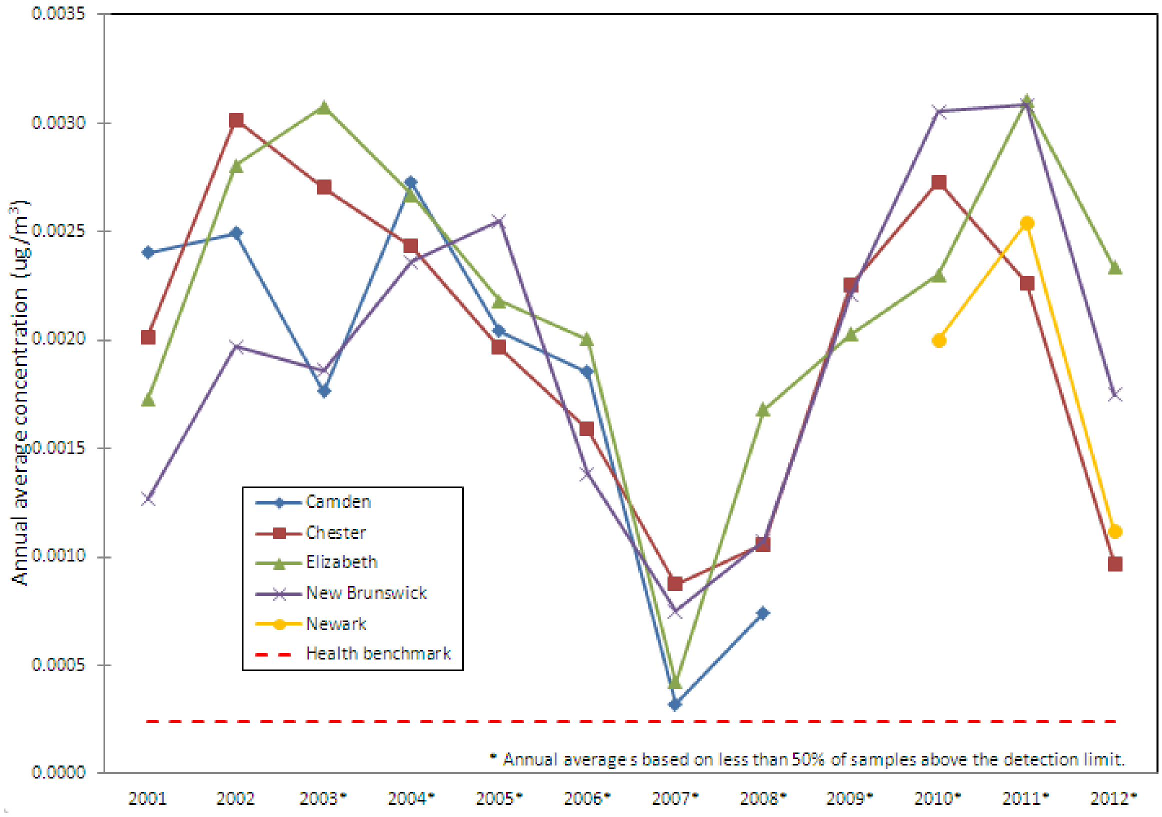


Figure 16
CHROMIUM – New Jersey Monitored Concentrations

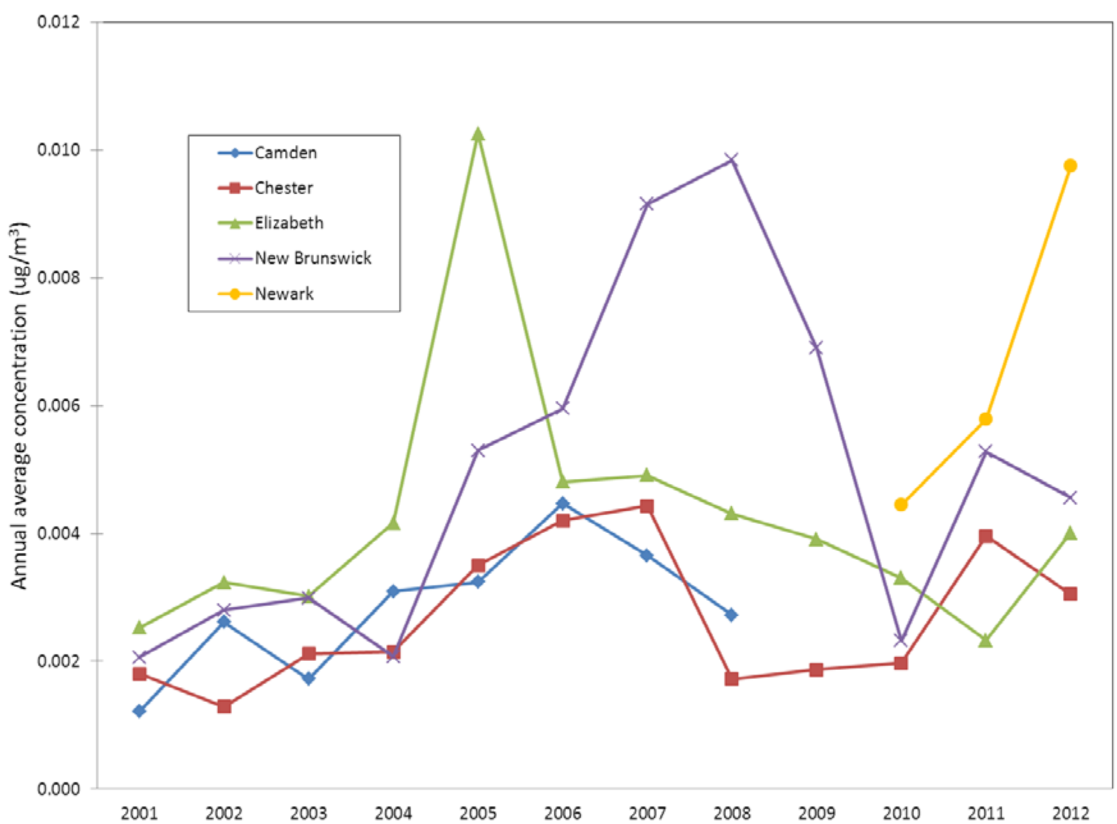


Figure 17
COBALT – New Jersey Monitored Concentrations

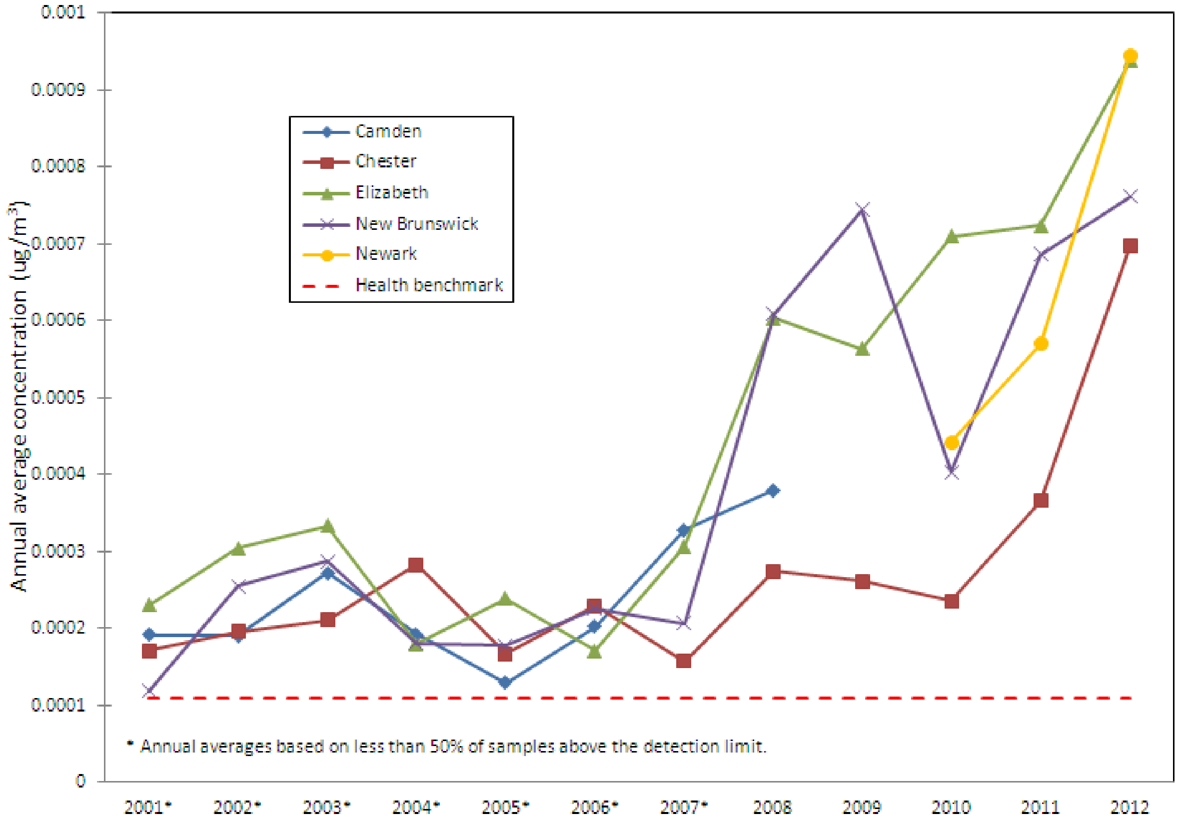


Figure 18
NICKEL – New Jersey Monitored Concentrations

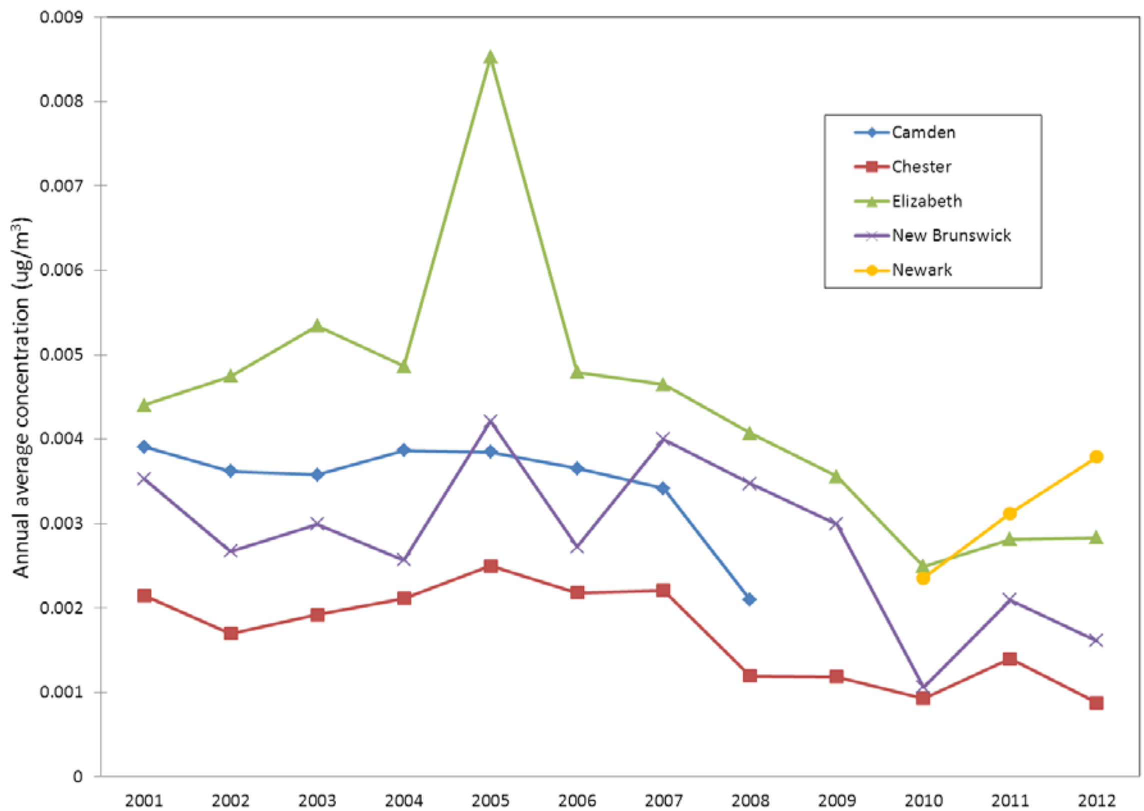
