

An aerial photograph of a lush green park area. A winding river flows through the center, surrounded by dense trees. A multi-lane road runs vertically on the left side of the image. In the background, a city skyline is visible under a clear sky.

Tracking and Reducing Chemicals in Toronto:

ChemTRAC Annual Report – 2011 Reporting Year

June 2013

416.338.7600 toronto.ca/health

 **TORONTO** Public Health

Reference

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Note to Readers

This report presents key findings from data reported under the City of Toronto's ChemTRAC program. Visit www.toronto.ca/chemtrac to search the data by neighbourhood, substance and business, to download this summary report and the entire data set, and to find information on reducing chemicals in your home and business.

This report is accompanied by a Board of Health (BOH) report that provides a summary, background and recommendations that were presented at the June 14, 2013 meeting of the Toronto BOH and can be found at the following link: http://www.toronto.ca/health/boh_index.htm

Legal Disclaimer

The City of Toronto makes every effort to review the accuracy of the information reported by facilities and which is presented in this report and on the ChemTRAC website. Any omissions or errors in the information are the sole responsibility of the facilities. The City of Toronto makes no representation or warranty as to the accuracy or completeness of the information.

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Foreword

Through the ChemTRAC program, Toronto Public Health (TPH) and its City partners are working to reduce toxic substances in our environment while supporting a local green economy. The ChemTRAC program uses three complementary tools to reduce the releases of toxic substances from industrial and commercial businesses in Toronto. The tools are the Environmental Reporting and Disclosure Bylaw, public disclosure of the dataset received through the bylaw, and supports for businesses to green their operations.

Businesses make up an integral part of our communities and neighbourhoods. Small and medium size businesses are the engine of our economy and provide jobs for many people who live in these neighbourhoods. They also provide goods and services to our communities. However, some of these activities can release toxic substances into our environment.

In 2012, the ChemTRAC program laid the foundation to support businesses in reducing their releases in each of the three program areas.

ChemTRAC released the first dataset to the public: Community members are using the online disclosure system to increase their understanding of local health and environmental issues. Citizens can look up the businesses in their neighbourhood and learn about their uses and releases of the priority substances. Citizens can also learn about the steps businesses are taking to improve their impact on the environment.

Phase 2 of the Bylaw came into effect: Small operations such as autobody shops, crematoriums and dry cleaning services were required for the first time to assess and report on how the 25 priority substances were processed, manufactured, used, or released in their facilities. By reviewing how toxic substances are used or released in their facility businesses can start identifying opportunities to reduce their use and release of priority substances while saving money.

Pollution Prevention Pilot Project: ChemTRAC has started a pilot project with a business panel to examine the best practices for supporting businesses to implement environmental improvements. The business panel thus far has provided invaluable insights into the future role of ChemTRAC in supporting businesses in implementing pollution prevention. The panel has been instructive in identifying areas where ChemTRAC could support businesses. For example, ChemTRAC could support businesses to work with suppliers to test new products to reduce the amount of potential risk to the business.

Moving forward, TPH will work with its City partners to develop the future role of ChemTRAC in supporting Toronto businesses as leaders in pollution prevention and innovation. ChemTRAC will support businesses to innovate, and improve their processes to be more efficient, competitive and greener.

Summary

ChemTRAC is a program that aims to protect public health by reducing the amount of toxic chemicals used and released by businesses in Toronto.

The Environmental Reporting and Disclosure Bylaw (Municipal Code Chapter 423) is the starting point to help reach this goal. The Bylaw requires businesses to report their use and release of 25 priority substances. Businesses must report to the City every year if they meet or exceed reporting thresholds. Businesses can often find opportunities for greening, reducing costs and improving efficiencies when they go through the process of tracking chemicals to determine if they need to report.

ChemTRAC offers support for businesses on greening opportunities, how to reduce their chemical use and release (also called pollution prevention) and sustainable practices.

The information that is reported from businesses is released as a map on the ChemTRAC website and a searchable database (toronto.ca/chemtrac). The dataset is also available on the City of Toronto's Open Data website (toronto.ca/open). Communities can use the information to better understand the businesses in their neighbourhood.

This report presents key findings based on the amounts of priority substances reported as manufactured, processed, used or released during 2011 by facilities in Toronto. This report also highlights the pollution prevention activities of the ChemTRAC program.

Overall, the data reported for the 2011 showed a very similar pattern to the data collected for 2010:

- Volatile organic compounds (VOCs), nitrogen oxides (NO_x) and fine particulate matter (PM_{2.5}) remain priority substances of highest health concern because they were most released, by mass.

- VOCs and PM_{2.5} were the priority substance most manufactured, processed or used, by mass.
- The total amount of all priority substances released is a small proportion (about 8 per cent overall) of the total amount reported manufactured, processed or used by facilities.
- Polycyclic aromatic hydrocarbons (PAHs) cadmium, mercury and lead are still priority substances of highest health concern because of their high toxicity.

There were also some notable differences between the data collected in 2010 and 2011:

- In the 2011 data, tetrachloroethylene (perchloroethylene) was identified as a priority substance of high health concern.
- The number of facilities that reported information on their use and release of priority substances almost doubled.
- In order to help businesses meet the Bylaw requirements ChemTRAC is being phased in over three years. The 2011 data reported was the first reporting year for Phase Two sectors.
- Phase Two sectors - chemical wholesale, waste management and remediation services, medical and diagnostic laboratories, dry cleaning and laundry services, automotive repair and maintenance, and funeral services - accounted for 39% of the total facilities that reported information on chemical use and release.
- The priority substances 1,2-dichloroethane and carbon tetrachloride were reported for the first time in 2011.
- When comparing reported data for Phase One facilities and City Operated facilities in 2010 and 2011 overall manufactured, processed or otherwise used increased by 2% while overall releases decreased by 3%.

Once all phases report in 2013, a more complete picture will be available of how businesses in Toronto manufacture, process, use or release priority substances. Over the long term, the information will help track reductions of priority substances used and released in Toronto.

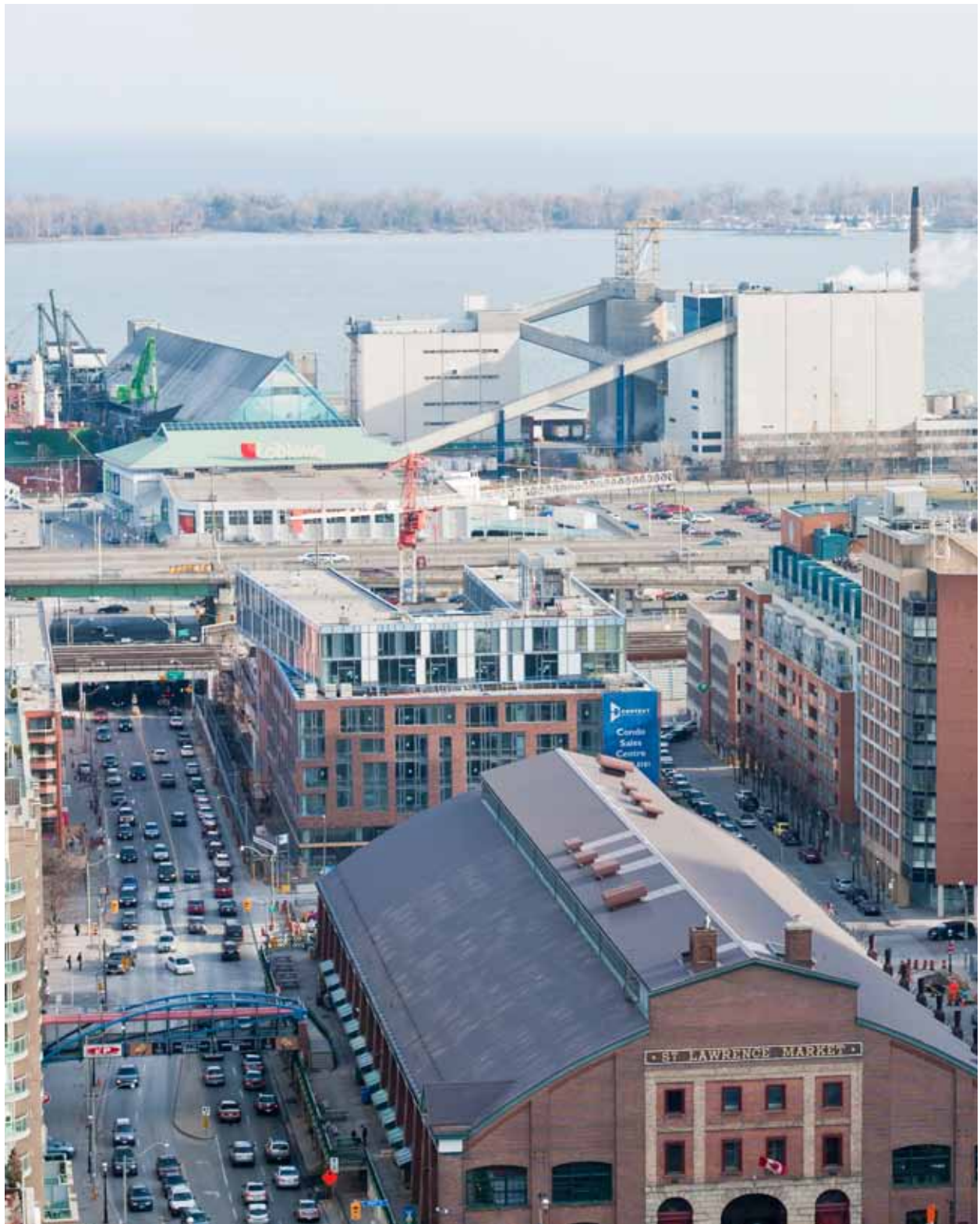


Businesses can often find opportunities for greening, reducing costs and improving efficiencies when they go through the process of tracking chemicals to determine if they need to report.

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Introduction

There are Many Sources of Air Pollution in Toronto

In a city like Toronto, there are toxic substances in our air that can harm our health in many ways. The chemicals come from personal, commercial, industrial activities and natural sources (e.g. wind erosion, forest fires, volcano eruptions).

For example, you can cause air pollution when you:

- burn gas, like driving a car or using a gas lawn mower
- heat a home
- use chemicals in the home, like fumigating or using household cleaners and paints

Businesses may also release toxic substances. Some examples of releases are when they:

- use natural gas for heat in their processes
- manufacture goods, ranging from chemicals and furniture to food
- paint cars
- dry clean clothes
- print materials

The ChemTRAC Program

Toronto Public Health (TPH) developed ChemTRAC to reduce toxic chemicals in our environment and support a local green economy. To meet this goal, the program has three main elements:

- The Environmental Reporting and Disclosure Bylaw (Municipal Code Chapter 423) that requires businesses to track and report the manufacture, process, use and release of 25 priority substances. This information can help businesses identify opportunities for greening and cost savings;

- Support for businesses to green their operations through pollution prevention and innovation; and,
- The analysis and public release of the ChemTRAC data in multiple forms to help communities better understand the businesses in their neighbourhood.

The information collected through the Bylaw improves our understanding of how and where facilities contribute to the presence of the toxic substances in Toronto's environment. Toronto Public Health will use this information to help identify opportunities for the City to support businesses in greening their operations.

Overview of the Annual Report

Chapter 1: Provides an overview of the Environmental Reporting and Disclosure Bylaw and the 25 priority substances.

Chapter 2: Presents key findings from the second year of data collected by the Environmental Reporting and Disclosure Bylaw. The entire 2011 data set is available online at www.toronto.ca/chemtrac. The data represents the reported amounts of priority substances that facilities manufactured, processed, used or released during 2011.

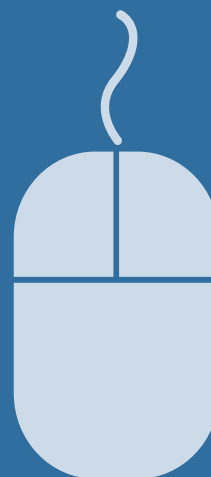
Chapter 3: Profiles the use and release of priority substances from each industrial sector.

Chapter 4: Highlights how businesses, communities and ChemTRAC are working together to green business operations.

Chapter 5: Identifies emerging priorities.

Using ChemTRAC's Online Disclosure System

ChemTRAC's online disclosure system is the place to go to answer your questions about priority substances and facilities in Toronto. Use the map (<http://app.toronto.ca/ctpd/findFacility.html>) to find out:



*Which facilities in your **neighbourhood** are reporting to ChemTRAC?*

Step 1: Select disclosure reports tab

Step 2: Select "By Facility"

Step 3: Type in your intersection, address, or name of facility into search box OR Scroll down below the map and select the facility name in the alphabetical listing

Step 4: Click on "Go"

Step 5: To view the substances used and released by this facility click "Substance use and release"

*Which substances does a **certain sector** manufacture, process, use or release?*

Step 1: Select disclosure reports tab

Step 2: Select "By Industry"

Step 3: Scroll down to the sector of interest

Step 4: Click ► to expand/contract the list to reveal the priority substances

NOTE: To find out the facilities reporting in this sector click ► beside the priority substance name. You can also find out more about the priority substance by clicking its name.

*Which sectors manufactured, processed, used or released a **certain priority substance**?*

Step 1: Select disclosure reports tab

Step 2: Select "By Substance"

Step 3: Scroll down to the substance of interest

Step 4: Click ► to expand/contract the list to reveal the sectors

NOTE: To find out the facilities reporting in this sector click ► beside the sector name. You can also find out more about the priority substance by clicking on its name.

Visit www.toronto.ca/open to download the complete data set.

Chapter 1: About the Environmental Reporting and Disclosure Bylaw

The Environmental Reporting and Disclosure Bylaw (Municipal Code Chapter 423) requires facilities in Toronto to report their use and release of 25 priority substances (Table 1-1) every year, if they meet reporting requirements.

