Tracking and Reducing Chemicals in Toronto

5th Annual ChemTRAC Report

May 2016

Table of Contents

List of Tables

List of Figures

Chapter 1: Improving Health By Reducing Chemicals In Our Environment

In an urban environment like Toronto, the public's health may be affected by a number of environmental factors, including chemicals that pollute the air, water and land. Exposure to these chemicals can occur in our homes, workplaces and outside.

Smog-forming pollutants and other chemical substances come from different sources. Some come from sources outside the city, others from inside the city itself. Production of electricity, heating of buildings, transportation and commercial and industrial facilities are all important contributors to pollution. Overall, air quality mostly depends on what sources exist in different neighbourhoods and how weather patterns carry pollutants in the air.

We come in contact with these chemicals outdoors and indoors, in homes and workplaces. Prolonged exposure to toxic substances, and in some cases even at low levels, may cause:

- Heart and lung damage
- Cancer
- Birth defects
- Reproductive problems
- Chronic diseases

The ChemTRAC program was developed to help better understand where 25 priority chemicals come from and to encourage pollution prevention to protect health. ChemTRAC collects information from businesses and institutions in Toronto. The information is collected through Toronto's Environmental Reporting and Disclosure Bylaw (Municipal Code Chapter 423). Similar programs in Canada and other countries have been found to lead to reductions in chemicals used and released from facilities.

The program can be divided into three main areas:

- The Environmental Reporting and Disclosure Bylaw, which requires businesses to track and report their manufacturing, use and release of priority chemicals.
- The analysis and release of chemical data; and
- The greening of businesses through pollution prevention and innovation.

ChemTRAC is a release inventory, a database of air pollution sources and their releases within our local airshed. Data collected in release inventories can be used to better understand contaminant trends over time, highlight key sources and support pollutant modelling studies.

This report contains information on facility operations during the 2014 calendar year. The data was reported to the City of Toronto in 2015.

Chapter 2: ChemTRAC 2014 Data Highlights

Facility Representation by Sector

The Environmental Reporting and Disclosure Bylaw requires facilities in Toronto to report their use and release of the 25 priority chemicals annually, if they meet reporting requirements. In total, more than 600 facilities reported on their 2014 operations. Table 1 shows the number of facilities within each sector that reported information on their manufacture, use and release of these chemicals.

Table 1: Number of facilities that reported data on priority substances for 2014 operations

Sector	Number of facilities that reported 2014
Automotive repair and maintenance	37
Chemical and related products manufacturing	109
Chemical wholesale	4
Computer and electronic product manufacturing	13
Dry cleaning and laundry services	84
Electrical equipment, appliance and component manufacturing	15
Fabricated metal product manufacturing	70
Food, beverage and tobacco products manufacturing	60
Funeral services	7
Medical and diagnostic laboratories	3
Non-metallic mineral product manufacturing	24
Paper product manufacturing	9
Power generation	2
Primary metal manufacturing	10
Printing and publishing	60
Waste management and remediation services	4
Water and wastewater treatment	8
Wood products manufacturing	30
All others	81
Total	**630**

Priority Substances Manufactured, Processed or Used

Table 2 shows the total amounts reported as manufactured, processed or otherwise used for each priority substance in 2014. Approximately 82,400 tonnes of priority substances were reported in total. Volatile organic compounds (VOCs), particulate Matter$_{2.5}$ ($PM_{2.5}$), manganese, nitrogen oxides (NO_x) and tetrachloroethylene were the priority substances with the largest reported amounts.

Table 2: Total amounts of priority substances manufactured, processed, or otherwise used in 2014

Priority Substance	Manufactured (kg)	Processed (kg)	Otherwise Used (kg)
Acetaldehyde	2,045	1,310	-
Acrolein	-	-	-
Benzene	0	524	228
1,3-Butadiene	988	14,847	-
Cadmium	-	1,003	11
Carbon Tetrachloride	-	-	-
Chloroform	125		6,006
Chromium, Hexavalent	0	127,683	21,626
Chromium, Non-Hexavalent	0	571,363	0
1,2-Dibromoethane	-	-	-
1,4-Dichlorobenzene	-	-	-
1,2-Dichloroethane	-	-	10
Dichloromethane	420	254,798	84,554
Formaldehyde	6,247	56,622	27,150
Lead	8,731	319,034	8,443
Manganese	**30**	**2,153,524**	**1,860**
Mercury	2	98	357
Nickel	0	546,872	56,250
NO_x	1,533,994	57	-
PAHs	57	32	0
$PM_{2.5}$	**755,779**	**2,590,053**	**0**
Tetrachloroethylene	-	573,107	28,590
Trichloroethylene	1	12,403	4,228
Vinyl Chloride	3	-	-
VOCs	**515,624**	**68,425,152**	**3,702,328**
Total	**2,824,046**	**75,648,482**	**3,941,641**

(-) represents a null value.

Priority Substances Released to the Environment

Similar to data from 2013 operations, the total releases of priority substances represent a small proportion (about 10 per cent overall) of the total amount reported as manufactured, processed or used by facilities. This proportion varies for each pollutant. Table 3 shows the total amounts released to air, water and land for each substance in 2014. Volatile organic compounds (VOCs), nitrogen oxides (NO_x), $PM_{2.5}$ were the priority substances with the largest reported amounts.

Table 3: Total amounts of priority substances released to air in 2014

Priority Substance	Released to Air (kg)
VOCs	**5,181,952**
NO_x	**1,531,784**
$PM_{2.5}$	**295,486**
Trichloroethylene	33,149
Dichloromethane	18,785
Formaldehyde	14,060
Tetrachloroethylene	11,510
Acetaldehyde	2,353
Chromium, Non-hexavalent	1,048
1,3-Butadiene	988
Chloroform	723
Manganese	593
Nickel	575
Benzene	305
Lead	284
PAHs	79
Chromium, Hexavalent	72
Mercury	19
Cadmium	7
Vinyl chloride	3
Total	**7,093,775**

Health Ranking of Substances

The 25 priority substances vary in their toxicity. Some substances, such as PAHs 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 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. 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 cancer and non-cancer effects and are assigned a TEP score for each category. Table 4 shows the reported releases to air ranked by the cancer TEP, and Table 5 ranks the releases by non-cancer TEP. The cancer ranking indicates that although substances like PAHs, cadmium and hexavalent chromium 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-cancer rankings, lead, mercury and cadmium are likely to be of highest health concern.

Table 4: Reported quantities of priority substances released to air in 2014 ranked by Cancer toxic equivalent potential (TEP) score

Priority Substance	Released to Air (kg)	Cancer TEP value	Cancer TEP Score
PAHs	**79**	**6,300**	**497,700**
Cadmium	**7**	**26,000**	**182,000**
Tetrachloroethylene	**11,510**	**0.96**	**11,050**
Lead	284	28	7,952
Chromium, Hexavalent	46	130	5,980
Dichloromethane	18,785	0.2	3,757
Trichloroethylene	33,149	0.05	1,657
Chloroform	723	1.6	1,157
Nickel	249	2.8	697
1,3-Butadiene	988	0.53	524
Benzene	305	1	305
Formaldehyde	14,060	0.02	281
Acetaldehyde	2,353	0.01	24
Vinyl chloride	3	1.9	6
1,2-Dichloroethane	0	2.5	0

Table 5: Reported quantities of priority substances released to air in 2014 ranked by Non-Cancer toxic equivalent potential (TEP) score

Priority Substance	Released to Air (kg)	Non-Cancer TEP value	Non-Cancer TEP Score
Lead	**284**	**580,000.00**	**164,720,000**
Mercury	**19**	**5,000,000.00**	**95,000,000**
Cadmium	**7**	**1,900,000.00**	**13,300,000**
VOCs	5,180,851	1.00	5,180,851
PM2.5	295,301	17.00	5,020,117
NOx	1,532,152	2.20	3,370,734
Chromium*	484	3,100.00	1,500.400
Nickel	249	3,200.00	796,800
Tetrachloroethylene	11,510	65.00	748,150
Manganese	454	780.00	354,120
Formaldehyde	14,060	16.00	224,960
Dichloromethane	18,785	7.00	131,495
Acetaldehyde	2,353	9.30	21,883
Chloroform	33,149	0.63	20,884
Trichloroethylene	723	14.00	10,122
Benzene	305	8.10	2,471
1,3-Butadiene	988	2.20	2,174
Vinyl chloride	3	69.00	207
1,2-Dichloroethane	0	4.20	0

**Chromium total includes both Hexavalent and Non-Hexavalent Chromium*

Industry Contribution to Total Release

The information reported by businesses on operations that took place in 2014 can be summarized by industry. Table 6 shows the percentage contribution by industry sectors to 1) total release by mass, 2) Cancer TEP, and 3) Non-Cancer TEP.

Table 6: Sector contribution to Total Release (by mass), Cancer TEP and Non-Cancer TEP in 2014

Sector[a]	Percent Contribution to Total Release (by mass)[b]	Percent Contribution to Cancer TEP [b]	Percent Contribution to Non-Cancer TEP [b]
Automotive	<1	<1	<1
Chemical Wholesale	4.9	<1	<1
Computer & Elect. Prod. Mfg	<1	<1	1
Dry Cleaning	<1	1.6	<1
Electrical Equip, Appl/Comp Mfg	<1	19.5	<1
Fab Metal Prod Mfg	4.5	<1	<1
Food & Beverage	10.2	<1	<1
Funeral Services	<1	0.0	17.1
Manufacturing	39.6	1	28.3
Medical	<1	<1	<1
Non Metallic Mineral Prod Mfg	2.8	<1	7.4
Paper Prod Mfg	3.4	<1	<1
Power Generation	4.1	<1	<1
Primary Metal Mfg	<1	<1	19.2
Printing	12	<1	<1
Waste Management	<1	50.4	<1
Wastewater Treatment	5.9	22	19.2
Wood Industries	2.3	0.0	<1
All other	7.0	4.2	4.6
Total	100	100	100

[a] *Sectors are defined based on North American Industry Classification System (NAICS)*

[b] *<1 indicates a value less than one*

Chapter 3: Distribution of Facilities in Toronto

The majority of facilities reporting information on their operations to ChemTRAC were found in non-residential areas.

Figure 1: Distribution of facilities within residential and non-residential areas that provided information on the manufacture, use or release of priority substances in 2014

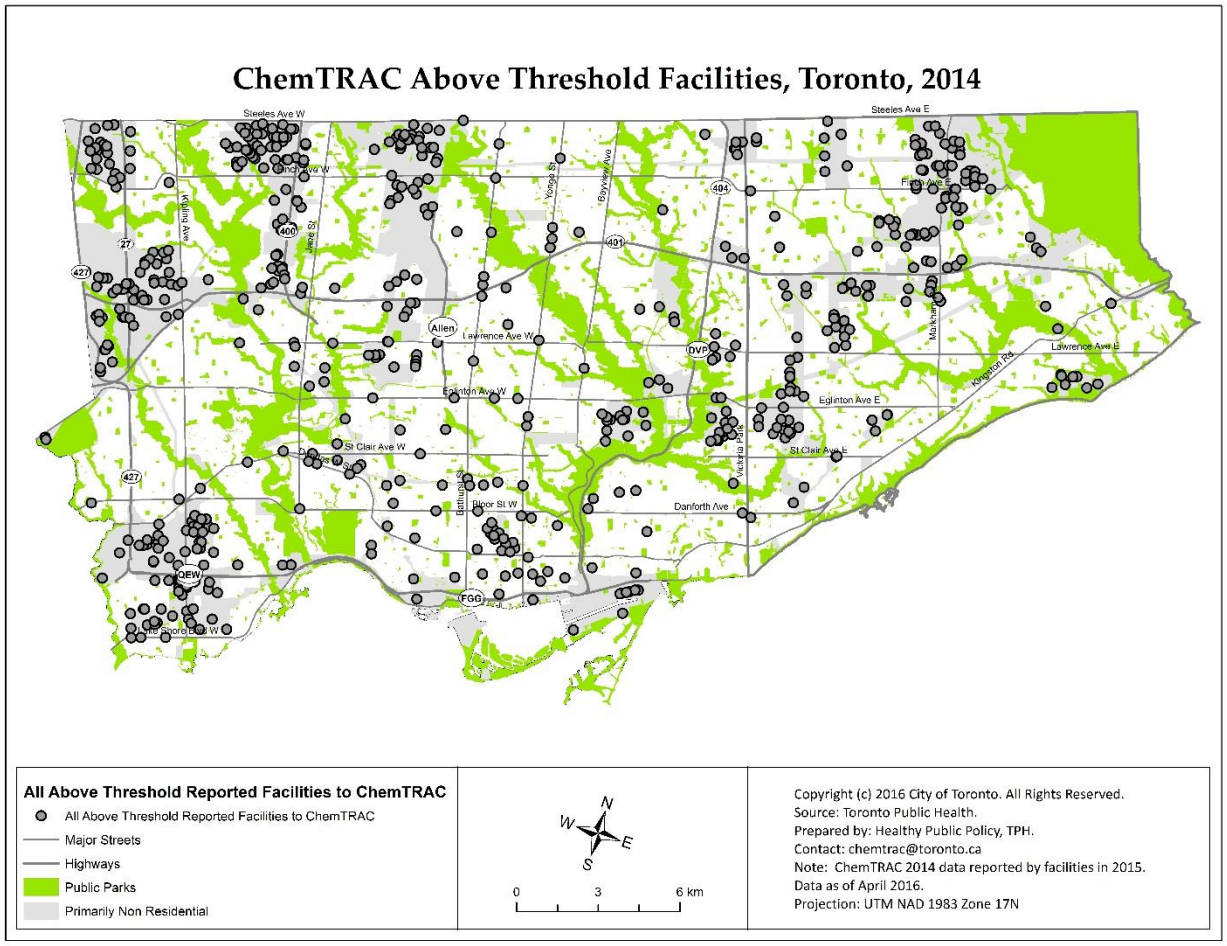


Figure 2: Distribution of facilities that provided information on the manufacture, use or release of priority substances in 2014 and socioeconomic status as represented by proportion of residents living at or below the 2013 Low Income Measure