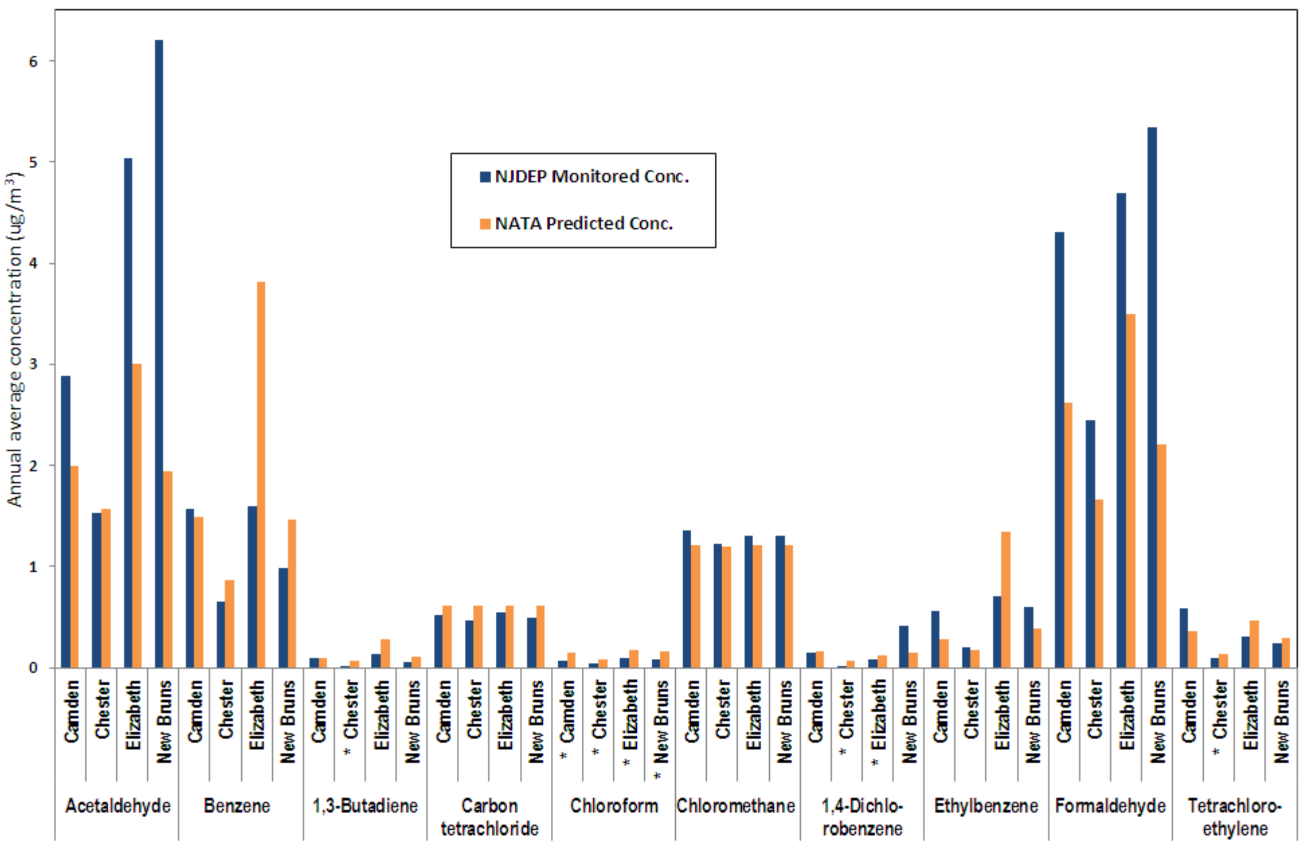


Figure 19 below shows a comparison of annual average concentrations measured at New Jersey's four air toxics monitoring sites in 2005 with annual average concentrations predicted by USEPA's 2005 NATA (at the monitoring site census tract). Most of the pollutants show agreement within a factor of 2 or less, although acetaldehyde and formaldehyde appear to be underestimated by NATA.

Figure 19
2005 New Jersey Monitored Concentrations Compared
to 2005 NATA Predicted Concentrations



* Monitoring data average is based on less than 50% of samples above the detection limit.

Table 6

CHESTER NJ 2012 Toxic VOCs Monitoring Data[a]