TPH used two approaches to identify the 25 priority substances (Toronto Public Health, 2007)¹:

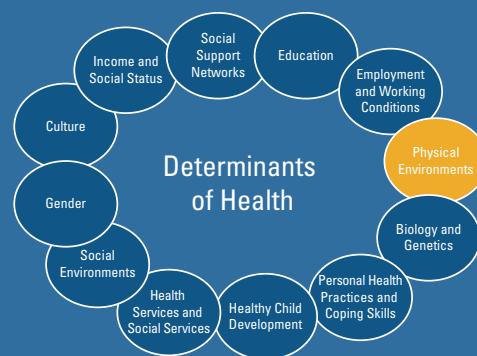
- **Prioritizing chemicals using estimated releases and a health-based ranking scheme.** Using estimates of releases from Toronto businesses, Toronto Public Health ranked chemicals using Toxicity Equivalence Potential (TEP). The method – described later in Chapter 2 – uses estimates of the amount of a substance released, the potential for human exposure, and the toxicity of the substance to calculate a relative risk score for each substance.
- **Identifying chemicals in Toronto’s air that exceed health-based benchmarks.** Data on air quality were obtained from Environment Canada and the Ontario Ministry of the Environment. The air quality data were compared with reference levels from the California Environmental Protection Agency, the Ontario Ministry of the Environment, and the New Jersey Department of Environmental Protection to identify substances in Toronto’s air that were at levels of concern.

The 25 priority substances identified by these two approaches include solvents, metals and combustion by-products that can cause short-term and long-term adverse health effects.

Toronto residents are most commonly exposed to these substances by breathing them in.

ChemTRAC Priority Substances and Your Health

Human health is shaped by income level, social status, education, the physical environment and many other determinants of health .



Exposure to toxic substances in our physical environment (air, water, land) is one factor that impacts health.

Exposure to toxic substances, even at low levels, over a long time can cause:

- heart and lung damage
- cancer
- birth defects
- reproductive problems
- chronic diseases, like asthma

ChemTRAC aims to reduce 25 toxic substances that are of priority health concern in Toronto’s environment.

For more information on each priority substance visit: <http://www.toronto.ca/health/chemtrac/substances.html>

¹ Toronto Public Health. 2007. Process to Identify Priority Substances of Health Concern for Enhanced Environmental Reporting Toronto, Canada. http://www.toronto.ca/health/hphe/pdf/aei_bohreport_techreport_finaljuly3.pdf.

Table 1-1: ChemTRAC Priority Substances and their Reporting Thresholds

Substance	Mass Reporting Threshold (kg/yr)
GROUP A	
Acetaldehyde	100
Acrolein	100
Benzene	100
1,3-Butadiene	100
Cadmium and its compounds	1
Carbon tetrachloride	100
Chloroform (Trichloromethane)	100
Chromium, Hexavalent and its compounds	10
Chromium, Non-hexavalent and its compounds	100
1,2-Dibromo ethane (Ethylene dibromide)	100
1,4-Dichlorobenzene	100
1,2-Dichloroethane (Ethylene dichloride)	100
Dichloromethane (Methylene chloride)	100
Formaldehyde	100
Lead and its compounds	10
Manganese and its compounds	10
Mercury and its compounds	1
Nickel and its compounds	100
Tetrachloroethylene (Perchloroethylene)	100
Trichloroethylene	100
Vinyl chloride	100
GROUP B	
Polycyclic Aromatic Hydrocarbons (PAHs)	10
GROUP C	
Nitrogen Oxides (NO _x)	200
Particulate Matter 2.5 (PM _{2.5})	30
Volatile Organic Compounds (VOCs) total	100

Phased-In Reporting

Annual reporting is being phased in over three years to allow time for all facilities, particularly small and medium-sized enterprises, to learn about their requirements under the Bylaw. Phase One and City-owned Facilities were required to report for the second time in 2012. Phase Two sectors reported for the first time and include chemical wholesale, waste management and remediation services, medical and diagnostic laboratories, dry cleaning and laundry services, automotive repair and maintenance, and funeral services. Facilities from Phase Three could also choose to submit information. For a description of the sectors in each phase, refer to Table 1-2

Table 1-2: Annual Reporting Phase-In for *Environmental Reporting and Disclosure Bylaw*.

PHASE ONE Submitted first report of data by June 30, 2011	PHASE TWO Submitted first report of data by June 30, 2012	PHASE THREE Will submit 2012 data by June 30, 2013
AFFECTED SECTORS: <ul style="list-style-type: none"> • chemical and related product manufacturing • City of Toronto facilities • food, beverage and tobacco product manufacturing • power generation • printing & publishing • water treatment • wood product manufacturing 	AFFECTED SECTORS: <ul style="list-style-type: none"> • autobody refinishing • chemical wholesale • dry cleaning & laundry services • funeral services • medical & diagnostic laboratories • waste management & remediation 	AFFECTED SECTORS: all other sectors (such as small manufacturing)



Chapter 2: Summary of 2011 Data

The data reported for 2011 operations covers a subset of businesses in Toronto since only Phase 1 and Phase 2 sectors were required to report by June 30, 2012.

Toronto Public Health reviews and validates all information submitted by facilities. Toronto Public Health collaborated with Environment Canada's National Pollutant Release Inventory team to review data and issues. When necessary, TPH contacted facilities to request clarification or re-submission of data to ensure the data are as accurate as possible.

Facilities That Reported

A total of 1,638 facilities reported information about their operations in 2011. This is a larger number of facilities than for 2010 because Phase Two facilities are now required to report. Additionally, due to increased awareness of the Bylaw, more Phase One facilities reported information about their operations in 2012 than in 2011.

For operations in 2011:

- 539 Phase One facilities and 607 Phase Two facilities provided information to ChemTRAC – some identified themselves as below thresholds or as exempt from reporting requirements and others provided data on chemicals.
- 492 Phase Three facilities submitted information early.
- 41 facilities operated by the City of Toronto also submitted information.
- Due to increased awareness of the Bylaw, in 2012, 38 new Phase One facilities provided chemical information to ChemTRAC and 139 identified themselves as exempt or below threshold.

Toronto Public Health expects the number of facilities submitting data to continue to increase as awareness grows and Phase Three businesses begin reporting in 2013. Table 2-1 shows the number of facilities within each phase that reported information about their operations in 2011.



A total of 1,638 facilities reported information about their operations in 2011.

Table 2-1: Number of facilities that reported on their operations in 2011

Total number of facilities for each sector	Sector	Number of facilities that met reporting thresholds	Number of facilities that identified themselves as below thresholds	Number of facilities that identified themselves as exempt from reporting
	PHASE ONE FACILITIES			
140	Chemical and related products manufacturing	111	22	7
109	Food, beverage and tobacco products manufacturing	61	28	20
8	Power generation	5	1	2
179	Printing and publishing	78	80	21
11	Water and wastewater treatment	7	3	1
74	Wood products manufacturing	45	21	8
18	Other city facilities (not listed in Phase 1 & 2)	5	12	1
539	PHASE ONE SUBTOTAL	312	167	60
	PHASE TWO FACILITIES			
8	Chemical Wholesale	6	1	1
23	Waste management and remediation services	4	8	11
49	Medical and diagnostic laboratories	3	31	15
180	Dry cleaning and laundry services	94	48	18
315	Automotive repair and maintenance	113	99	103
32	Funeral services	8	20	4
607	PHASE TWO SUBTOTAL	228	207	172
492	PHASE THREE FACILITIES	38	235	219
	TOTAL	578	609	451

Figure 2-1: Distribution of facilities (all phases) within residential and non-residential areas that provided information on the manufacture, process, use or release of priority substances in 2011

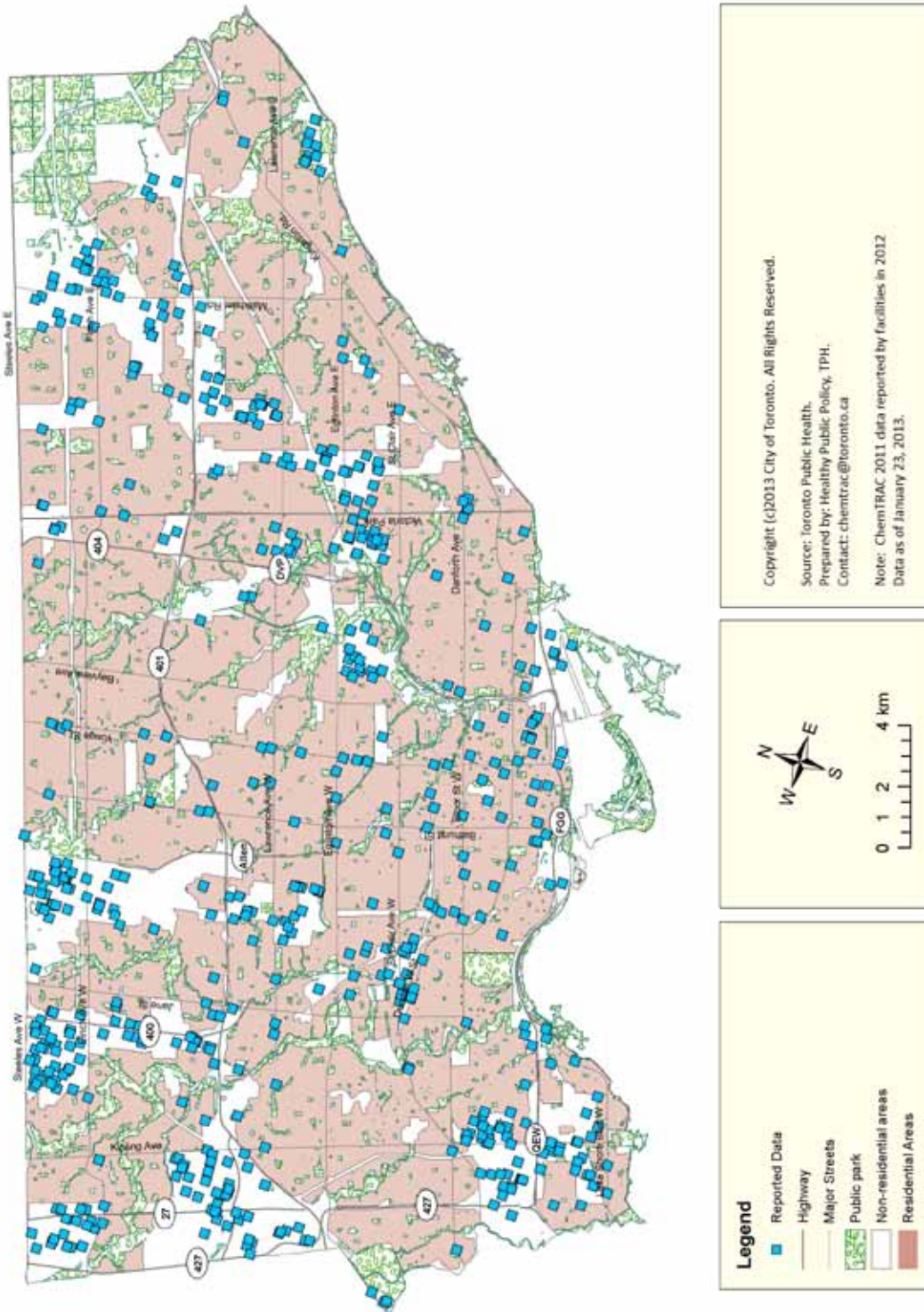
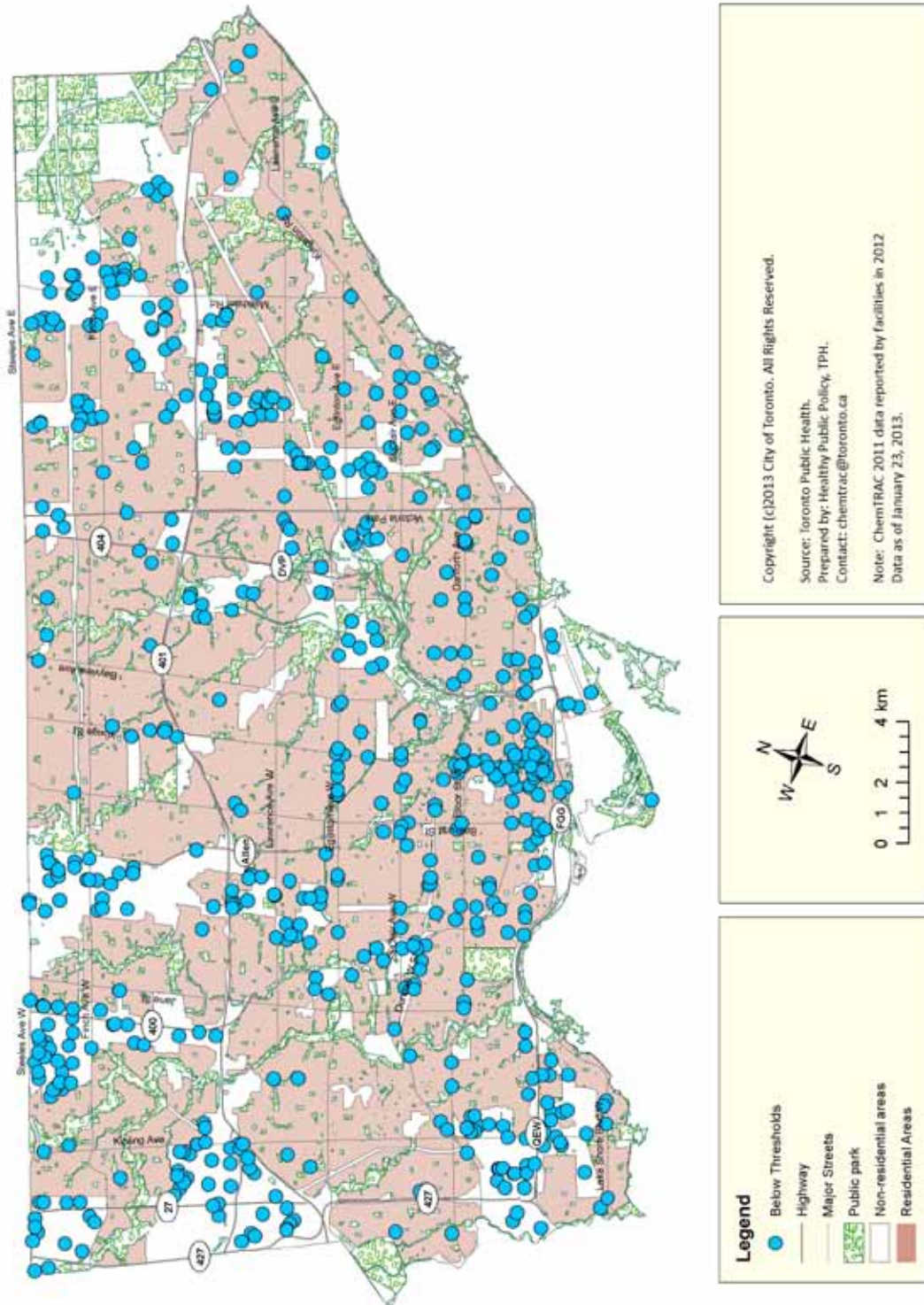


Figure 2-2: Distribution of facilities (all phases) identified themselves as below thresholds in 2011



The majority of facilities reporting information on their operations to ChemTRAC were found in non-residential areas for 2011. About one third of facilities that met the threshold (Figure 2-1) were found in residential areas while just less than half of the facilities below-threshold were found in residential areas (Figure 2-2).