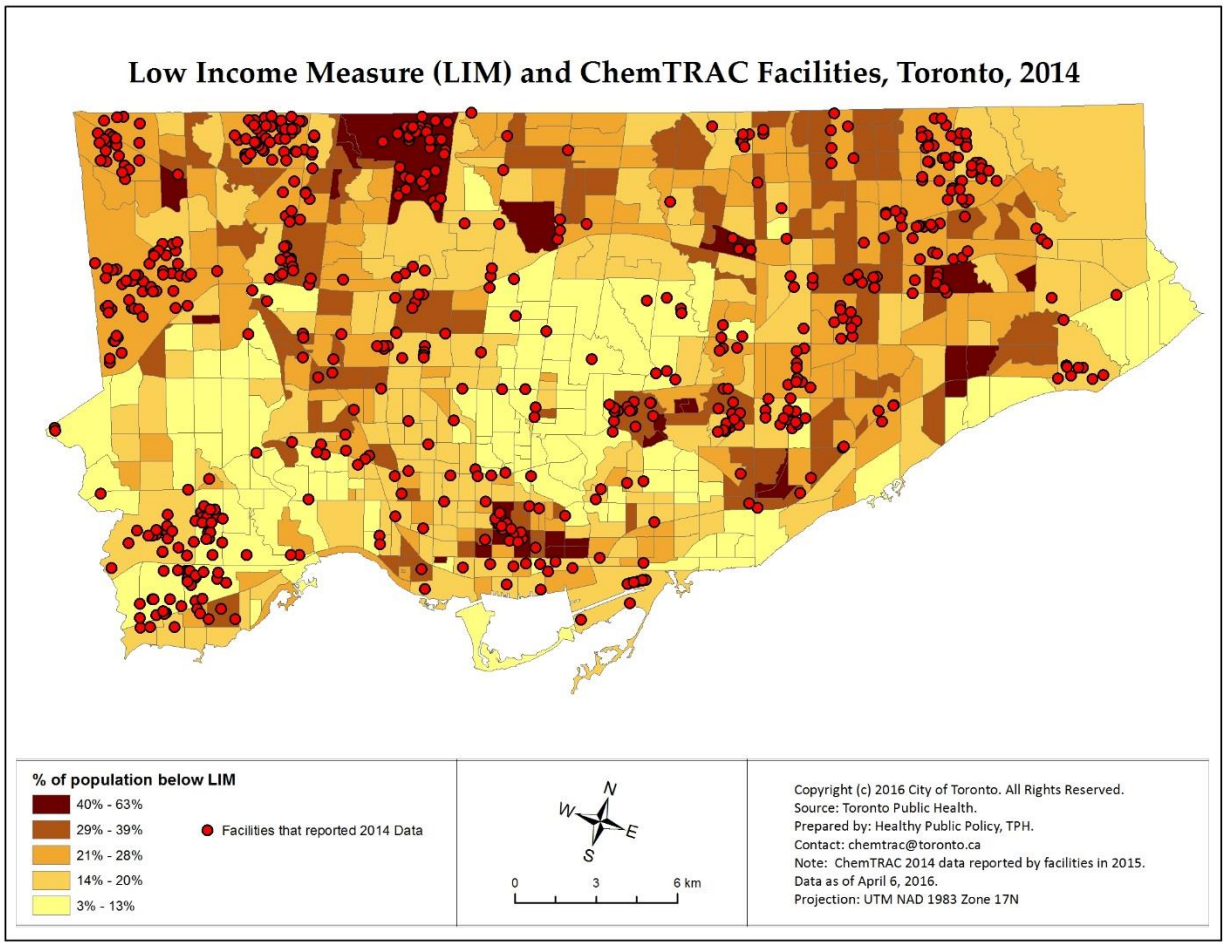


Figure 3: Distribution of Cancer TEP in 2014

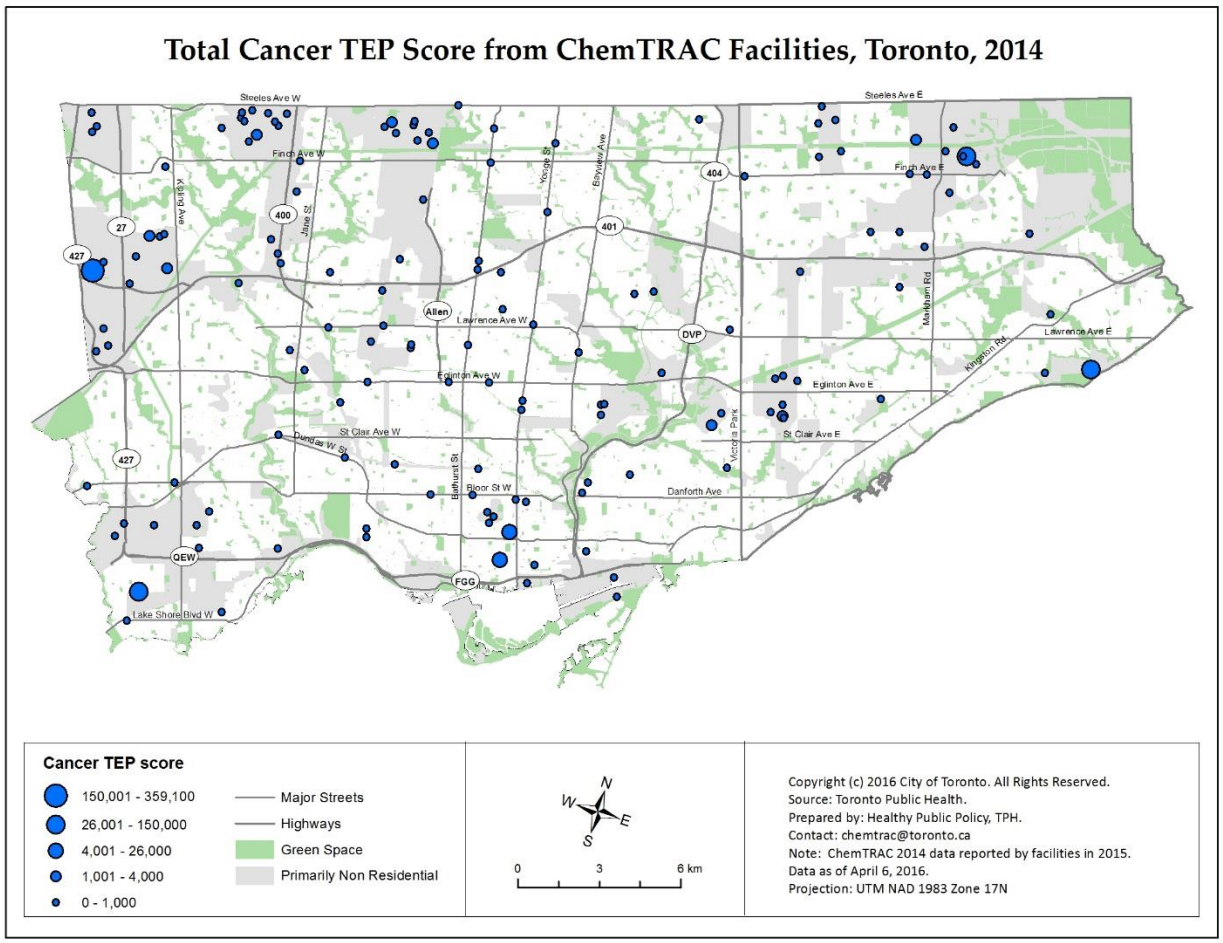
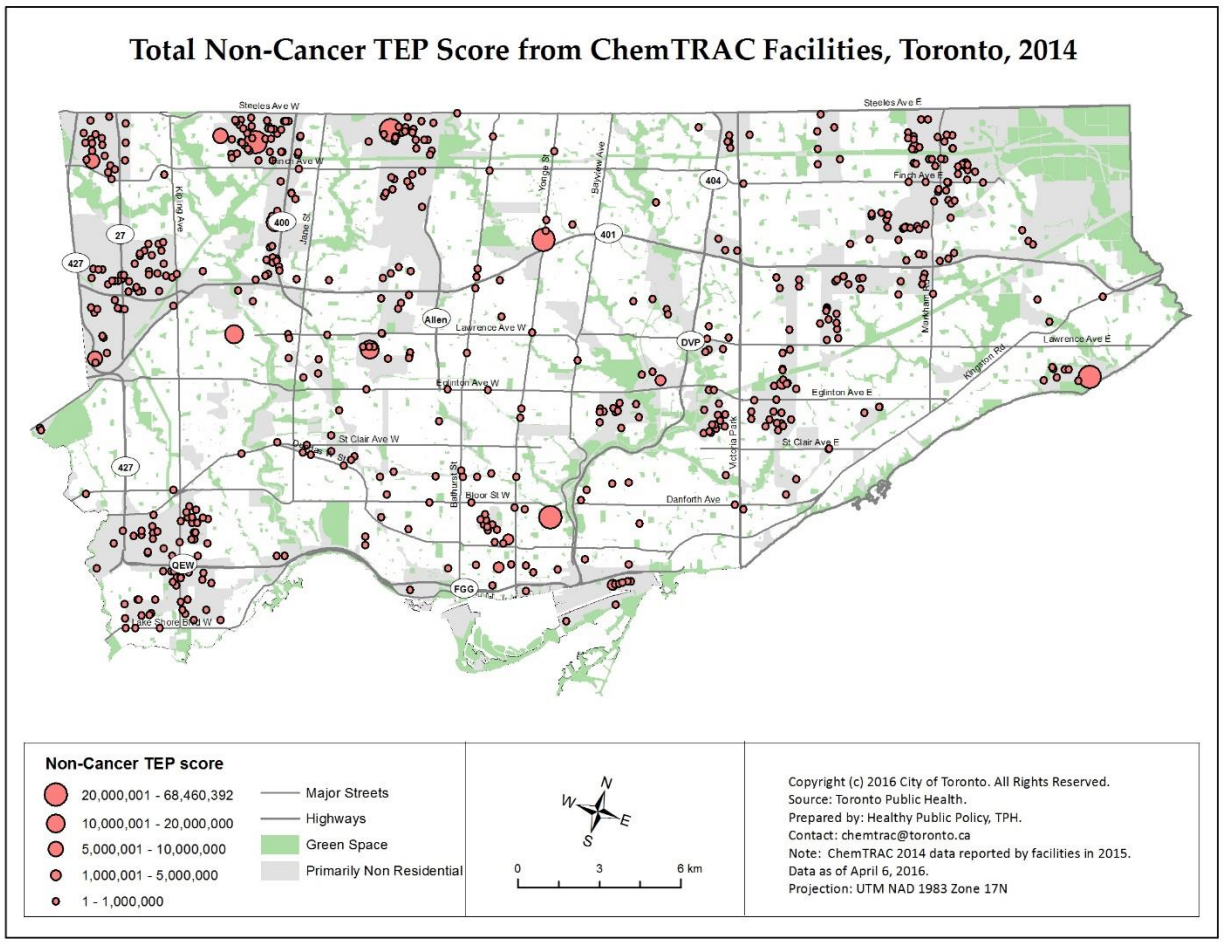


Figure 4: Distribution of Non-Cancer TEP in 2014



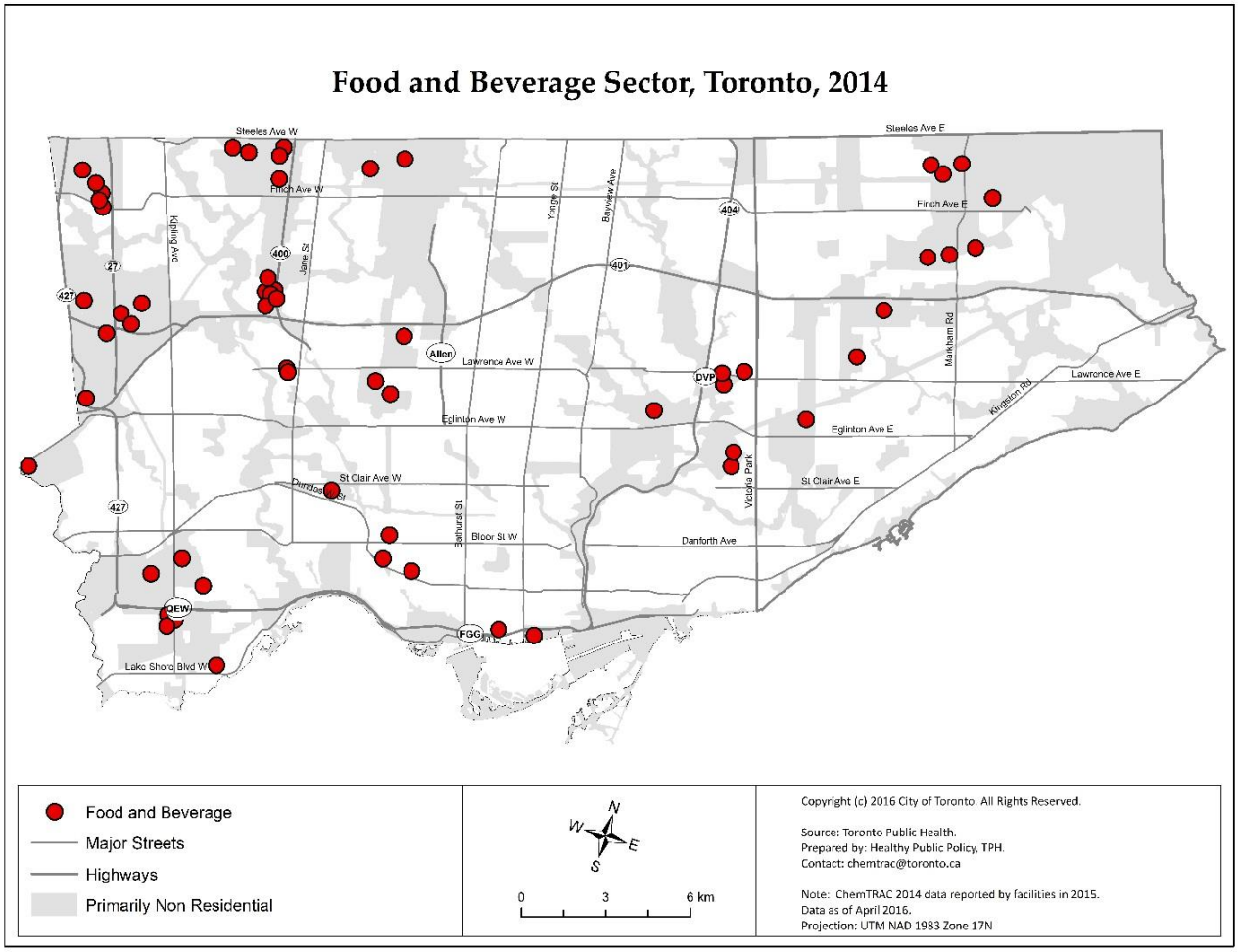
Chapter 4: Sector Quick Facts

The information reported by businesses in 2015 (about operations that took place in 2014) is summarized by industry type below.

Food and Beverage Manufacturing

Types of activities: 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, and tobacco manufacturing.

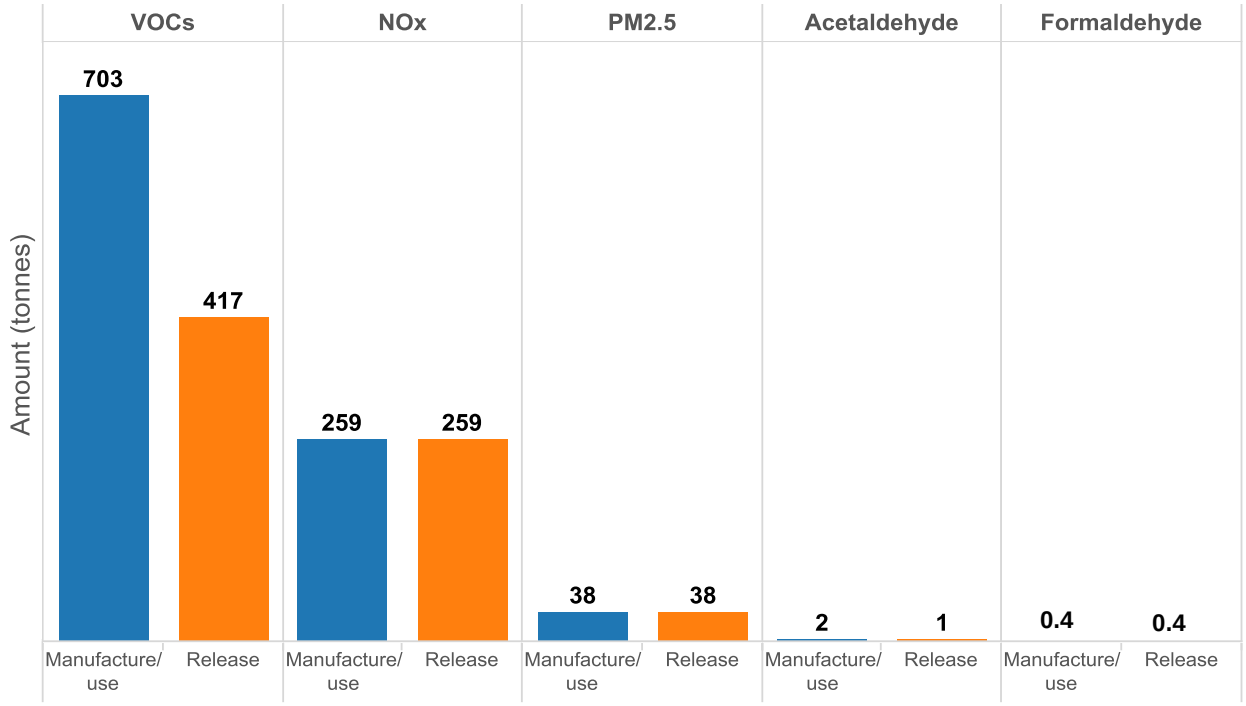
- Number of facilities that met the threshold: 60
- Range in number of employees per facility: 1 to 741
- Total amount released: 715 tonnes
- Total amount manufactured, processed or used: 1,003 tonnes
- Number of priority substances reported: 5



Top substances reported are:

- Volatile organic compounds (VOCs)
- Nitrogen oxides (NOx)
- Particulate matter 2.5 ($PM_{2.5}$)
- Acetaldehyde
- Formaldehyde

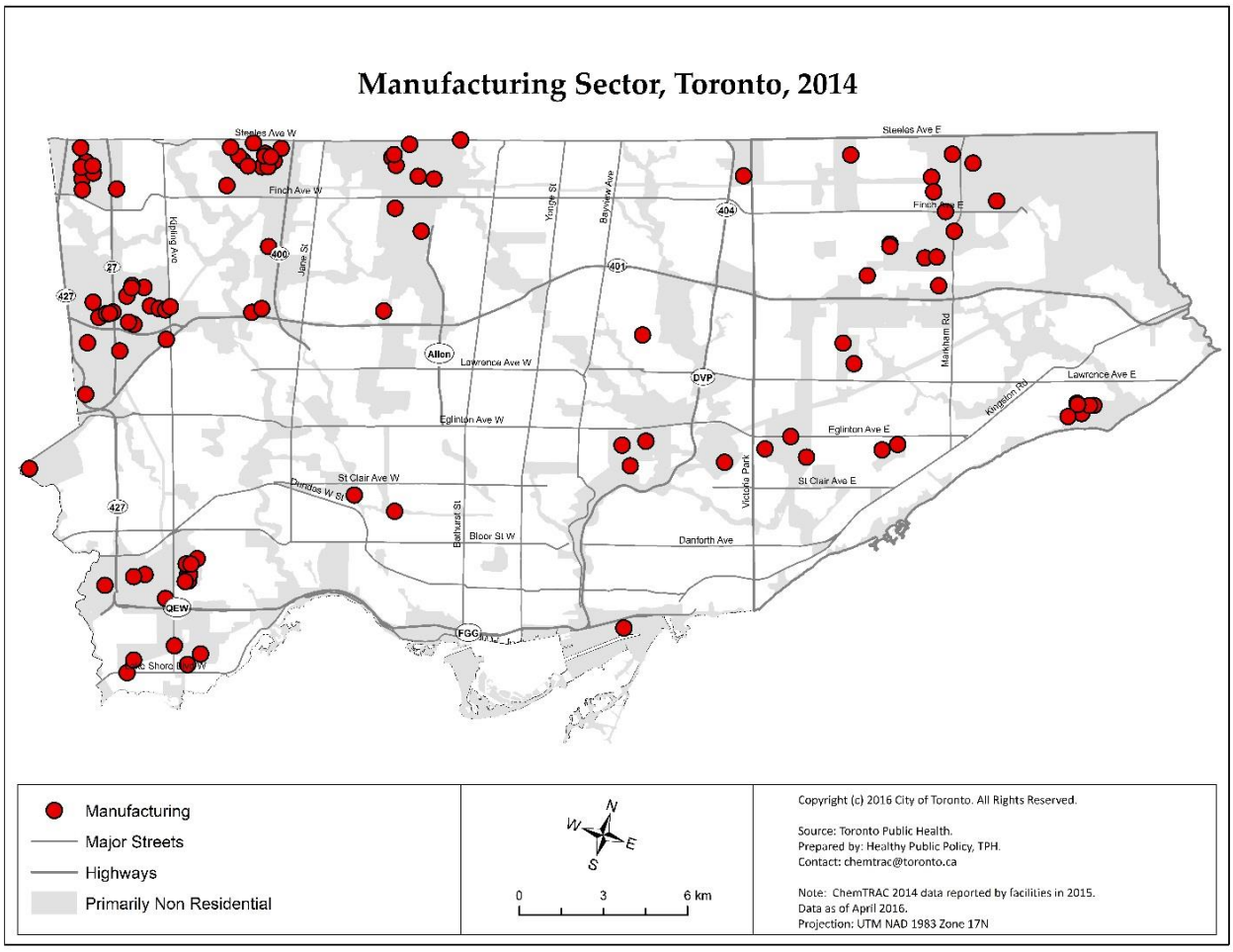
Figure 5: Amount of substances reported by Food and Beverage facilities for 2014



Manufacturing (including chemical and petroleum products)

Types of activities: Manufacturing of basic chemicals, synthetic fibers, plastics, pigments, paints, fertilizers, drugs, cosmetics and soaps.