Analyte[b]	CAS No.	Annual Mean (ppbv)[c,d]	Annual Median (ppbv)[c,d]	24-Hour Max. (ppbv)	Annual Mean (ug/m^3)[c,d]	Annual Median (ug/m^3)[c,d]	24-Hour Max. (ug/m^3)	Health Bench-mark (ug/m^3)[e]	Annual Mean Risk Ratio[f]	Detection Limit (ug/m^3)	% Above Minimum Detection Limit
Acetaldehyde	75-07-0	0.83	0.77	2.98	1.50	1.38	5.37	0.45	**3**	0.007	100
Acetone	67-64-1	0.90	0.87	2.26	2.14	2.05	5.37	31000	0.0001	0.014	100
Acetonitrile	75-05-8	0.76	0.33	10.80	1.28	0.56	18.13	60	0.02	0.012	100
Acetylene	74-86-2	0.49	0.41	1.29	0.52	0.43	1.37			0.078	100
Acrolein	107-02-8	0.37	0.31	1.26	0.85	0.70	2.89	0.02	**42**	0.165	100
Acrylonitrile	107-13-1	*0.013*	0	0.68	*0.029*	0	1.48	0.015	**2**	0.130	7
tert-Amyl Methyl Ether	994-05-8	*0.0005*	0	0.009	*0.002*	0	0.038			0.067	8
Benzaldehyde	100-52-7	0.013	0.012	0.040	0.056	0.052	0.17			0.087	95
Benzene	71-43-2	0.20	0.18	0.73	0.64	0.57	2.34	0.13	**5**	0.010	100
Bromochloromethane	74-97-5	0	0	0	0	0	0			0.323	0
Bromodichloromethane	75-27-4	*0.002*	0	0.040	*0.012*	0	0.27			0.094	13
Bromoform	75-25-2	*0.002*	0	0.016	*0.019*	0	0.17	0.91	0.02	0.217	20
Bromomethane	74-83-9	0.012	0.012	0.038	0.046	0.047	0.15	5	0.009	0.078	87
1,3-Butadiene	106-99-0	0.019	0.017	0.072	0.042	0.038	0.16	0.033	**1.3**	0.024	82
Butyraldehyde	123-72-8	0.070	0.055	0.88	0.21	0.16	2.60			0.035	100
Carbon Disulfide	75-15-0	0.096	0.017	2.92	0.30	0.053	9.09	700	0.0004	0.009	100
Carbon Tetrachloride	56-23-5	0.11	0.11	0.14	0.67	0.67	0.87	0.17	**4**	0.088	100
Chlorobenzene	108-90-7	*0.001*	0	0.017	*0.004*	0	0.078	1000	0.000004	0.110	8
Chloroethane	75-00-3	*0.001*	0	0.066	*0.003*	0	0.17	10000	0.0000003	0.066	3
Chloroform	67-66-3	0.017	0.018	0.10	0.084	0.088	0.50	0.043	**2**	0.083	70
Chloromethane	74-87-3	0.55	0.54	1.22	1.14	1.11	2.52	0.56	**2**	0.029	100
Chloroprene	126-99-8	*0.0001*	0	0.007	*0.0004*	0	0.025	7	0.0001	0.119	2
Crotonaldehyde	123-73-9	0.12	0.030	0.84	0.34	0.086	2.40			0.043	98
Dibromochloromethane	594-18-3	0.003	0.002	0.015	0.034	0.020	0.15			0.030	52
1,2-Dibromoethane	106-93-4	*0.0007*	0	0.008	*0.005*	0	0.061	0.0017	**3**	0.131	10
m-Dichlorobenzene	541-73-1	*0.001*	0	0.013	*0.008*	0	0.078			0.222	18
o-Dichlorobenzene	95-50-1	*0.001*	0	0.013	*0.008*	0	0.078	200	0.00004	0.126	20
p-Dichlorobenzene	106-46-7	0.005	0.004	0.022	0.030	0.024	0.13	0.091	0.3	0.114	59
Dichlorodifluoromethane	75-71-8	0.50	0.49	0.65	2.46	2.43	3.19	200	0.01	0.089	100
1,1-Dichloroethane	75-34-3	0	0	0	0	0	0	0.63		0.061	0
1,2-Dichloroethane	107-06-2	0.018	0.018	0.030	0.072	0.073	0.12	0.038	**2**	0.065	95
1,1-Dichloroethylene	75-35-4	*0.0004*	0	0.008	*0.002*	0	0.032	200	0.00001	0.056	7
cis-1,2-Dichloroethylene	156-59-2	*0.0006*	0	0.037	*0.002*	0	0.15			0.048	2
trans-1,2-Dichloroethylene	156-60-5	0	0	0	0	0	0			0.048	0
Dichloromethane	75-09-2	0.13	0.11	0.53	0.45	0.38	1.85	2.1	0.2	0.080	100

[a] See page 29 for footnotes.

Table 6

CHESTER NJ 2012 Toxic VOCs Monitoring Data[a]

Analyte[b]	CAS No.	Annual Mean (ppbv)[c,d]	Annual Median (ppbv)[c,d]	24-Hour Max. (ppbv)	Annual Mean (ug/m^3)[c,d]	Annual Median (ug/m^3)[c,d]	24-Hour Max. (ug/m^3)	Health Bench-mark (ug/m^3)[e]	Annual Mean Risk Ratio[f]	Detection Limit (ug/m^3)	% Above Minimum Detection Limit
1,2-Dichloropropane	78-87-5	0	0	0	0	0	0	0.1		0.088	0
cis-1,3-Dichloropropene	542-75-6	0	0	0	0	0	0			0.082	0
trans-1,3-Dichloropropene	542-75-6	0	0	0	0	0	0			0.073	0
Dichlorotetrafluoroethane	76-14-2	0.017	0.017	0.024	0.12	0.12	0.17			0.161	100
2,5-Dimethylbenzaldehyde	5799-94-2	0	0	0	0	0	0			0.016	0
Ethyl Acrylate	140-88-5	*0.0001*	0	0.006	*0.0004*	0	0.025	2	0.0002	0.049	2
Ethyl tert-Butyl Ether	637-92-3	0.098	0.10	0.27	0.41	0.42	1.14			0.059	80
Ethylbenzene	100-41-4	0.038	0.038	0.10	0.16	0.16	0.44	0.40	0.4	0.048	100
Formaldehyde	50-00-0	2.00	1.68	5.95	2.45	2.06	7.31	0.077	**32**	0.028	100
Hexachloro-1,3-butadiene	87-68-3	*0.002*	0	0.013	*0.017*	0	0.14	0.045	0.4	0.085	20
Hexaldehyde	66-25-1	0.015	0.011	0.13	0.062	0.045	0.52			0.090	90
Isovaleraldehyde	590-86-3	0	0	0	0	0	0			0.007	0
Methyl Ethyl Ketone	78-93-3	0.10	0.091	0.40	0.30	0.27	1.18	5000	0.0001	0.071	100
Methyl Isobutyl Ketone	108-10-1	0.030	0.026	0.21	0.12	0.11	0.87	3000	0.0000	0.061	93
Methyl Methacrylate	80-62-6	*0.0001*	0	0.007	*0.001*	0	0.025	700	0.0000	0.088	3
Methyl tert-Butyl Ether	1634-04-4	0.034	0.036	0.089	0.12	0.13	0.32	3.8	0.03	0.040	77
n-Octane	111-65-9	0.044	0.040	0.13	0.21	0.19	0.63			0.093	95
Propionaldehyde	123-38-6	0.11	0.089	0.54	0.26	0.21	1.27	8	0.03	0.007	100
Propylene	115-07-1	0.37	0.30	4.37	0.64	0.51	7.52	3000	0.0002	0.057	100
Styrene	100-42-5	0.025	0.029	0.057	0.11	0.12	0.24	1.8	0.06	0.102	80
1,1,2,2-Tetrachloroethane	79-34-5	*0.001*	0	0.014	*0.008*	0	0.096	0.017	0.5	0.124	15
Tetrachloroethylene	127-18-4	0.013	0.012	0.066	0.089	0.081	0.45	0.17	0.5	0.136	93
Tolualdehydes		0.020	0.016	0.11	0.097	0.079	0.53			0.025	96
Toluene	108-88-3	1.39	0.96	5.46	5.24	3.63	20.57	5000	0.001	0.170	100
1,2,4-Trichlorobenzene	102-82-1	*0.0006*	0	0.014	*0.005*	0	0.10	4	0.001	0.163	10
1,1,1-Trichloroethane	71-55-6	0.009	0.009	0.016	0.049	0.049	0.087	1000	0.00005	0.109	92
1,1,2-Trichloroethane	79-00-5	*0.0001*	0	0.008	*0.001*	0	0.044	0.063	0.01	0.115	2
Trichloroethylene	79-01-6	*0.001*	0	0.014	*0.007*	0	0.075	0.5	0.01	0.118	16
Trichlorofluoromethane	75-69-4	0.26	0.26	0.35	1.47	1.46	1.99	700	0.002	0.084	100
Trichlorotrifluoroethane	76-13-1	0.085	0.083	0.13	0.65	0.64	1.03	30000	0.00002	0.130	100
1,2,4-Trimethylbenzene	95-63-6	0.037	0.037	0.11	0.18	0.18	0.53			0.123	97
1,3,5-Trimethylbenzene	108-67-8	0.017	0.019	0.045	0.086	0.093	0.22			0.108	85
Valeraldehyde	110-62-3	0.017	0.014	0.13	0.061	0.049	0.47			0.011	97
Vinyl chloride	75-01-4	*0.0004*	0	0.007	*0.001*	0	0.018	0.11	0.01	0.028	7
m,p-Xylene	1330-20-7	0.076	0.074	0.24	0.33	0.32	1.06	100	0.003	0.009	100
o-Xylene	95-47-6	0.038	0.035	0.11	0.16	0.15	0.47	100	0.002	0.087	100

