Environment and Climate Change Canada
Environnement et Changement climatique Canada

Proposed Changes to National Pollutant Release Inventory Reporting Requirements for 2020-2021

Summary of Stakeholder Comments and Environment and Climate Change Canada's Response

September 2020

Canada

Contact Information

For more information on the National Pollutant Release Inventory (NPRI), consult the NPRI website. Questions and requests for assistance can be directed to Environment and Climate Change Canada:

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Should any inconsistencies be found between this guide and the official Canada Gazette, Part I Notice with respect to substances in the National Pollutant Release Inventory for 2020 and 2021, published on February 15, 2020, the Notice will prevail.

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Cette publication est aussi disponible en français sous le titre de Modifications proposées aux exigences de déclaration de l'Inventaire national des rejets de polluants pour 2020-2021 – Résumé des commentaires des intervenants et des réponses d'Environnement et Changement climatique Canada.

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1. Introduction

The National Pollutant Release Inventory (NPRI) is Canada's legislated, publicly-accessible inventory of pollutant releases (to air, water and land), disposals and transfers for recycling. It supports a wide number of environmental initiatives, including pollution prevention and decision-making on chemicals management. Facilities meeting certain requirements must report information on their releases of pollutants to the NPRI each year. Changes to NPRI reporting requirements are made according to an established process and in consultation with stakeholders.

In early 2018, the NPRI created a work plan for the 2020-2021 NPRI reporting requirements with input from a multi-stakeholder work group. The work plan included a list of potential changes to the NPRI for which Environment and Climate Change Canada (ECCC) would develop consultation documents and conduct consultation periods. A meeting was held with the work group in Ottawa (February 6-7, 2018) to start the new consultation cycle. The work group then continued their work by discussing work plan items via teleconference on four separate occasions throughout 2018 and 2019, and one face-to-face meeting in Gatineau (June 11-12 2019).

This document outlines (1) the changes ECCC has made to the NPRI reporting requirements beginning with the 2020 reporting year, (2) the changes ECCC has made to the requirements beginning with the 2021 reporting year, and (3) the changes ECCC plans to make to the requirements for the 2022 and 2023 reporting years. The final 2020-2021 requirements were published in Part I of the *Canada Gazette* on February 15, 2020. This document describes the new and planned requirements, summarizes the corresponding comments received from stakeholders during consultation periods, and provides ECCC's response to those comments. For each of the proposed changes, input was solicited from stakeholders and the public using consultation documents which are included in appendices to this document.

2. Addition of naphthenic acid fraction compounds

In 2010, ECCC received a proposal to add naphthenic acids (NAs) to the NPRI from Environmental Defence (Appendix 1). ECCC referred the proposal to a multi-stakeholder work group and the work group submitted recommendations (Appendix 2). ECCC decided to defer consideration of the proposal until a definition of this group of compounds became available and methods for measuring NAs were further developed (Appendix 3). Based on work in these areas between 2012 and 2018, ECCC developed a consultation document outlining proposed changes to the NPRI related to NAs (Appendix 4). Consultations were conducted from January 15 to July 10, 2018. The NPRI Multi-Stakeholder Work Group and Environmental Defence provided input on ECCC's proposals to:

1. Add classically defined naphthenic acids with no specific Chemical Abstracts Services Registry Number (CAS RN), to the NPRI substance list, starting in the 2020 reporting year, with a mass reporting threshold of 10 tonnes and a 1% concentration threshold (except for by-products and tailings, which have no concentration threshold).
2. List naphthenic acids with the qualifier "and their salts", meaning that salts of naphthenic acids, expressed as the molecular weight of the acid, must be included.
3. Limit the reporting of naphthenic acids to facilities in the following two North American Industry Classification System (NAICS) Canada 2017 Version 2.0 Codes:
    - 211141: In-situ oil sands extraction; and
    - 211142: Mined oil sands extraction.

For more information on the definition of the different groups of naphthenic acids, and for more information on the proposed changes, see Appendix 4. Stakeholders were also provided with additional information and asked to provide input on two specific questions during consultations (Appendix 5). During consultations, a meeting between industry and ECCC scientists took place to discuss analytical methods for NAs (see Appendix 6 for a summary of the discussion).

Since the close of the consultation period, ECCC and Health Canada released a *Draft screening assessment for the commercial naphthenic acids group*, which proposes to conclude that commercial naphthenic acids (CAS RNs 1338-24-5 and 61789-36-4) are not toxic according to the criteria of section 64 of the *Canadian Environmental Protection Act, 1999* (CEPA 1999). There are currently 33 commercial naphthenic acid substances on the Domestic Substances List, each with a unique identifying CAS number, of which 19 met categorization criteria and have been or are being assessed under the Government of Canada's Chemicals Management Plan. To date, none has been concluded to pose a risk to the environment or human health.

After reviewing stakeholder input and the proposed conclusions of the screening assessment for commercial naphthenic acids, ECCC is proceeding as follows:

Naphthenic acid fraction compounds (NAFCs) and their salts will be added to the list of Part 1A NPRI substances. Reporting requirements for this substance group will take effect beginning with the 2020 reporting year. A facility will be required to report NAFCs if the following conditions are met:

1. Employees work a total of 20 000 hours or more, or activities to which the employee threshold does not apply take place at the facility; and
2. The total quantity of NAFCs present in one or more of the following scenarios is 10 tonnes or more:
    a) manufactured, processed or otherwise used at a concentration (by weight) of 1% or more,
    b) incidentally manufactured, processed or otherwise used as a by-product at any concentration,
    c) contained in tailings disposed of during the calendar year at any concentration, and
    d) contained in waste rock disposed of during the calendar year that is not clean or inert at a concentration (by weight) of 1% or more.

Any facility meeting the above conditions will be required to report releases and transfers of NAFCs, regardless of industrial sector.

For the purposes of reporting to the NPRI, naphthenic acid fraction compounds, also known as acid extractable organics, include:

1. Classically defined naphthenic acids: mono-carboxylic acids which include chain compounds and compounds with one or more alicyclic ring structures with the general formula $C_nH_{2n+Z}O_2$, where “n” indicates the carbon number and “Z” is referred to as the “hydrogen deficiency” (the number of hydrogen atoms that are lost as the structures become more compact) and is zero or a negative even integer (from -2 to -12). More than one isomer will exist for a given Z homolog, and the carboxylic acid group is usually bonded or attached to a side chain, rather than directly to the cycloaliphatic ring. The molecular weights differ by 14 mass units (CH_2) between n series and by two mass units (H_2) between Z series. Naphthenic acids are weak organic acids present primarily as their sodium naphthenate salts in oil sands process-affected water;
2. Diverse polar organic compounds present in bitumen and oil sands process-affected water.

This includes several compound classes, including aromatic, adamantine, or diamondoid structures, sulfur- and nitrogen-containing compounds, and oxygenated acids. Naphthenic acid fraction compounds extracted from oil sands process-affected water are primarily composed of larger, more complex compounds than commercial naphthenic acids, with a lower proportion of acyclic structures; and

3. Salts of naphthenic acids, expressed as the molecular weight of the acid.

For the purposes of reporting to the NPRI, NAFCs do not include naphthenic acids used solely in the context of commercial mixtures.

Facilities will be able to select a method of estimation for the purposes of reporting to the NPRI, including the source testing methods outlined in the consultation document and Fourier-transform infrared spectroscopy that is currently in use by industry. Facilities will also be permitted to use a method of estimation other than source testing, such as engineering estimates, to report NAFCs to the NPRI.

Table 1 summarizes comments received during consultations, and presents ECCC's response to the comments. Comments were received from the following stakeholders:

- Canadian Association of Petroleum Producers
- Canadian Fuels Association
- Canadian Steel Producers Association
- Canadian Vehicle Manufacturers' Association
- Cree Nation Government
- Environmental Defence
- Mining Association of Canada

Table 1. Summary of Stakeholder Comments and Environment and Climate Change Canada's Response Regarding the Proposal to Add Naphthenic Acids to the National Pollutant Release Inventory

No./Topic	Stakeholder Comments	Environment and Climate Change Canada Response
1. Substance definition	Naphthenic acid fraction compounds (NAFCs) are more representative than classically defined naphthenic acids (NAs) of the range of compounds found in bitumen and oil sands process-affected water. Limiting reporting to NAs would lead to significant underreporting of releases and underestimation of toxicity and risks. Therefore, reporting should not be restricted to NAs but reporting of NAFCs should be required instead. Reporting on	NAFCs will be added to the NPRI substance list, instead of the narrower group of classically defined NAs.

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	NAFCs should provide more useful and meaningful information. If reporting of NAs is required, an explanation of how quantities of NAs released can be used to predict quantities of NAFCs is needed. The information that may be available to facilities and the reasonableness of obtaining that information need to be considered. Facilities should be allowed to report for either NAs or NAFCs based on the data that is available.	Since reporting for NAFCs will be required, this no longer applies. Based on input from industry stakeholders, it is likely that most facilities will report NAFCs (see topic #3 below). NAFCs are measurable using an industry-standard widely-available technique, whereas the methods for measuring classically defined NAs are less widely available and are not standardized. In the event that the only information a facility has is on classically defined NAs, the facility will be permitted to report classically defined NAs, and will be required to provide a comment indicating what is being reported.
2. Sectors	Sector specific requirements are not in keeping with NPRI guiding principles, unless a clear case can be made that there are special circumstances that would warrant a sector-specific approach. A clear case has not been established for limiting reporting of NAs to specific sectors. The requirement to report NAs *should* apply to all sectors. The requirement to report NAs *should not* apply to all sectors. The impact on facilities in sectors other than oil sands extraction is unknown. Requiring all sectors to track this substance will increase burden and costs. Given that NAs are expected to be associated with specific sectors, the cost of requiring all sectors to track this substance outweighs the benefit of any potential additional data collected.	Two of the guiding principles of the NPRI are that the coverage should be comprehensive and that the data should present as complete a picture as possible of the sources of releases of NPRI substances. In keeping with these principles, sector-specific reporting requirements have been established only in special circumstances. In order to be consistent with guiding principles and with past practice, substances that are added to the NPRI are not added in a sector-specific manner unless a clear case can be made that there are special circumstances that would warrant a sector-specific approach. In this case, the sector-specific requirement was proposed in an attempt to narrow down the definition of classically defined NAs and to make it clear that that commercial NAs would be specifically exempt from reporting. It is expected that major sources of releases and transfers of NAs are oil sands extraction facilities and

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		creating a sector-specific reporting requirement was therefore not expected to result in significant gaps in the data. ECCC has decided to make the requirement to report NAFCs apply to all facilities that meet the reporting thresholds in all sectors. The listing will specifically state that it does not apply to commercial NAs. In this way, the reporting requirement will apply to the key facilities of concern, without the need for a sector-specific requirement. During consultations, additional information was provided to stakeholders on the number and type of facilities that may be required to report NAFCs to the NPRI (Appendix 5). ECCC expects that any facility that is manufacturing, processing or otherwise using large amounts of crude oil or petroleum products will need to track and possibly report NAFCs. It is unlikely that facilities that are not engaged in these activities would need to track and report NAFCs. As is often the case when new substances are proposed to be added to the NPRI, there is currently insufficient data for ECCC to determine with certainty how many and which facilities will need to report NAFCs.
	The refining sector processes crude but is not a significant source of releases of NAs. Most NAs present in crude are decomposed in the refining process. Since NAs are not volatile, there could be releases to wastewater, which would be reportable to NPRI if the reporting threshold is met. Most facilities in this sector do not currently track NA or NAFC releases to their wastewater.	ECCC recognizes that some sectors will contribute more significant releases than others. ECCC expects that facilities in any sector that meet reporting thresholds, and that have or can reasonably be expected to have access to the information needed to estimate NAFCs releases and transfers, will report those releases and transfers to the NPRI.
3. Reporting thresholds	Environmentally relevant releases may occur at much shorter timelines than the annual releases reported to the NPRI (e.g.,	ECCC has considered the recommendation to require reporting of releases and transfers in shorter timeframes than annual quantities. The purpose of NPRI reporting

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	spills or flaring). These types of releases should be tracked.	is to provide information on annual trends in emissions and releases. The NPRI is not intended to capture specific information on releases at a particular moment in time. Reporting requirements under other regulatory instruments, on the other hand, are often more detailed and require more frequent monitoring and reporting. Requiring daily, weekly and monthly breakdown for all substances through the NPRI is not warranted and would result in data quality concerns. Annual quantities are currently required to be broken down by quarter for most NPRI substances and by month for criteria air contaminants. ECCC will continue to require reporting this way.
	Releases may be significant at levels below the annual manufacture, process or otherwise use threshold of 10 tonnes at 1% concentration. Releases from facilities that do not meet these thresholds should be tracked.	Based on the average concentration of NAFCs in unrefined Athabasca bitumen and based on production data for oil sands extraction facilities, ECCC expects that all oil sands extraction facilities will be required to report NAFCs even with a 10-tonne threshold. Facilities that process large quantities of crude oil, either from the Athabasca region or from other areas (e.g., refineries) or large quantities of petroleum products, are also expected to meet the 10-tonne and 1% thresholds for reporting NAFCs. ECCC expects that the 10-tonne threshold is appropriate for NAFCs at this time. NPRI has a process in place for the ongoing review of thresholds and the proposal of lower thresholds. If, after a few years of collecting data on NAFCs, the 10-tonne threshold and 1% concentration threshold are not resulting in sufficient reporting of NAFCs, this process can be used to evaluate reduced thresholds.
4. Challenges associated with estimating releases and disposals from oil	There are significant practical challenges to estimating releases and disposals of NAs in oil sands mining and *in situ* operations.	ECCC recognizes that releases to tailings ponds do not necessarily constitute a final release or disposal. When the reporting requirements for tailings were established in 2009 (retroactive to 2006), this was

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sands extraction facilities	During mining operations, some NAs partition to oil sands process affected water (OSPW) which is released to tailings ponds that are distinct from the natural environment. Tailings ponds allow the heavier solid particles to settle and allow the OSPW to physically clarify for reuse and recycling. Once OSPW is sufficiently clarified, that water (containing NAs and unrecovered bitumen) is returned to the extraction process as recycled water. Due to this water recycling, NAs measured in OSPW would not reflect a "release" and would instead reflect repeated cycles of reuse as part of bitumen extraction, clarification, and degradation. The quantities of NAs present at any one time can be determined, but annual releases cannot be calculated on this basis. Unless reuse is taken into account, individual molecules of NAs in OSPW would be counted multiple times, resulting in significant over estimates of disposals of NAs.	accounted for by requiring the reporting of net quantities of NPRI substances disposed of in tailings ponds (i.e., the annual disposal quantity is equal to the quantity sent to tailings impoundment areas minus the quantity removed from those areas for reuse or further processing). The net quantity is the final amount of NPRI substances that are either added or removed at the end of the applicable calendar year. For some facilities, the net quantity will be a positive value and for other facilities it will be a negative value. The internal movement of substances within the same type of management area does not need to be reported. This approach will also apply to reporting of NAFCs to tailings management areas.
	Some NAs partition to OSPW where they can be measured. However, NAs cannot currently be accurately measured in the solid phase of oil sands tailings.	While there is a lack of established methods for measuring NAs in solids, they can be measured. Essentially the same methods used for water are applicable to solids, with an initial extraction step. See, for example A laboratory evaluation of the sorption of oil sands naphthenic acids on organic rich soils (Janfada *et al.*, 2006). However, if a facility does not have or cannot be reasonably expected to have information on the quantities of NAFCs disposed of in the solid phase of tailings, then the facility would not be required to report these quantities.
	Tailings ponds are distinct from the natural environment, therefore releases to tailings ponds should not be treated as though they are releases to the environment.	Quantities of NPRI substances that are deposited in tailings impoundment areas are reported as disposals, separately from releases, since they are disposed of in areas that are distinct from the natural environment.

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	It is important to have reporting on both quantities of NAs released *to* tailings ponds and *from* tailings ponds to the receiving environment from oil sands extraction facilities.	Quantities of NPRI substances, including NAFCs, that are disposed of in tailings are required to be reported. In addition, any releases or transfers from tailings ponds (e.g., substances released to air from pond surfaces or substances discharged to surface waters) must also be reported.
	In *in situ* operations, NAs only exist in repeatedly recycled water in a closed-loop system. NAs that are raised from below ground are re-injected to their original, naturally occurring source. They are not exposed to the air, held in tailings ponds or released to surface water at any point in the process. Since NAs are not released, there is no environmental risk. Therefore, *in situ* operations should be exempt from reporting for NAs since the requirement would create reporting burden that is not associated with health or environmental risks.	While *in situ* operations operate a virtually closed-loop system, they are still required to report to the NPRI if they manufacture, process or otherwise use an NPRI substance, even if the release and transfer quantities are zero. The other use of a substance includes its release or disposal, even underground. NPRI reporting requirements were deliberately set up this way, in part because there may be little or no environmental or health risks during normal operations, but accidental releases, such as spills, could still occur. Even though a facility may report zero releases of a substance, the presence of a zero report in the inventory provides the valuable information that a substance is present on site in a quantity above the reporting threshold. Therefore, all facilities that manufacture, process or otherwise use NAFCs and meet the reporting thresholds will be required to report releases and transfers of NAFCs to the NPRI, even if those release and transfer quantities are zero. *In situ* facilities are required to report net quantities of NPRI substances, including NAFCs, that are released underground – the total quantity of the NPRI substance injected underground and not recovered within the same calendar year. The quantity of the substance recovered may possibly exceed the quantity injected within a given calendar year, in which case, a quantity of zero would be reported and a comment would be provided.

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5. Analytical methods	The consultation document recommended two mass spectrometry (MS) methods for measuring classically defined NAs. MS methods for measuring NAs are not widely available and there is no standard or reference method. The methods are based on developing research. The cost of specialized analyses is high. Based on these issues, the MS methods noted in the consultation document are not suitable for the purposes of reporting NAs to the NPRI. Industry already measures and reports on NAs provincially, using Fourier-transform infrared spectroscopy (FTIR). FTIR provides a gross estimation of NAFCs, which does not match the narrower group of classically defined NAs in the consultation document. NPRI should allow reporting of NAFCs to be based on FTIR to be consistent with existing industry practice and more widely available laboratory capabilities. If ECCC does not prescribe a specific method of analysis, there will be a lack of consistency in reported quantities since facilities will be allowed to select from a range of methods of estimation.	ECCC allows facilities to select their method of estimation for the purposes of reporting to the NPRI (e.g., source testing, emission factors, mass balance). Unless direct measurements are required federally or by another jurisdiction, ECCC does not prescribe that a specific method must be used. ECCC does not currently plan to prescribe a method of analysis for NAFCs for the purposes of reporting to the NPRI. The two MS methods described in the consultation document, FTIR (currently used by industry), or another method will be permitted to be used to estimate releases and transfers. Consistency in reporting to the NPRI is an important consideration for the data to be understood and used, and continuing to work together to arrive at a consistent and reasonable method to be used by different facilities is a long-term goal for ECCC.
6. Releases of NAs to air	The paper referred to in the consultation document that measured NAs in particulate matter in the air (Yassine and Dabek-Zlotorzynska, 2017) is preliminary, does not link NAs in air to oil sands activities, uses an analytical method that is not widely available and does not provide a means for estimating annual releases of NAs to air. It is therefore recommended to not add the requirement for reporting of NAs released to air to the NPRI. Industry is willing to work with ECCC to establish consistent methods for measuring releases to air as the science develops.	The paper was referred to in the consultation document to show that preliminary work has detected the presence of NAs in air. It was not intended to imply that facilities would be required to monitor concentrations of NAs in ambient air using the method described in the paper to derive estimates of annual emissions of NAs. Facilities will be required to report all releases to air, water and land and all transfers for disposals and recycling of NAFCs if the reporting thresholds are met and if the facility has access or can reasonably be expected to have access to that information. ECCC recognizes that facilities may not have access to

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		information to be able to report on NAFC releases to air at this time. Methods may become more readily available, however, improving the ability of facilities to report releases of NAFCs to air in the future.
7. Other mechanisms for collecting data	ECCC should consider if NPRI is the appropriate method for collecting data on NA releases if or the needs of data users could be met using a different mechanism (e.g., a notice issued under section 71 of CEPA 1999)	Surveys issued under section 71 of CEPA 1999 generally apply to a single year, do not always require reporting of releases, the results are not made public and access to data within the government is restricted. Ongoing data collection and the public availability of the data are key features of the NPRI. There are no other public Canada-wide sources of pollutant release information. There is interest in using data on releases of NAFCs on an ongoing basis from various users both within and outside government, making NPRI an ideal mechanism for collecting and publishing this information.
8. Future research	Identify a clear plan and timeline for developing analytical and quantification methods for NAFCs.	As part of the Oil Sands Monitoring Program, ECCC plans to continue efforts to harmonize and standardize the methodology for measuring NAFCs. Research is contingent on funding, so it is not possible to provide an exact timeline at this time. Future efforts are expected to focus on developing stands and reference materials, and conducting round-robin interlaboratory studies.
9. Timeline	The requirement for facilities to report should be implemented no later than 2020.	Facilities will be required to report releases and transfers of NAFCs beginning with the 2020 reporting year.
10. Chemical Abstracts Services Registry Numbers (CAS RNs)	Specific CAS RNs provide certainty, clarity, and consistency for reporting facilities and data users. CAS RNs should be provided with NPRI reporting requirements. Without defined CAS RNs, information gathering is more difficult and data quality can be impacted.	ECCC recognizes that CAS RNs are important for reporting facilities and data users, and includes CAS RNs with substance listings where possible. NAFCs are a large group of diverse substances and many of the individual substances have not yet been identified. Therefore it is not yet possible to provide a list of applicable CAS RNs with the NPRI listing for NAFCs.
11. Ontario *Toxics Reduction Act,*	Changes to NPRI reporting requirements change requirements for facilities in	ECCC takes into account the impact that changes to NPRI reporting requirements

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2009	Ontario that are subject to the Ontario *Toxics Reduction Act, 2009*. This can increase the reporting burden on certain facilities in Ontario.	may have on reporting obligations for related programs in other jurisdictions, such as the Ontario *Toxics Reduction Act, 2009*. However, the government of Ontario has decided, for the 2018 calendar year and onwards, that newly listed substances will no longer require reporting or planning under the *Toxics Reduction Act, 2009*. This means that changes to NPRI requirements that require new substances to be reported will no longer require reporting in Ontario under the *Toxics Reduction Act, 2009*, so this specific concern no longer applies. In general, decisions on whether to make changes to the NPRI are considered in light of NPRI objectives and using the published decision factors and considerations for NPRI changes. Stakeholders that are concerned with the impacts that NPRI changes may have on related reporting to another jurisdiction should contact that jurisdiction to determine what options may exist to reduce these impacts.

3. Addition of PREPOD and BENPAT

The NPRI Multi-Stakeholder Work Group provided input on ECCC's proposal to add two substances to the Part 1B list of substances:

1. 2-Propanone, reaction products with diphenylamine, also known as PREPOD (CAS RN 68412-48-6); and
2. 1,4-Benzenediamine, N,N'-mixed phenyl and tolyl derivatives, also known as BENPAT (CAS RN 68953-84-4).

Each of these substances was proposed to have a manufacture, process or otherwise use (MPO) threshold of 50 kg and a 1% concentration threshold (Appendix 7). Consultations on these changes were conducted from May 3 to June 27, 2019.

After reviewing stakeholder input, ECCC will be adding PREPOD and BENPAT to the Part 1B list of NPRI substances, with 50 kg and 1% MPO thresholds.

Table 2 summarizes comments received during consultations, and presents ECCC's response to the comments. Comments were received from the following stakeholders:

- Canadian Steel Producers Association
- Canadian Vehicle Manufactures' Association
- Ecology Action Centre

Table 2. Summary of Stakeholder Comments and Environment and Climate Change Canada's Response Regarding the Proposed Addition of PREPOD and BENPAT to the NPRI

No./Topic	Stakeholder Comments	Environment and Climate Change Canada Response
1. Increase in resources required to report to the NPRI	All facilities will be subject to the reporting requirements, even though these substances are only associated with specific sectors or activities.	ECCC recognizes that each addition to the NPRI substance list results in incremental increases in the resources required by facilities, for both tracking and reporting substances. ECCC continuously reviews the NPRI substance list to ensure that it remains relevant and meets the needs of internal government programs and other data users. This includes the deletion of less relevant substances to help offset the increase in effort associated with the addition of substances.

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		The overall benefit of the additional data for performance measurement of the Pollution Prevention Planning Notice for PREPOD and of having more information on BENPAT and PREPOD available to the public through the NPRI is expected to outweigh the additional resources required to collect the information. Two of the guiding principles of the NPRI are that the coverage should be comprehensive and that the data should present as complete a picture as possible of the sources of releases of NPRI substances. In keeping with these principles, sector-specific reporting requirements have been established only in special circumstances. In order to be consistent with guiding principles and with past practice, substances that are added to the NPRI are not added in a sector-specific manner unless a clear case can be made that there are special circumstances that would warrant a sector-specific approach.
2. Other mechanisms for collecting data	ECCC should consider if NPRI is the appropriate method for collecting data on releases of these substances or if or the needs of data users could be met using a different mechanism (e.g., a notice issued under section 71 of CEPA 1999).	Surveys issued under section 71 of CEPA 1999 generally apply to a single year, and do not always require reporting of releases. Often results of these surveys are not made public and access to data within the government is often restricted. Ongoing data collection and the public availability of this data are key features of the NPRI. There are no other public, Canada-wide sources of pollution release information for these substances. There is also an interest in using data on releases of PREPOD and BENPAT within the government. These factors make the NPRI an ideal mechanism for collecting and publishing this information.
3. Reporting thresholds	The mass and concentration thresholds should be lower than the proposed 50 kg and 1% thresholds.	ECCC expects that the 50 kg and 1% concentration thresholds are appropriate for both PREPOD and BENPAT at this time. NPRI has a process in place for an ongoing review of thresholds and the proposal of lower thresholds. If, after a few years of

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		collecting data on these two substances, the 50 kg and 1% concentration threshold are not resulting in sufficient reporting, this process can be used to evaluate changes in reporting requirements.
4. Risk management tool	ECCC should implement a pollution prevention risk management tool for BENPAT as soon as possible.	ECCC conducted a mandatory survey under section 71 of CEPA 1999 in the winter of 2018. Results of this survey will be taken into account as a decision is made on an appropriate risk management instrument for BENPAT. Data reported through the NPRI will allow tracking of releases of BENPAT and could provide a source of information for performance measurement of any instrument that may be put in place for this substance.
4. No effect	This change does not affect the iron and steel sector.	ECCC thanks stakeholders for taking the time to consider the proposed changes and provide this information.
5. Support for proposed change	The addition of these substances is strongly supported, given use quantities and concerns about potential impacts on aquatic ecosystems.	ECCC thanks stakeholders for taking the time to consider the proposed changes.

4. Addition of azo disperse dyes and deletion of the individual listing for C.I. disperse yellow

The NPRI Multi-Stakeholder Work Group provided input on ECCC's proposal to make the following two changes:

1. Remove C.I. Disperse Yellow 3 (CAS RN 2832-40-8) from Part 1A of the NPRI substance list; and
2. Add a group of 26 azo disperse dyes to Part 1B of the NPRI substance list with a manufacture, process or otherwise use (MPO) threshold of 10 kg and a concentration threshold of 0.1%.

For more information on the proposed change, including the identity of the 26 azo dyes, see Appendix 8. Consultations were conducted on the proposed changes from May 3 to June 27, 2019.

After reviewing stakeholder input, ECCC will be removing the individual listing for disperse yellow from the Part 1A list and adding a group of 26 azo dyes to the Part 1B list, with an MPO threshold of 10 kg and a concentration threshold of 0.1%.

Table 3 summarizes comments received during consultations, and presents ECCC's response to the comments. Comments were received from the following stakeholders:

- Canadian Steel Producers Association
- Canadian Vehicle Manufacturers' Association
- Ecology Action Centre

Table 3. Summary of Stakeholder Comments and Environment and Climate Change Canada's Response Regarding the Proposed Addition of Azo Disperse Dyes to the NPRI		
No./Topic	**Stakeholder Comments**	**Environment and Climate Change Canada Response**
1. Increase in resources required to report to the NPRI	All facilities will be subject to the reporting requirements, including the associated assessment and due diligence activities that are needed to ensure compliance each year, even these substances are only associated with specific sectors or activities.	ECCC recognizes that each addition to the NPRI substance list results in incremental increases in the resources required by facilities, for both tracking and reporting substances. ECCC continuously reviews the NPRI substance list to ensure that it remains relevant and meets the needs of internal government programs and other data users. This includes the deletion of less relevant substances to help offset the increase in effort associated with the addition of substances. The overall benefit of the additional data for performance measurement and of having more information on azo disperse dyes available to the public through the NPRI is expected to outweigh the additional resources required to collect the information. Two of the guiding principles of the NPRI are that the coverage should be comprehensive and that the data should present as complete a picture as possible of the sources of releases of NPRI substances. In keeping with these principles, sector-specific reporting requirements have been established only in special circumstances. In order to be consistent with guiding principles and with past practice, substances that are added to the NPRI are not added in a sector-specific manner unless a clear case can be made that there are special circumstances that would warrant a sector-specific approach.
2. Other mechanisms for collecting data	ECCC should consider if NPRI is the appropriate method for collecting data on releases of azo disperse dyes or if the needs of data users could be met using a different mechanism (e.g., a notice issued under section 71 of CEPA 1999).	Surveys issued under section 71 of CEPA 1999 generally apply to a single year, and do not always require reporting of releases. Often results of these surveys are not made public and access to data within the government is often restricted. Ongoing data collection and the public availability of this data are key features of the NPRI. There are no other public, Canada-wide sources of pollution release information for these substances. There is also an interest

Table 3. Summary of Stakeholder Comments and Environment and Climate Change Canada's Response Regarding the Proposed Addition of Azo Disperse Dyes to the NPRI		
No./Topic	**Stakeholder Comments**	**Environment and Climate Change Canada Response**
		in using data on releases of these azo disperse dyes within the government. These factors make the NPRI an ideal mechanism for collecting and publishing this information. C.I. Disperse Yellow 3 is already on the NPRI. The addition of 25 azo disperse dyes will provide data on overall releases of azo dyes. Collecting information on releases of this group of substances through the NPRI will also allow ECCC to evaluate the effectiveness of the *Proposed release guidelines for Disperse Yellow 3 and 25 other azo disperse dyes in the textile sector.*
3. No effect	This change does not affect the iron and steel sector.	ECCC thanks stakeholders for taking the time to consider the proposed changes and provide this information.
4. Support for proposed change	The change is supported.	ECCC thanks stakeholders for taking the time to consider the proposed changes.

5. Deletion of decabromodiphenyl oxide

The NPRI Multi-Stakeholder Work Group provided input on ECCC's proposal to delete decabromodiphenyl oxide, (CAS RN 1163-19-5) from the list of Part 1A substances. Consultations were conducted on this proposed change from May 3 to June 27, 2019. For more information on the proposed change, including the rationale for deleting this substance from the NPRI, see Appendix 9.

After reviewing stakeholder input, ECCC will be will be deleting decabromodiphenyl oxide from the NPRI substance list.

Table 4 summarizes comments received during consultations, and presents ECCC's response to the comments. Comments were received from the following stakeholders:

- Canadian Steel Producers Association
- Ecology Action Centre

Table 4. Summary of Stakeholder Comments and Environment and Climate Change Canada's Response Regarding the Deletion of decaBDE from the NPRI

No./Topic	Stakeholder Comments	Environment and Climate Change Canada Response
1. No effect	Deletion of decabromodiphenyl oxide from the NPRI does not affect the iron and steel sector	ECCC thanks stakeholders for taking the time to consider the proposed changes and provide this information.
2. No objection	Deletion of this substance from the NPRI seems reasonable given the prohibitions	ECCC thanks stakeholders for taking the time to consider the proposed changes.

6. Changes to the list of speciated volatile organic compounds

Consultations on other changes to reporting requirements for speciated VOCs were conducted from May 3 to June 27, 2019. The NPRI Multi-Stakeholder Work Group provided input on ECCC's proposal to add reporting requirements for isomers of propylene glycol methyl ether acetate (PGMEA) to the NPRI (see Appendix 10). The consultation document also included two notifications for which stakeholder input was not requested:

1. The deletion of three substances from the Part 5 list of speciated VOCs:
    a. adipic acid (CAS RN 124-04-9),
    b. heavy alkylate naphtha (CAS RN 64741-65-7), and
    c. white mineral oil (CAS RN 8042-47-5).
2. The removal of CAS RNs of four Part 5 isomer groups:
    a. butene (all isomers) (CAS RN 25167-67-3),
    b. hexene (all isomers) (CAS RN 25264-93-1),
    c. trimethylbenzene (specified isomers) (CAS RN 25551-13-7), and
    d. xylene (all isomers) (CAS RN 1330-20-7).

After reviewing stakeholder input, ECCC will be adding the requirement to report releases to air of the following isomers and mixture of PGMEA:

1. alpha-PGMEA (CAS RN 108-65-6),
2. beta-PGMEA (CAS RN 70657-70-4), and
3. mixtures of PGMEA (CAS RN 84540-57-8).

PGMEA will be moved to the Isomer Groups section of the list of Part 5 substances and will continue to be listed with the CAS RN 108-65-6, although the two additional CAS RNs noted above also apply.

ECCC is also proceeding with the deletion of three substances from the Part 5 list:

1. Three substances will be deleted from the Part 5 list:
    a. adipic acid (CAS RN 124-04-9),
    b. heavy alkylate naphtha (CAS RN 64741-65-7), and
    c. white mineral oil (CAS RN 8042-47-5).

ECCC is not proceeding with the removal of the CAS RNs of the four Part 5 isomer groups. This change may be implemented in the future, in the modernized reporting system.

Table 5 summarizes comments received during consultations, and presents ECCC's response to the comments. Comments were received from the following stakeholders:

- Canadian Steel Producers Association

Table 5. Summary of Stakeholder Comments and Environment and Climate Change Canada's Response Regarding Other Changes to Requirements for Speciated VOCs		
No./Topic	**Stakeholder Comments**	**Environment and Climate Change Canada Response**
1. No effect	The addition of isomers of PGMEA does not affect the iron and steel sector.	ECCC thanks stakeholders for taking the time to consider the proposed changes and provide this information.

7. Changes to the requirements for dioxins, furans and hexachlorobenzene

Consultations were conducted on proposed changes to the reporting requirements for dioxins, furans and hexachlorobezene from February 15 to April 12, 2019. The NPRI Multi-Stakeholder Work Group provided input on ECCC's proposals to make the following two changes to reporting requirements:

1. Change the toxic equivalency factors (TEFs) for two dioxin congeners and three furan congeners from the 1988 North Atlantic Treaty Organization standard, to the 2005 World Health Organization (WHO) standard (see Table 6); and
2. Expand the activity requiring reporting of dioxins, furans and hexachlorobenzene "manufacturing of iron using a sintering process" to include the iron ore pelletizing process.

Table 6. Current and proposed toxic equivalency factors (only those with changes are included)

Congener	Current Toxic Equivalency Factor	Proposed Toxic Equivalency Factor
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	0.5	1
Octachlorodibenzo-p-dioxin	0.001	0.0003
2,3,4,7,8-Pentachlorodibenzofuran	0.5	0.3
1,2,3,7,8-Pentachlorodibenzofuran	0.05	0.03
Octachlorodibenzofuran	0.001	0.0003

After reviewing stakeholder input, ECCC will be updating the TEFs to those shown in Table 6. The "manufacturing of iron using a sintering process" activity will be updated to "manufacturing of iron using a sintering or pelletizing process."

Table 7 summarizes comments received during consultations, and presents ECCC's response to the comments. Comments were received from the following stakeholders:

- Canadian Association of Physicians for the Environment
- Canadian Fuels Association
- Canadian Steel Producers Association
- Ciment Québec Inc.
- Cree Nation Government

Table 7. Summary of Stakeholder Comments and Environment and Climate Change Canada's Response Regarding the Proposed Change to NPRI Reporting Requirements for Dioxins, Furans and Hexachlorobenzene		
No./Topic	**Stakeholder Comments**	**Environment and Climate Change Canada Response**
1. Support for proposed change	The changes are supported, since NPRI requirements should be based on the latest available science.	ECCC thanks stakeholders for taking the time to consider the proposed changes.
2. Emissions from other sectors and sources	There is potential for emissions of dioxins and furans from other sectors and sources such as the oil and gas industry, waste disposal practices, such as open burning and barrel-burning, and the combustion of PCBs. It is important to look at the current context of Canadian sources of dioxins, furans and hexachlorobenzene (and other dioxin-like substances) when considering any changes to the list of activities.	ECCC will continue to look into other sectors and activities that may be sources of emissions of dioxins, furans and hexachlorobenzene in Canada. An initial contract to review various sources of these substances has been completed and the results will be used as a starting point for making future changes. As we consider changes to the current list of activities, we will take into account the Canadian context and any changes to requirements will be made in accordance with NPRI decision factors and processes.
3. Provincial Regulations	Some facilities may need to manage two different sets of toxic equivalency factors when reporting to provincial regulations and the NPRI.	ECCC acknowledges that not all regulations utilize the 2005 WHO standard for toxic equivalencies. However, the 2005 WHO standard is based on the most recent science available. This change will result in small changes for only five of the seventeen dioxin and furan congeners listed on the NPRI. Reporting facilities will need to check with other programs and regulations to ensure they are reporting the correct values.

8. Changes to the requirements for reporting pollution prevention information

The NPRI Multi-Stakeholder Work Group provided input on ECCC's proposal to add the requirement to specify which NPRI substances are impacted by pollution prevention (P2) activities (Appendix 12). Consultations on the proposed changes were conducted from May 3 to June 27, 2019. ECCC also sought input from reporting facilities on changes to the NPRI reporting module, to make reporting this data as simple and streamlined as possible, including removing some of the questions about P2 plans (Appendix 12).

After reviewing stakeholder input, ECCC will be requiring that P2 activities be linked to specific substances where applicable when reporting to the NPRI, beginning with the 2021 reporting year. ECCC will also be removing the questions about whether the facility's P2 plan addresses substances, energy conservation or water conservation, and whether the plan was updated during the calendar year. Facilities will still be asked whether they have a documented P2 plan, the reason for the plan (or the reason why P2 was not implemented), which P2 planning notice applies, and will be encouraged to provide a brief description of the plan in a comment field. In addition, ECCC will provide the option for facilities to indicate if they participated in another type of organized P2 plan or strategy (e.g., an industry association initiative).

Table 8 summarizes comments received during consultations, and presents ECCC's response to the comments. Comments were received from the following stakeholders:

- Canadian Association of Petroleum Producers
- Canadian Fuels Association
- Canadian Steel Producers Association
- Chemistry Industry Association of Canada
- Ecology Action Centre

Table 8. Summary of Stakeholder Comments and Environment and Climate Change Canada's Response Regarding the Proposed Changes to Reporting of Pollution Prevention Information		
No./Topic	**Stakeholder Comments**	**Environment and Climate Change Canada Response**
1. Increase in resources required to report to the NPRI	Changes to the requirements for reporting P2 information will increase the amount of effort and time needed to report. The increase in reporting burden outweighs the benefit of collecting the data through NPRI.	ECCC recognizes that this change will result in an increase in resources required by facilities to report. However, ECCC believes that there is value in (i) making information on P2 activities available to the public alongside information on releases of substances through the NPRI, (ii) making this information available to internal and external users of NPRI data and (iii) using NPRI data to evaluate the effectiveness of P2 actions in reducing substance releases. The value of the information collected is expected to outweigh the additional resources required to collect the information.
2. Other mechanisms for collecting data	P2 information submitted through Pollution Prevention Planning Notice annual reports and emissions reductions shown in Ontario *Toxics Reduction Act, 2009* comparison reports can be used for information on P2 activities, instead of the NPRI.	Ongoing data collection and the public availability of the data are key features of the NPRI. There are no other public Canada-wide sources of pollutant release information. Various users both within and outside government have shown interest in using data on P2 activities, particularly in conjunction with release data, in the public and easy to use formats available through NPRI. This interest in using the data on an ongoing basis makes NPRI an ideal mechanism for collecting and publishing this information. NPRI provides a platform for all facilities to submit information on voluntary P2 activities related to all NPRI substances. Pollution Prevention Planning Notice reports are only required by those facilities that are subject to the Notice and are limited to the substance targeted by the Notice. The Ontario *Toxics Reduction Act, 2009* only applies to facilities in Ontario, whereas the NPRI collects and publishes information from facilities across Canada. Furthermore, the *Toxics Reduction Act, 2009* will be repealed on December 31, 2021 and reporting obligations under the Act will cease as of that date.

Table 8. Summary of Stakeholder Comments and Environment and Climate Change Canada's Response Regarding the Proposed Changes to Reporting of Pollution Prevention Information		
No./Topic	**Stakeholder Comments**	**Environment and Climate Change Canada Response**
		Publishing P2 activities alongside NPRI data makes it much easier for data users to analyze the data, since it is all in one place for all sectors. It would be more difficult to analyze P2 data if, for a particular sector, users had to look elsewhere for data.
	Responsible Care® (a chemistry industry initiative) should be recognized as part of the process of reporting P2 activities to the NPRI. The NPRI submission process should be modified so that Responsible Care members can identify themselves in order to avoid duplication as part of P2 reporting. This would simplify the reporting process for members while appropriately recognizing their efforts towards pollution prevention.	Members of Responsible Care have always had the ability to promote their P2 actions and to include details of actions taken in the reporting form's optional comment boxes. We encourage members to give details on their P2 actions and to identify themselves as participants to the Responsible Care program. ECCC will include the option for facilities to indicate if they participate in another type of organized P2 strategy or initiative, like Responsible Care, in the reporting system.
3. Guidance for reporting facilities and data users	Guidance for facilities on reporting P2 activities should be developed in consultation with industry.	Guidance for facilities to report P2 activities is already available by selecting "Toggle In-Context Help" from the top line menu in the online reporting system.
	If a particular pollution prevention activity was implemented at a site, it would be expected that emissions reported will show a decrease. However, other types of facility or site activities could offset the reduction and the net emissions reported could be higher. The benefits or effects of a potential pollution prevention activity may not be apparent in the same year in which that activity is implemented. These are potential source of confusion for data users. ECCC should	ECCC would like to encourage facilities to submit P2 activities that have either been initiated, implemented or completed in the reporting calendar year. Therefore, delays in the expected benefits of the activity can be declared when reporting activities in the P2 section of the online reporting system. ECCC will provide this guidance in the help text of the reporting system.

Table 8. Summary of Stakeholder Comments and Environment and Climate Change Canada's Response Regarding the Proposed Changes to Reporting of Pollution Prevention Information		
No./Topic	**Stakeholder Comments**	**Environment and Climate Change Canada Response**
	provide guidance to reporting facilities outlining how they could convey this in their reporting so as to avoid any misinterpretation by data users.	ECCC will consider adding guidance on interpreting pollution prevention information to the guide for Using and interpreting data from the National Pollutant Release Inventory.
4. Online reporting system	The proposed implementation of changes in the reporting system as outlined in the consultation document is supported, particularly the ability to provide additional context surrounding pollution prevention activities. As changes are implemented in the reporting software, ECCC should allow reporting facilities to access the system in order to test the new functionality before reporting is required.	ECCC thanks stakeholders for taking the time to consider the proposed changes to the reporting software for reporting of pollution prevention information. ECCC intends to involve interested reporting facilities in testing the reporting system through various industry associations.
5. Support for the proposed changes	The proposed changes are supported.	ECCC thanks stakeholders for taking the time to consider the proposed changes

9. Changes to the requirements for reporting criteria air contaminant and speciated volatile organic compound releases

Consultations were conducted on proposed changes to the reporting requirements for criteria air contaminants (CACs) and speciated volatile organic compounds (VOCs) from February 20 to May 1, 2019. ECCC conducted extensive analyses of existing US and Canadian sources of data on emissions of air pollutants to determine the proposed changes. The analyses, proposed changes, rationale for the changes and expected impacts of the proposed changes are described in the full consultation document (February 2019) (Appendix 13).

