Environment and Climate Change Canada
Environnement et Changement climatique Canada

REPORTING GUIDANCE for the Wastewater Sector to the National Pollutant Release Inventory

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Contact Information
ec.inrp-npri.ec@canada.ca
1-877-877-8375

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Disclaimer

Should any inconsistencies be found between this Guide and the official *Canada Gazette* Notices and their amendments, the most recent Government Notice from the Department of the Environment in the *Canada Gazette* with respect to the substances in the National Pollutant Release Inventory will prevail.

Table of Contents

List of Figures

List of Tables

Preface

Introduction

The National Pollutant Release Inventory (NPRI), a federal program created in 1992, is the only nation-wide, publicly-accessible inventory that provides information on pollutants released to the environment, disposed of, and transferred for recycling. Some of these substances are manufactured, processed or used by municipal wastewater facilities (see the Terminology section) and result in potential discharges to the environment. Under the authority of subsection 46(1) of the *Canadian Environmental Protection Act, 1999* (CEPA 1999), the discharges of NPRI substances from wastewater facilities are required to be reported to the NPRI.

This Guide was developed to help wastewater facility operators/managers understand the NPRI reporting requirements and how they should report. This will improve the quality of reporting, and the accuracy of information provided.

This Guide is intended to be equally useful to both small and large wastewater facilities. Managers of small facilities will find Section 3.1 of particular interest.

This Guide provides information to supplement the *Guide for Reporting to the National Pollutant Release Inventory.* Additional guidance regarding information on the estimation methodologies and calculation examples may be found in the *NPRI Toolbox*.
For wastewater facilities, all substances collected in the influent from industrial, commercial or residential sources, or produced during wastewater treatment are considered to be incidentally processed or otherwise used and are therefore to be considered as "by-products".

Cette publication est aussi disponible en français sous le titre de « *Guide de déclaration à l'Inventaire national des rejets de polluants à l'intention du secteur des eaux usées* ».

Exclusions from this guide

Some activities commonly associated with wastewater sector services are not included in this Guide but are covered in the other guidance documents, including the *Guide for Reporting to the National Pollutant Release Inventory*. These activities include:

- laboratory operations,
- stationary combustion equipment operations,
- sewage sludge incineration,
- non-hazardous solid waste incineration, and
- hazardous waste incineration.

Terminology

Following are definitions of two basic terms used in this Guide:

Wastewater Treatment Sector – This refers to wastewater facilities serving communities, and includes, but is not limited to, wastewater facilities owned and/or operated by municipalities; wastewater facilities on federal lands serving communities (such as military bases) and wastewater facilities on Aboriginal lands serving Aboriginal communities. The wastewater facilities may also be owned and/or operated by private individuals or corporations in public-private partnership situations. The North American Industry Classification System (NAICS) code associated with this sector is 221320 (sewage treatment facilities).

Wastewater Facility – This refers to both the wastewater collection system and wastewater treatment system. It also includes wastewater collection systems where wastewater is directly discharged to a water body without treatment (see Section 1.2 Definition of Wastewater Facility for NPRI – Reporting Purposes in Chapter 1 for more information). NPRI reports are required from all wastewater facilities (treatment plants and collection systems) which meet the reporting requirements.

Structure of this guide

This Guide includes four chapters: the first helps the wastewater facility determine whether to report; the second discusses how to report the releases and disposals; the third provides specific additional guidance for reporting needs; and the fourth provides guidance associated with data quality.

1 Chapter one

1.1 Step 1: Determine whether a report is required for your facility - Overview

Wastewater facilities that met certain criteria must report releases, disposals and transfers of designated substances to the NPRI. This section identifies steps to determine whether your facility met the threshold requirements for reporting, and, if so, whether any designated substances could potentially meet the threshold for reporting on a substance-by-substance basis.

Figure 1 identifies the sequence of steps to determine whether a report is required. These steps are detailed further in this chapter.

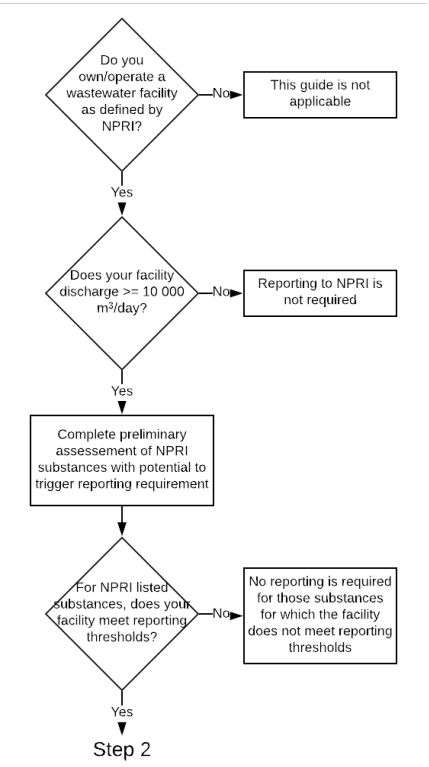

Figure 1 - Step 1: Flow chart for determining whether a report is required for your facility.

1.2 Definition of wastewater facility for NPRI reporting purposes

For NPRI purposes, a wastewater facility is defined as wastewater collection/ treatment systems that discharge treated or untreated wastewater into surface waters with an annual average flow rate of 10 000 cubic metres per day or more. For NPRI reporting, a wastewater facility includes both treatment **and** collection systems.

A wastewater collection system is the system of sewers and/or ditches that convey sanitary or combined sewage for a community. The volume of sewage released to surface waters from the collection system must be included in the calculation of annual average discharge per day from the wastewater facility. These include:

- direct discharge of sewage from a main outfall where no treatment exists,
- sanitary sewer system overflows,
- combined sewer system overflows, and
- pumping station or storage tank overflows.

For the purpose of NPRI reporting, a sewer overflow event is defined as a discharge of diluted raw sewage to surface water from the collection system. These events can happen at locations in the sewer network, or at pumping and storage facilities.

A wastewater collection system includes adjacent service areas or adjoining sewer sheds that function as a single integrated system for a community. When determining whether your facility met the flow threshold and substance reporting criteria, you must consider discharges to the environment from **all** components of the system. Where no wastewater treatment systems exist, the wastewater facility is the entire collection system, and may require NPRI reporting if it met the discharge threshold.

A wastewater treatment system is a plant or process that accepts a community's and/or industrial wastewater collection system flows and treats them to remove substances from the wastewater. The volume of both treated and untreated sewage released from the wastewater treatment system must be included in the calculation of annual average discharge per day from the wastewater facility. These include:

- effluent flows,
- sludge treatment discharges (waste sludge/biosolids),
- backwash and filter discharges released to surface waters (i.e., not including process waste recycled back into the wastewater treatment system),
- tank drainage released to surface waters (i.e., not including process waste recycled back into the wastewater treatment system), and

- bypass flows released to surface waters (untreated or partially treated) for repair and maintenance activities, or otherwise from hydraulic overloads.

For the purpose of NPRI reporting, a bypass event is defined as a discharge of untreated or partially treated sewage from a wastewater treatment plant. Typically, this is caused by a bypass or short-circuiting of the secondary treatment process(es) and results in a discharge of blended primary and secondary treated sewage.

Communities with collection systems discharging into another community's collection system do not have to report to the NPRI. If the receiving community meets the reporting requirements, reporting may be required.

While all releases, disposal and transfers need to be reported, the key releases from the wastewater facilities include releases to water, air, and to land, including those to land and water from overflows and bypasses and spills. Disposals of sludge and biosolids must also be included in the reporting data.

1.3 Assessment of whether a wastewater facility met the discharge threshold

For any given reporting year, the discharge threshold triggering NPRI reporting for a wastewater facility is an annual daily average of 10 000 cubic metres or more to surface waters. There is no minimum threshold of employee hours.

Daily average discharge is calculated based on the total flows in the reporting year. Total flows include effluent discharges, bypass event flows at the wastewater treatment plant and/or at pumping stations, combined sewer overflows, and sanitary sewer system discharges to surface waters. The total of all these flows is divided by the number of days in a year (365 days or 366 days for leap years) to obtain the average daily discharge.

Consider the total discharges from all components that function as an integrated system for the community. The collection system may comprise of several adjacent service areas, and there may be a number of treatment plants within the system. Collection systems that are not adjoining and serve distinct communities within a regional municipality should be considered separately.

Treatment plants must submit individual facility reports, including any overflows (bypass events) or other discharges from the collection system associated with the plant. Collection systems that discharge raw sewage may be reported as a single facility.

If your system did not meet the 10 000 cubic metres daily average discharge threshold further action is not needed and no NPRI report is required. For Environment and Climate Change Canada's (ECCC) information and records, inform the NPRI that you have completed the calculations and determined that no report is required. However, if it is determined that your facility did meet the discharge threshold, the next step is to determine whether any NPRI substances need to be reported.

The following section provides typical examples of wastewater collection and treatment systems. Each example defines the facility boundaries and the application of the discharge threshold. The components of the wastewater infrastructure used in the illustrations are shown in **Figure 2**.

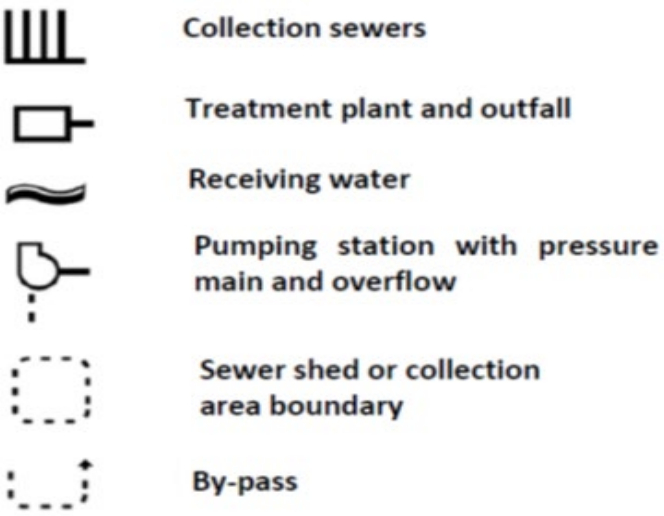

Figure 2 - Typical wastewater infrastructure components.

Scenario 1

Description:

A community is served by a single gravity wastewater collection system with no overflows or pumping stations, and a treatment plant as shown in **Figure 3**.

Facility boundary:

This is considered single facility.

Discharge threshold:

The average daily flow threshold is applied to the releases from the treatment plant plus any bypass events from the treatment plant.

Reporting of substances (if substance thresholds are satisfied):

Quantities of substances released in final effluent from the treatment plant are reported as direct discharges, receiving waters are identified and concentrations are supplied. Quantities of substances from bypass events are reported as spills, receiving waters are identified and concentrations are supplied.

Note that depending on the situation, the facility may also need to report for disposals and/or transfers.