2011 Data of Priority Substances Manufactured, Processed or Used by Phase One and Two Sectors

Table 2-2 shows the total amounts reported as manufactured, processed or otherwise used for each priority substance in 2010 and 2011. Since the data from Phase Three facilities are incomplete,

the analysis in this report focuses on the data from Phase One and Phase Two facilities only.

As expected, the addition of the Phase Two facilities resulted in larger amounts of substances reported as manufactured, processed or otherwise used in 2011 than in 2010. Tetrachloroethylene, volatile organic compounds (VOCs), nitrogen oxides (NO_x), cadmium and lead were the priority substances with the largest percent increase in reported amounts.

There are three priority substances for which no data have been reported (see Table 2-2). Toronto Public Health expects that information will come in future years as more facilities report.

Table 2-2: Total amounts of priority substances (in kilograms) that Phase One and Two facilities reported were manufactured, processed or used in 2010 and 2011 (sorted by amounts for 2011)

Chemical	Total Manufactured Processed or Used (kg) 2010 ^A	Total Manufactured Processed or Used (kg) 2011
Volatile Organic Compounds (VOCs)	47,829,081	61,768,480
Fine Particulate Matter (PM _{2.5})	4,862,403	2,686,483
Tetrachloroethylene	8,130	2,339,912
Nitrogen Oxides (NO _x)	1,084,566	1,175,032
Manganese	484,961	462,342
Vinyl chloride	387,172	395,946
Dichloromethane	263,149	301,102
Chromium, Non-Hexavalent	338,537	271,965
Formaldehyde	298,402	230,100
Lead	146,455	221,163
1,3-Butadiene	112,891	94,754
Trichloroethylene	21,371	44,007
Chromium, hexavalent	1,638	35,616
Nickel	18,640	25,119
Chloroform	4,185	8,228
Acetaldehyde	10,948	6,075
Cadmium	273	2,250
Mercury	1,538	819
Benzene)	199	268
Carbon tetrachloride	15	42
1,2-Dibromoethane	42	29
PAHs	36	28
Acrolein	0	0
1,2-Dibromoethane	0	0
1,4-Dichlorobenzene	0	0
TOTAL	55,874,632	70,069,760

^A Updates have been made to the data reported for 2010 since publication in the 2011 Annual Report. The online database also reflects these changes.

2011 Data of Priority Substances Released to the Environment by Phase One and Two Sectors

For all substances together, the total releases represent a small proportion (about 8 per cent overall) of the total amount reported manufactured, processed or used by facilities. This proportion varies for each pollutant – for example, for acetaldehyde, nearly all (over 97 percent) of what was reported manufactured or used was released. This is similar to 2010.

Table 2-3 shows the total amounts released to air, water and land for each substance in 2010 and 2011,

and the proportion of the manufacture, process or use that these releases represent.

As expected, the addition of Phase Two facilities resulted in larger amounts of priority substances reported as released in 2011 than in 2010.

1,3 butadiene, tetrachloroethylene and trichloroethylene were the priority substances with the largest percent increase in reported amounts.

There are four priority substances for which no data have been reported (see Table 2-3). Toronto Public Health expects that information will come in future years as more facilities report.

Table 2-3: Total amounts (in kilograms) of priority substances that Phase One and Two facilities reported were released to air, water and land in 2011, and the percentage this represents of total amount reported manufactured, processed and used sorted by 2011 data.

Chemical	Total Release (kg) in 2010 ^B	Total Release (kg) in 2011	Percentage of Total Manufacture Process or Use of Chemical that Was Released in 2011
Volatile Organic Compounds (VOCs)	3,984,023	3,931,246	6.4
Nitrogen Oxides (NO _x)	1,059,566	1,170,149	99.6
Particulate Matter (PM _{2.5})	174,187	190,473	7.1
Trichloroethylene	9,342	16,080	36.5
Dichloromethane	19,928	9,179	3.0
Tetrachloroethylene	290	8,399	0.4
Acetaldehyde	10,901	6,021	99.1
Lead	7,015	4,423	2.0
Formaldehyde	4,850	4,281	1.9
1,3-Butadiene	0	2,699	2.8
Nickel	2,457	2,586	10.3
Chloroform	262	348	4.2
Cadmium	218	316	14.0
Mercury	65	124	15.1
Benzene	39	121	45.1
Manganese	77	57	0.0
Polycyclic Aromatic Hydrocarbons (PAHs)	36	28	100.0
1,2-Dichloroethane	7	5	17.2
Carbon tetrachloride	2	5	11.9
Vinyl chloride	1	3	0.0
Chromium, Non-Hexavalent	22	0	0.0
1,2-Dibromoethane	0	0	N/A
1,4-Dichlorobenzene	0	0	N/A
Acrolein	0	0	N/A
Chromium, hexavalent	0	0	N/A
TOTAL	5,273,288	5,346,543	8

^B Updates have been made to the 2010 data since publication in the 2011 Annual Report. The online database also reflects these changes.

2010 to 2011 Comparison

Comparing the total reported release and use of the 25 priority substances year over year will provide insights into how businesses in Toronto are embracing pollution prevention. Overtime, we will be able to identify trends and progress in reductions.

At present, year to year comparison is only possible for Phase One facilities and City Operated facilities that were required to report for both 2010² and 2011:

- While overall total reported manufacture, process or other use increased by 2% the overall reported releases decreased by 3%.
- For individual substances changes in reported amounts varied.

² The data used in the comparison analysis reflect that updates to the 2010 data that were made since publication in the 2011 Annual Report.

Table 2-4: Quantities of priority substances released to air in 2011 ranked by carcinogenic toxic equivalency potentials (TEP) score

Priority Substance	Released to Air (kg)	TEP value	Carcinogen TEP Score
Polycyclic Aromatic Hydrocarbons (PAHs) ^c	28	6300	176,400
Cadmium	6	26000	156,000
Tetrachloroethylene	8,399	0.96	8,063.04
Dichloromethane	18,358	0.20	3,671.60
1,3-Butadiene	2,699	0.53	1,430.47
Carbon tetrachloride	5	270	1,350
Lead	35	28	980
Trichloroethylene	16,080	0.05	804
Chloroform	348	1.60	556.80
Benzene	121	1.00	121
Formaldehyde	4,281	0.02	85.62
Acetaldehyde	6,021	0.01	60.21
1,2-Dichloroethane	5	2.50	12.50
Vinyl chloride	3	1.90	5.70

^c To be more health protective the TEP for Benzo[a]pyrene was used to represent the whole PAH group. Individual TEP scores were not used because PAHs are difficult to measure and ChemTRAC does not require reporting on individual PAHs. Benzo[a]pyrene is the most toxic type of PAH.

Other reporting programs similar to ChemTRAC show that over time large reductions in releases can be anticipated. Typically, reductions start with incremental changes.

Health Ranking of Substances

The 25 priority substances vary in their toxicity. Some substances, such as lead and cadmium, are very toxic and could pose a risk even when released in small amounts. Other substances, for example volatile organic compounds (VOCs) and nitrogen oxides (NO_x), have a low toxicity but the overall health risk may be high when they are released in large quantities.

One way of taking this different toxicity into account is to rank them by their toxic equivalency potentials (TEPs). Toxic equivalency potential

Table 2-5: Quantities of priority substances released to air in 2011, ranked by non-cancer toxic equivalency potential (TEP) score

Priority Substance	Released to Air (kg)	TEP value	Non-Carcinogen TEP Score
Mercury	24	5,000,000	120,000,000
Lead	35	580,000	20,300,000
Cadmium	6	1,900,000	11,400,000
Volatile organic compounds (VOCs) ^D	3,931,144	1.00	3,931,144
Particulate matter 2.5 (PM _{2.5})	190,473	17	3,238,041
Nitrogen Oxides (NO _x)	1,170,149	2.20	2,574,328
Tetrachloroethylene	8,399	65	545,935
Dichloromethane	18,358	7	128,506
Formaldehyde	4,281	16	68,496
Acetaldehyde	6,021	9.30	55,995
Manganese	57	780	44,460
Carbon tetrachloride	5	2,300	11,500
Trichloroethylene	16,080	0.63	10,130
1,3-Butadiene	2,699	2.20	5,938
Chloroform	348	14	4,872
Benzene	121	8.10	980
Vinyl chloride	3	69	207
1,2-Dichloroethane	5	4.20	21

^DThis TEP value is based on the VOC toluene, which is often used as an indicator for VOC mixtures

provides a value based on the amount released and the toxicity of a substance. The substances can then be compared with each other to give a better indication of the relative health risk.³ A high TEP value represents a higher potential to cause harm. The TEP scoring system ranks substances that cause cancer (carcinogens) and substances with other health impacts (non-carcinogens) separately. Some of the 25 priority substances have both carcinogenic and non-carcinogenic effects and are assigned a TEP score for each category.

Table 2-4 shows the reported releases to air ranked by the carcinogenic TEP, and Table 2-5 ranks the releases by non-carcinogenic TEP. The carcinogenic ranking indicates that although substances like

cadmium and tetrachloroethylene were reported in small amounts, the overall potential for adverse health impact of these releases are estimated to be much higher than for other substances. For non-carcinogenic rankings, mercury, cadmium and lead are likely to be of highest health concern.

Priority Substances of Highest Health Concern

For 2011, eight priority substances ranked highest by release or TEP scores.⁴

- Volatile organic compounds (VOCs), nitrogen oxides (NO_x) and particulate matter 2.5 (PM_{2.5}) were released in the highest amounts in 2011. These substances contribute

³ The TEP score is calculated by multiplying a unique toxicity value for the substance by the amount used or released. Chemicals with the highest scores have the highest potential to cause harm. The reference chemical for carcinogens is benzene and the reference chemical for non-carcinogens is toluene.

⁴ The TEP scores in this report only reflect the releases from industrial and commercial businesses that report to ChemTRAC.

to smog formation, which TPH estimated in 2004 to be responsible for about 1,700 premature deaths and 6,000 hospitalizations a year in Toronto.

- Cadmium, polycyclic aromatic hydrocarbons (PAHs) and tetrachloroethylene had the highest carcinogenic TEP scores.
- Mercury, lead and cadmium had the highest non-carcinogenic TEP scores.

All of these substances were identified in 2010 as substances with the highest health concern except tetrachloroethylene. Tetrachloroethylene reported releases for operations in 2011 were higher than those reported for 2010 because of the addition of the Phase Two sectors.

Appendix 1 and 2 provide more detail on the sources and health impacts of these eight substances.

How ChemTRAC Compares with Other Reporting Programs

ChemTRAC adds important new information to what is collected through the National Pollutant Release Inventory (NPRI) and Ontario's *Toxics Reduction Act* (TRA). There are several key differences between the programs and the data that are collected:

- ChemTRAC's reporting thresholds are much lower than those of the other programs, so in some cases facilities will provide data that are not reported to NPRI or TRA;
- ChemTRAC collects data from large, medium and small facilities, which provides a more detailed picture of sources in our communities, while NPRI and TRA apply to very large facilities only;
- ChemTRAC collects data on both use and release of priority substances. The NPRI does not collect use data. The TRA collects use data but allows facilities to publish the data in ranges rather than as specific amounts.

For 2011, ChemTRAC data for Phase One and Two facilities can be compared to NPRI data reported for the same year:

- 85% of facilities that reported to ChemTRAC in 2011 did not report to the NPRI
- For 9 priority substances – trichloroethylene, tetrachloroethylene, dichloromethane, formaldehyde, nickel, acetaldehyde, chloroform, benzene and manganese – ChemTRAC is the only program that collected information on their releases.
- 23% of the total mass of priority substances reported to ChemTRAC were not reported to NPRI.
- 77% of releases to air of carcinogens as calculated by TEP reported to ChemTRAC were not reported to NPRI.
- 47% of releases to air of substances with non-carcinogenic health effects as calculated by TEP reported to ChemTRAC were not reported to NPRI.
- Many small and medium-size facilities such as autobody manufacture and repair shops, dry cleaners and laundry services reported information for the first time.
- Data on the manufacture, process and use of priority substances for Phase Two facilities have not been reported before.

As the full ChemTRAC program is phased in next year, we expect to see data on many more small and medium-sized facilities that are entirely new.