9.1 Original Proposed Changes

The NPRI Multi-Stakeholder Work Group provided input on ECCC's proposals to make the following changes to the reporting requirements for CACs and speciated VOCs:

1. Reduce the minimum stack height at which reporting of CACs and speciated VOCs is required by individual stacks (stack height threshold), from 50 metres to 15 metres.
2. Exempt horizontal stacks, stacks with rain caps, and stacks/vents from storage tanks from individual stack reporting requirements.
3. Allow reporting of groups of stacks as a single or virtual "stack" if:
    a. A facility has received prior permission from a regulatory authority to group stacks for air dispersion modelling for the purposes of obtaining approval or a permit; or
    b. The grouped stacks are ≥15m and <50m in height. Stacks ≥50m in height cannot be grouped and will continue to be required to report individually. The grouped stacks must be within 100m of the approximate geographic centre of the group; releases from the grouped stacks must be ±10% of the average releases from all stacks in the group; and the stack height, inside diameter, exit temperature and exit velocity must be within ±20% of the average.
4. Change the minimum quantity of releases at which reporting of CACs and speciated VOCs is required by individual stacks (stack air release thresholds) to those shown in Table 9.

Table 9. Current and Proposed Stack Air Release Thresholds		
Criteria air contaminant	**Current stack air release threshold (tonnes)**	**Proposed stack air release threshold (tonnes)**
Nitrogen oxides (expressed as nitrogen dioxide) (NOx)	5	15
Sulphur dioxide (SO_2)	5	100
Particulate matter with a diameter less than or equal to 2.5 micrometres ($PM_{2.5}$)	0.15	0.25
Particulate matter with a diameter less than or equal to 10 micrometres (PM_{10})	0.25	0.75
Total particulate matter (TPM)	5	100
Carbon monoxide (CO)	5	15
Volatile organic compounds (VOCs)	5	25

5. Require a method of quantification (basis of estimate) to be reported for each release quantity reported for stacks.
6. Require that stack or point release quantities of CACs be reported separately for combustion and non-combustion sources.
7. Require a basis of estimate to be reported for each combustion and non-combustion release quantity.
8. Require that the type(s) of fuel associated with combustion sources be reported.
9. Increase the threshold requiring speciated VOCs to be reported by individual stacks, from 5 tonnes of total VOCs to 25 tonnes of total VOCs.
10. Require that release quantities of speciated VOCs from individual stacks be reported separately for combustion and non-combustion sources.
11. Require that total VOCs released from stacks or points (other than individual stacks) be speciated separately from VOCs released from all other sources (storage or handling, fugitive, spills and other non-point). These speciated VOCs would be required to be reported separately for combustion and non-combustion sources.
12. Require that the basis of estimate be reported each time total VOCs are speciated.
13. Add “speciation profile” to the list of bases of estimate that can be used by facilities to estimate and report releases.
14. Require an indication of whether stack or point release quantities of particulate matter (PM) include condensable particulate matter (CPM).

9.2 Revised Proposed Changes

After reviewing stakeholder comments received during the consultation period, ECCC prepared revised proposed changes for an additional comment period from May 14 to June 27, 2019 (Appendix 14). The following revised changes were proposed:

1. Reduce the minimum stack height at which reporting of CACs and speciated VOCs is required by individual stacks (stack height threshold), from 50 metres to 25 metres.
2. Exempt stacks with no or little initial vertical velocity, for example, horizontal stacks, stacks with rain caps, stacks/vents from storage tanks and stacks with an annual average exit temperature of 50° Celsius or lower from individual stack reporting requirements.
3. Allow reporting of groups of stacks as a single or virtual "stack" if:
    a. A facility has received prior permission from a regulatory authority to group stacks for air dispersion modelling for the purposes of obtaining approval or a permit; or
    b. The grouped stacks are ≥25m and <50m in height. Stacks ≥50m in height cannot be grouped and will continue to be required to report individually. The grouped stacks must be within 250m of the approximate geographic centre of the group; releases from the grouped stacks must be ±35% of the average releases from all stacks in the group; and the stack height, inside diameter, exit temperature and exit velocity must be within ±35% of the average
4. Change the minimum quantity of releases at which reporting of CACs and speciated VOCs is required by individual stacks (stack air release thresholds) to the revised proposed thresholds shown in Table 10.

Table 10. Current and Proposed Stack Air Release Thresholds

Criteria air contaminant	Current stack air release threshold (tonnes)	Proposed stack air release threshold (tonnes)	Revised proposed stack air release threshold (tonnes)
NOx	5	15	**15**
SO_2	5	100	**50**
$PM_{2.5}$	0.15	0.25	**1**
PM_{10}	0.25	0.75	**2**
TPM	5	100	**50**
CO	5	15	**15**
VOCs	5	25	**10**

5. Increase the threshold requiring speciated VOCs to be reported by individual stacks, from 5 tonnes of total VOCs to 10 tonnes of total VOCs.

After reviewing stakeholder input, ECCC is proceeding as follows:

Changes to the reporting requirements for CACs and speciated VOCs will be implemented beginning with the 2022 reporting year, to allow more time for (1) upgrades to be made to the online system for reporting to the NPRI, (2) industry to prepare for the changes, and (3) consultations on issues that have not yet been resolved. ECCC has not implemented any changes to

reporting requirements for CACs and speciated VOCs (except for those described in section 6 of this document) for the 2020 reporting year.

ECCC intends to conduct more analyses and consultations prior to making changes to reporting requirements beginning with the 2022 reporting year. ECCC intends to consult on how to implement these changes in advance of the publication of the reporting requirements for 2022-2023.

In the future, ECCC may conduct more consultations on reporting of CPM to the NPRI, depending on the outcome of discussions with the United Nations Economic Commission for Europe under the Convention on Long-range Transboundary Air Pollution.

Tables 12-16 summarize comments received during consultations, and presents ECCC's response to the comments. Comments were received from the following stakeholders during the February 20-May 1, 2019 consultation period:

- Canadian Association of Petroleum Producers
- Canadian Association of Physicians for the Environment
- Canadian Energy Pipeline Association and Canadian Gas Association
- Canadian Fuels Association
- Canadian Steel Producers Association
- Canadian Vehicle Manufacturers' Association
- Canadian Wastewater Association
- Cement Association of Canada
- Chemistry Industry Association of Canada
- Ciment Québec Inc.
- Community Health Opposition to Known Emissions Dangers
- Domtar
- Fertilizer Canada
- Forest Products Association of Canada and National Council for Air and Stream Improvement
- Keepers of the Athabasca

Additional comments were received from the following stakeholders on the revised proposed changes:

- Canadian Association of Petroleum Producers

- Canadian Energy Pipeline Association and Canadian Gas Association
- Canadian Fuels Association
- Canadian Vehicle Manufacturers' Association
- Ecology Action Centre
- Forest Products Association of Canada and National Council for Air and Stream Improvement

Table 12. Summary of General Stakeholder Comments and Environment and Climate Change Canada's Response Regarding the Proposal to Change Reporting Requirements for Reporting Releases of CACs

No./Topic	Stakeholder Comments	Environment and Climate Change Canada Response
1. Online reporting system and bulk upload	All but one of the industry stakeholders that expressed support for some or all of the proposed changes indicated that the support is contingent on (1) reliably functioning online reporting software and/or (2) updated and improved bulk upload functionality. Comments on the challenges associated with the 2019 reporting cycle (for reporting of 2018 data) were also received from industry stakeholders that did not support the proposed changes to reporting requirements for CACs and speciated VOCs. Some stakeholders recommended delaying the implementation of any changes to reporting requirements for CACs and speciated VOCs until improvements can be made to the reporting software and bulk upload. One stakeholder recommended that the bulk upload function be expanded to include reporting for all NPRI substances as well as National Emissions Reduction Masterplan (NERM) substances.	ECCC acknowledges the concerns of stakeholders regarding the challenges associated with the online reporting system encountered when reporting 2018 data in 2019, which were submitted with written comments and expressed at the Work Group meeting on June 11, 2019. In the short-term, the department intends to dedicate resources to apply lessons-learned from technical difficulties reported in the previous reporting years and improve the stability of the existing NPRI reporting system in order to ensure that industry reporters meet the 2020 reporting deadline (2019 data year). This should include the release of the existing system in March 2020 for early reporting, increased testing and improved communication with all partners. In addition to these system-wide improvements, staff will continue to work directly with companies, as needed, to address any issues they may have. Furthermore, as a long-term solution, ECCC is dedicating resources to modernize completely the NPRI reporting system on time for the 2021 reporting deadline (2020 data year). The intent is to carry out a code simplification, streamline the flow of the system, and upgrade the framework used. As part of this course of action, new functionalities and data tools will also be evaluated.

Table 12. Summary of General Stakeholder Comments and Environment and Climate Change Canada's Response Regarding the Proposal to Change Reporting Requirements for Reporting Releases of CACs		
No./Topic	**Stakeholder Comments**	**Environment and Climate Change Canada Response**
		ECCC is cognizant of the potential challenges that numerous changes to the NPRI reporting requirements could create on the reporting process. In light of this, changes to reporting requirements for CACs and speciated VOCs will not be implemented until the 2022 reporting year, with reports due by June 1, 2023, at which point the modernized reporting system will be in place. ECCC intends to update the NPRI bulk application to reflect any changes to reporting requirements that are implemented. NPRI is currently evaluating the feasibility of expanding the bulk upload functionality to include all NPRI substances, but has no plans to include NERM substances in the schema.
2. Guidance for data users	Consideration needs to be given to ensuring that the users of NPRI data understand the context and limitations of the data and are in a position to use it appropriately, as reporting becomes more complex.	ECCC will consider adding guidance on interpreting the new data to the guide for Using and interpreting data from the National Pollutant Release Inventory.
3. Detailed analyses in support of consultations	The high level of detail in the consultation document established a clear expectation and justification for changes and facilitated dialogue among stakeholders. It should be used as a model for future consultation.	ECCC will continue to provide as much information as possible in support of consultations on changes to NPRI reporting requirements.
4. Coordination with provinces	ECCC should consider further consultations with provinces in order to streamline and harmonize data collection systems and quantification methods so that the same numbers are reported federally and provincially. ECCC may also want to consider working with Alberta as they have recently established annual emissions inventory reporting requirements for all industrial facilities regulated by Alberta Environment and Parks for use in regional modelling.	ECCC intends to review provincial reporting requirements with a view towards harmonizing requirements and methods, to the extent possible in the context of reporting to the NPRI.
5. Scope and mandate of the NPRI	One stakeholder expressed concerns that the proposed changes are moving NPRI away from its intended scope and beyond the original mandate of the program. This ongoing extension of expectation of efforts	Canada's Green Plan (1990) called for the development of a national database of releases of hazardous pollutants. The NPRI was developed to improve our understanding of the nature and quantity of

Table 12. Summary of General Stakeholder Comments and Environment and Climate Change Canada's Response Regarding the Proposal to Change Reporting Requirements for Reporting Releases of CACs		
No./Topic	**Stakeholder Comments**	**Environment and Climate Change Canada Response**
	was not the intent of the program when developed and implemented. ECCC should follow the principles established for NPRI and not use proposed changes to the program as the opportunity to expand the program scope and increase the reporting burden on facilities. NPRI data collection and management should be done in a cost-effective manner; NPRI reporting should be as simple as possible and should not unreasonably burden reporting facilities.	toxic substances being released in Canada. The purpose of the NPRI was established by the Multi-Stakeholder Advisory Committee (MSAC) in 1992 when NPRI was first created: "to provide comprehensive, national data on releases of specified substances to air, water and land." The original vision of the NPRI was to: • Help Canadians understand pollutants in their communities • Inform actions to reduce pollution by (a) encouraging emitters to be proactive in reducing releases, and (b) helping governments target their programs and regulations effectively. • Track Canada's progress in reducing releases Ten guiding principles were established by the MSAC, one of which was noted in the stakeholder's comments: "Reporting to the NPRI should be made as simple as possible; it should not unreasonably burden reporting facilities." However, two of the other guiding principles are: • "The NPRI data base and annual report should present as complete a picture as possible of the release sources of NPRI substances" and • "Over time, the NPRI should evolve in response to public, government and industry needs." Since the beginning of the program, the scope was intended to evolve by responding to the needs of the public, the government, and industry. As our knowledge about pollutants in Canada advances, it informs potential changes to the data included in the NPRI. Today's drivers for change, as noted in the Process for proposing and considering changes to the NPRI, include supporting ECCC's air quality modelling activities and the

Table 12. Summary of General Stakeholder Comments and Environment and Climate Change Canada's Response Regarding the Proposal to Change Reporting Requirements for Reporting Releases of CACs		
No./Topic	**Stakeholder Comments**	**Environment and Climate Change Canada Response**
		development of other pollutant inventories, among others.
6. Cost benefit analysis	The proposed changes would benefit from a more comprehensive cost-benefit analysis. The current analysis seems to be focused on an estimation of the number of facilities that would be affected, without considering the expected additional costs for these affected facilities to comply with the new requirements.	NPRI does not conduct comprehensive quantitative cost benefit analyses of changes to reporting requirements like those that are done for regulations in Regulatory Impact Analysis Statements. For a regulation, the costs for pollution control equipment, for example, can be compared against the benefits of a quantifiable reduction in releases of pollutants. While it may be possible to estimate the cost of reporting to the NPRI in terms of the time required by facility personnel to track substances, calculate releases and report the data, it is not necessarily possible to quantify the "benefit" of NPRI data for comparison. Instead, as outlined in the Process for proposing and considering changes to the NPRI, value vs. cost is a consideration that must be addressed when evaluating change to NPRI reporting requirements. In this process, value can be demonstrated when the drivers for the change are fulfilled and information gaps are reduced enough to obtain data that meets the stated objective(s). Key factors include whether there is value in requiring the on-going reporting of additional information and whether the data received be of satisfactory quality to meet identified objectives. The number of facilities that will be impacted by the change is estimated by ECCC, by sector where possible, to serve as a proxy for the cost side of the equation. This information can be used by stakeholders to help evaluate the costs associated with the changes.

Table 13. Summary of Stakeholder Comments and Environment and Climate Change Canada's Response Regarding the Proposal to Change Reporting Requirements for Reporting Releases of CACs from Individual Stacks		
No./Topic	**Stakeholder Comments**	**Environment and Climate Change Canada Response**
1. Increase in resources required to report to the NPRI	The reduction in the stack height threshold will significantly increase the time and resources required by facilities to report to the NPRI, despite the increases in the stack air release thresholds. The impacts will vary depending on the sector. Estimates of the additional amount of time required to gather the required information, calculate releases and enter data into the online reporting system are in the range of days to weeks. Note that some estimates were submitted in response to the originally proposed stack height threshold of 15m and some were in response to the revised proposed threshold of 25m. These estimates do not necessarily take into account the offset in burden associated with the planned exemptions for certain stacks, reporting of grouped stacks or the time required to collect and report information on stack characteristics as well as releases. One stakeholder raised the concern that any increase in mandatory requirements may have the adverse impact of less voluntary reporting of NERM substances, due to reprioritizing efforts to NPRI reporting.	ECCC recognizes that reducing the stack height threshold will result in an increase in the resources required by facilities to report to the NPRI. The overall benefit of the additional data for improving air quality modelling and inventory compilation, for use by other data users, and of having more information available to the public through the NPRI, is expected to outweigh the additional resources required to collect the information. ECCC plans to implement requirements in a manner that will help minimize the increase in resources required to report to the NPRI while capturing the most important information for modellers and compilers. For example, ECCC intends to exempt certain stacks from individual stack reporting requirements, including non-vertical stacks (e.g., gooseneck and horizontal stacks), stacks with rain caps, and stacks/vents from storage tanks and other sources with ambient or near-ambient release temperatures. Releases from these stacks would still need to be reported, but not on an individual stack basis. ECCC also intends to allow the reporting of grouped stacks. In addition, ECCC intends to continue consultations on exempting stacks based on exit temperature (see below). ECCC recognizes the value of initiatives such as NERM. However, in general, decisions on whether to make changes to the NPRI are considered in light of NPRI objectives and using the published decision factors and considerations for NPRI changes.
2. Reporting of grouped stacks	The proposed criteria for allowing the reporting of grouped stacks is too limiting and would preclude some facilities from using this option. Additional criteria or	Based on the request for more flexibility in the criteria for grouping stacks received during the initial consultation period, ECCC revised the criteria that

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	flexibility are needed to allow stacks with near surface emissions or lower emissions to be grouped into a virtual source. Confirmation was requested that once certain stacks are grouped, that the grouping not be deemed permanent. Some facilities would like the flexibility to be able to change the groupings from year to year.	were originally proposed by increasing the allowable differences in stack characteristics and locations (see sections 9.1 and 9.2). The revised criteria should allow more facilities to take advantage of this option to help reduce the increase in efforts required for reporting. In cases where a facility has a group of stacks that fall outside these criteria but that they believe should be able to report those stacks as a group, the facility can work with ECCC to evaluate the situation. Stack grouping is not permanent. Facilities will be permitted to include a stack in a group in one year and then report that stack individually or as part of a different group in another year. Facilities can also report a group of stacks for one CAC and report one or more of those stacks in a different group for another CAC within the same or different years, if needed.
3. Exit temperature and exit velocity thresholds	Some industry stakeholders commented that there is little value in additional thresholds for stack exit temperature and exit velocity thresholds and that these additional thresholds are not supported, since the benefit of the thresholds would be outweighed by the increased complexity of the reporting requirements. Other stakeholders are not opposed to a temperature threshold even though they would not benefit from it. Another stakeholder strongly supports the use of an exit temperature threshold, whether it is a specific temperature like 50C, or a more qualitative indicator, such as exempting stacks that do not have "heated" releases.	In regional air quality modelling, releases from stacks with little or no initial vertical velocity can be treated as ground level releases without significant impacts on modelling results. As such, certain stacks can be exempted from individual stack reporting requirements (releases from these stacks would still need to be reported, but not on an individual stack basis). This includes non-vertical stacks (e.g., gooseneck and horizontal stacks), stacks with rain caps, and stacks/vents from storage tanks. This exemption is not intended to increase the efforts required by facilities to report, but is rather aimed at reducing the efforts required for some sectors. ECCC intends to continue consultations on exempting stacks where releases occur at or around ambient temperature from individual stack reporting

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		requirements. We will be requesting input from stakeholders on how to implement a requirement based on exit temperature that will benefit some facilities in a way that does not increase the time and resources required to report to the NPRI for facilities that would not benefit from a temperature threshold. Based on the comments received, there does not seem to be interest from industry stakeholders in having an exit velocity threshold. ECCC does not intend to pursue this option further, in the absence of industry stakeholder interest.
4. Rationale for collecting information on CAC releases from stacks less than 50m in height	Some stakeholders requested more information on the rationale for collecting data on releases of CACs from stacks that are less than 50m in height. Some stakeholders commented that the proposed changes to the stack height threshold would not meet the expressed objective of improving air quality modelling results, and that the increase in resources required to report to the NPRI would outweigh any improvements in modelling results. One stakeholder provided the example of local air dispersion modelling results from forest products facilities in Canada that suggest that releases from on-site stacks below 50m have very limited impact on ambient concentrations beyond the near field. Another stakeholder commented that releases from vehicle manufacturing facilities do not have long range effects and should be treated as near surface emissions, despite the elevation of the releases. Other stakeholders expressed concerns that the dispersion of releases from shorter stacks can be heavily influenced by nearby buildings, topography and	ECCC's current operational air quality forecast model is GEM-MACH (Global Environmental Multi-scale - Modelling Air quality and CHemistry). This is a comprehensive air quality model containing a full description of atmospheric chemistry and meteorological processes. Currently, when NPRI data are used as inputs to GEM-MACH, all releases that are not assigned to specific stacks that are 50m in height or higher are treated as ground-level emissions. However, when these releases occur at an elevation above ground level and at elevated temperatures and velocities, the releases may behave very differently in the atmosphere than ground-level emissions. Treating them as surface level emissions therefore affects the accuracy of model results. The rationale for collecting information from stacks with a reduced 25m height threshold is to improve modelling results by no longer treating releases occurring between 25 and 50m in height as ground level emissions. GEM-MACH is a regional-scale model covering most of North America in 10 km by 10 km grid cells. Local air quality dispersion models, such as the American

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	micrometeorology, and that the accuracy of regional models may be reduced by using information on releases from shorter stacks, especially those that are in close proximity to buildings. Concerns were raised that if these influences were not accounted for in regional modelling, the stated objective of improving modelling results would not be met. Note that many of the concerns of stakeholders about the effect of using information from shorter stacks on modelling results were raised in the context of the originally proposed 15m stack height threshold. Some, but not all, stakeholders submitted additional comments when the proposed stack height threshold was revised to 25m, indicating their concerns were at least partially addressed by the higher threshold. Some stakeholders expressed support for, or recognition or understanding of the rationale for making changes to stack reporting requirements and the value of the data for inventory compilers, air quality modellers and other data users.	Meteorological Society/US Environmental Protection Agency Regulatory Model (AERMOD), are designed for small-scale regulatory applications and use advanced methods for handling complex terrain and building downwash effects. Typically, local dispersion modelling is done at the sub-kilometre horizontal scale. Local terrain characteristics can significantly affect the results of small-scale air quality modelling, however, ECCC modelling is done at the regional and global scales, where the effects of local terrain on modelling results are not resolved. In addition, using a 25m stack height threshold, instead of the originally proposed 15m threshold, is expected to considerably reduce the impact of local- and building-scale processes on the modelling results. ECCC thanks stakeholders for taking the time to consider the proposed changes.
5. Requiring reporting only for stacks in specific areas	A stakeholder recommended that the requirement to report releases from individual stacks only be applied to targeted facilities located in highly populated or high emission concentration areas and not to facilities located in rural or isolated areas.	Facilities in isolated areas may use local air dispersion modelling to demonstrate minimal impacts on ambient concentrations of air pollutants at the fence line of the facility for regulatory compliance purposes. In these cases, the results only model the effects of emissions from activities at the facility in question and over a very short distance. Stacks are used to reduce the impacts on ambient concentrations in the immediate vicinity of the facility, but the releases from stacks can travel long distances and cause impacts in other areas. ECCC's air quality model uses

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		emissions from all sources, anthropogenic and natural, and models the effects of those emissions over larger geographic areas. Emissions from stacks at facilities in isolated areas can travel long distances and, combined with emissions from all other sources, have impacts on air quality in other areas. Equally, emissions from remote stacks can be transported to the isolated location where they will combine with the emissions from the isolated source. Therefore, it is important for ECCC to collect information on emissions from facilities that are located in all areas.
6. Difficulty estimating releases from individual stacks	Some industry stakeholders commented that emissions data are generally available only at the facility level and that stack-level information is not normally tracked. In cases where test data are not available, facilities would need to rely on ad-hoc, site-specific factors to apportion emissions to individual stacks. The use of stack-specific factors whose uncertainty cannot be quantified, on top of the industry-specific factors used to estimate facility-wide emissions, will create a great amount of uncertainty in the source data. This uncertainty will be compounded when annual emission estimates are processed to shorter term rates for input to the air dispersion model. Other industry stakeholders commented that information on releases from individual stacks is readily available and can be reported relatively easily.	ECCC recognizes that facilities may not currently be tracking emissions at the individual stack level and that there will be uncertainty associated with data that is apportioned to stacks based on facility-level release calculations. It is ECCC's position that facility-reported stack data, despite the uncertainty associated with those data, will be more accurate inputs for air quality modelling than the current method of assuming that all releases occur at ground level unless they are assigned to a stack 50m in height or higher. ECCC thanks stakeholders for taking the time to consider the proposed changes.
7. Guidance for reporting facilities	ECCC should provide guidance for reporting facilities, including definitions of specific stack parameters. Currently little guidance exists regarding the meaning of: stack exit velocity, exit temperature, stack height and diameter. For example, if the stack is a flare, it will have both actual stack height and effective	ECCC intends to provide guidance for reporting facilities, including possible updates to the 2002 Criteria air contaminants (CACs) technical source guide for reporting to the National Pollutant Release Inventory and Supplementary guide for reporting criteria air contaminants (CACs) to the

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	(pseudo) stack height and actual stack diameter and effective (pseudo) stack diameter. Additionally, for modelling purposes, the British Columbia Air Quality Dispersion Modelling Guideline recommends the use of an effective stack exit temperature of 1273 K and effective stack exit velocity of 20 m/s. This is primarily because it is not possible to calculate annually the exit velocity and temperature of flares and other external combustion equipment stacks.	National Pollutant Release Inventory, when the changes to reporting requirements for CACs are implemented, and will consider including guidance on reporting of stack characteristics.
8. Uncertainty associated with using US data to predict effects in Canada	There is uncertainty associated with using US National Emissions Inventory (NEI) data to try to predict the impacts on facilities in Canada of changing NPRI reporting requirements. There are many differences in the characteristics between facilities in the two countries. For example, US compressor stations largely use reciprocating engine compressor drives as opposed to turbines in Canada, and the pipeline transmission systems in the US tend to be older. NEI data is not necessarily consistent between the states, and stack data from US vehicle manufacturing facilities are not necessarily representative of conditions at Canadian vehicle manufacturing facilities.	In order to determine the best type of criteria at which stacks should be required to report, an analysis was performed on two stack databases: the 2008 Alberta Industrial Air Emissions Survey and the 2014 US NEI. These data sets were used since detailed stack data (beyond that reported to the NPRI, which does not include stacks below 50m in height) are not available Canada-wide or for other provinces. ECCC recognizes that using data from the US and Alberta to predict what will happen across Canada if NPRI stack reporting requirements are changed cannot be done with complete certainty, since conditions will vary between the two countries and between the provinces. However, in the absence of comprehensive stack data for Canada, the US and Alberta data were the best available data for the analysis. A qualitative uncertainty analysis was included in the February 2019 consultation document. ECCC intends to evaluate the impact of the changes that are implemented once a few years of data are available, to determine if the requirements need to be refined based on Canadian data.
9. Create an inventory of stacks	A stakeholder recommended that ECCC create an inventory of Canadian stacks of	An inventory of stacks and their characteristics would not be useful for

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before implementing requirements to report releases from stacks	certain characteristics (15-50m in height, emitting CACs) to use to evaluate the possible impacts of proposed changes to stack reporting requirements, before implementing any changes to the requirements.	evaluating options for NPRI reporting requirements without information on releases of CACs from those stacks. An inventory of stacks, their characteristics and their CAC releases is what ECCC proposed to collect (with a revised height threshold of 25m), albeit on an annual basis, instead of an initial one-time requirement as suggested by the stakeholder. NPRI is an annual inventory of releases of substances and information about those releases and as such, it is not suited to one-time data collection efforts. As part of the normal process for implementing changes to NPRI reporting requirements, ECCC instead intends to evaluate the current changes once a few years of data become available, to ensure the implemented changes are meeting the needs of data users and that the value of the data continues to justify the effort required to collect it.
10. Release coverage target	ECCC should consider individual release coverage targets for each CAC as opposed to a single target for all CACs, or consider percentage improvement in release coverage instead, to make changes to thresholds.	ECCC used an 80% release coverage target to select the proposed stack height and stack air release thresholds in the February 2019 consultation document. Based on comments received during the initial consultation period, ECCC adopted a more flexible approach to revise the proposed thresholds. The revised proposed 25m stack height threshold and stack air release thresholds were selected based on improvements to release coverage without strictly adhering to the 80% release coverage target. When the thresholds are applied to the US and Alberta datasets, the 80% target is not met for any of the CACs except SO_2. With these new thresholds, however, significant improvements in release coverage are still expected for all CACs.
11. Stack threshold for particulate matter	A stakeholder recommended retaining the current stack reporting requirements for PM and instead using the data on emissions	ECCC intends to use stack level data for PM for more than just compiling the Black Carbon Inventory. Information on

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	from combustion and non-combustion sources to calculate black carbon emissions for the Black Carbon Inventory.	releases of PM from more stacks than are currently reporting can also be used for air quality modelling and by other users of NPRI stack release data.
12. Increase in stack air release thresholds for SO_2 and PM	The proposed stack air release thresholds for SO_2 and TPM are too high (100 tonnes paired with a 15m stack height threshold) and may result in less information being reported.	The original proposed stack air release threshold of 100 tonnes for TPM and SO_2 paired with a 15m stack height threshold was revised to 50 tonnes with a 25m stack height threshold. Based on analyses of the US and Alberta data, the type of threshold to get reporting from the highest number of stacks that are releasing the greatest quantities of CACs involves increased stack air release thresholds and a reduced stack height threshold. The combination of 50 tonnes and 25m is expected to result in an overall increase in the number of stacks reporting for SO_2 and TPM. Where reporting from individual stacks is not required, the quantities of these CACs released from facilities will still be required to be reported, as part of total stack or point releases instead.
13. Allowable methods of estimation	The proposal does not specify whether emission factors or direct measurements will be required to be used to estimate stack releases.	Facilities will be able to select the method of estimation they would like to use from the list of methods that are acceptable for the purposes of reporting to the NPRI: • continuous emission monitoring systems • predictive emission monitoring • source testing • mass balance • site-specific emission factor • published emission factor • engineering estimates • speciation profile (new – see Table 14)
14. Support for, agreement with, or no objection to the proposed changes	a. Stack height threshold (some stakeholders indicated support for or agreement with a 15m stack height threshold, other stakeholders indicated support for a 25m stack height threshold)	ECCC agrees with the position of some industry stakeholders that a 25m stack height threshold is preferable to a 15m threshold. Based on the analyses of the US and Alberta data, a 25m threshold may not result in the 80% release

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	b. Increasing the stack air release thresholds in conjunction with a decreased stack height threshold c. Exempting certain types of stacks d. Requiring a basis of estimate be reported for each stack (some stakeholders indicated that this information should be readily available to reporting facilities).	coverage target being met, but it should significantly increase the release coverage for all CACs. This should allow for the collection of data for modelling, with far less of an increase in the resources required by facilities to report to the NPRI than with a 15m threshold. ECCC thanks stakeholders for taking the time to consider the proposed changes.
	All but one of the industry stakeholders that expressed support for the proposed changes to the stack height and stack air release thresholds indicated that the support is contingent on reliably functioning reporting software and/or updated and improved bulk upload functionality.	See Table 12 for ECCC's response to stakeholder comments on the reporting software.

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1. Increase in resources required to report to the NPRI	Requiring the reporting of speciated VOCs from an increased number of individual stacks will significantly increase the time and resources required by facilities to report to the NPRI. The proposed changes could result in significant changes in current stack testing programs and tracking of each individual VOC.	ECCC recognizes that the changes to the reporting requirements for total and speciated VOCs will result in an increase in the resources required by facilities to report to the NPRI. The overall benefit of the additional data for improving air quality modelling, for use by other data users, and of having more information available to the public through the NPRI is expected to outweigh the additional resources required to collect the information. ECCC is implementing requirements in a manner that will help minimize the increase in reporting burden and to capture the most significant releases, by: allowing the

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No./Topic	**Stakeholder Comments**	**Environment and Climate Change Canada Response**
		reporting of grouped stacks; establishing a stack air release threshold for individual VOCs (see below); and establishing a threshold to account for the temperature of releases from stacks (see Table 13).
2. Need for a threshold for speciated VOCs from individual stacks	Many stacks may only release very small quantities of individual VOCs. Requiring reporting of very small quantities of individual VOCs will not significantly improve the overall speciation rate (the percentage of total VOCs released from a stack that is broken down into speciated VOCs). Having a threshold for speciated VOCs from stacks will help to balance the value of the additional data against the increase in the time and resources required to report, by capturing information on the more significant releases of individual VOCs. One industry stakeholder recommended a stack air release threshold of 10 tonnes for speciated VOCs, i.e., only if a speciated VOC is released from an individual stack in a quantity of 10 or more tonnes would it need to be reported (the quantity released would still be reported as part of total VOCs). Note that the speciated VOC would only need to be reported for the stack if three other thresholds are met: (1) the facility-wide 10-tonne threshold for total VOCs, (2) the 10-tonne stack air release threshold for total VOCs, and (3) the facility-wide 1-tonne threshold for that VOC would have to be met.	ECCC agrees with the position of some industry stakeholders that an air release threshold for speciated VOCs from individual stacks will help to minimize the increase in resources required to report to the NPRI, compared to the originally proposed changes. ECCC intends to analyze the US dataset to determine and propose a suitable threshold, and conduct consultations on this issue as part of the 2022-2023 Work Group Work Plan. A stack air release threshold for individual VOCs represents a fourth air release threshold for determining if a report is required. As part of the process for continuing consultations, ECCC will be seeking ideas from stakeholders on how to simplify these requirements.
3. Remove the requirement to report speciated VOCs released from individual stacks	A stakeholder suggested to reduce the time and resources required by facilities to report to the NPRI, and to ensure the data collected is of value, the requirement to report speciated VOCs released from individual stacks should be removed.	The need for information on speciated VOCs from individual stacks was established when speciated VOCs were first added to the NPRI in 2003. In the absence of stack-specific release information for an individual VOCs, all releases of that VOC are treated as occurring at ground level in air quality models, which can significantly impact the results. As such, ECCC will not be removing the requirement to report

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		speciated VOCs from individual stacks that meet the height and air release thresholds.
4. Reporting of only a subset of speciated VOCs from stacks	A stakeholder recommended that rather than require all speciated VOCs be reported from individual stacks, ECCC should instead consider requiring reporting of only a subset of the listed speciated VOCs (e.g., benzene, toluene, ethylbenzene and xylene).	The current set of speciated VOCs in Part 5 was developed after extensive analysis of the VOC emissions from all industries emitting VOCs, supplemented by further analysis of Part 5 VOC reporting to the NPRI for the 2006-2015 period. While a subset of the Part 5 speciated VOCs may be sufficient for some facilities or even industries, it will fail to capture significant emissions of other Part 5 VOC species that are known to be released and impact air quality.
5. Speciation profile	Clarify if the proposed speciation profile change means that ECCC will be adding the term "speciation profile" to the list of options that reporting facilities can choose from. The use of proper speciation profiles are key to the usefulness and interpretation of the data. Sector guidance from ECCC may be needed in this area.	ECCC intends to add "speciation profile" to the list of bases of estimate that reporting facilities can choose from. We expect that this basis of estimate will be most frequently used when reporting for speciated VOCs, but may also be used for reporting of other substances (e.g., particulate matter fractions). Previously, a basis of estimate was not required to be reported when a quantity of total VOCs was speciated, so speciation profile was not added to the list of bases of estimate until now. ECCC intends to prepare guidance for facilities that are required to report for CACs and speciated VOCs, and will consider including guidance on the selection of proper speciation profiles.
6. Support for, agreement with or no objection to the proposed changes	a. Increasing the stack air release threshold for total VOCs b. Requiring reporting of speciated VOCs from more stacks c. Reporting releases of speciated VOCs from individual stacks separately for combustion and non-combustion sources d. Speciating VOCs from individual stacks, from stacks that do not meet thresholds and points, and from all other sources separately e. Requiring a basis of estimate be reported each time a quantity of total VOC releases is speciated	ECCC thanks stakeholders for taking the time to consider the proposed changes.

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	f. Adding "speciation profile" to the list of bases of estimate.	

Table 15. Summary of Stakeholder Comments and Environment and Climate Change Canada's Response Regarding the Proposal to Change Reporting Requirements for Reporting Combustion and Non-Combustion Sources, with Bases of Estimates and Reporting of Fuel Type		
No./Topic	**Stakeholder Comments**	**Environment and Climate Change Canada Response**
1. Rationale for collecting this information and difficulty estimating combustion and non-combustion emissions separately	Estimating emissions separately for some types of processes and equipment will be difficult or not possible, especially for total and speciated VOCs (e.g., emissions from direct-fired wood dryers or lumber kilns are a combination of emission from wood drying and combustion). Prorating of total emissions into emissions from combustion and non-combustion sources may not be possible, particularly where field or experimental data are not available. Depending on the method used to estimate combustion emissions separately from non-combustion emissions, there may be increased uncertainty associated with the data or the data may be inaccurate. The increase in reporting burden outweighs the value of collecting data with a high level of uncertainty. The value of information on fuel type for improving inventory compilation and air quality modelling is not clear.	ECCC inventory compilers and air quality modellers need separate data on releases of air pollutants from combustion sources to (1) prepare and submit the annual Air Pollutant Emissions Inventory (APEI) to the United Nations Economic Commission for Europe (UNECE) to meet international reporting obligations under the Convention on Long-range Transboundary Air Pollution (CLRTAP); (2) prepare and publish the annual Black Carbon Inventory report under the Arctic Council's Framework for Action on Enhanced Black Carbon and Methane Emissions Reductions and Canada's voluntary commitment under the Gothenburg Protocol; and (3) prepare model-ready emissions files for regional air quality modelling that is used, for example, for forecasting the Air Quality Health Index, and for evaluating policy scenarios. See ECCC's Air quality modelling site for more information on uses of air quality modelling data. Releases from combustion sources must be reported separately in the APEI, only combustion-related data are used to calculate black carbon releases, and releases from combustion sources are treated differently than non-combustion sources in modelling inventories. When using NPRI data that is reported as totals for all activities, APEI assigns applies a ratio of combustion to non-combustion sources to separate the releases by

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		source. These ratios may not be the best representation of conditions at a particular facility and may be based on outdated studies. Because the Black Carbon Inventory only uses combustion-related releases, compilers assume that the presence of stack at a facility and releases of CO, NOx and $PM_{2.5}$ indicate that the facility's releases are from combustion. A speciation profile of $PM_{2.5}$ to black carbon releases is then selected for the facility based on the name of the stack and the facility-reported NAICS code. Speciation profiles are often fuel-specific, NPRI stack names are often ambiguous or provide no indication of the source(s) associated with the stack and NPRI data for stacks <50m in height is not available. Air quality modellers assign generic source classification codes (SCCs) to NPRI-reported releases. SCCs are used in emissions processing of point sources to link to temporal profiles, VOC and PM speciation profiles, default stack characteristics, etc. SCCs are process- and fuel-specific, and generic SCCs are less useful than more specific ones. ECCC recognizes that it may be difficult for some facilities to estimate releases separately for combustion and non-combustion sources for some or all processes and that there will be uncertainty associated with reported releases. It is ECCC's position, however, that facilities are in a much better position to provide these estimates than the Department and that the uncertainty will be less than the uncertainty associated with the current methods described above.
	It is not clear what value there is of collecting information on fuel type from	Information on releases from combustion and non-combustion point sources,

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	stacks that do not meet thresholds and points. Only emissions from stacks 50 m in height or more above grade should be required to be reported separately by combustion and non-combustion sources. Where a facility cannot accurately estimate combustion and non-combustion emissions, they should be permitted to submit information on total emissions from both types of sources.	regardless of the elevation of the release is important for air quality modelling. Point sources are processed differently (spatially and temporally) from fugitive emissions for input to air quality models. Information on releases from combined sources will be permitted to be reported. However, this option should only be used if the facility is absolutely unable to estimate releases separately.
2. Guidance for reporting of combustion and non-combustion sources	ECCC should provide guidance for reporting facilities on what constitutes combustion and non-combustion sources and on how to estimate combustion and non-combustion emissions separately. ECCC should work with sectors to develop this guidance. The definitions for combustion and non-combustion sources should be aligned with federal greenhouse gas reporting requirements.	ECCC plans to provide guidance for reporting facilities that will reflect changes to reporting requirements for CACs, including information on what constitutes combustion and non-combustion sources and ways that releases could be estimated separately. NPRI plans to work with industry association representatives as well as ECCC sector groups during the development of this guidance. ECCC works to align NPRI reporting requirements with those of other ECCC programs and regulations where possible. When developing the definition of combustion and non-combustion sources for the purposes of reporting to the NPRI, ECCC intends to pursue opportunities for aligning NPRI's definition with those of other jurisdictions where possible.
3. Community right to know intent of the NPRI	Reporting of fuel type goes beyond the community right-to-know intent of the NPRI. What goes into a facility and the details of the processes supporting the facility's operation are not relevant to the public. The release of this information would not improve the right-to-know respecting the quality of the air they breathe and the water they use.	NPRI data can directly support the community right-to-know intent of the program – by allowing individual community members access to information on releases of pollutants in their area. NPRI data can also indirectly support community right-to-know – for example, by forming an input to Canadian Environmental Sustainability Indicators (CESI) or to the Air Quality Health Index (AQHI). While citizens may not be directly accessing raw NPRI data when using CESI or AQHI, they are obtaining valuable information about the state of their environment that affects their daily lives, and that information is based in

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		part on NPRI data. It is ECCC's position that this also fulfils the community right-to-know intent of the NPRI. In addition to the community right-to-know objective, NPRI objectives include identifying priorities for action and supporting targeted regulatory initiatives. Providing contextual information, such as information on the type(s) of fuel associated with releases, helps to meet these objectives as well.
4. Confidential business information	Information on fuel type is confidential business information and public release of information on fuel type could affect a facility's competitiveness. As such, the proposed requirement is strongly opposed.	ECCC recognizes that detailed information on fuel quantities used and fuel characteristics, and data on releases reported separately by process or by fuel type could be considered to be confidential information. However, NPRI will only be requiring that the fuel type or types that apply to a combustion-related release be reported. It is ECCC's position that public release of general information on fuel types used will not affect a facility's competitiveness. In addition, all facilities subject to NPRI reporting requirements will be subject to the same requirement.
5. Reporting of emissions by fuel type	It would be very difficult or impossible to estimate emissions from each fuel type for certain types of facilities and specific processes. Some processes use many types of fuels and the mix of fuels will change over time. Many types of equipment burn more than one type of fuel. It is not possible to link a particular fuel to a particular emission.	ECCC recognizes that it may be difficult or impossible to report emissions separately by each type of fuel that is used at the facility. NPRI did not propose to require reporting of emissions by fuel type, and is not currently planning to do so. Instead, reporting facilities will be required to select all the fuels that apply to an emissions estimate from a pick list for emissions from combustion sources for (i) each stack that meets thresholds and (ii) the total of emissions from exempted stacks, stacks that do not meet thresholds and points. The quantities of emissions will not be required to be reported separately for each fuel type that applies. See Appendix 13 for the check list of fuels.
6. Other sources of data on fuel type	ECCC should explore options to work with associations who collect fuel-specific data	Statistics Canada collects information on energy use in Canada and publishes the

Table 15. Summary of Stakeholder Comments and Environment and Climate Change Canada's Response Regarding the Proposal to Change Reporting Requirements for Reporting Combustion and Non-Combustion Sources, with Bases of Estimates and Reporting of Fuel Type		
No./Topic	**Stakeholder Comments**	**Environment and Climate Change Canada Response**
	for individual facilities on behalf of Statistics Canada. Data sharing would significantly reduce the reporting burden on facilities and would help ensure consistent data across government departments including Statistics Canada and ECCC.	Report on Energy Supply and Demand in Canada (RESD) annually. RESDs are generally available about 15-18 months after the year to which the data apply, e.g., the preliminary 2017 RESD was published May 29, 2019. Revised reports are generally available 26-28 months after the year to which the data apply. Only summary data is published, some data are suppressed to meet the confidentiality requirements of the *Statistics Act*, and detailed data can only be purchased by ECCC on the understanding that ECCC will not make the data publicly available. These factors make Statistics Canada data on fuel types unsuitable for use with NPRI data – preliminary NPRI data are generally available 7 months after the year to which the data apply and reviewed data are available 12 months after the year to which the data apply; and NPRI data are all publicly available. RESD data are far more detailed than the data that NPRI will collect. In order to minimize the increase in efforts required to report on fuel type to the NPRI, facilities will only have to select all the fuel types that apply to a particular release quantity from a check list.
7. Other uses of source- or activity-level data	The proposal states that there may be uses for source- or activity-level data, including establishing performance benchmarks or comparing the performance of like sources. These might not be suitable uses for data from pipeline operations. Pipeline configurations and operations vary widely. Some pipelines are designed and operated to deliver natural gas over long distances. The larger compressors along these systems tend to be turbine driven, run more steady state and year round. Other pipeline systems have more integrated, network style configurations. The operations along these systems are more variable and compressors are run with a view to optimizing system operation in	ECCC thanks stakeholders for taking the time to consider the proposed changes and provide this information.