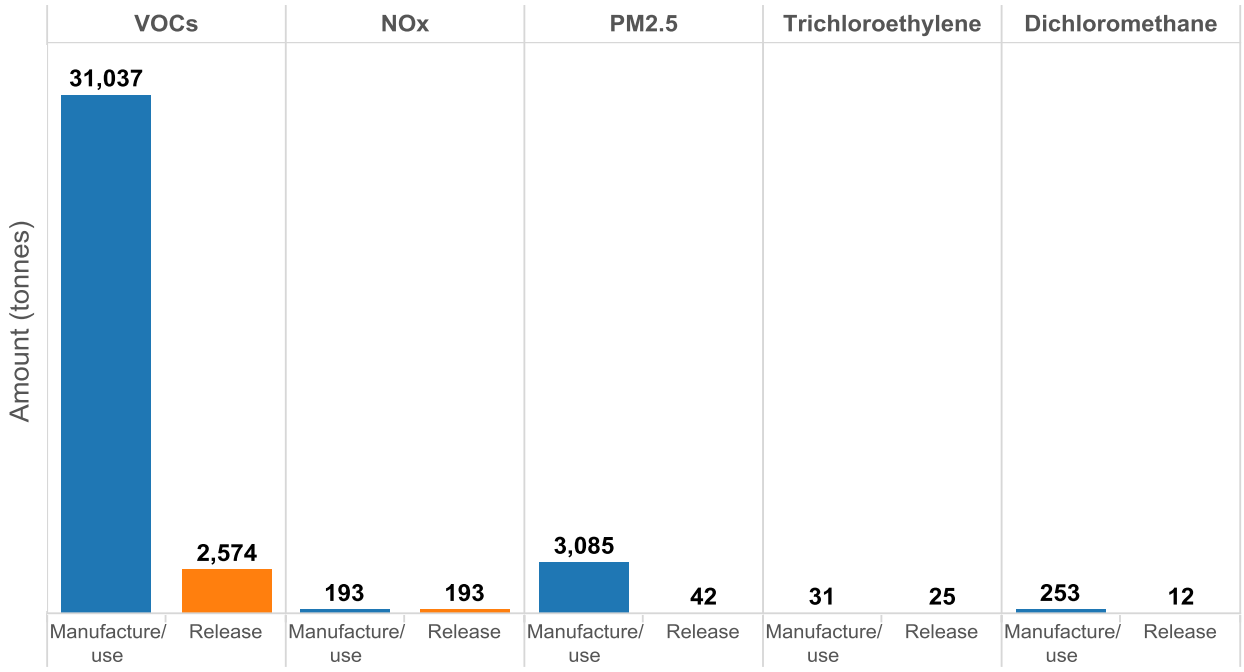
- Number of facilities that met the thresholds: 109
- Range in number of employees per facility: 2 to 1,200
- Total amount released: 2,850 tonnes
- Total amount manufactured, processed or used: 35,128 tonnes
- Number of priority substances reported: 17



Top substances reported are:

- Volatile organic compounds (VOCs)
- Nitrogen oxides (NOx)
- Particulate matter 2.5 ($PM_{2.5}$)
- Trichloroethylene
- Dichloromethane

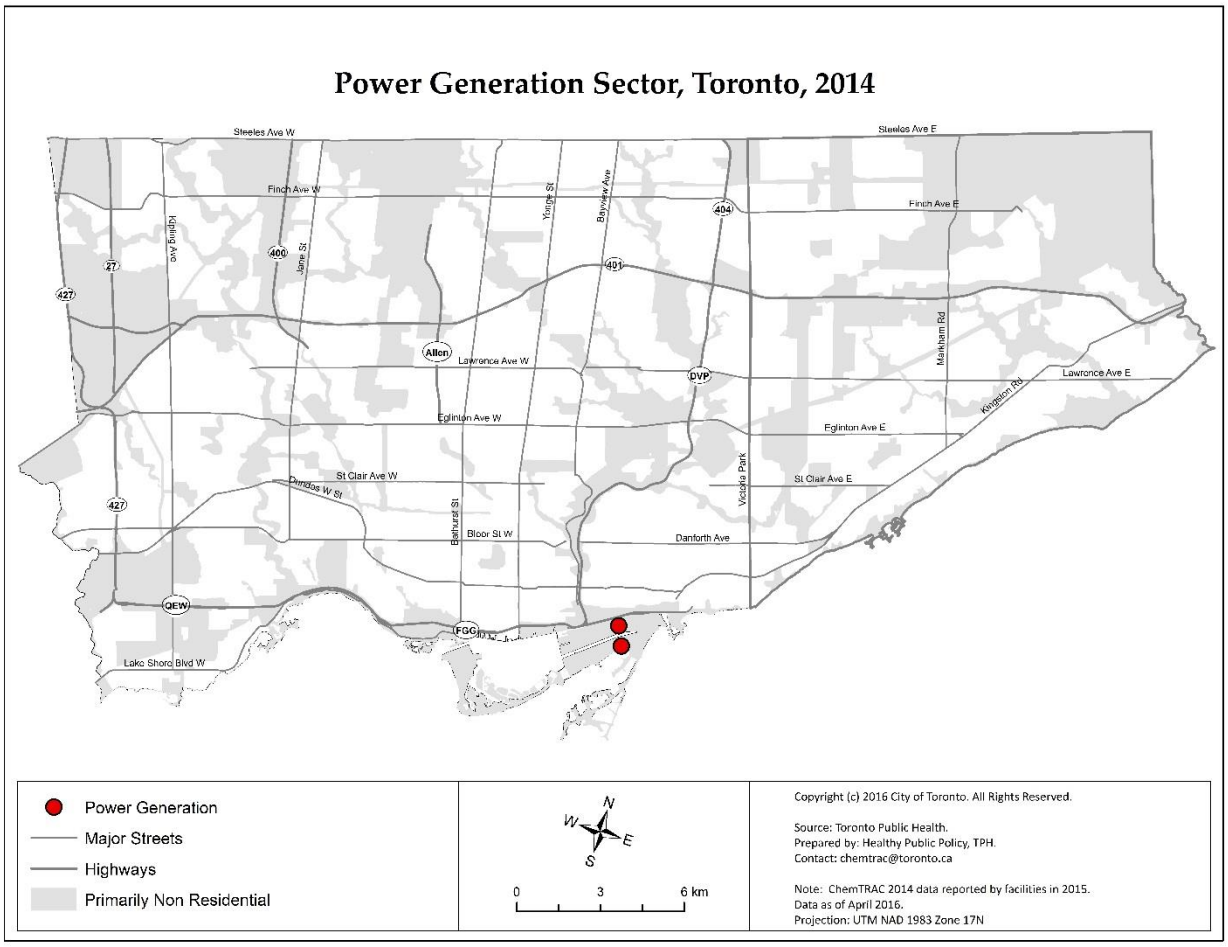
Figure 6: Amount of substances reported by manufacturing facilities for 2014



Power Generation

Types of activities: Generation of bulk electric power

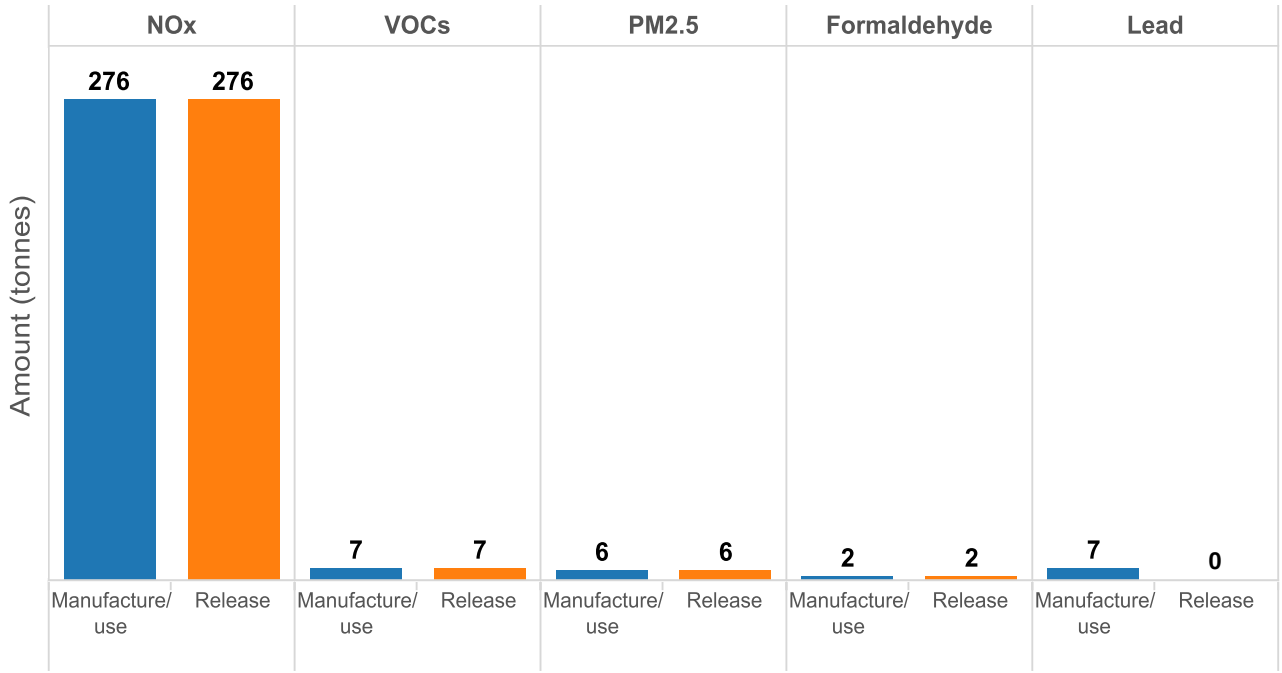
- Number of facilities that met the thresholds: 2
- Range in number of employees per facility: 30 to 850
- Total amount released: 291 tonnes
- Total amount manufactured, processed or used: 298 tonnes
- Number of priority substances reported: 6



Top substances reported are:

- Nitrogen oxides (NOx)
- Volatile organic compounds (VOCs)
- Particulate matter 2.5 ($PM_{2.5}$)
- Formaldehyde
- Lead

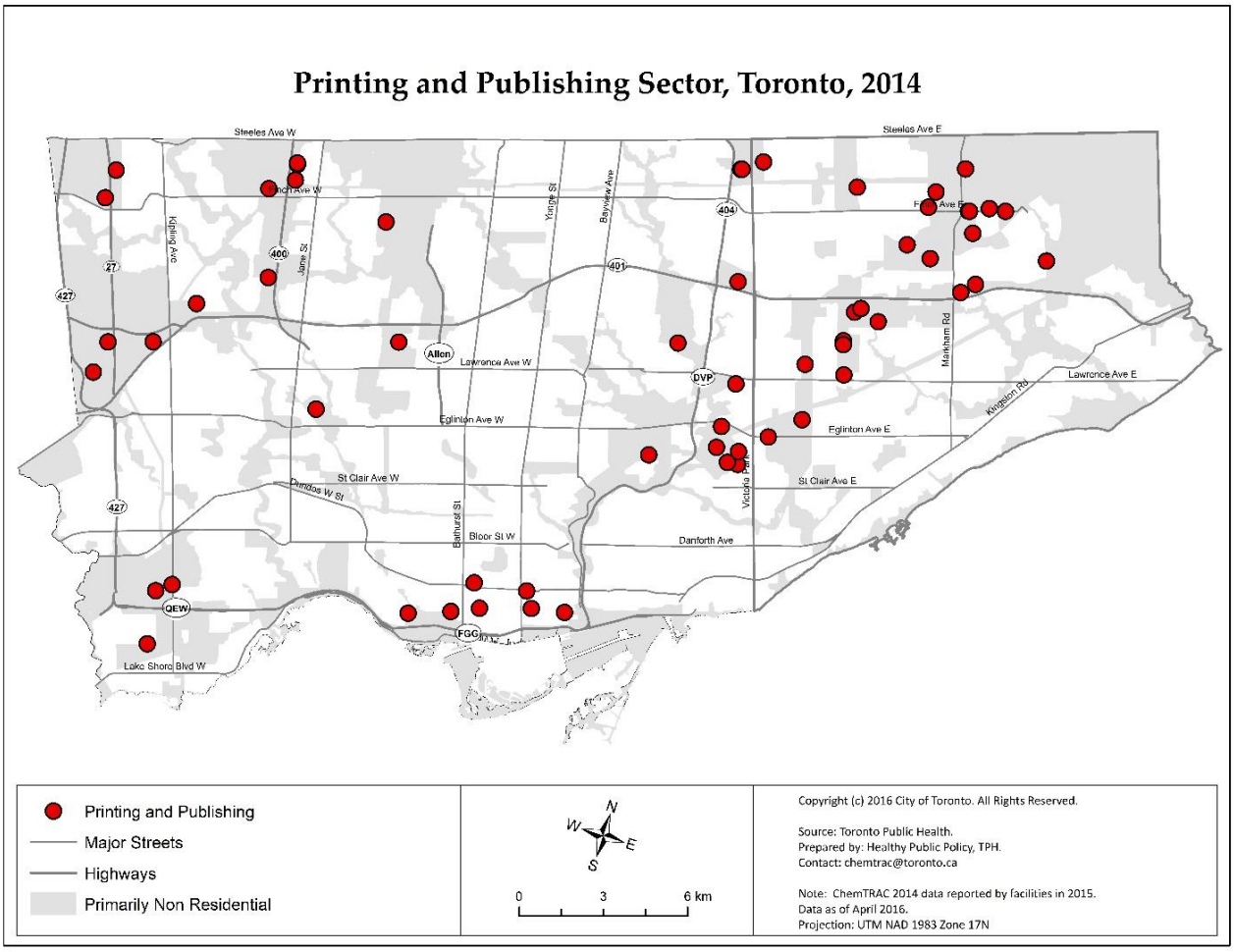
Figure 7: Amount of substances reported by Power Generation facilities for 2014



Printing and Publishing

Types of activities: Printing newspapers, books, labels, business cards, food wrappers, etc.

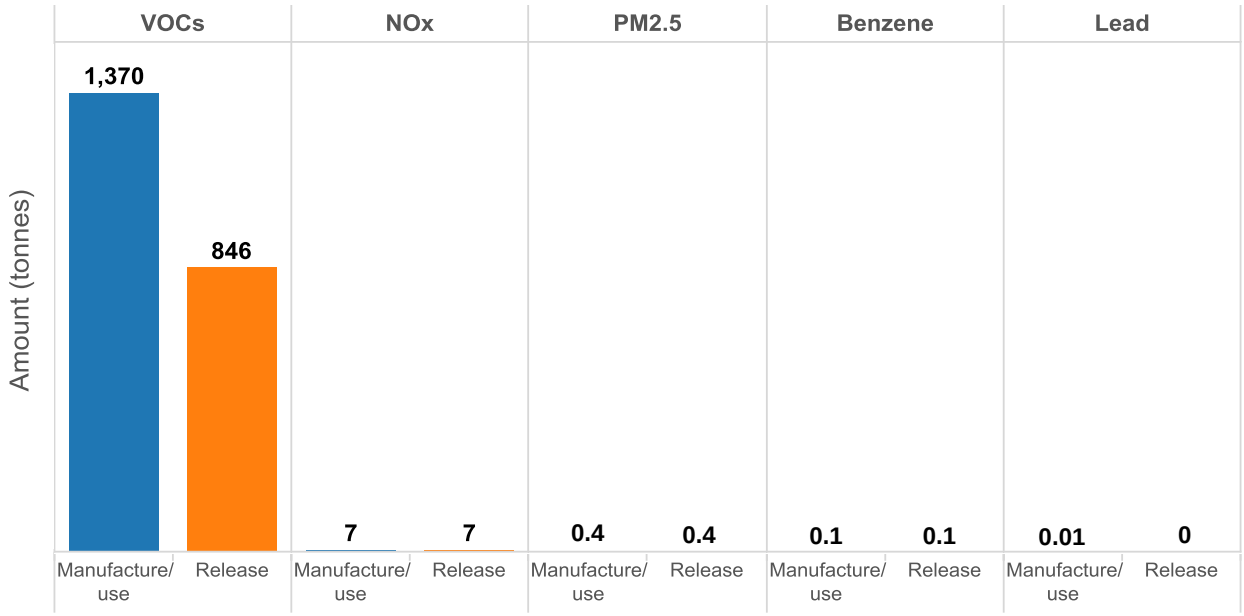
- Number of facilities that met the thresholds: 60
- Range in number of employees per facility: 1 to 200
- Total amount released: 853 tonnes
- Total amount manufactured, processed or used: 1,377 tonnes
- Number of priority substances reported: 5



Top substances reported are:

- Volatile organic compounds (VOCs)
- Nitrogen oxides (NOx)
- Particulate matter 2.5 ($PM_{2.5}$)
- Benzene
- Lead