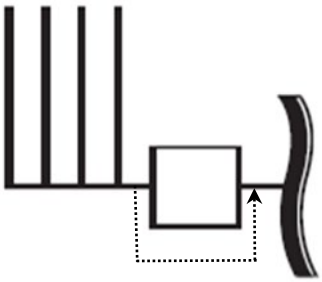

Figure 3 - Scenario 1: Single gravity collection system and a treatment plant.

Scenario 2

Description:

A community is served by a wastewater collection and treatment system that consists of two or more sewage sub-systems connected by pressure mains and a single treatment plant as shown in **Figure 4**. The pumping stations have overflows that occasionally release to surface waters. The treatment plant has bypass events that occasionally release to surface waters.

Facility boundary:

This is considered single facility.

Discharge threshold:

The average daily flow threshold is applied to the releases from the treatment plant, plus any overflows from the pumping station and bypass events from the treatment plant.

Reporting of substances (if substance thresholds are satisfied):

Quantities of substances released in final effluent from the treatment plant are reported as direct discharges, receiving waters are identified and concentrations are supplied.

Quantities of substances from overflow and bypass events are reported as spills, receiving waters are identified and concentrations are supplied.
Note that depending on the situation, the facility may also need to report for disposals and/or transfers.

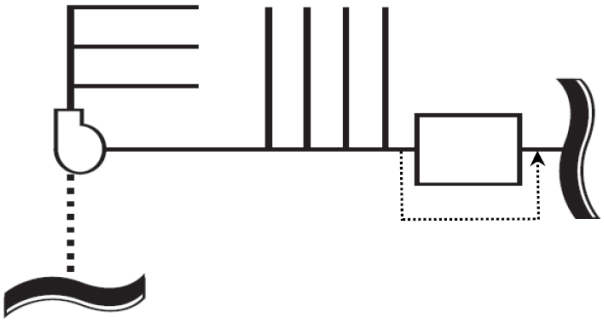

Figure 4 - Scenario 2: Multiple sub-systems with one treatment plant.

Scenario 3

Description:

A community is served by a wastewater collection system that consists of two or more separate wastewater collection and treatment systems as shown in **Figure 5**. The systems are not connected, but the separate systems serve adjacent service areas or sewer sheds and function as a single, integrated system for the community.

Facility boundary:

In this situation, each system is considered individually, and would report separately if applicable.

Discharge threshold:

The average daily flow threshold is applied to the total releases from all treatment plants (including their bypasses) and overflows.

Reporting of substances (if substance thresholds are satisfied):

Quantities of substances released in final effluent from the treatment plants are reported as direct discharges for each facility, receiving waters are identified and concentrations are supplied.

Quantities of substances from overflows and bypass events from the treatment plants are reported as spills for each separate facility report and concentrations are supplied.

Note that depending on the situation, the facility may also need to report for disposals and/or transfers.

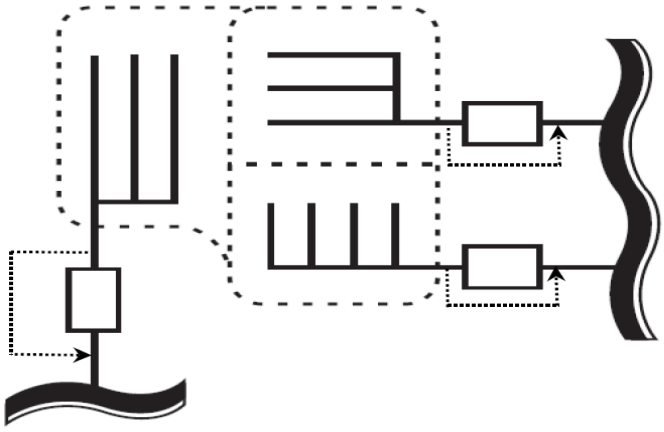

Figure 5 - Scenario 3: Multiple sewer sheds with multiple treatment plants.

Scenario 4

Description:

A community is served by two or more collection sub-systems that release raw sewage to surface waters as shown in **Figure 6**. The sub-systems serve adjacent (contiguous) sewer sheds and function as a single, integrated system for the community.

Facility boundary:

This is considered single facility.

Discharge threshold:

The average daily flow threshold is applied to the total release from all sub-systems within the community.

Reporting of substances (if substance thresholds are satisfied):

Quantities of substances released from the system are reported as direct discharges, receiving waters are identified and concentrations are provided. Note that depending on the situation, the facility may also need to report for disposals and/or transfers.

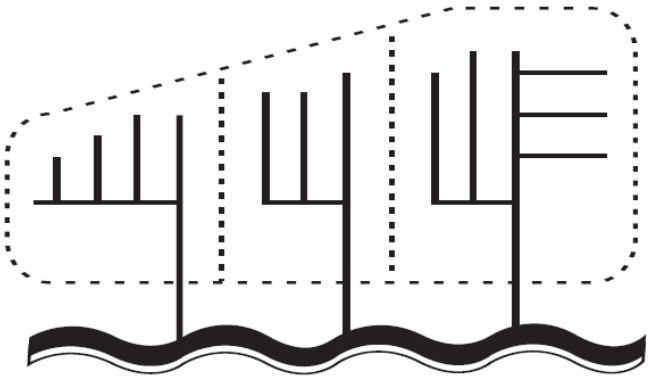

Figure 6 - Scenario 4: Multiple sub-systems and multiple sewer sheds discharging raw sewage to surface water.

1.4 Substance reporting thresholds

Facilities that met the discharge threshold must report for substance(s) that met the applicable threshold(s). **Table 1–1** is a brief summary of the reporting threshold characteristics for the substance groups. It is important to also consult the appropriate edition of the ECCC publication *Guide for Reporting to the National Pollutant Release Inventory* for complete information and details on reporting thresholds.

For wastewater facilities, all substances collected in the influent from industrial, commercial or residential sources, or produced during wastewater treatment are considered to be incidentally processed or otherwise used and are therefore to be considered as "by-products". As a result, there is no threshold concentration for substances in the influent or produced, and facilities must report the releases, disposals and transfers of any such NPRI substances that exceed the specified mass reporting thresholds.

Part 1A and 1B substances, found only in products used in the facility, are not considered in the threshold calculations if substance concentration in the product was below the concentration threshold (by weight) (e.g., fuels, solvents). Refer to the most recent *Guide for Reporting to the National Pollutant Release Inventory.*

1.5 Information sources and factors to consider for preliminary assessment of NPRI substances

This section provides information sources and guidance for facilities about the factors influencing the substances commonly found in wastewater.

1.5.1 Information sources

The following four potential sources of information should be reviewed:

- water and wastewater design and technical guides,
- safety data sheets,
- NPRI Toolbox, and
- permits and regulatory approvals.

To determine which NPRI substances may be present and released or disposed of, wastewater, facilities may find the following additional sources of information helpful:

- monitoring data on influent, effluent and biosolids quality,
- information from sewer use by-law monitoring or enforcement,
- information from industrial sewer use compliance agreements or monitoring of industrial customer discharges,
- information from the composition of the community industrial customer base,
- NPRI reports submitted by industrial customers reporting releases to the wastewater treatment facility,
- regulatory reports submitted by industrial customers reporting releases and use,
- information on sewer system configuration (i.e., combined sewer system versus sanitary sewer system), and
- literature and technical information available on typical substances and their release concentrations to various media.

Table 1-1: Summary of the substance reporting threshold.

Guidance notation	NPRI *Canada Gazette* notice reference	Type of threshold	Threshold value (per year)
Part 1A Substances	Schedule 1, Part 1, Group A substances	Commonly referred to as "core substances", this group makes up the majority of substances on the NPRI list and most have been on it since the start of the NPRI.	10 tonnes

Guidance notation	NPRI *Canada Gazette* notice reference	Type of threshold	Threshold value (per year)
Part 1B substances	Schedule 1, Part 1, Group B substances	These substances are referred to as "alternate threshold substances" and have a lower reporting threshold than Part 1A substances. They may have significant environmental or human health impacts in small amounts.	Low thresholds – Varies by substance
Part 2 substances (PAHs)	Schedule 1, Part 2 substances	These substances are polycyclic aromatic hydrocarbons (PAHs) that may be used as commercial chemicals, incidentally manufactured in certain industrial processes, or contained in tailings.	50 kg for all 31 PAHs combined
Part 3 substances	Schedule 1, Part 3 substances	These substances are polychlorinated dibenzo-p-dioxins (dioxins), polychlorinated dibenzofurans (furans) and hexachlorobenzene that are released as by-products of industrial and combustion processes. They can be found as contaminants in pesticides, solvents or wood preservatives.	Activity-based. Generally not applicable to the wastewater sector
Part 4 substances	Schedule 1, Part 4 substances	These substances are known as criteria air contaminants (CACs), commonly released from combustion sources that can cause or contribute to air issues such as smog and acid rain.	CO: 20 tonnes NO_x: 20 tonnes (expressed as NO_2) $PM_{2.5}$: 0.3 tonnes PM_{10}: 0.5 tonnes SO_2: 20 tonnes TPM: 20 tonnes VOCs: 10 tonnes
Part 5 substances (speciated VOCs)	Schedule 1, Part 5, substance	These substances are volatile organic compounds (VOCs) also known as "speciated VOCs" which are subject to additional reporting requirements. They are listed on the NPRI in three groups: individual substances, isomer groups, and other groups and mixtures.	1 tonne air release, if 10 tonnes total VOC threshold has been met

NPRI does not require additional monitoring or measurement of the quantities or concentration of substances released to the environment, beyond those already required under the provisions of other laws or regulations. You are, however, required to show "due diligence" in obtaining the information required for reporting. Refer to the *Guide for Reporting to the National Pollutant Release Inventory* for more information. A literature review of reported concentrations of NPRI substances in wastewater is identified in **Tables 1–2, 1–3** and **1–4**.

1.5.2 Factors to consider

Several factors will determine what NPRI substances are released, disposed of, or transferred from wastewater facilities. These factors include:

- wastewater collection system customer base (i.e. the number and types of industrial dischargers to the system), wastewater collection system characteristics (i.e. combined system or sanitary system)
- wastewater treatment system configuration and process (i.e. passive versus active treatment systems, final destination of products from the process)
- substances used in, or produced by the process (i.e. use of chemicals, transformation of substances in some treatment trains), and
- other emission considerations

1.5.3 Wastewater collection system customer base

Knowledge of the type of discharges to sanitary sewer systems (residential, organic chemical manufacturing, high-tech industry, etc.) will assist in determining what substances should be addressed.

In communities with predominantly residential sanitary sewage volumes, assess the annual production of typical substances, which include total reduced sulphur, ammonia and products of chlorination, such as chloroform (where chlorination is used for disinfection in the treatment process). Additional substances may include total phosphorus, metals and other products from residential and commercial cleaning functions, including car washes.

In communities with a mix of residential and industrial and/or commercial customers, consider the potential reporting requirements based on the nature of the discharges by non-residential customers. Total phosphorus and metals such as copper, zinc and manganese are among the more common Part 1A substances in wastewater that may exceed the 10-tonne reporting threshold, depending on flow volumes and substance

concentrations. The lower reporting thresholds for Part 1B substances, including mercury, cadmium, arsenic, lead and hexavalent chromium (and their compounds), as well as Part 2 substances (PAHs), means that these substances are commonly reportable.