Table 15. Summary of Stakeholder Comments and Environment and Climate Change Canada's Response Regarding the Proposal to Change Reporting Requirements for Reporting Combustion and Non-Combustion Sources, with Bases of Estimates and Reporting of Fuel Type		
No./Topic	**Stakeholder Comments**	**Environment and Climate Change Canada Response**
	response to a more instantaneous type of demand. On some of these pipeline systems and at storage locations, the compressors serve a peaking function, and run from several hundred hours to several thousand hours during a year, with differences in run-time year-over-year and seasonally.	
8. Support for or no objection to the proposed changes	Reporting of emissions by combustion and non-combustion sources and reporting of a basis of estimate for these emissions is supported. Not requiring emissions to be reported separately by each fuel type and not requiring information on fuel use at the process or equipment level is supported. The ability of reporting facilities to select all fuels that might apply from a check list for emissions from combustion sources is preferred or supported.	ECCC thanks stakeholders for taking the time to consider the proposed changes.

Table 16. Summary of Stakeholder Comments and Environment and Climate Change Canada's Response Regarding the Proposal to Change Reporting Requirements for CPM		
No./Topic	**Stakeholder Comments**	**Environment and Climate Change Canada Response**
1. Issues with methods for measuring CPM	Given the significant positive bias in the US Environmental Protection Agency Method 202 and the ECCC reference method for measuring CPM, NPRI should not require CPM to be reported.	ECCC is aware of the challenges associated with measuring CPM releases based on existing reference methods. CPM releases are not and will not be required to be reported. Only filterable PM is and will continue to be required to be reported.
2. Challenges with reporting this information	Some facilities may not know if they are releasing CPM.	NPRI will not be asking facilities if they are releasing CPM. ECCC is aware that some facilities using certain methods of estimation are already reporting CPM, so NPRI will be asking facilities if the estimation method they used to calculate

Table 16. Summary of Stakeholder Comments and Environment and Climate Change Canada's Response Regarding the Proposal to Change Reporting Requirements for CPM		
No./Topic	**Stakeholder Comments**	**Environment and Climate Change Canada Response**
	Some facilities may not know if the estimation method they are using includes CPM.	reported PM emissions includes CPM or not. If a facility does not know whether their PM estimates include CPM, they will be allowed to indicate this.
3. No or little effect	The natural gas pipeline sector generally does not expect to trigger the stack thresholds for reporting PM.	ECCC thanks stakeholders for taking the time to consider the proposed changes and provide this information.
4. Support for the proposed change	Requiring an indication of whether or not a PM release quantity includes CPM, instead of requiring CPM to be reported is supported. Allowing facilities the option to indicate that they do not know if their PM estimates include CPM is supported.	ECCC thanks stakeholders for taking the time to consider the proposed changes.

Appendix 1

Proposal by Environmental Defence to add naphthenic acids to the NPRI

November 2010

The following proposal was submitted by Environmental Defence on November 11, 2010.

- Start of Proposal -

1. Summary of modification requested

We request the addition of naphthenic acids to the National Pollutant Release Inventory (NPRI).

2. Background on the substance

a. CAS #: 1338-24-5
b. Specific substance information (uses): Naphthenic acids are a byproduct of oil sands production and are primarily found in oil sands tailings.
c. Proposed reporting thresholds for additions: We recommend the same reporting threshold as for Part 1 substances in Schedule 1 of the Canada Gazette Notice, which is no minimum concentration threshold when determining whether the manufactured, processed or otherwise used threshold is met (Canada Gazette, 2009).

3. Rationale

As a result of a judicial review of the NPRI program, mines are now required to report on the quantity and concentration of NPRI substances disposed of in tailings in addition to direct release to air, water and land. This includes oil sands mines.

Following the change in reporting requirements, oil sands facilities report on a range of NPRI substances found in tailings, including polycyclic aromatic hydrocarbons, ammonia, zinc lead and arsenic (Environment Canada, 2009). However, because it is not currently listed as an NPRI substance, the facilities are not required to report naphthenic acids.

Yet Alberta Environment has acknowledged that naphthenic acids are the "primary source of toxicity" in oil sands tailings (Singh), and Environment Canada has also identified naphthenic acids are a primary source of toxicity in oil sands tailings (Shugart). It is therefore important that tar sands facilities be required to report naphthenic acids. Below is a more detailed rationale for the addition of naphthenic acids to the NPRI according the decision factors outlined by Environment Canada.

a. Does the substance meet NPRI criteria

1. Is the substance manufactured, processed or otherwise used (M,P,O) in Canada?

Naphthenic acids are a byproduct of oil sands extraction and, as such, are manufactured, processed or otherwise used in Canada. There are currently 840 million cubic metres of oil sands tailings (Alberta Energy Resources Conservation Board, 2010) stored in massive lakes in northern Alberta that cover 170 square kilometres. While there is no cumulative assessment of the amount of naphthenic acids stored in the tailings lakes, tailings have been reported to contain naphthenic acids at concentrations of 80-100 mg/L (S.S. Leung et al, 2003).

The problem is also growing quickly. Two-hundred million litres of oil sands tailings are produced each day, and the volume of tailings will increase by an estimated 30% between now and 2020 (The Pembina Institute, 2010).

2. Is the substance of health and/or environmental concern?

Naphthenic acids have been identified as an environmental and health concern. Environment Canada has identified them as the primary source of toxicity in tar sands tailings, as has Alberta Environment. Many scientific studies have demonstrated the environmental impacts of oil sands tailings, and point to naphthenic acids as the main source of toxicity (Leung et al, 2003; Bendell-Young et al, 2000; Gentes et al, 2006; Peters et al 2007; Pollet et al 2000; Rogers et al 2002; van den Heuvel et al, 2000; Young et al, 2007). Below are some examples, but not an exhaustive list, of the impacts of naphthenic acids:

- Naphthenic acids are toxic to mammals, causing liver and heart damage and brain hemorrhage at high doses and weight lose and liver enlargement from chronic exposure (Rogers et al, 2002).At lethal doses, naphthenic acids cause nervous system depression, convulsion and respiratory arrest leading to death in mice.
- Yellow perch eggs exposed to naphthenic acids showed increased rates of deformity and lower birth size than those not exposed (Peters et al, 2007).
- Nestling tree swallows exposed to oil sands tailings containing naphthenic acids show lower weight and are less able to withstand stress than those not exposed, decreasing their chance of survival (M-L Gentes et al, 2006).
- Naphthenic acids influence the community structure of aquatic microorganisms at concentrations beginning at 6-20 mg/L (S.S. Leung et al, 2003).

Fort Chipewyan, a community located downstream from the oil sands, is experiencing an elevated rate of cancer (Alberta Cancer Board, 2009). Community members and doctors working in the community have repeatedly raised concerns that the elevated cancer rates are linked to oil sands pollution, stemming from tailings leaking into the water, yet no comprehensive health study has been conducted to investigate the health impacts of oil sands on the community.

3. Is the substance released to the Canadian environment?

The main source of naphthenic acids is the production of oil sands. In natural surface waters in the Athabasca region, naphthenic acids are found at a concentration of 1-2 mg/L. In oil sands talings, naphthenic acids can exceed 100 mg/L (S.S. Leung et al, 2003).

Oil sands companies are now required to report on NPRI substances contained in tailings ponds, and tailings ponds contain significant quantities of naphthenic acids, therefore naphthenic acids should be included in the list of substances that must be reported in tailings.

However, there is ample evidence that oil sands tailings, and therefore naphthenic acids, are released into the environment beyond the tailings ponds. The containment areas for tailings ponds in the oil sands are built from materials the companies excavate from the surrounding area - earthen materials - and are not lined. In their project proposals, companies assume that tailings ponds will systematically leak into the surrounding area.

Environmental Defence released a report that for the first time publicly estimated how much contaminated water the tailings ponds leak (Environmental Defence, 2008). The report compiled company data from environmental assessment reports to conservatively estimate that the tailings ponds already leak four billion litres each year, with projections that this figure could reach over 25 billion litres within a decade should proposed projects go ahead.

There are also documented cases of contaminated tailings water reaching surface water, including:

- An environmental assessment Shell Canada Ltd. projected that contaminated tailings from its operations would reach Jackpine Creek (Alberta Energy Utilities Board, 2004).
- An academic study from the University of Waterloo estimates that Suncor Energy's Tar Island pond had been leaking almost 6 million litres a day into the Athabasca River (Barker et al, 2007).
- Another incident is documented in correspondence between the Alberta government and Syncrude, and in an assessment commissioned by Syncrude from Golder Associates (Syncrude Canada, 2007; Golder Associates 2009). It is clear that contaminated tailings

materials leaked into Beaver Creek, a tributary of the Athabasca River, over a number of years.

- Another incident of leakage into surface water concerns Suncor's South Tailings Pond leaking into McLean Creek. A study on the issue, in part by a Suncor engineer (Stephens et al) admits that the leakage into the creek will not be stopped, but rather than the company would try to manage the concentrations of deleterious substances in the creek.

Furthermore, two recent research studies demonstrated that chemicals contained in oil sands tailings - including polycyclic aromatic hydrocarbons, lead, mercury, cadmium - are in snow and water downstream of the oil sands facilities, and that several exceeded what is considered a safe level (Kelly et al, 2009; Kelly et al, 2010). While these two studies did not look at concentrations of naphthenic acids specifically, they show that pollution from oil sands tailings is being released into the environment.

b. Do facilities contribute significant releases of the substance

There is no cumulative assessment of the quantity of naphthenic acids released by the oil sands industry because it is currently not tracked or reported publicly. Approximately 1.5 barrels of mature fine tailings are produced per barrel of oil sands. In 2008, oil sands mining produced 856,000 barrels of oil per day, resulting in 1.284 million barrels of tailings produced each day (Grant, 2008). These tailings contain naphthenic acids at a concentration of 80-100 mg/L, meaning that up to 20.4 tonnes of naphthenic acids are produced each day and nearly 7,500 tonnes each year by oil sands facilities. Given the evidence that tailings ponds leak into the surrounding environment, it is important facilities to track and report on both naphthenic acids that are stored in tailings ponds, and the amount released to the water through leakage.

c. Does inclusion of the substance support one or more of the objectives of the NPRI?

Given that naphthenic acids have been identified by the federal and provincial governments as the main source of toxicity of oil sands tailings, inclusion of naphthenic acids in the NPRI will allow tracking of releases, provide a better understanding of the risks posed by oil sands tailings and support voluntary and regulatory measures to reduce the toxicity of oil sands tailings and minimize the threat to the environment and human health posed by tailings ponds.

d. Is the substance reported elsewhere? If it is, is there additional value in reporting to the NPRI?

Naphthenic acids are not publicly reported elsewhere in Canada. The United States Environmental Protection Agency, however, has placed naphthenic acids on the hazardous substances list of the

Comprehensive Environmental Response, Compensation and Liability Act (known as Superfund), which requires tracking of naphthenic acids.

4. Proposed Timing for the Change

We recommend that facilities be required to report on naphthenic acids beginning in 2012 or sooner.

5. Industrial Sectors Affected

Oil sands mining facilities will be the primary sector affected to the best of our knowledge. There are currently 5 facilities reporting to the NPRI in this category.

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- End of Proposal -

Appendix 2

Proposal to add naphthenic acids to the NPRI for the 2012 reporting year – Recommendations of the NPRI Multi-Stakeholder Work Group

June 2012

1. Introduction

The Recommendations of the National Pollutant Release Inventory (NPRI) Multi-Stakeholder Work Group (WG) summarizes the WG's current views and recommendations on the proposal that Environment Canada (EC) received to add naphthenic acids (NAs) to the NPRI for the 2012 reporting year and beyond.

1.1. Background

On November 11, 2010, Environmental Defence submitted a proposal to add NAs (CAS RN 1338-24-5) to the NPRI starting with the 2012 reporting year.

NAs are a by-product of oil sands production and are primarily found in oil sands tailings. Commercial NA mixtures are used as solvents, detergents, and rubber reclaiming agents.

While NAs are present in all crude oils and bitumen and have a number of industrial and commercial applications, Environmental Defence is primarily concerned with releases of NAs related to oil sands development. Oil sands facilities report on a range of NPRI substances released to and from tailings ponds. However, NAs are not currently listed as an NPRI substance, and facilities are not required to report NAs. Environmental Defence's rationale for the addition, as identified in the proposal, is that NAs have been identified as a key source of toxicity in oil sands tailings and it is therefore important that information on this group of substances be publicly available.

Environmental Defence proposes that NAs be added to the list of Part 1 substances. The proposal specifically mentions the following:

a. CAS #: 1338-24-5
b. Specific substance information (uses): Naphthenic acids are a by-product of oil sands production and are primarily found in oil sands tailings.
c. Proposed reporting thresholds for additions: They recommend the standard 10-tonne reporting threshold for NPRI substances.

1.2. Work Group Process

A process for modifying the NPRI exists that fully describes how to propose changes to the NPRI program; the considerations when assessing changes to the NPRI substance list, including specific

decision factors; and the consultative approach used by EC when considering changes to the NPRI.[1]

The NPRI is following the consultation process as outlined in the NPRI process for modifying the NPRI. The process calls for a multi-stakeholder work group (WG) to provide recommendations on proposed modifications to the NPRI. To obtain a balanced foundation for the NPRI, the current NPRI WG members include representatives from industry, aboriginal organizations, and environmental non-governmental organizations (ENGOs).

The recommendations of the WG will be considered by EC in making decisions on possible changes to the NPRI reporting requirements, which are published in the Canada Gazette, Part I.

2. Issues Referred to NPRI Work Group

This section reflects the discussion and recommendations of the WG following a meeting in April 2012 on the topics listed below:

1. Does the addition of NAs meet the five NPRI decision factors
2. Reporting on a broader category (i.e. naphthenic acid fraction compounds) versus NAs with CAS RN 1338-24-5
3. Ability to estimate quantities and availability of analytical methods
4. Threshold
5. Should the listing be broadly applicable to all sectors
6. Timing

2.1. Does the addition of Naphthenic Acids meet the five NPRI decision factors

Background

In evaluating a proposed change to the NPRI list of substances, a rationale should be provided against each of five decision factors. The decision factors are listed below and were developed to guide decision within the NPRI program in determining whether a proposed addition or deletion has merit. If the results of these five decision factors indicate that a substance should be added to the

[1] See *Modifying the National Pollutant Release Inventory: A Guide to the Procedures to Follow When Submitting Proposals and a Description of the Stakeholder Consultation Process*. [This document has been replaced by the *Process for Proposing and Considering Changes to the National Pollutant Release Inventory* (2016).]

NPRI, the value of the information versus the cost of obtaining it and making it available through the NPRI should also be taken into account.[1]

1) Does the substance meet the NPRI criteria, that is:
    a) Is the substance manufactured, processed or otherwise used (M, P, O) in Canada?
    b) Is the substance of health and/or environmental concern?
    c) Is the substance released to the Canadian environment?
    d) Is the substance present in the Canadian environment?
2) Do facilities contribute significant releases of the substance?
3) Does inclusion of the substance support one or more of the objectives of NPRI?
    a) To identify priorities for action
    b) To encourage voluntary action to reduce releases
    c) To allow tracking of progress in reducing releases
    d) To improve public understanding
    e) To support targeted regulatory initiatives
4) Is the substance reported elsewhere? If it is reported elsewhere, is there nonetheless additional value in reporting the information again?
5) Is the substance already on the NPRI in some form? If it is already on the NPRI in some form, is there nonetheless additional value in including it in another form?

The Environmental Defence proposal outlines their rationale and concluded that all five of the decision factors were met for the addition of naphthenic acids.

Work Group Views

There was not consensus among the WG that the addition of NAs to the NPRI meets the five decision factors. Some members disagreed with the conclusion for factor 1)b) "Is the substance of health and/or environmental concern?" because the specific substance(s) to be added has not been determined, and the evaluation of NAs under the Canadian Environmental Protection Act, 1999 (CEPA 1999) has not been completed. They feel that this information is needed to determine if the substance(s) is of health and environmental concern. Also, the contribution of individual NAs to the overall toxicity is unknown and therefore the characterizations of individual NAs need to be completed. An ENGO member stated that recent literature documents that NAs have endocrine disruptor effects as well as other impacts, and therefore agrees that the substance meets the criteria of being of health and/or environmental concern.

A member disagreed with the conclusion for factor 2)"Do facilities contribute significant releases of the substance?" because it is uncertain if the source of NAs are naturally occurring or from facilities. There was also some question as to whether disposals to tailings should be considered under this decision factor. EC clarified that the CEPA 1999 definition of releases includes substances disposed of in tailings ponds.

Furthermore, an analysis of the burden on reporters of adding this substance has not been completed, and would be difficult at this time due to the uncertainty over what exactly would be added and what analytical methods are available and recommended. Once the substance(s) to be added are determined, the implications of reporting should be determined for all sources, in addition to the oil sands.

Work Group Recommendations

There was no consensus for a WG recommendation on whether or not the NPRI decision factors are met.

2.2. Reporting on a broader category (i.e. naphthenic acid fraction compounds) versus NAs with CAS RN 1338-24-5

Background

The Chemical Abstracts Services Registry Number (CAS RN) 1338-24-5 refers to commercial NA mixtures, which are used as solvents, detergents, and rubber reclaiming agents. None of the commercial NAs are currently listed on the NPRI. NAs with the CAS RN 1338-24-5 met the criteria of the categorization process, which was completed in 2006 as a requirement of the CEPA 1999 to identify which chemicals required further action. An assessment will be completed at a later date to determine whether this substance meets the criteria of toxic under section 64 of CEPA 1999.

The NA mixtures with CAS RN 1338-24-5 contain only approximately 30% of the NAs found in oil sands processing water (OSPW), according to EC scientists. Using this CAS RN would not capture comprehensive data on NAs in oil sands tailings, and would limit the data to commercially used NAs. In order to capture more comprehensive data, information on a broader group of compounds known as "acid extractable organics" or "naphthenic acid fraction compounds" (NAFCs) (with no specific CAS RN) could be collected.

Work Group Views

Some comments supported that the proposed addition of NAs should not be limited to the CAS RN identified in the proposal. A WG member stated that upon reviewing the references in the proposal,

they seem to refer to the broader group and not specifically that CAS RN. Reporting of the broader group may also provide a more complete picture of the overall effects.

One WG member said that regardless of which substance is added, the broad principle should be kept in mind that the addition has to be defined in a way to provide meaningful information. One WG member noted that under either option, other sectors will be impacted even though not addressed within the Environmental Defence proposal explicitly.

Another WG member prefers specific CAS RNs since they provide much better direction about what needs to be reported, and therefore more consistent data. Information about broad compound groups with no specific CAS RNs may result in less ability to understand the health and environmental impacts due to the lack of information on specific NA compounds. Reporters will need clear definitions of, and guidance around, what is to be included within the broader category of substances if NAs are added to the NPRI substance list without any specific CAS RN.

Some WG members noted that it would be helpful to know the fate (transformation) of NAs and, if there are significant differences in toxicity among the various NA compounds, it would be helpful to have a "toxic equivalent" method developed for the purpose of reporting.

Work Group Recommendations

No consensus was reached among WG members. Certain members feel that looking at the broader group of compounds better reflects the intent of the proposal while others say we should limit the listing to specific CAS RNs.

2.3. Ability to estimate quantities and availability of analytical methods

Background

There are currently no reliable analytical methods for measuring specifically those NAs defined by CAS RN 1338-24-5, out of the broader group of similar compounds that are present in oil sands processing water. The term "naphthenic acids" is usually used to represent a broader group of substances known as "acid extractable organics" or "naphthenic acid fraction compounds" (NAFCs). There are reliable analytical methods for measuring this larger group of compounds.

It should be noted that work is on-going within the scientific community to refine the analytical methods for measuring these compounds. The results of this work are expected to be available later this year – in time for gathering of data for the 2013 reporting year. Should the addition proceed for 2012, there are methods other than source testing that can be used by facilities to report to the NPRI (e.g. engineering estimates), and some facilities may already have information

on this substance. However, an important point to consider is that for the 2012 reporting year, there may be some issues with data quality. NPRI reporting is based only on information that an owner/operator possesses or may reasonably be expected to have access to.

Work Group Views

WG members expressed concern that there is not enough information currently to ensure that the applicable analytical methods are, or will be broadly available, reliable and of reasonable cost to reporters if NAs are added for the 2012 reporting year. Depending on the final results of the on-going work in the scientific community, there is also some uncertainty as to whether enough information will be available for the 2013 reporting year. The answer to this question also depends on what the definition of this substance would be (specific CAS RNs versus broader category).

Work Group Recommendations

There was agreement among industry members of the WG that due to the high level of uncertainty over the availability of methods at the current time, a decision on addition of this substance should be deferred until more information is known. Other members did not provide specific recommendations on this issue.

2.4. Threshold

Background

Environmental Defence proposed that NAs be added to the core list of NPRI substances (Part 1A). In that case the following standard NPRI threshold would apply:

Any person who owns or operates a contiguous facility or offshore installation would be required to submit an NPRI report for NAs if both of the following criteria are met:

1. employees work a total of ≥ 20 000 hours (the equivalent of 10 full-time employees), or activities to which the employee threshold does not apply (incineration, wood preservation, terminal operations, wastewater treatment and pits and quarries) take place at the facility, and
2. the total amount of NAs
    a. manufactured, processed or otherwise used (MPO) at a concentration (by weight) of 1% or more, plus
    b. incidentally manufactured, processed or otherwise used as a by-product at any concentration, plus
    c. contained in tailings disposed of during the calendar year at any concentration, plus
    d. contained in waste rock that is not clean or inert that is disposed of during the

calendar year at a concentration (by weight) of 1% or more

is ≥ 10 tonnes.

Oil sands facilities producing tailings (at which the proposal is directed) would trigger this threshold for reporting, based on the large quantity of tailings produced and the fact that no concentration threshold would exist for NAFCs that are incidentally produced or that are in tailings. Once the threshold is met, all releases, disposals and transfers for recycling of the substance would be reportable, regardless of concentration. Facilities from other sectors might also meet the threshold, depending on quantities and concentrations of NAs manufactured, processed or otherwise used.

Work Group Views

A member stated that the threshold chosen should be one that would capture quantities that are of health and environmental concern. At this time it is unknown if 10 tonnes will capture this data. Another concern was that there is limited information on quantities of this substance from oil sands or other sectors therefore it is unknown what threshold is needed to capture this level of data.

It was suggested that if the default 10-tonne threshold is applied, EC should reevaluate whether the threshold is applicable after a few years of reporting, presuming that additional scientific data will be available to inform the alternative threshold decision making process.

Work Group Recommendations

WG members reached consensus that the default 10-tonne threshold would apply, since there is not currently enough information to decide on the applicability of an alternate threshold. However, WG members agreed that the definition of this substance (specific CAS RNs versus broader category) is needed before the threshold can be decided.

2.5. Should the listing be broadly applicable to all sectors

Background

Although the focus of the proposal is on issues related to NAs in tailings, it does not propose the exclusion of reporting on this substance from other sectors or sources. Two of the guiding principles of the NPRI[2] are that the coverage should be comprehensive and that the data should present as complete a picture as possible of the release sources of NPRI substances. In keeping with these principles, sector-specific reporting requirements have been established only in special circumstances (such as the need for activity-based thresholds for dioxins, furans and

[2] Guiding principles of the NPRI are from *The Final Report of the Multi-Stakeholder Advisory Committee* (December 1992).

hexachlorobenzene). In order to be consistent with the guiding principles and with past practice, substances that are added to the NPRI should not be added in a sector-specific manner unless a clear case can be made that there are special circumstances that would warrant a sector-specific approach.

Work Group Views

Generally WG members agreed that requirements should be as broadly applicable as possible and only by exception is there justification for sector specific requirements. Some WG members said that the question should be revisited when the substance(s) have been determined, and the sources and reporting impacts are known.

One WG member expressed that chemicals in hydraulic fracturing fluid used to extract natural gas should not be overlooked as a potential source of NAs. EC replied that the reporting of chemicals in hydraulic fracturing fluid is being looked at as part of the NPRI review of reporting requirements from the oil and gas extraction sector.

Work Group Recommendations

No reasons were given for restricting the reporting requirements to a specific sector or sectors. However a few WG members expressed that more information is required to provide a recommendation.

2.6. Timing

Background

There are four options for the recommendation on timing of implementing this change, as follows:

1) Add NAs to the NPRI for the 2012 reporting year
2) Add NAs to the NPRI for a later reporting year
3) Defer decision to add NAs to the NPRI
4) Do not add NAs to the NPRI

Work Group Views

All WG members agreed that adding NAs to the NPRI for the 2012 reporting year (Option #1) is not recommended because of the uncertainty with the ability to estimate quantities and because it is already partway through 2012 and reporters would have to already be gathering the data. It was also agreed that the decision of not adding NAs to the NPRI (Option #4) should not be recommended at this time.

There was some discussion between Option 2 and Option 3. Some members expressed that a decision could be reached now to add NAs to the NPRI for the 2013 reporting year, with additional time to work out technical details before reporting started. Conversely, other members felt that until more information is received, the decision should be deferred. If the decision is to be deferred, certain members expressed concerns that the timing for the decision should not be left open to ensure timely resolution of this issue.

Work Group Recommendations

The WG recommends that NAs should not be added to the NPRI for the 2012 reporting year. Additional work should be completed on issues such as substance definition, analytical methods, and reporting impacts in order to make an informed decision regarding the addition of NAs for the 2013 or future reporting years.

Appendix A: List of NPRI Multi-Stakeholder Work Group Members

Industry Representatives

Name	Organization
Kathryn Podgurny *	Canadian Association of Petroleum Producers (CAPP)
Giulia Brutesco	Canadian Electricity Association (CEA)
Jim Cormack *	Canadian Energy Pipeline Association (CEPA), Canadian Gas Association (CGA), and Canadian Energy Partnership for Environmental Innovation (CEPEI)
Nancy Coulas	Canadian Manufacturers & Exporters (CME)
Andy Sebestyen	Canadian Steel Producers Association (CSPA)
Karen Hou *	Canadian Vehicle Manufacturers' Association (CVMA)
Allan Mumby *	Canadian Water and Wastewater Association (CWWA)
Darren Brown *	Cement Association of Canada
Peter Baltais *	Chemistry Industry Association of Canada (CIAC), and Canadian Petroleum Products Institute (CPPI)
Justyna Laurie-Lean *	Mining Association of Canada (MAC)

Aboriginal Organizations

Name	Organization
Andrew Black	Assembly of First Nations
Alan Penn *	Grand Council of the Crees

Environmental Non-Governmental Organizations

Name	Organization
James White *	Ecology Action Centre
John Jackson *	Great Lakes United
Anna Tilman	International Institute of Concern for Public Health
Ramsey Hart	Mining Watch
Olga Schwartzkopf *	Soil and Water Conservation Society (SWCS), BC Chapter

* present at the April 11, 2012 teleconference discussing these recommendations

Appendix 3

Environment Canada's response to the proposal to add naphthenic acids to the National Pollutant Release Inventory

December 2012 and July 2014

A. Status Update (July 2014)

The December 2012 response to this proposal (see below) indicated that two information items were needed before continuing the established process to consider whether to add naphthenic acid fraction compounds to the list of National Pollutant Release Inventory (NPRI) substances. The first item is now available, while the second item is not yet available.

1. The proceedings of the Naphthenic Acid Strategies Workshop (Saskatoon, November 24-25, 2011) were expected to include consistent terminology for the group of substances of interest, and to establish a precise description of this group of substances. The workshop proceedings were published in August 2013 (Headley et al., 2013). Workshop participants agreed on terminology for the group of substances of concern ("oil sands naphthenic acids" or "naphthenic acid fraction compounds") and on a description of what substances are included in the group (as originally described in Headley et al., 2011). Previously, Environment Canada decided to proceed with consideration of this larger group of substances, rather than only those included in CAS RN 1338-24-5 as originally proposed (see below for the rationale for this decision). As expected, the workshop proceedings confirmed that the group of substances that are of concern are naphthenic acid fraction compounds.
2. The results of an inter-laboratory study were expected to describe the best analytical methods for measuring these compounds. The results of this study would assist industry with determining how to estimate their releases of this complex mixture of substances, should naphthenic acid fraction compounds be added to the NPRI in the future. The results of the inter-laboratory study on analytical methods are not yet available.

Environment Canada intends to resume stakeholder consultations on the possible addition of naphthenic acid fraction compounds to the NPRI when the results of the inter-laboratory study become available.

References

J. V. Headley, M. P. Barrow, K. M. Peru and P. J. Derrick (2011): Salting-out effects on the characterization of naphthenic acids from Athabasca oil sands using electrospray ionization, Journal of Environmental Science and Health, Part A: Toxic/Hazardous Substances and Environmental Engineering, 46, 844-854.

J. V. Headley, K. M. Peru, M. H. Mohamed, R. A. Frank, J. W. Martin, R. R.O. Hazewinkel, D. Humphries, N. P. Gurprasad, L. M. Hewitt, D. C.G. Muir, D. Lindeman, R. Strub, R. F. Young, D. M. Grewer, R. M. Whittal, P. M. Fedorak, D. A. Birkholz, R. Hindle, R. Reisdorph, X. Wang, K. L. Kasperski, C. Hamilton, M. Woudneh, G. Wang, B. Loescher, A. Farwell, D. G. Dixon, M. Ross, A. Dos Santos Pereira, E. King, M. P. Barrow, B. Fahlman, J. Bailey, D. W. Mcmartin, C. H. Borchers, C. H. Ryan, N. S. Toor, H. M. Gillis, L. Zuin, G. Bickerton, M. Mcmaster, E. Sverko, D. Shang, L. D. Wilson and F. J. Wrona (2013): Chemical fingerprinting of naphthenic acids and oil sands process waters – A review of analytical methods for environmental samples, Journal of Environmental Science and Health, Part A: Toxic/Hazardous Substances and Environmental Engineering, 48:10, 1145-1163.

B. Original Environment Canada Response, December 2012

1. Introduction

On November 11, 2010, Environmental Defence submitted a proposal to add naphthenic acids (CAS RN 1338-24-5) to the National Pollutant Release Inventory (NPRI) starting with the 2012 reporting year.

While naphthenic acids (NAs) are present in all crude oils and bitumen, and have a number of industrial and commercial applications, Environmental Defence is primarily concerned with releases of NAs related to oil sands development. Oil sands facilities report on a range of NPRI substances released to and from tailings ponds. However, NAs are not currently listed as an NPRI substance, and facilities are not required to report NAs. Environmental Defence's rationale for the addition, as identified in the proposal, is that NAs have been identified as a key source of toxicity in oil sands tailings and it is therefore important that information on this group of substances be publicly available.

2. Recommendations of the NPRI Multi-Stakeholder Work Group

As part of the established process for modifying the NPRI[1] the Environmental Defence proposal to add NAs to the NPRI was referred to the NPRI Multi-Stakeholder Work Group (WG) for discussion

[1] See Proposal to Add Naphthenic Acids to the NPRI for the 2012 Reporting Year – Recommendations of the NPRI Multi-Stakeholder WG.

and recommendations. The WG's recommendations on the proposal are available on the NPRI website.Footnote2

3. On-Going Work on Naphthenic Acids

Work is on-going within the scientific community to develop (1) consistent terminology for the group of substances of interest, (2) to establish a precise description of this group of substances, and (3) to determine the best analytical methods for measuring these compounds.

An international workshop on "Analytical Strategies for Naphthenic Acids (NAs)" was held by Environment Canada on November 24-25, 2011. Workshop participants discussed developing consistent terminology and analytical methods for NAs. An inter-laboratory study was recommended to follow the workshop. The inter-laboratory study was organized and led by Environment Canada. A manuscript on the workshop and the inter-laboratory study has been prepared and will be submitted to the Journal of Environmental Science and Health, Part A. Pending the outcome of the external review process, the manuscript is expected to be published during 2013. The results of the workshop and inter-laboratory study are expected to provide the information that Environment Canada needs to move forward with the process for making a decision on whether to add NAs to the NPRI.

It should be noted that NAs with the CAS RN 1338-24-5 met the criteria of the Chemicals Management Plan categorization process, which was completed in 2006 as a requirement of the Canadian Environmental Protection Act, 1999 (CEPA 1999) to identify which chemicals required further action. A risk assessment on NAs will be completed in the future (2016-2020) by Environment Canada and Health Canada, to determine whether this substance meets the criteria of toxic under section 64 of CEPA 1999. Information resulting from the risk assessment will therefore not be available in time to inform a decision on the current proposal to add NAs to the NPRI.

4. Environment Canada's Response

Environment Canada understands that Environmental Defence would like data on NAs that may be released, disposed of, or recycled during industrial processes, including the extraction of bitumen from the oil sands. Although Environmental Defence has identified NAs with CAS RN 1338-24-5 as capturing this information, Environment Canada does not agree with this. The group of NAs with CAS RN 1338-24-5 is limited to commercial mixtures of NAs used as solvents, detergents and rubber reclaiming agents. These mixtures represent less than half of NAs found in bitumen and crude oil. Accordingly, Environment Canada will examine the addition of naphthenic acid fraction

compounds (NAFCs) to the NPRI, since this is a larger group of NAs, and information on the larger group of substances is expected to satisfy the information request.

The ongoing work described in Section 3 above is expected to fill a significant information gap that currently exists regarding a precise description for NAFCs. Without this information, it is Environment Canada's view that a decision cannot be made on whether to add NAs to the NPRI. The WG recommendations support this view. Accordingly, Environment Canada will continue the established process for modifying the NPRI[2] once this information is available. The earliest that this information is expected to be available is 2013.

4.1 Rationale

4.1.1 Substances

Environmental Defence proposed to add naphthenic acids (CAS RN 1338-24-5) to the NPRI for the purpose of capturing comprehensive data on toxic substances in oil sands tailings. Environment Canada has decided that NAs with this specific CAS RN is not the appropriate substance listing to capture the data requested in the proposal. Therefore, Environment Canada will consider the addition of naphthenic acid fraction compounds (with no specific CAS RN) instead, based on the following rationale.

CAS RN 1338-24-5 specifically refers to commercial NA mixtures, which are used as solvents, detergents and rubber reclaiming agents. However, NA mixtures with CAS RN 1338-24-5 contain less than half of the NAs found in bitumen and crude oil. Using CAS RN 1338-24-5 would therefore limit the data to commercially used NAs. It would not capture comprehensive data on NAs that may be released, disposed of or recycled during industrial processes, including the extraction of bitumen from oil sands, and would therefore not satisfy the stated intent of the proposal.

The term "naphthenic acids" is not always used to represent the same group of substances. The term is usually used to represent a broader group of substances known as "acid extractable organics" or "naphthenic acid fraction compounds" (NAFCs). In addition, there is no current consensus on a precise description of NAs or NAFCs. In order to collect useful data on NAs from industry, a clear description of the group of substances on which reporting is required must be available. A precise description is not currently available, but is expected to become available as a result of the on-going work described above.

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[2] See Modifying the National Pollutant Release Inventory: *A Guide to the Procedures to Follow When Submitting Proposals and A Description of the Stakeholder Consultation Process*. [Since replaced by the *Process for proposing and considering changes to National Pollutant Release Inventory* (2016)]

Environment Canada's position is supported by the recommendations of the WG. The WG was not able to reach a consensus recommendation on the issue of which group of substances to consider for addition to the NPRI. However, some members of the WG felt that any possible listing of this group of substances should not be limited to the CAS RN 1338-24-5 (Recommendation 2.2).

4.1.2 Timing

Environmental Defence proposed to add NAs to the NPRI starting with the 2012 reporting year. Environment Canada will not be in a position to fully consider this proposal until a precise description for NAFCs is available (Section 3 above). This description is expected to become available during 2013. This position is also supported by the following recommendations of the WG:

1. The WG recommendation that "… a decision on addition of this substance should be deferred until more information is known" (Recommendation 2.3); and
2. The WG recommendation that "…NAs should not be added to the NPRI for the 2012 reporting year." This will allow time for additional work to be completed on issues identified with the proposal (Recommendation 2.6).

Environment Canada will continue to consider Environmental Defence's proposal once the description of NAFCs is available. The information from the workshop and inter-laboratory studies will be used for further stakeholder consultations on the proposal during 2013.

Appendix 4

Addition of naphthenic acids (and their salts) to the National Pollutant Release Inventory – Consultation document

January 2018

Addition of naphthenic acids (and their salts) to the National Pollutant Release Inventory

Consultation Document – January 2018

Summary

Environment and Climate Change Canada (ECCC) is consulting on the addition of naphthenic acids (and their salts) to the National Pollutant Release Inventory (NPRI), beginning with the 2020 reporting year. The substance is proposed to be defined as classically defined naphthenic acids and their salts, a broad category of substances that are present in waste generated by processing of oil sands. ECCC is proposing to restrict reporting on naphthenic acids and their salts to the oil sands sector, reflecting the intent of the initial proposal for their addition to the NPRI.

The public is invited to provide comments on this proposal and send them to the NPRI at ec.inrp-npri.ec@canada.ca by April 16, 2018. Consultation on the proposed change is also being conducted with the NPRI Multi-Stakeholder Work Group from January 15, 2018 to April 16, 2018.

Comments and recommendations received during consultation will be considered as ECCC makes a decision on the proposed change. A summary of comments and recommendations received from the NPRI Work Group and others will be posted on the NPRI website, along with ECCC's decision, once it is available.

1. What is meant by Naphthenic Acids?

The term "naphthenic acids" is not always used to represent the same group of substances. For the purposes of this consultation document, the following three terms are described below: naphthenic acids, naphthenic acid fraction compounds and commercial naphthenic acids. More specific definitions and additional details are provided in Annex A.

1.1 Naphthenic Acids

Naphthenic acids are a large and diverse group of organic acids that are natural components of petroleum. Naphthenic acids are weak organic acids present primarily as their sodium naphthenate salts in oil sands process-affected water (Headley et al., 2011).

1.2 Naphthenic Acid Fraction Compounds

The term "naphthenic acid fraction compounds" (or "acid extractable organics") is used to describe a broader group of diverse polar organic compounds present in bitumen and oil sands process-affected water. This group of substances includes naphthenic acids as classically defined (sections 1.1 above and A.1 in Annex A) as well as other compound classes, and is primarily composed of larger,

more complex compounds than commercial naphthenic acids (Bartlett et al., 2017; Marentette et al., 2015).

1.3 Commercial Naphthenic Acids

Commercial mixtures of naphthenic acids (CAS RN 1338-24-5 may apply) can be used as solvents, detergents, rubber reclaiming agents, rust and corrosion inhibitors, lubricants and emulsifiers. The composition of commercial mixtures varies widely, depending on the manufacturer (Headley et al., 2002; Grewer et al., 2010; Marentette et al., 2015).

Naphthenic acids with CAS RN 1338-24-5 were determined to meet the health criteria for the categorization of the *Domestic Substances List* and are being assessed in Phase 3 of the Chemicals Management Plan (CMP). Publication of the draft screening assessment report is currently planned for April to September 2018. The results of the screening assessment will be considered when making a decision on the addition of naphthenic acids to the NPRI.

2. Background

In November 2010, Environmental Defence submitted a proposal to add naphthenic acids (CAS RN 1338-24-5) to the National Pollutant Release Inventory (NPRI). Proposals to make changes to the NPRI are evaluated according to an established process. As part of this process, following an internal evaluation of the proposal, consultations were undertaken with the NPRI Multi-Stakeholder Work Group in April 2012.

Based on Work Group recommendations and expert advice, ECCC decided the following:

1. To examine the addition of naphthenic acid fraction compounds to the NPRI, rather than evaluate the possible addition of commercial naphthenic acids with CAS RN 1338-24-5 to the NPRI. Information on this larger group of substances, which is more representative of the substances in oil sands tailings, was thought to more appropriately meet the intent of the proposal.

2. To resume consultations when more information on the characterization of this group of compounds and on methods of analysis became available, specifically, the results of an inter-laboratory study, which were expected to describe a comparison of analytical methods for measuring these compounds. These results were expected to be published in 2013, which would have allowed for consideration of the addition of naphthenic acid fraction compounds to the NPRI starting in the 2014 or 2016 calendar years.

ECCC's decision at that time was based on the conclusion that commercial naphthenic acids are not representative of naphthenic acid fraction compounds derived from oil sands process-affected water in terms of chemical structure, relative abundance, environmental persistence, and additional toxic substituents (Bartlett et al., 2017, Marentette et al., 2015). Recent ECCC research has extensively tested and profiled all commercial mixtures and evaluated them against naphthenic acid fraction compound extracts of oil sands process-affected water from multiple operators and found them to be disparate chemically and in their effects on multiple aquatic vertebrate and invertebrate species (Bartlett et al 2017; Marentette et al. 2015).

Since the consultations in 2012, initial inter-laboratory work led to the design of additional studies (the final results of these are not yet available). These additional studies meant that ECCC was not in a position to move forward with consultation on this addition for previous reporting years.

Based on the inter-laboratory work completed thus far (Kovalchik et al., 2017), ECCC is moving forward with consultations to add naphthenic acids (defined in sections 1.1 and A.1) and their salts to the NPRI starting with the 2020 reporting year. This group of classically-defined naphthenic acids is narrower than the group of naphthenic acid fraction compounds and will not cover the complete range of acid extractable organics found in bitumen and oil sands process-affected water. However, analytical methods for naphthenic acids, with demonstrated proficiency or equivalence of results, currently exist. On the other hand, methods for the characterization and quantification of naphthenic acid fraction compounds are still emerging and results of the inter-laboratory study for naphthenic acid fraction compounds are still in progress. Naphthenic acid quantities reported to the NPRI will serve as a surrogate for naphthenic acid fraction compound quantities until such time as methods for their characterization and quantification are developed. The NPRI listing for naphthenic acids will be reviewed at that time.

3. Proposed Change

ECCC is consulting on the addition of naphthenic acids (defined in sections 1.1 and A.1), with no specific CAS RN, to Part 1A of the NPRI substance list, starting in the 2020 reporting year. As a Part 1A substance, naphthenic acids would have a mass reporting threshold of 10 tonnes and a 1% concentration threshold (except for by-products and tailings, which have no concentration threshold).

Naphthenic acids are proposed to be listed with the qualifier "and their salts," meaning that salts of naphthenic acids, expressed as the molecular weight of the acid, must be included. This is consistent with the way that all weak acids and bases are listed in the NPRI. Sampling results from the methods of analysis described in Section 5.1 should return salts collectively as their naphthenate ions, detected as naphthenic acids.

Since the naphthenic acids of concern in the initial proposal are associated with extraction and processing of oil sands bitumen, the requirement to report naphthenic acids to the NPRI is proposed to be restricted to facilities in the following two 2017 North American Industry Classification (NAICS) Canada Codes:

- 211141: In-situ oil sands extraction
- 211142: Mined oil sands extraction

4. Decision Factors for the Addition of Substances to the NPRI

Proposals to make changes to the NPRI are evaluated according to an established process that requires the evaluation of four decision factors (see below). ECCC agrees that naphthenic acids meet the decision factors for addition to the NPRI, as described below. This determination is based on the rationale provided by Environmental Defence in their 2010 proposal, and supplemented by additional information.

1. *Does the substance meet NPRI criteria?*

    a) *Is the substance manufactured, processed or otherwise used by facilities in Canada?*

    Yes. Naphthenic acids are naturally present in bitumen. Facilities that extract or process bitumen are manufacturing, processing or otherwise using naphthenic acids.

b) Is the substance of health and/or environmental concern?

Yes. In their proposal, Environmental Defence cites numerous studies demonstrating the toxicity of naphthenic acids. Natural Resources Canada's *Oil Sands Water Toxicity: A Critical Review* provides an overview of the toxicity of oil sands process-affected water and summarizes toxicity studies for specific substances, including naphthenic acids (Natural Resources Canada, 2010). Recent research on the toxicity of naphthenic acids to aquatic biota is summarized in Headley et al. (2013), Marentette et al. (2015) and Bartlett et al. (2017).

c) Is the substance released to the Canadian environment or disposed of by facilities, and do facilities contribute significant releases of the substance?

Yes. During the oil sands extraction process, naphthenic acids are solubilized and concentrated in process water and disposed of in tailings. Numerous studies demonstrate that oil sands extraction processes result in significantly elevated concentrations of naphthenic acids in oil sands tailings water compared to surface waters (summarized in Natural Resources Canada, 2010). In their proposal, Environmental Defence cites instances of releases from oil sands tailings to surface water. Research on source identification has demonstrated the possible migration of naphthenic acids from oil sands tailings to groundwater adjacent to those tailings ponds (Frank et al., 2014). Naphthenic acids are also released to air from oil sands in particulate matter (Yassine and Dabek-Zlotorzynska, 2017).

d) Is the substance present in the Canadian environment?

