

# **Guide to calculations for ChemTRAC reporting:**

## **Meat processing**

**Version 1.1**

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## How do I use this guide?

**Part 1 of this guide will help you understand the ChemTRAC program, collect information about your facility, use the ChemTRAC calculator for Meat processing, and report substances to ChemTRAC, if needed.**

**Part 2 of this guide will help you reduce your facility's environmental impact.**

**The Appendices provide additional information about emissions calculations.**

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*City of Toronto, 2012*

*For more information about ChemTRAC, call 3-1-1 or visit [www.toronto.ca/chemtrac](http://www.toronto.ca/chemtrac)*

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**DISCLAIMER:** This guide is for educational and informational purposes only. The City of Toronto assumes no liability for the accuracy or completeness of these materials. Readers are responsible for ensuring compliance with Toronto's Environmental Reporting and Disclosure Bylaw (Municipal Code Chapter 423). These materials should not be relied upon as a substitute for legal or professional advice. Readers should seek their own legal or professional advice in regard to their use of the information contained in the guide.

## Introduction to the ChemTRAC program

There are chemicals in Toronto's environment that can harm our health. These substances come from vehicle exhaust, homes, businesses and other sources.

Toronto Public Health identifies 25 of these chemicals as "priority substances" because they are found in our local environment at levels that are of concern for health. Evidence links these substances to short-term health effects like respiratory problems, and longer-term impacts such as cancer. In a business setting, these substances can come from process heating, cleaning with solvents, welding and other processes.

The list of 25 substances and the reporting thresholds are included in Table 5 on page 42.

ChemTRAC is a City of Toronto program that:

- tracks where businesses use and release these priority substances;
- helps businesses reduce or replace these substances with safer alternatives; and
- provides the public with information on priority substances in their community.

As part of ChemTRAC, Toronto's Environmental Reporting and Disclosure Bylaw (Municipal Code Chapter 423) requires many businesses to report to the City each year if they use or release a certain amount of priority substances to the environment. Meat processing facilities are covered by this bylaw.

This guide is designed to help you:

- understand if your facility uses and releases any ChemTRAC priority substances;
- use ChemTRAC calculators to determine if you are required to report to the City of Toronto;
- use the ChemTRAC online reporting system to submit data to the City; and
- consider ways to reduce your environmental impact.

Additional information on the ChemTRAC program and the Environmental Reporting and Disclosure Bylaw is available by calling 3-1-1 or online at: **<http://www.toronto.ca/chemtrac/>**

## The Rendering and Meat Processing sector

The North American Industrial Classification System (NAICS) code 311614 is comprised of facilities engaged in rendering animal fat, bones and meat scraps, or preparing meat and meat by-products from carcasses. It includes boxed meat plants engaged in assembly-line cutting and packing of purchased carcasses, are included. It excludes facilities that produce dog food, cat food, and animal feed from purchased meat.

This guide uses the term “meat processing facilities” to refer to all facilities in the Rendering and Meat Processing sector.

Meat processing facilities are required to report their data every year if they use or release above the reporting threshold. The report is due by June 30 each year. Annual data that is reported each June should cover the period from January 1 to December 31 of the previous year.

## Identifying ChemTRAC substances in meat processing facilities

Table 1 lists the typical equipment and processes used in a meat processing facility. Most facilities will use rendering equipment such as blood dyers. Many facilities will perform meat smoking and use natural gas-fired equipment for cooking and drying.

Table 1 also shows the ChemTRAC priority substances that are released in a typical meat processing facility. The ChemTRAC calculator can help you estimate the levels of these substances in your facility.

**Table 1. ChemTRAC substances released in a meat processing facility and their source of release**

ChemTRAC priority substances	Manufacturing processes and equipment		
	Meat smoking <sup>1</sup>	Meat rendering (blood dryers)	Natural gas cookers / dryers
Acetaldehyde	X		
Benzene			X
Cadmium and its compounds			X
Chromium (non-hexavalent) and its compounds			X
Formaldehyde	X		X
Lead and its compounds			X
Manganese and its compounds			X
Mercury and its compounds			X
Nickel and its compounds			X
Nitrogen Oxides			X
PM <sub>2.5</sub>	X	X	X
PAHs			X
VOCs	X		X

1. The priority substances released from meat smoking depend on the method used.

Most of the substances listed in Table 1 are released in very small amounts. It is likely that only **acetaldehyde, formaldehyde, VOCs, PM<sub>2.5</sub>, NO<sub>x</sub>** would be released in amounts that would appear as non-zero in the ChemTRAC calculator for meat processing.

## Part 1: Gathering data, using the calculator, and reporting to ChemTRAC

**Formaldehyde.** Formaldehyde is a colorless gas with a characteristic pungent smell. It is reacted with phenol or urea to produce resins used as permanent adhesives for plywood and carpet manufacturing. In a meat processing facility, it is released from wood smoking.

**Acetaldehyde.** Acetaldehyde is an organic compound that occurs widely in a nature and is produced industrially on a large scale. It is used in the production of perfumes, resins and dyes. In a meat processing facility, it is released from liquid smoking and wood smoking.

**Volatile Organic Substances (VOCs).** VOCs are a group of organic chemicals that easily evaporate into the air. You can often smell them. They are released from solvents, paints, inks and cleaning products. In meat processing facilities, they are released into the air during the use of wood smokers. They are also released in small quantities when natural gas is burned.

**Particulate Matter 2.5 (PM<sub>2.5</sub>).** The term “particulate matter” describes solid and liquid particles found in the air we breathe. Particulate matter that is smaller than 0.0025 millimetres in diameter is called PM<sub>2.5</sub> and may not be visible to the naked eye. In a meat processing facility, PM<sub>2.5</sub> is released into the air from the use of blood dryers.

**Combustion by-products from natural gas burners.** Several substances are released when natural gas is burned to heat ovens or sterilization equipment. Nitrogen oxides are released in significant quantities, and a number of other ChemTRAC priority substances are released in smaller quantities.

### The health effects of ChemTRAC substances

**Acetaldehyde.** Acetaldehyde is possible carcinogenic to humans. Chronic exposure to low levels of inhaled acetaldehyde may increase the risk of cancer in all parts of the respiratory tract.

**Formaldehyde.** Formaldehyde is carcinogenic to humans. It is a weak initiator of cancer and a strong promoter of cancer. It is also highly reactive and can irritate the nose, eyes, skin, throat and lungs at low levels of chronic exposure.

**PM<sub>2.5</sub>.** Because of their small size, PM<sub>2.5</sub> can lodge deeply into the lungs. Numerous studies have linked PM to aggravated cardiac and respiratory diseases such as asthma, bronchitis and emphysema, and to heart disease.

**VOCs.** Short-term health effects of exposure to VOCs may include eye, nose, and throat irritation, headaches, loss of coordination, and nausea. Over longer periods, VOCs can damage the liver, kidneys, and central nervous system.

**NO<sub>x</sub>.** Long-term exposure to NO<sub>x</sub> causes or worsens respiratory disease such as emphysema and bronchitis, and can aggravate existing heart disease.

For more information on the health effects of these substances, as well as other ChemTRAC priority substances, visit

<http://www.toronto.ca/health/chemtrac/substances.htm>.

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The Table shown below depicts the maximum input values for this sector, which reach the thresholds.

Chemical/Process/Source	Max. Amount	Unit	Substances of Concern	Threshold Reached
Meat Smoking: Liquid Smoke	1,754,386	kg	VOCs, Acetaldehyde	100 kg VOCs
Meat Smoking: Wood Smoke	3,012,848	kg	Acetaldehyde, Formaldehyde	100 kg Acetaldehyde
Meat Smoking: Wood Smoke Batch Smoker- Quantity of Wood Used	1,258	kg	VOCs, PM <sub>2.5</sub>	30 kg PM <sub>2.5</sub>
Meat Smoking: Wood Smoke Continuous Smoker - Quantity of Wood Used	476	kg	VOCs, PM <sub>2.5</sub>	30 kg PM <sub>2.5</sub>
Meat Smoking: Wood Smoke Continuous Smoker, wet scrubber- Quantity of Wood Used	2,299	kg	VOCs, PM <sub>2.5</sub>	30 kg PM <sub>2.5</sub>
Meat Smoking: Both	3,609,177	kg	VOCs, Acetaldehyde, Formaldehyde	100 kg Acetaldehyde
Meat Smoking: Both, Batch Smoker - Quantity of Wood Used	1,258	kg	VOCs, PM <sub>2.5</sub>	30 kg PM <sub>2.5</sub>
Meat Smoking: Both, Continuous Smoker - Quantity of Wood Used	476	kg	VOCs, PM <sub>2.5</sub>	30 kg PM <sub>2.5</sub>
Meat Smoking: Both, Continuous Smoker, wet scrubber - Quantity of Wood Used	2,299	kg	VOCs, PM <sub>2.5</sub>	30 kg PM <sub>2.5</sub>
Rendering	131,614	kg	PM <sub>2.5</sub>	30 kg PM <sub>2.5</sub>
Natural Gas, uncontrolled	124,853	m <sup>3</sup>	NOx, VOCs, PM <sub>2.5</sub>	200 kg NOx
Natural Gas, Low NOx Burner	249,705	m <sup>3</sup>	NOx, VOCs, PM <sub>2.5</sub>	200 kg NOx
Natural Gas, Low NOx Burner and Recirculated Flue Gas	390,165	m <sup>3</sup>	NOx, VOCs, PM <sub>2.5</sub>	200 kg NOx

## Calculating emissions

To help Toronto businesses calculate their emissions and comply with the Environmental Reporting and Disclosure Bylaw, Toronto Public Health developed calculators that are specific to industrial sectors and processes. Access these calculators from the ChemTRAC website at **<http://www.toronto.ca/health/chemtrac/tools.htm>**.