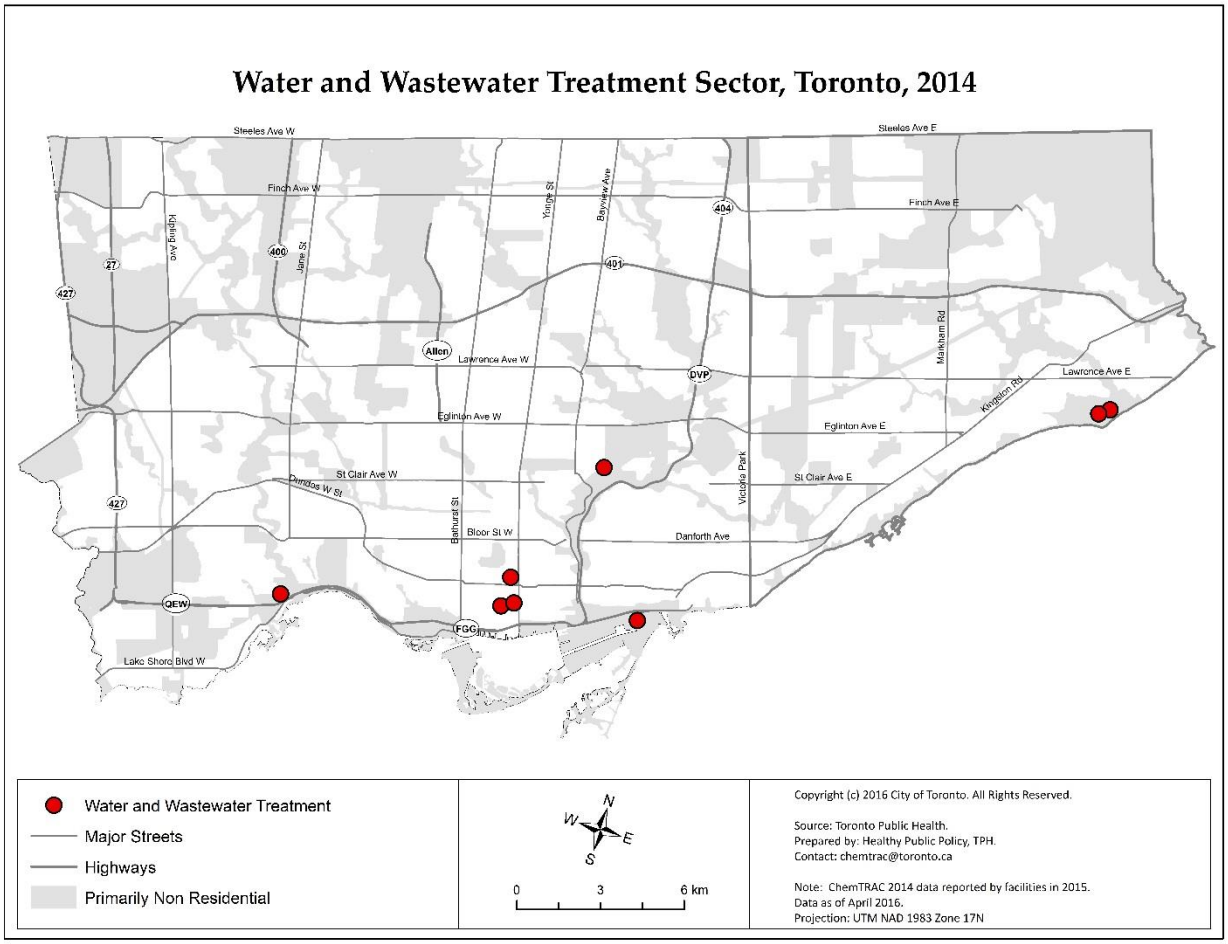
Figure 8: Amounts of substances reported by Printing and Publishing facilities for 2014



Water and Wastewater

Types of activities: Water, wastewater and sewage treatment plants

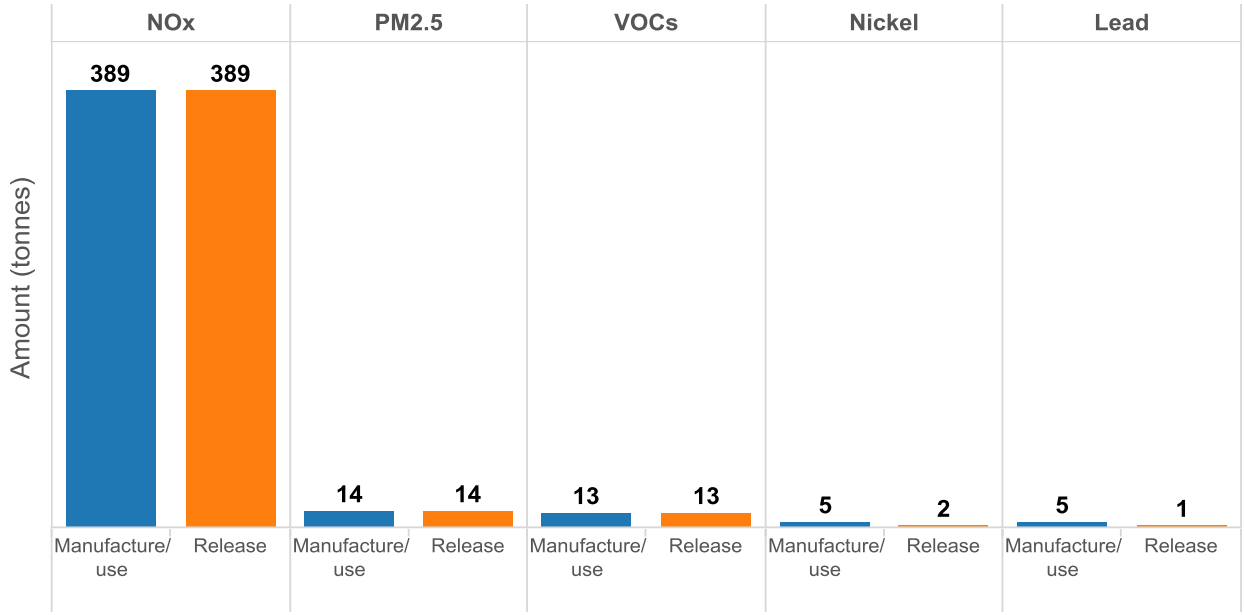
- Number of facilities that met the thresholds: 8
- Range in number of employees per facility: 5 to 174
- Total amount released: 419 tonnes
- Total amount manufactured, processed or used: 426 tonnes
- Number of priority substances reported: 7



Top substances reported are:

- Nitrogen oxides (NOx)
- Particulate matter 2.5 ($PM_{2.5}$)
- Volatile organic compounds (VOCs)
- Nickel
- Lead

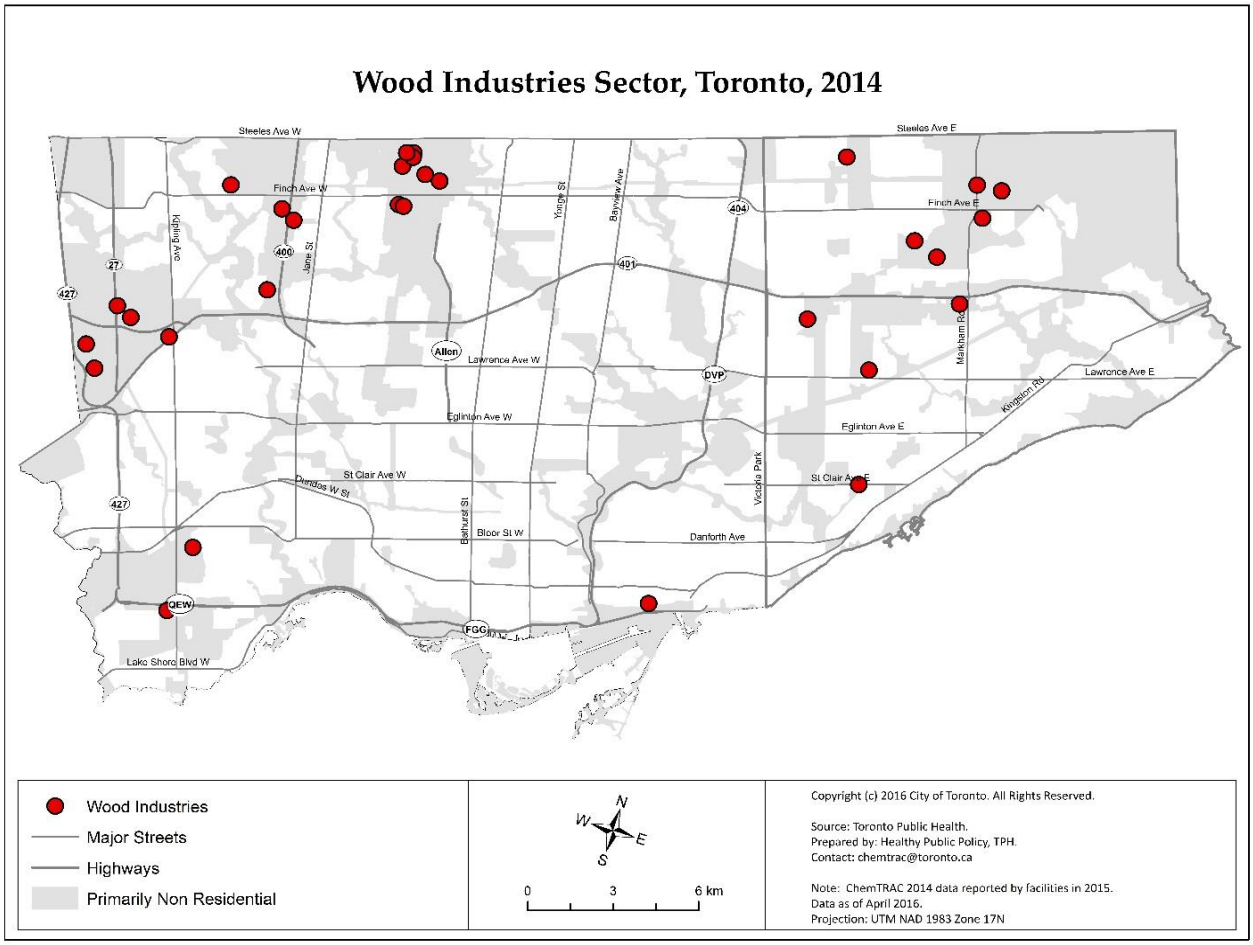
Figure 9: Amounts of substances reported by Water and Wastewater Treatment facilities for 2014



Wood Industries

Types of activities: Creation of wood-based products including paper, cardboard, pallets, furniture and cabinetry.

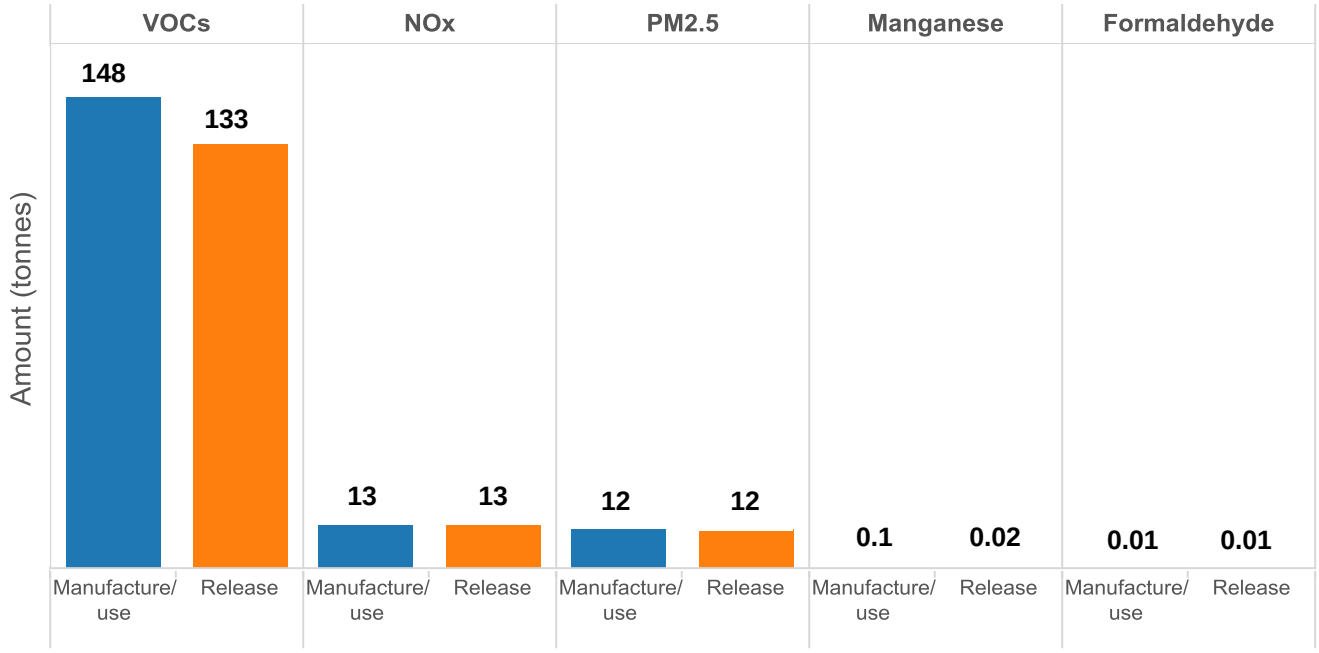
- Number of facilities that met the thresholds: 30
- Range in number of employees per facility: 1 to 681
- Total amount released: 158 tonnes
- Total amount manufactured, processed or used: 173 tonnes
- Number of priority substances reported: 6



Top substances reported are:

- Volatile organic compounds (VOCs)
- Nitrogen oxides (NOx)
- Particulate matter 2.5 ($PM_{2.5}$)
- Manganese
- Formaldehyde

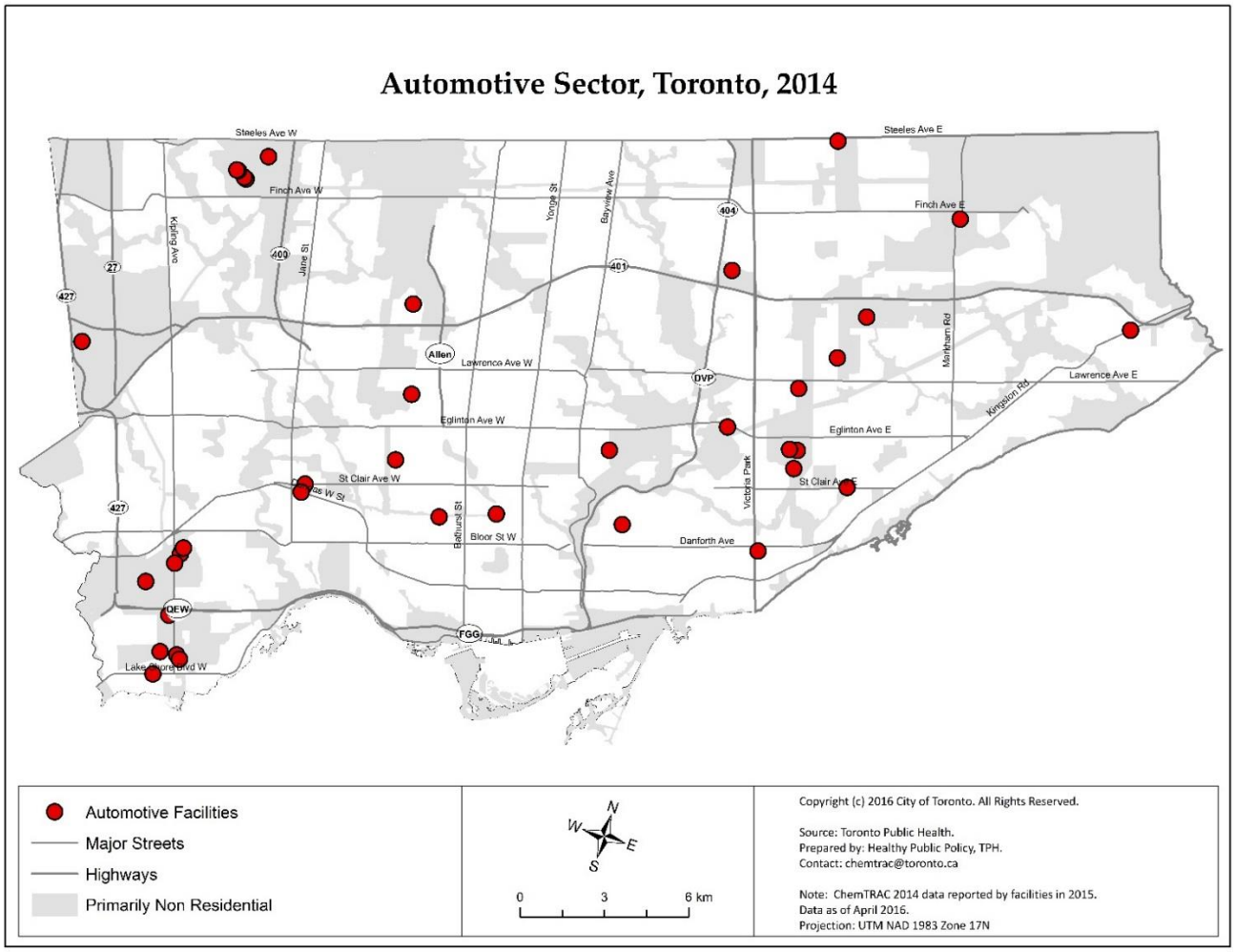
Figure 10: Amounts of substances reported by Wood Industries for 2014



Auto Body, Collision Repair and Auto Refinishing Sector

Types of activities: Painting, repairing and customizing cars, trucks, vans and commercial trailers.