Yes. Naphthenic acids may be present in the environment as a result of natural or industrial processes. Naphthenic acids can enter surface water systems through natural mechanisms such as groundwater mixing and erosion of riverbank oil deposits in oil sands areas that are not under development. Naphthenic acids have been detected in various concentrations in tailings, surface water and groundwater in Alberta (Frank et al., 2014; Grewer et al., 2010; Headley et al., 2011; Leung et al., 2003).

2. *Does inclusion of the substance support one or more of the objectives of the NPRI?*

- *To improve public understanding*
- *To identify priorities for action*
- *To encourage voluntary action to reduce releases*
- *To allow tracking of progress in reducing releases (including successful reductions)*
- *To support targeted regulatory initiatives*
- *To support development of other pollutant release inventories, such as the Air Pollutant Emissions Inventory, and related international reporting obligations, where appropriate.*

Yes. Requiring reporting of information on naphthenic acids will support the objectives of the NPRI. In particular, NPRI reporting will allow tracking of releases and improve public understanding. NPRI data on naphthenic acids may support CMP activities and other targeted regulatory initiatives such as the development of Canadian Environmental Quality Guidelines. It is anticipated that, as research progresses, methodologies for measuring naphthenic acids will evolve from measuring total concentrations to concentrations of the individual classes of acids that are toxic to aquatic biota. This emerging line of research will continue to unfold as

knowledge of the chemical compositions and toxicities of the mixtures of naphthenic acids derived from natural and industrial sources continue to be investigated. As such, NPRI data will be useful in support of these initiatives, which are part of the Joint Canada-Alberta Implementation Plan for Oil Sands Monitoring.

3. *Is the substance reported elsewhere in Canada? If it is reported elsewhere, is there nonetheless additional value in reporting the information through the NPRI?*

No. Information on releases, disposals and recycling of naphthenic acids is not reported elsewhere in Canada.

4. *Is the substance already on the NPRI in some form? If it is already on the NPRI in some form, is there nonetheless additional value in including it in another form?*

No. Naphthenic acids are not currently on the NPRI list of substances in any form.

5. Impacts of the Proposed Change

5.1 Analytical Methods

Headley and McMartin (1992), Natural Resources Canada (2010), and Headley et al. (2011, 2013 and 2016), among others, discuss the challenges associated with the measurement of naphthenic acids in environmental samples. A wide variety of analytical methods exist and emerging technologies are being developed, as described in Headley et al. (2013) and Brunswick et al. (2015, 2016 and 2017). Inter-laboratory studies have been conducted (Kovalchik et al., 2017) and are ongoing to compare the accuracy and precision of these methods for use in routine analyses.

Facilities that report to the NPRI can measure naphthenic acids by a diverse range of methods that have demonstrated proficiency or equivalence of results, evidence for which is reported in the ECCC led inter-laboratory studies (Kovalchik et al., 2017). Based on advice from ECCC research scientists, the recommended methods are mass spectrometry methods based on time-of-flight mass spectrometry (TOFMS) or Orbitrap mass spectrometry, with or without on-line chromatography, but employing one or more internal standards to correct for instrumental variance that may occur running different samples (R. Strub, ECCC Environmental Science and Technologies Laboratories, personal communication, November 16, 2017).

As part of the ongoing inter-laboratory work, a traceable internal standard of a monoaromatic isomer (and an isotopically labelled analog) with diagnostic potential for tailings seepage tracking is being custom synthesized by a private firm and is expected to be available by March 2018 (R. Strub, personal communication, November 16, 2017). Certified Reference Materials applicable for laboratories analyzing oil sands related effluents are being developed for water soluble bitumen-derived organics present in oil sands process-affected waters, groundwaters, and surface waters, as these are the primary sources to the Athabasca oil sands region. The oil sands process-affected water reference material is expected to be available by March 2018, and the surface and ground water reference materials are expected to be available by March 2019 (R. Strub, personal communication, November 27, 2017). Given this timing, these materials are expected to be available in advance of the requirement for reporting, which would take effect for 2020.

For the purposes of reporting to the NPRI, facilities are also able to use methods of estimation other than source testing. There are no published emission factors for naphthenic acids, but a facility

could develop a site-specific emission factor or use mass balance or engineering estimation methods to estimate releases.

5.2 Facilities

Facilities in the in-situ and mined oil sands extraction sectors (2017 NAICS 211141 and 211142) will be required to report for naphthenic acids if mass, concentration and employee thresholds are met. These two new NAICS codes were introduced by Statistics Canada starting in 2017. Previously, these facilities would have been covered by the 2012 NAICS code 211114 (non-conventional oil extraction). In 2016, 73 facilities in the non-conventional oil extraction sector with ten or more employees reported to the NPRI. It is expected that these facilities would have to report for naphthenic acids, if they meet the mass and concentration thresholds.

Facilities that will be required to report for naphthenic acids will most likely already be reporting other substances to the NPRI. The majority of these facilities will have reported to the NPRI for at least one substance in previous years. The incremental costs of reporting for an additional substance, and the costs associated with source testing where it is reasonable to undertake sampling to generate information for NPRI reporting, are expected to be low relative to the value of the information that will be collected.

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Annex A: Additional Information on the Different Types of Naphthenic Acids

A.1 Naphthenic Acids

Naphthenic acids are a large and diverse group of organic acids that are natural components of petroleum. As described by Headley et al. (2011), naphthenic acids are classically defined as mono-carboxylic acids which include chain compounds and compounds with one or more alicyclic ring structures with the general formula $C_nH_{2n+Z}O_2$, where "n" indicates the carbon number and "Z" is referred to as the "hydrogen deficiency" (the number of hydrogen atoms that are lost as the structures become more compact) and is zero or a negative even integer (from -2 to -12). More than one isomer will exist for a given Z homolog, and the carboxylic acid group is usually bonded or attached to a side chain, rather than directly to the cycloaliphatic ring. The molecular weights differ by 14 mass units (CH_2) between n series and by two mass units (H_2) between Z series. Naphthenic acids are weak organic acids present primarily as their sodium naphthenate salts in oil sands process-affected water (Headley et al., 2011).

A.2 Naphthenic Acid Fraction Compounds

The term "naphthenic acid fraction compounds" (or "acid extractable organics") is used to describe the diverse polar organic compounds present in bitumen and oil sands process-affected water. This group of substances includes naphthenic acids as classically defined (section A.1) and several other compound classes, including aromatic, adamantine, or diamondoid structures (Rowland et al., 2011a-c), sulfur- and nitrogen-containing compounds, and oxygenated acids (Barrow et al., 2009; Bataineh et al., 2006; Headley et al., 2011). Naphthenic acid fraction compounds extracted from oil sands process-affected water are primarily composed of larger, more complex compounds than commercial naphthenic acids, with a lower proportion of acyclic structures (Bartlett et al., 2017; Marentette et al., 2015).

A.3 Commercial Naphthenic Acids

Commercial mixtures of naphthenic acids (CAS RN 1338-24-5 may apply) can be used as solvents, detergents, rubber reclaiming agents, rust and corrosion inhibitors, lubricants and emulsifiers. The composition of commercial mixtures varies widely, depending on the manufacturer (Headley et al., 2002; Grewer et al., 2010; Marentette et al., 2015).

Appendix 5

Additional information provided to stakeholders on naphthenic acids

April 2018

During the consultation period on the proposal to add NAs to the NPRI, stakeholders were asked to consider the following two questions:

1. Should NPRI add classically defined NAs (as defined in the consultation document) to the list of substances, or should NAFCs be listed instead?
2. Should NPRI restrict the requirement to report either NAFCs or NAs to facilities in the oil sands extraction sectors?

In order to assist with the second question, stakeholders were provided with the number of facilities reporting to the NPRI in 2016 in sectors that might manufacture, process or otherwise use NAs, if the requirement to report were not limited to the oil sands extraction sectors (see table below). It is unknown how many of these facilities would trigger the 20 000-hour employee threshold, the 10-tonne threshold and the 1% concentration threshold to be required to report.

Sector	North American Industrial Classification (NAICS) code	Number of facilities that reported to the NPRI in 2016
Oil and gas extraction	211	2920
Services to oil and gas extraction	213118	33
Petroleum refineries	324110	16
Asphalt paving mixture and block manufacturing	324121	58
Asphalt shingle and coating material manufacturing	324122	6
Other petroleum and coal product manufacturing (e.g., lubricant and grease plants)	324190	14
Petrochemical manufacturing	325110	9
Petroleum product wholesaler-distributors (terminals)	412110	76
Total		3132

Appendix 6

Summary of the meeting to discuss analytical methods for naphthenic acids

April 2018

Summary of the meeting to discuss analytical methods for naphthenic acids

On April 4, 2018, a meeting was held by WebEx/teleconference to discuss the proposal to add classically defined naphthenic acids (NAs) to the NPRI. Present at the meeting were staff of NPRI's Development Unit; research scientists from ECCC's Environmental Science and Technology Laboratories and Aquatic Contaminants Research Division; representatives from the Canadian Association of Petroleum Producers and the Mining Association of Canada; and scientists and engineers from Suncor, Syncrude, Imperial, Devon Energy and Canadian Natural Resources Limited.

ECCC presented on the work that is being done by the Department on developing analytical methods for NAs:

- A workshop was held in Edmonton in March 2016 at which a definition for NAs was agreed upon
- The workshop identified the need for appropriate reference materials, proper field sampling procedures and an appropriate standard for quantitating naphthenic acids
- Since the workshop, ECCC has been working to address these needs by synthesizing an internal standard; working to generate reference mixtures of oil sands process-affected water and ground and surface water; and determining a preservation method
- Once the certified reference materials and internal standard, ECCC is planning another interlaboratory study to confirm their use in quantitating NAs (2018-2019)

During the discussion, the following was heard from industry:

- Industry has been using Fourier-transform infrared spectroscopy (FTIR) to screen for total NAs or acid extractable organics (AEOs) (also referred to as naphthenic acid fraction compounds or NAFCs) for some time. FTIR provides a gross estimation of AEOs, which does not match the more narrow group of classically defined NAs in the consultation document
- Industry is concerned that they will be asked to use a method of analysis that is not widely available at commercial labs, such as the mass spectrometry methods recommended in the consultation document, in order to measure classically defined NAs
- Their view is that a more cost effective method would be to use FTIR to report AEOs to the NPRI, or use the measured value of AEOs to estimate the quantity of classically defined NAs to be reported
- There is also a concern that if ECCC does not prescribe a specific method of analysis, there will be a lack of consistency in reported quantities
- Industry is only measuring AEOs in water streams, not in solid or gaseous phases. Research has shown that NAs can be measured in air, but the method is semi-quantitative. NAs have very low volatility and should remain in the water column
- Since NAs stay in the liquid phase and do not settle out in tailings ponds, they will tend to be returned to the facility as part of recycled process water. The same NAs will end up being deposited in tailings many times over the course of a year

ECCC provided the following information and responses to these points:

- ECCC does not currently plan to prescribe a method of analysis for NAs for the purposes of reporting to the NPRI, but recommends the methods of analysis described in the consultation document
- The method that is being developed by ECCC is intended to be an operational method and many private sector labs are expected to have the equipment to perform this type of method
- There are currently commercial labs in Canada that can perform the recommended mass spectrometry methods:
    - Vogon Laboratory Services, Ltd. www.vogonlabs.ca/ (Contact: Ralph Hindle)
    - ALS www.alsglobal.com/ca (Contact: Mark Hugdahl)
- Consistency in reporting to the NPRI is an important consideration for the data to be understood and used, and continuing to work together to arrive at a consistent and reasonable method to be used by different facilities, and a consistent approach to air releases, will be useful
- A closed mass balance approach could also be used to estimate NA releases at a facility, instead of source testing
- The draft screening assessment of the commercial NAs group under the Chemicals Management Plan is planned for fall 2018. The substances being assessed are not the NAs associated with oil sands extraction

During the meeting, there was a productive discussion about the current work being done both by ECCC scientists and within industry to better understand this class of compounds specifically, and oil sands tailings in general. Given the very complicated nature of naphthenic acids and oil sands tailings, some key areas of interest include improving understanding of their toxicity, of differences between the natural sources and those from oil sands processing, and of how they transform over time.

Next steps:

- Provide a summary of this technical discussion to the NPRI Work Group
- Industry will be invited to participate in the next NA interlaboratory study being prepared by ECCC this fiscal year
- Close of consultation period (July 10, 2018)
- ECCC to consider comments received, and decide on requirements for 2020

Appendix 7

Addition of PREPOD and BENPAT to the National Pollutant Release Inventory – Consultation document

May 2019

Environment and Climate Change Canada
Environnement et Changement climatique Canada

Addition of PREPOD and BENPAT to the National Pollutant Release Inventory

Consultation Document, May 2019

Canada

INTRODUCTION

The purpose of this consultation document is to obtain input on the proposed addition of two substances (PREPOD and BENPAT) to the National Pollutant Release Inventory (NPRI) substance list. Environment and Climate Change Canada (ECCC) is proposing that this change would take effect as of the 2020 NPRI reporting year.

Since 1992, a multi-stakeholder work group has been advising ECCC on proposed changes to reporting requirements and other issues related to the NPRI. We invite the work group, other interested or impacted stakeholders and the public to comment on this proposal before June 27, 2019, via email at ec.inrp-npri.ec@canada.ca.

ECCC will consider comments received in response to this consultation and will provide a consultation summary once a decision has been made. ECCC plans to publish the final reporting requirements for reporting years 2020 and 2021, in Part I of the *Canada Gazette*, in early 2020.

PROPOSED CHANGES

ECCC is proposing to add both PREPOD and BENPAT to the NPRI substance list starting with the 2020 reporting year. PREPOD is derived from the substance's long name "2-Propanone, reaction products with diphenylamine", and has the Chemical Abstract Services Registry Number (CAS RN) 68412-48-6. BENPAT is derived from the long name "1,4-Benzenediamine, N,N'-mixed phenyl and tolyl derivatives", and has a CAS RN of 68953-84-4.

PREPOD and BENPAT are proposed to be listed in Part 1, Group B of the substance list, with a manufacture, process or otherwise use threshold of 50 kg and a 1% concentration threshold (Table 1).

Table 1. Summary of proposed changes

Substance Name	CAS RN	Chemical Formulae	NPRI Substance List Part and Group	Manufacture, Process or Otherwise use Threshold	Concentration Threshold
PREPOD	68412-48-6	$C_{12}H_{11}N$ and C_3H_6O	Part 1, Group B	50 kg	1%
BENPAT	68953-84-4	$C_{18}H_{16}N_2$ $C_{19}H_{18}N_2$ and $C_{20}H_{20}N_2$			

BACKGROUND

Environment and Climate Change Canada (ECCC) continuously reviews the National Pollutant Release Inventory (NPRI) substance list to ensure that it remains relevant and meets the needs of internal government programs and other data users. Activities under the Chemicals Management Plan (CMP) are a key input, and inform possible changes to the NPRI substance list. Such changes include addition of substances concluded as toxic following risk assessment under CMP, deletion of substances for which an NPRI listing is no longer warranted, and threshold changes where reporting on a substance is not adequate to meet needs. In addition, ECCC agreed to consider the addition of persistent and bioaccumulative substances to the NPRI in response to the recent House of Commons review of the Canadian Environmental Protection Act, 1999 (CEPA)[1].

In 2011, the substances PREPOD (CAS RN 68412-48-6) and BENPAT (CAS RN 68953-84-4) were reviewed in Batch 11 of the CMP. Both were deemed to be toxic under paragraph 64(a) of CEPA, as they were determined to be harmful to the environment. Additionally, one component of PREPOD, diisopropyldimethylacridan (DIPDMA), is persistent, bioaccumulative, and inherently toxic (PBiT) and PREPOD was determined to meet the criteria for virtual elimination. As a result, PREPOD was added to the List of Toxic Substances (Schedule 1 of CEPA) in 2016. BENPAT is scheduled to be added to the List of Toxic Substances in the near future.

PREPOD and BENPAT are complex organic substances that are used in Canada. PREPOD is used as an antioxidant in the manufacture of rubber products. BENPAT is a mixture of phenyl and tolyl derivatives, and used as an additive to protect elastomers against ozone deterioration.

The risk management tool determined as the best fit for PREPOD was a Pollution Prevention (P2) Planning Notice. The proposed Notice was published in July 2018 for comments,[2] with the final Notice planned for publication in spring/summer 2019. The Notice will apply to owners or operators of facilities in the chemical manufacturing and rubber product manufacturing sectors that have an industrial effluent and that manufacture or use PREPOD, or a mixture or a compound containing PREPOD, where the quantity of PREPOD is greater than 100 kg in one calendar year on the date of publication of the final Notice or any time thereafter. The risk management objective for the Notice is to reduce the presence of PREPOD in industrial effluents.

A risk management tool for BENPAT has yet to be developed. To assist in developing one, a survey was issued in 2018 under section 71 of CEPA (s.71) that applied to any person who, in 2016 or in 2017, manufactured, imported or used a total quantity greater than 100 kg of BENPAT. Results of this survey are not yet available, but NPRI will take the most recent use and import information into account before finalizing the decision on the addition of BENPAT to reporting requirements. As little empirical data for releases into the Canadian environment is currently available, data collected under the NPRI would form a baseline of releases to help facilitate the performance evaluation of any risk management instrument that is developed.

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[1] *See the* Follow-Up Report to the House of Commons Standing Committee on Environmental and Sustainable Development on the *Canadian Environmental Protection Act, 1999*

[2] See the *Proposed notice requiring the preparation and implementation of pollution prevention plans in respect of reaction products of 2-propanone with diphenylamine (PREPOD), CAS RN 68412-48-6, in industrial effluents*.

RATIONALE

NPRI Decision Factors

Proposals to make changes to the NPRI are evaluated according to an established process that requires evaluation of four decision factors. ECCC has determined that PREPOD and BENPAT meet the decision factors for addition to the NPRI, as described below.

1. Does the substance meet NPRI criteria?

a) Is the substance manufactured, processed or otherwise used by facilities in Canada?

PREPOD: According to results of a 2017 s.71 survey, between 100 000 and 1 million kg was manufactured in Canada in 2016. PREPOD was also imported in 2016 as a component of vehicle parts and already assembled vehicles in the automotive industry. The main use is as an antioxidant in rubber products. The amount of PREPOD within these products is reported to be up to approximately 2%. PREPOD is also used as a paint additive and coating additive, plasticizer, abrasive, oxidizing or reducing agent.

BENPAT: According to results of a 2006 s.71 survey, between 1 000 000 and 10 000 000 kg of BENPAT was imported into Canada and was used in rubber product manufacturing in concentrations of 0.29 to 2.17%. It is generally used as an additive to protect elastomers against ozone deterioration. Results of a more recent s.71 in 2018 are not yet available, but NPRI will take the more recent use and import quantities into account before finalizing the decision on BENPAT.

b) Is the substance of health and/or environmental concern?

PREPOD: PREPOD is considered to be persistent in water, soil and sediments. One component, diisopropyldimethylacridan (DIPDMA), has been identified as both persistent and bioaccumulative in accordance with the *Persistence and Bioaccumulation Regulations*, due to its tendency to partition to particles and lipids of organisms caused by its hydrophobic nature. PREPOD is highly hazardous to aquatic organisms. PREPOD has a low predicted no-effect concentration value of 0.1 µg/L, meaning that small quantities released can produce an impact on the environment. The DIPDMA component of PREPOD has a high bioaccumulation factor (18,600).

BENPAT: Experimental toxicity values indicate that BENPAT is highly hazardous to aquatic organisms, at low exposure concentrations. BENPAT was concluded to be persistent in water, soil and sediment and meets the criteria for persistence, but not bioaccumulation, as set out in the *Persistence and Bioaccumulation Regulations.* A predicted no-effect concentration value of 0.43 µg/L was determined in the assessment and it was concluded that there is potential for ecological harm in Canada from this substance.

c) Is the substance released to the Canadian environment or disposed of by facilities, and do facilities contribute significant releases of the substance?

PREPOD: Releases, disposals and transfers of PREPOD can occur in wastewater, air, landfill and recycling. The largest concern is the potential presence of PREPOD in effluent discharged to a receiving water body. Analytical results of samples collected at industrial facilities in 2014-2015 have shown low concentrations of PREPOD in industrial effluents. PREPOD is a complex mixture, and, as such, contains a number of components in different concentrations. The concentrations of individual components in PREPOD released to the environment are therefore uncertain.

BENPAT: Exposure is anticipated to be from effluent release to receiving waterbodies. However, current release quantities are uncertain. Data collected through the NPRI will inform ECCC of the extent to which this substance is being used and released in Canada.

d) Is the substance present in the Canadian environment?

PREPOD and BENPAT are not naturally produced in the environment, but are found in the environment as a result of human activities.

2. Does inclusion of the substance support one or more of the objectives of the NPRI?

- *To improve public understanding*
  - Adding these substances to the NPRI will provide the Canadian public with information on where they are used and quantities released from NPRI-reporting facilities.
- *To identify priorities for action*
  - PREPOD contains a number of components in different concentrations, with one classified as persistent and bioaccumulative (DIPDMA). Knowing exactly how much is being released will allow for the evaluation and performance measurement of the proposed P2 planning notice. It will also support the development of additional risk management tools, if warranted.
  - A Risk Management tool has yet to be proposed for BENPAT. Data collected through the NPRI will be used to develop a baseline of data, identifying the number of facilities using the substance, as well as how much is being released into the environment.
  - By adding these substances to the NPRI list, ECCC would obtain a better understanding of the distribution of facilities that may release these substances and the quantity of releases into the Canadian environment. This will provide information to support possible future actions on these substances.
- *To allow tracking of progress in reducing releases (including successful reductions)*
  - It is unknown at this time exactly how much of either PREPOD or BENPAT, is entering the environment. Having both chemicals reported through the NPRI would begin to fill in this significant data gap.
- *To support targeted regulatory initiatives*
  - NPRI data on releases of PREPOD can be used in assessing the effectiveness of the P2 Notice. This is in line with ECCC's commitment to provide better performance measurement of instruments developed under CEPA.
  - NPRI data on releases of BENPAT can be used in the performance evaluation of any risk management instrument respecting this substance and to establish a baseline.

3. Is the substance reported elsewhere in Canada?

PREPOD and BENPAT are not reported elsewhere in Canada at this time.

4. Is the substance already on the NPRI in some form?

PREPOD and BENPAT are not currently listed on the NPRI.

Alternate Thresholds

PREPOD

ECCC is proposing to add PREPOD to Part 1, Group B of the NPRI substance list with a mass threshold of 50 kg and a concentration threshold of 1%. The threshold selected for the proposed P2 planning notice is 100 kg manufactured or used. By having a lower threshold for NPRI than for the P2 notice, ECCC expects that all facilities captured by the P2 planning notice will report to NPRI. Additionally, ECCC will be able to identify other facilities who do not meet the P2 planning notice threshold, but have releases of this substance that may surpass the threshold in the future.

The low reporting threshold is justified given the low predicted no-effect concentration (0.1 µg/L) and high bioaccumulation factor (18,600) for one component of PREPOD.

BENPAT

In order to establish a good baseline of data and obtain adequate reporting coverage on releases to the environment, ECCC is proposing to add BENPAT to Part 1, Group B of the NPRI substance list with a mass threshold of 50 kg and a concentration threshold of 1%.

The low reporting threshold is justified given the low predicted no-effect concentration (0.43 µg/L) for BENPAT.

IMPACTS OF THE PROPOSED CHANGES

The manufacture and primary uses of PREPOD and BENPAT occur at facilities in the chemical or rubber products manufacturing sectors. Based on the CMP screening assessments and s.71 surveys, ECCC expects approximately five (5) facilities to report for PREPOD and approximately nine (9) facilities to report for BENPAT, from the chemical and rubber products manufacturing sectors. All of these facilities are currently reporting to the NPRI for one or more other substances.

Facilities are expected to have access to information on the quantities of PREPOD and BENPAT manufactured, processed or otherwise used. Facilities using these substances are also expected to be able to estimate the quantities of PREPOD and BENPAT released, disposed of and recycled by their facilities. Facilities such as municipal wastewater treatment plants, where PREPOD and BENPAT are not intentionally used, will need to undertake reasonable efforts to obtain information on the quantities of these substances in their influent and effluent, to determine if they need to report and the quantities to be reported. ECCC will consider developing guidance for reporting these two substances, if needed to assist facilities.

Appendix 8

Addition of azo disperse dyes to the National Pollutant Release Inventory – Consultation document

May 2019

Environment and Climate Change Canada
Environnement et Changement climatique Canada

Addition of Azo Disperse Dyes to the National Pollutant Release Inventory

Consultation Document, May 2019

Canada

INTRODUCTION

The purpose of this consultation document is to obtain input on the proposed addition of certain azo disperse dyes with molar weights below 360 g/mol to the National Pollutant Release Inventory (NPRI) substance list. Environment and Climate Change Canada (ECCC) is proposing that this change would take effect as of the 2020 NPRI reporting year.

Since 1992, a multi-stakeholder work group has been advising ECCC on proposed changes to reporting requirements and other issues related to the NPRI. We invite the work group, other interested or impacted stakeholders and the public to comment on this proposal before June 27, 2019, via email at ec.inrp-npri.ec@canada.ca.

ECCC will consider comments received in response to this consultation and will provide a consultation summary once a decision has been made. ECCC plans to publish the final reporting requirements for reporting years 2020 and 2021, in Part I of the *Canada Gazette*, in early 2020.

PROPOSED CHANGES

ECCC is proposing to make the following changes to reporting requirements, beginning with the 2020 reporting year:

1. Remove "C.I. Disperse Yellow 3" (CAS RN 2832-40-8) from Part 1, Group A of the NPRI substance list. This substance would still be required to be reported as part of the group of azo disperse dyes (see below).
2. Add "Azo disperse dyes" (no single CAS RN applies) to Part 1, Group B of the NPRI substance list. The listing will specify that it applies to the 26 azo disperse dyes with molar weights below 360 g/mol listed in Table 1 below. The proposed manufacture, process or otherwise use (MPO) threshold would be a single 10 kg threshold, at a concentration of 1% or more, that would apply to the whole group, rather than for each substance individually.

Table 1. Substances proposed to be included in the azo disperse dyes group

CAS RN	Color Index Name
12222-69-4 20721-50-0	Disperse Black 9
16889-10-4	Disperse Red 73
21811-64-3	Disperse Yellow 68
2581-69-3	Disperse Orange 1
27184-69-6	Not applicable (n/a)
2734-52-3	Disperse Red 19
2832-40-8	Disperse Yellow 3
2872-52-8	Disperse Red 1
31464-38-7	Disperse Orange 25:1
31482-56-1	Disperse Orange 25 Disperse Orange 36
3179-89-3	Disperse Red 17
3180-81-2	Disperse Red 13
40880-51-1	Disperse Red 50

CAS RN	Color Index Name
43047-20-7	Disperse Orange 138
4314-14-1	Disperse Yellow 16
6054-48-4	Disperse Black 1
6250-23-3	Disperse Yellow 23
6253-10-7	Disperse Orange 13
6300-37-4	Disperse Yellow 7
6439-53-8	Disperse Yellow 5
65122-05-6	n/a
6657-00-7	n/a
69472-19-1	Disperse Orange 33
730-40-5	Disperse Orange 3
83249-52-9	Disperse Yellow 241
842-07-9	Solvent Yellow 14 Disperse Yellow 97

BACKGROUND

ECCC continuously reviews the NPRI substance list to ensure that it remains relevant and meets the needs of internal government programs and other data users. Activities under the Chemicals Management Plan (CMP) are a key input, and inform possible changes to the NPRI substance list. Such changes include addition of substances concluded as toxic following risk assessment under CMP, deletion of substances for which an NPRI listing is no longer warranted, and threshold changes where reporting on a substance is not adequate to meet needs.

As part of Phase II of the CMP, 22 azo solvent dyes[1] and 74 azo disperse dyes[2] were assessed to determine whether they were toxic according to section 64 of the *Canadian Environmental Protection Act,* 1999 (CEPA). These substances are used primarily in the textile dye market. Disperse dyes are exclusively used for textile dyeing and are principally used in the dyeing of synthetic fibres such as polyester, polyester blends, cellulose acetate and nylon. They are used as a colourant – pigment, stain, dye or ink.

One of the dyes, C.I. Disperse Yellow 3 (DY3 or Solvent Yellow 77; CAS RN 2832-40-8) was assessed as part of the azo solvent dyes group and was determined not to pose a risk to human health. DY3 was further assessed as part of the disperse dyes group (DY3 has expected uses as both a solvent and a disperse dye). The assessment concluded that DY3 met the criteria under paragraph 64(a) of CEPA, as it was determined to be potentially harmful to the environment. DY3 has since been added to the List of Toxic Substances (Schedule 1 of CEPA)

The remainder of the solvent and disperse dyes were concluded not to meet the criteria of section 64 of CEPA. However, DY3 and 25 other azo disperse dyes with molar weights below 360 g/mol were identified to have potential ecological effects of concern.[3]

The risk management approach identified for these substances was to implement release guidelines. The proposed release guidelines were published in February 2019.[4] The guidelines recommend limits for the release of the 26 azo dyes into the aquatic environment from textile dye formulation and textile dyeing activities. The release guidelines are proposed to apply to any person who operates a textile dye formulation or textile dyeing facility; uses any of the 26 azo disperse dyes; and releases an effluent containing any of the 26 azo disperse dyes at the final discharge point of the facility. The release guidelines also contain provisions for reporting on the use and release of the dyes to ECCC.

DY3 is currently listed under Part 1, Group A of the NPRI substance list with a 10-tonne manufacture, process or otherwise use (MPO) threshold, at 1% concentration. It has been on the list since the inception of the program.

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[1] For more information, see *Screening Assessment: Aromatic Azo and Benzidine-based Substance Grouping, Certain Azo Solvent Dyes*.
[2] For more information, see *Screening assessment: Aromatic Azo and Benzidine-based Substance Grouping, Certain Azo Disperse Dyes*.
[3] For more information, see *Screening assessment: Aromatic Azo and Benzidine-based Substance Grouping, Certain Azo Disperse Dyes* and the *Risk Management Approach for Acetamide, N-[4-[(2-hydroxy-5-methylphenyl)azo]phenyl]-(Disperse Yellow 3)*.
[4] For more information, see the *Proposed release guidelines for Disperse Yellow 3 and 25 other azo disperse dyes in the textile sector*.

Since that time, no facility has reported DY3 to the NPRI. This is most likely due to the standard 10-tonne MPO threshold used for DY3, since use quantities would be typically quite small (in kilograms). Facilities that use this substance are typically micro (less than 5 employees) or small (5 to 99 employees) businesses. As such, the 20 000-hour employee threshold for NPRI reporting (which is equivalent to approximately 10 full-time employees) might also mean that smaller facilities would not need to report.

As the information being requested by the release guidelines is very similar to information collected under the NPRI, ECCC is proposing to add azo disperse dyes to the NPRI. Reporting to NPRI will allow ongoing tracking of use and release of these azo disperse dyes, and support performance measurement of the release guidelines.

RATIONALE

NPRI DECISION FACTORS

Proposals to make changes to the NPRI are evaluated according to an established process that requires evaluation of four decision factors. ECCC has determined that the azo disperse dyes group meets the decision factors for addition to the NPRI, as described below.

1. Does the substance meet NPRI criteria?

a) Is the substance manufactured, processed or otherwise used by facilities in Canada?

Azo disperse dyes represent a significant proportion of the textile dye market. Disperse dyes are exclusively used for textile dyeing and are principally used in the dyeing of synthetic fibres such as polyester, polyester blends, cellulose acetate and nylon. DY3 is not manufactured in Canada, but is imported. The Domestic Substances List Inventory Update indicated that DY3 was imported in a range of 100-1000 kg as an azo disperse dye in the Canadian textile sector in 2008. The other 25 azo disperse dyes have not been reported as being in commerce in Canada in quantities above 100 kg. However, it is possible that these substances are manufactured, processed or otherwise used in Canada in smaller amounts. Grouping these 26 substances will mean that a single 10 kg threshold will apply for the whole group, rather than for each substance individually. This is expected to capture reporting of releases that would otherwise not be met by thresholds for reporting under CMP or the current 10-tonne NPRI threshold for DY3. In addition, the 25 azo disperse dyes may be used by industry as alternatives to DY3 and may enter into commerce in Canada in larger quantities in the future. NPRI would then be in a position to track releases of these substances.

b) Is the substance of health and/or environmental concern?

DY3 meets the criteria under paragraph 64(a) of CEPA, as it is entering or may enter the environment in a quantity or concentration or under conditions that have or may have an immediate or long-term harmful effect on the environment or its biological diversity.[5] The Screening Assessment Report for Certain Azo Disperse Dyes also noted that azo disperse dyes with molar weights below 360 g/mol have demonstrated a higher level of toxicity to aquatic organisms, likely due to their increased bioavailability, and therefore are substances with ecological effects of concern.

[5] See *Screening assessment: Aromatic Azo and Benzidine-based Substance Grouping, Certain Azo Disperse Dyes*.

c) Is the substance released to the Canadian environment or disposed of by facilities, and do facilities contribute significant releases of the substance?

Azo disperse dyes are anthropogenically produced and are not expected to occur naturally in the environment. The exposure sources of concern, identified in the Screening Assessment Report for Certain Azo Disperse Dyes, are the release of DY3 to surface water from textile dye formulation and potential for release from synthetic textile dyeing (disperse dye application) from equipment cleaning or releases to wastewater of leftover dye.

d) Is the substance present in the Canadian environment?

Azo disperse dyes may be present in water, sediment and soil as a result of human activities (e.g., releases of effluent from wastewater treatment facilities, application of wastewater biosolids to agricultural land). In the 2014-2017 monitoring campaign, DY3 was detected in 23 water samples out of 462 taken. Twenty out of 39 tested sites had DY3 levels over the detection limit, with concentrations ranging from 4.3 to 137 ng/L. Due to their low vapour pressures, azo disperse dyes are not expected to be present in air.

2. Does inclusion of the substance support one or more of the objectives of the NPRI?

- *To improve public understanding*
- *To identify priorities for action*
- *To encourage voluntary action to reduce releases*
- *To allow tracking of progress in reducing releases (including successful reductions)*
- *To support targeted regulatory initiatives*
- *To support development of other pollutant release inventories, such as the Air Pollutant Emission Inventory, and related international reporting obligations, where appropriate.*

Releases of azo disperse dyes reported to the NPRI will be publicly available and can be used to improve public understanding of releases of these substances resulting from textile dye formulation and use. This information will also assist ECCC in obtaining a better understanding of who is using and releasing DY3 and the other 25 azo disperse dyes, which can help to identify priorities for action and allow tracking of progress in reducing releases. NPRI data can also be used for evaluating the performance of the release guidelines, thereby supporting a targeting regulatory initiative.

3. Is the substance reported elsewhere in Canada? If it is reported elsewhere, is there nonetheless additional value in reporting the information through the NPRI?

The proposed release guidelines include provisions for reporting the use and release of azo disperse dyes. The release guidelines are voluntary, however, whereas reporting to the NPRI would be mandatory and the data would be publicly available as part of the inventory.

4. Is the substance already on the NPRI in some form? If it is already on the NPRI in some form, is there nonetheless additional value in including it in another form?

DY3 is currently listed under Part 1, Group A of the NPRI substance list. It has been listed since 1993 but has never been reported. ECCC is proposing to remove the individual listing for DY3 and have DY3 be reported as part of a group, along with 25 other azo disperse dyes.

ALTERNATE THRESHOLDS

Mass and concentration thresholds

For azo disperse dyes with molar weights less than 360 g/mol, the threshold selected for the proposed release guidelines is intended to limit releases into the aquatic environment from textile dye formulation and textile dyeing activities below the predicted no effect concentration of 2.3 micrograms per litre (µg/L) at the final discharge point of the facility. More information on the calculations can be found in the proposed release guidelines, but in summary these calculations result in a daily use threshold for the release guidelines of:

- 90 kg/day of azo disperse dyes for textile dye formulation
- 10 kg/day of azo disperse dyes for textile dyeing processes

The need for a reduced NPRI reporting threshold to capture releases of these dyes is because no facility has reported since 1993 at the current 10-tonne threshold for DY3, and the information on use patterns which indicates that use quantities are in the range of kilograms. The low reporting threshold is justified given the low predicted no effect concentration of 2.3 µg/L.

By adding azo disperse dyes with molar weights below 360 g/mol to NPRI's Part 1 Group B with a mass threshold of 10 kg and a concentration threshold of 1.0%, ECCC expects that all facilities that fall under the release guidelines will report to NPRI. In addition, by having a lower threshold for NPRI, it will assist ECCC in identifying those facilities which did not reply to the last section 71 survey notice (due to the 100 kg threshold), but who may be surpassing the threshold for the release guidelines.

Employee threshold

For this proposal, as it is currently unknown to what extent DY3 or any of the other 25 azo disperse dyes with molar weights below 360 g/mol are being used and released in Canada, the employee threshold will remain at the current 20,000 hours. However, changes to the employee threshold could be reviewed after a few years of data is received, if it is determined that the 20,000 hours are a barrier to reporting.

IMPACT

The primary use of azo disperse dyes with molar weights below 360 g/mol occurs at textile mills and textile product mills (North American Industry Classification System codes 313, 314 and 325220).

It is currently unknown exactly how many facilities are using imported DY3 or any of the other 25 azo disperse dyes with molar weights below 360 g/mol (they are currently not being manufactured in Canada). It is also unknown how much is being released into the Canadian environment. However, during consultations in 2017, ECCC was informed that four facilities in Canada were using the substance.

The release guidelines are a voluntary risk management instrument, whereby facilities sign a declaration form and report their release values. In order to reduce possible duplicative reporting requirements, ECCC is proposing to have facilities that declare under the release guidelines report their release quantities to the NPRI using the Department's Single Window.

Facilities are expected to have access to information on quantities of azo disperse dyes with molar weights below 360 g/mol that are manufactured, processed or otherwise used. It is also anticipated that facilities will be able to estimate the quantities released, disposed of and recycled by their facilities. Both the release guidelines and Screening Assessment contain calculations to assist facilities in determining their release values.

Appendix 9

Deletion of decabromodiphenyl oxide from the National Pollutant Release Inventory – Consultation document

May 2019

Environment and Climate Change Canada
Environnement et Changement climatique Canada

Deletion of decabromodiphenyl oxide from the National Pollutant Release Inventory

Consultation Document, May 2019

Canada

INTRODUCTION

The purpose of this consultation document is to obtain input on the proposed deletion of decabromodiphenyl oxide from the National Pollutant Release Inventory (NPRI) substance list. Environment and Climate Change Canada (ECCC) is proposing that this change would take effect as of the 2020 NPRI reporting year.

Since 1992, a multi-stakeholder work group has been advising ECCC on proposed changes to reporting requirements and other issues related to the NPRI. We invite the work group, other interested or impacted stakeholders and the public to comment on this proposal before June 27, 2019, via email at ec.inrp-npri.ec@canada.ca.

ECCC will consider comments received in response to this consultation and will provide a consultation summary once a decision has been made. ECCC plans to publish the final reporting requirements for reporting years 2020 and 2021, in Part I of the *Canada Gazette*, in early 2020.

PROPOSED CHANGE

ECCC is proposing to remove decabromodiphenyl oxide, also called decabromodiphenyl ether or decaBDE (the name used in this document) from the list of NPRI substances beginning with the 2020 reporting year.

BACKGROUND

ECCC continuously reviews the NPRI substance list to ensure that it remains relevant and meets the needs of internal government programs and other data users. Activities under the Chemicals Management Plan (CMP) are a key input, and inform possible changes to the NPRI substance list. Such changes include addition of substances concluded as toxic following risk assessment under CMP, deletion of substances for which an NPRI listing is no longer warranted, and threshold changes where reporting on a substance is not adequate to meet needs.

NPRI currently lists the substance decabromodiphenyl oxide, or decaBDE, with the Chemical Abstract Services Registry Number (CAS RN) 1163-19-5.

DecaBDE was assessed as part of a group of polybrominated diphenyl ethers (PBDEs) and found to be harmful to the environment according to section 64(a) of the *Canadian Environmental Protection Act, 1999* (CEPA). PBDEs are brominated flame retardants used to slow the ignition and spread of fire and are found in many items (e.g., carpet underlay, furniture foam, automotive parts, electronics and appliances). PBDEs are subject to the *Prohibition of Certain Toxic Substances Regulations, 2012 (PCTSR)*, which prohibit the manufacture, use, sale, offer for sale or import of PBDEs, with an exemption for manufactured items. A consultation document was published on December 21, 2018, which proposed to amend the PCTSR to remove the exemption for manufactured items containing PBDEs, except in spare parts containing decaBDE for vehicles until 2036. This exemption is consistent with the listing of decaBDE under the Stockholm Convention on Persistent Organic Pollutants.

DecaBDE has been on the list of NPRI substances since the program began in 1993. There has been limited reported releases of decaBDE to water or land since then. Releases to air have been reported below 1 tonne since 2014, while transfers for disposals and recycling have not been reported since 2012.

RATIONALE

The main source of release of decaBDE to the environment is expected to be from consumer products and not industrial releases due to the prohibition on the manufacture, use, sale, offer for sale and import of decaBDE. Furthermore, its use is expected to further decline with the proposed removal of exemptions for manufactured items containing PBDEs (except for decaBDE in spare automotive parts until 2036). Therefore, ECCC is proposing to remove decaBDE from the list of NPRI substances beginning with the 2020 reporting year.

IMPACTS OF THE PROPOSED CHANGES

Since reporting on decaBDE has been very limited, and would be expected to remain minimal given its prohibition, there will not be a significant loss of information resulting from this deletion. There will be a minor reduction in effort for certain reporting facilities, as they will no longer need to track their use of this substance to determine if they meet the NPRI criteria for reporting.

Appendix 10

Changes to the National Pollutant Release Inventory list of speciated volatile organic compounds for 2020 – Consultation and notification document

May 2019

Environment and Climate Change Canada
Environnement et Changement climatique Canada

Changes to the National Pollutant Release Inventory List of Speciated Volatile Organic Compounds for 2020

Consultation and Notification Document – May 2019

Canada

1. INTRODUCTION

Based on consultations that were done in 2017, changes were made to the National Pollutant Release Inventory (NPRI) Part 5 list of speciated volatile organic compounds (VOCs) beginning with the 2018 reporting year.[1] A number of additional issues with the Part 5 list have been identified. This document provides an opportunity for consultations on the modification of the listing of a Part 5 substance (see section 2).

Since 1992, a multi-stakeholder work group has been advising ECCC on proposed changes to NPRI requirements and other issues related to the NPRI. We invite the work group, other interested or impacted stakeholders and the public to comment on this proposal before June 27, 2019, via email at ec.inrp-npri.ec@canada.ca.

ECCC will consider comments received in response to this consultation and will provide a consultation summary once a decision has been made. ECCC plans to publish the final reporting requirements for reporting years 2020 and 2021, in Part I of the *Canada Gazette*, in early 2020.

This document also provides notification for other changes that are already decided for 2020 (see sections 3 and 4).

2. CONSULTATION: PROPOSED CHANGE TO PROPYLENE GLYCOL METHYL ETHER ACETATE

2.1 BACKGROUND

In 2006, propylene glycol methyl ether acetate [PGMEA; Chemical Abstracts Services Registry Number (CAS RN) 108-65-6] was added to the Other Groups and Mixtures part of the Part 5 list. However, the listing should have appeared in the Isomer Groups section of the Part 5 list instead, with the "all isomers" qualifier, since it is an isomer group and not an "other group or mixture."

2.2 PROPOSED CHANGE

ECCC is proposing to move PGMEA from the Other Groups and Mixtures section of the Part 5 list to the Isomer Groups section of the Part 5 list and add the qualifier "all isomers", beginning with the 2020 reporting year. The change to the listing for PGMEA is expected to better reflect the original intent of the listing.

Reporting on three isomers is proposed to be required:

1. alpha-PGMEA (CAS RN 108-65-6),
2. beta-PGMEA (CAS RN 70657-70-4), and
3. mixtures of PGMEA (CAS RN 84540-57-8).

[1] For more information, see https://www.canada.ca/en/environment-climate-change/services/national-pollutant-release-inventory/public-consultations/closed-national-pollutant-release-inventory-consultations.html.