Chapter 3: Examination of Data by Individual Sectors

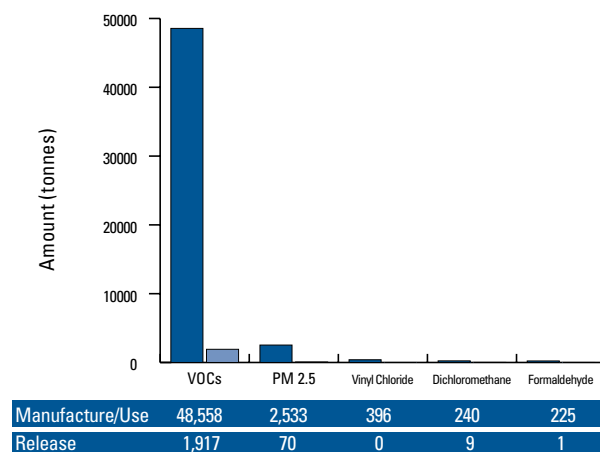
Chemical and Related Products Manufacturing



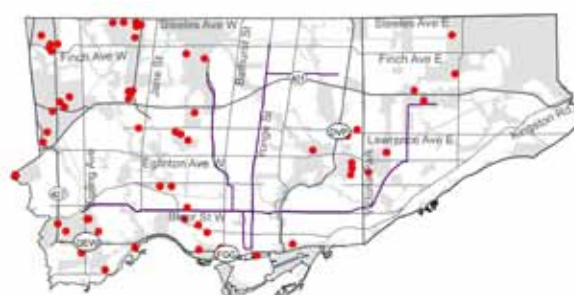
Quick Facts

- Types of activities: Manufacturers of basic chemicals, synthetic fibers, plastics, pigments, paints, fertilizers, drugs, cosmetics and soaps
- Number of facilities that met threshold: 111
- Number of facilities below threshold: 22
- Range in number of employees per facility: 1 to 1200
- Total amount manufactured, processed or used: 52,767 tonnes
- Total amount released: 2,247 tonnes
- Number of priority substances reported: 22
- Top emitter of VOCs and PM_{2.5}

Figure 3-1: Chemical and related products manufacturing sector – amount (in tonnes) of selected priority substances reported for 2011



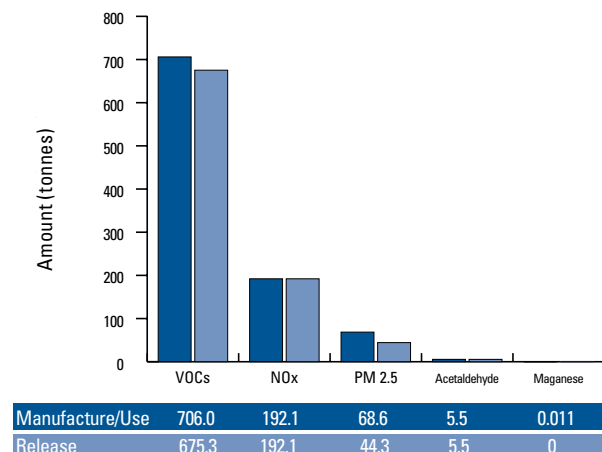
Food, Beverage and Tobacco Products Manufacturing



Quick Facts

- Types of activities: Food manufacturing - meat processing, baking, fruit and vegetable canning, frozen food manufacturing and dairy product manufacturing
- Beverage manufacturing - soft drink, ice, and bottled water manufacturing, beer brewers and wine distillers
- Tobacco manufacturing
- Number of facilities that met threshold: 61
- Number of facilities below threshold: 28
- Range in number of employees per facility: 1 to 172
- Total amount released: 972 tonnes
- Total amount manufactured, processed or used: 917 tonnes
- Number of priority substances reported: 8
- Second largest emitter of PM_{2.5} and third largest emitter of VOCs

Figure 3-2: Food, beverage and tobacco manufacturing sector – Amount (in tonnes) of selected priority substances reported for 2011



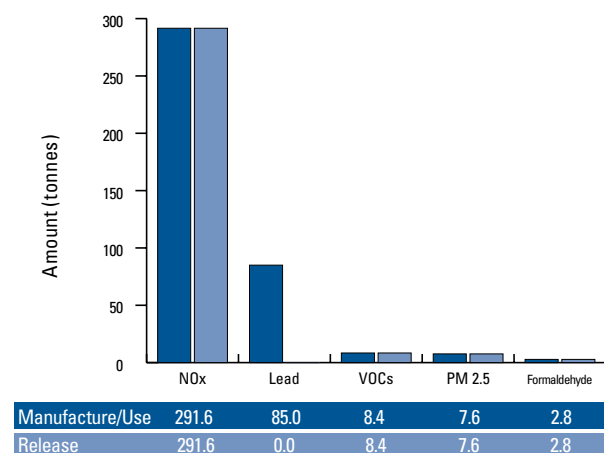
Power Generation



Quick Facts

- Type of activities: Generation of bulk electric power
- Number of facilities that met threshold (see map): 5
- Number of facilities below threshold: 1
- Range in number of employees per facility: 1-363
- Total amount manufactured, processed or used: 396 tonnes
- Total amount released: 311 tonnes
- Number of priority substances reported: 6
- Top emitter of NO_x
- Potential sources of NO_x: burning fossil fuel
- Potential sources of lead: from underground cable joints

Figure 3-3: Power generation sector – Amount (in tonnes) of selected priority substances reported for 2011



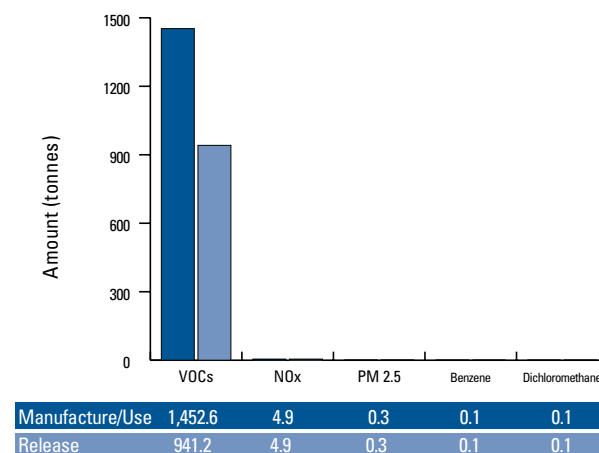
Printing and Publishing



Quick Facts

- Types of activities: Printing newspapers, books, labels, business cards and food wrappers, etc
- Printing media - paper, metal, glass, plastics, apparel and textiles
- Number of facilities that met threshold (see map): 78
- Number of facilities below threshold: 80
- Range in number of employees per facility: 1-200
- Total amount manufactured, processed or used: 1,458 tonnes
- Total amount released: 947 tonnes
- Number of priority substances reported: 11
- Potential source of VOCs: printing inks and solvents used to clean machinery

Figure 3-4: Printing and publishing sector – Amount (in tonnes) of selected priority substances reported for 2011



Water and Wastewater Treatment



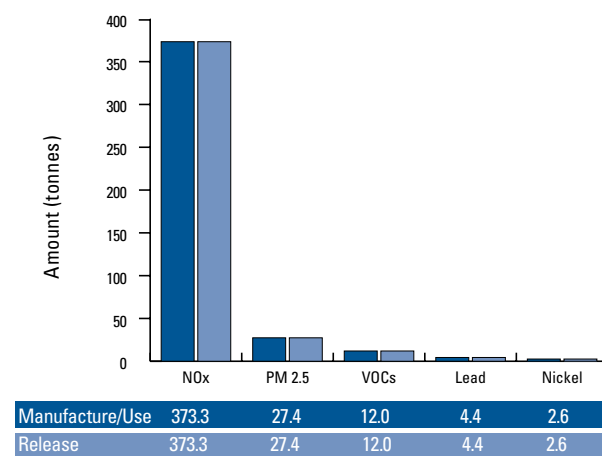
Quick Facts for 2011

- Type of activities: Water, wastewater and sewage treatment plants
- Number of facilities that met threshold (see map): 7
- Number of facilities below threshold: 3
- Range in number of employees per facility: 5-174
- Total amount manufactured, processed or used: 420 tonnes
- Total amount released: 420 tonnes
- Number of priority substances reported: 7
- Top emitter of cadmium, mercury and lead

Potential sources of release:

- Priority substances enter the treatment plants in waste water from other facilities and pass through relatively unchanged.
- Incinerator at Highland Creek Treatment plant is the primary source of lead and mercury releases to air. The City is upgrading the incinerator to reduce releases and is reviewing options to manage biosolids without incineration.

Figure 3-5: Water and wastewater treatment sector – Amount (in tonnes) of selected priority substances reported for 2011



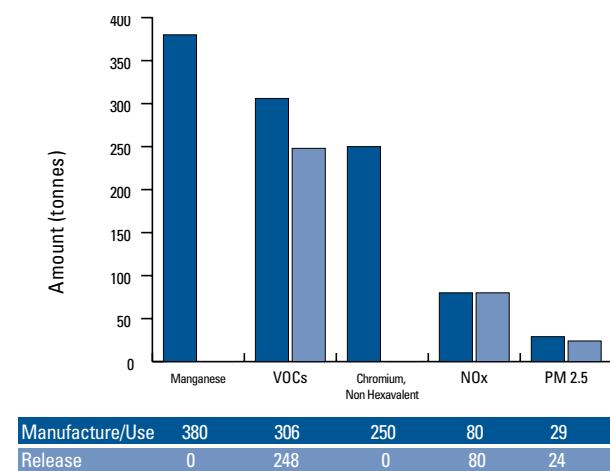
Wood Products Manufacturing



Quick Facts for 2011

- Type of activities: Create wood-based products including paper, cardboard, pallets, furniture and cabinetry
- Number of facilities that met threshold (see map): 45
- Number of facilities below threshold: 21
- Range in number of employees per facility: 1-1,100
- Total amount manufactured, processed or used: 1,045 tonnes
- Total amount released: 352 tonnes
- Number of priority substances reported: 7
- Potential source of release: Metals reported are likely from welding activities

Figure 3-6: Wood products manufacturing sector – Amount (in tonnes) of selected priority substances reported for 2011



Automotive Repair and Maintenance



Quick Facts for 2011

- Type of activities: Painting, repairing and customizing cars, trucks, vans and commercial trailers
- Number of facilities that met threshold (see map): 113
- Number of facilities below threshold: 99
- Range in number of employees per facility: 1-100
- Total amount manufactured, processed or used: 128 tonnes
- Total amount released: 108 tonnes
- Number of priority substances reported: 10

Chemical Wholesale



Quick Facts for 2011

- Types of activities: Wholesale of industrial and household chemicals, cleaning compounds and preparations, plastics resins, plastic basic forms and shapes, and industrial gases
- Number of facilities that met threshold (see map): 6
- Number of facilities below threshold: 1
- Range in number of employees per facility: 1-125
- Total amount manufactured, processed or used: 12,921 tonnes
- Total amount released: 1 tonnes
- Number of priority substances reported: 5

Figure 3-7: Automotive repair and maintenance sector – Amount (in tonnes) of selected priority substances reported for 2011

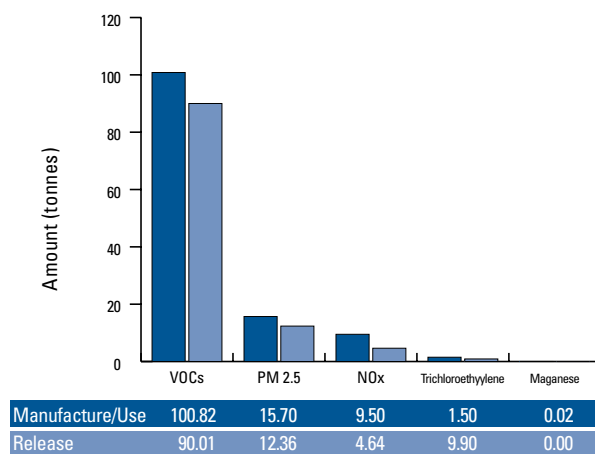
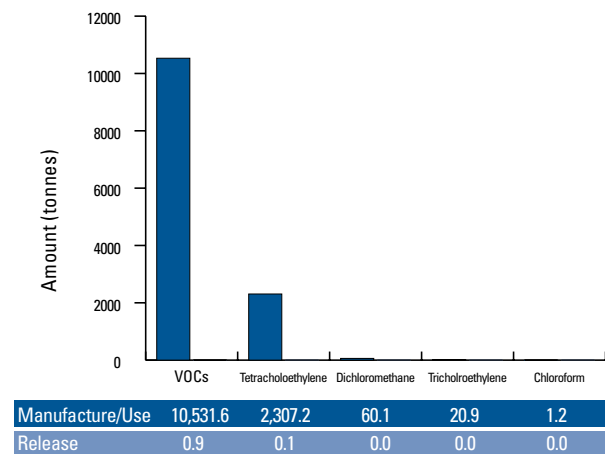
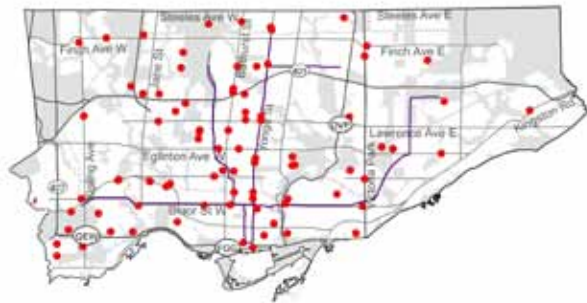


Figure 3-8: Chemical wholesale sector – Amount (in tonnes) of selected priority substances reported for 2011



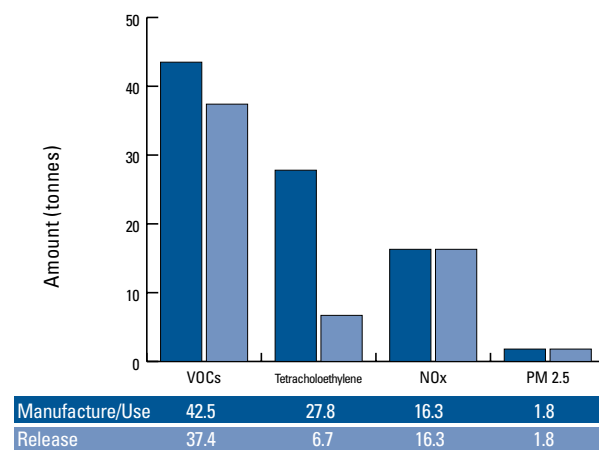
Dry Cleaning & Laundry Services



Quick Facts for 2011

- Types of activities: Self-service laundry, laundering services, laundering and supplying laundered uniforms, linens and other fabric items and dry cleaning
- Number of facilities that met threshold (see map): 94
- Number of facilities below threshold: 48
- Range in number of employees per facility: 1-300
- Total amount manufactured, processed or used: 90 tonnes
- Total amount released: 62 tonnes
- Number of priority substances reported: 4