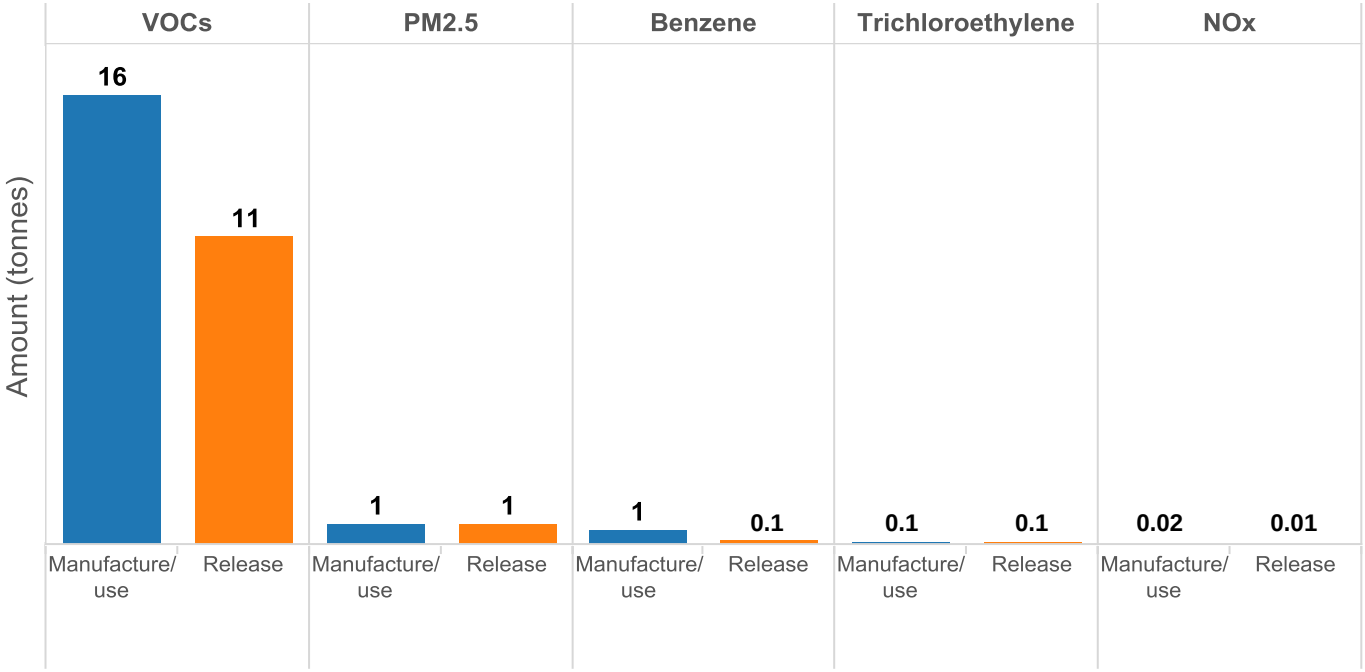
- Number of facilities that met the thresholds: 37
- Range in number of employees per facility: 1 to 65
- Total amount released: 12 tonnes
- Total amount manufactured, processed or used: 17 tonnes
- Number of priority substances reported: 5



Top substances reported are:

- Volatile organic compounds (VOCs)
- Particulate matter 2.5 ($PM_{2.5}$)
- Benzene
- Trichloroethylene
- Nitrogen oxides (NOx)

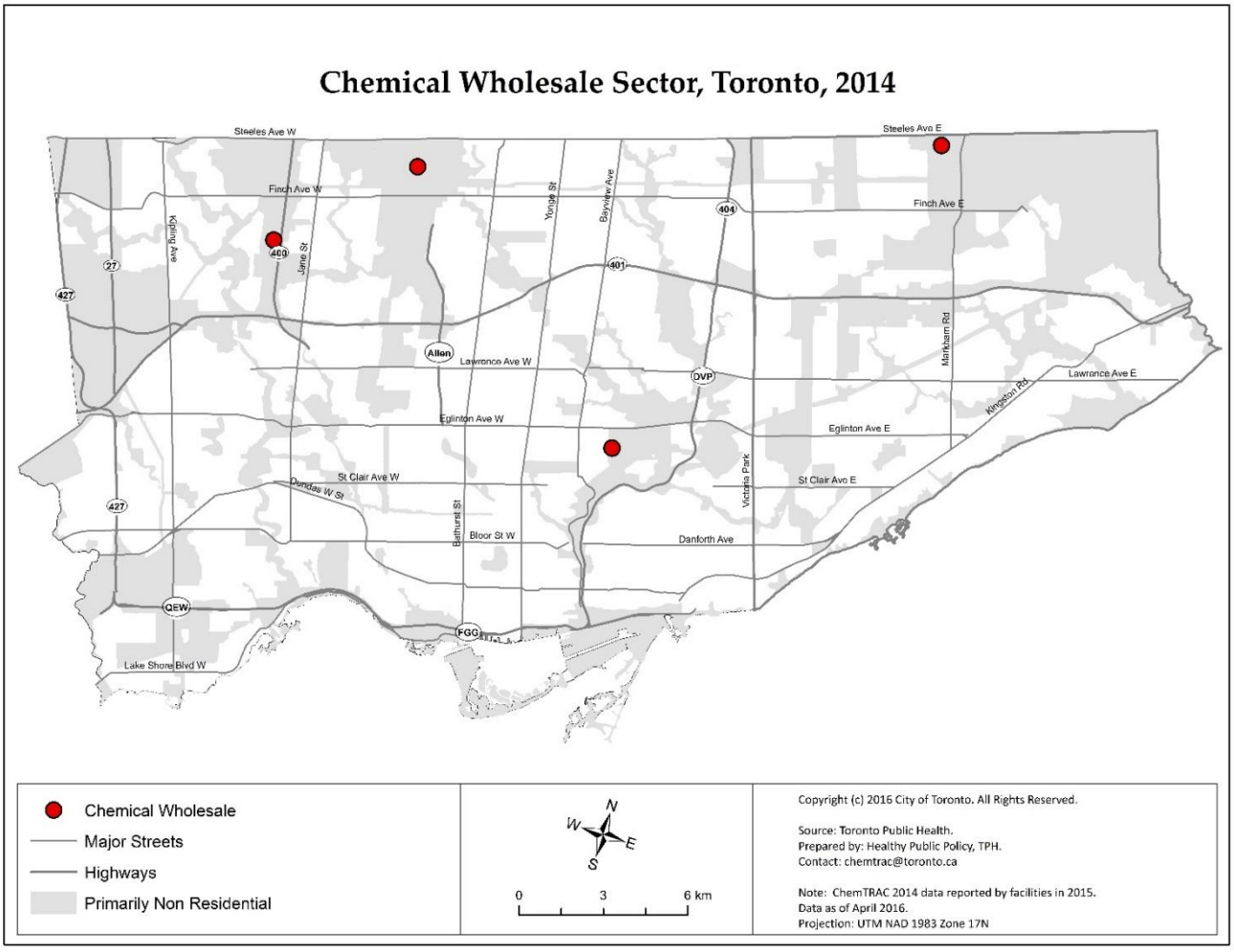
Figure 11: Amounts of substances reported by Autobody Refinishing facilities for 2014



Chemical Wholesale

Types of activities: Wholesale of industrial and household chemicals, cleaning compounds and preparations, plastics resins, plastic basic forms and shapes, and industrial gases.

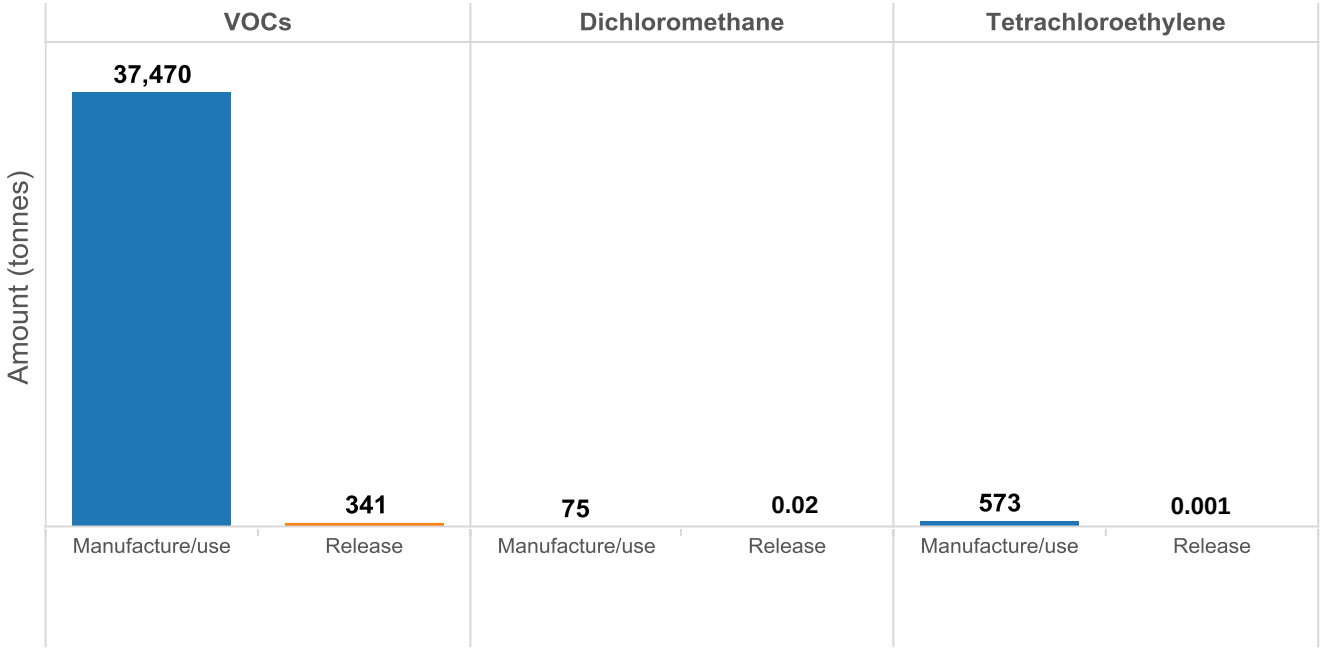
- Number of facilities that met the thresholds: 4
- Range in number of employees per facility: 18 to 125
- Total amount released: 341 tonnes
- Total amount manufactured, processed or used: 38,118 tonnes
- Number of priority substances reported: 3



Top substances reported are:

- Volatile organic compounds (VOCs)
- Dichloromethane and
- Tetrachloroethylene (Perchloroethylene)

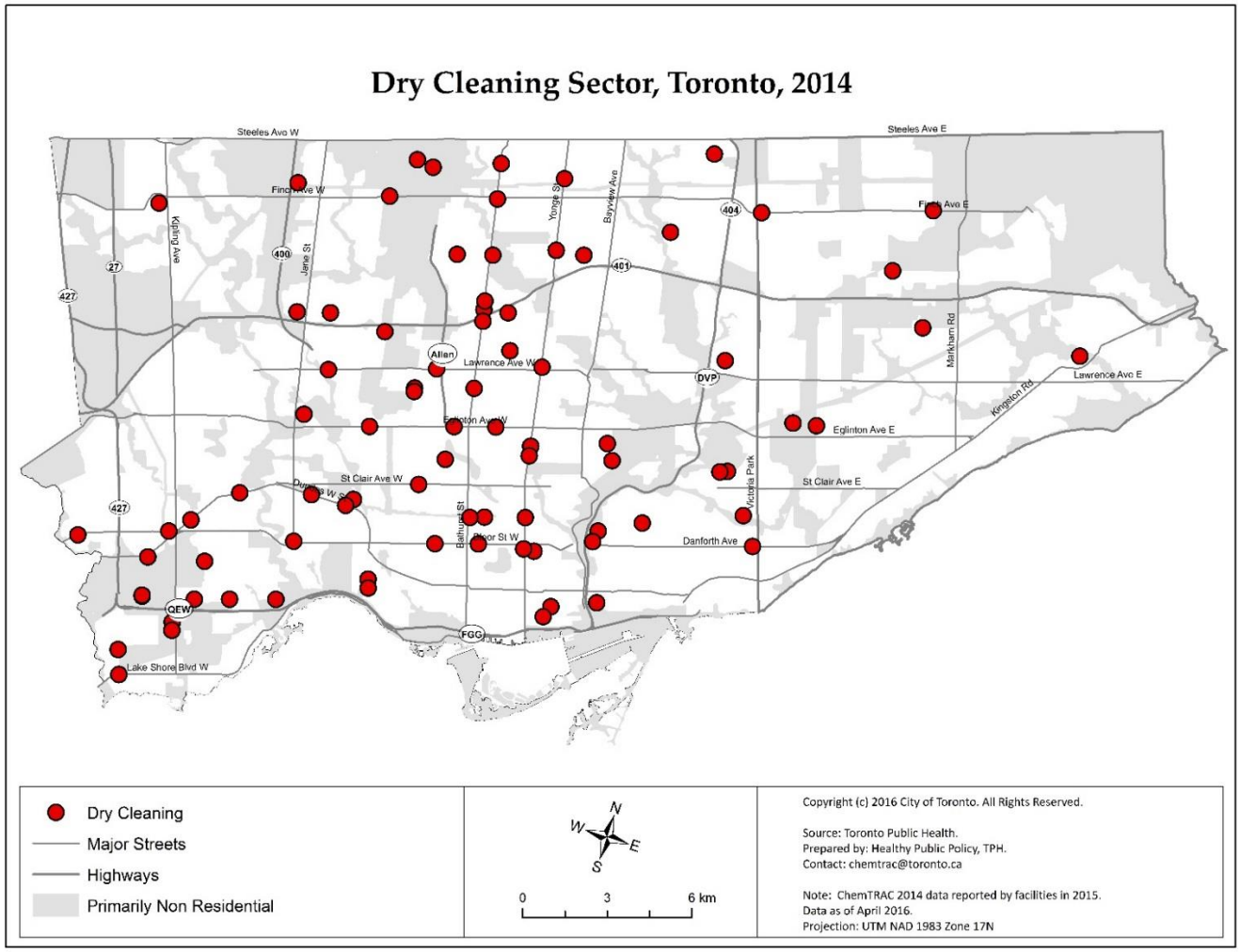
Figure 12: Amount of substances reported for Chemical Wholesale in 2014



Dry Cleaning and Industrial Laundry

Types of activities: Self-service laundry, laundering services, laundering and supplying laundered uniforms, linens and other fabric items and dry cleaning.

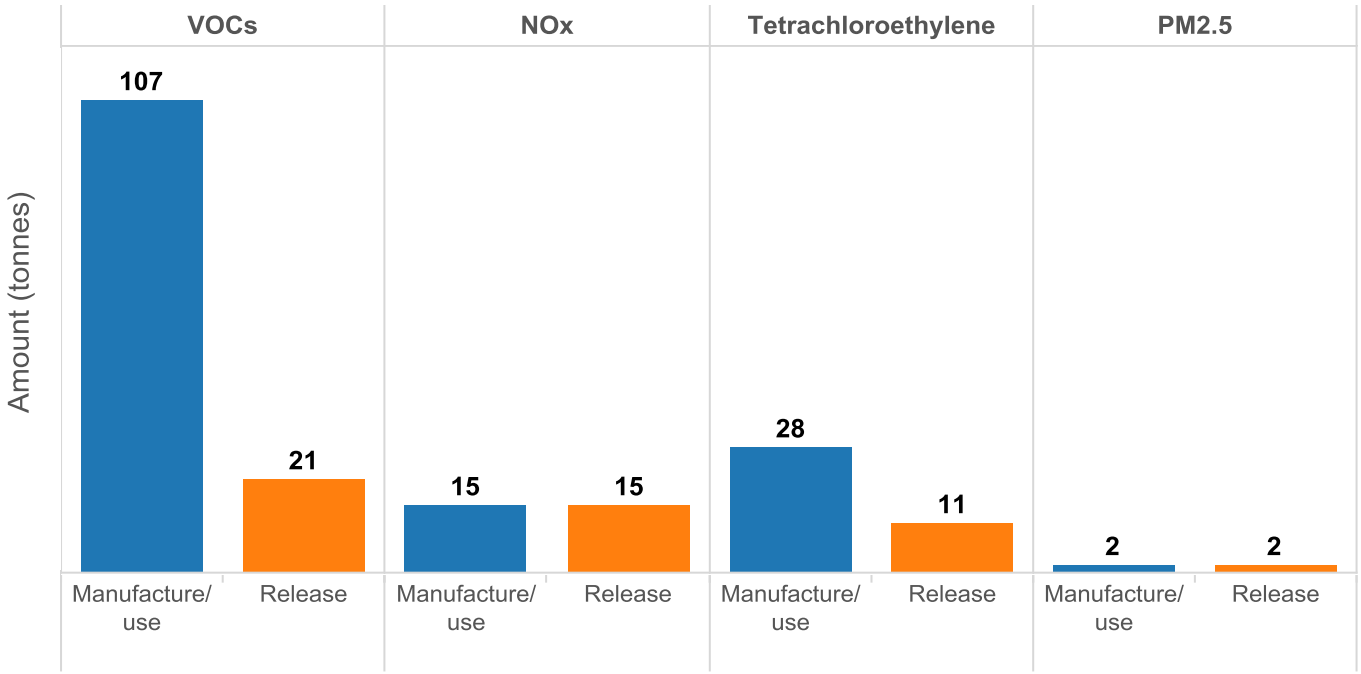
- Number of facilities that met the thresholds: 84
- Range in number of employees per facility: 1 to 240
- Total amount released: 50 tonnes
- Total amount manufactured, processed or used: 152 tonnes
- Number of priority substances reported: 4



Top substances reported are:

- Volatile organic compounds (VOCs)
- Nitrogen oxides (NOx)
- Tetrachloroethylene (Perchloroethylene)
- Particulate matter 2.5 ($PM_{2.5}$)