a See page 29 for footnotes.

Table 7
ELIZABETH NJ 2012 Toxic VOCs Monitoring Data[a]

Analyte[b]	CAS No.	Annual Mean (ppbv)[c,d]	Annual Median (ppbv)[c,d]	24-Hour Max. (ppbv)	Annual Mean (ug/m^3)[c,d]	Annual Median (ug/m^3)[c,d]	24-Hour Max. (ug/m^3)	Health Bench-mark (ug/m^3)[e]	Annual Mean Risk Ratio[f]	Detection Limit (ug/m^3)	% Above Minimum Detection Limit
Acetaldehyde	75-07-0	1.47	1.35	4.15	2.65	2.43	7.48	0.45	**6**	0.007	100
Acetone	67-64-1	1.26	1.15	3.60	2.98	2.73	8.55	31000	0.0001	0.014	100
Acetonitrile	75-05-8	0.25	0.19	1.07	0.42	0.32	1.80	60	0.007	0.012	100
Acetylene	74-86-2	1.11	0.91	2.88	1.18	0.97	3.06			0.078	100
Acrolein	107-02-8	0.78	0.38	9.63	1.78	0.88	22.1	0.02	**89**	0.165	100
Acrylonitrile	107-13-1	*0.013*	0	0.31	*0.029*	0	0.67	0.015	**2**	0.130	11
tert-Amyl Methyl Ether	994-05-8	*0.0003*	0	0.010	*0.001*	0	0.042			0.067	3
Benzaldehyde	100-52-7	0.031	0.028	0.14	0.13	0.12	0.60			0.087	100
Benzene	71-43-2	0.33	0.28	1.10	1.04	0.90	3.51	0.13	**8**	0.010	100
Bromochloromethane	74-97-5	0	0	0	0	0	0			0.323	0
Bromodichloromethane	75-27-4	*0.001*	0	0.047	*0.009*	0	0.31			0.094	7
Bromoform	75-25-2	*0.001*	0	0.011	*0.011*	0	0.11	0.91	0.01	0.217	13
Bromomethane	74-83-9	0.013	0.013	0.038	0.050	0.050	0.15	5	0.01	0.078	93
1,3-Butadiene	106-99-0	0.06	0.051	0.16	0.14	0.11	0.35	0.033	**4**	0.024	100
Butyraldehyde	123-72-8	0.13	0.12	0.31	0.38	0.35	0.92			0.035	100
Carbon Disulfide	75-15-0	0.09	0.052	0.45	0.28	0.16	1.41	700	0.0004	0.009	100
Carbon Tetrachloride	56-23-5	0.11	0.11	0.13	0.67	0.70	0.84	0.17	**4**	0.088	100
Chlorobenzene	108-90-7	*0.003*	0	0.15	*0.013*	0	0.70	1000	0.00001	0.110	7
Chloroethane	75-00-3	*0.002*	0	0.039	*0.006*	0	0.10	10000	0.000001	0.066	8
Chloroform	67-66-3	0.02	0.023	0.12	0.12	0.11	0.61	0.043	**3**	0.083	70
Chloromethane	74-87-3	0.58	0.56	1.35	1.20	1.15	2.79	0.56	**2**	0.029	100
Chloroprene	126-99-8	*0.0003*	0	0.021	*0.001*	0	0.076	7	0.000178	0.119	2
Crotonaldehyde	123-73-9	0.12	0.056	0.74	0.34	0.16	2.13			0.043	100
Dibromochloromethane	594-18-3	*0.002*	0	0.016	*0.024*	0	0.16			0.030	39
1,2-Dibromoethane	106-93-4	*0.0002*	0	0.007	*0.002*	0	0.054	0.0017	0.96	0.131	3
m-Dichlorobenzene	541-73-1	*0.0017*	0	0.043	*0.010*	0	0.26			0.222	15
o-Dichlorobenzene	95-50-1	*0.0015*	0	0.047	*0.009*	0	0.28	200	0.00004	0.126	13
p-Dichlorobenzene	106-46-7	0.012	0.011	0.049	0.073	0.066	0.29	0.091	0.8	0.114	84
Dichlorodifluoromethane	75-71-8	0.51	0.51	0.67	2.51	2.50	3.31	200	0.013	0.089	100
1,1-Dichloroethane	75-34-3	*0.00007*	0	0.004	*0.0003*	0	0.016	0.63	0.0004	0.061	2
1,2-Dichloroethane	107-06-2	0.02	0.019	0.037	0.075	0.077	0.15	0.038	**2**	0.065	90
1,1-Dichloroethylene	75-35-4	*0.0004*	0	0.018	*0.002*	0	0.071	200	0.00001	0.056	3
cis-1,2-Dichloroethylene	156-59-2	*0.0006*	0	0.036	*0.002*	0	0.14			0.048	2
trans-1,2-Dichloroethylene	156-60-5	*0.0002*	0	0.011	*0.0007*	0	0.044			0.048	2
Dichloromethane	75-09-2	0.15	0.13	0.36	0.53	0.46	1.26	2.1	0.3	0.080	100