1.5.4 Wastewater collection system characteristics

Combined sewer systems carry stormwater as well as sanitary sewage. If your wastewater facility treats combined sewage, you will need to consider the loadings of contaminants in the stormwater when estimating levels of substances in the wastewater your facility handles. Such substances include, but are not limited to, arsenic, cadmium, chromium, cobalt, copper, manganese, mercury, molybdenum, nickel, lead, selenium, vanadium, zinc, and PAHs. For wastewater facilities serving a diverse industrial client base, substances present as a result of runoff will likely add to the total loadings already present in the wastewater stream. For wastewater facilities serving a primarily residential customer base with a combined sewer system, substances in the wastewater from runoff may have come from the stormwater component of combined sewage.

1.5.5 Wastewater treatment system configuration and process

The configuration of a wastewater treatment system (or lack of a treatment system) will influence the quantities of substances released to various media, and can influence the transformation of some NPRI substances. For example, use of aeration will increase the quantity of volatile substances released to air.

1.5.6 Substances used in or produced by the process

In addition to substances in the influent, you must consider products **used** in the wastewater treatment process, and substances **produced** by the process. The identification of substances produced, will depend on the treatment process and substances used or present in the influent. **Table 1–2** identifies NPRI substances produced/used in various processes. Some substances produced or used, may also be present in the influent, in which case you must consider both the quantities in the influent and the quantities produced/used.

1.5.7 Other emission considerations

Wastewater treatment facilities may have other emission sources to consider when determining total NPRI substance quantities released, disposed of or transferred. The operation of stationary equipment, for example co-generation equipment and standby power systems, may result in releases of particulate matter and nitrogen oxides. In addition, emissions or releases resulting from other on-site activities may need to be

included in the estimates for total releases, disposals, or transfers of substances from the facility. For these types of emissions, which are not specifically related to wastewater stream releases, disposals, and transfers, refer to the *Guide for Reporting to the National Pollutant Release Inventory*.

It should be noted that in the Tables provided below, if only a range of concentration is available for a substance, use the average of the range for threshold determination or release calculation unless there is a reason to expect higher than average concentrations.

1.6 Identification of a short list of NPRI substances for release estimation in step 2

1.6.1 Introduction

If your facility met the discharge threshold and you expect that some NPRI substances were present or released in excess of the reporting thresholds, you must next identify specific substances of potential concern. The technique recommended in this section is designed to develop a list of potential substances for your particular facility that will require further calculations for reporting purposes (i.e. substances that will be carried forward to Chapter 2).

Tables 1–2, 1–3 and **1–4** summarize substances in wastewater influent, effluent and biosolids with typically measurable concentrations. These results are provided for reference, as part of the initial screening assessment. Substances of concern for individual facilities will vary based on a number of factors, as identified in Section 1.5 above. By using monitoring data, literature values and an assessment of non-residential discharges to the sewer system, it is possible to assess which NPRI substances may be of potential concern.

Table 1-2: Literature concentration ranges for NPRI substances reported in influent or effluent and substances used or produced by the wastewater treatment activities.

NPRI substance	Influent concentration	Effluent concentration	Production or use (by process)	CAS number or other substance identifier	NPRI threshold (tonnes MPO)
Ammonia (Total)	22,000-31,000 µg/L (CCME, 2005)		Used as NH_4OH as caustic agent	NA-16	10
	42.3 mg/L (Australian Government, June 2011)		Formed during Headworks Screening, Grit Separation Biological process		
Antimony (and its compounds)	0.43-0.54 µg/L (CCME, 2005)	0.6-9 µg/L (CCME, 2005)*		NA-01	10
	<0.005-3.0 µg/L (ECCC, 2010, 2011, 2012)	<0.005-1.99 µg/L (ECCC, 2010, 2011, 2012)**			
Arsenic (and its compounds)	<0.118-7.06 µg/L (ECCC, 2010, 2011, 2012, 2018)	0.11-4.39 µg/L (ECCC, 2010,2011, 2012, 2018)**		NA-02	0.05
Benzene	1–2 ppb (Stubin et al., 1996)	<0.5- <1 µg/L (CCME, 2005)*		71-43-2	10
Bisphenol A	34-8000 ng/L (Median 400 ng/L) (Guerra et al., 2015)	5-7400 ng/L (Median 150 ng/L) (Guerra et al., 2015)**		80-05-7	0.1
Bis (2-ethylhexyl) phthalate	19–54 µg/L (CCME, 2005)	1.2-33.9 µg/L (CCME, 2005)*		117-81-7	10
2-Butoxyethanol	33–80 ppb (Lepri et al., 1997)			111-76-2	10
	2–44 ppb (Stubin et al., 1996)				
Cadmium	0.29–1.88 µg/L	0.02-14 µg/L		NA-03	0.005

NPRI substance	Influent concentration	Effluent concentration	Production or use (by process)	CAS number or other substance identifier	NPRI threshold (tonnes MPO)
	(CCME, 2005)	(CCME, 2005)*			
	<0.026-16.9 µg/L (ECCC, 2010, 2011, 2012, 2018)	0.004-4.29 µg/L (ECCC, 2010, 2011, 2012, 2018)**			
Carbon disulphide	0.057 ppm (Environment Australia, 1999)			75-15-0	10
Carbon tetrachloride	0 ppb (Stubin et al., 1996)	38 ppb (Stubin et al., 1996)		56-23-5	10
Chlorobenzene			Formed during chlorine disinfection	108-90-7	10
Chloroform	2.5-3.2 µg/L (CCME, 2005)	2.16-4.0 µg/L (CCME, 2005)*	Formed during chlorine disinfection	67-66-3	10
Chromium (and its compounds)	0–0.3 ppm (CWWA, June 14, 2001)	0–0.2 ppm (CWWA, June 14, 2001)		NA-04	10
	<0.038-197 µg/L (ECCC, 2010, 2011, 2012, 2018)	<0.038-55.9 µg/L (ECCC, 2010, 2011, 2012, 2018)**			
Hexavalent chromium (and its compounds)	2-3 µg/L (CCME, 2005)	<0.2-140 µg/L (CCME, 2005)*		NA-19	0.05
Cobalt (and its compounds)	0.58–1.06 µg/L (CCME, 2005)	<5-15 µg/L (CCME, 2005)*		NA-05	0.05
	<0.006-42.7 µg/L (ECCC, 2010, 2011, 2012, 2018)	<0.006-34.2 µg/L (ECCC, 2010, 2011, 2012, 2018)**			
Copper (and its compounds)	106-123.3 µg/L (CCME, 2005)	3.3-190 µg/L (CCME, 2005)*	Used as $CuSO_4$	NA-06	10
	0.098 mg/L (Australian Government, June 2011)				
	0.123 ppm (Environment Australia, 1999)	1.12-119 µg/L (ECCC, 2010, 2011, 2012, 2018)**			
	16-344 µg/L (ECCC, 2010, 2011, 2012, 2018)				

NPRI substance	Influent concentration	Effluent concentration	Production or use (by process)	CAS number or other substance identifier	NPRI threshold (tonnes MPO)
Dibutyl phthalate	Di-n-butyl phthalate: 1-2 µg/L (CCME, 2005) Di-*n*-butyl phthalate: 14–68 ppb (Lepri et al., 1997) Di-*iso*-butyl phthalate: 32–114 ppb (Lepri et al., 1997) 0.044 ppm (Environment Australia, 1999)	Di-n-butyl phthalate: 0.3-1620 µg/L (CCME, 2005)*		84-74-2	10
o-Dichlorobenzene (1,2-Dichloro benzene)	22 ppb (Stubin et al., 1996)	<0.5-4.61 µg/L (CCME, 2005)*		95-50-1	10
p-Dichlorobenzene (1,4-Dichloro-benzene)	0.6-1.55 µg/L (CCME, 2005)	0.06-4.61 µg/L (CCME, 2005)*		106-46-7	10
1,2-Dichloropropane	1 ppb (Stubin et al., 1996)			78-87-5	10
Diethyl phthalate	3–250 ppb (Stubin et al., 1996)			84-66-2	10
N, N-Dimethylaniline (and its salts)		Dimethylaniline: 26–64 ppb (Clark et al., 1991)		121-69-7	10
N, N-Dimethyl-formamide		Dimethylformamide: 32 ppb (Clark et al., 1991)		68-12-2	10
Dimethyl phthalate	5–13 ppb (Lepri et al., 1997)			131-11-3	10
Ethylbenzene	0.8 µg/L (CCME, 2005) 1–11 ppb (Stubin et al., 1996)	<0.5-4.91 µg/L (CCME, 2005)*		100-41-4	10
Ethylene glycol	21–50 ppb (Lepri et al., 1997)			107-21-1	10

NPRI substance	Influent concentration	Effluent concentration	Production or use (by process)	CAS number or other substance identifier	NPRI threshold (tonnes MPO)
Hydrogen sulphide	Sulphide: 96-131 µg/L (CCME, 2005)	Sulphide: <0.05-4.8 µg/L (CCME, 2005)*	Formed during non-aerated treatment processes	7783-06-4	10
	2.86 ppm (Environment Australia, 1999)				
	2.2-670 µg/L (ECCC, 2015)	<2-8.2 µg/L (ECCC, 2015)			
Lead (and its compounds)	9.16-13 µg/L (CCME, 2005)	0.2- <200 µg/L (CCME, 2005)*		NA-08	0.05
	<0.006-47.8 µg/L (ECCC, 2010, 2011, 2012, 2018)	<0.006-4.94 µg/L (ECCC, 2010, 2011, 2012, 2018)**			
Manganese (and its compounds)	44-109 µg/L (CCME, 2005)	18-753 µg/L (CCME, 2005)*		NA-09	10
	0.177 mg/L (Australian Government, June 2011)	4.35-985 µg/L (ECCC, 2010, 2011, 2012, 2018)**			
	12.8-868 µg/L (ECCC, 2010, 2011, 2012, 2018)				
Mercury (and its compounds)	0.12-0.26 µg/L (CCME, 2005)	0.0065-0.36 µg/L (CCME, 2005)*		NA-10	0.005
	0.00026 mg/L (Australian Government, June 2011)	<0.003-0.301 µg/L (ECCC, 2010, 2011, 2012)**			
	<0.003-1.67 µg/L (ECCC, 2010, 2011, 2012)				
Methanol			Used as the carbon source for denitrification	67-56-1	10
Molybdenum trioxide	Molybdenum: 2.57-3.57 µg/L (CCME, 2005)	<5-47.0 µg/L (CCME, 2005)*		1313-27-5	10
	Molybdenum: <0.005-35 µg/L (ECCC, 2010, 2011, 2012, 2018)	Molybdenum: <0.005—23.9 µg/L (ECCC, 2010, 2011, 2012, 2018)**			
Naphthalene	0.12-0.35 µg/L (CCME, 2005)	0.05-0.38 µg/L (CCME, 2005)*		91-20-3	10