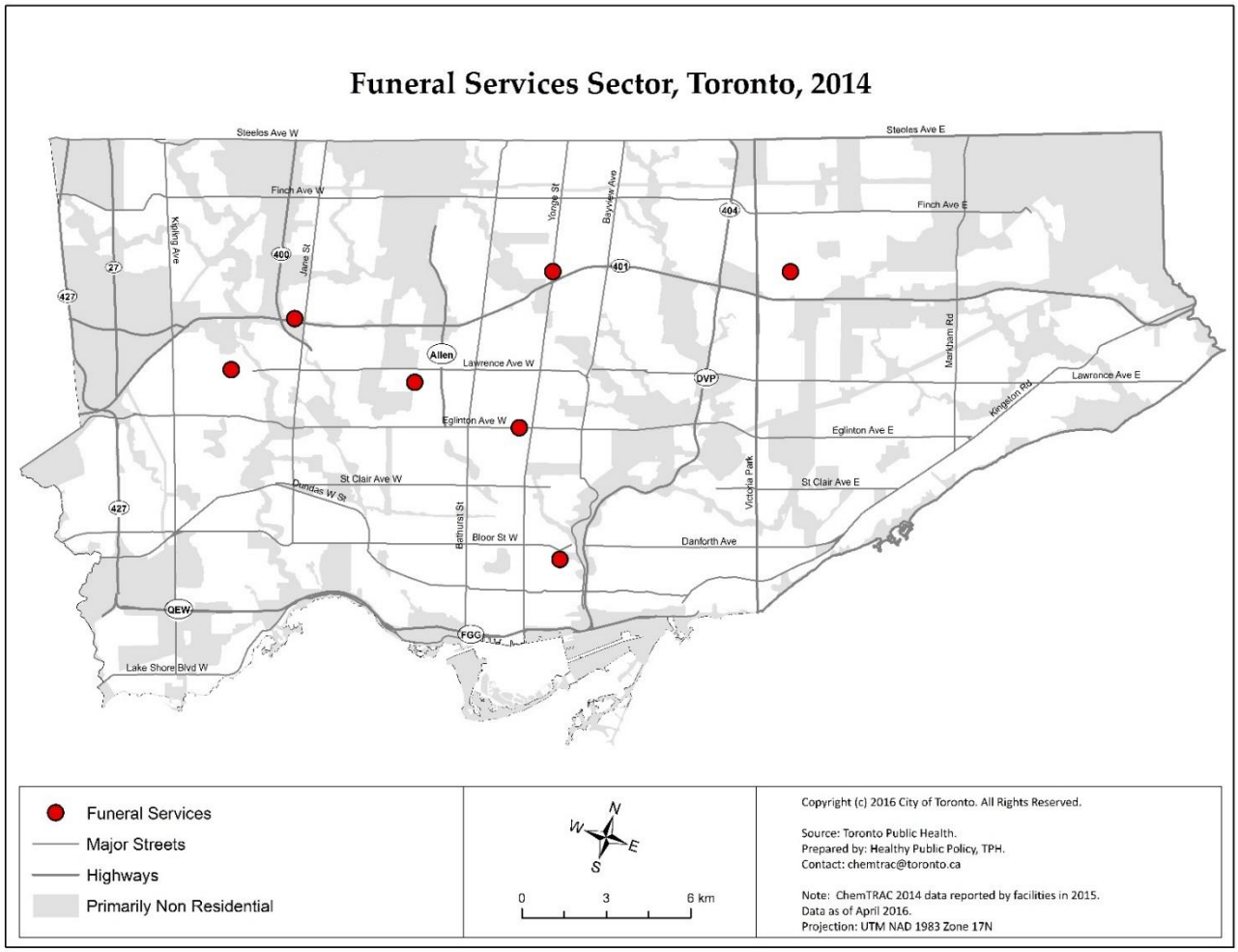
Figure 13: Amounts of substances reported by Dry Cleaning and Industrial Laundry facilities for 2014



Funeral Services

Types of activities: Funeral homes, cemeteries and crematoria

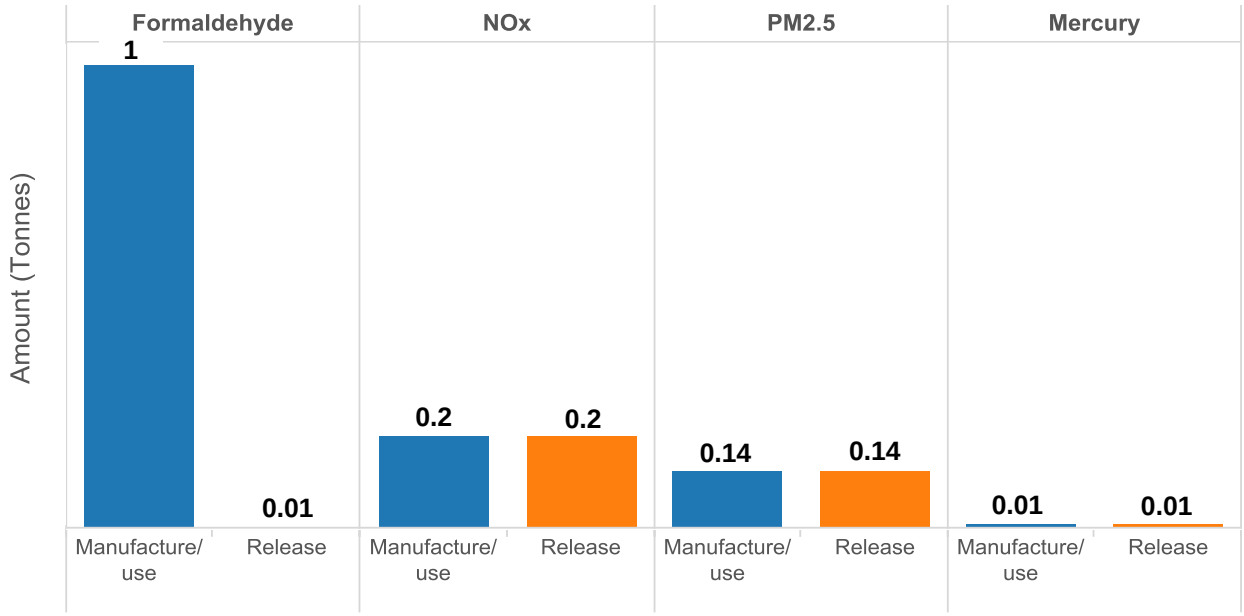
- Number of facilities that met the thresholds: 7
- Range in number of employees per facility: 1 to 25
- Total amount released: 0.4 tonnes
- Total amount manufactured, processed or used: 2 tonne
- Number of priority substances reported: 4



Top substances reported are:

- Formaldehyde
- Nitrogen oxides (NOx)
- Particulate matter 2.5 ($PM_{2.5}$)
- Mercury and its compounds

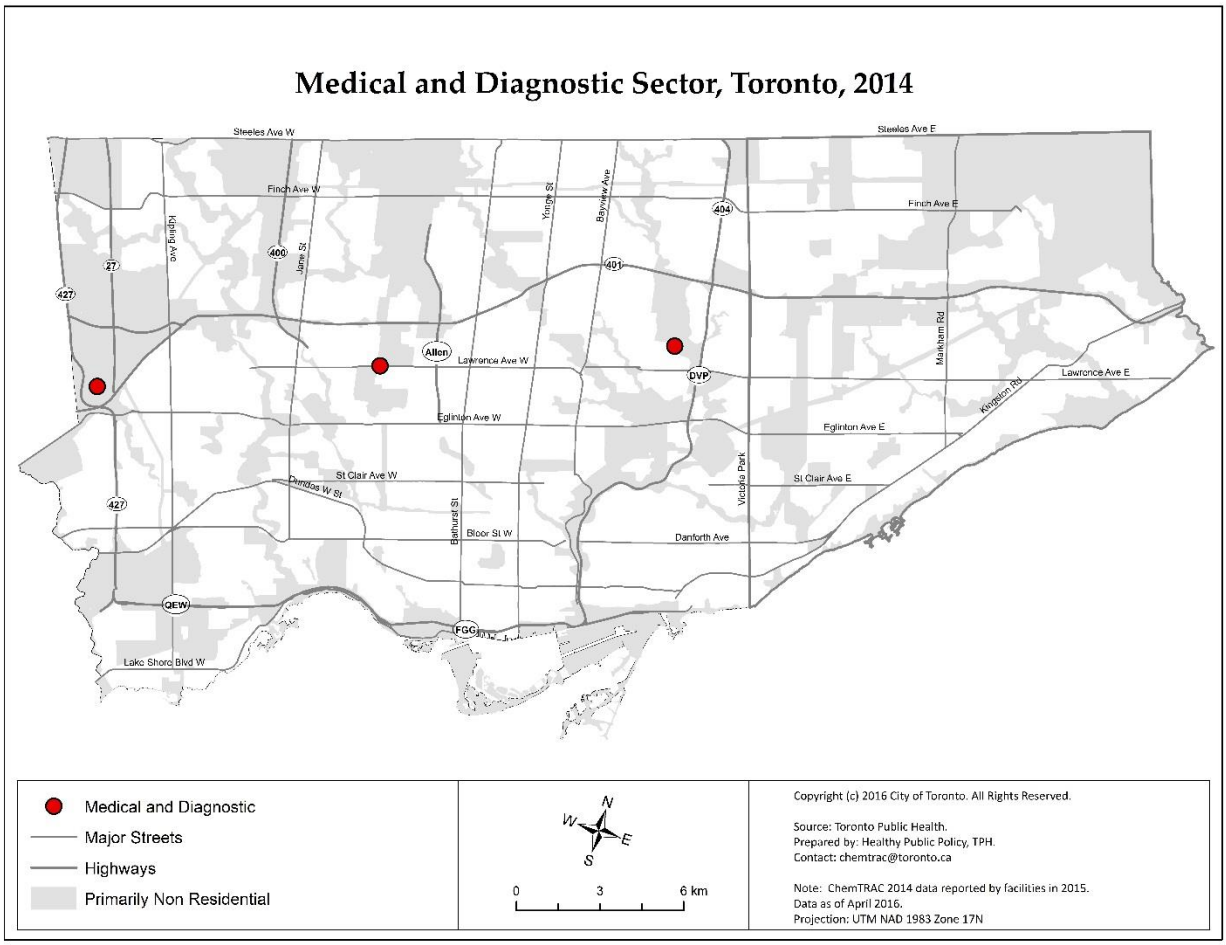
Figure 14: Amount of substances reported for Funeral Services in 2014



Medical and Diagnostic

Types of activities: Analytic or diagnostic services to the medical profession or patient on referral from a health practitioner.

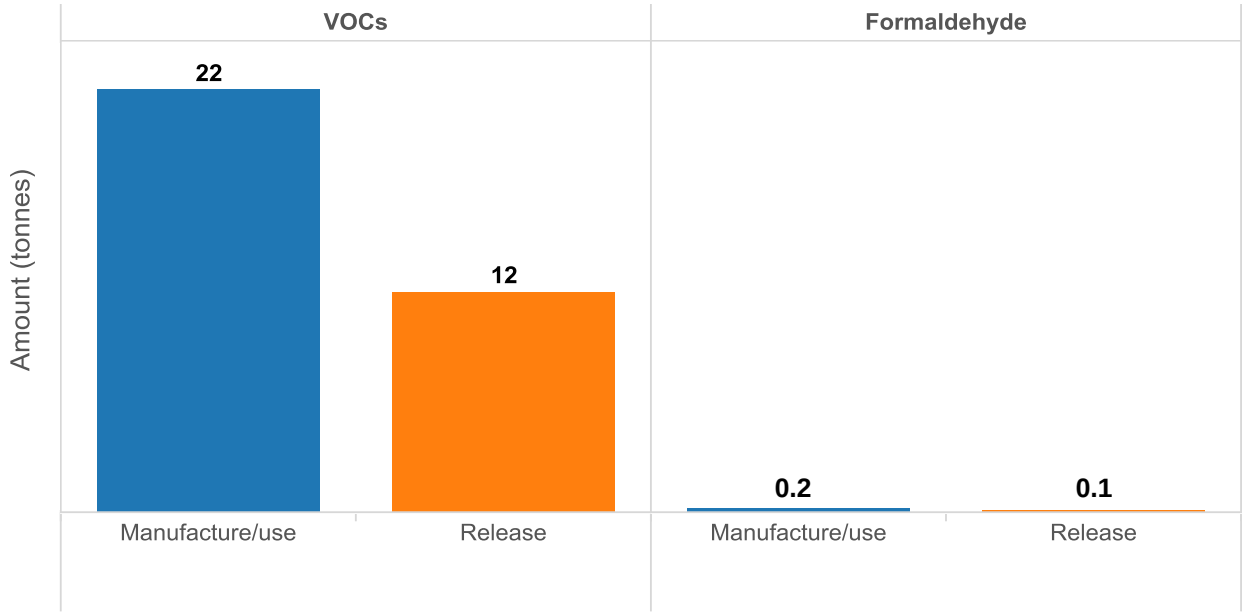
- Number of facilities that met the thresholds: 3
- Range in number of employees per facility: 55 to 600
- Total amount released: 12 tonnes
- Total amount manufactured, processed or used: 22 tonnes
- Number of priority substances reported: 2



Top substances reported are:

- Volatile organic compounds (VOCs)
- Formaldehyde

Figure 15: Amounts of substances reported by Medical and Diagnostic services for 2014



Waste Management and Remediation

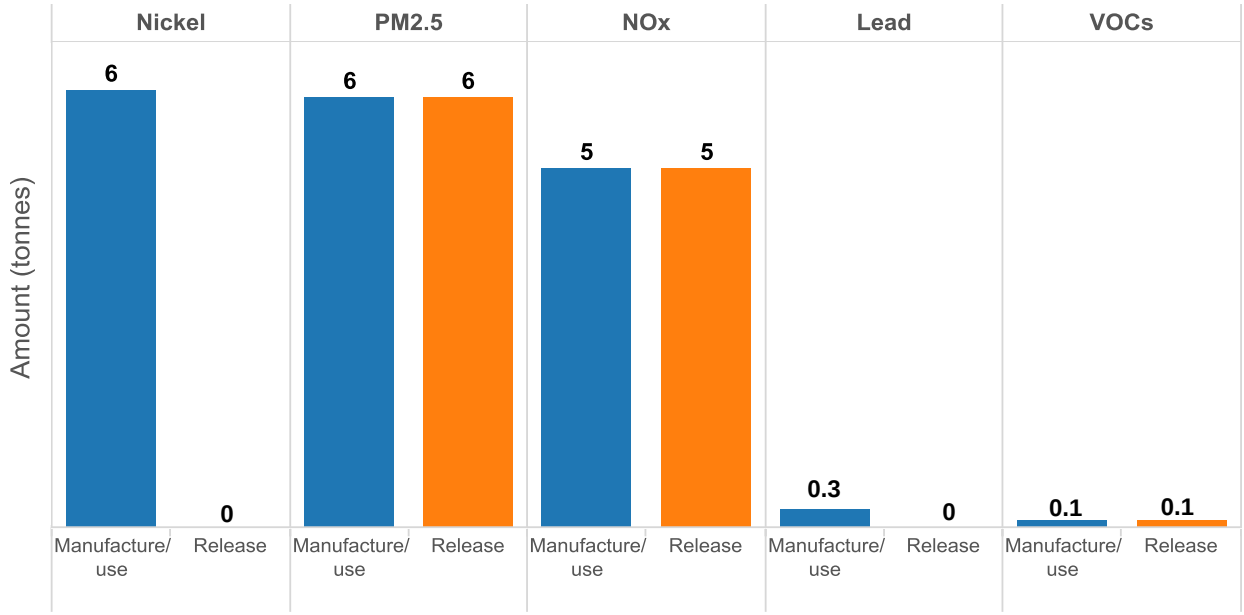
Types of activities: Waste collection, treatment and disposal services, environmental remediation services, septic tank pumping services and recovery facilities.

- Number of facilities that met the thresholds: 4
- Range in number of employees per facility: 1 to 193
- Total amount released: 11 tonnes
- Total amount manufactured, processed or used: 18 tonnes
- Number of priority substances reported: 8

Top substances reported are:

- Nickel
- Particulate matter 2.5 ($PM_{2.5}$)
- Nitrogen oxides (NOx)
- Lead
- Volatile organic compounds (VOCs)

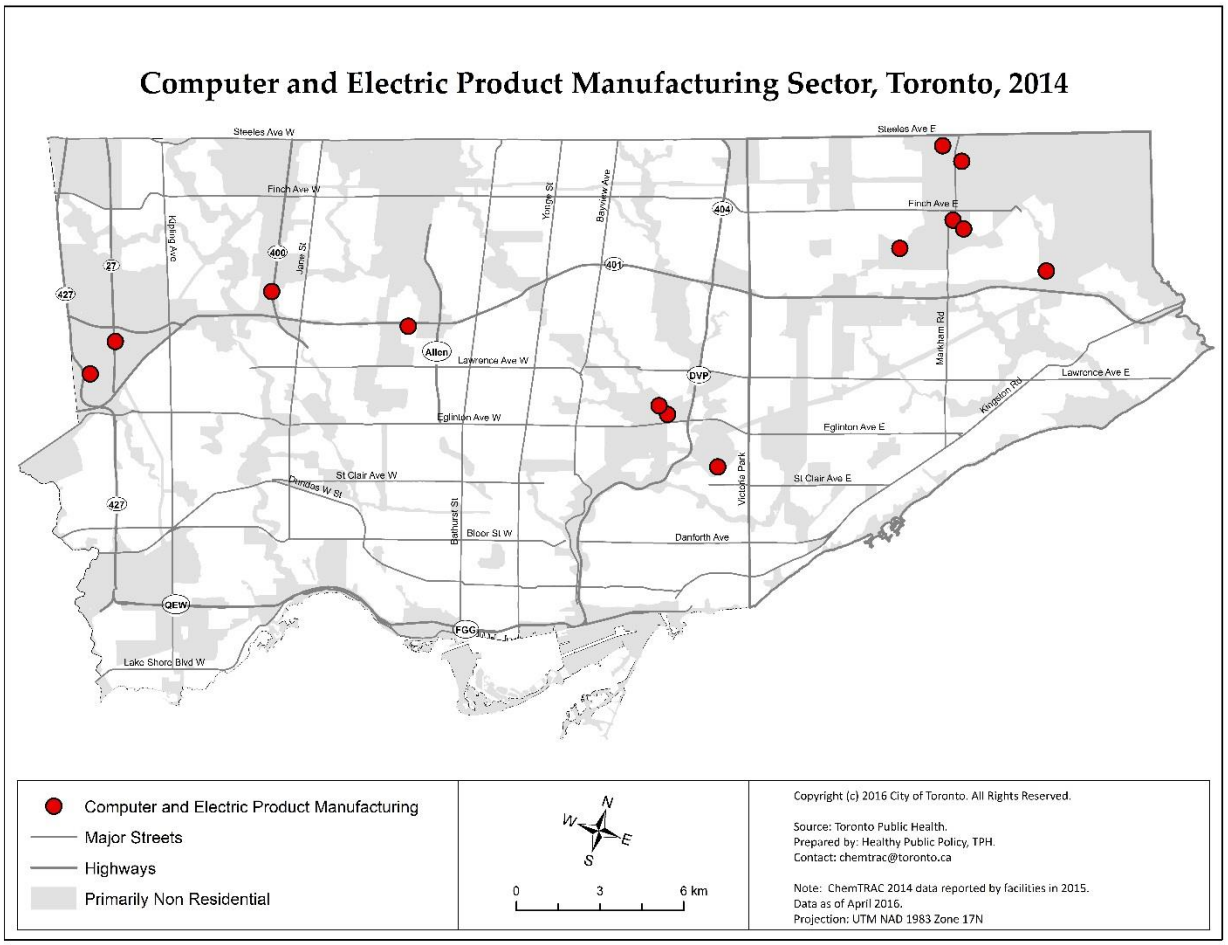
Figure 16: Amounts of substances reported by Waste Management facilities for 2014



Computer and Electric Product Manufacturing

Types of activities: Manufacture of computers, computer peripherals, and communications equipment.