[a] See page 29 for footnotes.

Table 7
ELIZABETH NJ 2012 Toxic VOCs Monitoring Data[a]

Analyte[b]	CAS No.	Annual Mean (ppbv)[c,d]	Annual Median (ppbv)[c,d]	24-Hour Max. (ppbv)	Annual Mean (ug/m^3)[c,d]	Annual Median (ug/m^3)[c,d]	24-Hour Max. (ug/m^3)	Health Bench-mark (ug/m^3)[e]	Annual Mean Risk Ratio[f]	Detection Limit (ug/m^3)	% Above Minimum Detection Limit
1,2-Dichloropropane	78-87-5	0	0	0	0	0	0	0.1		0.088	0
cis-1,3-Dichloropropene	542-75-6	0	0	0	0	0	0			0.082	0
trans-1,3-Dichloropropene	542-75-6	0	0	0	0	0	0			0.073	0
Dichlorotetrafluoroethane	76-14-2	0.017	0.016	0.024	0.12	0.11	0.17			0.161	100
2,5-Dimethylbenzaldehyde	5799-94-2	0	0	0	0	0	0			0.016	0
Ethyl Acrylate	140-88-5	*0.00007*	0	0.004	*0.0003*	0	0.016	2	0.0001	0.049	2
Ethyl tert-Butyl Ether	637-92-3	0.054	0.060	0.11	0.22	0.25	0.48			0.059	82
Ethylbenzene	100-41-4	0.094	0.088	0.27	0.41	0.38	1.17	0.40	1.0	0.048	98
Formaldehyde	50-00-0	3.16	2.71	7.54	3.88	3.33	9.26	0.077	**50**	0.028	100
Hexachloro-1,3-butadiene	87-68-3	*0.0008*	0	0.012	*0.009*	0	0.13	0.045	0.2	0.085	11
Hexaldehyde	66-25-1	0.036	0.036	0.075	0.15	0.15	0.31			0.090	100
Isovaleraldehyde	590-86-3				0	0	0			0.007	0
Methyl Ethyl Ketone	78-93-3	0.18	0.16	0.51	0.53	0.46	1.49	5000	0.0001	0.071	100
Methyl Isobutyl Ketone	108-10-1	0.036	0.032	0.072	0.15	0.13	0.29	3000	0.00005	0.061	98
Methyl Methacrylate	80-62-6	*0.016*	0	0.14	*0.057*	0	0.49	700	0.0001	0.088	39
Methyl tert-Butyl Ether	1634-04-4	0.023	0.026	0.059	0.084	0.094	0.21	3.8	0.02	0.040	79
n-Octane	111-65-9	0.091	0.083	0.37	0.43	0.39	1.71			0.093	100
Propionaldehyde	123-38-6	0.22	0.17	0.60	0.52	0.41	1.43	8	0.06	0.007	100
Propylene	115-07-1	3.44	0.92	42.1	5.92	1.59	72.46	3000	0.002	0.057	100
Styrene	100-42-5	0.036	0.039	0.099	0.15	0.17	0.42	1.8	0.09	0.102	95
1,1,2,2-Tetrachloroethane	79-34-5	*0.0005*	0	0.009	*0.003*	0	0.062	0.017	0.2	0.124	8
Tetrachloroethylene	127-18-4	0.028	0.025	0.099	0.19	0.17	0.67	0.17	**1.1**	0.136	98
Tolualdehydes		0.031	0.025	0.13	0.15	0.12	0.62			0.025	100
Toluene	108-88-3	0.55	0.48	2.08	2.09	1.79	7.84	5000	0.0004	0.170	100
1,2,4-Trichlorobenzene	102-82-1	*0.0004*	0	0.02	*0.003*	0	0.15	4	0.001	0.163	3
1,1,1-Trichloroethane	71-55-6	0.010	0.010	0.022	0.054	0.055	0.12	1000	0.0001	0.109	93
1,1,2-Trichloroethane	79-00-5	0	0	0	0	0	0	0.063		0.115	0
Trichloroethylene	79-01-6	*0.007*	0	0.051	*0.037*	0	0.27	0.5	0.07	0.118	48
Trichlorofluoromethane	75-69-4	0.27	0.27	0.36	1.54	1.53	1.99	700	0.002	0.084	100
Trichlorotrifluoroethane	76-13-1				0	0	0	30000		0.130	0
1,2,4-Trimethylbenzene	95-63-6	0.096	0.095	0.25	0.47	0.47	1.22			0.123	100
1,3,5-Trimethylbenzene	108-67-8	0.035	0.034	0.085	0.17	0.17	0.42			0.108	100
Valeraldehyde	110-62-3	0.039	0.037	0.093	0.14	0.13	0.33			0.011	100
Vinyl chloride	75-01-4	*0.0001*	0	0.005	*0.0002*	0	0.013	0.11	0.002	0.028	2
m,p-Xylene	1330-20-7	0.25	0.22	0.70	1.08	0.96	3.05	100	0.01	0.009	100
o-Xylene	95-47-6	0.11	0.10	0.28	0.46	0.43	1.22	100	0.005	0.087	100

[a] See page 29 for footnotes.