These calculators help businesses do three things:

- Identify which ChemTRAC priority substances are used or released in their facility
- Calculate the amounts of ChemTRAC priority substances used or released
- Determine what they are required to report to the ChemTRAC program.

Appendix B describes how the calculators calculate estimates of the quantities of ChemTRAC priority substances that are released from your facility.

The release of ChemTRAC priority substances can be calculated using methods other than the ChemTRAC calculators. See **<http://www.toronto.ca/health/chemtrac/tools.htm>** for a list of alternative methods.

In the next section, we will work through worksheets to prepare you to use the ChemTRAC calculator for Meat Processing.



## Worksheets for collecting information

The worksheets found on the next pages are intended to help you collect all the information needed to use the ChemTRAC calculator for Meat Processing. Three worksheets are provided:

- Meat smoking
- Meat rendering
- Natural gas use (in ovens / cookers / dryers)

A printer-friendly version of the worksheets can be found as Appendix A. They can be printed and completed by hand so that you have all information available on-hand for entry into the ChemTRAC calculator.

Note: If your facility has more processes than are included in the ChemTRAC calculator for Meat processing, you may need to use additional calculators to identify other emissions. You would then add these amounts to the numbers generated by the ChemTRAC calculator for Meat Processing. You can use ChemTRAC's "Calculation of Totals" calculator to combine the findings of multiple calculators and determine if you exceed ChemTRAC thresholds. See Appendix C for more details.

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### Worksheet 1: Meat smoking

This worksheet will help you collect information on meat smoking in your facility. By filling out the [Worksheet 1 Tables](#) on the next page, you will have all the information you need to complete the “Meat Smoking” section of the ChemTRAC calculator. You should collect data on your facility for the period from January 1 to December 31 of a calendar year.

**Skip this worksheet if you do not smoke meat onsite.**

**1. Is meat smoked onsite? If so, how is meat smoking done?**

In [Worksheet 1 Table 1](#) on the next page, use an “X” to indicate if your facility smokes meat onsite, and if you use wood smoke, liquid smoke or both wood and liquid smoke.

**2. How much meat was smoked using wood smoke? Liquid smoke?**

The ChemTRAC calculator asks for the quantity of meat smoked using wood smoke and liquid smoke during the reporting year.

You can collect information on annual quantity of material processed in: kilograms, metric tonnes, pounds, US tons, or UK tons.

You can start by estimating the quantity processed each week or month.

*Example: 1,000 kilograms per month \* 12 months per year = 12,000 kg per year*

Enter this data in [Worksheet 1 Table 2](#) on the next page. For smoking processes that your facility does not use, enter “0” or leave the cells blank.

**3. ONLY for wood smoking: What type of smoker is used, how much wood is used, and what type of wood is used?**

The ChemTRAC calculator asks you to select the **type of smoker** used – either batch smoker or continuous smoker. For continuous smokers, indicate whether or not a **wet scrubber** is installed to control emissions. Information on wet scrubbers is provided in *Control technologies for reducing emissions* on page 28.

The ChemTRAC calculator asks for the **total quantity of wood or sawdust** used for smoking during the reporting year. Again, you can collect information in kilograms, metric tonnes, pounds, US tons, or UK tons.

Finally, the ChemTRAC calculator asks for the **type of wood** used:

- Mesquite
- Hickory
- Maple
- Other / Mix

Enter this information in [Worksheet 1 Table 3](#) on the next page.

## Part 1: Gathering data, using the calculator, and reporting to ChemTRAC

Worksheet 1 Table 1 – Overview of meat smoking

<b>Is meat smoked onsite?</b>	<input type="checkbox"/> Yes <input type="checkbox"/> No
<b>How is smoking done?</b>	<input type="checkbox"/> Wood smoke only <input type="checkbox"/> Liquid smoke only <input type="checkbox"/> Both

Worksheet 1 Table 2 – Total annual quantity of meat smoked

Process	How much meat was smoked?	Units
<b>Wood smoke</b>	_____	<input type="checkbox"/> kilograms (kg) <input type="checkbox"/> pounds (lb) <input type="checkbox"/> tons - UK <input type="checkbox"/> tons – US <input type="checkbox"/> tonnes - metric
<b>Liquid smoke</b>	_____	<input type="checkbox"/> kilograms (kg) <input type="checkbox"/> pounds (lb) <input type="checkbox"/> tons - UK <input type="checkbox"/> tons – US <input type="checkbox"/> tonnes - metric

Worksheet 1 Table 3 – Additional information on wood smoking

Complete ONLY if wood smoking is used	
<b>What type of smoker is used?</b>	<input type="checkbox"/> Batch smoker <input type="checkbox"/> Continuous smoker  <b>If a continuous smoker is used:</b> Are emissions controlled with a wet scrubber? <input type="checkbox"/> Yes <input type="checkbox"/> No
<b>How much wood or sawdust was used?</b>	_____ <input type="checkbox"/> kilograms (kg) <input type="checkbox"/> pounds (lb) <input type="checkbox"/> tons - UK <input type="checkbox"/> tons – US <input type="checkbox"/> tonnes - metric
<b>What type of wood is used?</b>	<input type="checkbox"/> Mesquite <input type="checkbox"/> Hickory <input type="checkbox"/> Maple <input type="checkbox"/> Other / Mix

## Part 1: Gathering data, using the calculator, and reporting to ChemTRAC

### Worksheet 2: Meat rendering

This worksheet will help you collect information on meat rendering using blood dryers in your facility. By answering the questions below and filling out the [Worksheet 2 Tables](#) below, you will have all the information you need to complete the “Rendering” section of the ChemTRAC calculator. You should collect data on your facility for the period from January 1 to December 31 of a calendar year.

#### 4. Do you operate blood dryers?

In [Worksheet 2 Table 1](#) below, use an “X” to indicate whether or not your facility uses blood dryers as part of meat rendering.

#### 5. How much meat was processed in blood dryers?

The ChemTRAC calculator asks for the quantity of blood meal product dried during the reporting year.

You can collect information on annual quantity of material processed in: kilograms, metric tonnes, pounds, US tons, or UK tons.

If it is helpful, you can start by estimating the quantity processed each week or month.

*Example: 1,000 kilograms per month \* 12 months per year = 12,000 kg per year*

Enter this data in [Worksheet 2 Table 2](#) below. If your facility does not use blood dryers, enter “0” or leave the table blank.

[Worksheet 2 Table 1 –Blood dryers](#)

<b>Do you operate blood dryers?</b>	<input type="checkbox"/> Yes <input type="checkbox"/> No
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[Worksheet 2 Table 2 – Quantity of blood meal product dried](#)

<b>What quantity of blood meal product was dried during the reporting year?</b>	<div><div>_____</div><div><input type="checkbox"/> kilograms (kg) <input type="checkbox"/> pounds (lb) <input type="checkbox"/> tons - UK <input type="checkbox"/> tons – US <input type="checkbox"/> tonnes - metric</div></div>
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## Part 1: Gathering data, using the calculator, and reporting to ChemTRAC

### *Worksheet 3: Natural gas use (in ovens / cookers / dryers)*

This worksheet will help you collect information on your facility's ovens, cookers and dryers. By answering the questions below and filling out the [Worksheet 3 Tables](#) on the next page, you will have all the information you need to complete the "natural gas fired equipment" section of the ChemTRAC calculator. You should collect data on your facility for the period from January 1 to December 31 of a calendar year.

**Skip this worksheet if you do not use any natural gas fired equipment for manufacturing.**

**6. What control technologies are installed on your natural gas equipment?**

You can find this information in the operating manuals for the heating equipment that your facility uses. Descriptions of control technologies can be found in Part 2 on page 27 of this guide. If you do not know which control technologies are in place, assume that none are. Use this information to fill out [Worksheet 3 Table 1](#) on the next page.

**7. How much natural gas do ovens / cookers / dryers use?**

This question can be answered using EITHER Option A or Option B. Use the Option that you have selected to complete [Worksheet 3 Table 2](#) on the next page.

**Option A – What is the total amount of natural gas used for manufacturing equipment?** You can get this information from your annual gas bills. Note that the gas bills might include gas used for other purposes, such as heating the facility itself. You should consider only gas used for manufacturing processes such as cooking and drying. One way to know how much gas is used for manufacturing is to compare winter and summer bills. Winter bills will likely include facility heating as well as gas used for manufacturing. Summer months will likely include only gas used for manufacturing.

**OR**

**Option B – What is the thermal rating of your manufacturing equipment?** This rating (in BTU/hr) would be found in your equipment's operating manual. You will also need to estimate the average number of hours per day, days per week, and weeks per year that this equipment is in operation.

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### Worksheet 3 Table 1 – Control technologies information

<b>Cookers / dryers are equipped with (add a checkmark):</b>	
a. Low NO <sub>x</sub> burners only	_____
b. Low NO <sub>x</sub> burners with recirculated flue gas	_____
c. No control technologies	_____

### Worksheet 3 Table 2 – Natural gas usage

<b>Option A. Total natural gas used for the cookers / dryers</b>
Add values in cubic metres <b>OR</b> cubic feet: _____ m <sup>3</sup> (cubic metres) or _____ ft <sup>3</sup> (cubic feet)

**OR**

<b>Option B. Thermal rating of the cookers / dryers</b>
Record value in British Thermal Units per hour _____ BTU/hr
Also estimate the average time that the equipment is in operation: _____ hours per day and _____ days per week and _____ weeks per year

### Using the calculator

To calculate your use and release of ChemTRAC substances, you need to enter the information from the worksheets in this guide into the appropriate sections of the ChemTRAC calculator for Meat processing. The ChemTRAC calculator will then automatically calculate the quantities of ChemTRAC substances released from your facility. This section of the guide provides a step-by-step walkthrough of the use of the calculator.