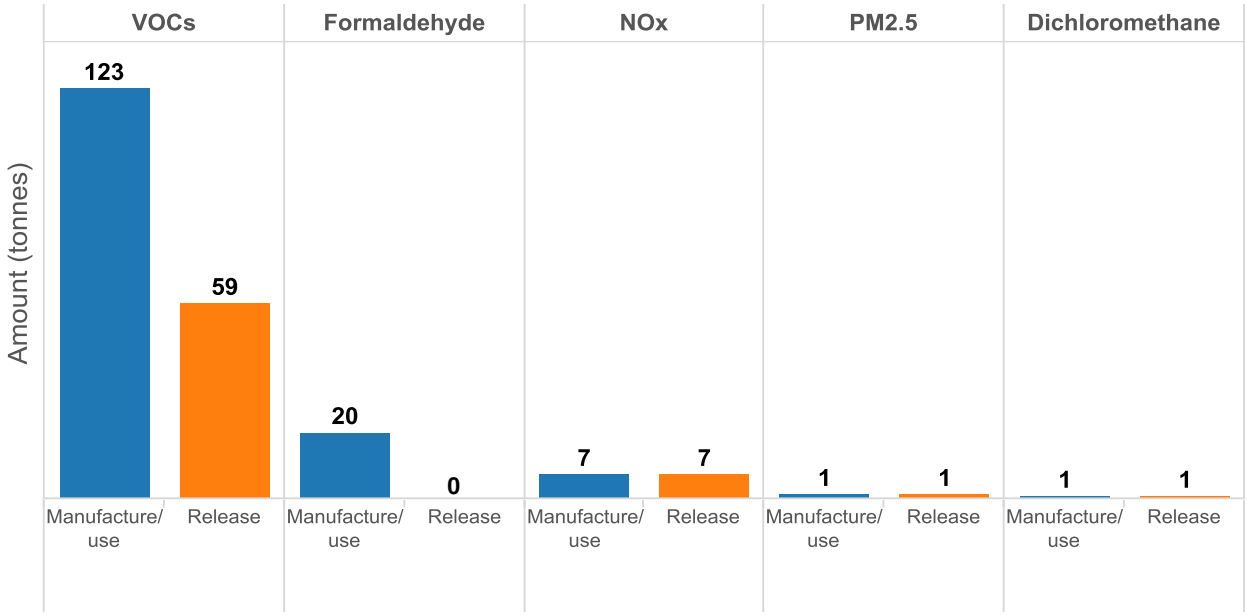
- Number of facilities that met the thresholds: 13
- Range in number of employees per facility: 12 to 800
- Total amount released: 68 tonnes
- Total amount manufactured, processed or used: 166 tonnes
- Number of priority substances reported: 9



Top substances reported are:

- Volatile organic compounds (VOCs)
- Formaldehyde
- Nitrogen oxides (NOx)
- Particulate matter 2.5 ($PM_{2.5}$)
- Dichloromethane

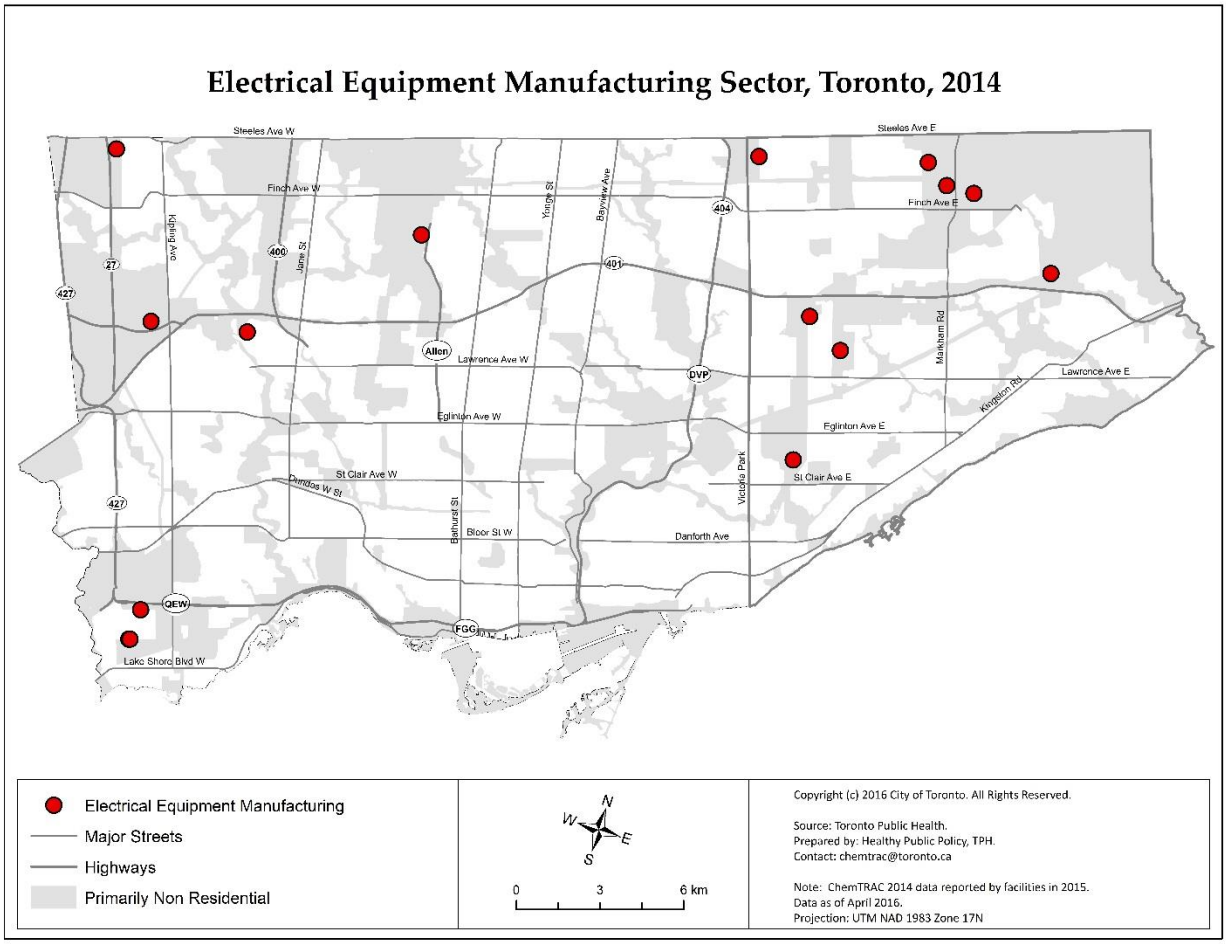
Figure 17: Amounts of substances reported by Computer and Electric Product Manufacturing facilities for 2014



Electrical Equipment, Appliance and Component Manufacturing

Types of activities: Manufacture of product that generate, use and distribute electrical power. Common activities include Metal cutting, metal processing, painting and welding.

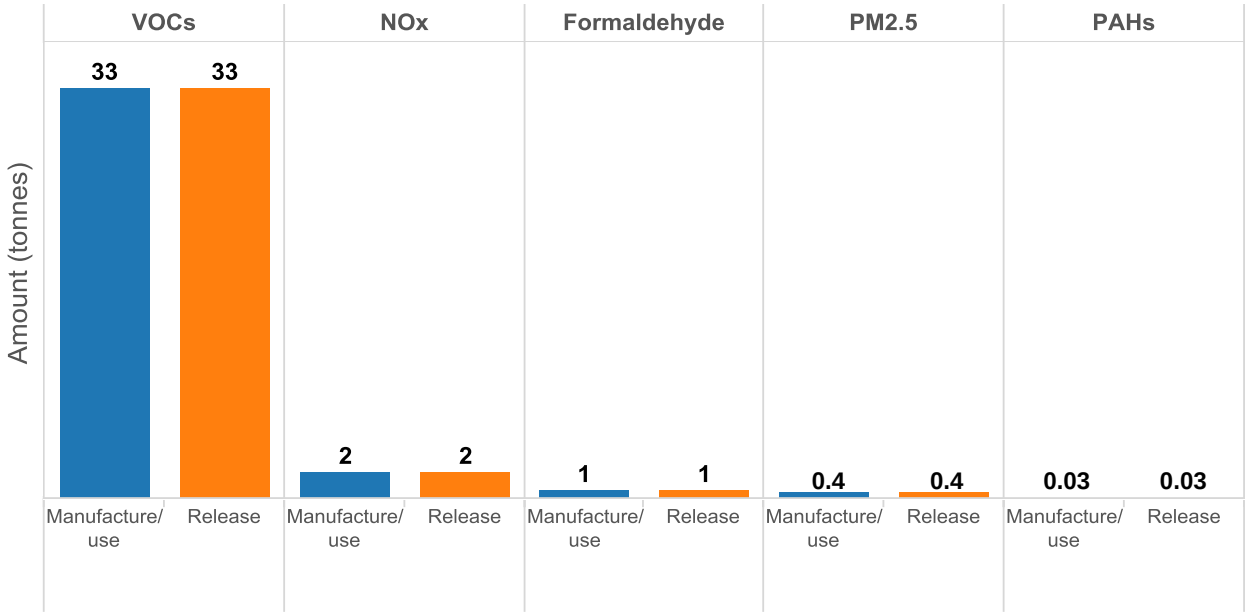
- Number of facilities that met the thresholds: 15
- Range in number of employees per facility: 15 to 320
- Total amount released: 36 tonnes
- Total amount manufactured, processed or used: 155 tonnes
- Number of priority substances reported: 9



Top substances reported are:

- Volatile organic compounds (VOCs)
- Nitrogen oxides (NOx)
- Formaldehyde
- Particulate matter 2.5 ($PM_{2.5}$)
- Polycyclic aromatic hydrocarbons (PAH_s)

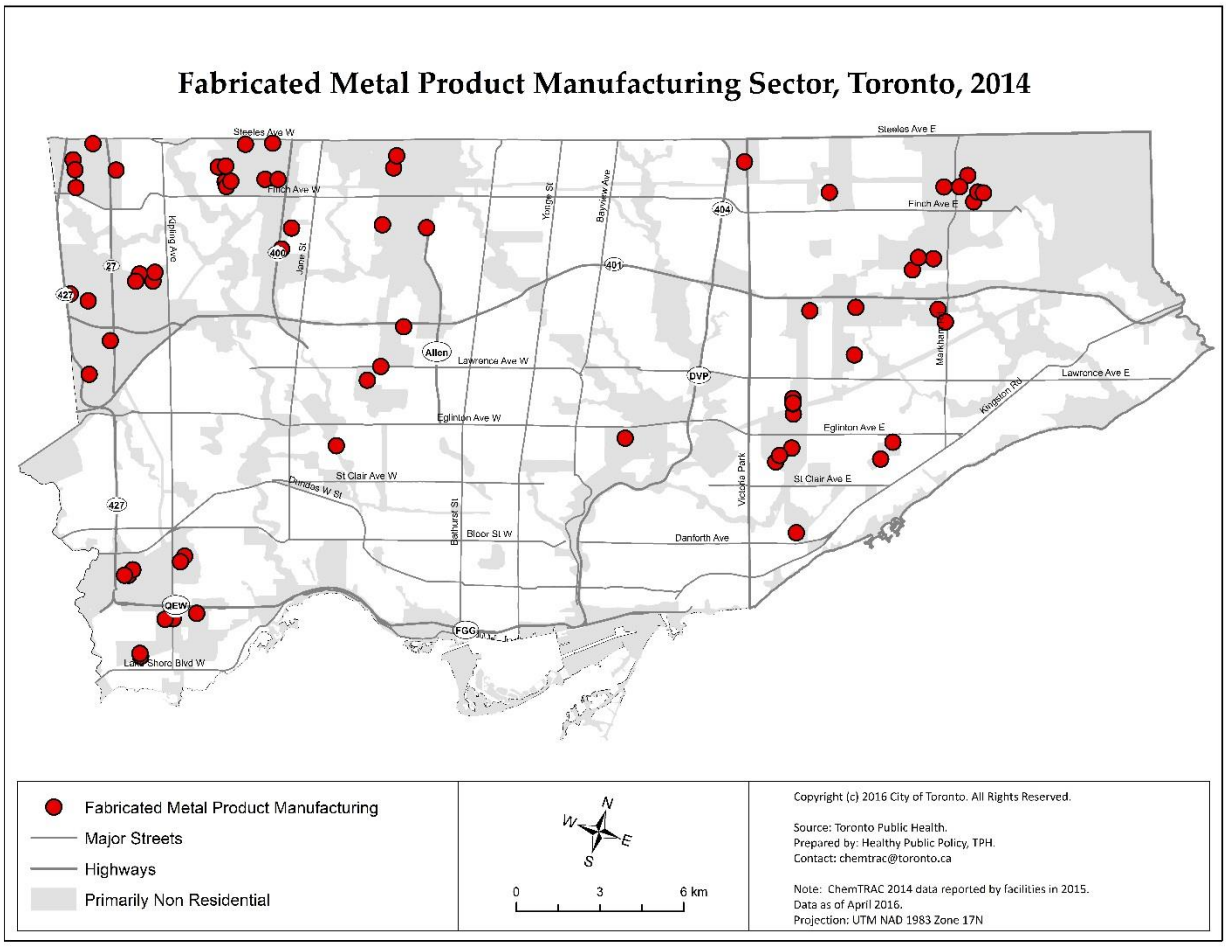
Figure 18: Amounts of substances reported by Electrical Equipment, Appliance and Component Manufacturing facilities for 2014



Fabricated Metal Product Manufacturing

Types of activities: Transformation of metal to end-use products by forging, stamping, bending, forming, machining, welding and assembling

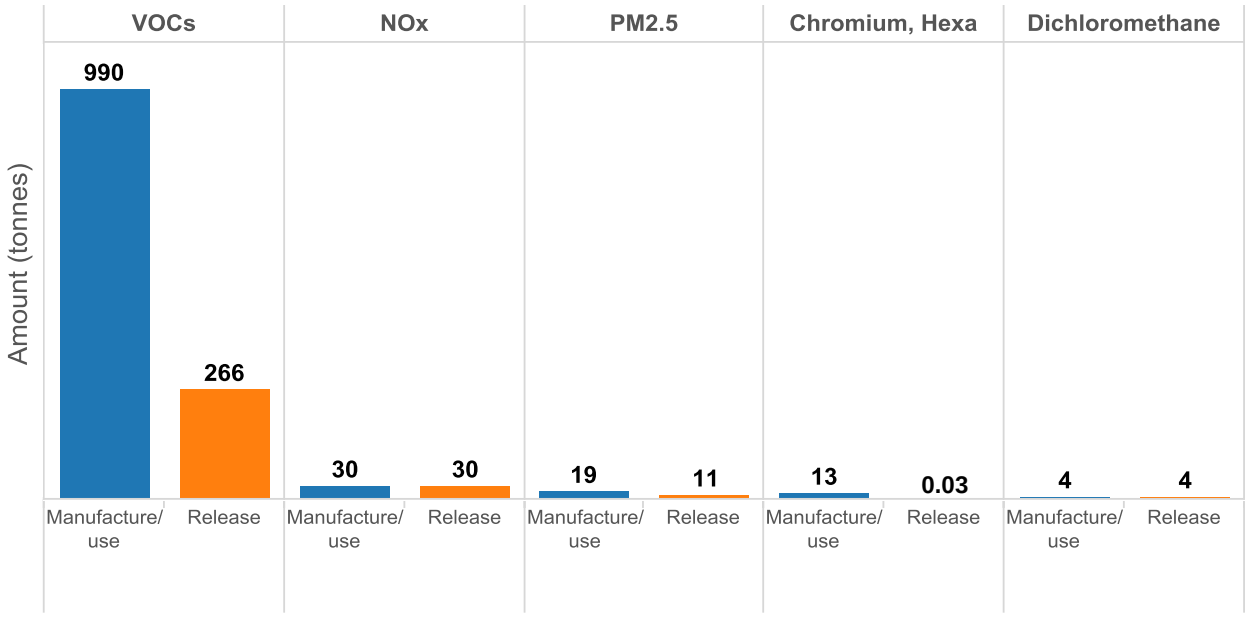
- Number of facilities that met the thresholds: 70
- Range in number of employees per facility: 1 to 293
- Total amount released: 313 tonnes
- Total amount manufactured, processed or used: 2,303 tonnes
- Number of priority substances reported: 11



Top substances reported are:

- Volatile organic compounds (VOCs)
- Nitrogen oxides (NOx)
- Particulate matter 2.5 ($PM_{2.5}$)
- Chromium Hexavalent
- Dichloromethane