NPRI substance	Influent concentration	Effluent concentration	Production or use (by process)	CAS number or other substance identifier	NPRI threshold (tonnes MPO)
	0.044-1.2 µg/L (ECCC, 2014)	0.0068-0.24 µg/L (ECCC, 2014)**			
Nickel (and its compounds)	3-6.7 ug/L (CCME, 2005)	2.1-900 µg/L (CCME, 2005)*		NA-11	10
	<0.017-674 µg/L (ECCC, 2010, 2011, 2012, 2018)	<0.0170-43.6 µg/L (ECCC, 2010, 2011, 2012, 2018)**			
Nitrate ion	1.77 ppm (Bertrand-Krajewski et al., 1995)	<80-28,400 µg/L (CCME, 2005)*	Formed during pre-treatment and secondary treatment	NA-17	10
Nitrogen oxides (expressed as NO_2)		5-4,800 µg/L (CCME, 2005)*	Formed during the biological nitrogen removal process	11104-93-1	20 tonnes release to air
Nitrilotriacetic acid (and its salts)			Used as the chelating agent	139-13-9	10
N-Nitroso-diphenylamine	12–57 ppb (Lepri et al., 1997)	0.043-3 µg/L (CCME, 2005)*		86-30-6	10
Nonylphenol and its ethoxylates	Nonylphenol: 240–465 ppb (Lepri et al., 1997)	Nonylphenol: <0.020-16 µg/L (CCME, 2005)*	Formed during the biological process	NA-20	1
	Nonylphenol: 0.7–155 ppb (Bennie, 1999)				
	4-nonylphenol: Median 2540 ng/L 4-nonylphenol diethoxylate: Median 1300 ng/L 4-nonylphenol monoethoxylate: Median 2300 ng/l (ECCC, 2013)	4-nonylphenol: Median 203 ng/L 4-nonylphenol diethoxylate: Median < 330 ng/L 4-nonylphenol monoethoxylate: Median 124 ng/l (ECCC, 2013)**			
Octylphenol and its ethoxylates	4-n-octylphenol: Median < 26.4 ng/l (ECCC, 2013)	4-n-octylphenol: Median < 3.6 ng/l (ECCC, 2013)**		NA-21	10
Phenol (and its salts)	26-40 µg/L (CCME, 2005)	0.067-20 µg/L (CCME, 2005)*		108-95-2	10

NPRI substance	Influent concentration	Effluent concentration	Production or use (by process)	CAS number or other substance identifier	NPRI threshold (tonnes MPO)
Phenanthrene	0.19-0.98 µg/L (CCME, 2005)	<0.05-1.1 µg/L (CCME, 2005)*		85-01-8	0.05
	0.029-1.3 µg/L (ECCC, 2014)	0.0078-0.27 µg/L (ECCC, 2014)**			
Phosphorus (total)	4,700-6,900 µg/L (CCME, 2005)	190-2,460 µg/L (CCME, 2005)*		NA-22	10
Phthalic anhydride	3–8 ppb (Lepri et al., 1997)			85-44-9	10
Selenium (and its compounds)	0.3 µg/L (CCME, 2005)	<1-30.6 µg/L (CCME, 2005)*		NA-12	0.1
	<0.02120.4 µg/L (ECCC, 2010, 2011, 2012, 2018)	<0.021-12.9 µg/L (ECCC, 2010, 2011, 2012, 2018)**			
Silver (and its compounds)	2.67-2.75 µg/L (CCME, 2005)	0.12-1,250 µg/L (CCME, 2005)*		NA-13	10
	<0.005-85.9 µg/L (ECCC, 2010, 2011, 2012, 2018)	0.001-2.52 µg/L (ECCC, 2010, 2011, 2012, 2018)**			
Tetrachloroethylene	0.43-10.6 µg/L (CCME, 2005)	<0.5-120 µg/L (CCME, 2005)*		127-18-4	10
Thallium (and its compounds)	<0.001 – 0.091 µg/L (ECCC, 2010, 2011, 2012, 2018)	<0.001 - 0.014 µg/L (ECCC, 2010, 2011, 2012, 2018)**		NA-37	0.1
Toluene	0.7-2.6 µg/L (CCME, 2005)	0.48-15 (CCME, 2005)*		108-88-3	10
	2–47 ppb (Stubin et al., 1996)	2–110 ppb (Stubin et al., 1996)			
Total Reduced Sulphur			Formed during headworks, grit separation, aerobic and anaerobic processes	NA-M14	10 (air releases only)
1, 2, 4-Trichlorobenzene	2–44 ppb (Stubin et al., 1996)	0.01-0.36 µg/L (CCME, 2005)*		120-82-1	10
Trichloroethylene	1–46 ppb (Stubin et al., 1996)	<0.5-4.68 µg/L (CCME, 2005)*	Formed during chlorine disinfection	79-01-6	10
Vanadium (and its compounds	0–0.1 ppm (CWWA, June 14, 2001)	10.8 - <20 µg/L (CCME, 2005)*		NA - 40	10
	<0.006-67.2 µg/L	<0.006-75.4 µg/L			

NPRI substance	Influent concentration	Effluent concentration	Production or use (by process)	CAS number or other substance identifier	NPRI threshold (tonnes MPO)
	(ECCC, 2010, 2011, 2012, 2018)	(ECCC, 2010, 2011, 2012, 2018)**			
Xylene (all isomers)	0.8-5 µg/L (CCME, 2005)	0.37-27 µg/L (CCME, 2005)*		1330-20-7	10
Zinc (and its compounds)	68.2-103.7 µg/L (CCME, 2005)	10-1,400 µg/L (CCME, 2005)*	Used as a possible source	NA-14	10
	0.12 mg/L (Australian Government, June 2011)	0.682-133 µg/L (ECCC, 2010, 2011, 2012, 2018)**			
	19.2-705 µg/L (ECCC, 2010, 2011, 2012, 2018)				

(*) Secondary/Tertiary treatment

(**) Primary with chemical assist/Secondary/Lagoon/Advanced

Table 1-3: Concentrations of NPRI substances in sludge reported in the literature.

NPRI substance (and compounds)	Concentration in sludges and biosolids (dry basis)	CAS number or substance identifier	NPRI threshold (tonnes MPO)
Antimony	<0.003-32.3 µg/g (ECCC, 2010, 2011, 2012)*	NA-01	10
Arsenic	1.18-49.2 µg/g (Metcalfe & Eddy, 2014)** 0.05-12.2 µg/g (ECCC, 2010, 2011, 2012)*	NA-02	0.05
Bisphenol A	38-12,000 ng/g (Median 460 ng/g) (Guerra et al., 2015)*	80-05-7	0.1
Cadmium	0.21-11.8 µg/g (Metcalfe & Eddy, 2014)** <0.0067-94 µg/g (ECCC, 2010, 2011, 2012)*	NA-03	0.005
Chromium	6.74-1160 µg/g (Metcalfe & Eddy, 2014)** 2.18-157 µg/g (ECCC, 2010, 2011, 2012)*	NA-04	10
Cobalt	0.87-290 µg/g (Metcalfe & Eddy, 2014)** 0.06-138 µg/g (ECCC, 2010, 2011, 2012)*	NA-05	0.05
Copper	115-2580 µg/g (Metcalfe & Eddy, 2014)** 36.3-25816.7 µg/g (ECCC, 2010, 2011, 2012)	NA-06	10
Lead	5.81-450 µg/g (Metcalfe & Eddy, 2014)** 0.78-423 µg/g (ECCC, 2010, 2011, 2012)*	NA-08	0.05
Manganese	34.8-14,900 µg/g (Metcalfe & Eddy, 2014)** 6.47-4240 µg/g (ECCC, 2010, 2011, 2012)*	NA-09	10
Mercury	0.17-8.3 µg/g (Metcalfe & Eddy, 2014)** 0.01-9.02 µg/g (ECCC, 2010, 2011, 2012)*	NA-10	0.005
Naphthalene	27-1400 ng/g (Median 150 ng/g) (ECCC, 2014)*	91-20-3	10
Nickel	7.44-526 µg/g (Metcalfe & Eddy, 2014)** 0.37-79.7 µg/g (ECCC, 2010, 2011, 2012*)	NA-11	10

NPRI substance (and compounds)	Concentration in sludges and biosolids (dry basis)	CAS number or substance identifier	NPRI threshold (tonnes MPO)
Nonylphenol and its ethoxylates	4-nonylphenol: Median 62900 ng/g 4-nonylphenol diethoxylate: Median 1240 ng/g 4-nonylphenol monoethoxylate: Median 4390 ng/g (ECCC, 2013)*	NA-20	1
Octylphenol and its ethoxylates	4-n-octylphenol: Median 64.7 ng/g (ECCC, 2013)*	NA-21	10
Phenanthrene	28-5100 ng/g (Median 405 ng/g) (ECCC., 2014)*	85-01-8	0.05
Selenium	1.1-24.7 µg/g (Metcalfe & Eddy, 2014)**	NA-12	0.1
	0.03-25.8 µg/g (ECCC, 2010, 2011, 2012)*		
Silver	<0.0002-16.4 µg/g (ECCC, 2010, 2011, 2012)*	NA-13	10
Thallium	<0.0002-0.81 µg/g (ECCC, 2010, 2011, 2012)*	NA-37	0.1
Vanadium	0.64-303 µg/g (ECCC, 2010, 2011, 2012)*	NA-40	10
Zinc	216-8550 µg/g (Metcalfe & Eddy, 2014)**	NA-14	10
	12.5-2870 µg/L (ECCC, 2010, 2011, 2012)*		

(*) concentration in biosolids

(**) concentration in sludges

Table 1-4: Literature concentration values for NPRI Substance reported in air.

NPRI substance	Air emission factor (g/m³)	Other related data	CAS number or other substance identifier	NPRI threshold (tonnes/year)
Ammonia (Total)	2.2 (Battye et al., 1994)		NA-16*	10 (MPO)
Chloroform	0.014 (US EPA, Apr. 1987)		67-66-3	10 (MPO)
Nitrogen oxides (expressed as NO_2)	0.00025–32.9 (estimate)	N_2O–N/g sewage–N (Barton and Atwater, 2002)	11104-93-1	20 (releases to air)
		0.04– 524 g N/m³ sewage (CWWA, June 14, 2001)		
Volatile organic compounds	1.07 (US EPA WEBFIRE, 2016)		NA - M16*	10 (releases to air)

**No single CAS number applies to this NPRI listing.*

Table 1-5: Sludge production estimates for various wastewater treatment processes reported in the literature (Metcalf & Eddy, 2014).