#### Getting started

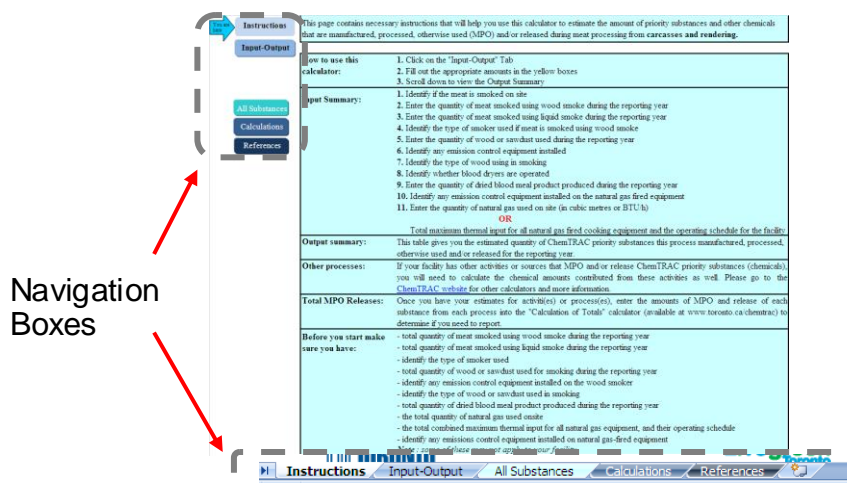
The ChemTRAC calculator for meat processing facilities can be read with software such as Microsoft Excel or Open Office. To find a copy of the calculator, go to <http://www.toronto.ca/health/chemtrac/tools.htm> and click on the "Meat processing" link found under the Food and Beverage Sector.

The calculator consists of five different screens:

- Instructions
- Input-Output
- All Substances
- Calculations
- References

**You only have to enter information into the Input-Output screen.** The other screens are provided in the calculator mainly for reference. No information needs to be entered in these screens.<sup>1</sup> These additional screens are discussed in Appendix C.

You can navigate between screens by clicking the buttons on the left side of each screen or by clicking on the tabs at the bottom of each screen:



<sup>1</sup> If you have site-specific emission factors for any ChemTRAC substance, they can be entered manually in the Calculator screen. See Appendix B for details.

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### *The Instructions screen*

The calculator should open on the Instructions screen. This screen contains instructions on how to use the calculator to estimate the amount of ChemTRAC substances and other substances that are used and released by your facility. It also provides a brief overview of the contents of the calculator. **You do not need to enter any information on this screen.**

### *The Input-Output screen*

The Input-Output screen is the screen where you will enter all information applicable to your facility. Information is typed in **yellow boxes** only. Any yellow cells that do not apply to your facility can be left blank. **Dropdown menus** are also used to input some information. The Input-Output screen can be filled out using the responses to the questions found within **Worksheets 1, 2 and 3** of the guide.

Once you input your facility's information into the appropriate yellow boxes and dropdown menus, the calculator automatically calculates the quantities of ChemTRAC substances that are manufactured, processed, otherwise used and released to air from your facility.<sup>2</sup> The values are displayed in the **Output Summary table** found at the bottom of the Input-Output screen. You should compare the values that are manufactured, processed or otherwise used to the ChemTRAC reporting thresholds to see if you are required to report ChemTRAC substances. See *Interpreting Results* on page 19 for more information.

The next pages will walk you through the Input-Output screen. The image on the next page illustrates the different areas of the Input-Output screen.

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<sup>2</sup> The definitions for 'Manufactured', 'Processed', 'Otherwise Used', and 'Released to Air' can be found on the References screen of the ChemTRAC calculator.



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**Meat Smoking**

Is meat smoked onsite?

If yes, how is smoking done?

If yes, how much meat is smoked using wood smoke?

If yes, how much meat is smoked using liquid smoke?

If wood smoke is used, what type of smoker is used?

If wood smoke is used, how much wood or sawdust was used during the reporting year?

If using a continuous smoker, are emissions controlled with a wet scrubber?

If wood smoke is used, what type of wood is used?

**Rendering**

Do you operate blood dryers?

If yes, provide the quantity of blood meal product dried:

**Natural Gas Fired Ovens/Cookers/Dryers**

Identify emissions control installed:

Please complete ONLY A or B

A) the quantity of natural gas

Total quantity of natural gas used:

OR

B) the thermal input and operating schedule

Total maximum thermal input for all natural gas fired cooking equipment:

Operating schedule:

Enter data from worksheet 1 here

Unit Conversion Table			
1 pounds	=		kg
1 tons (US)	=		kg
1 tons (UK)	=		kg
1 tonnes (metric)	=		kg
1 cubic feet (ft³)	=		m³

Use this table to quantity of meat, wood, or blood into kg, and volume of gas into cubic

Enter data from worksheet 2 here

Enter data from worksheet 3 here

**OUTPUT SUMMARY (Only ChemTRAC priority substances)**

ChemTRAC Priority Substances	Quantity (kg/yr)			
	Manufactured <sup>1</sup>	Processed <sup>1</sup>	Otherwise Used <sup>1</sup>	Released to Air <sup>1</sup>
Nitrogen Oxides (NOx)	0	0	0	0
Formaldehyde	0	0	0	0
Benzene	0	0	0	0
Lead and its compounds	0	0	0	0
Manganese and its compounds	0	0	0	0
Mercury and its compounds	0	0	0	0
Nickel and its compounds	0	0	0	0
Cadmium and its compounds	0	0	0	0
Acetaldehyde	0	0	0	0
Chromium (non-hexavalent) and its compounds	0	0	0	0
Particulate Matter 2.5 (PM 2.5)	0	0	0	0
Total PAHs	0	0	0	0
Volatile Organic Compounds (VOCs)	0	0	0	0

<sup>1</sup> Definitions available in references

The output values are calculated here

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### Entering information from Worksheet 1: Meat smoking

The image below displays the area of the Input-Output screen where you enter information on meat smoking. It shows an example of information from [Worksheet 1](#) entered into the appropriate areas of the screen.

**Question 1:** A user has indicated that the facility uses both liquid smoke and wood smoke by selecting “**both**” from the dropdown menu. They have selected “**Yes**” from the dropdown menu to indicate that meat is smoked onsite.

**Question 2:** A user has typed “**25,000 kg**” into the yellow box for quantity of meat smoked using wood smoke. They have typed in “**50,000 kg**” as the quantity of meat smoked using liquid smoke.

**Question 3:** Because the facility uses wood smoking, Question 3 is completed. “**Batch smoker**” and “**hickory**” are selected from the dropdown menus for type of smoker and type of wood. “**3,000 kg**” is typed in as the quantity of wood or sawdust used for smoking.

**The input box requires data in kilograms.** If you have collected information in other units (e.g. pounds, US tons, UK tons), you should use the **Unit Conversion Table** on the right side of the Input-Output screen to convert to kilograms. This is discussed on the next page.

Meat Smoking		
Is meat smoked onsite?	Yes	⬆⬇⬆
If yes, how is smoking done?	Both	⬆⬇⬆
If yes, how much meat is smoked using wood smoke?	25000	kg/yr
If yes, how much meat is smoked using liquid smoke?	50000	kg/yr
If wood smoke is used, what type of smoker is used?	Batch Smoker	⬆⬇⬆
If wood smoke is used, how much wood or sawdust was used during the reporting year?	3000	kg/yr
If using a continuous smoker, are emissions controlled with a wet scrubber?	Select	⬆⬇⬆
If wood smoke is used, what type of wood is used?	Hickory	⬆⬇⬆

### Entering information from Worksheet 2: Meat rendering

The image on the next page displays the area of the Input-Output screen where you enter information on the use of blood dryers for meat rendering. It shows an example of information from [Worksheet 2](#) entered into the Input-Output screen.

**Questions 4 and 5:** “**Yes**” is selected from the dropdown menu to indicate that the sample facility uses blood dryers. The value “**230,000**” is typed into yellow box for quantity of blood meal product dried.

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<b>Rendering</b>		
Do you operate blood dryers?	Yes	⬆ ⬇ ⬆
If yes, provide the quantity of blood meal product dried:	230000	kg/yr

### Entering information from Worksheet 3: Natural gas fired equipment

The image below displays the area of the Input-Output screen where you enter information on natural gas use in cooking and drying equipment. It shows an example of information from [Worksheet 3](#) entered into the Input-Output screen.

**Question 6:** A sample user has indicated that no emissions control equipment is installed on natural gas fired equipment by selecting “**None**” from the dropdown menu.

**Question 7:** In this example, the user has opted for Option B and has indicated that the maximum thermal input for all heating equipment is 50,000 BTU/hr. The facility operates for 12 hours per day, 5 days per week, 50 weeks per year.

**If you are using Option A, the input box requires quantity of natural gas in cubic metres (m<sup>3</sup>).** If you have collected information in cubic feet (ft<sup>3</sup>), you should use the **Unit Conversion Table** on the right side of the Input-Output screen to convert.