Figure 3-9: Dry cleaning and laundry sector – Amount (in tonnes) of selected priority substances reported for 2011



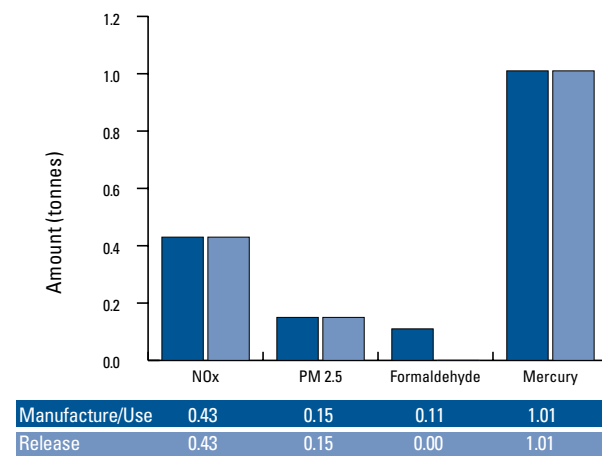
Funeral Services



Quick Facts for 2011

- Types of activities: Funeral homes, cemeteries and crematoria
- Number of facilities that met threshold (see map): 8
- Number of facilities below threshold: 20
- Range in number of employees per facility: 1-30
- Total amount manufactured, processed or used: 0.7 tonnes
- Total amount released: 0.6 tonnes
- Number of priority substances reported: 4

Figure 3-10: Funeral services sector – Amount (in tonnes) of selected priority substances reported for 2011



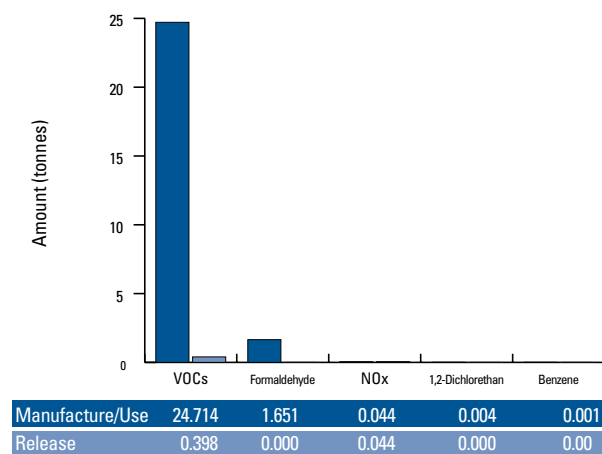
Medical & Diagnostic



Quick Facts for 2011

- Type of activities: Analytic or diagnostic services to the medical profession or patient on referral from a health practitioner
- Number of facilities that met threshold (see map): 3
- Number of facilities below threshold: 31
- Range in number of employees per facility: 1-600
- Total amount manufactured, processed or used: 26.4 tonnes
- Total amount released: 0.4 tonnes
- Number of priority substances reported: 6

Figure 3-11: Medical and diagnostics sector – Amount (in tonnes) of selected priority substances reported for 2011



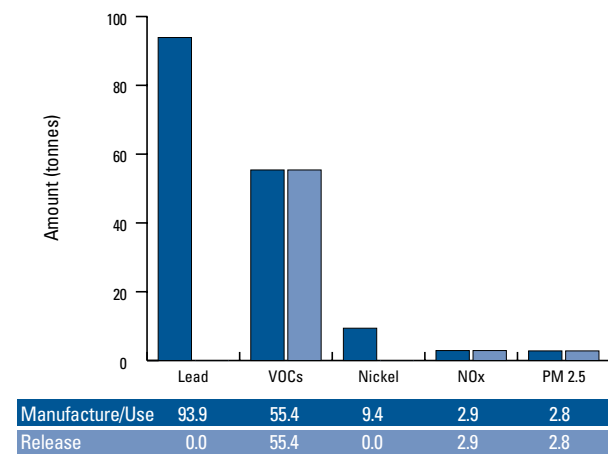
Waste Management & Remediation



Quick Facts for 2011

- Types of activities: waste collection, treatment and disposal services, environmental remediation services, septic tank pumping services and recovery facilities
- Number of facilities that met threshold (see map): 4
- Number of facilities below threshold: 8
- Range in number of employees per facility: 1-1,000
- Total amount manufactured, processed or used: 169 tonnes
- Total amount released: 61 tonnes
- Number of priority substances reported: 14

Figure 3-12: Waste management and remediation services sector – Amount (in tonnes) of selected priority substances reported for 2011



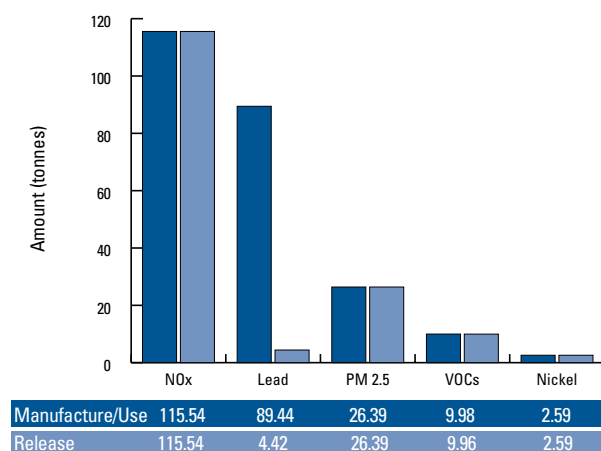
City Operated Facilities



Quick Facts for 2011

- Types of facilities: Printing facility, water treatment plants, organics processing facility, and facilities operated by Toronto Hydro and the Toronto Transit Commission
- Number of facilities that met threshold (see map): 15
- Number of facilities below threshold: 16
- Range in number of employees per facility: 12 to 1295
- Number of priority substances reported: 11
- Total amount manufactured, processed or used: 245 tonnes
- Total amount released: 160 tonnes

Figure 3-13: City facilities – Amount (in tonnes) of selected priority substances reported for 2011



Chapter 4: Making Progress Towards Pollution Prevention

Pollution prevention refers to actions that reduce or eliminate pollution at the source – rather than managing it once it has been created. The ChemTRAC program is designed to support businesses in identifying pollution prevention opportunities and implementing those opportunities that are good for public health and for business.

Pollution prevention actions include:

- modifying production processes
- using non-toxic or less-toxic substances
- implementing conservation techniques
- re-using or substituting materials
- improvements in housekeeping
- training
- changing operating procedures
- inventory control

ChemTRAC requires facilities to examine chemical use and release in much more detail than before. For some business operators this will be the first time they consider the priority substances in their operations. For most businesses their primary focus is the final goods or service they are selling.

For the three year period from 2007 until 2009, for 90 pollution prevention programs in the United States, the National Pollution Prevention Roundtable reported “\$6.6 billion in economic benefits and more than 7 billion pounds [3.17 million metric tonnes] of pollution minimized or eliminated” (The National Pollution Prevention Roundtable, 2013).⁵

By considering the priority substances in their operations, businesses may find cost-savings opportunities to reduce their use or release of toxic chemicals. For example, they may find cost-savings by using products containing priority substances more efficiently or reduce their health safety costs by consulting suppliers for safer alternatives.

Pollution prevention has yielded other benefits to businesses such as increased profitability, differentiation in the market place, improved employee retention and improved product quality.

Through reviewing the priority substances in their processes, a business may ask questions like:

- Is there a more efficient way to use this cleaning product to reduce my release of VOCs to the environment and save my business money at the same time?
- Can I operate my processes at a lower temperature to reduce my consumption of natural gas and reduce the release of NO_x and PM_{2.5} and save my business money at the same time?

Pollution prevention does not happen overnight, even with motivation. Instead it takes time for businesses to build the knowledge and capacity required to take action. ChemTRAC supports businesses in making progress towards pollution prevention, for example:

- Live Green Toxics Reduction Grants: These grants are intended to raise awareness, understanding and implementation of toxics reduction opportunities in businesses and the community. They are offered in partnership with Live Green.

⁵The National Pollution Prevention Roundtable. (2013). A Cornerstone of Environmental Sustainability: Pollution Prevention Results from 2007 to 2009. Retrieved 2013, from <http://www.p2.org/wp-content/uploads/p2-results-2007-9-final.pdf>

Switching to low VOC paints changed how a local Toronto autobody shop looked at environmental regulations. Although the switch was legally mandated by the federal government, this autobody shop was an early adopter. The shop found that not only did the changeover in paints reduce VOCs, it also saved money and improved product quality. The low VOC paint provided better coverage than the original paint reducing the amount of paint needed. In addition, the automated system enabled the autobody shop to mix paint on-demand reducing the amount of wasted mixed paint produced. Since the switch in paint, the autobody shop is continually looking for additional ways to reduce paint costs, use and releases of VOCs.



- ChemTRAC Pollution Prevention Pilot Project: With the support of the Toronto Atmospheric Fund, TPH and its City partners are reviewing approaches that TPH could use to assist businesses green their operations.

Live Green Toxic Reduction Grants

The Live Green Toxic Reduction Grants help empower residents to talk with their neighbourhood businesses about the ChemTRAC program and toxic reduction opportunities. For example, the Toronto Cancer Prevention Coalition's (TCPC) grant project increased Toronto residents' awareness of and interest in the ChemTRAC program. Toronto Cancer Prevention Coalition created a community service provider friendly toolkit and held a workshop to inform the community about the context of ChemTRAC and the benefits of greening businesses. The workshop curriculum and materials will also be used in future community events. Through this grant, TCPC was able to reach out to community groups across Toronto. As a result, community groups, like Jane and Finch Community and Family Centre are now initiating their own projects on air pollution in their neighbourhood.

The Grants also help businesses learn about the ChemTRAC program and greening opportunities. For example, the Toronto Association of Business Improvement Areas (TABIA) coordinated events at local Business Improvement Area meetings. Through greenTbiz, TABIA's environmental and conservation program, TABIA designed a toolkit tailored to Toronto businesses.

Live Green Toxics Reduction Grants: These grants are intended to raise awareness, understanding and implementation of toxics reduction opportunities in businesses and the community.

Live Green Toxic Reduction Grants 2010 to 2012

- Business Improvement Areas and Small & Medium-sized Businesses Toxic Reduction and Awareness Program (*Toronto Association of Business Improvement Areas*)
- A Community's Right-to-Know: Making Pollution Public and Improving Environmental Health in the Jane-Finch Neighbourhood (*Jane/Finch Community and Family Centre*)
- New Tools in the Public Interest: Utilizing Toronto's Environmental Reporting and Disclosure Bylaw for Community Pollution Prevention (*Toronto Cancer Prevention Coalition*)
- Stimulating Toxics Reduction at Small-Medium Enterprises through Safe Chemical Policies and Green Purchasing Specifications in Health Care (*Canadian Coalition for Green Health Care*)
- Toxics Reduction Initiative in the Auto Refinishing Industry in Toronto (*Hamilton District Autobody Repair Association*)
- Training Small and Medium-Sized Companies to Understand and Choose Safer Chemical Alternatives (*Clean Production Action*)

Pollution Prevention Pilot Project

The purpose of the pollution prevention pilot project is to gain the necessary information to design a program that will support Toronto businesses in implementing pollution prevention. Toronto Public Health and its City partners are taking three complementary approaches to gather this information:

- On the ground feedback: ChemTRAC formed a volunteer panel of six Toronto businesses. Panel members provide their insights into motivators, barriers and solutions for implementing pollution prevention opportunities at their businesses.
- Learn by doing: ChemTRAC staff along with a pollution prevention consultant worked with volunteers to assess their business for pollution prevention opportunities and develop an implementation plan. To further understand the barriers to implementation, the volunteers will be reporting on their progress over the course of the next two years.
- Learn from others: ChemTRAC reviewed similar programs in other jurisdictions to identify best practices for pollution prevention programs.

The outcomes from the pilot project will be used to design the ChemTRAC pollution prevention program to address the priorities described in the following section. Depending on the sector and their needs program elements could include:

- Guides and self-assessment tools
- Networking events
- Training
- Incentives and grants
- Access to low-interest loans
- Environmental audits and customized advisory services
- Sector specific initiatives and technology demonstrations
- Business community competitions

ChemTRAC Pollution Prevention Business Panel Members

- Lynda Mullen, C.J. Graphics Inc.
- Jim Ecclestone, Calstone Inc.
- George Usher, Dextran Products Limited
- Wayne Hosaki, Birchmount Collision Inc.
- Kanak Chauhan, Tekwood (Division of Teknion Canada)
- Derek Sawyer, City of Toronto, Dufferin Organics Processing Plant

ChemTRAC Pollution Prevention Business Panel City Partners Advisory Group

- Toronto Environment Office
- Toronto Water
- Toronto Economic Development and Culture



Chapter 5: Making Progress on Priorities for Action

All people in Toronto are exposed to some of the 25 priority substances. The sources of these substances are spread across Toronto (Figures 5-1, 5-2 and 5-3).

In 2011, over 500 facilities reported to ChemTRAC. 89% of facilities reported releases of priority substances that lead to smog formation and priority substances with non-cancer effects. Non-cancer effects can include birth defects, reproductive effects and other chronic diseases. Less than 15% of facilities reported releases of carcinogens.

To begin to address these releases, TPH is developing a plan to systematically work through priorities for action. As a guiding principle, priorities for action will focus on reducing health inequities. The first priority will be to work with those facilities that release substances of greatest potential health risk in Toronto neighbourhoods that are most vulnerable.

People with lower socioeconomic status are more likely to have poor health because conditions like poverty, unemployment, social isolation and poor housing can contribute to stress, heart disease and other health effects.⁶ Some research suggests that lower socioeconomic position predisposes people to greater susceptibility to health effects from air pollution because of already compromised health status.⁷

Using socio-economic status as an indicator for poorer overall health, TPH will identify neighbourhoods that have a double burden. These neighbourhoods have both low socio-economic status and close proximity to facilities that release priority substances (Figure 5-4).