Treatment Process	Dry Solids ($kg/10^3 m^3$)	
	Range	Typical
Primary Sedimentation	110-170	150
Activated Sludge	70-100	80
Trickling Filter	60-100	70
Extended Aeration	80-120	100
Aerated Lagoon	80-120	100
Filtration	12-24	20
Algae Removal	12-24	20
Chemical Addition for Phosphorus Removal - Low Lime	240-400	300
Chemical Addition for Phosphorus Removal – High Lime	600-1300	800
Suspended Growth Nitrification	Negligible	Negligible
Suspended Growth Denitrification	12-30	18

1.6.2 Selecting substances of potential concern

Whether a substance has the potential to reach the reporting threshold levels in a year will depend, in part, on the concentration of the substance in the raw wastewater and the annual average daily flow rate of the facility. You should review information available to you to identify NPRI substances present at concentrations sufficient to trigger a reporting requirement. Based on your average flow rate, **Equation 1** can be used to ascertain the concentrations of substances required to exceed the reporting thresholds for your particular facility:

$$\boldsymbol{C_{substance} = (T \times 10^6\ g/tonne)/(Q_{facility} \times 365\ days/year)} \qquad \textbf{EQ - 1}$$

Where:

$C_{substance}$: concentration of a substance in the influent that will trigger a reporting requirement, mg/l, or g/m^3, or ppm;

T: NPRI threshold*, tonne/year;

$Q_{facility}$: average daily flow rate of discharge from your collection/treatment system, m^3/day;

(*): For substances with lower thresholds, it may be more convenient to use kilograms rather than tonnes and inserting the appropriate conversion factor.

The results of these calculations can be compared to concentrations from monitoring data, literature values and other information sources (such as an Industrial Waste Program) to determine which substances may be of concern.

For facilities with high daily average flow rates, some NPRI substances may be reportable at threshold concentrations less than the method detection limits. In such cases, you will need information from biosolids concentrations or from the reported information in the NPRI database to estimate releases or disposals, as discussed in Chapter 2.

For the purposes of initial assessment of threshold amounts, it is assumed that substances present in parts per million (ppm) are measurable in terms of milligrams per litre (or grams per cubic metre).

1.6.3 Triggering reporting for Part 1 substances

Part 1 (both 1A and 1B) substances are assessed on the basis of whether they were manufactured, processed or otherwise used (MPO). As a general rule, reporting for Part

1 substances is triggered by the amount of substance initially present in the raw wastewater (collection system and treatment plant). Part 1 substances reduced in volume by the treatment process must be assessed on the basis of raw wastewater concentrations, even if the amount of substance released or disposed of, subsequent to treatment, was less than the trigger reporting threshold. For example, the concentration by weight of many organic substances on the Part 1 substance list is greater in raw wastewater than the total weight released or disposed of because the substances are transformed by biological wastewater treatment. Release and disposal calculations are described in Chapter 2. Exceptions to the general rule for triggering Part 1 substances on the basis of raw wastewater concentrations include:

- Part 1 substances produced as a result of the process (e.g., chlorine disinfection by-products). In this case, the quantity of substance produced should be used to determine whether the threshold was exceeded.
- Part 1 substances present in the raw wastewater *and* produced by the process (e.g., nonylphenols). In this case, the quantity of substance in the raw wastewater plus that produced should be used to determine whether the threshold was exceeded.
- Part 1 substances used in the process like chlorine or chlorine dioxide. In this case, the total amount of substance used, plus any present in the raw wastewater, should be used to determine whether the threshold is exceeded.

On an annual basis, a substance present at:

- 1 ppm will accumulate to 10 tonnes with a daily flow rate of just over 27 300 m^3/day,
- 2.7 ppm will accumulate to 10 tonnes with a daily flow rate of just over 10 000 m^3/day,
- 10 ppm will accumulate to 10 tonnes with a daily flow rate of just over 2 700 m^3/day, and
- 25 ppm will accumulate to 10 tonnes with a daily flow rate of about 1 100 m^3/day.

Note that Part 1A NPRI substances present in the raw wastewater at concentrations of 2.7 ppm (2.7 mg/L) or higher will trigger a reporting requirement at the minimum flow criterion of 10 000 m^3/day.

The substances with lower thresholds (i.e., Part 1B substances) will accumulate to their threshold levels with concentrations in parts per billion (ppb) for many facilities. For example, the reporting threshold for mercury is 5 kg. At a concentration of 1 ppb (1

µg/L) in the raw wastewater, mercury will accumulate annually to 5 kg with a daily flow of 13 700 m^3/day.

Refer to the literature values provided in **Tables 1–2** and **1–3** for indications of which substances may be of typical concern based on your flow rate. When reviewing figures in **Table 1–3**, remember that biosolids data could be useful to estimate raw wastewater concentrations for Part 1 substances. As a result, calculations must take into account removal efficiencies in the process and releases to other media, as described in Chapter 2.

1.6.4 Triggering reporting for Part 2, Part 4 and Part 5 substances

Part 2 substances are assessed on the basis of quantities released, disposed of or transferred. The quantities of Part 2 substances in biosolids, effluent and overflows (or other untreated discharges) and released to the air are used to determine whether the reporting trigger was met. For a conservative assessment, Part 2 substance concentrations in raw wastewater could be used to assess trigger thresholds.

Part 4 and Part 5 substances are assessed on the basis of quantities released to air. Part 4 and Part 5 substances may be released throughout the collection system, the treatment process or through operation of stationary equipment on site. On-site stationary combustion equipment is not addressed in this Guide, for further information, refer to the NPRI Toolbox.

Emission factors, where available, could be used to assess what Part 4 and Part 5 substances exceeded the release threshold. Emission factors are discussed in Chapter 2 and in the *NPRI Toolbox*.

1.6.5 Preliminary list

Based on the calculations of your facility flows with reporting threshold limits, along with additional community-specific sources of information and literature values, you will be able to develop a list of potential substances of concern. This list of substances forms the basis for calculations of releases and disposals in the next step, described in Chapter 2.

2 Chapter two

Step 2: Estimate releases and disposals and collect the information required for the NPRI report

2.1 Overview

From Chapter 1, NPRI reporters will have a list of substances that potentially exceeded their respective threshold reporting limits. The next step is to estimate quantities of these substances released to each media (air, water or land) or, alternatively, the quantities of substances transferred or disposed of.

Step 2 comprises of several steps, as identified in Figure 7. As a result of the more detailed calculations and information review of wastewater information in Step 2, NPRI reporters may discover that some substances did not exceed threshold limits to trigger reporting. In addition, reporters may find that they have insufficient information to assess the presence of certain substances. For this reason, the final number of substances reported might be less than that initially developed in Step 1.

2.2 Classify substances

Various substances respond differently to the treatment process, and this response will affect the calculations of volumes released to air, water, sludge or biosolids (treated sludge).

NPRI substances of potential concern for wastewater treatment facilities can be classified into five groups according to their physical properties, and their fate and transformation during treatment:

- metals,
- volatile organics,
- volatile inorganics,
- non-volatile substances, and
- special substances.

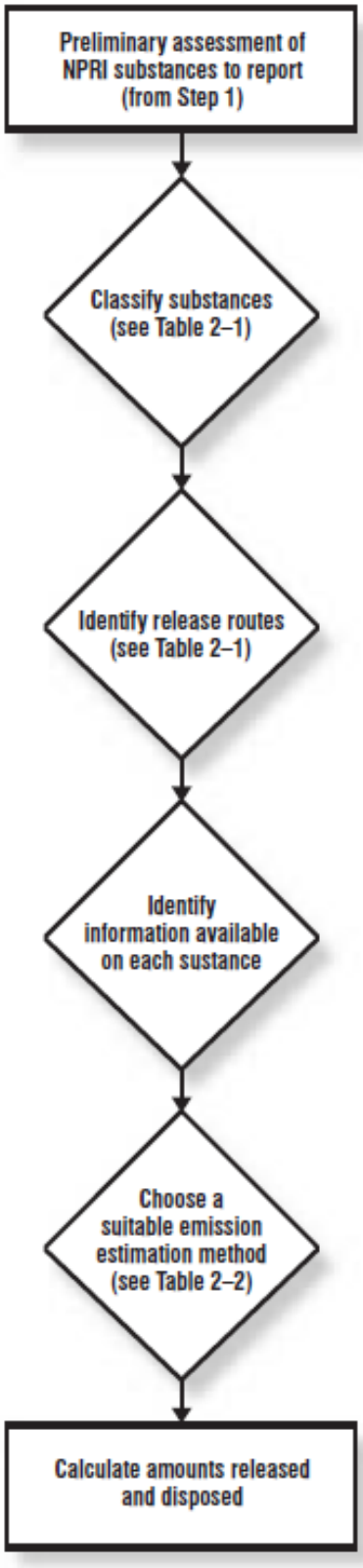

Figure 7 - Step 2: Estimate releases, transfers, disposals and spills

2.2.1 Metals

Metals do not change throughout such treatment processes, although they can occur in different forms. As a result, the total released and/or disposed of is equal to the total in raw wastewater. Metals are released primarily to sludge and biosolids. There are insufficient data to assess what portion of metals is captured in raw solids (screenings, grit and scum) however, it is known that metals originate primarily from industry and domestic graywater. Effluent can also contain trace amounts of metals, depending upon the type of treatment employed. Metals are not normally released to air.

NPRI reporters will likely base the metal release and disposal estimates on biosolids monitoring results. As indicated in section 2.6, this estimation method must take into account removal efficiencies of the process to calculate releases to water on the basis of known solids' concentrations.

2.2.2 Volatile organics

Volatile organics can be degraded to simple compounds, depending on the type of biological treatment used. As a result, the total released and/or disposed is less than the total in influent when biological treatment is involved. It is important to note that volatile organics listed in Part 1A must be considered individually with respect to the 10-tonne reporting threshold. In addition, if the aggregated air releases of all volatile organic compounds (VOCs) is 10 tonnes or more, the total amount must be reported collectively as "VOCs" (Total VOCs is reportable as a Part 4 substance). If a VOC is a Part 5 substance and released to air, it must be considered with respect to the 1-tonne reporting threshold. Volatile organics are released to air, effluent, sludge and biosolids.

Nonylphenol and Octylphenol are exceptions of a VOCs that increase in concentration as a result of biological treatment. These are formed as a result of biodegradation of surfactant (i.e. alkylphenol ethoxylates).

2.2.3 Volatile inorganics

Volatile inorganics can behave in a similar way to volatile organics. They are released to air, effluent and sludge. Their possible presence in biosolids and raw solids must be determined for each individual compound.

Unlike volatile organics, volatile inorganics can be either decomposed or formed as a result of various physical or chemical phenomena depending on the type of treatment used. Special consideration of ammonia emissions to air should be provided for wastewater treatment facilities.

2.2.4 Non-volatile substances

Non-volatile substances are typically released to effluent, sludge, and biosolids, and can be altered during the treatment processes.

2.2.5 Special substances

Special substances are those that cannot be generalized by each of the above four groups. For the wastewater sector, the special substances of concern are phosphorus (total), mercury, and total reduced sulphur (TRS). Phosphorus and mercury are released to all media (air, water and land) but for the purpose of NPRI, reporting of TRS emissions are limited to releases to air only. ECCC provides guidance for estimating TRS emissions as hydrogen sulphide (H_2S) using H_2S equivalence factors for various sulphur compounds contributing to TRS. A separate sub-section is provided to focus on the reporting of phosphorus, which has been valued as a nutrient in its impacts on the environment.