<b>Natural Gas Fired Ovens/Cookers/Dryers</b>		
Identify emissions control installed:	None	⬆ ⬇ ⬆
<b>Please complete ONLY A or B</b>		
<b>A) the quantity of natural gas</b>		
Total quantity of natural gas used:		m <sup>3</sup> /yr
<b>OR</b>		
<b>B) the thermal input and operating schedule</b>		
Total maximum thermal input for all natural gas fired cooking equipment:	50000	BTU/h
Operating schedule:	12	hours/day
	5	days/week
	50	weeks/year

### Unit Conversion Table

The blue and yellow unit conversion box on the right side of the calculator allows you to convert:

- Quantity of meat or wood into kilograms.
- Quantity of natural gas used into cubic metres (m<sup>3</sup>).

Enter the value from Worksheet 1 or 2 in the appropriate yellow box at the left of the table (in pounds, US tons, metric tonnes, cubic feet, etc). The tool will automatically convert the quantity into tonnes or cubic metres in the blue column

## Part 1: Gathering data, using the calculator, and reporting to ChemTRAC

at the right of the table. This value can then be entered into the main areas of the input-output screen.

As an example in the illustration below, “**30,000 pounds**” is typed into the yellow box at the left. It is automatically converted to “**13,608 kilograms**”, displayed in the blue box at the right of the table.

Unit Conversion Table			
30000	pounds	=	13608.000 kg
1	tons (US)	=	907 kg
1	tons (UK)	=	1016 kg
1	tonnes (metric)	=	1000 kg
1	cubic feet (ft <sup>3</sup> )	=	0.028 m <sup>3</sup>

### Reading the Output Summary table

The Output Summary table displays the quantities of ChemTRAC substances that are manufactured, processed, released, or otherwise used in your facility. These values are the results of all of the calculations based on the information entered in the Input-Output Screen. The Output Summary table on the next page is the result of the sample information entered in the sample screens above.

OUTPUT SUMMARY (Only ChemTRAC priority substances)				
ChemTRAC Priority Substances	Quantity (kg/yr)			
	Manufactured <sup>1</sup>	Processed <sup>1</sup>	Otherwise Used <sup>1</sup>	Released to Air <sup>1</sup>
Nitrogen Oxides (NOx)	7	0	0	7
Formaldehyde	0	0	0	0
Benzene	0	0	0	0
Lead and its compounds	0	0	0	0
Manganese and its compounds	0	0	0	0
Mercury and its compounds	0	0	0	0
Nickel and its compounds	0	0	0	0
Cadmium and its compounds	0	0	0	0
Acetaldehyde	2	0	0	2
Chromium (non-hexavalent) and its compounds	0	0	0	0
Particulate Matter 2.5 (PM 2.5)	124	0	0	124
Total PAHs	0	0	0	0
Volatile Organic Compounds (VOCs)	69	0	0	69

You should compare the values that are manufactured, processed, otherwise used and released to air to the ChemTRAC reporting thresholds to see if you are required to report ChemTRAC substances. See Interpreting Results on page 19 for more details.

### Interpreting results

**Compare results to thresholds.** Once the amounts of ChemTRAC substances manufactured, processed, otherwise used and released to air have been calculated, you must compare these amounts to the ChemTRAC reporting thresholds listed in the Environmental Reporting and Disclosure Bylaw.<sup>3</sup> These thresholds are listed in Appendix C of this guide and in Table 2 on the next page.

**Combining multiple calculation methods.** Some facilities may need to add results of the ChemTRAC calculator for Meat processing with emissions from other processes that happen in the facility. This is discussed in Appendix C.

**If there are no other processes and, therefore, the ChemTRAC calculator is the only tool used to estimate emissions,** the values in the Output Summary table of the calculator can be compared directly to the ChemTRAC reporting thresholds. See an example in Table 2.

**If results exceed thresholds you must report.** The methods for comparing results to reporting thresholds are different for different groups of ChemTRAC substances. For VOCs, PM<sub>2.5</sub> and NO<sub>x</sub>, reporting is only required if the substances are released to air at or above thresholds. For other substances quantified by this calculator, reporting is only required if the amount manufactured, processed or otherwise used is at or above thresholds.

Table 2 on the next page compares the Output Summary table from the *Using the Calculator* section to ChemTRAC thresholds.

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<sup>3</sup> The full by-law can be found at <http://www.toronto.ca/health/chemtrac/report.htm>.

## Part 1: Gathering data, using the calculator, and reporting to ChemTRAC

Table 2. Comparison of results from the ChemTRAC calculator and reporting thresholds

Output Summary table from the ChemTRAC calculator					Comparison to ChemTRAC thresholds	
ChemTRAC Priority Substances	Manufactured (kg/yr))	Processed (kg/yr	Otherwise used (kg/yr)	Released to Air (kg/yr)	Reporting threshold (kg/yr)	Is reporting required?
<b>Particulate matter 2.5 (PM<sub>2.5</sub>)</b>	<b>124</b>	<b>0</b>	<b>0</b>	<b>124</b>	<b>30</b>	<b>YES</b>
Volatile organic compounds (VOCs)	69	0	0	69	100	No
Nitrogen Oxides	7	0	0	7	200	No
Acetaldehyde	2	0	0	2	100	No
Benzene	0	0	0	0	100	No
Formaldehyde	0	0	0	0	100	No
Total PAHs	0	0	0	0	10	No
Cadmium and its compounds	0	0	0	0	1	No
Chromium (non-hexavalent) & compounds	0	0	0	0	100	No
Manganese and its compounds	0	0	0	0	10	No
Mercury and its compounds	0	0	0	0	1	No
Nickel and its compounds	0	0	0	0	100	No

In the Table 2 example, PM<sub>2.5</sub> are ***released to air*** above thresholds.

Therefore, in this example, the manufacture and release to air of Particulate Matter 2.5 (PM<sub>2.5</sub>) would need to be reported to the ChemTRAC program.

## Reporting to ChemTRAC

**You are only required to report to ChemTRAC if you meet or exceed reporting thresholds for one or more priority substances.**

Facilities that meet or exceed reporting thresholds for one or more substances must use the Online Reporting System to report to the ChemTRAC program. You can access the system from any computer with an internet connection. If your facility is exempt or below reporting thresholds, you can use the system to notify the City and volunteer environmental information.

You can find the online reporting system on the ChemTRAC webpage:  
**<http://www.toronto.ca/health/chemtrac/report.htm>**.

### *You will need the following information to report to ChemTRAC*

- Your First Time Access Code **OR** Registration ID
- Your facility name, address, number of employees and contact information
- Your NAICS code
- The names of substances you are reporting
- Quantities of priority substances (in kilograms).


The screenshot shows the Toronto City website's navigation bar with links like HOME, CONTACT US, and HOW DO I...?. Below this is a section titled 'ChemTRAC - 4 Steps to Reporting'. A sidebar on the left lists various links including 'Public Health Home', 'A - Z Index', 'Contact us', and 'ChemTRAC' with sub-links like 'Background', 'Info for businesses', '4 steps to reporting', 'Info for communities', 'Links', and 'Contact ChemTRAC'. The main content area is titled 'Reporting to the Environmental Reporting and Disclosure Bylaw (Municipal Code Chapter 423)'. It features a red-bordered box containing the text 'Ready to report?' and a link to 'ChemTRAC Online Reporting System'. An arrow points from a separate box on the right, labeled 'Click here to access the system', to this link. Below this, there is a paragraph explaining the responsibility of facility owners and a link to 'Frequently Asked Questions about Reporting'. A section titled 'The following steps are provided as a guide to help you report:' shows a four-step process: Step 1 (Determine if the Bylaw applies to you), Step 2 (Determine if you need to report in a given year), Step 3 (Prepare your data for reporting), and Step 4 (Submit your data online by June 30th).

## Part 1: Gathering data, using the calculator, and reporting to ChemTRAC

[Frequently asked questions](#)  
[Contact us](#)  
[Terms of use](#)  
[User Guide](#)

### ChemTRAC

You are in a secure site.



## Welcome to the ChemTRAC data reporting system

This application will allow you to:

- Report the use and release of priority substances under Toronto's Environmental Reporting and Disclosure Bylaw (Municipal Code Chapter 423)
- Indicate if your facility is below reporting thresholds
- Indicate that the reporting requirements do not apply to your facility
- Provide information on your facility's environmental activities

To report online, you will need the **First Time Access Code** or your **Registration ID**.

To protect your privacy and security it is recommended that you close the browser after submitting your information.

To protect the secured exchange of information between you and this secure site, this transaction requires that your browser supports 128-bit data encryption. To continue, you may be asked to download and install the latest version of your browser.

As a security precaution, page sessions will end automatically as indicated at the top of each page.

To proceed with reporting information on chemical use and release you must read and consent to the [Terms of Use](#) and click the **I Agree** button below.

**Note:** Use of the browser Back button is not supported. Please use the reporting system's back/next button(if applicable) to navigate when necessary.

### *First Time Access Code for new users*

If you are a first time user, you will need a “First Time Access Code” to use the system. The City sends most businesses their First Time Access Code by mail. If you did not receive or have lost your First Time Access Code, please call 3-1-1.

### *Registration ID for facilities already in the system*

If you have already reported in the online system, you have been issued a Registration ID. This ID number is to be used for future visits to the ChemTRAC reporting system. If you have lost your Registration ID, please call 3-1-1.



## Part 1: Gathering data, using the calculator, and reporting to ChemTRAC

The screenshot shows the ChemTRAC login interface. At the top, there is a section titled "First Time Signing In?" with a button labeled "Register with First Time Access Code". Below this is a section titled "Already Registered?" which includes a text input field for "Registration ID:". A message below the field states: "If you have lost or forgotten your Registration ID, please contact us at (416) 338-7600". At the bottom of this section is a "Sign In" button. The footer of the page includes the City of Toronto logo and the copyright notice "© City of Toronto 1998-2011".