Toronto Public Health currently offers support to facilities across Toronto to better understand



⁶ Toronto Public Health (2008). *The Unequal City: Income and Health Inequalities in Toronto*.

⁷ Adler, N. E., Boyce, T., Chesney, M. A., Cohen, S., Folkman, S., Kahn, R. L., & Syme, S. L. (1994). Socioeconomic status and health: The challenge of the gradient. *American Psychologist*, 49(1), 15-24.



their use and release of chemicals and identify opportunities to green their practices.

Working with partners, TPH will develop new targeted programs with facilities in vulnerable neighbourhoods. Lessons learned with facilities in the more vulnerable communities will be shared with facilities across Toronto.

Partners include other government agencies, such as the Ontario Ministry of the Environment, Environment Canada and Partners in Project Green (Toronto Region Conservation). Toronto Public Health also works with City partners such as Economic Development and Culture and the Environment and Energy Office. For example, TPH collaborates with the Environment and Energy Office to conduct air quality modelling studies to evaluate the potential health risk of substances in Toronto neighbourhoods.⁸

The management of toxic substances in the environment is a joint responsibility of federal, provincial and municipal governments. Regulatory and voluntary programs address toxic substances from a number of sources, including but not limited to businesses, cars and trucks, homes, consumer products, energy production. These programs are designed to work together to reduce and in some cases eliminate toxic substances in the environment.

At the municipal level, the City of Toronto works with its multiple agencies, boards, departments and divisions to address the sources of pollution in its jurisdiction. Toronto Public Health administers several programs to reduce the release of toxic substances from vehicles and several programs to empower Torontonians to take action to protect their health (See Appendix 3).

⁸ The first study was completed in 2012 (Wards 30 and 32). A second study, in South Etobicoke (Wards 5 and 6) is underway.

Figure 5-1: Distribution of facilities (Phase One and Two) that reported releases to air in 2011 with weighted circles indicating the range of releases in kg

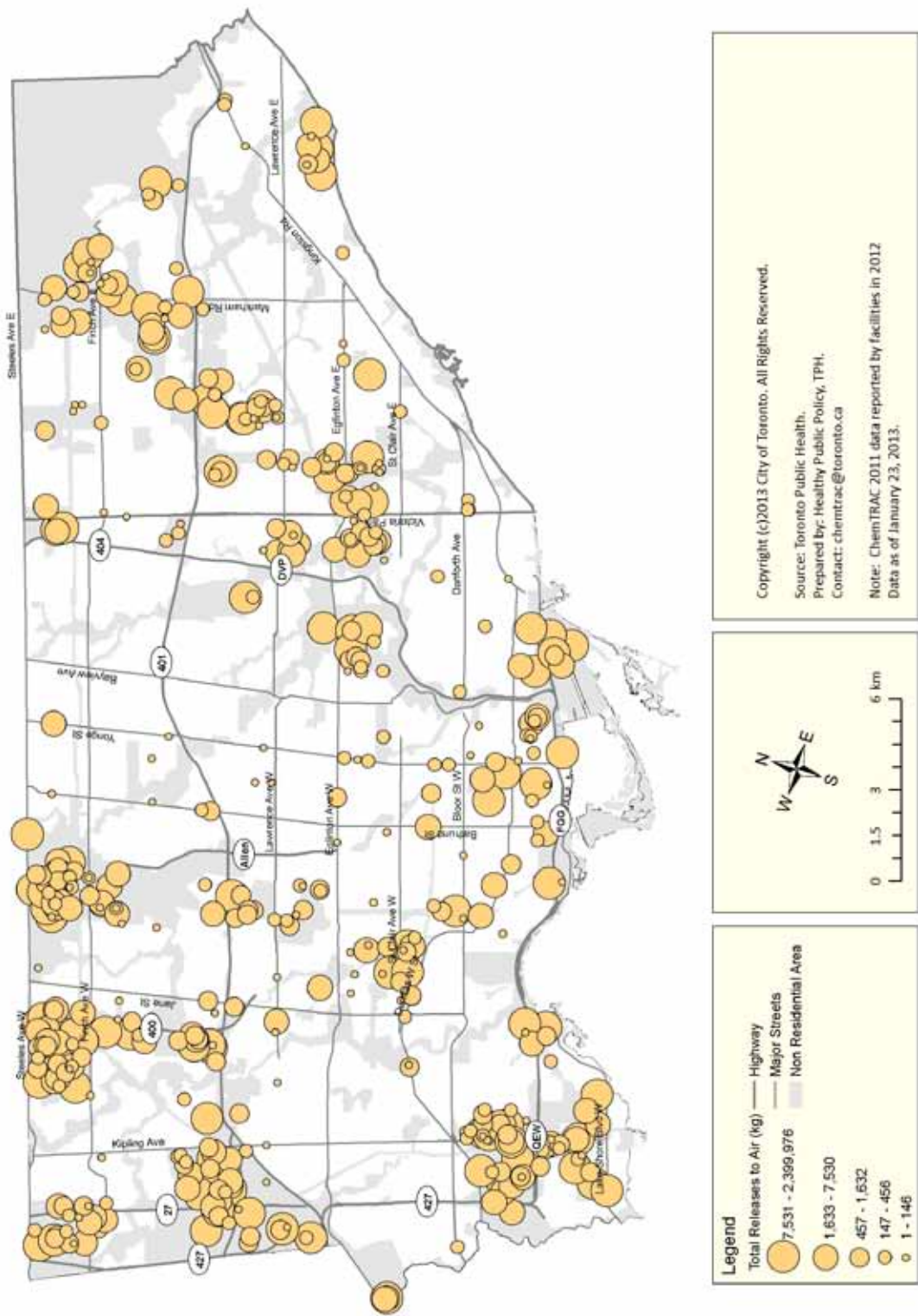


Figure 5-2: Distribution of facilities (phase One and Two) that reported releases to air in 2011 with weighted circles indicating the non-carcinogenic TEP scores

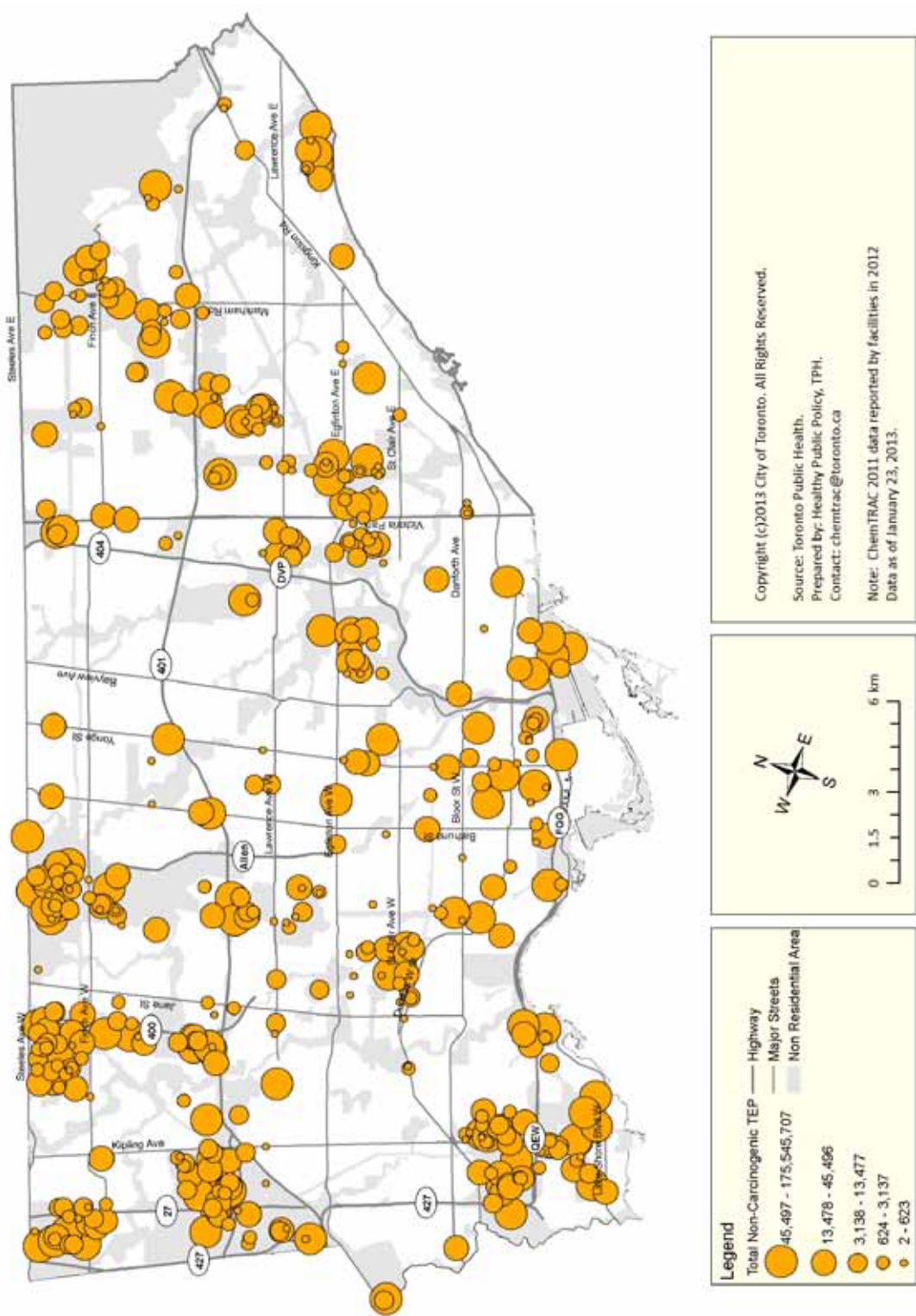


Figure 5-3: Distribution of facilities (Phase One and Two) that reported releases to air in 2011 with weighted circles indicating the range of carcinogenic TEP scores

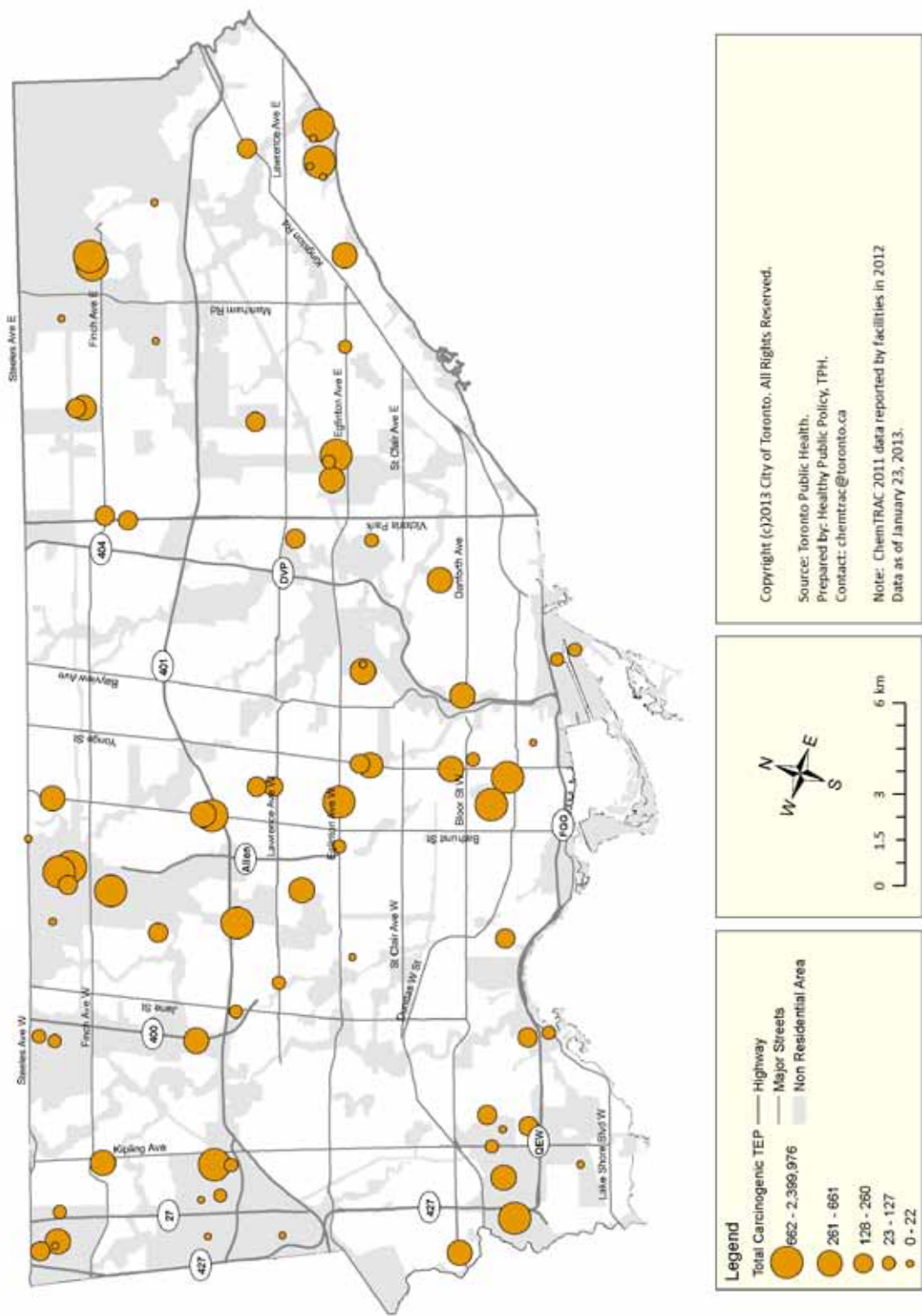
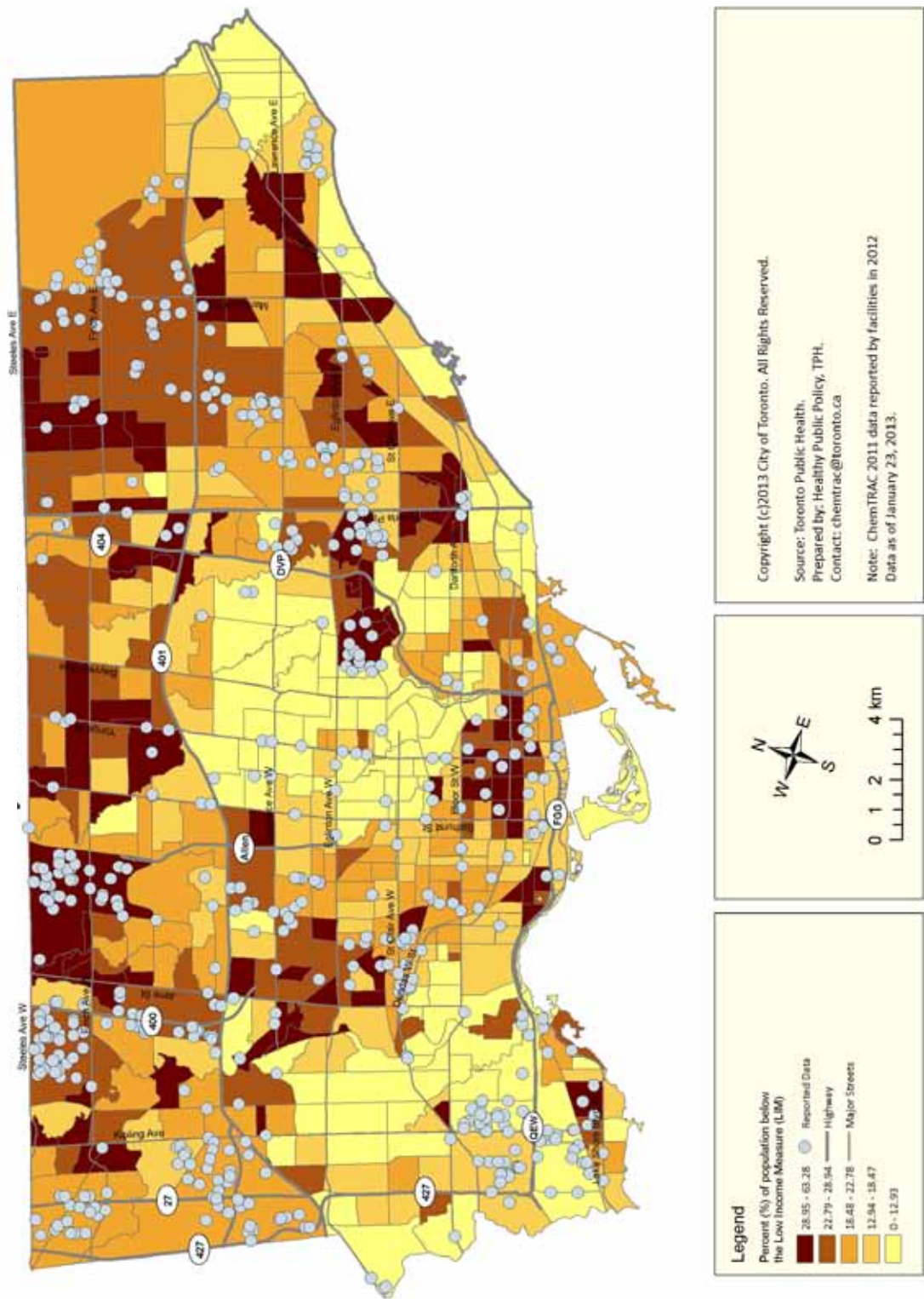