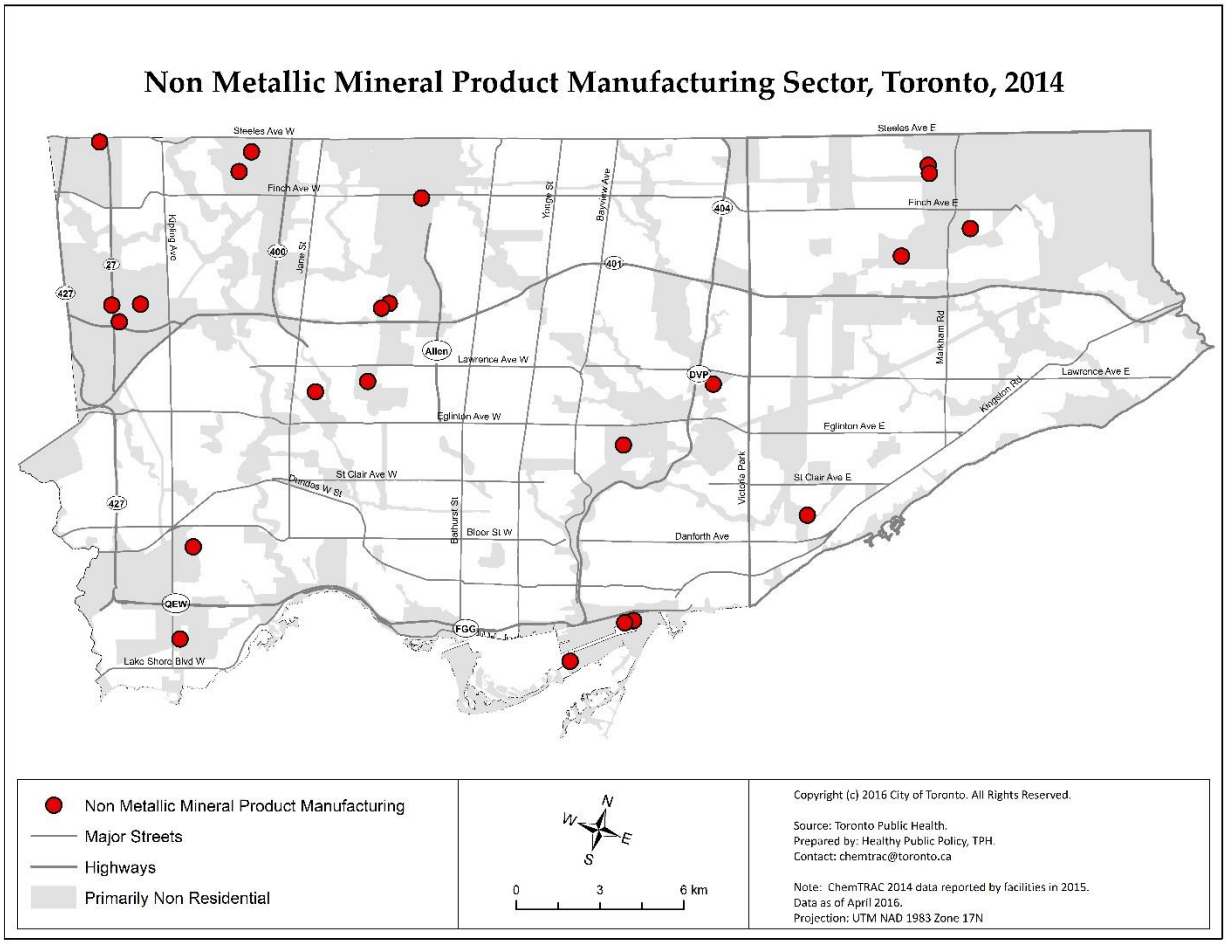
Figure 19: Amounts of substances reported by Fabricated Metal Product Manufacturing facilities for 2014



Non-Metallic Mineral Product Manufacturing

Types of activities: Transformers of mined or quarried non-metallic minerals, such as sand, gravel, stone, clay, and refractory materials into products for intermediate or final consumption. Processes used include grinding, mixing, cutting, shaping, and honing.

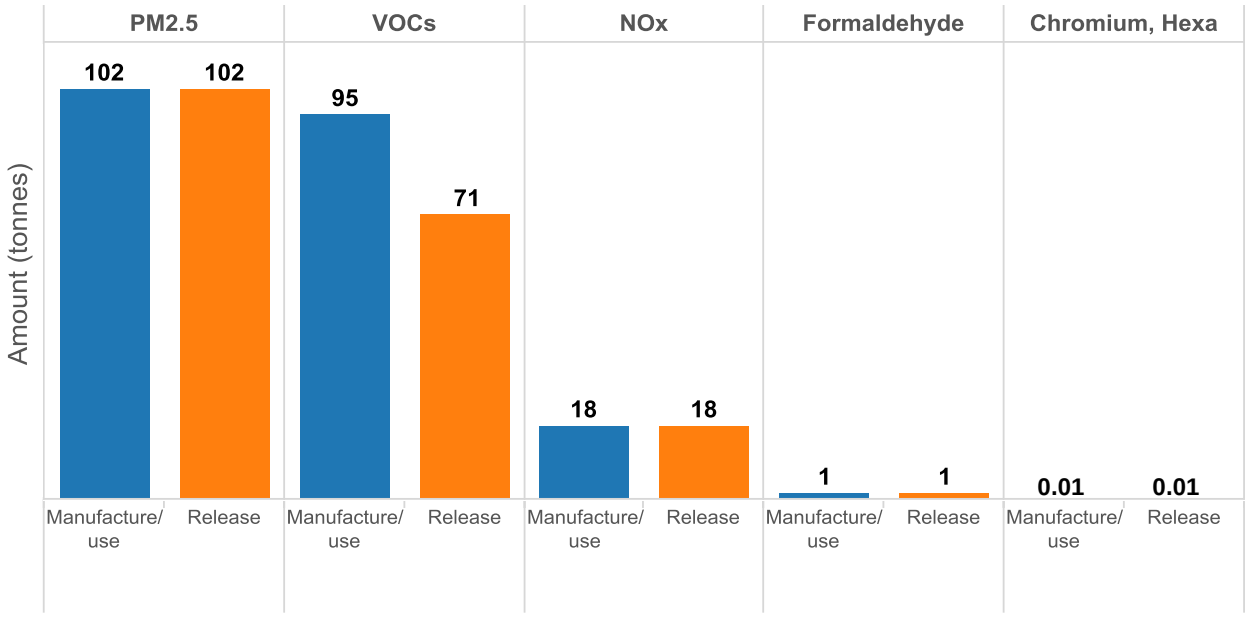
- Number of facilities that met the thresholds: 24
- Range in number of employees per facility: 1 to 140
- Total amount released: 192 tonnes
- Total amount manufactured, processed or used: 702 tonnes
- Number of priority substances reported: 8



Top substances reported are:

- Particulate matter 2.5 ($PM_{2.5}$)
- Volatile organic compounds (VOCs)
- Nitrogen oxides (NOx)
- Formaldehyde
- Chromium Hexavalent

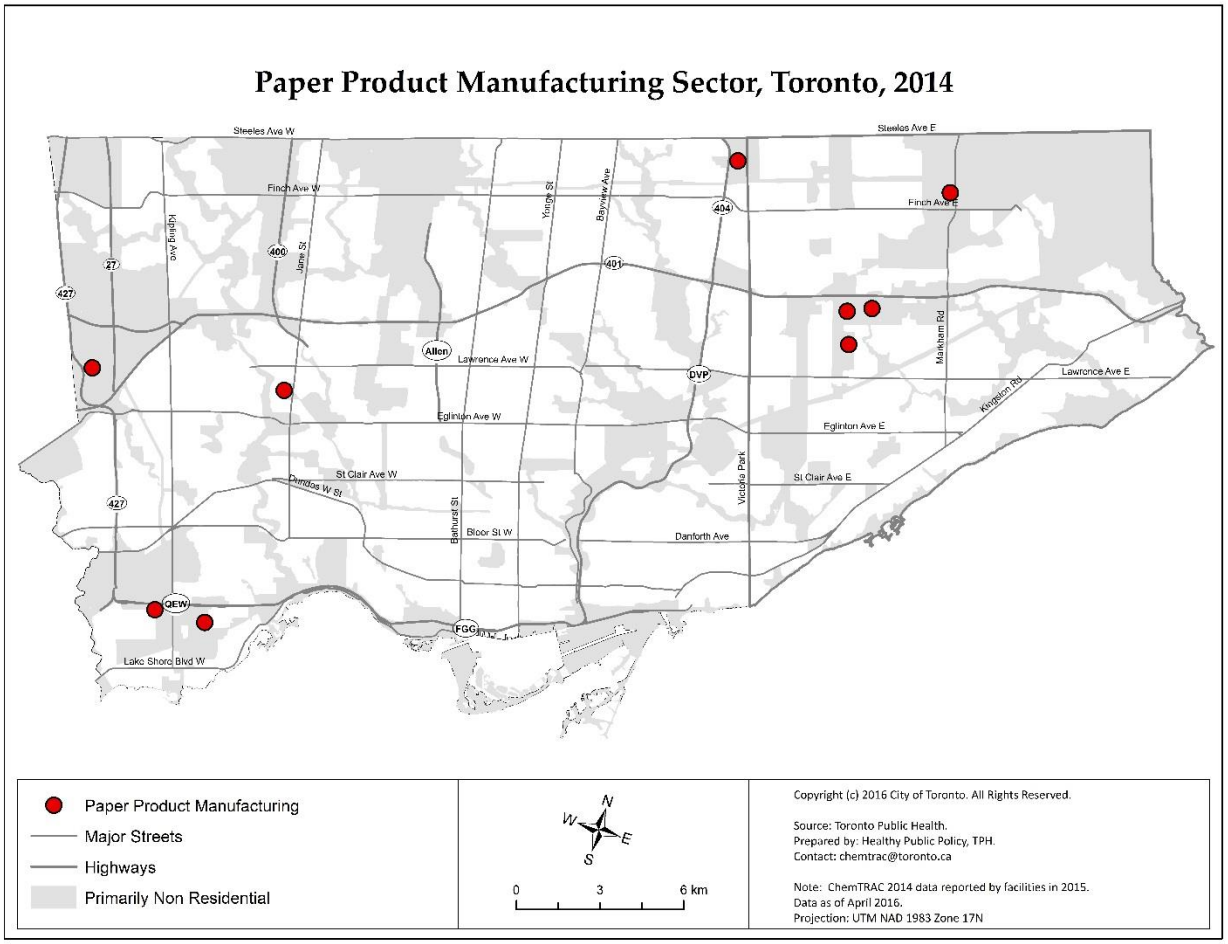
Figure 20: Amounts of substances reported by Non-Metallic Mineral Product Manufacturing facilities for 2014



Paper Product Manufacturing

Types of activities: Manufacturer pulp, paper and paper products. The manufacture of pulp involves separating the cellulose fibres from other impurities in wood, used paper or other fibre sources. The manufacture of paper involves matting these fibres into a sheet. Converted paper products are produced from paper and other materials by various cutting and shaping techniques.

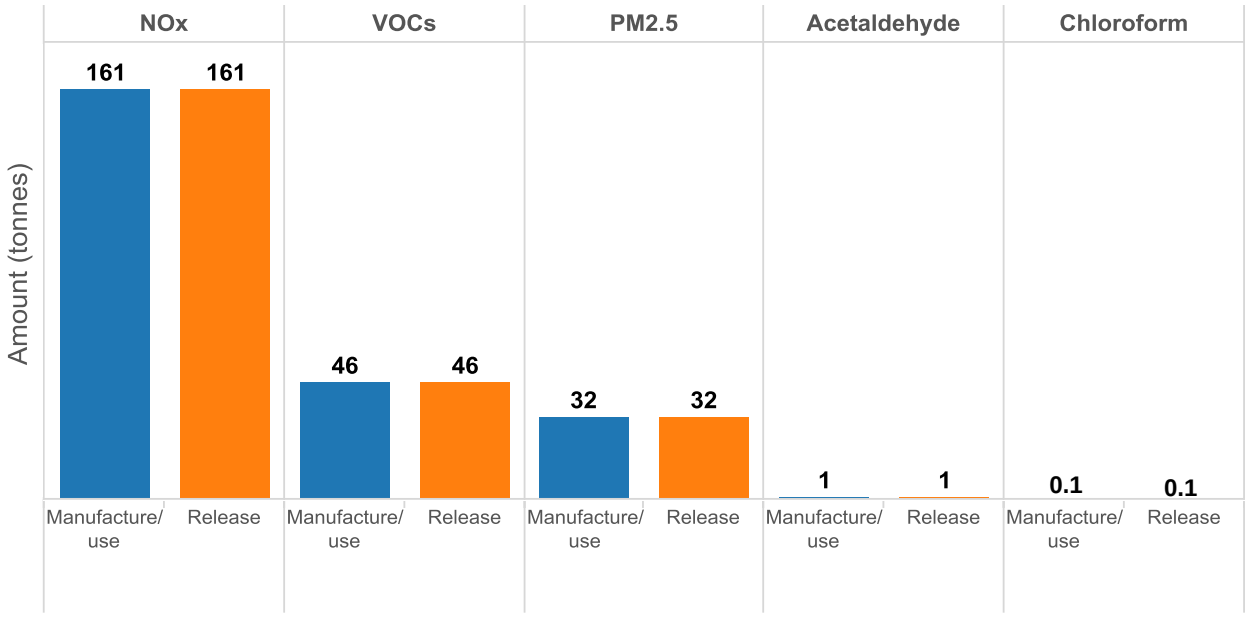
- Number of facilities that met the thresholds: 9
- Range in number of employees per facility: 6 to 457
- Total amount released: 240 tonnes
- Total amount manufactured, processed or used: 240 tonnes
- Number of priority substances reported: 6



Top substances reported are:

- Nitrogen oxides (NOx)
- Volatile organic compounds (VOCs)
- Particulate matter 2.5 ($PM_{2.5}$)
- Acetaldehyde
- Chloroform

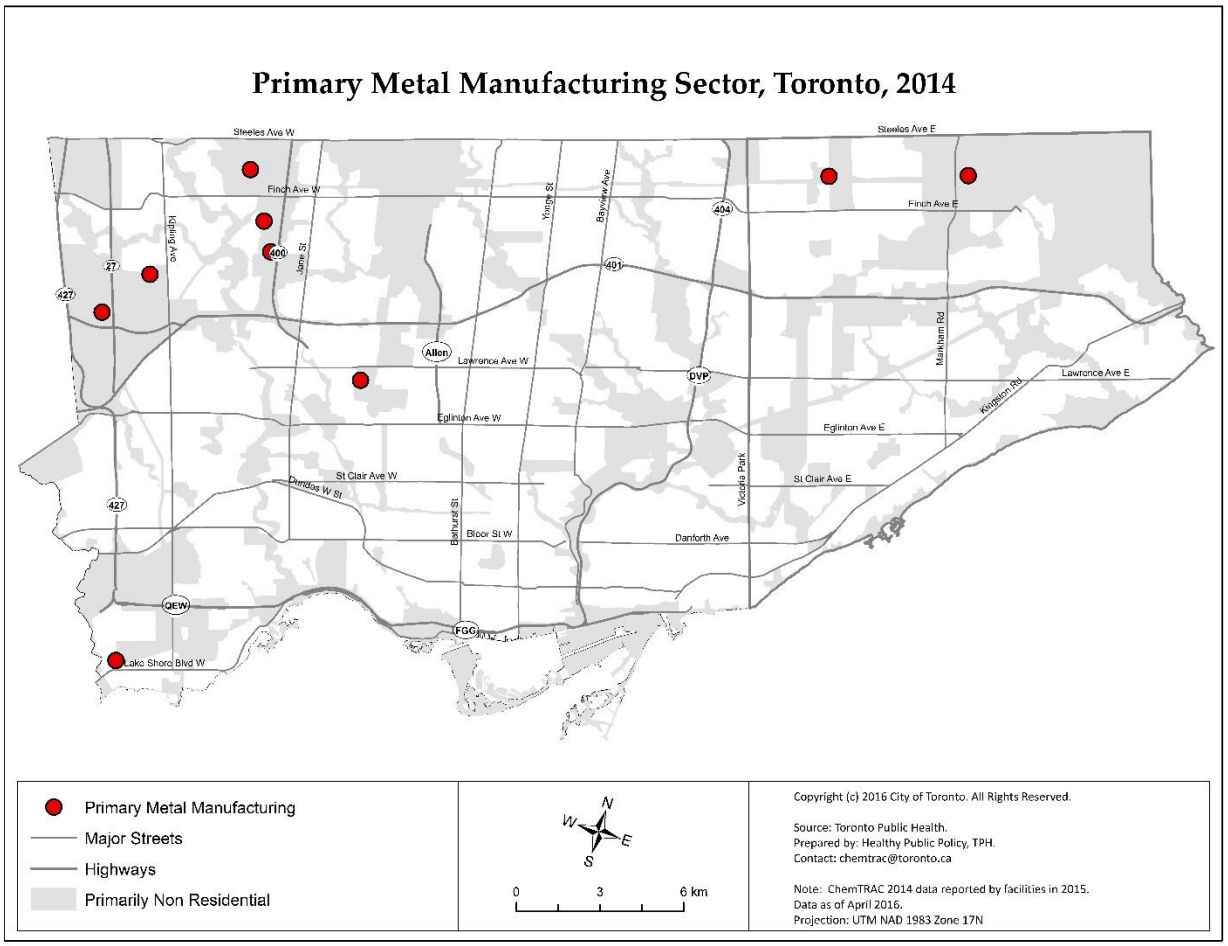
Figure 21: Amounts of substances reported by Paper Product Manufacturing facilities for 2014



Primary Metal Manufacturing

Types of activities: Primarily engaged in smelting and refining ferrous and non-ferrous metals from ore, pig or scrap in blast or electric furnaces. The output of smelting and refining is used in rolling and drawing operations to produce sheet, strip, bars, rods and wire, and in molten form to produce castings and other basic metal products.

- Number of facilities that met the thresholds: 10
- Range in number of employees per facility: 17 to 350
- Total amount released: 44 tonnes
- Total amount manufactured, processed or used: 542 tonnes
- Number of priority substances reported: 9



Top substances reported are:

- Particulate matter 2.5 ($PM_{2.5}$)
- Nitrogen oxides (NOx)
- Volatile organic compounds (VOCs)
- Lead
- Nickel

Figure 22: Amounts of substances reported by Primary Metal Manufacturing facilities for 2014