### *Once you have entered the online reporting system*

The online system has seven steps. You will see your progress at the top of the screen. In the screenshot below, Step 1 is complete and Step 2 is in progress.

The screenshot shows the ChemTRAC main dashboard. At the top left is the "Toronto" logo. Below it is a sidebar with links: "Frequently asked questions", "Contact us", "Terms of use", and "User Guide". The main header area says "ChemTRAC" and "You are in a secure site." Below this is a progress bar with seven steps: "Step 1 Facility Registration", "Step 2 Reporting Period", "Step 3 Chemical Selection", "Step 4 Use & Release (0 of 0)", "Step 5 Environmental Statement", "Step 6 Summary Notification", and "Step 7 Confirmation & Print". Step 1 is marked as complete with a green leaf icon, and Step 2 is marked as in progress with a green leaf icon. At the bottom left is a 15-minute countdown timer. A note at the bottom states: "Note: This registration session will automatically end fifteen minutes after this Web page has finished loading."

To move to the next step, you must enter all the required information on the screen and click the "Next" button at the bottom of the screen. You can use the "Back" button to change the information you provided in previous steps.

Please remember to have all your information ready before you enter the system. **You will only have fifteen minutes to complete each screen before the system logs you out.** If your session expires before you hit the "submit" button, you will need to re-enter all your information. If you are running out of time, you can reset the countdown without losing information by switching to a different page then returning to the page you were working on.

### *Step 1. Facility registration*

In Step 1, you will enter your facility name, address, number of employees and company contact information. You will also enter your **NAICS code** in the section entitled "Type of facility". You must begin by selecting the 2-digit NAICS code from the dropdown menu. For meat processing facilities, this will be "31 – Manufacturing". Then, you can select the appropriate 4-digit code (3116), and finally, the 6 digit code (311614).

## Part 1: Gathering data, using the calculator, and reporting to ChemTRAC

Not sure of your NAICS Code? Click this link, [NAICS Code Help](#), to search for your code.

NAICS 2-Digit:	31 – Manufacturing
NAICS 4-Digit:	3116 – Meat Product Mfg.
NAICS 6-Digit:	311614 – Rendering & Meat Processing from Carcasses

### Step 2. Reporting period

In Step 2, you will choose the calendar year from the dropdown menu and select “Yes” in response to the statement “I am ready to report for the year above”.

If your calculations showed you to be below the reporting threshold, you can enter “No” in response to the statement “I am ready to report for the year above” and then enter “I do not meet the threshold.”

### Step 3. Chemical selection

In Step 3, you will identify the ChemTRAC substances that exceed reporting thresholds for your facility. The example below illustrates the selection of Particulate Matter 2.5 (PM<sub>2.5</sub>) for reporting.

<input type="checkbox"/>	Polycyclic Aromatic Hydrocarbons (PAHs)
<input type="checkbox"/>	11104-93-1 Nitrogen Oxides (NO <sub>x</sub> )
<input checked="" type="checkbox"/>	Particulate Matter 2.5 (PM 2.5)
<input type="checkbox"/>	Volatile Organic Compounds (VOCs) Total

### Step 4. Use and release

In Step 4, you will enter information for each substance that you identified in Step 3. You will identify the appropriate row based on whether the substance was “manufactured”, “processed”, “otherwise used” and/or “released to air”. You will then enter the quantity of the substance that your facility released in kilograms, without decimal places.

Next, you will need to **enter the total quantity of the substances that your facility manufactured and released, in kilograms and without decimals**. For example, 17.2 kg would be rounded to 17 kg and 17.6 kg rounded to 18 kg.

Finally, you will select an estimation method from the dropdown menu.

**Select “ChemTRAC calculator” if you have used the ChemTRAC calculator.**

The example on the next page illustrates how to complete Step 4 for PM<sub>2.5</sub> using sample emissions data from Table 2 of this guide. In the example shown, the user has indicated that 124 kg of PM<sub>2.5</sub> are “manufactured” and “released to air”.

## Part 1: Gathering data, using the calculator, and reporting to ChemTRAC

Particulate Matter 2.5 (PM 2.5) (Reporting Threshold = 30.0 kg)	
Quantity (kg)	Estimation Method
If you used more than one method to estimate data, please choose the main one	
Manufactured: ⓘ 124	ChemTRAC calculator
Processed: ⓘ	- Select Estimation Method From List -
Otherwise Used: ⓘ	- Select Estimation Method From List -
<b>Total Use:</b>	124
Release to Air: ⓘ 124	ChemTRAC calculator
Release to Land: ⓘ	- Select Estimation Method From List -
Release to Surface Water: ⓘ	- Select Estimation Method From List -
<b>Total Release:</b>	124

### Step 5. Environmental statement

In Step 5, you have the option of entering information about your environmental activities including: if you have completed environmental training courses, created a Pollution Prevention Plan, or adopted an Environmental Management System. Pollution Prevention Plans are discussed briefly in Part 2 of this guide. You will also specify if you report to the National Pollutant Release Inventory or to the Toronto Sewer Use Bylaw.

### Steps 6 and 7. Summary notification, confirmation and printing

In Steps 6 and 7, you will not enter any new information. You will review the information you provided, submit your report, and receive a printable record.

### Optional reporting for facilities below threshold levels of priority chemicals

For those businesses or facilities that do not meet or exceed ChemTRAC thresholds, the online reporting system allows you to identify yourself as a “non-reporter”. This will allow you to stay informed on ChemTRAC program initiatives. It will also help Toronto Public Health assess trends over time and gauge the effectiveness of the ChemTRAC program.

### Part 2: Reducing the environmental impact of your facility

*This section of the guide provides information about reducing the environmental impact of your facility.*

- *It provides an overview of pollution prevention strategies*
- *It identifies relevant control technologies for reducing emissions*
- *It provides guidance on getting started with pollution prevention.*

### Pollution prevention strategies

The ChemTRAC program requires facilities to report on substances that are manufactured, processes or otherwise used in quantities that are equal to or greater than ChemTRAC reporting thresholds. Although it is not required as part of the ChemTRAC program, it is good business practice for facilities to also take action to reduce the creation, use and release of ChemTRAC priority substances.

Minimizing the use and release of harmful substances at the source is called pollution prevention (or P2) and is widely recognized as good business practice. Collecting data for ChemTRAC gives you the information you need to consider P2 options in your facility.

#### How can a business benefit from pollution prevention (P2)?

- P2 can reduce operating costs from the use of chemicals and energy
- P2 can reduce the costs of waste management and the risk of liability
- P2 can improve worker health and safety
- P2 can improve community relations and build a business' reputation as socially and environmentally responsible
- P2 can improve a business' ability to respond to consumer demands for "greener" products

#### Pollution prevention strategies

Businesses have many options for reducing the use of harmful substances in their facilities. Not all of the options will be relevant to all businesses. Three types of strategies and examples are presented below.

1. **Use low-cost, good operating practices.** Simple changes to normal practices can reduce the use and release of harmful chemicals at no cost to business owners.

*For example: Keep gas burners in good operating condition. Well-maintained equipment uses less gas, saves money, and reduces NO<sub>x</sub> emissions.*

2. **Install control technologies or equipment.** New control technologies and equipment can reduce the release of harmful chemicals and save money by improving operating efficiency.

*For example: Install low NO<sub>x</sub> burners on gas-fired equipment. These burners cut nitrogen oxide emissions in half.*

3. **Modify products or inputs.** Traditional products and processes can be replaced with alternatives that use and release less harmful chemicals.

*For example: Switch to water-based biodegradable cleaners. Though not discussed in the guide, caustic or acidic cleaners emit VOCs.*

## Control technologies for reducing emissions

Control technologies can reduce, but not eliminate, the quantity of ChemTRAC substances that are released from meat processing facilities. Control technologies can be used to help reduce emissions of ChemTRAC substances.

### *Control technologies for particulate matter, VOCs, formaldehyde and acetic acid*

Recall that these substances are released when a continuous smoker is used. A wet scrubber can help reduce the emissions released to air of these substances.

**Wet scrubber.** Wet scrubber describes a variety of devices that remove pollutants from a furnace flue gas or from other gas streams. In a wet scrubber, the polluted gas stream is brought into contact with the scrubbing liquid, by spraying it with the liquid, by forcing it through a pool of liquid, or by some other contact method, so as to remove the pollutants.

### *Control technologies for NO<sub>x</sub> emissions from natural gas equipment*

There are two common control technologies that can help decrease the amount of nitrogen oxides (NO<sub>x</sub>) released from natural gas fired manufacturing equipment: low NO<sub>x</sub> burners and recirculated flue gas.

**Low NO<sub>x</sub> burners.** When natural gas is used to create heat, the gas passes over a flame, gets combusted, and produces combustion by-products, including NO<sub>x</sub>. A low NO<sub>x</sub> burner combusts the gas in several stages. This allows the flame to burn at a cooler temperature, which reduces the amount of NO<sub>x</sub> that is created as a by-product. A low NO<sub>x</sub> burner can reduce NO<sub>x</sub> creation by about 50%.

**Recirculated flue gas.** When natural gas gets combusted to produce heat, the resulting air containing the combustion by-products is called flue gas. If the flue gas is mixed back into the natural gas being fed to the flame (i.e. recirculated), this changes the combustion process and results in less NO<sub>x</sub> being produced. Recirculated flue gas is often used with low NO<sub>x</sub> burners. Recirculated flue gas with low NO<sub>x</sub> burners can reduce NO<sub>x</sub> emissions by about 70%.