2.3 IMPACTS OF THE PROPOSED CHANGE

In 2017, 69 facilities in 31 sectors reported PGMEA, including one facility in the utilities sector, one in the construction sector and 67 in the manufacturing sector. These facilities may already be reporting for all isomers of PGMEA, or may only be reporting for the CAS RN that appeared in past Notices. Therefore, some or all of these facilities could be impacted by this change.

The addition of isomers to the listing of PGMEA may cause some facilities that do not currently report for PGMEA to meet the 1-tonne threshold and be required to report for PGMEA in future years. It is unknown how many facilities will be affected this way, but based on past reporting, it is likely that the bulk of these facilities will be in the manufacturing sector.

This change is not expected to require any new facilities (i.e., facilities that have not reported to the NPRI in the past) to become subject to NPRI reporting requirements.

3. NOTIFICATION: DELETION OF THREE SPECIATED VOCS

Four substances that were proposed to be deleted in 2018 were retained for an additional two years at the request of the Ontario Ministry of the Environment, Conservation and Parks:

1. adipic acid (CAS RN 124-04-9),
2. heavy alkylate naphtha (CAS RN 64741-65-7),
3. tetrahydrofuran (CAS RN 109-99-9), and
4. white mineral oil (CAS RN 8042-47-5).

During consultations in 2017, the Ontario Ministry of the Environment, Conservation and Parks indicated that the additional two years would provide them time to investigate the addition of reporting requirements for these substances to Ontario legislation, without creating a gap in reporting. Based on this input, ECCC decided to defer the deletion of these four substances until 2020.

Since that decision was made, a draft screening assessment report was published by ECCC proposing to conclude that one of these substances, tetrahydrofuran, is toxic according to the criteria of section 64 of the *Canadian Environmental Protection Act* (CEPA).[2] As a potential CEPA-toxic substance, ECCC will not be deleting tetrahydrofuran starting in the 2020 reporting year. Instead, tetrahydrofuran will be evaluated in the future to determine whether any changes to reporting requirements are warranted.

The remaining three substances (adipic acid, heavy alkylate naphtha and white mineral oil) will be removed from Part 5 of the NPRI substance list, beginning with the 2020 reporting year.

[2] See the *Draft screening assessment – furan compounds group* at https://www.canada.ca/en/environment-climate-change/services/evaluating-existing-substances/screening-assessment-furan-compounds-group.html.

4. NOTIFICATION: REMOVAL OF CAS RNS FROM THE GAZETTE NOTICE

All of the substances in the Isomer Groups section of the Part 5 list are either listed with the qualifier "all isomers", or the isomers that must be reported are specified, meaning that multiple CAS RNs apply to each listing. Four of these 18 listings include a CAS RN in Schedule 1 of the *Notice with respect to the substances in the National Pollutant Release Inventory*:

1. butene (all isomers) (CAS RN 25167-67-3),
2. hexene (all isomers) (CAS RN 25264-93-1),
3. trimethylbenzene (specified isomers) (CAS RN 25551-13-7), and
4. xylene (all isomers) (CAS RN 1330-20-7)

Users of the Notice, and of the online versions of the NPRI substance list[3] that is based on the Notice, may mistakenly believe that the single listed CAS RN is the only one that needs to be considered when reporting to the NPRI. There are, however, multiple CAS RNs that apply to each of these listings. A complete list is provided in the NPRI Toolbox.[4]

Beginning with the 2020 reporting year, ECCC intends to list these four substances in the Isomer Groups Section of Part 5 of Schedule 1 without specific CAS RNs. ECCC recognizes that the use of CAS RNs is important for facilities to track NPRI substances and will continue to provide the list of applicable CAS RNs for these substances in the NPRI Toolbox.

[3] See https://www.canada.ca/en/environment-climate-change/services/national-pollutant-release-inventory/substances-list/threshold.html and https://www.canada.ca/content/dam/eccc/documents/xlsx/inrp-npri/2018_and_2019_NPRI_substance_list.xlsx.
[4] See https://www.canada.ca/en/environment-climate-change/services/national-pollutant-release-inventory/report/tools-calculating-emissions.html#n7.

Appendix 11

Proposal to modify the National Pollutant Release Inventory reporting requirements for dioxins, furans, and hexachlorobenzene – Consultation document

February 2019

Proposal to Modify the National Pollutant Release Inventory Reporting Requirements for Dioxins, Furans, and Hexachlorobenzene

Consultation Document

Summary

Environment and Climate Change Canada (ECCC) is proposing two changes to the National Pollutant Release Inventory (NPRI) reporting requirements for dioxins, furans, and hexachlorobenzene for the 2020 reporting year.

The first proposed change is to update the toxic equivalency factors for reporting dioxins and furans to the 2005 World Health Organization (WHO) standard. This change will maintain the NPRI as a relevant and up-to-date information source for dioxins, furans, and hexachlorobenzene in the Canadian environment.

The second proposed change is to expand the currently listed activity "manufacturing of iron using a sintering process" to include the iron ore pelletizing process. The proposed wording is: "manufacturing of iron using a sintering or pelletizing process". Iron ore pelletizing is a potentially significant source of dioxins and furans to the environment, and two facilities in Canada currently perform this activity but do not report to the NPRI for these substances.

The public is invited to provide comments on this proposal and send them to the NPRI at ec.inrp-npri.ec@canada.ca by April 12, 2019. Consultation on the proposed change is also being conducted with the NPRI Multi-Stakeholder Work Group from February 15, 2019 to April 12, 2019.

Comments and recommendations received during consultation will be considered as ECCC makes a decision on the proposed change. ECCC will post its decision on the NPRI website, and provide a summary of comments and recommendations received from the NPRI Work Group and others, once it is available.

1. Current Reporting Requirements for Dioxins, Furans, and Hexachlorobenzene

Polychlorinated dibenzo-p-dioxins (dioxins), polychlorinated dibenzofurans (furans) and hexachlorobenzene are released primarily as by-products of industrial and combustion processes. These substances are also found as contaminants in certain pesticides or chlorinated solvents. Hexachlorobenzene may also be found as a contaminant in the wood preservative pentachlorophenol. These substances are included on the List of Toxic Substances under the *Canadian Environmental Protection Act, 1999* (CEPA), and first appeared on Part 3 of the NPRI substance list in 2000.

Reporting releases, disposals, or transfers for recycling of dioxins, furans and hexachlorobenzene is mandatory for a facility where any of the following activities take place:

1. Activities for which reporting is mandatory regardless of the number of employees at a facility:
    - Non-hazardous solid waste incineration of ≥ 26 tonnes of waste, including conical burners and beehive burners
    - Biomedical or hospital waste incineration of ≥ 26 tonnes of waste
    - Hazardous waste incineration
    - Sewage sludge incineration
    - Wood preservation using pentachlorophenol

2. Activities for which reporting is mandatory if employees worked more than 20,000 hours during the calendar year:
    - Base metals smelting (copper, lead, nickel or zinc only)
    - Smelting of secondary aluminum
    - Smelting of secondary lead
    - Manufacturing of iron using a sintering process
    - Operation of electric arc furnaces in steel foundries
    - Operation of electric arc furnaces in steel manufacturing
    - Production of magnesium
    - Manufacturing of Portland cement
    - Production of chlorinated organic solvents or chlorinated monomers
    - Combustion of fossil fuel in a boiler unit, with a nameplate capacity of ≥ 25 megawatts of electricity, for the purpose of producing steam for the production of electricity
    - Combustion of hog fuel originating from logs that were transported or stored in salt water in the pulp and paper sector
    - Combustion of fuel in kraft liquor boilers used in the pulp and paper sector
    - Titanium dioxide pigment production using the chloride process

A facility must report quantities of dioxins, furans, and hexachlorobenzene released, disposed of, or transferred resulting from any of the listed activities, regardless of quantity or concentration. Detailed reporting requirements can be found in the Guide for Reporting to the NPRI (Environment and Climate Change Canada, 2018).

2. Proposed Changes

2.1 Update the toxic equivalency factors for reporting dioxins and furans

ECCC is proposing to update the toxic equivalency factors (TEFs) for NPRI reporting of dioxins and furans from the 1988 North Atlantic Treaty Organization (NATO) standard, to the 2005 WHO standard. This change would take effect as of the 2020 NPRI reporting year.

The current list of TEFs on the NPRI was reevaluated at a WHO-International Program on Chemical Safety expert meeting in 2005 (Van den Berg et al., 2006). Updating the current TEFs will require changes to five (5) individual congeners (highlighted in Table 1). The proposed changes will improve the relevancy of the NPRI data on dioxins and furans and improve comparability with other pollutant release and transfer registries, including the United States Toxics Release Inventory. Methods and requirements for estimating and reporting dioxins and furans to the NPRI will remain unchanged.

Table 1. Proposed changes to toxic equivalency factors (TEFs). Five substances will be affected by the update (highlighted).

Congener	Abbreviation	Chemical Abstracts Service Registry Number	Current TEFs (North Atlantic Treaty Organization, 1988)	Proposed TEFs (United States Toxics Release Inventory, 2016 & World Health Organization, 2005)
2,3,7,8-Tetrachlorodibenzo-p-dioxin	2,3,7,8-TCDD	1746-01-6	1	1
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	1,2,3,7,8-PeCDD	40321-76-4	0.5	1
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	1,2,3,4,7,8-HxCDD	39227-28-6	0.1	0.1
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	1,2,3,6,7,8-HxCDD	57653-85-7	0.1	0.1
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	1,2,3,7,8,9-HxCDD	19408-74-3	0.1	0.1
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	1,2,3,4,6,7,8-HpCDD	35822-46-9	0.01	0.01
Octachlorodibenzo-p-dioxin	OCDD	3268-87-9	0.001	0.0003
2,3,7,8-Tetrachlorodibenzofuran	2,3,7,8-TCDF	51207-31-9	0.1	0.1
2,3,4,7,8-Pentachlorodibenzofuran	2,3,4,7,8-PeCDF	57117-31-4	0.5	0.3
1,2,3,7,8-Pentachlorodibenzofuran	1,2,3,7,8-PeCDF	57117-41-6	0.05	0.03
1,2,3,4,7,8-Hexachlorodibenzofuran	1,2,3,4,7,8-HxCDF	70648-26-9	0.1	0.1
1,2,3,7,8,9-Hexachlorodibenzofuran	1,2,3,7,8,9-HxCDF	72918-21-9	0.1	0.1
1,2,3,6,7,8-Hexachlorodibenzofuran	1,2,3,6,7,8-HxCDF	57117-44-9	0.1	0.1
2,3,4,6,7,8-Hexachlorodibenzofuran	2,3,4,6,7,8-HxCDF	60851-34-5	0.1	0.1
1,2,3,4,6,7,8-Heptachlorodibenzofuran	1,2,3,4,6,7,8-HpCDF	67562-39-4	0.01	0.01
1,2,3,4,7,8,9-Heptachlorodibenzofuran	1,2,3,4,7,8,9-HpCDF	55673-89-7	0.01	0.01
Octachlorodibenzofuran	OCDF	39001-02-0	0.001	0.0003

2.2 Include iron ore pelletizing in the list of activities

ECCC is proposing to expand the activity "manufacturing of iron using a sintering process" to include the iron ore pelletizing process. The proposed wording is: "manufacturing of iron using a sintering or pelletizing process". This change would take effect as of the 2020 NPRI reporting year.

Sintering and pelletizing are similar processes that have been identified as sources of dioxins and furans. The main difference between the two processes is the diameter of the particles used for agglomeration. Sintering is the agglomeration of coarse iron ore concentrate fines (in the millimetre range) and pelletizing is the agglomeration of ultra-fine particles of iron ore concentrate (in the micron range). Iron ore pellets are uniform in size and can be used in blast furnaces or for production of direct reduced iron.

Iron ore pelletizing occurs at two facilities in Canada, both of which have been reporting to the NPRI for many years but never for Part 3 substances. The proposed definition would capture emissions of dioxins and furans from iron ore pelletizing facilities while continuing to capture reporting from iron ore sintering activities. The only sinter plant in Canada was shut down in 2007 (Canadian Council of Ministers of the Environment, 2010), but one metal processing facility has reported releases of dioxins and furans from sintering activities since 2015 (Environment and Climate Change Canada, 2017).

3 Rationale for the Proposed Changes

The substances listed on Part 3 are extremely toxic at small concentrations and are persistent and bioaccumulative. The proposed changes are intended to maintain the NPRI as a relevant and up-to-date information source about releases of dioxins, furans, and hexachlorobenzene to the Canadian environment.

Iron ore pelletizing has been identified as a potential significant source of releases of dioxins and furans to the environment that is not currently being captured by NPRI reporting requirements (United Nations Economic Commission for Europe, 1998). Preliminary monitoring data suggests that estimated emissions to air of dioxins and furans from the two iron ore pelletizing facilities in Canada would be significant in comparison to the total releases to air of these substances currently reported by other NPRI facilities.

Initially, ECCC had proposed a number of changes to the list of activities that trigger reporting Part 3 substances. However, stakeholders suggested that ECCC conduct a review of the sources of releases of these substances before making changes to the list of activities, to ensure that any changes would address actual gaps in reporting and result in a meaningful improvement. ECCC has initiated this review, which will inform potential changes to the list of activities for the 2022 NPRI reporting year. ECCC is proposing to proceed with the inclusion of iron ore pelletizing due to the expected magnitude of emissions from this activity, to ensure that this change can be considered in time for 2020 reporting.

ECCC expects the results of the review of sources of releases of dioxins, furans and hexachlorobenzene to be available during spring 2019. ECCC will consider these results in making a decision on the proposed change to the list of activities, assuming they are available in time.

4 Impacts of the Proposed Changes

Impacts of the proposed changes are expected to be minimal on facilities already reporting to the NPRI.

Facilities that report releases of dioxins and furans may need to update their estimation formulas with the 2005 TEFs when submitting their NPRI reports. There may be a slight increase in the quantity of dioxins and furans reported to the NPRI resulting from the changes.

Expanding the iron ore sintering activity definition to include iron ore pelletizing is expected to affect two facilities in Canada that already report to the NPRI for other substances, and would now be required to also report for dioxins, furans and hexachlorobenzene. These facilities are expected to be able to quantify their releases as they currently estimate and report to provincial jurisdictions. However, this change is expected to result in a significant increase in the total releases of dioxins and furans to air captured by the NPRI and available to the public.

5 References

Canadian Council of Ministers of the Environment. 2010. Canada-wide standards for dioxins and furans: Pulp and paper boilers burning salt laden wood, waste incineration, iron sintering plants, steel manufacturing electric arc furnaces and conical municipal waste combustion – 2009 progress report. Available online: www.ccme.ca/en/resources/air/dioxins_furans.html

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United Nations Economic Commission for Europe. 1998. Protocol to the 1979 convention on long-range transboundary air pollution on persistent organic pollutants. Annex 5: s. 24. Available online: www.unece.org/env/lrtap/pops_h1.html

Van den Berg, M., et al. 2006. The 2005 World Health Organization reevaluation of human and mammalian toxic equivalency factors for dioxins and dioxin-like compounds, *Toxicol. Sci.* 93:223–241.

Appendix 12

New requirements for reporting pollution prevention information to the National Pollutant Release Inventory – Consultation document

May 2019

Environment and Climate Change Canada
Environnement et Changement climatique Canada

Changes to requirements for reporting pollution prevention information to the National Pollutant Release Inventory

Consultation Document, May 2019

Canada

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INTRODUCTION

The purpose of this consultation document is to obtain input on proposed changes to the National Pollutant Release Inventory (NPRI) reporting requirements for pollution prevention (P2) information, which would take effect as of the 2020 NPRI reporting year. Environment and Climate Change Canada (ECCC) is proposing to add the requirement to specify which NPRI substances were impacted by P2 activities. ECCC is also seeking feedback and suggestions from stakeholders on changes to the NPRI reporting module, to make reporting P2 information as simple and streamlined as possible.

Since 1992, a multi-stakeholder work group has been advising ECCC on proposed changes to reporting requirements and other issues related to the NPRI. We invite the work group, other interested or impacted stakeholders and the public to comment on this proposal before June 27, 2019, via email at ec.inrp-npri.ec@canada.ca.

ECCC will consider comments received in response to this consultation and will provide a consultation summary once a decision has been made. ECCC plans to publish the final reporting requirements for reporting years 2020 and 2021, in Part I of the *Canada Gazette*, in early 2020.

PROPOSED CHANGE

ECCC is proposing to require facilities to indicate which NPRI substances were impacted by reported P2 activities during the calendar year. Specifically, ECCC is proposing that facilities identify substances targeted by each P2 sub-activity. In order to limit reporting burden in light of these proposed changes, ECCC is also proposing to reduce the number of questions relating to P2 plans (see Annex 1 and 2 for more details).

This consultation is focused on making changes to the NPRI reporting requirements to be published in Part I of the *Canada Gazette* in early 2020. There will be further opportunities for engagement with stakeholders on the development of the NPRI reporting system before the launch of the new system in the spring of 2021.

BACKGROUND

The NPRI defines pollution prevention as: “the use of processes, practices, materials, products, substances or energy that avoid or minimize the creation of pollutants and waste, and reduce the overall risk to the environment or human health”. As shown in Annex 1, the current P2 reporting form is divided into eight (8) P2 activities that are then divided into a number of P2 sub-activities. The sub-activities are the specific P2 techniques that a facility may implement to achieve reductions in pollutant releases.

The NPRI currently requires facilities to report their P2 information at the facility level. However, P2 activities and sub-activities often apply to individual substances. As the data currently exists, it is nearly impossible to link the reported P2 activity to a specific substance unless a facility provides the name of that substance in a comment field. It is difficult for data users to analyze and understand the impacts of P2 activities on releases of substances from the facility.

In the past, facilities could identify the NPRI substances to which a P2 activity applied. Reporters found the previous method used to report P2 activities at the substance level to be repetitive and time consuming, which led to poor quality and missing data. When the system migrated to the Single Window system in 2010, the functionality for reporting P2 activities at a substance level was removed. However, given the interest from data users in reviving the link between P2 activities and substances, ECCC is exploring how the reporting system could collect this information in an efficient manner that would avoid the earlier problems with reporting. Improving the P2 information reported to the NPRI was also a recommendation made by stakeholders during the recent House of Commons review of the *Canadian Environmental Protection Act*, 1999.

RATIONALE

ECCC agrees that adding a linkage between NPRI substances and P2 activities meets and supports a number of the objectives of the NPRI. The proposed change would improve public understanding of specific substance releases, allow tracking of progress in reducing releases, and encourage voluntary action to reduce releases. Notably, linking P2 information to substances would have the following benefits:

- The public would be able to view the applications and effectiveness of certain P2 activities and sub-activities in reducing releases of specific NPRI substances.
- Data users would be able to analyze the impacts of P2 activities on releases of substances to the environment.
- Facilities could use the data to see what other facilities in their sectors are doing to prevent pollution and gauge the potential effectiveness of P2 activities and sub-activities targeting specific substances if implemented at their own facilities.

In addition, the changes would encourage the submission of detailed activity descriptions. Select descriptions, along with the associated target substances, could be profiled on the Government of Canada's existing How your business can prevent pollution webpage. This webpage provides practical ideas of how businesses can implement P2 activities within their establishment.

Data users have expressed that the missing link between NPRI substances and P2 data causes difficulties when doing analyses. In 2017, there were 613 NPRI facilities reporting P2 plans that addressed substances. Of these facilities, approximately 166 indicated a substance name in the facility-level P2 comment field. Even fewer facilities reported substance names or chemical abstract registry numbers (CAS RN) in the P2 activity comment fields. This analysis is approximate because it was necessary to read each reported comment to identify specified substances, therefore human error was a factor.

The comments currently being submitted in the P2 section relating to NPRI substances vary widely:

- Facilities often used different spellings or acronyms for substance names in the comment fields. CAS RN were almost never reported.
- Many facilities used the comments fields to specify substances not listed on the NPRI (e.g. greenhouse gases, water, battery fluid, oil, lubricants, etc.).

IMPACT

Facilities that report P2 activities would need to indicate the substances to which they applied. On average, a facility that reports on P2 plans and activities reports seven (7) substances to the NPRI. In 2017, 90% of NPRI facilities that reported P2 activities reported for 15 or fewer substances. Any changes made to the reporting system would take into consideration the impacts on the reporting community. Efforts will be made to streamline the reporting process for collecting the new data. Comment fields will continue to be provided in the reporting system so that facilities that wish to elaborate on their P2 plans and activities can do so. The proposed change would also provide facilities with the opportunity to describe the level of effort required to accomplish their actions, and specify the effectiveness of their actions in reducing their substances. Annex 2 provides further details on one way this change could be implemented in the current NPRI reporting module.

Data users would be better able to use the NPRI data on P2 activities in their analyses. The proposed change will provide a standard way for reporting facilities to indicate which NPRI substances were impacted by P2 activities, improving the usability of the NPRI data.

SPECIFIC QUESTIONS TO ADDRESS

ECCC is seeking views on the best approach to implementing the linkage between NPRI substances and P2 information:

- What is the best approach to implementing the linkage between NPRI substances and pollution prevention information?
- How can NPRI collect pollution prevention data in an efficient manner (Annex 2 provides one example)?
- Would the proposed linkage facilitate your use of the NPRI data in analyses?

ANNEX 1- CURRENT POLLUTION PREVENTION SCREENS FOUND IN THE NPRI REPORTING SYSTEM

The current P2 reporting form has two screens: the first asks for general information about P2 plans implemented at the facility, and the second asks for further details on P2 activities and sub activities.

FIGURE 1. THE CURRENT P2 REPORTING FORM IN THE NPRI MODULE.

b) Did the facility update their plan in the current reporting year? **

Yes

c) Does the plan address substances, energy conservation, or water conservation? **

- [ ] Substances (provide the name of the primary Substances in the comments field below)
- [x] Energy conservation
- [ ] Water conservation

Please summarize your pollution prevention plan. If you selected "Substances", please specify the substances that were addressed in your plan (this information will be publicly available). **

- Pollution Prevention Activities

Did the facility complete any **pollution prevention activities** in the current NPRI reporting year? *

Yes

Selecting "Yes" will initiate the reporting of the specific pollution prevention activities that were completed in the current reporting year on the following screen.

If no, please select all applicable reasons from the list below: **

- [ ] Substance, process or technology alternatives are unknown or unavailable
- [ ] Activities were implemented in a previous year; additional activities are either unnecessary or unfeasible at this time
- [ ] Insufficient capital to implement activities
- [ ] Insufficient understanding of how to implement pollution prevention activities
- [ ] Concern that product quality may decline as a result of activities
- [ ] Limited by regulatory or permit obligations
- [ ] Other (please specify):

**

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Save/Continue


National Pollutant Release Inventory (NPRI) and Partners
Canada
Home
Submission Management
Help
My Profile:Shaleen Humphreys
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Ec.gc.ca
SWIM > 2018 > Environment Canada Fontaine > Shaleen Inc. > Pollution Prevention > Pollution Prevention Activities
* indicates a required field, ** indicates a conditionally required field
Reporting Details
Reporting Dashboard
Facility Report
Applicable Programs
Contacts
Employees and Activities
General Facility Information
Verify Facility Information
Substance List
Reasons for adding/removing substances
Special Reports
Pollution Prevention
Pollution Prevention Activities
Electricity Generating Units
Pollution Prevention Activities
Report Progress: 12/22 Page Status: Incomplete
Please indicate the pollution prevention activities that your facility implemented by checking the appropriate activities from the categories listed below.
- Materials or Feedstock Substitution
Increased purity of materials
Substituted materials
Other (specify in comments field)
Please enter the name(s) of the key substances affected by the activities. Please also enter the name and description of the activity. **
- Product Design or Reformulation
Changed product specifications
Modified design or composition
Modified packaging
Other (specify in comments field)
Please enter the name(s) of the key substances affected by the activities. Please also enter the name and description of the activity. **
- Equipment or Process Modification
Modified equipment, layout or piping
Use of a different process catalyst
Instituted better controls on operating bulk containers
Changed from small volume containers to bulk containers
Modified stripping / cleaning devices
Changed to mechanical stripping / cleaning devices
Changed to aqueous cleaners
Modified or installed rinse systems
Improved rinse equipment design
Improved rinse equipment operations
Modified spray systems or equipment
Improved application techniques
Changed from spray to other system
Other (specify in comments field)
Please enter the name(s) of the key substances affected by the activities. Please also enter the name and description of the activity. **
- Spill and Leak Prevention
Improved storage or stacking procedures
Improved procedures for loading, unloading and transfer operations
Installed overflow alarms or automatic shut-off valves
Installed vapor recovery systems
Implemented inspection or monitoring program of potential spill or leak sources
Modified containment procedures
Improved draining procedures
Other (specify in comments field)
Please enter the name(s) of the key substances affected by the activities. Please also enter the name and description of the activity. **
- On-site Reuse, Recycling or Recovery

☐ Instituted recirculation within a process
☐ Other (specify in comments field)

Please enter the name(s) of the key substances affected by the activities. Please also enter the name and description of the activity. **

- Inventory Management or Purchasing Techniques

☐ Instituted procedures to ensure that materials do not stay in inventory beyond shelf-life
☐ Initiated testing of outdated material
☐ Eliminated shelf-life requirements for stable material
☐ Instituted better labeling procedures
☐ Instituted clearinghouse to exchange materials
☐ Instituted improved purchasing procedures
☐ Other (specify in comments field)

Please enter the name(s) of the key substances affected by the activities. Please also enter the name and description of the activity. **

- Good Operating Practice or Training

☐ Improved maintenance scheduling, record keeping
☐ Changed production schedule to minimize equipment and feedstock changeovers
☐ Training related to pollution prevention
☐ Other (specify in comments field)

Please enter the name(s) of the key substances affected by the activities. Please also enter the name and description of the activity. **

- Other Pollution Prevention Activities

☐ Other pollution prevention activities (specify in comments field)

Please enter the name(s) of the key substances affected by the activities. Please also enter the name and description of the activity. **

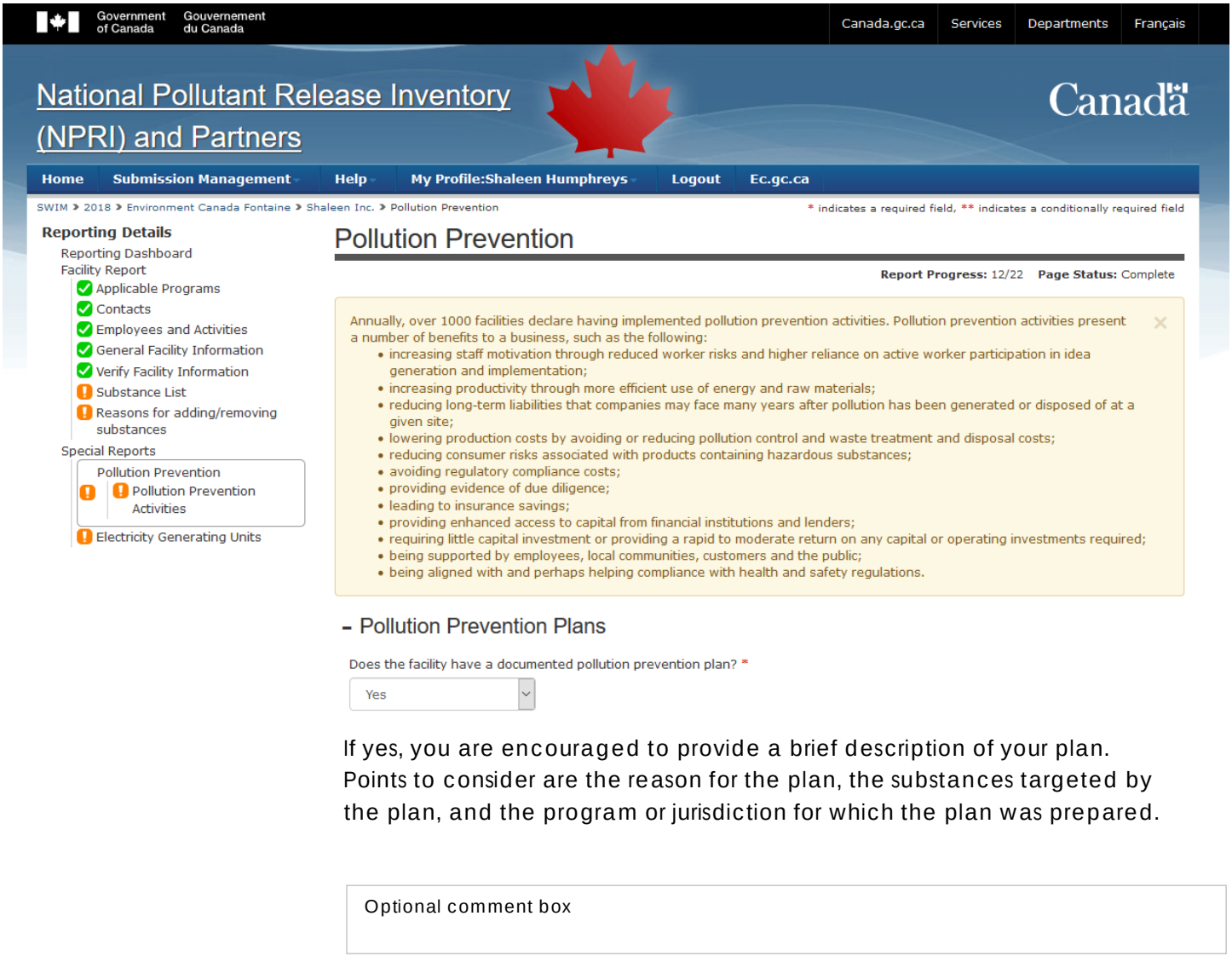
Back Save/Continue

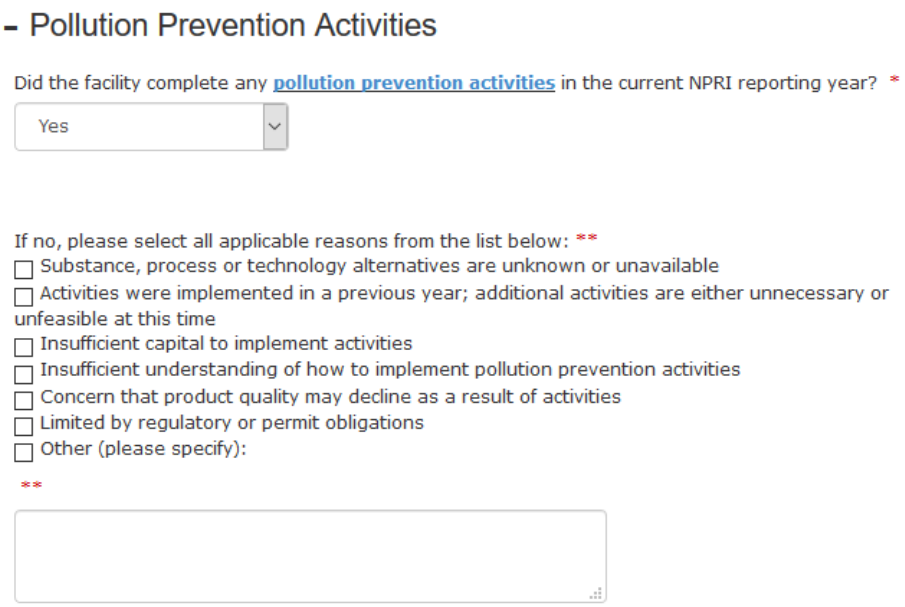
ANNEX 2- PROPOSED UPDATES TO THE NPRI REPORTING MODULE

This mock-up represents one possible implementation option for reporting the linkage between NPRI substances and P2 activities in the NPRI reporting module. Please note this is only a mock-up and changes may be made before the system is launched for 2020 reporting. There may also be further opportunity for stakeholders to provide input on the development of the reporting system during 2020.

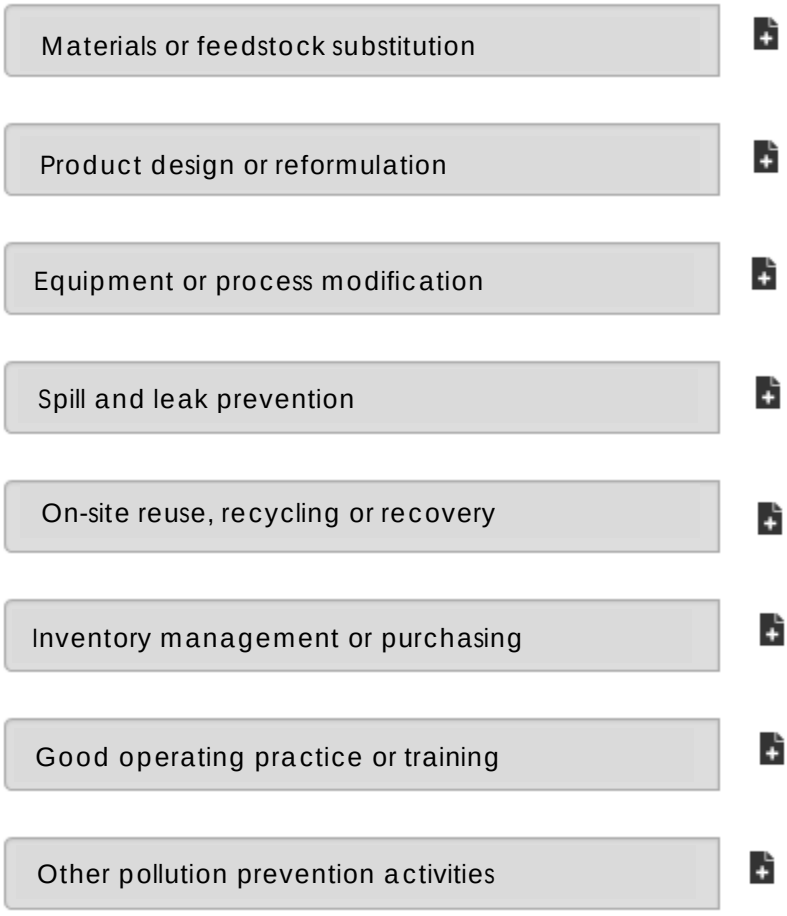
Facilities would no longer be required to answer additional questions pertaining to their P2 plans. A reporter would simply indicate whether their facility has a documented pollution prevention plan, and provide a description of the plan in the provided comment box. Figure 1 shows the new P2 reporting form that is being proposed by ECCC at this time.

FIGURE 2. PROPOSED UPDATES TO THE NPRI P2 REPORTING FORM





Select the "+" icon to report applicable pollution prevention activities that were completed in the current reporting year.



A new menu would appear under the "Pollution Prevention Activities" heading. If a reporter answers "Yes" to the question "Did the facility complete any pollution prevention activities in the current reporting year?" they must provide information for at least one of the following pollution prevention activities by clicking on the "+" icon. A reporting facility would only need to provide additional information for the P2 activities that apply to their facility.

Clicking the "+" icon would open a second screen (shown in Figure 3) that contains a table populated with the NPRI substances provided in the facility report. The table also includes options for "All NPRI substances" and "No NPRI substances" as some P2 activities have different impacts. A reporter would select the check box for each impacted NPRI substance and select the applicable P2 sub-activity from the drop-down menu. The contents of the drop-down menu in the third column will depend on which P2 activity is being reported on. The reporting facility can then provide additional details about their P2 activities and sub-activities, including the effectiveness of the implemented activities, in the optional comment fields provided in the final column of the table.

A reporting facility can also indicate if they would like to be contacted by ECCC to provide additional details on their P2 activities that may be profiled on the Government of Canada's How your business can prevent pollution webpage.

FIGURE 3. EXAMPLE SCREEN THAT WOULD APPEAR WHEN A REPORTER CLICKS THE "+" ICON BESIDE "MATERIALS OR FEEDSTOCK SUBSTITUTION".

Materials or Feedstock Substitution

For the NPRI substances impacted, identify the pollution prevention sub-activities from the drop-down menu that you implemented at your facility during the calendar year. In the optional description box, provide a description of your activity by specifying the action taken and results achieved, the expected and realized environmental benefits, and other benefits (such as cost savings). If applicable, please also specify affected operations or products, and technologies used.

These descriptions will be analyzed in order to evaluate the success of the various P2 activities, and might be included in the "How your business can prevent pollution" as examples of successfully implemented activities.

☐ I would like ECCC to contact me to highlight my successful P2 activities and gather more details related to how my facility prevents pollution.

Substance	This substance was impacted by P2 activities	Select the applicable sub-activity from the list. (If needed, name additional sub-activities in the next column)	Describe the implemented P2 activities, and indicate whether it was effective or not
All reported NPRI substances	☐		
No effect on any reported NPRI substances	☐		
Mercury (and its compounds)	☑	Increased purity of materials Substituted materials	
Nitrogen oxides (expressed as NO2)	☐		

Save Cancel

Appendix 13

New requirements for reporting criteria air contaminant and speciated volatile organic compound releases to the National Pollutant Release Inventory – Consultation document

February 2019

Environment and Climate Change Canada
Environnement et Changement climatique Canada

New requirements for reporting criteria air contaminant and speciated volatile organic compound releases to the National Pollutant Release Inventory

Consultation Document – February 2019

Canada

Summary

Environment and Climate Change Canada (ECCC) is consulting Canadians about new requirements for reporting information on releases criteria air contaminants (CACs) and speciated volatile organic compounds (VOCs) to the National Pollutant Release Inventory (NPRI). ECCC is proposing to make the following changes to the reporting requirements for CACs and speciated VOCs:

Reporting Releases from Individual Stacks

1. Reduce the minimum stack height at which reporting of CACs and speciated VOCs is required by individual stacks (stack height threshold), from 50 metres to 15 metres.
2. Increase the minimum quantity of releases at which reporting of CACs and speciated VOCs is required by individual stacks (stack air release thresholds), as follows:

Criteria air contaminant	Current stack air release threshold (tonnes)	Proposed stack air release threshold (tonnes)
Nitrogen oxides (expressed as nitrogen dioxide)	5	15
Sulphur dioxide	5	100
Particulate matter with a diameter less than or equal to 2.5 micrometres	0.15	0.25
Particulate matter with a diameter less than or equal to 10 micrometres	0.25	0.75
Total particulate matter	5	100
Carbon monoxide	5	15
Volatile organic compounds	5	25

3. Require a method of quantification (basis of estimate) to be reported for each release quantity reported for stacks.

Combustion and Non-Combustion Sources

4. Require that stack or point release quantities of CACs be broken down into combustion and non-combustion sources.
5. Require a basis of estimate to be reported for each reported combustion and non-combustion release quantity.
6. Require that the type(s) of fuel associated with combustion sources be reported.

Speciated Volatile Organic Compounds

7. Increase the threshold requiring speciated VOCs to be reported by individual stacks, from 5 tonnes of total VOCs to 25 tonnes of total VOCs.
8. Require that release quantities of speciated VOCs from individual stacks be reported separately by combustion and non-combustion sources.
9. Require that total VOCs released from stacks or points (other than individual stacks) be speciated separately from VOCs released from all other sources (storage or handling, fugitive, spills and other non-point). These speciated VOCs would be required to be reported separately by combustion and non-combustion sources.

10. Require that the basis of estimate be reported each time total VOCs are speciated.
11. Add “speciation profile” to the list of bases of estimate that can be used by facilities to estimate and report releases.

Condensable Particulate Matter

12. Require an indication of whether stack or point release quantities of particulate matter include condensable particulate matter.

The proposed changes are intended to provide additional information for data users, particularly for use by air quality modellers and compilers of air emission inventories, such as the Air Pollutant Emission Inventory and the Black Carbon Inventory. ECCC used existing data sets where possible to select the proposed thresholds and to evaluate the impacts of the proposed changes, in order to balance the value of the availability of more information against the increased reporting burden on facilities.

ECCC has created a multi-stakeholder work group to advise on this and other issues related to the NPRI. We also invite public comment on this proposal before May 1, 2019.

ECCC will provide a consultation summary once a decision has been made.

Contents

Tables

Figures

Equations

Abbreviations

2008 AB IAES	2008 Alberta Industrial Air Emissions Survey
2014NEIv1	National Emissions Inventory, 2014, version 1
2014v7.0 platform	2014 Version 7.0 Platform prepared for air quality modelling
AEP	Alberta Environment and Parks
APEI	Air Pollutant Emissions Inventory (Canada)
AQ	Air Quality
AQMS	Air Quality Management System
AQRD	Air Quality Research Division
CAC	Criteria Air Contaminant
CCME	Canadian Council of Ministers of the Environment
CEMA	Cumulative Environmental Management Association
CEMS	Continuous Emissions Monitoring System
CLRTAP	Convention on Long-range Transboundary Air Pollution
CMAQ	Community Multiscale Air Quality Modeling
CO	Carbon monoxide
CPM	Condensable particulate matter
ECCC	Environment and Climate Change Canada
EGU	Electricity Generating Unit
EPA	Environmental Protection Agency (US)
EPEA	Environmental Protection and Enhancement Act (Alberta)
EWG	Emissions Working Group
GEM-MACH	Global Environmental Multi-scale - Modelling Air quality and Chemistry
JOSM	Joint Oil Sands Monitoring
m	metre
NAICS	North American Industry Classification System
NEI	National Emissions Inventory (US)
NO_2	Nitrogen dioxide
NOx	Nitrogen oxides
NPRI	National Pollutant Release Inventory
PM	Particulate matter
PM_{10}	Particulate matter with a diameter less than or equal to 10 micrometres
$PM_{2.5}$	Particulate matter with a diameter less than or equal to 2.5 micrometres
pt_oilgas	2014NEIv1 point sources in the oil and gas sector
ptegu	2014NEIv1 point source data for electricity generating units
ptnonipm	2014NEIv1 point sources that are not in the oil and gas sector and are not electricity generating units
RAQDPS	Regional Air Quality Deterministic Prediction System
SCC	Source Classification Code
SMOKE	Sparse Matrix Operator Kernel
SO_2	Sulphur dioxide
SOx	Sulphur oxides
t	Tonne
TPM	Total Particulate Matter
UN ECE	United Nations Economic Commission for Europe
US	United States
VOCs	Volatile Organic Compounds

1. Introduction and Background

Starting in 2002, seven criteria air contaminants (CACs) were added to Part 4 of the National Pollutant Release Inventory (NPRI) list of substances (Table 1). In general, a facility is required to report for any CAC that is released in a quantity greater than or equal to the facility-wide air release threshold (Table 1). All sources of CACs must be reported for facilities that meet the 20 000-hour employee threshold, or facilities where activities to which the employee threshold does not apply take place. Facilities with fewer than 20 000 employee hours that meet the facility-wide air release thresholds are required to report for combustion sources of CACs. Some exclusions and exemptions apply, and additional CAC reporting requirements were added for facilities in the oil and gas sector starting with the 2018 reporting year.[1]

Once the facility-wide threshold has been met, any stacks at a facility that are 50 metres (m) or more in height (measured above grade) are required to report any CACs for which the stack air release threshold is met (Table 1).

Table 1. NPRI reporting thresholds for criteria air contaminants

Criteria air contaminant	Facility-wide air release threshold (tonnes)	Stack air release threshold (tonnes)
Nitrogen oxides (expressed as nitrogen dioxide) (NO_2)	20	5
Sulphur dioxide (SO_2)	20	5
Particulate matter with a diameter less than or equal to 2.5 micrometres ($PM_{2.5}$)	0.3	0.15
Particulate matter with a diameter less than or equal to 10 micrometres (PM_{10})	0.5	0.25
Total particulate matter (TPM)	20	5
Carbon monoxide (CO)	20	5
Volatile organic compounds (VOCs)	10	5

In 2003, requirements were added to report for speciated VOCs (Part 5 substances). The Part 5 list currently includes 65 individual VOCs, isomer groups and mixtures.[2] If Part 4 total VOCs are released to air in a quantity of 10 tonnes or more, each speciated VOC that is released to air in a quantity of one tonne or more must also be reported.

This proposal addresses numerous recommendations for changes to NPRI reporting requirements for CACs. In general, the recommendations fall into three categories:

1. Increase the number of individual stacks that are required to report to the NPRI;
2. Require source classification codes to be reported, and/or require process-level data to be reported, and/or require facility activity data to be reported; and
3. Require condensable particulate matter to be reported.