Table 8
NEW BRUNSWICK NJ 2012 Toxic VOCs Monitoring Data[a]

Analyte[b]	CAS No.	Annual Mean (ppbv)[c,d]	Annual Median (ppbv)[c,d]	24-Hour Max. (ppbv)	Annual Mean (ug/m^3)[c,d]	Annual Median (ug/m^3)[c,d]	24-Hour Max. (ug/m^3)	Health Bench-mark (ug/m^3)[e]	Annual Mean Risk Ratio[f]	Detection Limit (ug/m^3)	% Above Minimum Detection Limit
Acetaldehyde	75-07-0	0.78	0.75	1.83	1.41	1.36	3.30	0.45	**3**	0.007	100
Acetone	67-64-1	1.10	1.07	2.10	2.62	2.54	4.99	31000	0.0001	0.014	100
Acetonitrile	75-05-8	0.34	0.31	0.86	0.56	0.53	1.44	60	0.009	0.012	100
Acetylene	74-86-2	0.81	0.61	2.60	0.87	0.65	2.77			0.078	100
Acrolein	107-02-8	0.70	0.57	4.48	1.61	1.30	10.27	0.02	**80**	0.165	100
Acrylonitrile	107-13-1	See footnote “h” on page 29.									
tert-Amyl Methyl Ether	994-05-8	*0.0003*	0	0.009	*0.001*	0	0.038			0.067	3
Benzaldehyde	100-52-7	0.016	0.014	0.12	0.070	0.061	0.52			0.087	92
Benzene	71-43-2	0.27	0.24	1.25	0.86	0.75	3.99	0.13	**7**	0.010	100
Bromochloromethane	74-97-5	*0.0003*	0	0.009	*0.002*	0	0.048			0.323	3
Bromodichloromethane	75-27-4	*0.0005*	0	0.016	*0.004*	0	0.11			0.094	5
Bromoform	75-25-2	*0.002*	0	0.015	*0.018*	0	0.16	0.91	0.02	0.217	18
Bromomethane	74-83-9	0.011	0.012	0.042	0.045	0.047	0.16	5	0.009	0.078	88
1,3-Butadiene	106-99-0	0.042	0.034	0.12	0.092	0.074	0.26	0.033	**3**	0.024	100
Butyraldehyde	123-72-8	0.066	0.063	0.13	0.19	0.19	0.37			0.035	100
Carbon Disulfide	75-15-0	See footnote “h” on page 29.									
Carbon Tetrachloride	56-23-5	0.11	0.11	0.16	0.67	0.68	1.00	0.17	**4**	0.088	100
Chlorobenzene	108-90-7	*0.005*	0	0.26	*0.023*	0	1.18	1000	0.00002	0.110	10
Chloroethane	75-00-3	*0.029*	0	0.33	*0.076*	0	0.87	10000	0.00001	0.066	30
Chloroform	67-66-3	0.024	0.024	0.069	0.12	0.12	0.34	0.043	**3**	0.083	78
Chloromethane	74-87-3	0.58	0.56	1.66	1.21	1.15	3.43	0.56	**2**	0.029	100
Chloroprene	126-99-8	0	0	0	0	0	0	7		0.119	0
Crotonaldehyde	123-73-9	0.096	0.028	0.72	0.28	0.080	2.08			0.043	98
Dibromochloromethane	594-18-3	*0.003*	0	0.015	*0.026*	0	0.15			0.030	38
1,2-Dibromoethane	106-93-4	*0.0008*	0	0.008	*0.006*	0	0.061	0.0017	**4**	0.131	12
m-Dichlorobenzene	541-73-1	*0.002*	0	0.073	*0.015*	0	0.44			0.222	17
o-Dichlorobenzene	95-50-1	*0.003*	0	0.094	*0.017*	0	0.57	200	0.0001	0.126	18
p-Dichlorobenzene	106-46-7	0.009	0.009	0.035	0.053	0.054	0.21	0.091	0.6	0.114	68
Dichlorodifluoromethane	75-71-8	0.51	0.51	0.71	2.53	2.50	3.53	200	0.01	0.089	100
1,1-Dichloroethane	75-34-3	0	0	0	0	0	0	0.63		0.061	0
1,2-Dichloroethane	107-06-2	0.019	0.019	0.036	0.078	0.077	0.15	0.038	**2**	0.065	97
1,1-Dichloroethylene	75-35-4	*0.0001*	0	0.008	*0.0005*	0	0.032	200	0.000003	0.056	2
cis-1,2-Dichloroethylene	156-59-2	0	0	0	0	0	0			0.048	0
trans-1,2-Dichloroethylene	156-60-5	*0.0008*	0	0.014	*0.003*	0	0.056			0.048	7
Dichloromethane	75-09-2	0.17	0.15	0.44	0.59	0.51	1.53	2.1	0.3	0.080	100

[a] See page 29 for footnotes.

Table 8
NEW BRUNSWICK NJ 2012 Toxic VOCs Monitoring Data[a]