Table 3 on the next page summarizes control technologies for Meat processing facilities.

## Part 2: Reducing your facility's environmental impact

**Table 3. Control technologies found in Meat processing facilities**

<b>Manufacturing process</b>	<b>Control technology</b>	<b>ChemTRAC substance being controlled</b>	<b>Reduction ability of the control technology</b>
Continuous meat smoking	Wet scrubber	PM, VOCs, formaldehyde, acetic acid	Reduces PM emissions by 80%, VOCs by 75%, formaldehyde by 50% and acetic acid by 50%
Natural gas fired cookers / dryers	Low NO <sub>x</sub> burners	Nitrogen oxides (NO <sub>x</sub> )	Reduces NO <sub>x</sub> creation by about 50%
	Recirculated flue gas with low NO <sub>x</sub> burners	Nitrogen oxides (NO <sub>x</sub> )	Reduces NO <sub>x</sub> creation by about 70%

## More ways to reduce costs and improve performance

Minimizing the use and release of harmful substances is one aspect of improving environmental performance. Facilities can also take other steps to improve their economic and environmental sustainability.

1. **Reduce energy use.** By reducing energy use, manufacturers can save money on energy bills and reduce their environmental impact. Many energy-efficiency technologies have very short payback periods. Utilities also offer incentives for energy efficiency measures.

To reduce energy use, low-cost, good operating procedures can be adopted, and new technology or equipment can be installed. This includes:

- Undergoing an energy audit to identify opportunities for savings
- Encouraging employees to turn off lights and equipment when not in use
- Replacing old motors and heating units with more efficient equipment
- Installing a programmable thermostat to control heating and cooling
- Purchasing a heat exchanger system to recycle wasted burner heat.

2. **Reduce water use.** Working to reduce water use can save money and provide environmental benefits. Manufacturers can do a number of things to reduce water use.

To reduce energy use, low-cost, good operating procedures can be adopted, and new technology or equipment can be installed. This includes:

- Sweeping floors and machines instead of hosing them down with water
- Posting signs near sinks and hoses to encourage employees to use less water
- Purchasing high pressure, low volume cleaning equipment.
- Purchasing water sprayers with automatic shut-off nozzles.



### Getting started with pollution prevention

The good news is that you've already started by calculating emissions of ChemTRAC priority substances.

Next steps can include:

1. Evaluating actions to reduce use and release of energy, water and ChemTRAC substances.
2. Identifying funding for upgrades to facilities and equipment.
3. Implementing all cost-effective upgrades.
4. Tracking changes in the use and release of energy, water and substances.

To help in these steps, ChemTRAC is offering **free technical assistance visits**, **free training workshops** and additional resources to help businesses create an inventory of chemicals used at their facility, comply with the ChemTRAC program, and identify opportunities to improve their facilities' environmental performance.

For more information, visit:

[http://www.toronto.ca/health/chemtrac/assistance\\_program.htm](http://www.toronto.ca/health/chemtrac/assistance_program.htm) and  
<http://www.toronto.ca/health/chemtrac/gogreen.htm>.

Additional resources on reducing the environmental impact of meat processing facilities include:

- Dalhousie University. 2008. Fact Sheet: Eco-Efficiency in the Food Processing Industry. [http://eco-efficiency.management.dal.ca/Files/Business\\_Fact\\_Sheets/food\\_processing\\_fs.pdf](http://eco-efficiency.management.dal.ca/Files/Business_Fact_Sheets/food_processing_fs.pdf)
- New York State Department of Environmental Conservation. March 2001. Environmental Self-Assessment for the Food Processing Industry. <http://www.fpeac.org/poultry/EnvironmentalSelfAssessmentforFoodProcessingIndustry.pdf>
- Toronto Public Health, ChemTRAC. December 2010. Resource for Greening Food and Beverage Manufacturing: Pollution Prevention Information. [www.toronto.ca/health/chemtrac/pdf/GreenFoodBev.pdf](http://www.toronto.ca/health/chemtrac/pdf/GreenFoodBev.pdf)
- UNIDO. Pollution from food processing factories and environmental protection. [http://www.unido.org/fileadmin/import/32129\\_25PollutionfromFoodProcessing.7.pdf](http://www.unido.org/fileadmin/import/32129_25PollutionfromFoodProcessing.7.pdf)
- US EPA. 2002. Practical Guide to Environmental Management for Small Businesses. [http://www.smallbiz-enviroweb.org/Resources/smallbizfiles/EM\\_Guide0902.pdf](http://www.smallbiz-enviroweb.org/Resources/smallbizfiles/EM_Guide0902.pdf)

## Appendices

*The remaining pages of this guide offer additional material for your reference:*

**Appendix A. Printer-friendly versions of the four worksheets.**

**Appendix B. Additional material related to the ChemTRAC calculator.**

- *Descriptions of the remaining calculator screen*
- *How the calculator uses emission factors to calculate quantities of ChemTRAC substances*
- *How emission factors can be changed to site-specific values.*

**Appendix C. Combining the ChemTRAC calculator with other sources:**

*How to combine the ChemTRAC calculator for Meat processing facilities with emissions data from other sources.*

## Appendix A. Printer-friendly worksheets

These worksheets can be printed and completed by hand so that all information can be readily available for entry into the ChemTRAC calculator.

### Worksheet 1 Table 1 – Overview of meat smoking

<b>Is meat smoked onsite?</b>	<input type="checkbox"/> Yes <input type="checkbox"/> No
<b>How is smoking done?</b>	<input type="checkbox"/> Wood smoke only <input type="checkbox"/> Liquid smoke only <input type="checkbox"/> Both

### Worksheet 1 Table 2 – Total annual quantity of meat smoked

Process	How much meat was smoked?	Units
<b>Wood smoke</b>		<input type="checkbox"/> kilograms (kg) <input type="checkbox"/> pounds (lb) <input type="checkbox"/> tons - UK <input type="checkbox"/> tons – US <input type="checkbox"/> tonnes - metric
<b>Liquid smoke</b>		<input type="checkbox"/> kilograms (kg) <input type="checkbox"/> pounds (lb) <input type="checkbox"/> tons - UK <input type="checkbox"/> tons – US <input type="checkbox"/> tonnes - metric

## Additional Material

### Worksheet 1 Table 3 – Additional information on wood smoking

Complete ONLY if wood smoking is used	
What type of smoker is used?	<input type="checkbox"/> Batch smoker <input type="checkbox"/> Continuous smoker  <b>If a continuous smoker is used:</b> Are emissions controlled with a wet scrubber? <input type="checkbox"/> Yes <input type="checkbox"/> No
How much wood or sawdust was used?	<div style="text-align: right;"> <input type="checkbox"/> kilograms (kg)  <input type="checkbox"/> pounds (lb)  <input type="checkbox"/> tons - UK  <input type="checkbox"/> tons – US  <input type="checkbox"/> tonnes - metric           </div> _____
What type of wood is used?	<input type="checkbox"/> Mesquite <input type="checkbox"/> Hickory <input type="checkbox"/> Maple <input type="checkbox"/> Other / Mix

### Worksheet 2 Table 1 –Blood dryers

Do you operate blood dryers?	<input type="checkbox"/> Yes <input type="checkbox"/> No
------------------------------	---

### Worksheet 2 Table 2 – Quantity of blood meal product dried

What quantity of blood meal product was dried during the reporting year?	<div style="text-align: right;"> <input type="checkbox"/> kilograms (kg)  <input type="checkbox"/> pounds (lb)  <input type="checkbox"/> tons - UK  <input type="checkbox"/> tons – US  <input type="checkbox"/> tonnes - metric           </div> _____
--	---

### Worksheet 3 Table 1 – Control technologies information

<b>Cookers / dryers are equipped with (add a checkmark):</b>	
d. Low NO <sub>x</sub> burners only	_____
e. Low NO <sub>x</sub> burners with recirculated flue gas	_____
f. No control technologies	_____

## Additional Material

### Worksheet 3 Table 2 – Natural gas usage

<b>Option A. Total natural gas used for the cookers / dryers</b>
Add values in cubic metres <b>OR</b> cubic feet: _____ m <sup>3</sup> (cubic metres) or _____ ft <sup>3</sup> (cubic feet)

**OR**

<b>Option B. Thermal rating of the cookers / dryers</b>
Record value in British Thermal Units per hour _____ BTU/hr  Also estimate the average time that the equipment is in operation: _____ hours per day and _____ days per week and _____ weeks per year

## Appendix B. Additional material related to the ChemTRAC calculator

This appendix describes the remaining screens of the ChemTRAC calculator. You do not need to enter any information into these screens. However, if site-specific emission factors are known, they can be entered manually in the Calculations screen.

This appendix also describes emission factors and how the ChemTRAC calculator makes use of them.

### *The ChemTRAC calculator All Substances screen*

The All Substances screen provides a summary of the estimated quantities in kilograms per year of all ChemTRAC priority substances used and/or released by your facility that have been calculated by the ChemTRAC calculator. It also provides a summary of other substances used and/or released by your facility. You do not need to enter any information on this screen.

Refer to Table 1 of this guide to see which processes are responsible for the release of each substance.

Note that the CAS# refers to a unique identifier for the substance as given by the Chemical Abstracts Society. The CAS# is provided for reference only.

This page provides a summary of the estimated quantities of all ChemTRAC priority substances manufactured, processed, otherwise used and/or released.