Figure 5-4: Distribution of facilities (all phases) that provided information on the manufacture, use or release of priority substances in 2011, and socioeconomic status (represented by proportion of residents living at or below the Low Income Measure (LIM)^E)



^E Low Income Measure (LIM) is an income threshold. It is set at half of the median family income of Canada's population adjusted for family size. A person or family whose income falls below the LIM can be considered low income.



Appendix 1: Substances of Highest Health Concern - The most released priority substances

The three priority substances that were released in the largest amounts from facilities that reported to ChemTRAC in 2011 were:

- Volatile Organic Compounds (VOCs)
- Nitrogen Oxides (NO_x)
- Fine Particulate Matter (PM_{2.5})

All three of these substances are major contributors to smog. Every year in Toronto, smog is estimated to cause about 1,700 early deaths and 6,000 hospitalizations.

What is smog?

Smog is a mixture of vapours, gases and particles. It is produced when pollutants, like VOCs and nitrogen oxides, react with sunlight, fine particles and other pollutants.

How does smog harm our health?

Smog can worsen heart problems, asthma, bronchitis and other lung problems. Smog reduces lung function in healthy people. It also irritates eyes, nose and throat.

Smog affects everyone's health. However, some people are more sensitive to the effects of air pollution than others. Smog is especially harmful to:

- Children
- People with lung diseases and heart conditions
- People with asthma
- Seniors

People from this high-risk group may experience health effects at lower levels of pollution. Heart or lung conditions can become worse with poor air quality. Air pollution can also irritate the eyes, nose and throat and can cause wheezing, coughing and breathing difficulties.

More Information

- Toronto Public Health: Smog
<http://www.toronto.ca/health/airquality/smog/index.htm>
- Toronto Public Health: Air Quality Health Index
<http://www.toronto.ca/health/airquality/aqhi/currentreading.htm>
- Environment Canada: Impact of Air Pollution
<http://www.ec.gc.ca/indicateurs-indicators/default.asp?lang=en&n=D189C09D-1>

The three priority substances that were released in the largest amounts from facilities that reported to ChemTRAC in 2011 were:

- Volatile Organic Compounds (VOCs)
- Nitrogen Oxides (NO_x)
- Fine Particulate Matter (PM_{2.5})

All three of these substances are major contributors to smog.



Volatile Organic Compounds (VOCs)

What are they?

VOCs are a large group of chemicals, such as benzene and toluene, which easily evaporate into the air. They are found in thousands of products like paints, solvents, glues and inks. They are also in gasoline fumes.

What are they used for?

VOCs are used in a wide range products and industries. Some common products include paints and lacquers, paint strippers, solvents, cleaning supplies, pesticides, building materials and furnishings, office equipment such as copiers and printers and glues.

How do they enter the environment?

VOCs are released during their use and as by-product of industrial and combustion processes.

How do they enter my body?

You are exposed to VOCs by breathing in contaminated air, which can be inside the workplace and home and also outdoors, especially on high smog days. You can also be exposed through the skin if you touch a product which contains VOCs.

What are the health effects?

Along with the health effects caused by smog, individual VOCs can also have short and long term health effects.

- Eye, nose, and throat irritation
- Headaches and dizziness
- Nausea and vomiting

Long term exposure can cause:

- Liver, kidney and nerve damage
- Some VOCs also cause cancer

More Information

- Environment Canada: VOCs
<http://www.ec.gc.ca/cov-voc/default.asp?lang=En&n=59828567-1>



VOCs are found in thousands of products like paints, solvents, glues and inks. They are also in gasoline fumes.

Nitrogen Oxides (NO_x)

What are they?

Nitrogen oxides are a group of gases made of nitrogen and oxygen that break down quickly in the air. They react with other substances in the air to form acid rain and smog. The most common nitrogen oxide is nitrogen dioxide, which is the component of most concern for human health. Nitrous oxide is a greenhouse gas that contributes to climate change.

What are they used for?

Most of the nitrogen oxides found in the environment are produced as a by-product of combustion. Nitric oxide is used to bleach rayon and produce nitric acid. Nitrogen dioxide is sometimes used to bleach flour and is also used to produce rocket fuels, explosives, and other chemicals.

How do they get into the environment?

Nitrogen oxides are released in the air as a by-product of combustion, such as the burning of coal, gas, oil, and natural gas, along with cigarette smoking. They are also released during industrial processes such as welding, electroplating, and engraving.

How do they get into my body?

You can be exposed to nitrogen oxides by breathing polluted air. This can happen indoors through exposure to natural gas appliances (e.g. stove) and fireplaces, along with cigarette smoke. Outdoors, nitrogen oxides are present in the air and can be higher near areas with heavy traffic and on high smog days.

What are the health effects?

Along with the health effects caused by smog, individual nitrogen oxides can also have short and long term health effects.

Short term exposure can cause:

- shortness of breath
- tiredness and nausea
- contact with high concentrations of nitrogen oxide gases or nitrogen dioxide liquid can cause serious burns
- breathing high levels of nitrogen oxides can cause rapid burning, spasms

Long term industrial exposure can cause:

- lung damage
- damage to a developing fetus

More Information

- Environment Canada: Criteria Air Contaminants <http://www.ec.gc.ca/Air/default.asp?lang=En&n=7C43740B-1>
- ToxTown: Nitrogen Oxides http://toxtown.nlm.nih.gov/text_version/chemicals.php?id=19
- Agency for Toxic Substances and Disease Registry: ToxFAQs for Nitrogen Oxides <http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=396&tid=69>

Fine Particulate Matter (PM_{2.5})

What is it?

Fine particulate matter (PM_{2.5}) refers to particles that are smaller than 2.5 micrometres in diameter that are found in the air. These particles can include fumes, dust, dirt, chemicals, soot, smoke, and liquid droplets. In comparison, the average human hair is about 70 micrometres in diameter, which makes it 30 times larger than the largest fine particle.

In Toronto, PM_{2.5} contributes the largest part of the burden of illness from air pollution.

What is it used for?

PM_{2.5} is not used as a product itself, but is a by-product from many sources, including cars, trucks, buses, and wood burning.

How does it enter the environment?

PM_{2.5} is released directly to air from cars, trucks, home firewood-burning activities, industry, forest fires and burning wastes. It can also form in the air when air pollutants, including nitrogen oxides and volatile organic compounds, react with each other.

How does it get into my body?

Fine particulate matter is easily breathed in and gets deep into the lungs.

What are the health effects?

As with smog, children and the elderly are especially sensitive to the effects of PM_{2.5}.

Short and long term exposure can cause:

- premature death in people with heart or lung disease
- irregular heartbeat
- shortness of breath, coughing
- increased asthma symptoms

More Information

- Air Quality Ontario: Fine Particulate Matter <http://www.airqualityontario.com/science/pollutants/particulates.php>

In Toronto, PM_{2.5} contributes the largest part of the burden of illness from air pollution.



Appendix 2: Substances of Highest Health Concern - Priority Substances with Highest Toxic Equivalency Potential

Polycyclic Aromatic Hydrocarbons (PAHs)

What are they?

PAHs are a group of over 100 different chemicals that are formed during incomplete combustion, such as soot. PAHs are usually found as a mixture with several different substances.

What are they used for?

Most pure PAHs are not used as a product themselves, but instead are found as mixtures in coal, tar, oil, creosote, roofing tar and other bituminous products. Coal tar and associated coal tar products may be used as a fuel, in road and roof paving, in carbon electrode manufacturing and in wood preservation. Some PAHs are used in medicines, to make dyes, plastics, and pesticides.

How do they get into the environment?

PAHs are produced by burning fuel and other products where PAHs are found. Smoking cigarettes and burning wood in fireplaces also releases PAHs into the air.

How do they get into my body?

You can breathe in air contaminated with PAHs, which can come from sources like smoking, in workplaces that use and release PAHs, or wood smoke. PAHs are also found in smoked, barbecued, deep fried and charcoal-broiled meats. You get exposed to PAHs from these foods when you eat them.

What are the health effects?

Short term exposure can cause:

For many PAHs short term exposure is not a concern. For some, it can cause:

- lung irritation
- high exposure can result in convulsions, unconsciousness, and even death

Long term exposure can cause:

- cancer, including stomach, lung and bladder

More Information

- Carex: Polycyclic Aromatic Hydrocarbons (PAHs)
http://www.carexcanada.ca/en/polycyclic_aromatic_hydrocarbons/
- Agency for Toxic Substances and Disease Registry - ToxFAQs for PAHs
<http://www.atsdr.cdc.gov/tfacts69.html>

The effect of a substance depends on many factors like:

- Length of exposure
- Route of exposure (e.g. eating versus skin)
- Amount of exposure
- Toxicity of a substance
- An individual's health and age

Cadmium

What is it?

Cadmium is a natural element found in the earth's crust. Most soils and rocks, including coal and mineral fertilizers, contain some cadmium.

What is it used for?

There are many processes and industries that use products with cadmium. Some industries include smelting or electroplating facility, battery manufacturer, abrasive blasting, gas welding and cutting, metal preparation and pouring, painting, processing scrap that contains cadmium, steel welding, textile printing, semiconductor manufacturing, and soldering.

How does it get into the environment?

Cadmium is released into air from smelting, burning fossil fuels, applying fertilizers containing cadmium and is discharged to water from waste water treatment plants.

How does it get into my body?

You can breathe in air contaminated with cadmium, most commonly found in workplaces that make products containing cadmium. You can also breathe in cadmium from cigarette smoke. Another route of exposure is ingestion (eating, drinking). Low levels are found in all foods, but the highest levels are found in shellfish, liver, and kidney meats. Working with cadmium can get it on your hands. If it is on your hands when you eat, you may also ingest it.

What are the health effects?

Short term exposure can cause:

- cough, chest pain
- headache
- throat and nose irritation
- lung damage

Short term exposure to high levels can:

- severely irritate the stomach, leading to vomiting, diarrhea and sometimes death (from contaminated food or water)
- cause acute poisoning from breathing dusts and fumes

Long term exposure can cause:

- cancer, including lung, prostate, kidney and bladder
- lung and kidney damage
- difficulty breathing

More Information

- Carex: Cadmium
<http://www.carexcanada.ca/en/cadmium/>
- ToxTown: Cadmium
http://toxtown.nlm.nih.gov/text_version/chemicals.php?id=63
- Agency for Toxic Substances and Disease Registry: ToxFAQs for Cadmium
<http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=47&tid=15>

Tetrachloroethylene (perchloroethylene, Perc)

What is it?

Tetrachloroethylene, or Perc, is a colourless, manufactured chemical. It is nonflammable and evaporates quickly. Perc is also a VOC.

What is it used for?