2.2.6 Substance summary

Substances identified in Tables 1–2, 1–3 and 1–4 (Chapter 1), are categorized in Table 2–1 into the five substance groups. In some cases, substances are known to be present for various release routes, but there is no reliable information available to estimate release proportions; in such cases, question marks (?) are shown in Table 2–1.

Table 2-1: NPRI substance classes processed used and manufactured at municipal wastewater treatment facilities and their release routes

Class	Substance	Release route				
		Air	Effluent	Sludge	Raw Solids	Biosolids
Metals	Antimony	X	√	√	?	√
	Arsenic	X	√	√	?	√
	Cadmium	X	√	√	?	√
	Chromium (III)	X	√	√	?	√
	Chromium (VI)	X	√	√	?	√
	Cobalt	X	√	√	?	√
	Copper	X	√	√	?	√
	Manganese	X	√	√	?	√
	Nickel	X	√	√	?	√
	Selenium	X	√	√	?	√
	Silver	X	√	√	?	√
	Vanadium	X	√	√	?	√
	Zinc	X	√	√	?	√
Volatile organic compounds	Benzene	√	√	√	?	?
	Bis(2-ethylhexyl) phthalate	√	√	√	?	?
	2-Butoxyethanol	√	√	√	?	?
	Carbon tetrachloride	√	√	√	?	?
	Chlorobenzene	√	√	√	?	?
	Chloroform	√	√	√	?	?
	Dibutyl phthalate	√	√	√	?	?
	o-Dichlorobenzene	√	√	√	?	?
	(1,2-Dichlorobenzene)	√	√	√	?	?
	p-Dichlorobenzene	√	√	√	?	?
	(1,4-Dichlorobenzene)	√	√	√	?	?
	1,2-Dichloropropane	√	√	√	?	?
	Diethyl phthalate	√	√	√	?	?
	N,N-Dimethylaniline	√	√	√	?	?
	N,N-Dimethylformamide	√	√	√	?	?
	Dimethyl phthalate	√	√	√	?	?
	Ethylbenzene	√	√	√	?	?
	Ethylene glycol	√	√	√	?	?
	Methanol	√	√	√	?	?
	Naphthalene	√	√	√	?	?
	N-Nitrosodiphenylamine	√	√	√	?	?
	Nitrilotriacetic acid	√	√	√	?	?
	Nonylphenol	√	√	√	?	?
	Octylphenol	√	√	√	?	?
	Phenol	√	√	√	?	?
	Phenanthrene (a PAH)	√	√	√	?	?
	Phthalic anhydride	√	√	√	?	?
	Tetrachloroethylene*	√	√	√	?	?
	Toluene	√	√	√	?	?
	Total volatile organic compounds	√	√	√	?	?
	1,2,4-Trichlorobenzene	√	√	√	?	?
	Trichloroethylene	√	√	√	?	?

	Xylene	√	√	√	?	?
Volatile inorganics	Ammonia	√	√	√	?	?
	Carbon disulphide	√	√	√	?	√
	Chlorine	√	√	√	?	?
	Hydrogen sulphide	√	√	√	?	?
	Nitrogen oxides	√	√	√	?	?
Non-volatile substances	Molybdenum trioxide	X	√	√	?	?
	Nitrate ion	X	√	√	?	?
Special substances	Mercury	√	√	√	?	√
	Total phosphorus	√	√	√	?	√
	Total reduced sulphur	√	√	√	?	√

*Notes: * behaves as a VOC, though technically not a VOC.*

2.3 Identify release routes

The release routes for various substances depend on their classification (i.e., their physical properties). Release routes for which literature information exists are identified in Table 2–1. The release routes available for substance release or disposal will depend, in part, on the wastewater system configuration and process characteristics. For example, biosolids treatment at wastewater facilities can involve a series of processes. Each of these processes may result in on-site releases to air, or in off-site disposal when biosolids are transported for disposal or land application.

In addition to releases of substances from the wastewater treatment system, NPRI reporters must consider release routes available via the collection system. For example, release of Part 4 and Part 5 substances to air can occur in the collection and treatment systems.

2.4 Identify information available on each substance

In the preceding steps, a list of potential substances that trigger reporting requirements has been developed based on flows and literature or facility data. In addition, the most common substances have been classified, and generic release routes identified. The final information required is substance-specific information.

There are several potential sources of information, including:

- measured data on effluent, biosolids, air emissions, and raw wastewater from monitoring programs associated with municipal or provincial regulatory approvals
- measured data on industrial customer discharges
- reported information in the NPRI database

- compliance agreements for sewer use, and
- emission factors for air releases for specific substances or processes.

Data from commercial and industrial sewer use agreements, facility NPRI reports, and regulatory reporting are recommended for use when gathering data on discharge quantities to the sewer system.

2.5 Choose a suitable release estimation method

2.5.1 Estimation methods

There are seven methods of estimating quantities of substances released or disposed of, which include:

- continuous emission monitoring
- predictive emission monitoring
- source testing
- mass balance
- published emission factors
- site-specific emission factors, and
- engineering estimates.

Detailed information about each of these methods can be found in the Guide for Reporting to the National Pollutant Release Inventory – Methods for Estimating Quantities of NPRI Substances.

2.5.2 Suitability of methods for the substance classifications

The applicability of the estimation methods to each substance class is summarized in Table 2–2. In general:

- The monitoring or source testing method can be applied (indicated by an ''a'', for (applicable)) to all release routes except for many air releases.
- The mass balance method can be used for releases of all substance classes to each media.
- The emission factor method is applicable to air emissions of both volatile organics and inorganics. In theory, this method can be applied to releases to all media, but the available data for the wastewater sector is limited to air emissions of volatile organics and inorganics.
- The engineering estimation method can be based on either removal efficiency or mass transfer principles through applicable physical and chemical laws.

- The removal efficiency-based engineering estimation method is applicable to releases other than air of all substance classes. Data available to the wastewater sector are, however, limited to metals and volatile organics.
- The mass transfer-based engineering estimation method is only applicable to air emissions of volatile organics and inorganics.

Table 2-2: Applicability of release estimating methods to substance classes

Substance class	Release route	Emission estimating method				
					Engineering estimation	
		Monitoring or source testing	Mass balance	Emission factor	Removal efficiency	Mass transfer
Metals	Air	N/A	a	N/A	N/A	N/A
	Effluent	a	a	x	a	N/A
	Sludge	a	a	x	a	N/A
	Raw Solids	a	a	x	a	N/A
	Biosolids	a	a	x	a	N/A
Volatile organics	Air	a	a	a	N/A	a
	Effluent	a	a	x	a	N/A
	Sludge	a	a	x	a	N/A
	Raw solids	a	a	x	a	N/A
	Biosolids	a	a	x	a	N/A
Volatile inorganics	Air	a	a	a	N/A	a
	Effluent	a	a	x	x	N/A
	Sludge	a	a	x	x	N/A
	Raw solids	a	a	x	x	N/A
	Biosolids	a	a	x	x	N/A
Non-volatile substances	Air	N/A	a	N/A	N/A	N/A
	Effluent	a	a	x	x	N/A
	Sludge	a	a	x	x	N/A
	Raw solids	a	a	x	x	N/A
	Biosolids	a	a	x	x	N/A
Special substances	Air	a	a	a	a	a
	Effluent	a	a	x	x	N/A
	Sludge	a	a	x	x	N/A
	Raw solids	a	a	x	x	N/A
	Biosolids	a	a	x	x	N/A

Notes: a- applicable and data potentially available/attainable
x- No data
N/A – Not applicable

2.5.3 Practical application of methods for calculations

In most cases, a combination of methods will be used to estimate releases and disposals. For example, with monitoring information on biosolids' concentrations of substances, estimation of releases to water can also be made. This estimation requires knowledge of your facility's removal efficiencies or, alternatively, you may rely on literature values for removal efficiencies. (Available literature values are provided in **Table 2–3** as shown below.). Extrapolation from monitoring data, with assistance of engineering estimation, is expected to be the most common method used by the wastewater sector to estimate releases to water and disposals off site in biosolids.

Table 2-3: Typical pollutant removal efficiencies of wastewater treatment processes for select NPRI substances

Treatment process	Ammonia/ nitrogen	Inorganic nitrogen	Sulphides	VOCs	Metals
Coagulation, flocculation, sedimentation	N/A	N/A	N/A	N/A	60–99%
Primary sedimentation	N/A	N/A	N/A	N/A	0–60%
Sedimentation following biological treatment	N/A	N/A	N/A	N/A	60–99%
Sedimentation following biological treatment with chemical addition to influent	N/A	N/A	N/A	N/A	60–99%
Conventional aerobic treatment	0–20%	0–20%	90–99%	60–99%	N/A
Biological denitrification	60–99%	60–99%	90–99%	60–99%	N/A
Low-loading trickling filter	60–99%	0–20%	90–99%	60–99%	N/A
High-loading trickling filter	0–20%	0–20%	60–99%	60–99%	N/A
Anaerobic treatment	0–20%	0–20%	N/A	60–99%	N/A
Disinfection	20–90%	N/A	60–99%	N/A	N/A
Air stripping	60–99%	N/A	60–99%	60–99%	N/A
Carbon adsorption	20–90%	0–20%	60–99%	N/A	60–99%

Notes: N/A – *not applicable*

Emission factors for the wastewater sector are typically limited to air releases. Given limited information on the partitioning of substances between air/water/solids in the wastewater treatment process, the use of emission factors for substances released to water or solids will be limited. Particular chemical and/or engineering expertise may be required to undertake engineering estimation methods using mass-balance principles.

In the absence of alternative estimation methods, this should be done when information indicates the presence of an NPRI substance in excess of reportable trigger levels.

2.6 Calculate amounts released and disposed of

2.6.1 Introduction to estimating releases and disposals

For the wastewater sector, releases and spills of NPRI substances to air, water and land must be estimated. In addition, the fate of NPRI substances in sludge and biosolids must be reported in terms of off-site disposals.

Based on the most common information and reportable substances, two scenarios are provided for calculating amounts released and disposed—releases to air using emission factors, and releases to water and disposals off site using monitored biosolids data and engineering estimates.

2.6.2 Releases to air using emission factors

For this scenario, it is assumed that the facility has no monitored data for air releases, although some information on volatile substances may be available from raw wastewater, effluent or biosolids' monitoring. Using the list of substances from Step 1 indicating the reporting trigger was exceeded:

- Identify all substances that were released to air, using **Table 2–1**.
- Identify processes where releases to air occurred, and also identify points in the collection system where releases to air were likely to occur.
- Choose emission factors for the processes and collection system points identified. If applicable, you may choose to use the plant-wide emission factors for substances on your list. Otherwise, choose emission factors for specific components of your treatment and collection system.
- Using the emission factors, and flows in your facility, calculate the releases to air from each release source, and total the releases to air for each applicable substance.

In cases where there is no emission factor for the substance on the initial list, but monitoring data or NPRI release data indicates it is likely present in your system at quantities sufficient to trigger reporting, then you should research the volatility of the substance and other physical properties and use the engineering estimation method to estimate releases and disposals. For substances with minimal volatility and in the absence of an air release emission factor, you can assume that the substance is only released to water and/or sludge/biosolids.