ChemTRAC Priority Substances	CAS #	Quantity (kg/yr)			
		Manufactured	Processed	Otherwise Used	Released to Air
Benzene	71-43-2	0.0	0	0	0
Cadmium, and its compounds	n/a	0.0	0	0	0
Chromium (non-hexavalent), and its compounds	n/a	0.0	0	0	0
Formaldehyde	50-00-0	0.3	0	0	0
Lead, and its compounds	n/a	0.0	0	0	0
Manganese, and its compounds	n/a	0.0	0	0	0
Mercury, and its compounds	n/a	0.0	0	0	0
Nickel, and its compounds	n/a	0.0	0	0	0
Nitrogen Oxides (NOx)	11104-93-1	200.1	0	0	200
Particulate Matter (PM2.5)	n/a	7.6	0	0	8
Total PAHs	n/a	0.0	0	0	0
Total VOCs	n/a	22.0	0	0	22
<b>Other Substances</b>					
2-Methylnaphthalene	91-57-6	0.0	0	0	0
3-Methylchloranthrene	56-49-5	0.0	0	0	0
7,12-Dimethylbenz(a)anthracene	57-97-6	0.0	0	0	0
Acenaphthene	83-32-9	0.0	0	0	0
Acenaphthylene	208-96-8	0.0	0	0	0
Anthracene	120-12-7	0.0	0	0	0

↓  
Etc.

## Additional Material

### The ChemTRAC calculator Calculations screen

The Calculations screen includes the formulas used to calculate emissions using the information entered in the Input-Output screen. It also lists the emission factors used to calculate the release of substances.

While you do not need to enter any information on this screen, emissions factors can be modified if site-specific information is available (see illustration below).

You can modify the emission factors for meat smoking. You can also modify the emission factors for natural gas combustion listed in the Contaminant table. If emission factors are modified, be sure that they are entered in the appropriate units.

Meat Smoking

Source	Control	Contaminant	CAS #	Emission Factor (lb/ton wood burned)	Emission Rate (kg/yr)	Data Quality
Batch Smoker	None	PM	n/a	53	7.95E+01	D
		PM10 <sup>(1)</sup>	n/a	n/a	7.43E+01	D
		Particulate Matter 2.5 (PM 2.5) <sup>(1)</sup>	n/a	n/a	7.15E+01	D
		Volatile Organic Compounds (VOCs)	n/a	44	6.60E+01	D
Continuous Smoker	None	PM	n/a	140	0.00E+00	D
		PM10 <sup>(1)</sup>	n/a	n/a	0.00E+00	D
		Particulate Matter 2.5 (PM 2.5) <sup>(1)</sup>	n/a	n/a	0.00E+00	D
		Volatile Organic Compounds (VOCs)	n/a	17	0.00E+00	D
		Formaldehyde	50-00-0	1.3	0.00E+00	E
		Acetic Acid	64-19-7	4.5	0.00E+00	E

Contaminant	CAS #	Emission Factor (lb/1000000 ft <sup>3</sup> )			Emission Rate (kg/yr)	Data Quality	Comments
		Uncontrolled	Low NOx	Low NOx Recirc.			
Sulphur Dioxide	7446-09-5	0.6	0.6	0.6	0.0	A	
Nitrogen Oxides (NOx)	11104-93-1	100	50	32	6.7	B	
Carbon Monoxide	630-08-0	84	84	84	5.6	B	
Nitrous Oxide	10024-97-2	2.2	2.2	0.64	0.1	E	
Particulate Matter 2.5 (PM 2.5)	n/a	1.9	7.6	7.6	0.1	B	
Carbon Dioxide	124-38-9	120,000	120,000	120,000	8,004.7	A	
TOC	n/a	11	11	11	0.7	B	
Lead and its compounds	n/a	0.0005	0.0005	0.0005	0.0	D	
Methane	74-82-8	2.3	2.3	2.3	0.2	B	
Volatile Organic Compounds (VOCs)	n/a	5.5	5.5	5.5	0.4	C	
2-Methylnaphthalene	91-57-6	0.000024	0.000024	0.000024	1.60E-06	D	
3-Methylchloranthrene	56-49-5	< 0.0000018	< 0.0000018	< 0.0000018	1.20E-07	E	PAH
7,12-Dimethylbenz(a)anthracene	57-97-6	< 0.000016	< 0.000016	< 0.000016	1.07E-06	E	PAH
Acenaphthene	83-32-9	< 0.0000018	< 0.0000018	< 0.0000018	1.20E-07	E	PAH
Acenaphthylene	208-96-8	< 0.0000018	< 0.0000018	< 0.0000018	1.20E-07	E	PAH
Anthracene	120-12-7	< 0.0000024	< 0.0000024	< 0.0000024	1.60E-07	E	
Benzo(a)anthracene	56-55-3	< 0.0000018	< 0.0000018	< 0.0000018	1.20E-07	E	PAH
Benzene	71-43-2	0.0021	0.0021	0.0021	1.40E-04	B	

Other than to enter site-specific emission factors, all data, sample calculations and information presented in the Calculations screen are for reference only. They should not be modified in any way.

## Additional Material

### *The ChemTRAC calculator References screen*

The Reference screen describes from where the emission factors and assumptions used on the Calculations screen were taken. Source documents can be viewed by clicking on the links. The Reference screen also provides the definitions for 'Manufactured', 'Processed', 'Otherwise Used', and 'Released to Air'. No information needs to be entered on this screen.

Note that this tool is provided solely as an aid, and the City of Toronto makes no representation or warranty as to its applicability to your facility or to your obligation to comply with the Environmental Reporting and Disclosure Bylaw (Municipal Code Chapter 423). It is the responsibility of each facility owner or operator to take the necessary steps to ensure compliance with the bylaw.

The References screen is illustrated below.

This page provides all the reference information for the emission factors and assumptions used in the Calculations spreadsheet. Click on the links below to view the source documents.

Emission factors and an assessment of their data quality are provided in and the US EPA AP-42 "Meat Smokehouses", Section 9.5.2, 1995  
<http://www.epa.gov/ttn/chief/ap42/ch09/final/c9s05-2.pdf>  
US EPA AP-42 "Meat Rendering Plants", Section 9.5.3, 1995  
<http://www.epa.gov/ttn/chief/ap42/ch09/final/c9s05-3.pdf>  
US EPA AP-42 "Natural Gas Combustion", Section 1.4, 1998  
<http://www.epa.gov/ttn/chief/ap42/ch01/final/c01s04.pdf>  
Additional meat smoking emission factors are provided in Chapter 13 of the Air Pollution Engineering Manual, published by the Air & Waste Management Association in 1992.  
Emission factors for liquid smoke provided by Red Arrow International  
<http://www.redarrowinternational.com/index.html>  
Particulate matter size fractions are estimated using South Coast Air Quality Management District "Final –Methodology to Calculate Particulate Matter (PM) 2.5 and PM 2.5 Significance Thresholds", 2006  
[http://www.aqmd.gov/ceqa/handbook/PM2\\_5/finalAppA.doc](http://www.aqmd.gov/ceqa/handbook/PM2_5/finalAppA.doc)

#### Definitions<sup>1</sup>

**Manufacture** - To produce, prepare or compound a priority substance and includes the coincidental production of a priority substance as a by-product.

**Process** - The preparation of a priority substance, after its manufacture, for commercial distribution and includes the preparation of a substance in the same physical state or chemical form as that received by the facility, or preparation which produces a change in physical state or chemical form.

**Otherwise Use** - Any use, disposal or release of a priority substance at a facility that does not fall under the definitions of "manufacture" or "process." This includes the use of the priority substance as a chemical processing aid, manufacturing aid or some other use.

**Release** - The emission or discharge of a priority substance, whether intentional, accidental or coincidental, from a facility into the environment.



## Additional Material

### *Emission factors for Meat processing*

The ChemTRAC calculators are all based on published estimates of the emissions associated with different industrial processes. These estimates are called “emission factors”. Emission factors indicate the amount of a specific substance (e.g. nitrogen oxides) emitted by a specific activity (e.g. burning one cubic metre of natural gas).

Examples of some emission factors used in the ChemTRAC calculator for meat processing are listed in Table 4. If site-specific emission factors are available for the facility or processes, they can be entered in the Calculations sheet of the calculator. This is detailed in the discussion of the calculator’s Calculations screen.

**Table 4. Emission factors used in the Meat processing ChemTRAC calculator**

Source	Substance	Emission Factor
Batch smoking	Particulate matter (PM)	53 lb / tonne wood burned
Continuous smoker	VOCs	17 lb / tonne wood burned
Liquid smoke	Acetic acid	0.04 g per kg meat smoked
Natural gas equipment - uncontrolled	Nitrogen oxides	160.18 kg / 100,000 m <sup>3</sup>

#### Example: Using emission factors to estimate NO<sub>x</sub> emissions from natural gas fired manufacturing equipment

Table 4 shows that 160.18 kg of NO<sub>x</sub> is emitted for every 100,000 m<sup>3</sup> of natural gas burned without any control technologies.

Assume a facility uses 1,000,000 m<sup>3</sup> of natural gas for manufacturing in 2011.

#### **Total emissions of NO<sub>x</sub> for 2011 from natural gas-fired equipment**

= Emissions per unit of natural gas \* Volume of natural gas used in 2011

= 160.18 kg / 100,000 m<sup>3</sup> \* 1,000,000 m<sup>3</sup>

**= 1601.8 kg of NO<sub>x</sub>**

## Appendix C. Combining the Meat processing Calculator with other sources

Depending on your business, you may need to use more than one calculator to calculate the use and release from all processes at your facility. The "Calculation of Totals" calculator can be used to compile your data.<sup>4</sup> In this calculator, you can enter the values for each process at your facility. The calculator returns the total manufactured, processed or otherwise used amounts for the facility, by substance, and then compares it to the corresponding reporting threshold.