[1] See the Guide for Reporting to the NPRI for more information on specific reporting requirements. Also see Figure 13 in Appendix 4.

[2] In 2003, 60 speciated VOCs were added to the NPRI substance list. In 2006, 15 additional speciated VOCs were added to the list. Beginning with the 2018 reporting year, the list was adjusted by removing some substances, consolidating others into groups and adding new substances, for a total of 65 substances or groups of substances listed in Part 5.

The recommendations were made by air quality modellers and inventory compilers for whom NPRI data are critical inputs.

The initial recommended changes and Environment and Climate Change Canada's (ECCC) proposed path forward to address them are described in Chapter 2. Where possible, existing data sources were analyzed to determine the best changes to propose, and to estimate the potential impact of proposed changes. The methods and results of these analyses are described in Chapters 3 and 4. Chapter 5 presents the changes that ECCC is proposing to make to NPRI reporting requirements for CACs starting in 2020.

2. Recommendations to Change NPRI Reporting Requirements and Proposed Path Forward

2.1 Reporting of Stack Releases

2.1.1 Uses of NPRI Stack Data

2.1.1.1 Air Quality Modelling

The requirement to report releases from individual stacks was added to the NPRI in support of regional air quality (AQ) modelling. Such models are run routinely by ECCC to provide short-term forecasts of future air quality to both the general Canadian population and the at-risk population.[3] These models are also used by ECCC and provincial and regional agencies to provide guidance to air quality managers on the predicted AQ impact of changes in emissions arising from socioeconomic changes or potential control measures.

In order to predict air quality, CAC emissions from all types of sources must be accounted for, including smokestacks, industrial and other facilities, small point sources, area sources, on-road and off-road mobile sources, and natural sources. Stack characteristics (stack height, stack diameter, and exit temperature and velocity) influence how substances are emitted into the atmosphere. Most importantly, emissions of CACs injected higher in the atmosphere can be subject to a significantly different transport, diffusion, and temperature and chemical environment than those emitted near the ground. The ability to distinguish between emissions near the surface from those that are likely to rise higher into the atmosphere is therefore particularly important for modelling.

2.1.1.2 Air Pollutant Emissions Inventory

Canada's Air Pollutant Emission Inventory (APEI) has been prepared and published by Environment and Climate Change Canada since 1973. The APEI is a comprehensive inventory of emissions of 17 air pollutants at the national and provincial/territorial levels. This inventory serves many purposes, including fulfilling Canada's international reporting obligations under the 1979 Convention on Long-range Transboundary Air Pollution (CLRTAP) and the associated protocols ratified by Canada for the reduction of emissions of sulphur oxides (SOx), nitrogen oxides (NOx), cadmium, lead, mercury, dioxins and furans, and other persistent organic pollutants. Information on releases of CACs from stacks that is reported to the NPRI has been used by the APEI to differentiate between combustion and non-combustion emission sources.

[3] For more information, see ECCC's Air Quality Modelling and Air Quality Health Index pages.

2.1.1.3 Black Carbon Inventory

Definition

> **Black carbon**: a short-lived, small aerosol (or airborne) particle linked to both climate warming and adverse health effects. It is emitted from incomplete combustion of carbon-based fuels (fossil fuels, biofuels, wood) as a component of $PM_{2.5}$.

As a member of the Arctic Council, Canada has committed to producing and publishing an annual inventory of black carbon emissions.[4] Canada's Black Carbon Inventory serves to inform Canadians about black carbon emissions and provides valuable information for the development of air quality management strategies.

In many instances, stack emissions of $PM_{2.5}$ reported by facilities form the basis of black carbon estimates. For each individual stack, the appropriate black carbon speciation factor (or factors) is applied to the combustion-related $PM_{2.5}$. The emissions are then summed at the facility level and aggregated to form the sectoral emission estimate.

The uncertainty is high in determining the proportion of $PM_{2.5}$ emissions that arise from combustion emissions for industrial sources. The primary data source for estimating $PM_{2.5}$ emissions from many industrial sources is the NPRI, in which emissions are reported by facilities by stack or as one aggregate value for the facility as a whole, and are not broken down between combustion and non-combustion emissions. To date, engineering knowledge has been necessary to attribute a ratio to each sector, with varying degrees of accuracy.

2.1.2 Recommendations to Improve Stack Reporting

NPRI has received the following recommendations to improve stack reporting in support of the above programs:

1. In October 2015, Alberta Environment and Parks (AEP) made a number of recommendations for improving NPRI reporting for CACs, including a recommendation to lower the stack height threshold from 50m to 30m (the full text of the recommendation is included in Appendix 1). AEP points out that the 50m stack height threshold is adequate for reporting of SO_2 emissions, but many stacks shorter than 50m are emitting other CACs. During AQ modelling, stacks less than 50m are treated as a single combined near-ground level release, which can affect modelling results. AEP therefore recommended that the NPRI stack height threshold be lowered from 50m to 30m and added that the presence of measurement data could be used as an additional criterion requiring stack reporting. AEP also recommended that the methods used to quantify releases (basis of estimate) from individual stacks be reported, rather than a single estimation method for total stack or point releases of each substance, as is currently required.
2. In 2012, Cheminfo prepared a Gap Analysis on Air Emissions Data for the Emissions Working Group (EWG) of the Canadian Council of Ministers of the Environment, which identifies a variety of issues and gaps in national air emission inventories and provides suggestions for the EWG to consider in further developing the APEI and the NPRI. One of the suggestions was to improve NPRI stack reporting in support of AQ modelling (see Appendix 1 for the relevant excerpted text), possibly by lowering the stack height threshold or by finding better criteria to determine whether a stack should report.

[4] For more information, see the Black Carbon Emissions Inventory.

3. The Air Quality Research Division (AQRD) of ECCC performs AQ forecasting and prediction modelling using NPRI facility-reported data, including data on releases of CACs from individual stacks. In November 2015, AQRD recommended a number of changes to NPRI reporting requirements in support of AQ modelling, including a recommendation to reduce the stack height threshold to improve reporting of releases from individual stacks (see Appendix 1 for the full text of the recommendation).
4. The Joint Oil Sands Monitoring Program Emissions Inventory (JOSM Inventory) (2016) is based on a synthesis of the best available information from several existing emissions inventories, including NPRI data. The inventory was created in order to support AQ modelling and to help guide specific monitoring activities in the oil sands region. The JOSM Inventory report identifies a number of data gaps and makes recommendations, some of which are related to the NPRI. The lack of emissions data from individual stacks less than 50m in height was identified as a gap in the JOSM inventory (see Appendix 1). Reducing the NPRI stack height threshold would provide additional data in support of future development of the JOSM Inventory.
5. In the Black Carbon Inventory, stack emissions of $PM_{2.5}$ reported by facilities to the NPRI form the basis of black carbon estimation. Increasing the amount of $PM_{2.5}$ that is reported by individual stacks to the NPRI can therefore help to improve black carbon estimates in the Inventory.

2.1.3 Environment and Climate Change Canada's Response to Recommendations and Proposed Path Forward

NPRI is supportive of considering changes to the reporting requirements for stacks in order to increase the number of stacks for which information is required to be reported. While some of the suggestions for improving stack reporting were specific (e.g., lower the stack height threshold from 50m to 30m), there is also a recognition that the height of the stack may not necessarily be the best or only characteristic for determining whether a stack is a major source of CAC releases. Based on the suggestions received and the gaps identified, and early engagement input from NPRI stakeholders, three main questions were raised:

1. What is the best type of threshold to use to determine if reporting of CACs from a stack should be required (e.g., stack height and/or some other stack characteristic)?
2. What is the best quantitative threshold (stack height and/or release quantity) to improve reporting of CACs from individual stacks?
3. How can stack reporting be improved while also minimizing the increase in reporting burden?

ECCC used existing data sources to answer these questions (see Chapter 3) and to propose changes to NPRI reporting requirements beginning in 2020 (see Chapter 5).

NPRI recognizes the importance of having a basis of estimate reported with each release quantity, particularly to understand the uncertainty associated with reported quantities. ECCC is proposing to make this change to reporting requirements (see Chapter 5).

2.2 Reporting of Source Classification Codes, Process Level Data and Facility Activity Data

Definition

> **Source Classification Codes (SCCs)**: a system of over 13 000 codes developed by the US Environmental Protection Agency (EPA) to classify different types of activities that generate emissions. Each SCC represents a unique source category and specific process or function that emits air pollutants.[5]

2.2.1 Uses of Source Classification Codes, Process Level Data and Facility Activity Data

2.2.1.1 Air Quality Modelling

SCCs are critical for AQ modelling in order to determine the appropriate spatial surrogate fields and temporal and chemical speciation profiles to use for processing emissions. SCCs are required as inputs to the Sparse Matrix Operator Kernel (SMOKE) emissions processor, which generates the input files required by AQ models. SMOKE uses SCCs to spatially allocate annual emissions reported by jurisdiction to the model grid, to break down annual emissions into smaller units of time (e.g., hourly) and to further separate CAC species totals into individual components or substances (e.g., to separate out elemental carbon emissions from particulate matter emissions or to speciate total VOCs).

In the absence of facility-reported SCCs, AQ modellers must assign SCCs to facility-reported emissions. This is often done by sector since there is insufficient detailed information available at the individual facility level. Mismatched SCCs can lead to increased uncertainty in AQ modelling results due to the use of inappropriate spatial surrogate fields, temporal profiles, and/or speciation profiles to disaggregate reported emissions.

2.2.1.2 Air Pollutant Emissions Inventory

The APEI is a comprehensive and detailed inventory of air pollutant emissions in Canada, developed using two types of information:

- Facility-reported data, consisting of emissions from relatively large industrial, commercial and institutional facilities; and
- In-house estimates, including diffuse sources and other sources that are too numerous to be accounted for individually, such as road and non-road vehicles, agricultural activities, construction and solvent use.

The APEI is developed using many sources of information, procedures and emission estimation models. Emissions data reported by individual facilities to the NPRI are supplemented with documented, science-based estimation tools to quantify total emissions. Together, these data sources provide a comprehensive overview of emissions of certain air pollutants across Canada.

The NPRI has provided facility-reported data on the 17 pollutants included in the APEI, for more than 6 000 industrial and commercial facilities since 2002, and for heavy metals and persistent organic pollutants since 1994. These data are used in the APEI without modifications, except when data quality issues are detected and not addressed during the quality control exercise.

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[5] For more information on source classification codes, see Chapter 4 and see the US EPA Source Classification Codes page.

2.2.1.3 Black Carbon Inventory

Two important assumptions underlie the Black Carbon Inventory: black carbon is a fraction of $PM_{2.5}$ and only $PM_{2.5}$ emissions resulting from combustion contain significant amounts of black carbon. Therefore, the basis for the black carbon inventory is the $PM_{2.5}$ emitted from combustion processes, multiplied by black carbon to $PM_{2.5}$ ratios specific to each type of source or process. The ratio varies depending on the type of fuel and the type of equipment. Information reported to the NPRI is not sufficient to estimate black carbon emissions from facilities using present methods, except for a limited number of sources, such as coal-fired electricity generating stations. This leads to uncertainty in the Black Carbon Inventory for industrial sources. Assumptions are necessary to attribute a ratio to each sector, with varying degrees of accuracy. Facility activity data and process level data reported through the NPRI would help to improve the accuracy and reduce the uncertainty associated with black carbon estimates in the Inventory.

2.2.1.4 Other Uses of Source Classification Codes, Process Level Data and Facility Activity Data

Process level and facility activity data can be used for many purposes, for example:

- To develop estimates for emission reductions that could be achieved through management initiatives (e.g., regulations requiring emission controls);
- To improve the design and development of emissions control scenarios (e.g., fuel used, boiler output);
- To develop cost estimates for regulatory initiatives and to determine the potential impact of adoption of emission reduction technologies or operating practices that regulations seek to achieve. Estimates of costs and benefits (e.g., health benefits associated with reduced emissions for improved air quality) are typically required in a regulatory development process. Inventory data are useful to support such economic analyses;
- To improve data used to meet international reporting obligations, for example, reporting of annual emissions to the United Nations Economic Commission for Europe (UN ECE) under the CLRTAP.

Facility activity data (e.g., fuel consumption data, production data, raw material use, and other facility data) can be combined with emissions data to understand emissions performance. For example, activity data can be used to compare emissions per unit of fuel consumed between similar sources at the same or different facilities, which could in turn be used to better understand emission control performance from these sources. Other uses for facility activity data can include benchmarking, establishing new performance standards, checking compliance with standards, checking emission inventory estimation methods, trends analysis, and developing better understandings of the relationships between emissions and facility activities that impact the environment.

2.2.2 Recommendations to Require Reporting of Source Classification Codes, Process Level Data and Facility Activity Data

NPRI has received the following recommendations related to the reporting of SCCs, process level data and facility activity data (see Appendix 1 for the full text of the recommendations and gaps identified):

1. AEP recommended that NPRI require reporting of a representative SCC for individual stacks, as well as for all other categories of air releases that are required to be reported to the NPRI (storage or handling, fugitive, spills and other non-point).
2. The EWG Gap Analysis report identified both the lack of facility activity data and the lack of process or equipment level data as inventory gaps requiring further development.

3. AQRD recommended that NPRI require facilities to report CAC emissions by process type, including fuel used, and also the estimation method used to estimate these emissions.
4. The JOSM inventory report states that SCCs for some oil sands sources may need to be improved in the JOSM inventory. As one of the inputs to the JOSM inventory, adding the requirement to report SCCs to the NPRI would subsequently help to improve the JOSM inventory.

2.2.3 Environment and Climate Change Canada's Response to Recommendations and Proposed Path Forward

NPRI agrees that SCCs, process level data and facility activity data (particularly fuel type and quantities of fuel used) would be very valuable to collect and use for the purposes described in the preceding sections. However, NPRI is not currently considering the addition of requirements to report SCCs, detailed process level data and detailed facility activity data. Based on input from internal discussions, previous stakeholder input,[6] and recent early engagement input, there are a number of challenges associated with requiring this level of detailed reporting through the NPRI, mainly:

- Reporting of SCCs, process level data and detailed facility activity data would represent a significant increase in reporting burden on facilities.
- NPRI is intended to be a fully public inventory and all of the data that is collected is published. Data on individual processes and facility activity data can be considered confidential business information by industry. Publishing this data through the NPRI could cause a competitive disadvantage to those facilities that are required to report.
- Data on industrial energy consumption is collected and kept confidential by Statistics Canada through the Annual Industrial Consumption of Energy Survey. Aggregate data from this survey and other sources are available in the Report on Energy Supply and Demand in Canada. Collecting this data through the NPRI as well would be a duplication of reporting and data collection efforts.
- SCCs are a US EPA product and ECCC has no control over the development or modification of the codes. ECCC could prepare a Canadian system of classification codes, but these would not be usable by emissions processing software like SMOKE.
- Instead of requiring full process-level reporting, a requirement could be added to report a "representative" SCC for a stack, as suggested by AEP, or total release category (e.g., fugitive releases). However, emissions from facilities and from individual stacks may come from multiple processes, making it difficult for facilities to choose a representative SCC and making it difficult for data users to interpret the actual quantity of total releases are associated with that SCC.

Based on internal discussions, the most important process or facility activity level data are:

1. The quantity of releases from combustion sources and the quantity of releases from non-combustion sources;
2. For combustion sources, the fuel type(s);
3. The method used to quantify releases from combustion and non-combustion sources.

Collecting this type of information will improve ECCC's ability to assign SCCs to facility-reported data for AQ modelling, reconcile facility-reported data with in-house estimates in the APEI, and improve the

[6] See *Environment Canada Response to the First Report and Final Recommendations of the NPRI Multi-stakeholder Work Group on Substances (2001-2002)* (January 2002), available on request at ec.inrp-npri.ec@canada.ca.

accuracy of black carbon and condensable PM (see Section 2.3) estimates. In order to proceed with consultations on these potential changes, two questions needed to be addressed:

1. Should the requirement to report separate release quantities for combustion and non-combustion sources apply to all NPRI release categories (stack or point, storage or handling, fugitive, spills and other non-point)?
2. What impact would these changes have on reporting facilities?

ECCC used existing data sources to answer these questions (see Chapter 4) and propose changes to NPRI reporting requirements beginning in 2020 (see Chapter 5).

2.3 Reporting of Condensable Particulate Matter

Definitions

Primary particulate matter: particulate matter (PM) that is emitted directly into the atmosphere. Primary PM is made up of both filterable PM and condensable PM.

Secondary particulate matter: PM that is formed through physical or chemical transformations that take place in the atmosphere.

Filterable particulate matter: particles that are directly emitted by a source as a solid or liquid (aerosol) at stack or release conditions and that are captured on the filter of a stack test sampling train. Filterable PM is a component of primary PM.

Condensable particulate matter (CPM): material that is a vapor at stack conditions, but that condenses and/or reacts upon cooling and dilution in ambient air to form solid or liquid PM immediately after discharge from the stack. CPM is a component of primary PM. All CPM is assumed to be in the $PM_{2.5}$ fraction.

Only filterable primary PM is required to be reported to the NPRI. However, CPM can be released in significant quantities from facilities. In the US, over 44% of primary PM released from facilities is CPM (Table 2). CPM is of health and environmental concern: the Priority Substances List Assessment Report for Respirable Particulate Matter Less Than or Equal to 10 Microns makes no distinction between filterable PM and CPM when concluding that PM_{10} is toxic as defined in Section 64 of the *Canadian Environmental Protection Act, 1999*. CPM data are therefore important inputs for AQ modelling and forecasting.

Table 2. Releases of particulate matter from US facilities

	Releases (tonnes)	Releases as a percentage of primary PM releases
Filterable PM	227 316	55.8
Condensable PM	179 721	44.2
Primary PM	407 037	

Notes: Based on 2014 US National Emissions Inventory data for facility-based releases, including only those sources or activities that would be reportable to the NPRI. Does not include road dust releases, since these are not available at the facility level in the National Emissions Inventory.

2.3.1 Recommendations to Require Reporting of Condensable Particulate Matter

NPRI has received requests from APEI to require that facilities report CPM to the NPRI, for use as inputs to the APEI, and to support meeting international reporting obligations.

2.3.2 Environment and Climate Change Canada's Response to Recommendations and Proposed Path Forward

When TPM, PM_{10} and $PM_{2.5}$ were added to the NPRI substance list in 2002, the decision was made to require reporting on only the filterable portion due to:

- The limited availability of emission factors for CPM and the low quality of those emission factors, which would result in data of low quality being reported;
- The lack of consistency in reported data:
    - if some facilities included CPM in their reports, it would not be known which reported quantities included filterable PM and CPM, CPM only or filterable PM only. The lack of consistency would make the data more difficult to use;
    - facilities would likely use different procedures for measuring or calculating CPM, so the reported data would not be directly comparable between facilities; and
- The potential for double counting of VOC releases – CPM can contain VOCs which are already reported to the NPRI individually in Part 1 and/or Part 5 and as part of Part 4 total VOCs.

Since 2002, none of these issues have been fully resolved and new issues have also arisen:

- New, high quality emission factors for CPM have not been developed. Some work has been done, for example, recent work has been done by the Canadian Energy Partnership for Environmental Innovation to develop an emission factor for condensable and filterable PM from natural gas combustion. However, this is a combined emission factor that estimates both filterable and condensable PM together; separate filterable PM and CPM data are required for data users (e.g., black carbon is emitted in the filterable portion of PM and only filterable PM data can be used for black carbon estimates);
- The US EPA has developed reference Method 202 – Condensable Particulate Matter and ECCC has developed a reference method for the Determination of Condensable Particulate Matter. However, stakeholder input indicates that it would be quite challenging for facilities to accurately and comprehensively quantify CPM emissions, even with existing reference methods;
- Not all facilities would be able to perform source testing and might opt to use other methods of estimation (e.g., emission factors or engineering estimates) instead, affecting the comparability of data between facilities;
- The Black Carbon Inventory requires data on filterable PM only. NPRI filterable and condensable PM data would therefore need to be kept separate. Should NPRI require that condensable PM be reported by facilities, some facilities will only be able to report the two fractions together, which will complicate black carbon calculations; and
- The Task Force on Emission Inventories and Projections under the UN ECE CLRTAP has a long-term aim of standardized reporting of PM emissions, including both filterable and condensable components. Short-term changes to NPRI reporting requirements could end up being in conflict with future requirements under the Convention.

NPRI has considered the recommendation to add CPM to the list of reportable substances, as well as stakeholder input and input from internal discussions, and decided that CPM is not an appropriate candidate for addition to the NPRI at this time due to many technical challenges associated with having

facilities report the data. For now, ECCC can compile estimates of CPM releases based on filterable PM releases reported to the NPRI, using speciation profiles.

ECCC will be able to more accurately estimate CPM emissions if data on quantities from combustion and non-combustion sources and data on fuel type become available. This information will help ECCC to apply proper speciation profiles, since

1. The contribution of CPM to primary PM differs significantly for combustion and non-combustion sources. For example, Table 3 shows that 52.5% of filterable PM released from US facilities is from combustion sources compared to 83.6% of CPM releases; and
2. The contribution of CPM and filterable PM to primary PM can vary widely by industrial sector. Table 4 shows that the majority of filterable PM releases from US facilities in the mining, quarrying and oil and gas extraction and manufacturing sectors come from non-combustion sources, whereas the opposite is true for utilities and all other sectors.

It is possible that some facilities are already reporting CPM to the NPRI. This could be due to the use of a combined emission factor for both filterable PM and CPM, the use of a CPM emission factor instead of a filterable PM emission factor, or the use of a source testing method that includes CPM in the results. In order to help improve the accuracy of ECCC-estimated CPM releases, facilities could be asked to indicate whether their reported $PM_{2.5}$ quantities include CPM. ECCC is proposing to make this change to NPRI reporting requirements (see Chapter 5).

Table 3. Releases of particulate matter from US facilities, combustion and non-combustion sources

	Releases from combustion sources as a percentage of total releases	Releases from non-combustion sources as a percentage of total releases
Filterable PM	52.5	47.5
Condensable PM	83.6	16.4
Primary PM	66.2	33.8

Notes: 2014 US National Emissions Inventory data for facility-based releases, including only those sources or activities that would be reportable to the NPRI. Does not include road dust releases, since these are not available at the facility level in the National Emissions Inventory.

Table 4. Releases of particulate matter from US facilities by sector, combustion and non-combustion sources

	Source	Mining, quarrying, and oil and gas extraction	Utilities	Manufacturing	All other sectors
Filterable PM releases (tonnes)	Combustion	29.7	87.5	36.4	55.0
	Non-combustion	70.3	12.5	63.6	45.0
Condensable PM releases (tonnes)	Combustion	82.9	99.2	56.4	95.9
	Non-combustion	17.1	0.8	43.6	4.1
Primary PM releases (tonnes)	Combustion	39.5	94.5	43.2	69.2
	Non-combustion	60.5	5.5	56.8	30.8

Notes: 2014 US National Emissions Inventory data for facility-based releases, including only those sources or activities that would be reportable to the NPRI. Does not include road dust releases, since these are not available at the facility level in the National Emissions Inventory.

3. Analysis of Stack Data

3.1 Data Sources

In order to determine the best type of criteria at which stacks should be required to report, an analysis was performed on two stack databases: the 2008 Alberta Industrial Air Emissions Survey and the 2014 US National Emissions Inventory. These data sets were used since detailed stack data (beyond that reported to the NPRI, which does not include stacks below 50m in height) is not available Canada-wide or for other provinces. NPRI stack data for 2016 for stacks 50m or more in height were also used, for comparison to the US and Alberta data sets.

3.1.1 Alberta Industrial Air Emissions Survey

The 2008 Alberta Industrial Air Emissions Survey[7] (2008 AB IAES) was a mandatory survey used to collect industry-validated actual annual source-level air emissions data and information from air emitters in Alberta. The main purpose of the IAES was to provide data for emissions analysis and photochemical modelling to support air policy development and provide the scientific basis for cumulative effects management. The IAES covered 360 facilities with greater than 10 tonnes of annual NOx, SO_2 or TPM emissions for 2006, 2007 or 2008.

Stack-level emissions data for 2008 from the IAES were used in the analysis for the following CACs:

- nitrogen oxides (NOx),
- sulphur dioxide (SO_2),
- particulate matter with a diameter less than or equal to 2.5 micrometres ($PM_{2.5}$),
- particulate matter with a diameter less than or equal to 10 micrometres (PM_{10}),
- total particulate matter (TPM),
- carbon monoxide (CO), and
- volatile organic compounds (VOCs).

All point sources where the stack height was indicated and where the decommissioning date had not passed were included in the analysis, giving a data set of 3 707 stacks at 344 facilities, with an average number of stacks per facility of 15.

3.1.2 US National Emissions Inventory

The National Emissions Inventory (NEI) is a comprehensive and detailed estimate of air emissions of criteria pollutants, criteria precursors, and hazardous air pollutants from air emissions sources in the US. The NEI is released every three years based primarily upon data provided by State, Local, and Tribal air agencies for sources in their jurisdictions and supplemented by data developed by the US EPA. NEI point sources include emissions estimates for larger sources that are located at a fixed, stationary location. Annual emissions for all sources of required pollutants must be reported every three years, based on the emissions potential of each source, with a 100 ton (1 ton equals 0.907 metric tonnes) trigger one, report

[7] Requests for this data set should be submitted to: AENV.AirSurvey@gov.ab.ca. For more information on the Survey, see the Alberta Government Data Library.

all threshold (i.e., if the threshold is met for any one CAC, then all CACs must be reported) in most cases.[8]

2014 Version 1 National Emissions Inventory (2014NEIv1) data in the 2014 Version 7.0 Platform (2014v7.0 platform) prepared for air quality modelling were used in the analysis for the following CACs[9]:

- NOx,
- SO_2,
- filterable $PM_{2.5}$,
- filterable PM_{10},
- CO, and
- VOCs.

The point source data from three 2014v7.0 platform data sets[10, 11] were used:

- ptegu: 2014NEIv1 point source data for electricity generating units (EGUs)[12]
- pt_oilgas: 2014NEIv1 point sources including facilities with the following North American Industry Classification System (NAICS) codes: 211 (Oil and Gas Extraction), 213111 (Drilling Oil and Gas Wells), 213112 (Support Activities for Oil and Gas Operations), 4861 (Pipeline Transportation of Crude Oil), 4862 (Pipeline Transportation of Natural Gas)[13]
- ptnonipm: All 2014NEIv1 point sources not matched to the ptegu or pt_oilgas sectors, except for offshore point sources.[14]

The point sources where no stack height was indicated were removed from each of the 2014v7.0 platform data sets and the values for stack height and annual releases (feet and tons) were converted to metric (metres and tonnes). The three US data files contained data for 225 191 stacks at 33 619 facilities, with an average of 6.7 stacks per facility. The three US data files were then combined and the stacks from the 2008 AB IAES were added to create a single data set for the analysis, giving a total of 228 898 stacks at 33 963 facilities with each stack reporting an average of 3 CACs.

[8] The threshold for CO is 1 000 tons. Thresholds are lower for VOCs, CO, PM_{10} and $PM_{2.5}$ for sources in areas where national ambient air quality standards are not met. For example, in areas where the national ozone standard is not met, the threshold for VOCs ranges from 10-50 tons. For more information, see the Air Emissions Reporting Rule, 40 CFR Part 51.

[9] The data sets did not include TPM data, since TPM is not an NEI-reportable substance. The data sets include condensable PM as well as filterable PM; only the filterable PM data was used in the analysis, since only filterable PM is required to be reported to the NPRI.

[10] For more information on the data files, see the Technical Support Document (TSD) Preparation of Emissions Inventories for the Version 7.1, 2014 Emissions Modeling Platform for the National Air Toxic Assessment and the Sparse Matrix Operator Kernel (SMOKE) Modeling System v3.7 User's Manual.

[11] The 2014v7.0 platform downloadable data set also includes data for other sources that were not used in the analysis, for example, natural sources (emission from vegetation and land); releases from agricultural fires; non-point releases from oil and gas facilities; road dust from paved and unpaved roads, including unpaved roads at facilities; emissions from on-road and non-road vehicles; and residential fuel combustion.

[12] File name: ptegu_2014NEIv1_final_POINT_02nov2016_v0.csv.

[13] File name: pt_oilgas_2014NEIv1_final_POINT_03nov2016_v3.csv.

[14] File name: ptnonipm_2014NEIv1_final_POINT_commentfix_07mar2017_v0.csv.

3.1.3 NPRI Data

The September 14, 2017 version of NPRI data were used for the analysis, in two formats: the 2016 single year tabular data file and the 2009-2016 NPRI Access database. Data submitted for stacks with a reported height of less than 50m were excluded from the analysis. In 2016, releases from 780 stacks ≥50m in height were reported by 277 facilities, with an average 2.8 stacks being reported per facility and each stack reporting an average of 5 CACs.

3.1.4 Comparison of US, Alberta and NPRI Stack Data

3.1.4.1 Alberta and US Stacks

The number of stacks in the combined US and Alberta data set is shown as a distribution by stack height interval in Table 5. Just over 40% of the stacks are less than 10m in height. Table 6 shows the number and percent of stacks below various stack height thresholds. This gives an indication that if, for example, a stack height threshold of 30m were selected, threshold calculations would not need to be done for 89% of stacks.

Table 5. Number and percentage of Alberta and US stacks by stack height

	Number of stacks	Number of stacks as a percentage of all stacks
0m-<10m	92 484	40.4
10m-<15m	61 126	26.7
15m-<20m	25 875	11.3
20m-<25m	15 249	6.7
25m-<30m	9 053	4.0
30m-<35m	7 050	3.1
35m-<40m	3 084	1.3
40m-<45m	3 207	1.4
45m-<50m	2 229	1.0
≥50m	9 541	4.2
Total	228 898	100.0

Table 6. Number and percentage of Alberta and US stacks below various stack height thresholds

Stack height	Number of stacks	Number of stacks as a percentage of all stacks
<10m	92 484	40.4
<15m	153 610	67.1
<20m	179 485	78.4
<25m	194 734	85.1
<30m	203 787	89.0
<35m	210 837	92.1
<40m	213 921	93.5
<45m	217 128	94.9
<50m	219 357	95.8

The number of stacks releasing each CAC in the combined Alberta and US data set is shown in Table 7. These numbers were used to calculate the stack coverage for each of the scenarios (see sections 3.2.2 and 3.3). If added together, the total of 697 802 represents the number of stack-substance reports for the US and Alberta stacks. The total releases of each CAC, which were used to calculate release coverage for each of the scenarios, are also shown in Table 7.

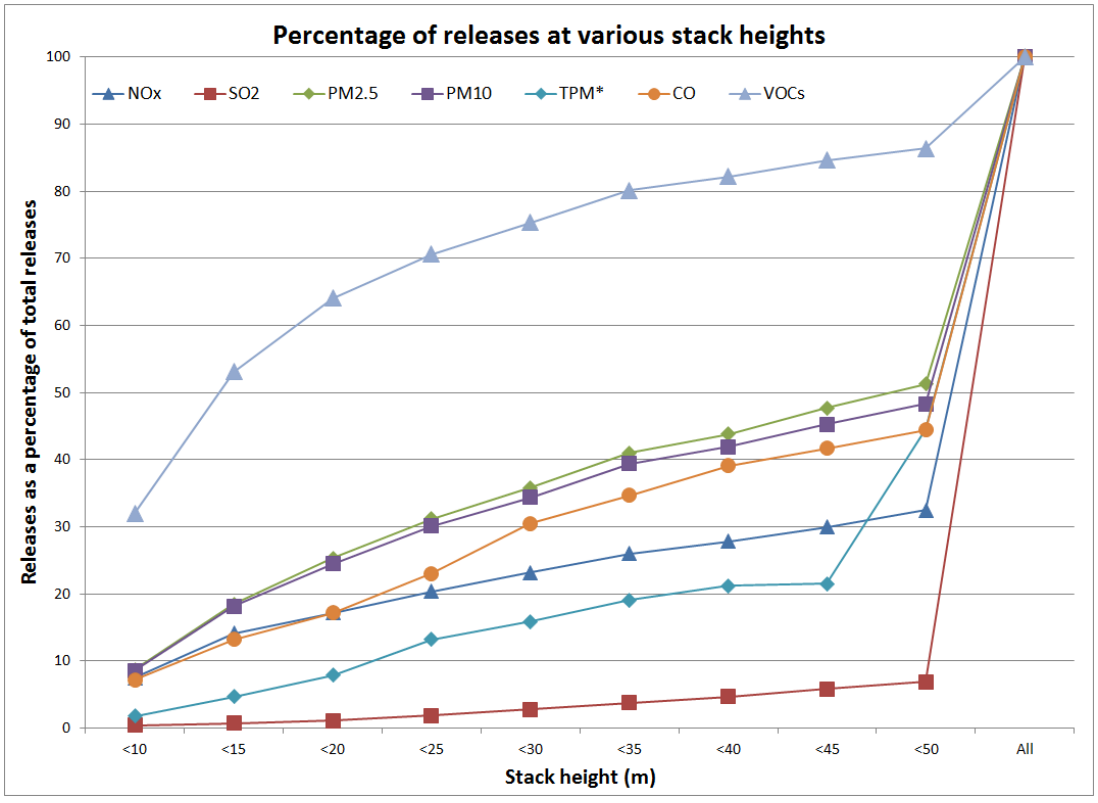
Figure 1 shows the percentage of each CAC that is released by stacks found in each height interval. For example, 93.1% of SO_2 releases come from stacks that are ≥50m in height, compared to only 48.7% of $PM_{2.5}$ and only 13.6% of VOCs. Figure 1 shows the importance of selecting an appropriate stack height threshold. For example, 35.8% of $PM_{2.5}$ releases come from stacks that are less than 30m in height. A 30m stack height threshold would therefore mean that a maximum of 64.2% of total releases would be reported by individual stacks, depending on the stack air release threshold.

Table 7. Number of stacks releasing the substance and total releases of the substance, Alberta and US stacks

	Number of stacks releasing the substance	Total releases of the substance (tonnes)
NO_2	96 495	3 070 098
SO_2	78 515	4 138 665
$PM_{2.5}$	135 640	187 593
PM_{10}	138 250	300 165
TPM	2 748	23 143
CO	95 245	2 288 886
VOCs	150 909	542 526

Notes: TPM data was not available for US stacks. The number of stacks reporting TPM and the total releases of TPM in this table are for Alberta stacks only.

Figure 1. Cumulative percentage of releases from various stack heights, Alberta and US stacks



* TPM data was not available for US stacks. The percentages of releases of TPM in this figure are for Alberta stacks only.

3.1.4.2 NPRI Stacks

In 2016, releases from 883 individual stacks reported to the NPRI, 780 of which had a reported height of ≥50m. Only those stacks that were reported to be ≥50m in height were used in the analysis. An average of five CACs was reported for each of the 780 stacks, for a total of 3 979 stack-substance reports. The number of stack-substance reports is shown by CAC Table 8.

The data in Table 9 show that the majority of NO_2, SO_2 and CO releases reported by NPRI facilities are reported under the stack or point releases category (which includes releases from individual stacks, as well as releases from stacks that do not meet thresholds and releases from points). The remaining release categories (storage or handling, spills, and other) contribute very little to total releases of NO_2, SO_2 and CO, but contribute a greater proportion of $PM_{2.5}$, PM_{10}, TPM and VOCs releases. Road dust makes up a third of reported PM_{10} releases and almost half of TPM releases.

Table 9 shows that under current NPRI reporting requirements, 70.2% of stack or point releases of SO_2 are attributed to individual stacks. Since 99.5% of total SO_2 releases are stack or point releases, the current stack reporting requirements are resulting in a good quantity of SO_2 releases being reported at the individual stack level. The percentage of stack or point releases that are reported by individual stacks is lower for NO_2, $PM_{2.5}$, PM_{10}, TPM and CO, ranging from 17% to 43.2%, and lowest for VOCs at 11.3%.

Table 8. Number of stacks ≥ 50m in height for which releases were reported to the NPRI

Criteria air contaminant	Number of stacks
NOx	597
SO_2	470
$PM_{2.5}$	672
PM_{10}	663
TPM	502
CO	600
VOCs	475
Total number of stack-substance reports	**3 979**

Notes: This total represents the number of stack-substance reports. It does not represent the number of individual stacks that report to the NPRI, as releases of multiple substances are reported from most stacks. The 3979 stack-substance reports submitted in 2016 were reported for 780 individual stacks.

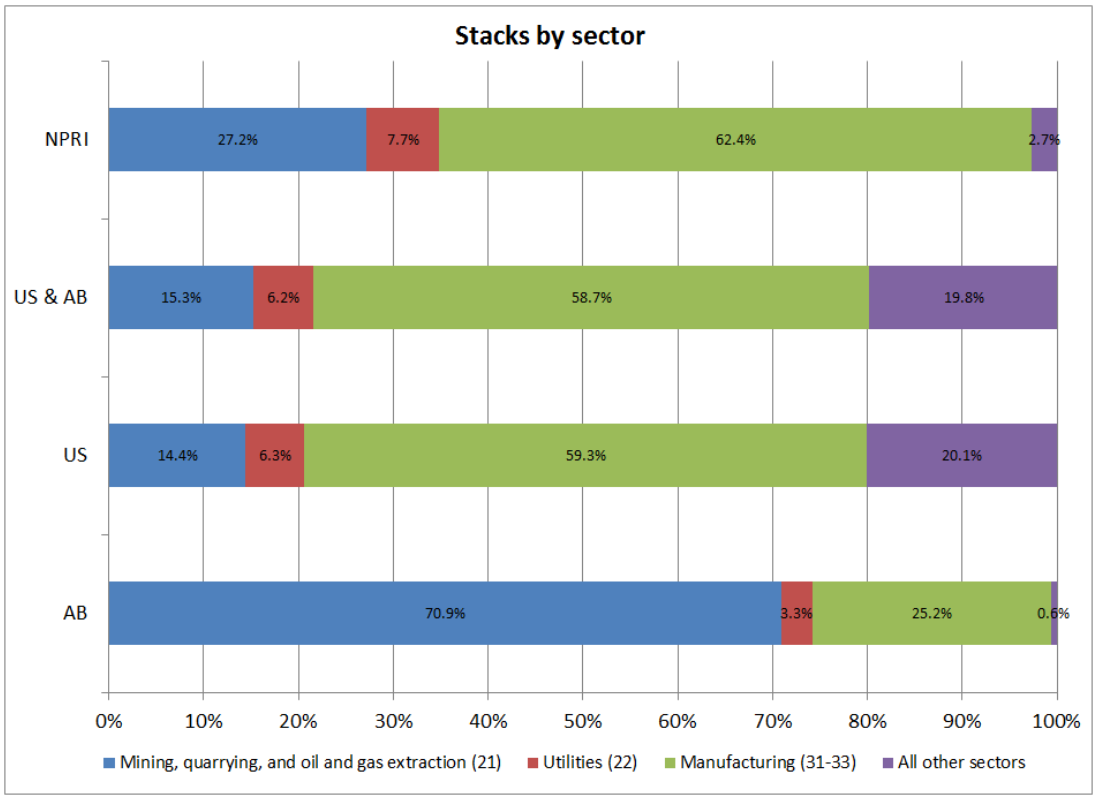
Table 9. Facility and stack releases of criteria air contaminants reported to NPRI

	Releases						
	NO_2	**SO_2**	**$PM_{2.5}$**	**PM_{10}**	**TPM**	**CO**	**VOCs**
Total releases (tonnes)	**587 544**	**975 538**	**48 326**	**136 433**	**329 515**	**1 738 689**	**187 453**
Stack or point releases (tonnes)	577 630	970 198	32 978	51 663	88 801	1 691 746	80 565
Releases reported for individual stacks ≥50m (tonnes)	170 351	681 092	14 023	22 315	33 853	286 833	9 099
Releases from individual stacks as a percentage of stack or point releases	29.5	70.2	42.5	43.2	38.1	17.0	11.3
Releases from individual stacks as a percentage of total releases	29.0	69.8	29	16.4	10.3	16.5	4.9
Stack or point releases as a percentage of total releases	98.3	99.5	68.2	37.9	26.9	97.3	43.0

3.1.4.3 Comparison of Industrial Sectors

Since the combined US and Alberta stack data set was used to draw conclusions about how changes to NPRI reporting requirements might work across Canada, the data sets were compared by sector for similarities and differences. Figure 2 and Table 38 in Appendix 2 show the breakdown by industrial sector of the stacks in each data set (NPRI stacks, combined US and Alberta stacks, US only stacks and Alberta only stacks). While the combined US and Alberta data sets were used in the analysis, TPM data was only available for Alberta and not the US, so the stacks for Alberta are also shown separately in Figure 2.

Figure 2. NPRI, US and Alberta stacks by sector



The distribution of stacks by certain sectors is relatively similar in the NPRI and combined Alberta and US data sets, i.e., for stacks at facilities in the manufacturing sectors (62.4% manufacturing for NPRI stacks, 58.7% for US and Alberta stacks) and for utilities (7.7% for NPRI, 6.2% for US and Alberta). The main differences in the distribution of stacks by industrial sectors between the NPRI and the US and Alberta data sets is in the mining, quarrying and oil and gas extraction sector and the category for "all other sectors" used in the graphs. Although the proportion of stacks in the mining, quarrying and oil and gas extraction sector in the NPRI data set is high compared to the combined Alberta and US data set, it is still more similar to the combined data set than to the Alberta data alone.

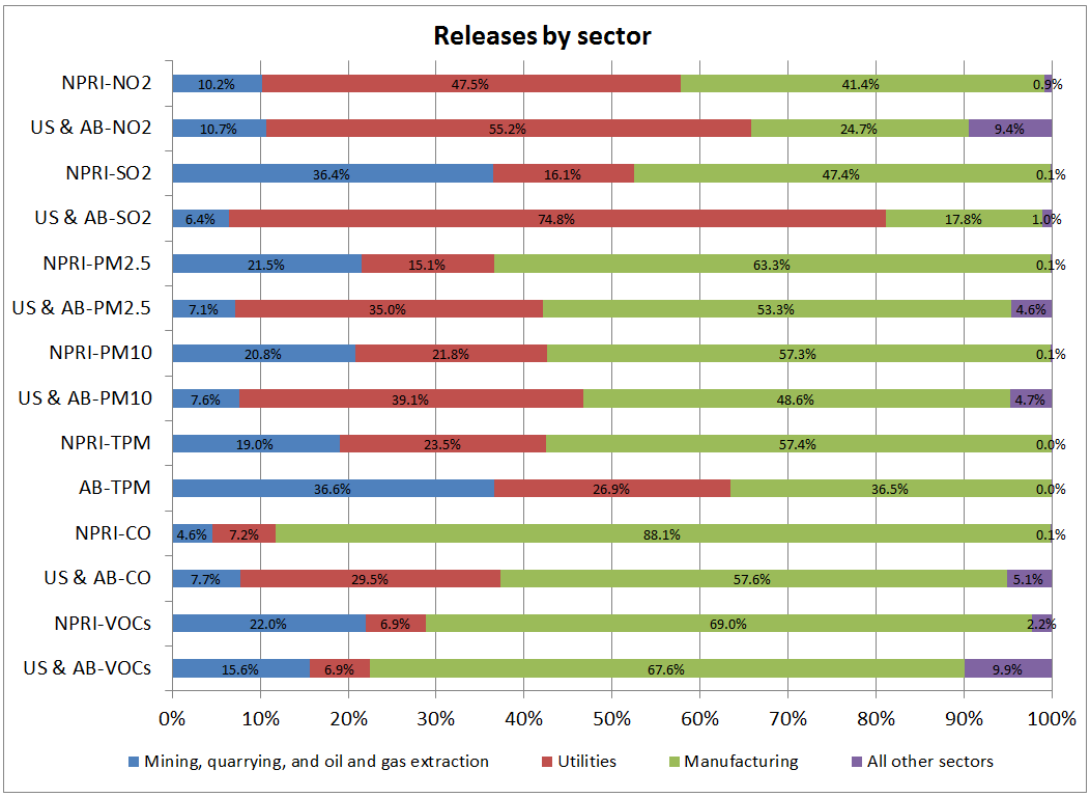
Since the "all other sectors" grouping in Figure 2 includes 2-digit NAICS codes for which NPRI reporting may not be required (e.g., certain agriculture and construction activities), there are very few stacks that reported under these categories to the NPRI (2.7% of NPRI stacks in 2016). In the combined US and

Alberta data sets, almost 20% of stacks are in the "all other sectors" group, most of which are from the US data. The sectors contributing the most to the 20% of stacks in "all other sectors" are (see Table 38 in Appendix 2):

- transportation and warehousing (7.2% of all stacks in the data set),
- wholesale trade (3.9%), and
- public administration (2.1%).