2.6.3 Releases to water and disposals using monitored biosolids data and engineering estimation

For this scenario, it is assumed that the facility has data for NPRI substances as a result of biosolids' monitoring and that the biosolids are transferred off site for disposal. Guidance for the NPRI reporting requirements of biosolids for wastewater treatment facilities is detailed in the Biosolids reporting guide available through the NPRI Toolbox. Using the list of substances from Step 1 indicating the reporting trigger was exceeded:

- Identify all substances that were released to sludge, using **Table 2–1**.
- Identify processes where sludge and biosolids were produced.
- For your facility, estimate the total volume of biosolids (or, if appropriate, sludge) produced annually. Be sure the final volume estimate is developed for the same sludge condition as the monitored data available (e.g., dry weight). Also ensure units of measure are compatible with the monitored data (e.g., kg/tonne).
- Using the concentration of specific NPRI substances in the biosolids, estimate disposals of these substances that resulted when biosolids were transferred off site. Report this amount for each substance in the appropriate "disposal" category.
- Identify removal efficiencies from wastewater to biosolids for the substances of interest. These may be developed based on data for your facility using the facility's sludge production rate, moisture condition and volume changes and raw wastewater concentrations. Alternatively, you can use literature values as indicated in **Table 2–3** above.
- Working from the removal efficiency of the substance to solids in the process, calculate the portion of substance remaining in effluent.
- Based on effluent flows and the portion of substance partitioned to water, calculate the amount of substance released to water annually.

2.6.4 Reporting of the concentration of the substance released to surface waters and estimating and reporting non-detect values

- When a direct discharge to surface waters is reported, the average annual concentration (ppm) of the NPRI substance in the effluent must also be reported.
- In NPRI reporting, the issue of measurements below the method detection limit (MDL) arises in several situations. The MDL is the smallest concentration of the substance under analysis (i.e., the analyte) that produces an instrumental response and that meets all analyte detection and identification criteria of a specified test method. An indication that a reportable substance is below the

MDL is not equivalent to stating that the substance is not present. If it is known that the substance is present, a concentration equivalent to half of the MDL should be used.

- In a year where multiple measurements of the concentration of a substance in a given process stream are all below the MDL, and there is no other reason to believe that the substance is present, it can be assumed that the concentration of the substance in that process stream is zero. If there is reason to believe that the substance is present, a value of half the MDL should be used to estimate the release.
- In a year where multiple measurements are taken, and some measurements indicate that the concentration is above the MDL and some indicate that it is below the MDL, there is reason to assume that the substance is present. Therefore, a value of half the MDL should be used for those measurements where the concentration is below the MDL.
- When using the MDL to estimate a direct discharge to water, the MDL must also be reported.

2.6.5 Calculation examples

Some simple examples of calculations using various estimation methods to determine the releases of NPRI substances for the wastewater sector are located in **Appendix A as Example 1, 2 and 3**. Additional examples of calculations can be found in the NPRI Toolbox.

3 Chapter three

Additional guidance

3.1 Smaller wastewater collection and treatment Facilities

Reporting to the NPRI is easier for facilities with lower average daily flows because, for the majority of substances (i.e., Part 1A substances), the concentration of substances in the influent will be at readily detectable limits. As indicated in Chapter 1 (section 1.6), a concentration of 2.7 ppm will accumulate to 10 tonnes with an average flow rate of about 10 000 cubic m^3/day. If your average flow is 27 300 m^3/day, Part 1A substances must be present in the raw wastewater at concentrations of 1 ppm to be reportable.

Assuming you meet the minimum daily flow requirement, follow these steps to determine what substances to report:

- For your average daily flow rate, calculate what concentration you need in the influent to accumulate to the mass threshold for the various substance groups. (See Equation (EQ-1), section 1.6, to calculate concentrations required to trigger reporting for your flows.)
- Review your monitoring data to determine which substances may meet these concentrations.
- Review information on non-residential dischargers to your system (i.e., Industrial Waste Program information or sewer-use compliance agreements) to determine what non-residential types of substances may be present in sufficient quantities. The Directory of Contaminant Sources in Municipal Wastewater Systems (2004), developed by the Canadian Water and Wastewater Association (CWWA) in collaboration with ECCC, may be of some assistance in this assessment.
- Review past NPRI reports for your facility using the NPRI online database search tool to see transfers of substances, and the quantities transferred, to and from your system in previous years. Discharges to sewage systems are reported as Off-site Transfers for Treatment Prior to Final Disposal under the municipal sewage treatment plant category.
- Review the literature data in Tables 1–2, 1–3 and 1–4 to identify substances that are reported in wastewater, and additional substances that would typically be present in sufficient concentrations to be reportable quantities for your flow rate.
- Using this information, choose an appropriate emission estimate method, as described in this Guide, and estimate releases from your facility.

Total ammonia (i.e., $NH_3 + NH_4^+$) and phosphorus (total) are the most likely substances you will have to report. Other substances depend on the specific characteristics of your facility and community. Metals with low reporting thresholds (such as mercury, cadmium, lead, arsenic and hexavalent chromium) can often be present at reportable levels, especially in communities with combined sewer systems.

3.2 Reporting of phosphorus

Total phosphorous would include organic and inorganic phosphorous, and particulate and dissolved phosphorous (including phosphates or soluble reactive phosphorus). There is no single CAS number to apply to this substance and it does not include phosphorus (yellow or white) for which there is a separate NPRI reporting threshold. Many industrial chemicals and products contain phosphorus. The NPRI Phosphorus Guidance lists some of them that may send their effluents to your facility.

It is believed that the most significant point source releases of total phosphorus would be the municipal wastewater sector, since the wastewater treatment facilities provide most of the available phosphorus to surface water bodies. It is estimated that a normal adult excretes 1.3 to 1.5 g of phosphorus per day. In addition, there are a large number of industrial sectors (some of them are listed in the NPRI Phosphorus Guidance) that use the phosphorus/phosphates as active ingredients in the finished products, which are subsequently transferred to the municipal wastewater system. These industrial sectors include, but are not limited to, the following: fertilizers, detergents, pulp and paper, food products such as dairy, meat, bakery products and soft drinks, and the manufacture of flame retardants, plasticizers, hydraulic fluids, toothpastes and pharmaceuticals.

The phosphorus-containing compounds used in these finished products consist of the following: dipotassium phosphate, disodium phosphate dihydrate, dicalcium phosphate/tricalcium phosphate, monopotassium phosphate, monocalcium phosphate/sodium acid pyrophosphate, monoammonium phosphate/diammonium phosphate, potassium tripolyphosphate, sodium tripolyphosphate, sodium hexametaphosphate, sodium acid pyrophosphate, sodium monofluorophosphate/dicalcium phosphate dihydrate, sodium aluminum phosphate, tricalcium phosphate, trisodium phosphate, tetrasodium pyrophosphate/disodium phosphate anhydrous, trisodium phosphate dodecahydrate, etc. Phosphorus-containing compounds are also widely used in steam power plants to control scaling in boilers caused by water hardness.

Some treatment systems are required to remove excessive phosphorus from their discharges that could cause eutrophication of the receiving water body. The success of the phosphorus removal depends on the treatment technologies (e.g. biological removal, chemical precipitation) used. A 2001 survey carried out by CWWA found the average phosphorus removal efficiency of wastewater treatment facilities to be 77.6%.

Estimates of phosphorus/phosphates in raw wastewater, based on the flow rate and concentration considerations, would most likely result in the substance at reportable levels. As with other NPRI substances, the reporting requirement of phosphorus would apply to releases to all media. Therefore, phosphorus in sewage sludge transported off site will be reported as disposals, in addition to that reported in the wastewater effluent or otherwise as spills.

An example calculation to show the reporting of phosphorus (total) is provided in Example 4 in **Appendix A.**

4 Chapter four

Data quality

4.1 Data quality estimates

ECCC has established the NPRI Data Quality Management Framework which ensures that high quality information meets the needs of data users. It defines data quality in terms of seven elements – 1) Relevance, 2) Accuracy, 3) Reliability, 4) Completeness, 5) Understandability, 6) Accessibility and 7) Timeliness.

In an effort to meet the expectations of the NPRI Data Quality Management Framework, reporting facilities must ensure that the quality of reported information is relevant, accurate and complete. This section is intended to help reporters decide which data to use when reporting to NPRI when multiple data sources and estimated methods, as described in Section 2.5, are available.

Normally, every release calculation should include some quantification or qualification of the uncertainty of the estimation. For the purposes of this Guidance document, this data qualification is referred to as "Data Quality". This is specifically intended to help evaluate the elements of accuracy and reliability (i.e. the higher the data quality, the greater the accuracy and reliability of the substance release calculation).

4.1.1 "Highest rated" data quality

- Source Testing and Monitoring Results: The highest quality data is provided by site-specific release rate estimates, by testing and monitoring substance releases over a given period.
- Mass Balance: A mass balance technique may be considered to provide a highest data quality estimate if:
    - 100% of the material balance is accounted for (e.g., 100% emitted to air);
    - it is reasonable to assume that the contaminants will not undergo a chemical transformation through the source/process; and
    - the material usage information has been validated (e.g. through purchasing and inventory records, process monitoring, etc.)

4.1.2 "Above-average" data quality

- Emission Factors: Emission rate estimates that are developed from tests on a moderate to large number of sources. Test data are generally taken from many randomly chosen facilities in the industry population where the source category

population is sufficiently specific to minimize variability in order to provide above-average quality of emission rate estimates.

- Engineering Calculations: Substance release rates estimates derived from fundamental scientific and engineering principles; and/or relevant empirical data can be considered above-average quality estimates if the estimating technique closely reflects historical monitoring data.
- Mass Balance: A mass balance technique may be considered to provide an above-average data quality estimate if:
    - 100% of the material balance is accounted for; and
    - it is reasonable to assume that the substances will not undergo a chemical transformation through the source/process.

4.1.3 "Average" data quality

- Engineering Calculations/Judgement: Substance release rate estimates derived from fundamental scientific and engineering principles; and/or relevant empirical data can be considered average data quality.
- Source testing or monitoring at one specific operating condition: Substance release estimates that are from source testing where the testing at only one specific operating condition. These tests are anticipated to provide average data quality.

There may be times when changes are required to the reportable substance assessment process. This may be because of updated emission factors or changes in site conditions that require a different substance release estimation approach. Such changes should be effectively dealt with by maintaining a change log and noting these changes when reporting to ECCC. The change log should clearly identify the timeline and the rationale for such changes. Furthermore, to ensure that the technical integrity of the submissions is maintained, the reported substance releases should be compared to an extent of at least three prior reporting years. Release values of substances that differ more than 10% from previous years should be closely examined and noted in your NPRI report.

When reporting releases, disposals and transfers of NPRI substances, the ECCC on-line reporting system also asks for the comments on the reasons for change in quantities from the previous year. These comments should reflect the rationale for the identified anomalies such as details about the facility's operations, how the substance is used, and the methods used to calculate reported quantities. This can help users of the data to better understand the context around the numbers that are reported for releases, disposals, spills, and transfer.