Analyte[b]	CAS No.	Annual Mean (ppbv)[c,d]	Annual Median (ppbv)[c,d]	24-Hour Max. (ppbv)	Annual Mean (ug/m^3)[c,d]	Annual Median (ug/m^3)[c,d]	24-Hour Max. (ug/m^3)	Health Bench-mark (ug/m^3)[e]	Annual Mean Risk Ratio[f]	Detection Limit (ug/m^3)	% Above Minimum Detection Limit
1,2-Dichloropropane	78-87-5	0	0	0	0	0	0	0.1		0.088	0
cis-1,3-Dichloropropene	542-75-6	0	0	0	0	0	0			0.082	0
trans-1,3-Dichloropropene	542-75-6	0	0	0	0	0	0			0.073	0
Dichlorotetrafluoroethane	76-14-2	0.017	0.017	0.027	0.12	0.12	0.19			0.161	100
2,5-Dimethylbenzaldehyde	5799-94-2	0	0	0	0	0	0			0.016	0
Ethyl Acrylate	140-88-5	*0.0001*	0	0.007	*0.0005*	0	0.029	2	0.0002	0.049	2
Ethyl tert-Butyl Ether	637-92-3	0.066	0.065	0.16	0.28	0.27	0.66			0.059	80
Ethylbenzene	100-41-4	0.059	0.057	0.15	0.25	0.25	0.64	0.40	0.6	0.048	100
Formaldehyde	50-00-0	1.49	1.33	4.79	1.83	1.63	5.88	0.077	**24**	0.028	100
Hexachloro-1,3-butadiene	87-68-3	*0.001*	0	0.014	*0.016*	0	0.15	0.045	0.4	0.085	18
Hexaldehyde	66-25-1	0.020	0.021	0.043	0.082	0.084	0.18			0.090	93
Isovaleraldehyde	590-86-3	0	0	0	0	0	0			0.007	0
Methyl Ethyl Ketone	78-93-3	0.13	0.13	0.24	0.39	0.38	0.70	5000	0.0001	0.071	100
Methyl Isobutyl Ketone	108-10-1	0.035	0.028	0.13	0.14	0.11	0.52	3000	0.00005	0.061	100
Methyl Methacrylate	80-62-6	*0.002*	0	0.043	*0.005*	0	0.15	700	0.00001	0.088	10
Methyl tert-Butyl Ether	1634-04-4	0.026	0.028	0.057	0.093	0.099	0.21	3.8	0.02	0.040	75
n-Octane	111-65-9	0.047	0.048	0.12	0.22	0.22	0.54			0.093	100
Propionaldehyde	123-38-6	0.10	0.090	0.26	0.24	0.21	0.62	8	0.03	0.007	100
Propylene	115-07-1	0.49	0.41	1.21	0.84	0.70	2.08	3000	0.0003	0.057	100
Styrene	100-42-5	0.043	0.047	0.097	0.18	0.20	0.41	1.8	0.1	0.102	92
1,1,2,2-Tetrachloroethane	79-34-5	*0.001*	0	0.016	*0.009*	0	0.11	0.017	0.5	0.124	15
Tetrachloroethylene	127-18-4	0.023	0.016	0.16	0.15	0.11	1.09	0.17	0.9	0.136	98
Tolualdehydes		0.021	0.017	0.09	0.10	0.084	0.44			0.025	100
Toluene	108-88-3	0.95	0.74	2.35	3.58	2.81	8.86	5000	0.0007	0.170	100
1,2,4-Trichlorobenzene	102-82-1	*0.002*	0	0.045	*0.013*	0	0.33	4	0.003	0.163	13
1,1,1-Trichloroethane	71-55-6	0.010	0.010	0.020	0.053	0.052	0.11	1000	0.0001	0.109	95
1,1,2-Trichloroethane	79-00-5	*0.0001*	0	0.006	*0.0005*	0	0.033	0.063	0.009	0.115	2
Trichloroethylene	79-01-6	*0.006*	0	0.11	*0.034*	0	0.59	0.5	0.07	0.118	42
Trichlorofluoromethane	75-69-4	0.27	0.27	0.42	1.54	1.51	2.37	700	0.002	0.084	100
Trichlorotrifluoroethane	76-13-1	0.087	0.085	0.11	0.67	0.65	0.87	30000	0.00002	0.130	100
1,2,4-Trimethylbenzene	95-63-6	0.056	0.056	0.16	0.28	0.28	0.77			0.123	100
1,3,5-Trimethylbenzene	108-67-8	0.024	0.026	0.06	0.12	0.13	0.29			0.108	95
Valeraldehyde	110-62-3	0.018	0.016	0.049	0.062	0.056	0.17			0.011	97
Vinyl chloride	75-01-4	*0.0005*	0	0.007	*0.001*	0	0.018	0.11	0.01	0.028	8
m,p-Xylene	1330-20-7	0.14	0.13	0.39	0.61	0.55	1.67	100	0.006	0.009	100
o-Xylene	95-47-6	0.061	0.058	0.16	0.26	0.25	0.70	100	0.003	0.087	100

[a] See page 29 for footnotes.

Footnotes for Tables 6 through 8

[b] Analytes in bold text had annual means above the long-term health benchmark.

[c] Numbers in italics are arithmetic means (or averages) based on less than 50% of the samples above the detection limit.

[d] For a valid 24-hour sampling event, when the analyzing laboratory reports the term “Not Detected” for a particular pollutant, the concentration of 0.0 ppbv is assigned to that pollutant. These zero concentrations were included in the calculation of annual averages and medians for each pollutant regardless of percent detection.

[e] The health benchmark is defined as the chemical-specific air concentration above which there may be human health concerns. For a carcinogen (cancer-causing chemical), the health benchmark is set at the air concentration that would cause no more than a one-in-a-million increase in the likelihood of getting cancer, even after a lifetime of exposure. For a non-carcinogen, the health benchmark is the maximum air concentration to which exposure is likely to cause no harm, even if that exposure occurs on a daily basis for a lifetime. These toxicity values are not available for all chemicals. For more information, go to www.nj.gov/dep/aqpp/risk.html.

[f] The risk ratio for a chemical is a comparison of the annual mean air concentration to the long-term health benchmark. If the annual mean is 0, then the annual mean risk ratio is not calculated.

[g] Acrolein concentrations are highly uncertain because of problems with collection and analysis methods.

[h] Acrylonitrile and carbon disulfide data from New Brunswick have been invalidated because of technical problems.

Table 9
Analytes with 100% Non-Detects in 2012

Analyte	CAS No.	Chester	Elizabeth	New Brunswick
Bromochloromethane	74-97-5	X	X	
Chloroprene	126-99-8			X
1,1-Dichloroethane	75-34-3	X		X
cis-1,2-Dichloroethylene	156-59-2			X
trans-1,2-Dichloroethylene	156-60-5	X		
1,2-Dichloropropane	78-87-5	X	X	X
cis-1,3-Dichloropropene	542-75-6	X	X	X
trans-1,3-Dichloropropene	542-75-6	X	X	X
2,5-Dimethylbenzaldehyde	5799-94-2	X	X	X
Isovaleraldehyde	590-86-3	X		X
1,1,2-Trichloroethane	79-00-5		X	

- In 2012, collected samples of these chemicals were never above the detection limits at the specific monitoring locations. However, they may be present in the air below the detection limit level. Chemical-specific detection limits can be found in Tables 6 through 8.

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