While Figure 2 shows the distribution of the *number of stacks* by sector (by percentage), Figure 3 and Table 39 in Appendix 2 show the distribution of *releases* from stacks by sector as a percentage of total releases of each CAC. This shows that the NPRI, US and Alberta data can be similar or can vary widely depending on the CAC and the sector. For example, a similar proportion of NO_2 releases from the mining, quarrying and oil and gas extraction sector can be seen between NPRI stacks (10.2%) and US and Alberta stacks (10.7%). A far greater proportion of CO releases come from NPRI stacks in manufacturing sector (88.1%) than from US and Alberta stacks (57.6%).

Figure 3. Releases from NPRI and US and Alberta stacks by criteria air contaminant and by sector



3.2 Criteria to Evaluate Thresholds

In order to provide additional data for data users while minimizing additional reporting burden on facilities, the objective for individual stack reporting is to:

1. Maximize the reporting of release quantities ("release coverage"; see Section 3.2.1)
2. Minimize the number of stacks required to report ("stack coverage"; see Section 3.2.2)
3. Minimize the number of stack-substance reports (see Section 3.2.3)

An additional consideration is the number of threshold calculations (see Section 3.2.4) that need to be performed by facilities to determine whether air releases need to be reported for a particular stack.

For the purposes of developing and comparing possible options for changes to stack reporting, targets were set at 20% or less for stack coverage and 80% or more for release coverage. A goal of no more than approximately double the number of current stack-substance reports was also set, in order to minimize the impact of potential changes. Without knowing the total number of stacks at NPRI facilities, it was not possible to set a numerical target for the number of threshold calculations.

3.2.1 Release Coverage

Release coverage is the quantity of releases reported by individual stacks as a percentage of all stack releases (Equation 1).

Equation 1. Calculation of Release Coverage

$$\textbf{Release coverage} = \frac{Releases\ reported\ by\ individual\ stacks\ with\ thresholds}{Total\ releases\ from\ all\ stacks\ with\ no\ thresholds} \times 100$$

If current NPRI reporting requirements are applied to the combined Alberta and US data set, the release coverage target of 80% or more is not met for any CACs, with the exception of SO_2 (see Scenario 1 in Table 41 in Appendix 2). For the purposes of AQ modelling, it is important to increase the release coverage for all CACs. However, a specific emphasis was placed on increasing the release coverage for NOx, SO_2 and CO in particular, since stack sources are highest for these substances relative to point, fugitive and natural sources. For the purposes of providing improved data to calculate black carbon emissions, an emphasis was also placed on increasing the release coverage of $PM_{2.5}$.

3.2.2 Stack Coverage

Stack coverage is the number of stacks required to report for a CAC as a percentage of all stacks releasing that CAC (Equation 2).

Equation 2. Calculation of Stack Coverage

$$\textbf{Stack coverage} = \frac{Number\ of\ stacks\ required\ to\ report\ the\ substance\ with\ thresholds}{Number\ of\ stacks\ releasing\ the\ substance} \times 100$$

The stack coverage rates estimated using current NPRI reporting requirements are all below the target of 20% or less (see Scenario 1 in Table 41 in Appendix 2). Note that the *number of stacks releasing the specific CAC* was used as the divisor instead of the *total number of stacks* in the data sets (228898) since not all stacks release a particular CAC. For example, CO releases were reported from 95245 stacks which results a stack coverage rate of 4.5% under current NPRI reporting requirements. If the total number of stacks in the data sets were used instead, including all the stacks that do not release any CO, the release coverage rate would be 1.9%.

3.2.3 Stack-Substance Reports

The number of stack-substance reports is the number of release values reported by substance and by individual stack. For example, in 2016, values for air releases of SO_2 were reported to the NPRI for 470 stacks ≥50m in height: each of these values would be considered a "stack-substance report." When added together for all CACs, there were 3 979 NPRI stack-substance reports in 2016 (Table 8). A target of no more than approximately double the current number of stack-substance reports was set, and Equation 3 was used to determine the number of stack-substance reports that would be required with various changes to reporting requirements.

Equation 3. Calculation of Stack-Substance Reports Extrapolated to Canada

$$\boldsymbol{Stack\ substance\ reports\ extrapolated\ to\ Canada} =$$
$$\left(\frac{Number\ of\ stack\ NOx\ reports\ with\ new\ thresholds}{Number\ of\ stack\ NOx\ reports\ with\ current\ thresholds} \times Number\ of\ stack\ NOx\ reports, NPRI, 2016\right) +$$
$$\left(\frac{Number\ of\ stack\ SO_2\ reports\ with\ new\ thresholds}{Number\ of\ stack\ SO_2\ reports\ with\ current\ thresholds} \times Number\ of\ stack\ SO_2\ reports, NPRI, 2016\right) +$$
$$\left(\frac{Number\ of\ stack\ PM_{2.5}\ reports\ with\ new\ thresholds}{Number\ of\ stack\ PM_{2.5}\ reports\ with\ current\ thresholds} \times Number\ of\ stack\ PM_{2.5}\ reports, NPRI, 2016\right) +$$
$$\left(\frac{Number\ of\ stack\ PM_{10}\ reports\ with\ new\ thresholds}{Number\ of\ stack\ PM_{10}\ reports\ with\ current\ thresholds} \times Number\ of\ stack\ PM_{10}\ reports, NPRI, 2016\right) +$$
$$\left(\frac{Number\ of\ stack\ TPM\ reports\ with\ new\ thresholds}{Number\ of\ stack\ TPM\ reports\ with\ current\ thresholds} \times Number\ of\ stack\ TPM\ reports, NPRI, 2016\right) +$$
$$\left(\frac{Number\ of\ stack\ CO\ reports\ with\ new\ thresholds}{Number\ of\ stack\ CO\ reports\ with\ current\ thresholds} \times Number\ of\ stack\ CO\ reports, NPRI, 2016\right) +$$
$$\left(\frac{Number\ of\ stack\ VOC\ reports\ with\ new\ thresholds}{Number\ of\ stack\ VOC\ reports\ with\ current\ thresholds} \times Number\ of\ stack\ VOC\ reports, NPRI, 2016\right)$$

3.2.4 Threshold Calculations

In order to determine the exact number of threshold calculations that would need to be performed to determine if a stack-substance report is required to be submitted to the NPRI, it is necessary to have a comprehensive list of all stacks of all heights at all NPRI facilities. Since this information was not available, the number of threshold calculations was estimated using an arbitrary number of stacks at NPRI facilities of 10 000 (Equation 4). The calculated number itself is only useful as a means to compare scenarios, and is not representative of the potential actual number of threshold calculations. This calculation gives the *maximum* number of threshold calculations since it assumes that all facilities will have to calculate release quantities for all seven CACs.

Equation 4. Calculation of the number of stack air release threshold calculations

$$\boldsymbol{Number\ of\ stack\ air\ release\ threshold\ calculations} =$$
$$\left(\frac{Number\ of\ stacks\ \geq stack\ height\ threhsold}{Total\ number\ of\ stacks\ (228\ 898)}\right) \times 10\ 000\ stacks \times 7\ CACs$$

Using this formula with the current stack height threshold of 50m and the current stack air release thresholds, the number of stack air release threshold calculations for US and Alberta stacks is 2 918. Dividing the number of stack threshold calculations for each scenario by the number required under current requirements gives the ratio indicating the increase in the number of calculations. For example, if new thresholds require 41 717 threshold calculations, this means that about 14 times the threshold calculations are needed compared to current requirements. This is likely an overestimation, since it assumes that all facilities will have to calculate release quantities for all seven CACs.

3.3 Determining the Best Type of Threshold

This analysis uses the detailed data from Alberta and the US on releases from individual stacks to calculate the stack coverage, release coverage, number of stack-substance reports and the increase in the number of threshold calculations for 40 scenarios, each scenario having a different combination of stack height, stack air release and monitoring equipment reporting requirements. Detailed descriptions of the scenarios are provided in Table 40 in Appendix 2.

Scenario 1 is the baseline of the existing NPRI criteria of 50m stack height and 5 tonne stack air release thresholds for NOx, SO_2, TPM, CO and VOCs, 0.15 tonnes for $PM_{2.5}$ and 0.25 tonnes for PM_{10}. Scenario 2 uses the current stack height threshold of 50m with the stack air release thresholds removed, to

evaluate whether stack air release thresholds are achieving the intended goal of reducing reporting burden without significantly reducing the quantity of information collected.

To estimate the potential impacts of different options for changes to NPRI stack reporting requirements, 38 additional scenarios, grouped into four types, were evaluated. Each scenario holds some variables constant while changing others:

- 8 scenarios where the only variable that was changed was the stack height threshold – reduced from 50m to 45m, 40m, 35m, 30m, 20m, 15m, 10m and 0m (Scenarios 3-10);
- 3 scenarios where the stack height threshold was 50m, 40m or 30m and the requirement to report for stacks with continuous emissions monitoring systems (CEMS) installed (regardless of height) was added (Scenarios 11-13);
- 15 scenarios where the stack height threshold was reduced to 30m, 20m, 15m, 10m and 0m and the stack air release thresholds were increased to 5, 10 and 20 times the current stack air release thresholds for each height threshold (Scenarios 14-28); and
- 12 "trigger one, report all" scenarios, i.e., if a certain quantity of any one CAC is released from a given stack, then all CACs released from that stack would have to be reported:
    - 9 scenarios with stack height thresholds of 0m, 15m and 30m and trigger thresholds of 50, 75 and 100 tonnes, with one trigger threshold applied to all CACs (Scenarios 29-37) and
    - 3 scenarios with stack height thresholds of 0m, 15m and 30m and trigger thresholds that vary by CAC, for example, 250 tonnes for SO_2 and TPM, 125 tonnes for NOx, CO and VOCs, 5 tonnes for $PM_{2.5}$ and 15 tonnes for PM_{10} (Scenarios 38-40).

The stack coverage, release coverage, extrapolated number of stacks that would be required to report in Canada, and the increase in the number of stack air release threshold calculations for each of the 40 scenarios are presented for all CACs in Table 41 in Appendix 2. The stack coverage and release coverage rates are shown by substance in Figures 4-10. In the graphs, the stack and release coverage targets of 20% and 80% are indicated by a box with a red dashed line. Scenarios that meet the stack and release coverage rates are indicated in red text in the legends. Scenarios that meet the <8 000 stack-substance reports target are indicated in the legends in bold (note that the <8 000 stack-substance reports target applies to the total number of stack-substance reports for all CACs, so the same scenarios will be bolded in each of the seven graphs). Legend entries that are in both red and bold text indicate where all three targets are met.

The requirements of each of the scenarios are briefly summarized in the legends of the graphs. For example:

- "6 (30m, 1x)" refers to Scenario 6 where the stack height threshold was 30m and the stack air release thresholds were not increased ("1x" refers to the multiplier applied to the current thresholds);
- "12 (40m or CEMS, 1x) refers to Scenario 12 where the stack height threshold was 40m, the requirement to report for stacks with CEMS installed regardless of stack height threshold was added, and the stack air release thresholds were not increased;
- "34 (15m, 100t trigger)" refers to Scenario 34 where the stack height threshold was 15m and a 100 tonne trigger threshold was used (i.e., if 100 tonnes of at least one CAC was released from the stack, then all CACs from the stack must be reported); and
- "27 (0m, 10x" refers to Scenario 27 where the stack height threshold was removed (0m) and the stack air release thresholds were increased by 10 times (10x).

Detailed descriptions of the requirements for each scenario are provided in Table 40 in Appendix 3.

Figure 4. NO_2 stack and release coverage

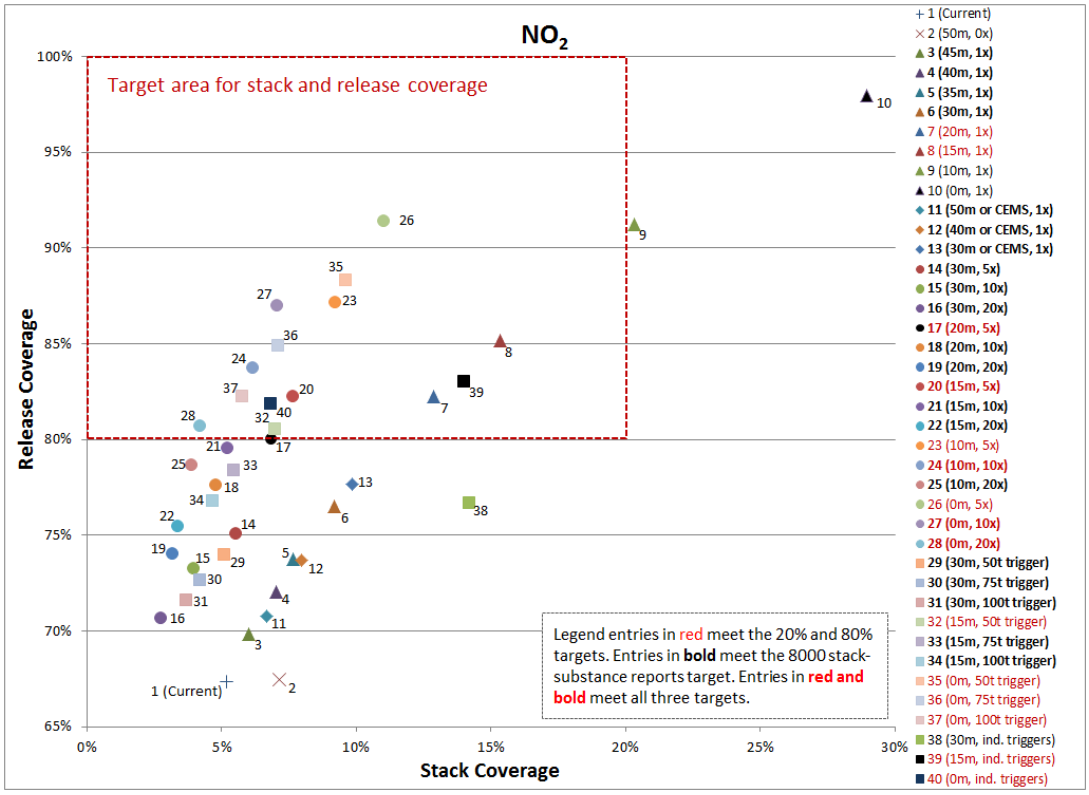


Figure 5. SO_2 stack and release coverage

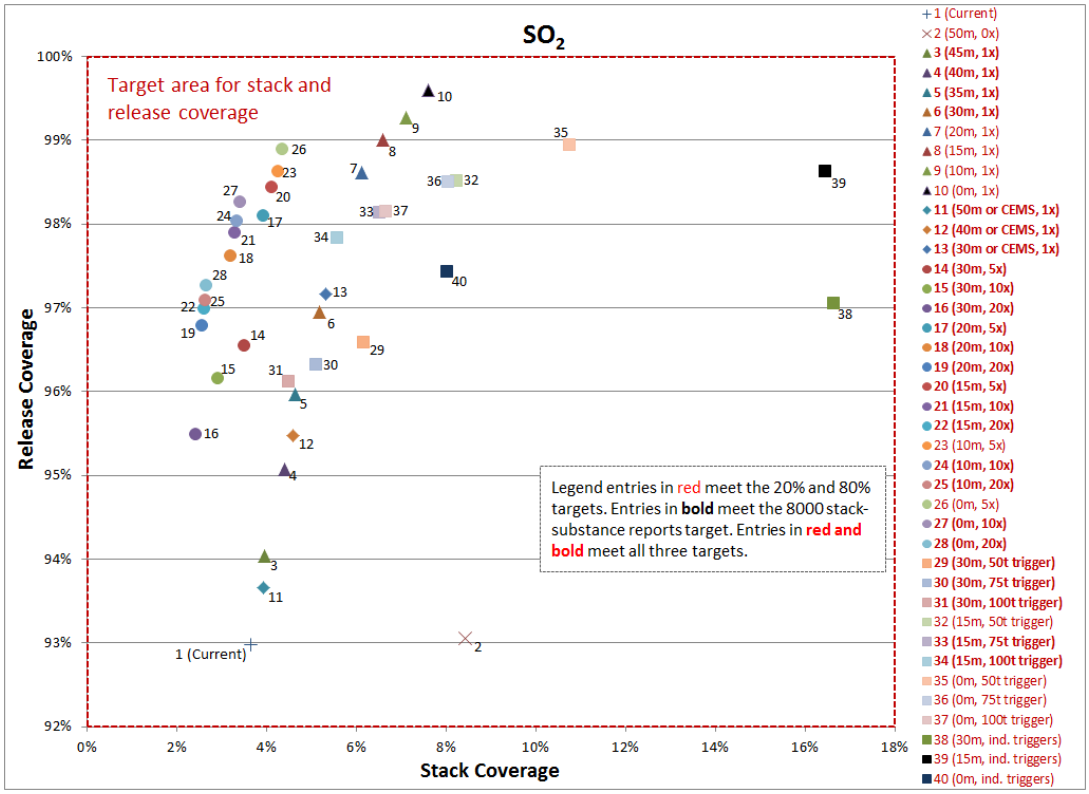


Figure 6. $PM_{2.5}$ stack and release coverage

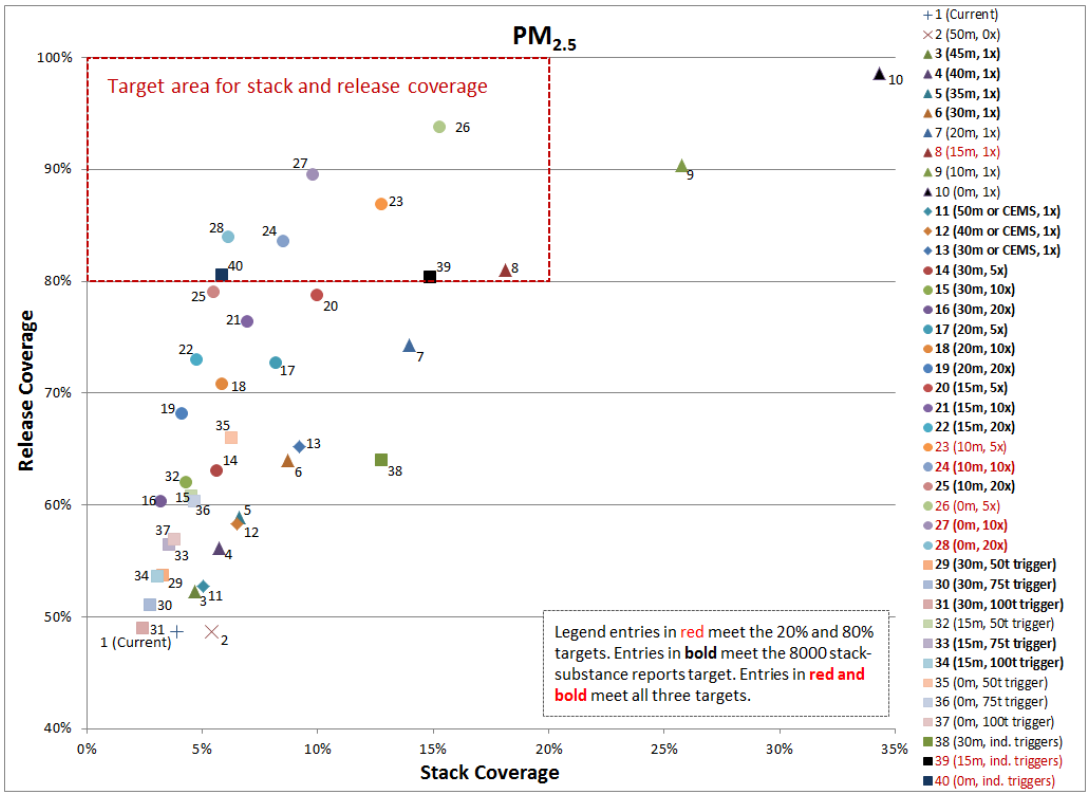


Figure 7. PM_{10} stack and release coverage

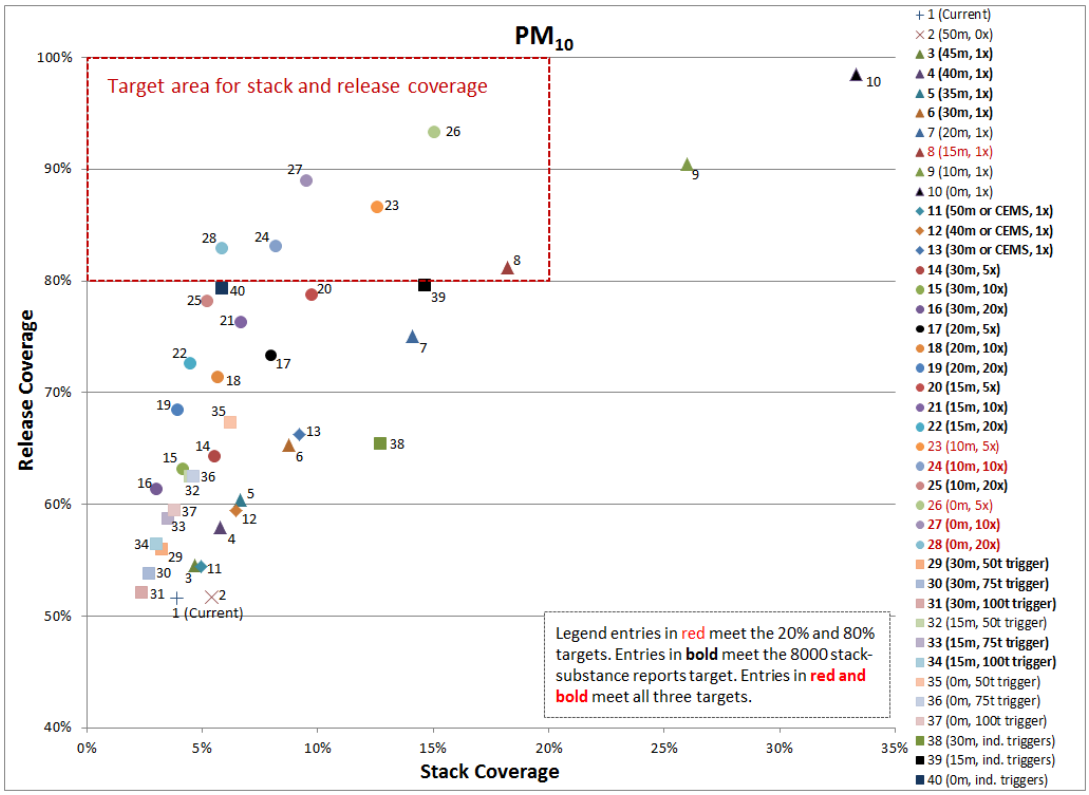


Figure 8. TPM stack and release coverage (*based on Alberta data only)

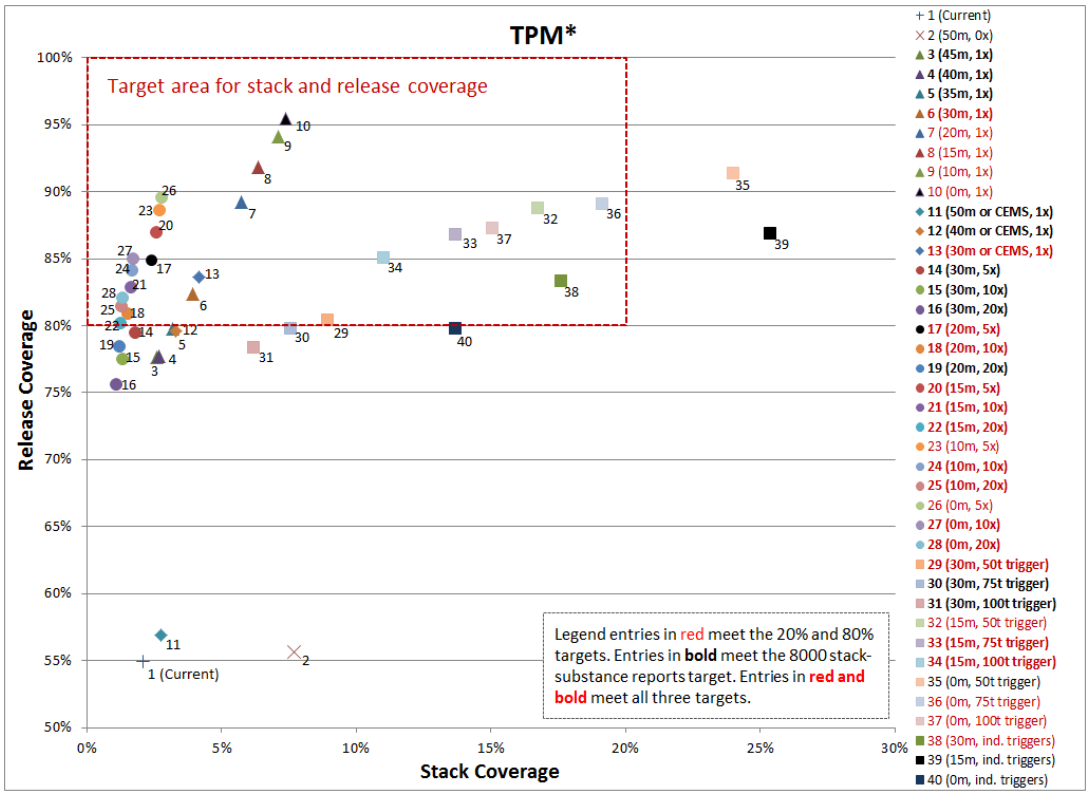


Figure 9. CO stack and release coverage

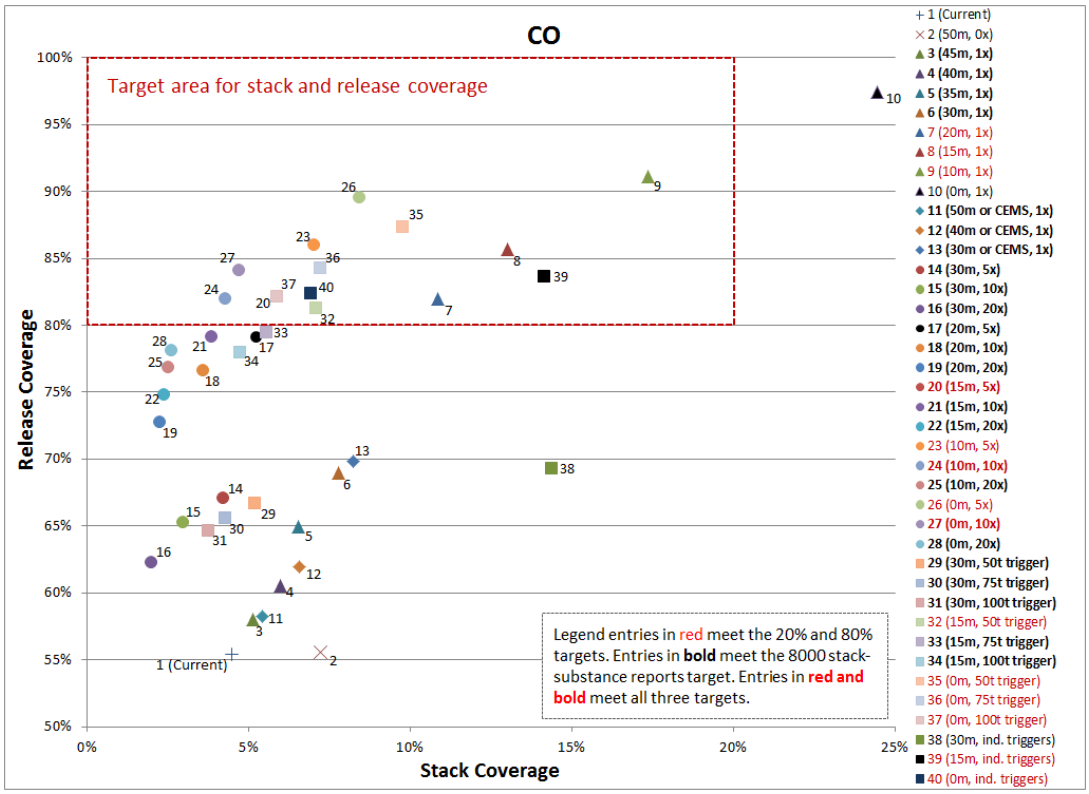
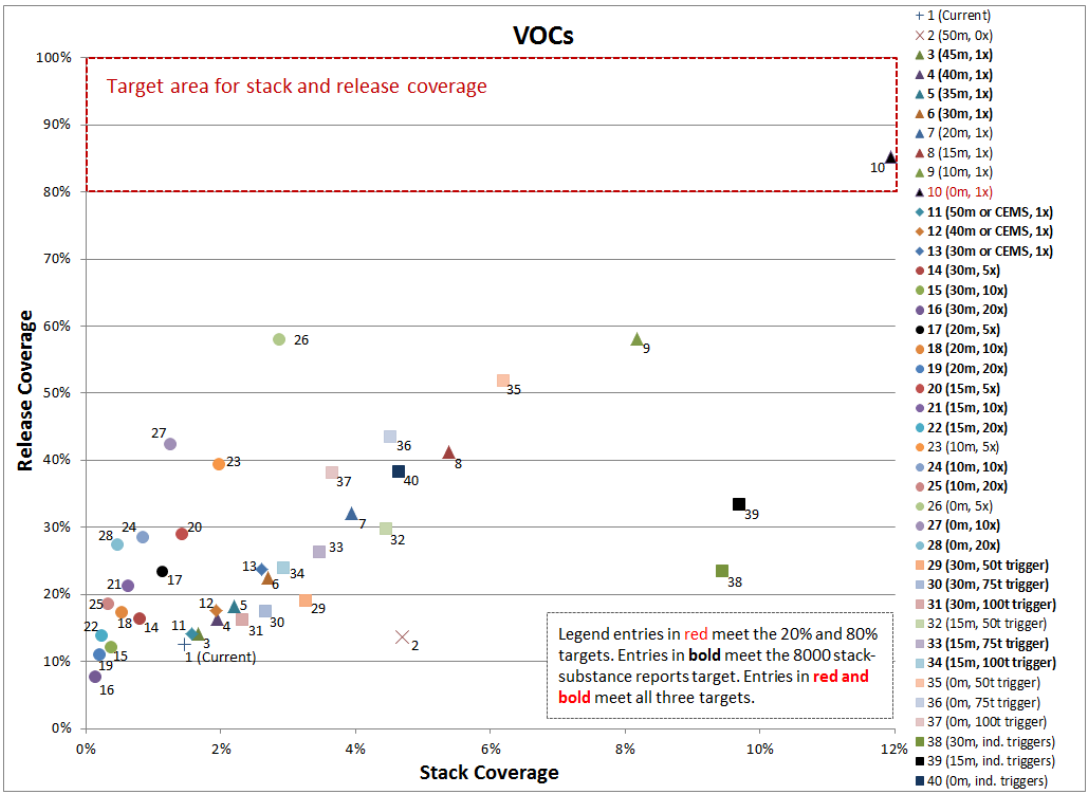


Figure 10. VOCs stack and release coverage



3.3.1 Current Reporting Requirements and the Effect of Stack Air Release Thresholds (Scenarios 1 and 2)

When the current NPRI reporting requirements for stacks are applied to the US and Alberta data (Scenario 1), the release coverage target of 80% is not met for any of the CACs except SO_2 (Figure 5). The stack coverage rates for all CACs are well below the targeted maximum of 20%; the highest stack coverage is 5.2% for NO_2 (Figure 4).

A comparison between Scenarios 1 and 2 shows that for all CACs, the stack air release thresholds are functioning as intended, to reduce reporting burden without significantly reducing the quantities of releases that are broken down by individual stacks (Table 41). For example, under the current reporting requirements (Scenario 1), the stack coverage for $PM_{2.5}$ is 3.9% compared to 5.4% when the stack release threshold of 0.15 tonnes is removed (Scenario 2) (Figure 6 and Table 41). The difference in release coverage between Scenarios 1 and 2, however, is only 0.05% compared to a difference of 1.5% in the number of stacks required to report. The difference is greatest for SO_2, with 4.8% fewer stacks reporting with the air release thresholds, but only 0.08% fewer releases being reported (Figure 5 and Table 41).

3.3.2 Effect of Reducing the Stack Height Threshold Only (Scenarios 3-10)

The scenarios where only the stack height thresholds were reduced met the targets for stack coverage, release coverage and stack-substance reports for at most two CACs (Table 41):

- Scenarios 3-5 (35m, 40m and 45m) meet the targets for SO_2;
- Scenario 6 (30m) meets the targets for SO_2 and TPM; and
- Scenarios 7-10 (0m, 10m, 15m, and 20m) do not meet the three targets for any CACs.

The results indicate that changing the stack height threshold alone (as has been previously discussed) would not achieve the desired stack and release coverage rates.

3.3.3 Effect of Maintaining or Reducing the Stack Height Threshold and Adding the Requirement to Report for Stacks with Continuous Emissions Monitoring Systems Installed (Scenarios 11-13)

Another suggested change was to reduce the height threshold and/or add the requirement for stacks with mandated CEMS installed to report (regardless of other thresholds), based on the theory that stacks that are required to have CEMS installed are likely to be major sources of CAC releases. Three scenarios of this type were evaluated, with 50m, 40m and 30m stack height thresholds:

- Scenarios 11 and 12 (50m and 40m stack height thresholds with no stack height threshold for stacks with CEMS) met the targets for stack coverage, release coverage and stack-substance reports for SO_2; and
- Scenario 13 (30m stack height threshold with no stack height threshold for stacks with CEMS) met the three targets for SO_2 and TPM.

These results indicate that changing the stack height threshold and adding the requirement to report for stacks with CEMS installed, regardless of height, would not achieve the desired stack and release coverage rates.

3.3.4 Effect of Reducing the Stack Height Threshold and Increasing the Stack Air Release Thresholds (Scenarios 14-28)

Of the four types of scenarios evaluated, only the scenarios where the stack height threshold was reduced and the stack air release thresholds were increased met the three targets for more than two CACs:

- Scenarios 24 (10m height threshold, 10 times the current stack air release thresholds) and 27 (no stack height threshold, 10 times the current stack air release thresholds) meet the targets for six of the seven CACs;
- Scenario 28 (no height threshold, 20 times release thresholds) meets the three targets for five of the seven CACs;
- Scenario 20 (15m height threshold, 5 times release thresholds) meets the targets for four of the CACs;
- Scenario 17 (20m height threshold, 5 times release thresholds) meets the targets for three of the CACs; and
- The other 10 scenarios of this type only meet the targets for two or fewer CACs.

The results for the best five scenarios are shown in Table 10. Scenario 1 (current NPRI thresholds) is also shown, for comparison. Cells highlighted in red in Table 10 indicate where the release coverage target has not been met. Scenarios 24 and 27 both use stack air release thresholds of 10 times the current thresholds and meet the three targets for all but VOCs, however, Scenario 27 has slightly higher stack and release coverage rates compared to Scenario 24. Scenario 20 meets the three targets for NOx, SO_2, TPM and CO. Scenario 28 meets the three targets for SO_2, $PM_{2.5}$, PM_{10} and TPM. The key differences between Scenarios 24 and 27 and between Scenarios 20 and 28 are the increase in the number of threshold calculations and number of stack-substance reports required, both of which are indicators of reporting burden.

Table 10. Five best threshold scenarios compared

		Scenarios					
		24 (10m, 10x)	**27 (0m, 10x)**	**28 (0m, 20x)**	**20 (15m, 5x)**	**17 (20m, 5x)**	**1 (Current – 50m, 1x)**
Number of CACs for which stack coverage, release coverage and stack-substance report targets are met		6	6	5	4	3	1
Percentage of stacks screened out based on the stack height threshold		40.4	0	0	67.1	78.4	95.8
Increase in the number of threshold calculations		14.3	24.0	24.0	7.9	5.2	1.0
Stack-substance reports extrapolated to Canada (target <8000)		5 215	5 986	3 679	6 467	5 706	3 979
Stack coverage (target ≤ 20%)	NOx	6.1	7.0	4.2	7.6	6.8	5.2
	SO_2	3.3	3.4	2.6	4.1	3.9	3.7
	$PM_{2.5}$	8.4	9.7	6.1	9.9	8.2	3.9
	PM_{10}	8.1	9.5	5.8	9.7	8.0	3.9
	TPM	1.6	1.7	1.3	2.5	2.4	2.1
	CO	4.2	4.7	2.6	5.9	5.2	4.5
	VOCs	0.8	1.2	0.5	1.4	1.1	1.5
Release coverage (target ≥ 80%)	NOx	83.8	87.0	80.8	82.3	80.0	67.4
	SO_2	98.0	98.3	97.3	98.4	98.1	93.0
	$PM_{2.5}$	83.7	89.6	84.0	78.8	72.8	48.6
	PM_{10}	83.1	89.0	83.0	78.8	73.3	51.6
	TPM	84.2	85.0	82.1	87.0	84.9	54.9
	CO	82.0	84.2	78.2	82.2	79.2	55.4
	VOCs	28.6	42.5	27.5	29.1	23.5	12.6

Even a stack height threshold as low as 10m (Scenario 24 vs. Scenario 27) results in 40% fewer threshold calculations and 13% fewer stack-substance reports being required compared to a 0m threshold, while reducing the release coverage by only 0.2%-4.9%. A stack height threshold of 15m results in 67% fewer potential threshold calculations compared to a 0m threshold [the difference between Scenario 20 and 26 (Scenario 26 is not shown in Table 10; see Table 41)] and a stack height threshold of 20m results in 78% fewer potential threshold calculations [the difference between Scenario 17 and 26 (see Table 41 for the results for Scenario 26)].

The comparison of these scenarios demonstrates that a combination of a reduced stack height threshold (10-20m) and increased stack air release thresholds appears to best achieve the target stack and release coverage rates, while minimizing the increase in threshold calculations and stack-substance reports required by NPRI facilities. This approach can focus efforts on stacks that contribute the largest proportion of releases of a substance.

These scenarios increase the stack air release thresholds for all seven CACs by the same proportion (5, 10 and 20 times the current thresholds). The effect of changing the release thresholds independently for each CAC was further evaluated (see section 3.4).

3.3.5 Effect of Trigger One, Report All Thresholds (Scenarios 29-40)

None of the "trigger one, report all" type thresholds met the stack and release coverage and stack-substance report targets for more than two CACs:

- Scenarios 29 (30m, 50 tonne trigger), 33 (15m, 75 tonne trigger) and 34 (15m, 100 tonne trigger) met the three targets for SO_2 and TPM;
- Scenarios 30 (30m, 75 tonne trigger) and 31 (30m, 100 tonne trigger) met the three targets for SO_2 only; and
- The remaining scenarios (32 and 35-40) did not meet the three targets for any CACs.

Scenarios 38-40 used individual trigger thresholds for each CAC to see if it was possible to meet the release coverage target for $PM_{2.5}$. While it was possible to reach the 80% release coverage target for the scenarios with stack height thresholds of 15m and 0m (Scenarios 39 and 40), the number of required stack-substance reports far exceed the target of 8 000. With a 30m stack height, even with a trigger threshold of 5 *kilograms* for $PM_{2.5}$ and very low trigger thresholds for the remaining CACs (Scenario 38), it is not possible to meet the 80% release coverage target for $PM_{2.5}$ with this type of threshold because 35.9% of $PM_{2.5}$ releases are from stacks that are less than 30m in height (see Figure 1).

The results indicate that a trigger one, report all threshold is not the best type of threshold to meet the goals of increasing stack reporting while minimizing the increase in reporting burden. Meeting the targets with this type of threshold is particularly challenging for the smaller PM fractions (PM_{10} and $PM_{2.5}$), likely because these are released in smaller quantities relative to the other CACs ($PM_{2.5}$ releases make up only 1.8% of the total releases of all CACs and PM_{10} releases make up 2.8% of total releases of all CACs compared to SO_2, for example, which makes up 36.5% of total releases).

In addition to the results of this analysis, previous[15] and recent stakeholder input indicates that a trigger one, report all approach would significantly increase reporting burden on industry and, in many cases, require reporting of very small quantities of releases, without necessarily resulting in significant overall emissions reporting.

3.4 Determining Quantitative Thresholds

Of the scenarios that were evaluated to determine the best type of stack thresholds, the ones with the most promising results were those that reduced the stack height threshold and increased the stack air release thresholds for all seven CACs by a set amount per scenario (either 5, 10 or 20 times the current thresholds) (Scenarios 14-28). However, a stack air release threshold for each CAC could be selected independently of the other substances, in order to maximize release coverage (particularly for NO_2, SO_2, $PM_{2.5}$ and CO), while minimizing the increase in reporting burden.

In order to determine the best stack height and stack air release thresholds for each CAC, the detailed US and Alberta stack data were used to determine the stack and release coverage rates and the number of stack-substance reports for four stack height thresholds (10m, 15m, 20m, 25m) and 31 stack air release thresholds, ranging from 0.15 tonnes to 300 tonnes for each CAC. The stack and release coverage and extrapolated number of stack-substance reports for these stack heights and stack air release thresholds are presented in Table 42 through Table 48 in Appendix 2.

[15] See *Environment Canada Response to the First Report and Final Recommendations of the NPRI Multi-stakeholder Work Group on Substances (2001-2002)* (January 2002), available on request at ec.inrp-npri.ec@canada.ca.

Note that based on the analysis, there does not appear to be a way to meet the 80% release coverage target for VOCs, even at the lowest stack height threshold (10m) and the lowest stack air release threshold (0.15 tonnes) (Table 48).

3.4.1 25m Stack Height Threshold

If a stack height threshold of 25m were chosen, it would not be possible to meet the release coverage targets for NO_2, $PM_{2.5}$, PM_{10}, CO and VOCs. Table 11 shows that even if the lowest evaluated stack air release thresholds are selected for NO_2, $PM_{2.5}$, PM_{10}, CO and VOCs, including thresholds that go below current thresholds, it is not possible to meet the release coverage target. Cells shaded in red in Table 11 indicate where targets are not met. Based on these results, a 25m stack height threshold is too high to achieve the desired release coverage of 80% or more for five of the seven CACs, eliminating it from consideration as a proposed change to NPRI reporting requirements.

Table 11. Stack and release coverage and stack-substance reports for a 25m stack height threshold with low stack air release thresholds

	NO_2	SO_2	$PM_{2.5}$	PM_{10}	TPM	CO	VOCs
New stack air release thresholds (tonnes)	0.15	5	0.15	0.15	5	0.15	0.15
Stack coverage (%)	17.6	5.6	10.9	12.2	4.5	16.8	10.5
Release coverage (%)	79.6	97.8	68.5	69.7	84.5	76.9	29.4
Extrapolated number of stack-substance reports	2 020	724	1 883	2 074	1 101	2 257	3 396
TOTAL number of stack-substance reports	**13455**						
Current NPRI stack air release thresholds (tonnes)	5	5	0.15	0.25	5	5	5
Current stack coverage (%)	5.2	3.7	3.9	3.9	2.1	4.5	1.5
Current release coverage (%)	67.4	93.0	48.6	51.6	54.9	55.4	12.6
Stack-substance reports (NPRI 2016)	597	470	672	663	502	600	475

3.4.2 10m-20m Stack Height Thresholds

Table 12 shows the results using the stack air release thresholds that result in the highest release coverage, without going below the current stack air release thresholds. While it is possible to meet the stack and release coverage targets for six of the CACs this way, the number of stack-substance reports for each stack height is well above the target of 8 000.

It is possible to meet the stack coverage, release coverage and stack-substance report targets for six of the seven CACs with a stack height threshold of 10 or 15m and with the stack air release thresholds shown in Table 13. It is possible to meet the three targets for four of the seven CACs with a 20m stack height threshold and the stack air release thresholds shown in Table 13. The 20m threshold does not allow the release coverage target to be met for $PM_{2.5}$, which is a key pollutant for which more information is needed. Therefore, a 20m stack height threshold is not recommended.