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*** Additional bibliographic materials are listed separately in the NPRI Toolbox.**

Appendix A - Sample calculations

Example 1 –
To determine the aqueous releases of ammonia using the monitoring data

Wastewater facility measures an ammonia concentration of 29 mg/L in the wastewater influent and measures an average of 5.2 mg/L of ammonia in its wastewater effluent.

Facility has an average daily flow of 25 000 m^3
This facility meets the flow threshold of ≥ 10 000 m^3/day
1 cubic metre = 1 000 L
25 000 m^3/day x 1 000 = 25 000 000 L/day
Ammonia (influent) 29 mg/L x 25 000 000 L/day x 365 days/year x 10^{-9} tonnes/mg
= 265 tonnes/year
This substance meets the mass quantity threshold (> 10 tonnes/year)
Therefore, need to report ammonia
Aqueous release of ammonia 5.2 mg/L x 25 000 000 L/day
= 130 000 000 mg/day x 365 day/year
= 47 450 000 000 mg/year or 47.45 tonnes/year

Example 2 –
To determine the quantities of copper in sludge from a wastewater treatment process using the engineering estimates

A chemical flocculation process treats 100 000 m^3/day of wastewater, which has a copper influent concentration of 0.3 ppm. The process is operated 365 days a year. The copper is removed from the wastewater by chemical flocculation and the thickened sludge is transported off site to be landfilled. The removal efficiency of chemical flocculation for heavy metals is in the range of 60–100% (see Table 2–3). An average efficiency of 80% is assumed for the process and used to calculate the amount of copper removed and captured in sludge, as follows:

$E_{sludge} = C_i \times Q \times t_{op} \times f_{removal} \times 10^{-6}$ tonnes/g
= 0.3 g/m^3 x 100 000 m^3/d x 365 d/year x 0.8 x 10^{-6} tonnes/g
= 8.76 tonnes/year

where

E_{sludge} = annual land release, tonne/year
C_i = 0.3 g/m^3 (copper concentration in wastewater influent)
Q = 100 000 m^3/day (daily volume of wastewater treated)
t_{op} = 365 days/year (operation days during a reporting year)
$f_{removal}$ = 80% (removal efficiency)

Example 3 –
To determine the aqueous releases of copper from a chemical flocculation process using the mass balance method

A wastewater facility has an influent volume of 100 000 m^3/day; 0.3 g/m^3 copper in the wastewater influent; and 8.76 tonnes/year copper land-released (as determined using engineering estimates as shown in example 2 above). Since the chemical effluent process has two release routes—effluent and thickened sludge—the copper released to the receiving water as the effluent is calculated as:

$E_{effluent} = M_{input} - M_{output}$
$= C_i \times Q \times t_{op} \times 10^{-6}$ tonne/g $- E_{sludge}$
$= (0.3$ g/$m^3 \times 100\,000$ m^3 /day $\times$ 365 day/year$) \times 10^{-6}$ tonne/g $- 8.76$ tonne/yr
$= 2.19$ tonne/yr

Example 4 –
To determine the annual release and transfer of phosphorus from a wastewater facility with a biological nutrient removal (BNR) process

A wastewater treatment facility contains a biological phosphorus removal process and treats 50 000 m^3/day of wastewater. The phosphorus removal efficiency is estimated at 95%. The raw wastewater has an average phosphorus concentration of 13.2 mg/L. The facility discharges the treated wastewater to a receiving water body and measures an average of 0.6 mg/L of phosphorus in its wastewater effluent, and is operated 365 days a year.

Facility has an average daily flow of 50 000 m^3
This facility meets the flow threshold of ≥ 10 000 m^3/day
1 m^3 = 1 000 L
50 000 m^3/day x 1 000 = 50 000 000 L/day
Phosphorus (influent) 13.2 mg/L x 50 000 000 L/day x 365 days/year x 10^{-9} tonnes/mg
= 240.9 tonnes/year
This substance meets the mass quantity threshold (>10 tonnes/year)
Therefore, need to report phosphorus

The wastewater treatment facility of BNR process generally generates two release streams and one transfer stream. The two release streams are air emission and effluent discharge, and the transfer stream is biosolids. Since all biosolids generated are transferred for off-site processing, there is no release to land.

The quantities of phosphorus in effluent and sludge from the wastewater process can be estimated using the monitoring data and removal efficiency principle, respectively.

$E_{effluent}$ = $C_{effluent}$ x Q x t_{op} x 10^{-9} tonnes/mg
= 0.6 mg/L x 50 000 000 L/day x 365 days/year x 10^{-9} tonnes/mg
= 10.9 tonnes/year

E_{sludge} = C_i x Q x t_{op} x $f_{removal}$ x 10^{-9} tonnes/mg
= 13.2 mg/L x 50 000 000 L/day x 365 days/year x 0.95 x 10^{-9} tonnes/mg
= 228.9 tonnes/yr

where

$E_{effluent}$	= annual aqueous release of phosphorus, tonne/year
E_{sludge}	= annual quantity of phosphorus in the sludge, tonne/year
$C_{effluent}$	= 0.6 mg/L (phosphorus concentration in wastewater effluent)
C_i	= 13.2 mg/L (phosphorus concentration in wastewater influent)
Q	= 50 000 m^3/day (daily volume of wastewater treated)
t_{op}	= 365 d/year (operation days during the reporting year)
$f_{removal}$	= 95% (phosphorus removal efficiency)

In the absence of air emission factor information, the annual air releases of phosphorus (uncontrolled) E_{air} is determined by the following mass balance equation:

$E_{effluent}$ + E_{sludge} + E_{air} + $E_{transformed}$ = C_i x Q x t_{op} x 10^{-9} tonnes/mg

Assuming that the quantity of phosphorus transformed in the BNR process is negligible,

E_{air} = C_i x Q x t_{op} x 10^{-9} tonnes/mg - ($E_{effluent}$ + E_{sludge} + $E_{transformed}$)
= 240.9 tonnes/yr - (10.9 tonnes/year + 228.9 tonnes/year + 0)
= 1.1 tonnes/year

Appendix B - Frequently asked questions

What substances do I have to report?

Based on typical influent concentrations of ammonia and phosphorus (total), it is expected that all facilities meeting the discharge threshold will be required to report ammonia and phosphorus (total) releases. A general rule for smaller facilities at the discharge flow around 10 000 m^3/day are to report Part 1A substances present in the influent at concentrations of about 2.7 mg/L. Part 1B substances should be assessed individually for likelihood of their presence in sufficient quantities. Larger facilities must determine reportable substances through calculations using information available to them, as described in more detail in this Guide.

How do I use monitoring data that show some readings below the detection limit and others above the detection limit?

Guidance on this question is provided under Section 2.6 and in the *Guide for Reporting to the National Pollutant Release Inventory – Methods for Estimating Quantities of NPRI Substances*.

Can I get information from the NPRI database on discharges to my sewer system?

Dischargers transferring reportable substances to a wastewater facility are required to report quantities to the NPRI. This information can be found in the NPRI database for your community as transfers to the municipal sewage treatment plant (MSTP). Check each discharger connected to your sewer system to determine if they reported substance transfers for *Off-Site Treatment Prior to Final Disposal* under the MSTP category.

Last year, I reported dioxins and furans, but there is no information in this Guide on these substances. Why not?

Dioxins and furans, along with hexachlorobenzene (HCB), are Part 3 substances that do not need to be reported for wastewater treatment or collection systems. Although some wastewater facilities reported on these substances in the past, it is not a requirement of the NPRI to do so. These substances are reportable for sewage-sludge incineration.

I run a small, mostly residential, wastewater facility. What is the simplest way to report?

Refer to Section 3.1 of this Guide.

Our community is served by two separate collection and treatment systems on each side of a river. Do we consider the flows from each system separately?

Systems divided by a river or other water body are considered to be adjacent if they function as a single, integrated system for the community. The discharge threshold would be applied to the two systems in total, but separate facility reports would be submitted (excludes systems with no treatment plant, in which case a single report would be submitted).

We have several collection and treatment systems serving communities within our amalgamated regional municipality. Do we consider the total flow from all systems within the regional municipality?

Combine the discharge flows from only the systems or groups of sub-systems that are contiguous or adjacent. If the systems serve distinct and separate communities within your regional municipality, you may consider them separately.

Sewage sludge from one of our treatment plants is pumped through a force main to another treatment plant. How do we report the quantity of substances in that sludge?

Unless the receiving plant was built solely for the purpose of treating sludge from the originating system, report the quantity as a transfer *Off-Site Treatment Prior to Final Disposal* under the MSTP category.

We have three collection and treatment systems that service our city. The systems have flows of 7 500, 8 200 and 9 000 m3/day. Individually, the systems do not meet the flow threshold. Do we have to report?

If the service areas are adjacent, including being separated by a river or other body of water, and they function as a single, integrated system for your city, you must apply the

total flow of 24 700 m^3/day to the 10 000 m^3/day threshold. Separate reports would be submitted for each facility.

Do I have to monitor more substances now to report to the NPRI?

No, the NPRI does not require additional monitoring, but you are expected to demonstrate due diligence in using information reasonably available to report.

We contract out the operation of our city's municipal treatment system to a private company. Who is required to submit the NPRI report for our system?

The NPRI notice requires the owner or operator of a facility to provide information to Environment and Climate Change Canada. Operators are expected to compile the information because they are most familiar with day-to-day operations. However, in the event of failure to comply with the notice, both parties would be subject to enforcement action.

How does the 1% concentration threshold and MPO threshold apply to the wastewater sector?

For Part 1A substances, if your facility manufactured, processed or otherwise used 10 tonnes or more of that substance at a concentration of 1% or greater by weight, or any concentration as a by-product, then you may be required to submit a report. NPRI has determined that substances arriving in the influent are incidentally processed during wastewater treatment and are therefore considered as by-products of the process. Consequently, the 1% concentration threshold would not apply and you are expected to report the substance once it exceeds the specific MPO threshold.

Our facility has generated sludge during wastewater treatment processes. Subsequently, the sewage sludge has been stabilized to become biosolids for land application. Should we report the substances contained in the biosolids? Is it not the fact that the biosolids are considered as a benign product for agricultural use, rather than as waste for disposal, and therefore the biosolids should be exempt from the reporting requirements?

Environment and Climate Change Canada continues to hold the view that biosolids are a by-product of the wastewater treatment process (i.e. a waste) and therefore should be reported as transfer for disposal. As a result, the wastewater treatment facilities must continue reporting the NPRI substances in biosolids. The facility must follow the NPRI reporting guidance on biosolids available through the NPRI Toolbox.

How do I look for the metals contained in the biosolids to calculate if they have exceeded the threshold for reporting?

Table 1–3 of this Guide should provide you with this basic information requirement. It should be recognized that the quantity of sludge generated would increase as the level of wastewater treatment increases.

Should a drinking-water treatment facility that adds chlorine to water and then sends water to customers for consumption/use consider reporting?

Yes, a drinking water treatment facility is considered as a potable water treatment facility and not as a wastewater treatment facility. It must report if 20 000-hour and substance thresholds are met.