The total combined release of substances (whether from the ChemTRAC Meat processing calculator only, or from other substance quantification methods as well) should be compared to the mass reporting thresholds listed in Schedule A of the Environmental Reporting and Disclosure Bylaw and provided in Table 5 on the last page of the guide.

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<sup>4</sup> The Calculation of Totals calculator can be found under the Totals bullet at <http://www.toronto.ca/health/chemtrac/tools.htm>.

## Additional Material



### Calculation of Totals

Last Update: October 21, 2011 by YS, JA, & ZI

- |  |
|--|
| <p>* This page gathers information to help you determine your facility-wide substance manufacture, process, otherwise use (MPO) and release estimates.</p> <p>* For each source of priority substances, enter the process name and then provide the quantity of each substance manufactured, processed, otherwise used and released.</p> <p>* In the "MPO" columns, identify whether the priority substance was manufactured, Processed or Otherwise used. To do this you may consult the "Guide to Reporting" available at <a href="http://www.toronto.ca/chemtrac">www.toronto.ca/chemtrac</a>. The definitions are provided in the Examples tab.</p> <p>* At the end of each row, you will find the facility-wide totals that need to be compared with the Mass Reporting Thresholds.</p> <p>* The last 4 columns indicate the amount of each substance that you must report to the City of Toronto</p> |
|--|

**The total quantities of ChemTRAC substances that would have to be reported are listed here**

Group	Pollutant	Quantity (kg/yr)				Quantity (kg/yr)				Totals to be reported with threshold (kg/yr)	Mass Reporting Threshold (kg/yr)	Reportable?	To be reported			
		Manufactured	Processed	Otherwise Used	Released to Air	Manufactured	Processed	Otherwise Used	Released to Air				Total Manufactured	Total Processed	Total Otherwise Used	Total Released to Air
		Process#1:				Process#2:							(kg/yr)	(kg/yr)	(kg/yr)	(kg/yr)
A	Acetaldehyde*									0	100	No	---	---	---	---
	Acrolein*									0	100	No	---	---	---	---
	Benzene*									0	100	No	---	---	---	---
	1,3-Butadiene*									0	100	No	---	---	---	---
	Carbon tetrachloride*									0	100	No	---	---	---	---
	Chloroform (Trichloromethane)*									0	100	No	---	---	---	---
	Chromium (non-hexavalent) <sup>1</sup>									0	100	No	---	---	---	---
	1,2-Dibromoethane (Ethylene dibromide)									0	100	No	---	---	---	---
	1,4-Dichlorobenzene*									0	100	No	---	---	---	---
	1,2-Dichloroethane (Ethylene dichloride)*									0	100	No	---	---	---	---
	Dichloromethane (Methylene chloride)									0	100	No	---	---	---	---
	Formaldehyde*									0	100	No	---	---	---	---
	Manganese <sup>1</sup>									0	10	No	---	---	---	---
	Nickel <sup>1</sup>									0	100	No	---	---	---	---
	Tetrachloroethylene (Perchloroethylene)									0	100	No	---	---	---	---
	Trichloroethylene*									0	100	No	---	---	---	---
	Vinyl chloride									0	100	No	---	---	---	---
	Cadmium <sup>1</sup>									0	1	No	---	---	---	---
Chromium (hexavalent) <sup>1</sup>									0	10	No	---	---	---	---	
Lead <sup>1</sup>									0	10	No	---	---	---	---	
Mercury <sup>1</sup>									0	1	No	---	---	---	---	
B	Total polycyclic aromatic hydrocarbons (PAHs)*									0	10	No	---	---	---	---
	Nitrogen oxides (NOx)									0	200	No	---	---	---	---
C	Particulate matter 2.5 (PM2.5)									0	30	No	---	---	---	---
	Total Volatile organic compounds (VOCs) <sup>2</sup>									0	100	No	---	---	---	---

## Additional Material

**Table 5. ChemTRAC priority substances and their reporting thresholds (adapted from Schedule A of the Environmental Reporting and Disclosure bylaw)**

ChemTRAC substance	ChemTRAC Mass reporting threshold (kg/yr)	Concentration threshold <sup>c</sup> % w/w
<b>Group A: report if sum of quantity manufactured, processed and otherwise used exceeds thresholds</b>		
Acetaldehyde	100	1
Acrolein	100	1
Benzene	100	1
1,3-Butadiene	100	1
Cadmium and its compounds	1	0.1
Carbon tetrachloride	100	1
Chloroform (Trichloromethane)	100	1
Chromium, Hexavalent and its compounds	10	0.1
Chromium, Non-hexavalent and its compounds	100	1
1,2-Dibromo ethane (Ethylene dibromide)	100	1
1,4-Dichlorobenzene	100	1
1,2-Dichloroethane (Ethylene dichloride)	100	1
Dichloromethane (Methylene chloride)	100	1
Formaldehyde	100	1
Lead and its compounds	10	0.1
Manganese and its compounds	10	1
Mercury and its compounds	1	0
Nickel and its compounds	100	1
Tetrachloroethylene (Perchloroethylene)	100	1
Trichloroethylene	100	1
Vinyl chloride	100	1
<b>Group B: report if sum of quantity released, disposed and transferred exceeds thresholds</b>		
Polycyclic Aromatic Hydrocarbons (PAHs)	10	N/A <sup>b</sup>
<b>Group C: report if quantity released to air exceeds thresholds</b>		
Nitrogen Oxides (NO <sub>x</sub> )	200	N/A
Particulate Matter 2.5 (PM <sub>2.5</sub> )	30	N/A
Volatile Organic Compounds (VOCs) total	100	N/A

**Notes:**

- N/A = not applicable
- The concentration threshold % w/w is not relevant to the emissions quantified using the ChemTRAC calculator for Meat processing

## Appendix D. Reporting Checklist

### Environmental Reporting and Disclosure Bylaw (Municipal Code Chapter 423)

#### Checklist for Facilities in Toronto

Make sure the data you submit in your reports are accurate. Here is a checklist to help you.

- Enter complete facility and contact information. If you are a consultant, identify yourself as the technical contact.
- Submit a **separate** report for **each** facility in Toronto.
- Complete the statement of certification.
- Report **all** of the priority substances (chemicals) that meet or exceed (equal to or greater than) the reporting thresholds.
- Report **both use and release** amounts of all priority substances that meet or exceed the reporting thresholds.
- Estimate use and release for **all** sources and processes in your facility.
  - This includes process such as heating by natural gas combustion, welding, equipment cleaning, drilling, grinding, crushing, sanding, and blending.
- Review the exemptions in the bylaw, such as building heating, and do not include these in your calculations.
- Compare current year estimates with that of previous years (if available) and explain any differences if present.
- If you report to NPRI and there is a difference between the amount of a substance reported to ChemTRAC and NPRI, explain the reason for the difference.
- You may need to make your records available for audit purposes. Securely store the records you based your report on and document:
  - Assumptions and parameters used for calculation and estimation of emissions
  - Procedures and methods used to measure emissions
  - Calibration records of any equipment used to measure emissions

## Additional Material

### Use and Release Calculations

- There are many sources of information that can help you identify the priority substances in your facility. Be sure to check all of them, including:

purchase records	year-end inventory	Material Safety Data Sheets (MSDS)
raw materials	Certificate of Approval or Environmental Compliance Approval	correspondence with supplier

- Use the best available method for use and release estimation. Use (if any) the most appropriate and most recent ChemTRAC calculator (available at [toronto.ca/health/chemtrac/tools.htm](http://toronto.ca/health/chemtrac/tools.htm)).
- Enter all the reportable data in kilograms (kg).
- Calculate the **total** amount of a substance used and released in **all** processes.
  - For example, process 1 used 90 kg VOC and released 75 kg. Process 2 used 60 kg VOC and released 56 kg. The total amount of use would be  $90+60=150$  kg and release  $75+56=131$  kg.
  - To help with these calculations you can use the free online ChemTRAC totals calculator.
- Double check that **decimal places** are entered in the correct place (e.g. 3.47 vs. 347)
- Check that the **total release** amount (release to land+water+air) is equal to or less than **total use** amount (manufactured+processed+otherwise used).
- Use the **average value** for use and release estimation if the substance content is listed in a range (e.g. 10-12% VOCs) on Material Data Safety Sheets or on other sources of substance data.
- The following priority substances are VOCs. Be sure to report them separately **and also include** them in your VOC estimation:

Acetaldehyde	Acrolein	Benzene
1.3-butadiene	Carbon Tetrachloride	Chloroform
1,4-Dichlorobenzene	1,2-Dichloroethane	Formaldehyde
Trichloroethylene	Vinyl chloride	Polycyclic Aromatic Hydrocarbons (PAHs)

## Additional Material

- Consider the effects of pollution control devices (e.g. filter) in the emission calculations.
- Consider the amount of waste transferred off-site (if any) in emission calculations.

**Disclaimer:** *This checklist is for information only. The City of Toronto assumes no liability for accuracy or completeness. Readers are responsible for ensuring compliance with Toronto's Environmental Reporting and Disclosure Bylaw (Municipal Code Chapter 423). This information should not be relied upon as a substitute for legal or professional advice. Readers should seek their own legal or professional advice in regard to their use of the information contained in it.*