Perc is widely used for dry cleaning fabrics and as a solvent for degreasing metals. It is also used in chemical manufacturing and to make rubber coatings. It is an ingredient in some aerosol products, solvents, printing inks, adhesives, sealants, paint removers, automotive cleaners, lubricants, and silicones. Perc can also be found in some consumer products such as typewriter correction fluid, adhesives, spot removers, wood cleaners, and shoe polish.

How does it get into the environment?

Perc can get into the air, water and soil throughout the dry cleaning process including waste disposal. It can also get into water and soil as a liquid that is leaked or spilt. If Perc gets into the water, a small amount of the chemical can contaminate a large amount of water.

How does it get into my body?

The main way Perc gets into your body is by breathing in air that is contaminated. People who work in dry cleaners, textile facilities and in chemical production facilities are most at risk of exposure. It can also get into your body from drinking contaminated water.

For people who do not work with perc, the most important route of exposure is by using products that contain the chemical, such as fabric finishers, adhesives, spot removers, typewriter correction fluid, shoe polish, and wood cleaners.

What are the health effects?

Short term exposure can cause:

- fluid in the lungs, severe shortness of breath

- nausea, vomiting
- headache, dizziness, sleepiness, confusion
- unconsciousness and death

Long term exposure can cause:

- the International Agency for Research on Cancer (IARC) and the US National Toxicology Program state that Perc probably causes cancer, including skin cancer, leukemia, lung and bladder cancers
- damage to central nervous system, liver, and kidneys

More Information

- Carex: Tetrachloroethylene
<http://www.carexcanada.ca/en/tetrachloroethylene/>
- Agency for Toxic Substances and Disease Registry - ToxFAQs for Tetrachloroethylene
<http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=264&tid=48>



Mercury

What is it?

Mercury is a metal that is found naturally in rocks, soil and volcanoes. Mercury exists in different forms; the most toxic is called methylmercury. Methylmercury is fat-soluble, which means once an animal or person gets it into their body, it is stored in fatty tissues. This is how fish and shellfish become contaminated with mercury.

Mercury is a pollutant of global concern. It is toxic, does not break down in the environment and can build up in our bodies. As a vapour, mercury can be carried on wind currents and stay in the atmosphere for long periods of time.

What is it used for?

Mercury is found in a wide range of products, including thermometers, fluorescent and compact light bulbs, dental amalgam fillings and waste. Mercury is used to make electrical equipment, wire, and switching devices. Computers and televisions can contain mercury, so if they

crack or break open, they can release toxic mercury vapour.

How does it get into the environment?

Mercury is released into the air, water and soils from a range of sources. Weathering processes, forest fires and flooding are natural sources that release mercury into the environment. About half of the mercury currently released into the atmosphere comes from human activity, such as the burning of fossil fuels, cement production, along with the improper disposal of products that contain mercury.

How does it get into my body?

Mercury can be get into your body many different ways. The main source is through food, such as swordfish and tuna. You can also be exposed to mercury by breathing contaminated air at work or by breathing contaminated air from spills, incinerators, and industries that burn fuels that have mercury. You can be exposed by breaking



Mercury is a pollutant of global concern. It is toxic, does not break down in the environment and can build up in our bodies.

products that contain mercury such as mercury thermometers or fluorescent light bulbs.

What are the health effects?

Exposure to high levels of mercury can cause:

- damage to the mouth, respiratory tract and lungs
- kidney failure
- blisters and ulcers on the lips and tongue
- muscle twitching, tremors
- death

Mercury is of particular concern because of its effect on children and fetuses. Depending on the level of exposure, the effects can include:

- a decrease in I.Q.
- delays in walking and talking
- lack of coordination
- blindness
- seizures

More Information

- Toronto Public Health: Fish and Mercury
http://www.toronto.ca/health/hphe/fish_mercury.htmEnvironment Canada: Mercury and its compounds
<http://www.chemicalsubstanceschimiques.gc.ca/fact-fait/mercury-mercure-eng.php>
- Health Canada: Mercury and Human Health
<http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/environ/merc-eng.php>
- Agency for Toxic Substances and Disease Registry - ToxFAQs for Mercury
<http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=113&tid=24>

Lead

What is it?

Lead is a heavy metal that is found naturally in rocks. It can be found everywhere in our environment, because it occurs naturally. It is released into the environment during mining, manufacturing and the use of fossil fuels.

What is it used for?

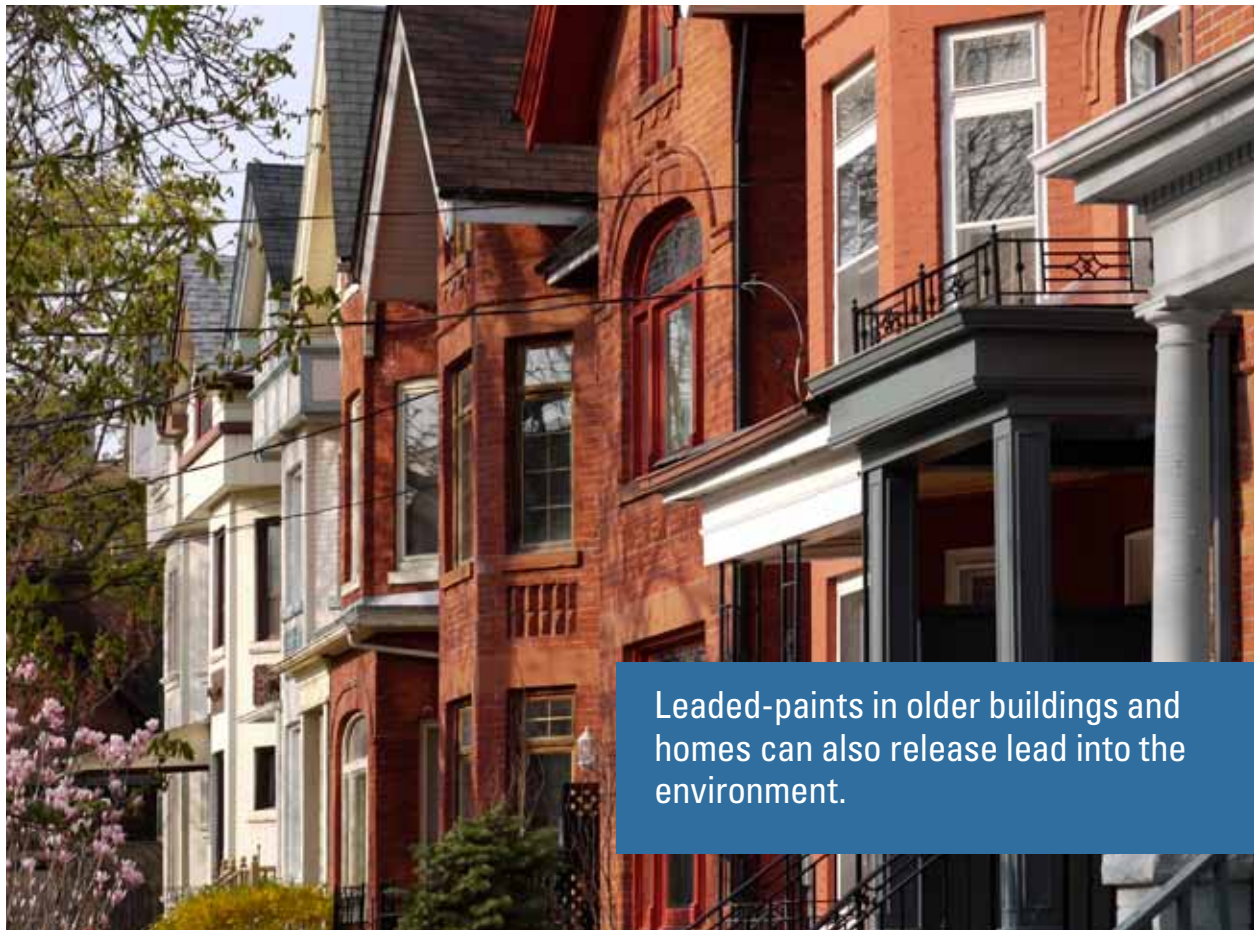
The most common use of lead is (lead-acid) batteries. Each car battery contains about 10 kg of lead. Lead oxide, or red lead, is the primary paint primer for iron and steel. Lead is also used in televisions, videos and computers, welding rods, stabilizers in plastic (PVC) piping and in crystal glassware. In the past lead was used in paints, gasoline and plumbing.

How does it get into the environment?

Lead gets into the environment when raw materials containing lead are processed, for example during smelting, refining and production of iron and steel. Lead can also enter the environment through recycling of car batteries, which are crushed and melted down. The families of people working in these industries may be exposed to high levels of lead from workers' clothing and tools when they are brought home.

How does it get into my body?

Lead can get into your body both outdoors and indoors. It is found in the air, soil, dust, drinking water, food and various consumer products. Before leaded gasoline was banned for cars in Canada in the 1990s, lead in the air was the



main source of exposure for Canadians. It is still a source of low-level lead exposure, but now adults are exposed mainly through food and drinking water.

Leaded-paints in older buildings, homes and cottages (pre-1980) can also release lead into the air, household dust, and soil if it is chipped, peeled or sanded. This is especially a concern during renovations.

What are the health effects?

Lead can be harmful to people of all ages and affects almost every organ and system in the body.

Short term exposure to high lead levels can cause:

- severe damage to the brain and kidneys
- miscarriage
- sperm damage
- death

Long term exposure of adults can cause:

- nerve damage
- weakness in fingers, wrists, or ankles increases in blood pressure, particularly in middle-aged and older people
- anemia

When infants and children are exposed to lead, it can have a wide range of effects on development and behavior, such as:

- hyperactivity
- irritability
- problems with learning and reading
- delayed growth
- hearing loss
- At high levels, lead can cause permanent brain damage and even death

More information

- Toronto Public Health: Lead
<http://www.toronto.ca/health/lead/index.htm>
- Health Canada: Lead Information
http://www.hc-sc.gc.ca/ewh-semt/contaminants/lead-plomb/asked_questions-questions_posees-eng.php
- Health Canada: Lead and Human Health
<http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/environ/lead-plomb-eng.php>
- Agency for Toxic Substances and Disease Registry - ToxFAQs for Lead
<http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=93&tid=22>

Appendix 3: Related Programs to Address Toxic Substances

Reducing Air Pollution From Transportation Sources

Transportation is a key source of air pollution emitted in Toronto. When considered on its own, transportation accounts for an estimated 440 deaths and 1700 hospitalizations in Toronto each year (Toronto Public Health, 2007).⁹ Toronto Public Health has several programs that work to reduce air pollution coming from vehicles.

20/20 The Way to Clean Air Campaign

Through 20/20 The Way to Clean Air Campaign (links), TPH works with the community and schools to reduce home energy use and vehicle use by 20%.



Idling Bylaw

Toronto Public Health works with Transportation Services to administer the Idling Bylaw to eliminate unnecessary idling and reduce emissions that contribute to air pollution and climate change.



Active Transportation

Toronto Public Health works with the community and Transportation services to promote walking or cycling instead of driving. Active transportation improves individual's health through physical activity and reduces the amount of pollution emitted from vehicles into the City's air. Toronto Public Health is working to identify and implement measures that make neighborhoods safer and more appealing for cyclists and pedestrians.

⁹ Toronto Public Health. 2007. Air Pollution Burden of Illness from Traffic in Toronto – Problems and Solutions. Toronto, Canada. http://www.toronto.ca/health/hphe/pdf/air_pollution_burden.pdf

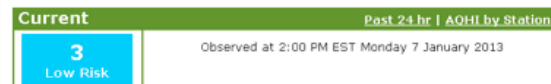
Empowering Torontonians To Reduce Their Exposure To Toxic Substances

Air Quality Health Index

Toronto Public Health works with Environment Canada and Health Canada to administer the Air Quality Health Index. Air Quality Health Index is a public information tool that helps Torontonians protect their health on a daily basis from the negative effects of air pollution. It helps individuals make decisions to protect their health by providing information on the level of risk associated with pollution levels and identifying those at risk.

Air Quality Health Index

Toronto



- | | |
|--|--|
| At-Risk Population: <ul style="list-style-type: none"> Enjoy your usual outdoor activities. Find out if you are at risk | General Population: <ul style="list-style-type: none"> Ideal air quality for outdoor activities. |
|--|--|



Canadian Partnership For Children's Health And The Environment

To protect children's health from environmental exposures and toxic substances, TPH participates in the [Canadian Partnership for Children's Health and Environment \(CPCHE\)](#). The partnership develops videos, fact sheets and other resources to empower parents to take action to reduce their children's exposure to toxic substance. The partnership also takes action through research and advocacy for policy change.

Mercury And Fish

To reduce children's and pregnant women's exposure to mercury, Toronto Public Health developed the Guide to Eating and Buying Fish. The Guide advises which fish to eat to balance the benefits of eating fish and shellfish while avoiding fish that contain high levels of mercury.

Lead Mitigation Strategy

Toronto Public Health works to reduce the public's exposure to lead, particularly those most vulnerable (infants, children and pregnant women), by: advocating for greater restrictions on lead inputs into the environment; participating in health research on lead; protecting the public from common sources of lead; and empowering the public to take action to reduce their exposures.

Urban Gardening

Toronto Public Health developed an innovative approach to address concerns about soil contaminants when planning an urban garden. This initiative provides tools and information to empower the public to engage in urban food production and gardening, while minimizing exposures to urban soil contaminants.



Creating Healthy Home Environments for KIDS


Top 5 Tips

- Bust that Dust
- Go Green when you Clean
- Renovate Right
- Get Drastic with Plastic
- Dish Safer Fish


See the video at ...

www.healthyenvironmentforkids.ca
www.environnementsainspourenfants.ca

canadian partnership for children's health & environment
partenariat canadien pour la santé des enfants et l'environnement



A Guide To Eating Fish For Women, Children and Families



Learn which fish are highest in omega-3 fats, lowest in mercury and how often you can eat them. Also, learn which fish are the best choice for the environment. Pick up your copy of the guide or visit our website.

This information is available in many other languages.

311 toronto.ca/health | TORONTO Public Health







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