Since a 20m threshold does not allow for the release coverage target for $PM_{2.5}$ to be met, this narrows the stack height threshold down to a choice between 10m and 15m. Both stack height thresholds meet the targets for stack coverage, release coverage and stack-substance reports when they are combined with the stack air release thresholds shown in Table 13. The 10m stack height threshold results in slightly higher stack and release coverage rates than the 15m stack height threshold. The main difference between the 10 and 15m stack height thresholds is that a 10m stack height threshold requires almost

double the number of threshold calculations compared to a 15m threshold (14 times the current number of threshold calculations with a 10m threshold vs. eight times the current threshold calculations with a 15m threshold (Table 13).

In conclusion, there is a significant difference in the difference in reporting burden between stack height thresholds of 10m and 15m – a 15m threshold, with the stack air release thresholds shown in Table 13, minimizes the increase in reporting burden without reducing release coverage rates below the 80% target for six of the CACs.

Table 12. Stack coverage, release coverage and stack-substance reports for stack air release thresholds that result in the highest stack coverage while not exceeding the 20% stack coverage target and not going below current stack air release thresholds

Stack height threshold	10m							15m							20m						
Percentage of stacks screened out at the stack height threshold	40.4							67.1							78.4						
Increase in the number of threshold calculations	14.3							7.9							5.2						
Criteria air contaminant	NO_2	SO_2	$PM_{2.5}$	PM_{10}	TPM	CO	VOCs	NO_2	SO_2	$PM_{2.5}$	PM_{10}	TPM	CO	VOCs	NO_2	SO_2	$PM_{2.5}$	PM_{10}	TPM	CO	VOCs
New stack air release thresholds (tonnes)	7.5	5	0.3	0.5	5	5	5	5	5	0.15	0.25	5	5	5	5	5	0.15	0.25	5	5	5
Stack coverage (%)	16.9	7.1	19.8	19.9	7.1	17.4	8.2	15.3	6.6	18.1	18.2	6.4	13.0	5.4	12.9	6.1	14.0	14.1	5.7	10.8	3.9
Release coverage (%)	90.6	99.3	89.5	89.4	94.1	91.1	58.2	85.1	99.0	81.0	81.2	91.8	85.7	41.2	82.3	98.6	74.3	75.1	89.2	81.9	32.2
Extrapolated number of stack-substance reports	1 945	915	3 431	3 392	1 717	2 328	2 646	1 763	846	3 142	3 096	1 541	1 743	1 744	1 479	786	2 421	2 399	1 383	1 454	1 273
Total number of stack-substance reports	**16374**							**13875**							**11196**						
Current NPRI stack air release thresholds (tonnes)	5	5	0.15	0.25	5	5	5	5	5	0.15	0.25	5	5	5	5	5	0.15	0.25	5	5	5
Current stack coverage (%)	5.2	3.7	3.9	3.9	2.1	4.5	1.5	5.2	3.7	3.9	3.9	2.1	4.5	1.5	5.2	3.7	3.9	3.9	2.1	4.5	1.5
Current release coverage (%)	67.4	93.0	48.6	51.6	54.9	55.4	12.6	67.4	93.0	48.6	51.6	54.9	55.4	12.6	67.4	93.0	48.6	51.6	54.9	55.4	12.6
Stack-substance reports (NPRI 2016)	597	470	672	663	502	600	475	597	470	672	663	502	600	475	597	470	672	663	502	600	475

Table 13. Stack coverage, release coverage and stack-substance reports for stack air release thresholds that maximize the increase in information reported while minimizing the increase in reporting burden

Stack height threshold	10m							15m							20m						
Percentage of stacks screened out at the stack height threshold	40.4							67.1							78.4						
Increase in the number of threshold calculations	14.3							7.9							5.2						
Criteria air contaminant	NO_2	SO_2	$PM_{2.5}$	PM_{10}	TPM	CO	VOCs	NO_2	SO_2	$PM_{2.5}$	PM_{10}	TPM	CO	VOCs	NO_2	SO_2	$PM_{2.5}$	PM_{10}	TPM	CO	VOCs
New stack air release thresholds (tonnes)	10	50	0.75	3	50	10	50	15	100	0.25	0.75	100	15	25	5	50	0.15	1	50	10	25
Stack coverage (%)	14.7	3.3	12.7	7.2	1.6	12.4	0.8	9.6	2.6	15.4	12.2	1.2	7.8	1.4	12.9	3.2	14.0	8.8	1.5	8.2	1.1
Release coverage (%)	90.0	98.0	87.0	82.0	84.2	89.6	28.6	83.6	97.0	80.6	80.0	80.2	83.7	29.1	82.3	97.6	74.3	73.8	80.9	81.2	23.5
Extrapolated number of stack-substance reports	1 688	428	2 209	1 231	396	1 663	270	1 108	333	2 675	2 078	299	1 047	456	1 479	408	2 421	1 500	361	1 105	364
Total number of stack-substance reports	**7886**							**7997**							**7639**						
Current NPRI stack air release thresholds (tonnes)	5	5	0.15	0.25	5	5	5	5	5	0.15	0.25	5	5	5	5	5	0.15	0.25	5	5	5
Current stack coverage (%)	5.2	3.7	3.9	3.9	2.1	4.5	1.5	5.2	3.7	3.9	3.9	2.1	4.5	1.5	5.2	3.7	3.9	3.9	2.1	4.5	1.5
Current release coverage (%)	67.4	93.0	48.6	51.6	54.9	55.4	12.6	67.4	93.0	48.6	51.6	54.9	55.4	12.6	67.4	93.0	48.6	51.6	54.9	55.4	12.6
Stack-substance reports (NPRI 2016)	597	470	672	663	502	600	475	597	470	672	663	502	600	475	597	470	672	663	502	600	475

3.5 Uncertainty

Using data from the US and Alberta to predict what will happen across Canada if NPRI stack reporting requirements are changed cannot be done with complete certainty, since conditions will vary between the two countries and between the provinces. However, in the absence of comprehensive stack data for Canada, the US and Alberta data were the best available data for this analysis. It was not possible to complete a quantitative uncertainty analysis. Some of the key areas of uncertainty include:

- An unknown number of the stacks in the data sets are at facilities that may not be required to report to the NPRI based on the employee threshold, exemptions for items (e.g., articles) and activities (e.g., retail sale of fuels), and the facility-wide air release thresholds:
    - Some sources of CACs are not required to be reported to the NPRI depending on the number of employees and the nature of activities at a facility;
    - The NEI reporting threshold is for potential releases, not actual releases;
    - The threshold for the 2008 AB IAES was 10 tonnes of releases to air; and
    - The NEI and IAES do not have any exemptions, exclusions or other types of thresholds like those of the NPRI that would affect whether or not a facility, stack or source is required to report.
- The NEI and AEIS thresholds may have excluded an unknown number of stacks from being required to report that would have otherwise been required to report to the NPRI (e.g., the NPRI release threshold for $PM_{2.5}$ is 0.3 tonnes, but the 100-ton trigger one, report all threshold of the NEI would exclude facilities that are only releasing $PM_{2.5}$ in quantities less than 100 tons). Therefore, some facilities that would be subject to the NPRI requirements may not be reflected in the analysis of US and AB data.
- The TPM data used in the analysis were for Alberta stacks only, since TPM data are not required to be reported to the NEI. There are key differences in the profile of industrial sectors that report to the NPRI and the sectors that reported to the 2008 AB IAES (Figure 2) and the contribution of various industrial sectors to total TPM releases between facilities that report to the NPRI and facilities that reported to the 2008 AB IAES (Figure 3).
- There are key differences in the contribution of various industrial sectors to total releases of all the other CACs between facilities that report to the NPRI and facilities that reported to the 2008 AB IAES and to the 2014 NEI. For example, almost 75% of SO_2 releases and almost 30% of CO releases in the combined US and Alberta data set are from utilities, compared to only 16% of SO_2 releases and 7% of CO releases reported by stacks to the NPRI (Figure 3). Extrapolated numbers of stack-substance reports may therefore be less reliable for some substances and some sectors.
- The data sets used in the analysis are from three different calendar years: 2016 for NPRI data, 2014 for US data and 2008 for Alberta data. The analysis was done with the most recent reviewed data available for each program, but using data from different years may introduce additional uncertainty into the analysis. For example, releases of five key air pollutants [sulphur oxides (SOx), NOx, VOCs, CO and $PM_{2.5}$] have been gradually declining in Canada since 1990.[16] The continued decrease in releases since 2008 is not reflected in the current analysis. Similarly, in the US, releases of SOx and NOx have been decreasing since 1990[17] and the continued decrease since 2014 also is not reflected in the current analysis.

[16] For more information, see Canadian Environmental Sustainability Indicators: Air pollutant emissions.
[17] For more information, see the US Air Pollutant Emissions Trends Data.

4. Analysis of Combustion and Non-Combustion Sources

4.1 Data Sources

In order to determine the NPRI release categories that would need to be broken down into combustion and non-combustion sources and to determine the possible impacts of such a change to reporting requirements, an analysis was performed on 2014 US NEI data. These data were used since detailed process level is not available Canada-wide. US EPA SCCs were used to identify the processes in the NEI data. NPRI CAC release data for were also used, for comparison to the US data set.

4.1.1 US National Emissions Inventory

2014 Version 1 National Emissions Inventory (2014NEIv1) data in the 2014 Version 7.0 Platform (2014v7.0 platform) prepared for AQ modelling were used in the analysis for the following CACs[18]:

- NOx,
- SO_2,
- filterable $PM_{2.5}$,
- filterable PM_{10},
- CO, and
- VOCs.

The point source data from three 2014v7.0 platform data sets[19, 20, 21] were used:

- ptegu: 2014NEIv1 point source data for EGUs[22]
- pt_oilgas: 2014NEIv1 point sources for facilities in the oil and gas sector[23]
- ptnonipm: All 2014NEIv1 point sources not matched to the ptegu or pt_oilgas sectors, except for offshore point sources.[24]

The three data files were combined and the annual release values were converted from tons to tonnes. The data files contained data for 405 321 release points at 77 703 facilities for 564 658 processes.[25]

[18] The data sets did not include TPM data, since TPM is not an NEI reportable substance. The data sets include condensable PM as well as filterable PM, but only the filterable PM data was used in the analysis, since only filterable PM is required to be reported to the NPRI.

[19] For more information on the data files, see the Technical Support Document (TSD) Preparation of Emissions Inventories for the Version 7.1, 2014 Emissions Modeling Platform for the National Air Toxic Assessment and the Sparse Matrix Operator Kernel (SMOKE) Modeling System v3.7 User's Manual.

[20] The 2014v7.0 platform downloadable data set also includes data for other sources that were not used in the analysis, for example, natural sources (emission from vegetation and land); releases from agricultural fires; non-point releases from oil and gas facilities; road dust from paved and unpaved roads, including unpaved roads at facilities; emissions from on-road and non-road vehicles; and residential fuel combustion.

[21] The 2014v7.0 platform downloadable point source data set does not include road dust. The 2014v7.1 platform downloadable non-point source data set contains a file with data for area fugitive dust, which includes dust from paved and unpaved roads, which was not used in the analysis, since these road dust emissions are not available at the facility level.

[22] File name: ptegu_2014NEIv1_final_POINT_02nov2016_v0.csv.

[23] File name: pt_oilgas_2014NEIv1_final_POINT_03nov2016_v3.csv.

[24] File name: ptnonipm_2014NEIv1_final_POINT_commentfix_07mar2017_v0.csv.

[25] The data are available on request at ec.inrp-npri.ec@canada.ca.

4.1.2 Source Classification Codes

The US EPA SCC bulk download list[26] was used in conjunction with the process-level data by SCC in the NEI data sets. The list includes 13 536[27] individual codes, classified into six categories of sources: biogenic, event, non-point, non-road, on-road and point.

4.1.3 NPRI Data

The September 14, 2017 version of NPRI data were used for the analysis, in two formats (2016 single year tabular data and 2009-2016 NPRI Access database) for 5 867 facilities submitting 15 003 substance reports were used for the following CACs:

- NO_2,
- SO_2,
- $PM_{2.5}$,
- PM_{10},
- CO, and
- VOCs

4.1.4 Comparison of US and NPRI Industrial Sectors

There are some key similarities and differences between sectors reporting releases of CACs in the US and Canada. The breakdown of facilities by industrial sector (2-digit NAICS code) is shown for NPRI and the US in Figure 11 and Table 49 in Appendix 3. The majority of facilities reporting one or more CACs to the NPRI are in the mining, quarrying and oil and gas extraction sector [54.2% (over 90% of which are oil and gas extraction facilities)], compared to 13.4% of facilities in the US. In the US, more facilities reporting to the NEI are in the utilities (9%) and manufacturing (38.8%) sectors compared to NPRI facilities (5.5% and 28.6%, respectively). Facilities in the "all other sectors" group in Figure 11 make up 11.6% of NPRI facilities, but 38.8% of US facilities. The sectors contributing the largest proportion to the all other sectors group in the US include other services (except public administration), transportation and warehousing, and wholesale trade (see Table 49 in Appendix 3).

Figure 11 shows the *number of facilities* by sector. Figure 12 and Table 50 in Appendix 3 show the *releases* from NPRI and US facilities by sector as a percentage of total releases of each CAC. This shows that the correspondence between the two data sets can vary widely depending on the CAC.

Figure 12 shows that the majority of NO_2 releases from US facilities (55.1%) come from utilities, but the majority of NO_2 releases from NPRI facilities come from mining, quarrying and oil and gas extraction facilities and NPRI stacks [47.5% (84.3% of which is from oil and gas extraction facilities)]. Over 78% of US SO_2 releases come from utilities, compared to 26% from NPRI facilities. The majority of NPRI SO_2 releases are from facilities in the manufacturing sector. The majority of $PM_{2.5}$, PM_{10}, CO and VOCs releases in the US are from facilities in the manufacturing sector. This is true for Canadian facilities for $PM_{2.5}$, CO and VOCs. However, the majority of PM_{10} emissions from NPRI facilities come from facilities in the mining, quarrying and oil and gas extraction sector.

[26] Downloaded on July 24, 2018.

[27] Two placeholder SCCs were removed from the US EPA list used in the analysis (79900101 and 2999001001).

Figure 11. Facilities reporting one or more criteria air contaminants by sector, Canada and US

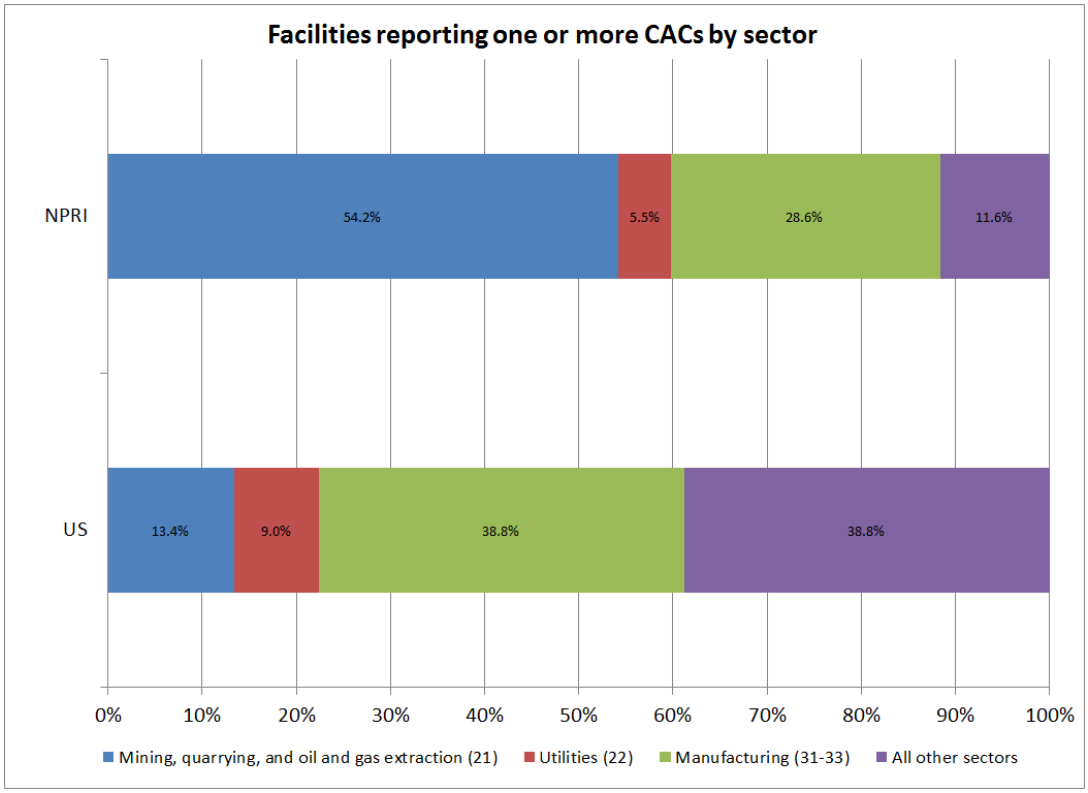
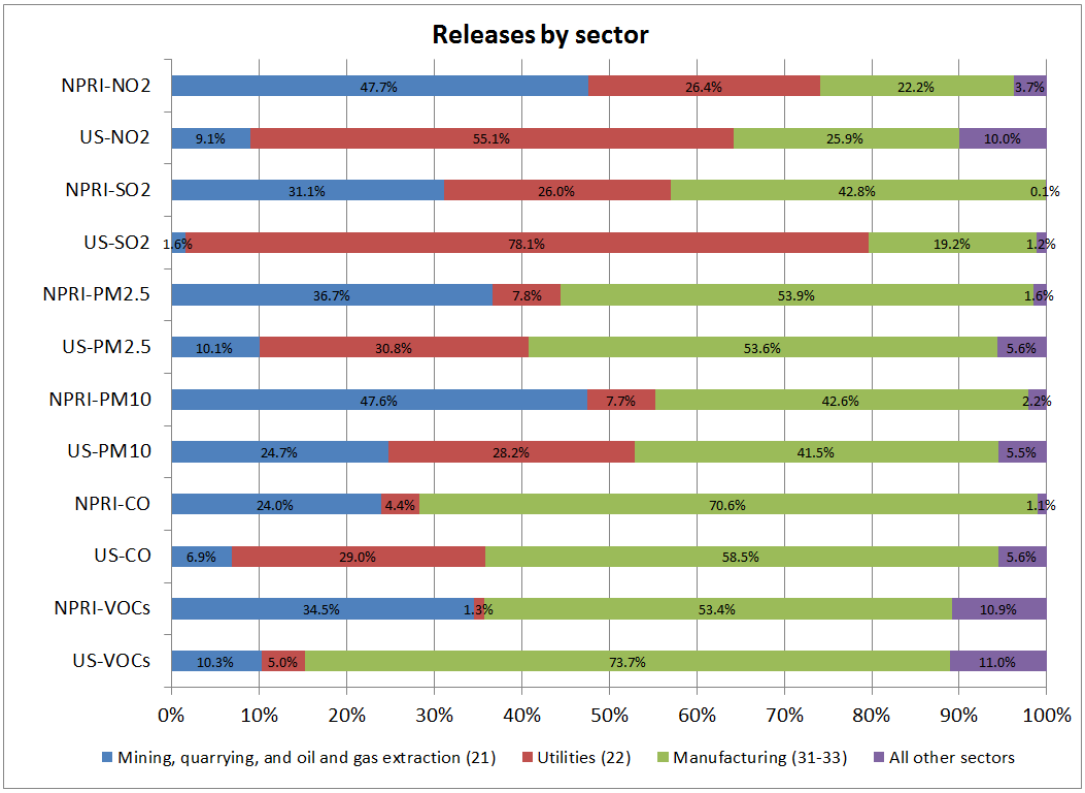


Figure 12. Releases from NPRI and US points by criteria air contaminant and by sector



4.2 Determining Reportable Sources, Combustion Sources and Release Categories

4.2.1 Determining Sources and Activities Required to Report to NPRI

The US NEI data sets contain releases from sources and activities that would not be required to report to the NPRI, for example, certain agriculture and construction activities. These non-reportable sources needed to be removed from the NEI data set in order to better evaluate which NPRI release categories would need to be broken down into combustion and non-combustion sources, and to determine the possible impacts of such a change to reporting requirements. In order to remove the non-reportable sources, each SCC was evaluated to determine whether it represents a reportable activity or a non-reportable activity.[28]

There are six general categories of SCCs (Table 14). Some of these categories were easily classified as representing non-reportable sources:

- **Biogenic sources**: natural sources of emissions from vegetation, for example, forests, vegetation and agricultural land. None of the biogenic SCCs were classified as reportable.
- **Event sources**: wildfires and prescribed burns. None of the event SCCs were classified as reportable.
- **Non-road sources**: off-road mobile sources that use gasoline, diesel, and other fuels. These source types include construction equipment, and lawn and garden equipment. None of the non-road SCCs were classified as reportable.
- **On-road sources**: on-road vehicles that use gasoline, diesel, and other fuels. On-road vehicles include light duty and heavy duty vehicles operating on roads, highway ramps, and during idling. None of the on-road SCCs were classified as reportable.

Table 14. Source classification code categories

Source category	Number of SCCs	Classified as reportable to NPRI	Classified as not reportable to the NPRI
Biogenic	80	0	80
Event	75	0	75
Non-point	2 355	1 481	874
Non-road	571	0	571
On-road	1 221	0	1 221
Point	9 234	8 792	442
Total	**13 536**	**10 273**	**3 263**

The SCCs in the remaining two general categories represent some activities that would be reportable to NPRI and some that would not:

- **Point sources**: sources (usually large) that are located at a fixed, stationary location. Point sources in the NEI include large industrial facilities and electric power plants, airports, and smaller industrial, non-industrial and commercial facilities. Of the 9 234 point SCCs, 442 were classified as not reportable to the NPRI (Table 14), including:
    - Fuel storage, transportation and marketing (gas stations)
    - Vehicles, mobile industrial equipment (e.g., forklifts), aircraft and marine vessels

[28] The list is available on request at ec.inrp-npri.ec@canada.ca.

    - Agricultural activities (e.g., beef cattle feedlots)
    - Oil and gas exploration and drilling, up to and including well completion
    - Open burning and residential incineration
    - Laboratories
- **Non-point sources**: sources that, individually, are too small in magnitude to report as point sources. Examples include residential heating, asphalt paving and commercial and consumer solvent use. Of the 2 355 non-point SCCs, 874 were classified as not reportable to the NPRI, including:
    - Residential fuel combustion
    - Vehicles, railroad equipment, aircraft and marine vessels
    - Oil and gas exploration and drilling, up to and including well completion
    - Construction[29]
    - Household and personal care product usage
    - Surface coating (painting traffic markings on roads)
    - Pesticide application
    - Fuel storage and marketing
    - Automotive repair shops
    - Chemical and bulk material transportation
    - Open, managed and prescribed burning
    - Agricultural production (crops and livestock)
    - Wild animal waste emissions
    - Laboratories

After the SCCs were categorized as reportable and not reportable to the NPRI, the non-reportable sources were excluded from the NEI data, leaving data from 52 591 facilities for 367 984 release points from 473 597 processes for use in the analysis. Table 15 shows the total releases of CACs that were contained in the NEI data sets broken down by reportable and non-reportable sources (Table 51 in Appendix 3 also shows the releases, separated by release category). Only the reportable releases were used in the analysis, meaning that over 90% of NO_2, SO_2, $PM_{2.5}$, PM_{10} and VOCs releases and almost 85% of CO releases from the NEI data sets were used in the analysis.

Table 15. Releases of criteria air contaminants from US facilities

	Releases (tonnes)			Releases as a percentage of total releases	
	Not reportable	**Reportable**	**Total**	**Not reportable**	**Reportable**
NO_2	198 127	2 943 534	3 141 661	6.3	93.7
SO_2	16 469	3 815 708	3 832 177	0.4	99.6
$PM_{2.5}$	7 445	227 325	234 770	3.2	96.8
PM_{10}	30 259	451 302	481 561	6.3	93.7
CO	422 718	2 324 880	2 747 598	15.4	84.6
VOCs	74 595	837 522	912 117	8.2	91.8

[29] Construction activities at existing facilities are required to be reported to the NPRI. However, it was not possible to separate construction SCCs into those at existing facilities and all other types of construction (e.g., new industrial, commercial and institutional construction), so all SCCs representing construction activities were classified as not being required to report to NPRI for the purposes of this analysis.

4.2.2 Determining the NPRI Release Categories for Sources and Activities

Releases to air must be reported to NPRI separately in the following release categories:

- **Stack or point releases**: releases from stack or point sources including stacks, vents, ducts, pipes or other confined process streams. Releases to air from pollution control equipment generally fall into this category.
- **Storage or handling releases**: releases to air from storage or handling of materials.
- **Fugitive releases**: releases that cannot be captured and releases that are unintentional, including
    - fugitive equipment leaks from valves, pump seals, flanges, compressors, sampling connections, open-ended lines, etc.
    - evaporative losses from surface impoundments and spills
    - releases from building ventilation systems
    - any other fugitive or non-point air emissions from land treatment, tailings, waste rock, storage piles, etc.
- **Spills**: accidental releases to air.
- **Road dust**: PM releases from road dust from unpaved roads at the facility.
- **Other non-point releases**: any other non-point releases to air that are not captured in the categories above.

In order to better evaluate which NPRI release categories would need to be broken down into combustion and non-combustion sources using the US data, each SCC was assigned a release category code (Table 16).[30] In addition to the six NPRI release categories, codes were also assigned for common sources and activities that are not reportable to the NPRI, for use in evaluating other suggested changes to reporting requirements that are not covered in this proposal (Table 16).

Once the SCCs with assigned release categories were combined with the NEI data, the release category was revised to stack or point releases for all release points where a stack height was indicated (e.g., fugitive releases that are collected and released from a stack or point would be required to be reported to the NPRI as stack or point releases).

Table 17 shows the percentage of releases of CACs from US facilities that would be reportable to the NPRI under four of the six NPRI release categories. No NEI data for spills were reported by facilities, and NEI data for road dust is not available at the facility level, so Table 17 only shows stack or point, storage or handling, fugitive and other non-point releases. Table 18 shows releases from NPRI facilities by release category as a percentage of total releases of that CAC. For more detailed results, see Table 51 in Appendix 3, which shows the releases of CACs from US facilities for all 18 release categories established for this analysis, for reportable and non-reportable sources.

Well over 90% of releases of NO_2, SO_2 and CO from US and Canadian facilities are stack or point releases. Only small quantities of releases of these three CACs are reported under the remaining release categories. The majority of $PM_{2.5}$ and PM_{10} releases from Canadian and US facilities are in the stack or point releases category, but the fugitive releases category also makes up a significant portion of total releases of these two CACs. The majority of VOC releases reported by Canadian and US facilities are in the stack or point releases category, but storage or handling and fugitive releases also make up a significant portion of total VOC releases.

[30] The list is available on request at ec.inrp-npri.ec@canada.ca.

Overall, the results in Table 17 and Table 18 indicate that concentrating efforts on breaking down stack or point releases into combustion or non-combustion sources would provide the most valuable results, while minimizing the increase in reporting burden. Data on how much combustion and non-combustion sources contribute to each release category are presented in the following section, which also help to support this conclusion.

Table 16. Release categories for source classification codes

	Release category code	Release category	Number of SCCs
Reportable to NPRI	1	Stack or point releases	4 047
	2	Storage or handling releases	1 944
	3	Fugitive releases	3 975
	4	Spills	3
	5	Other non-point releases	603
	6	Road dust from unpaved roads	1
Not reportable to NPRI	7	Vehicles [exhaust, break wear, tire wear. Excludes refueling and filling (see code 14)]	1 907
	8	Agriculture [except agricultural burning (see code 17)]	212
	9	Natural, biogenic and geogenic sources	81
	10	Oil and gas exploration and drilling (up to and including well completion)	19
	11	Road dust from paved roads	3
	12	Construction and demolition	48
	13	Fuel storage [non-reportable fuel storage at facilities that are otherwise required to report. Does not include fuel storage at gas stations (see code 14) or at terminals and bulk plants (see code 2)]	166
	14	Fuel transportation and marketing [including refueling and filling, except at terminals and bulk plants (see code 2)]	60
	15	Residential fuel combustion	40
	16	Transport of chemicals and bulk materials	215
	17	Open burning, forest fires, prescribed burning, agricultural burning, open burning dump	127
	18	All other non-reportable activities (e.g., laboratories, automotive repair shops, cigarette smoke, consumer product use, apartment incinerators)	85
Total			**13 536**

Note: the SCC for road dust from unpaved roads is not specific to roads at facilities; it is used for area sources of unpaved road dust.

Table 17. Releases from US facilities as a percentage of total releases by release category

	Stack or point	Storage or handling	Fugitive	Other non-point
NO_2	99.5	0.1	0.2	0.3
SO_2	99.8	0.0	0.1	0.1
$PM_{2.5}$	83.5	3.2	9.1	4.2
PM_{10}	66.7	6.8	22.4	4.1
CO	98.7	0.5	0.4	0.4
VOCs	64.3	5.8	20.6	9.3

Table 18. Releases from NPRI facilities as a percentage of total releases by release category

	Stack or point	Storage or handling	Fugitive	Spills	Other non-point
NO_2	98.3	0.0	0.7	0.0	1.0
SO_2	99.5	0.0	0.5	0.0	0.0
$PM_{2.5}$	75.6	2.0	21.5	0.0	0.9
PM_{10}	56.9	4.2	37.7	0.1	1.2
CO	97.3	0.0	2.2	0.0	0.5
VOCs	43.0	22.9	31.6	0.0	2.5

4.2.3 Dividing Sources into Combustion and Non-Combustion

In order to determine the relative contribution of combustion and non-combustion sources to total emissions, the SCCs were divided into two categories. This was accomplished by evaluating each SCC and classifying it as a combustion source or as a non-combustion source,[31] using process flowcharts and descriptions from the US EPA AP-42: Compilation of Air Emissions Factors.

SCCs use a hierarchical system in which level 1 is the least specific and level 4 is the most specific. The first level uses only the first digit for point sources and the first two digits for non-point sources, and provides general information on the category of the emissions. Table 19 shows the level 1 SCCs as they were divided into combustion and non-combustion sources, and provides examples of the types of combustion sources.

The SCCs with assigned values for combustion and non-combustion were then combined with the NEI data, to separate the US data into combustion and non-combustion sources. Table 20 shows total CAC releases for all reportable release categories from US facilities separately by combustion and non-combustion sources as a percentage of total releases. Over 90% of NO_2 and SO_2 releases are associated with combustion sources. The majority of $PM_{2.5}$ releases are from combustion sources (52.5%) whereas the majority of PM_{10} releases are from non-combustion sources (58.9%). The majority of CO releases (65.3%) are from combustion sources. Only 18.6% of VOCs releases are from combustion sources, compared to 81.4% from non-combustion sources.

Table 21 shows stack or point releases from US facilities separately by combustion and non-combustion sources as a percentage of total releases. Combustion and non-combustion sources both make significant contributions to stack or point releases for all CACs. In the absence of having this type of breakdown reported to the NPRI, data users are required to approximate the relative quantities of releases of the two types of sources.

Over 99% of fugitive releases of SO_2, $PM_{2.5}$, PM_{10} and VOCs releases are from non-combustion sources (Table 22). Over 5% of NO_2 and CO fugitive releases are from combustion sources, however, which indicate that it might be useful to collect data on releases of these two substances separately by source (combustion and non-combustion). The value of having data for fugitive releases of all CACs broken down by source must be balanced by the additional reporting burden, since this would be targeting less than 1% of total emissions for most of the CACs. Although fugitive emissions could be required to be broken down by source for only NO_2 and CO, this would increase the complexity of NPRI reporting requirements.

[31] The list is available on request at ec.inrp-npri.ec@canada.ca.

Table 19. Level 1 source classification codes divided into combustion and non-combustion sources

Level 1 SCC	Level 1 name	Number of SCCs	Classified as non-combustion sources	Classified as combustion sources	Examples of combustion sources
1	External combustion	242	0	242	Electricity generation, industrial boilers
2	Internal combustion engines	234	54	180	Electricity generation, industrial, commercial and institutional boilers, engine testing, vehicles, aircraft, marine vessels (excludes fuel storage and delivery and emissions from wastewater generated by combustion processes)
3	Industrial processes (point)	5 604	4 824	780	In-process fuel use, fuel-fired equipment, kilns, furnaces, incinerators, flares, dryers
4	Chemical, petroleum and solvent evaporation	1 597	1 581	16	Fuel-fired equipment, incinerators, flares
5	Waste disposal	811	313	498	Incineration, open burning, landfill gas destruction (with or without energy recovery)
6	Maximum achievable control technology [32] source categories	726	721	5	Antimony oxides manufacturing roasting and burn off
21	Stationary source fuel combustion	109	0	109	Electric utility, industrial, commercial, institutional and residential fuel combustion
22	Mobile sources	1 871	51	1 820	Vehicles, aircraft, marine vessels, railroad equipment (excludes refueling and “unknown”)
23	Industrial processes (non-point)	303	229	74	Flares, engines, charbroiling, construction vehicles, in-process fuel use
24	Solvent utilization	1 061	1 061	0	
25	Storage and transport	489	489	0	
26	Waste disposal, treatment, and recovery	76	43	33	Incineration, open burning
27	Natural sources	82	82	0	
28	Miscellaneous area sources	327	159	168	Wildfires, prescribed and managed burning, orchard heaters, cremation
32	Industrial processes (non-point)	1	0	1	Hydraulic fracturing engines
33	Liquefied petroleum gas distribution	1	1	0	
44	Brick kilns	1	0	1	Non-point brick kilns
55	Domestic ammonia	1	1	0	
Total		**13 536**	**9 609**	**3 927**	

[32] Maximum achievable control technology (MACT) standards are set by the US EPA to regulate hazardous air pollutant emissions.

Table 20. Criteria air contaminant releases from US facilities, combustion and non-combustion sources, all reportable release categories

	Combustion	Non-combustion
NO_2	92.0	8.0
SO_2	92.9	7.1
$PM_{2.5}$	52.5	47.5
PM_{10}	41.1	58.9
CO	65.3	34.7
VOCs	18.6	81.4

Table 21. Criteria air contaminant releases from US facilities, combustion and non-combustion sources, stack or point releases

	Combustion	Non-combustion
NO_2	92.4	7.6
SO_2	93.2	6.8
$PM_{2.5}$	62.8	37.2
PM_{10}	61.6	38.4
CO	66.2	33.8
VOCs	28.8	71.2

Table 22. Criteria air contaminant releases from US facilities, combustion and non-combustion sources, storage or handling, fugitive and other sources

	Storage or handling		Fugitive		Other	
	Combustion	Non-combustion	Combustion	Non-combustion	Combustion	Non-combustion
NO_2	0	100	5.1	95.0	0	100
SO_2	0	100	0.6	99.3	0	100
$PM_{2.5}$	0	100	0.7	99.3	0	100
PM_{10}	0	100	0.2	99.8	0	100
CO	0	100	5.6	94.4	0	100
VOCs	0	100	0.2	99.8	0	100

The results in Table 22 show that all storage or handling and other non-point releases are from non-combustion sources, indicating that a breakdown of combustion and non-combustion sources is not needed for these two release categories. NEI data for road dust releases from unpaved roads at facilities are not available; however, it can be assumed that all road dust releases are also from non-combustion sources.

If the requirement to report stack or point releases separately by combustion and non-combustion sources is implemented, some facilities would continue to only be required to report one quantity, either for combustion sources or non-combustion sources, meaning there would be no increase in reporting burden for these facilities. Some facilities would be required to report two quantities for stack or point releases, one for combustion sources and one for non-combustion sources. Less than 10% of US facilities would be required to report for combustion and non-combustion sources of NO_2, SO_2 and CO stack or point releases (Table 23), meaning that there would be no increase in reporting burden for over 90% of facilities releasing these three CACs. Eighteen percent of facilities reporting stack or point releases of $PM_{2.5}$ and 18.5% of facilities reporting stack or point releases of PM_{10} would be required to report for combustion and non-combustion sources. The largest increase in reporting burden would be

for facilities reporting VOCs – 28.5% of facilities would be required to report combustion and non-combustion sources of stack or point releases.

Table 23. US facilities reporting releases from combustion and non-combustion sources

	NO_2	SO_2	$PM_{2.5}$	PM_{10}	CO	VOCs
Number of facilities that would have to report combustion **and** non-combustion quantities, as a percentage of all facilities releasing the substance in all categories	8.1	7.1	18.0	18.5	8.1	28.5
Number of facilities that would have to report combustion **or** non-combustion quantities as a percentage of all facilities releasing the substance in all categories	91.9	92.9	82.0	81.5	91.9	71.5

4.3 Uncertainty

As mentioned previously, using data from the US to predict what will happen in Canada if NPRI reporting requirements are changed carries a certain amount of uncertainty, since conditions vary between the two countries (e.g., types of sectors, processes used). However, in the absence of comprehensive process level data for Canada, the US data was the best available data that could be used for the analyses described in this proposal. Some of the key areas of uncertainty include:

- An unknown number of the NEI release points are at facilities that may not be required to report to the NPRI based on the employee threshold, exemptions for items and activities, and the facility-wide air release thresholds:
    - Some sources of CACs are not required to be reported to the NPRI depending on the number of employees and the nature of activities at a facility;
    - The NEI reporting threshold is for potential releases, not actual releases; and
    - The NEI does not have any exemptions, exclusions or other types of thresholds like those of the NPRI that would affect whether or not a facility or a release point is required to report.
- The NEI thresholds may have excluded an unknown number of facilities from being required to report that would have otherwise been required to report to the NPRI, meaning that some facilities that would be subject to the NPRI requirements may not be reflected in the analysis of US data.
- There are key differences in the contribution of various industrial sectors to total releases CACs between facilities that report to the NPRI and facilities that reported to the NEI (Figure 11).
- The data sets used in the analysis are from two different calendar years: 2016 for NPRI data and 2014 for US data. The analysis was done with the most recent reviewed data available for each program, but using data from different years may introduce additional uncertainty into the analysis.
- Road dust releases are included in the NEI as an area source and are not available at the facility level. Road dust releases reported to the NPRI were therefore not included in the analysis. This allows comparison of Canadian and US data sources, but affects the overall contribution of the release categories to total CAC releases shown in Table 18.
- TPM data are not included in the NEI data sets since TPM is not a substance that is reportable to the NEI. It is unknown what impact proposed changes to reporting requirements would have on facilities reporting TPM.

5. Proposed Changes to NPRI Reporting Requirements

5.1 Proposed Changes to Reporting Requirements for Stacks

5.1.1 Proposed Changes and Rationale

Based on the recommendations received and analysis of detailed stack information from Alberta and the US, ECCC is proposing to make three changes to the reporting requirements for stacks, beginning with the 2020 reporting year:

1. Reduce the current 50m stack height threshold for reporting CACs (Part 4 substances) and speciated VOCs (Part 5 substances) from individual stacks to 15m above grade.
2. Increase the current stack air release thresholds to the proposed thresholds shown in Table 24.
3. Require a basis of estimate to be reported for each stack-substance report.

Table 24. Current and proposed stack air release thresholds

Criteria air contaminant	Current stack air release threshold (tonnes)	Proposed stack air release thresholds (tonnes)
NO_2	5	**15**
SO_2	5	**100**
$PM_{2.5}$	0.15	**0.25**
PM_{10}	0.25	**0.75**
TPM	5	**100**
CO	5	**15**
VOCs	5	**25**

Note that no changes are proposed to the facility-wide air release thresholds for CACs (see Table 1). The current and proposed reporting requirements are shown in flowcharts in Appendix 4 (Figure 13 and Figure 14).

A 15m stack height threshold with the proposed stack air release thresholds shown in Table 24 would allow for the targets for stack and release coverage (20% or less and 80% or more, respectively) and stack-substance reports (less than 8 000) to be met for all CACs except VOCs. The 15m threshold would minimize the increase in reporting burden as compared to a lower (10m) stack height threshold (see Table 13). A higher stack height threshold (20m or more) combined with the stack air release thresholds shown in Table 13 would result in a smaller increase in reporting burden than a 15m threshold; however, the release coverage targets would not be met for $PM_{2.5}$, PM_{10} and VOCs. Data on $PM_{2.5}$ releases from stacks are of particular importance and the release coverage for this substance is therefore a key measure.

The basis of estimate associated with each stack-substance report will provide information on the method used to estimate each reported release quantity, since the method used often varies from one source to another within a facility. This added contextual information will provide data users with a better indication of uncertainty associated with each reported release quantity.

5.1.2 Expected Impact of Proposed Changes

5.1.2.1 Facilities and Sectors

The proposed changes are expected to increase the quantities of CAC releases that are broken down into individual stacks, for all CACs. This would make more information available to the public and provide more data for air quality modelling and compilation of the Black Carbon Inventory.

The proposed changes are expected to result in an overall increase in reporting burden on certain facilities; however, the proposed threshold levels have been selected to minimize this increase. These thresholds were based on the results of the analysis described in Section 3, which used available data from the US, Alberta and NPRI.

ECCC expects that the proposed changes will approximately double the number of stack-substance reports required to be submitted annually as of the 2020 reporting year (see Table 13). With the proposed stack height and stack air release thresholds, there is an increase in the extrapolated number of stack-substance reports for NO_2, $PM_{2.5}$, PM_{10} and CO (Table 13), which indicates an increase in reporting burden. However, the extrapolated number of stack-substance reports *decreases* for SO_2, TPM and VOCs, partially offsetting the increase for other CACs (Table 13).

There are no proposed changes to the employee, activity and facility-wide CAC thresholds, so the changes will not require any additional facilities to start reporting to the NPRI. Those facilities that currently report for one or more CACs may have to start reporting releases from individual stacks or start reporting for more individual stacks. In 2016, 5 867 facilities reported to the NPRI for one or more CACs. Some, but not all, of these facilities are expected to have to start or increase reporting for individual stacks. Table 25 shows the breakdown of these facilities by sector (2-digit NAICS code).

Table 25. Number of facilities that reported one or more criteria air contaminants to the NPRI by sector

NAICS code	Sector	Number of facilities
11	Agriculture, forestry, fishing and hunting	41
21	Mining, quarrying, and oil and gas extraction	3 179
22	Utilities	322
23	Construction	18
31-33	Manufacturing	1 683
41-42	Wholesale trade	143
48-49	Transportation and warehousing	283
51	Information and cultural industries	1
53	Real estate and rental and leasing	3
54	Professional, scientific and technical services	7
56	Administrative and support, waste management and remediation services	110
61	Educational services	23
62	Health care and social assistance	10
72	Accommodation and food services	1
81	Other services (except public administration)	19
91	Public administration	24
Total		**5 867**

ECCC recognizes that the impacts of the proposed changes will be different across the sectors, with facilities in some having a larger increase in reporting burden while facilities in other sectors may have a

small or no increase in reporting burden. Table 26 shows the number of stack-substance reports submitted to NPRI in 2016 by sector and Table 27 shows the extrapolated number of stack-substance reports under the proposed requirements by sector, calculated using ratios developed from the US and Alberta stack data. Table 13 shows that the overall target of no more than doubling the number of stack-substance reports is expected to be met with the proposed changes. Table 27 shows that some sectors will be more impacted than others and that the impacts can vary greatly depending on the CAC. For example, facilities in the manufacturing sector could be required to submit as many as five times the number of stack-$PM_{2.5}$ reports, but only 0.6 times the stack-SO_2 reports. For facilities in the mining, quarrying and oil and gas extraction sector, about six times the stack-$PM_{2.5}$ reports could be required, compared to an increase of only 1.1 times the number of stack-SO_2 reports.

Table 26. Number of NPRI stack-substance reports by sector

NAICS code	Sector	NO_2	SO_2	$PM_{2.5}$	PM_{10}	TPM	CO	VOC
21	Mining, quarrying, and oil and gas extraction	151	155	130	104	177	183	122
22	Utilities	55	53	32	25	53	56	25
31-33	Manufacturing	370	376	302	369	416	415	323
56	Administrative and support, waste management and remediation services	7	6	6	4	7	7	5
61	Educational services	11	7			10	10	
62	Health care and social assistance	3	3				1	
Total		**597**	**600**	**470**	**502**	**663**	**672**	**475**

Table 27. Extrapolated number of stack-substance reports under proposed requirements by sector

NAICS code	Sector	NO_2	SO_2	$PM_{2.5}$	PM_{10}	TPM	CO	VOC
21	Mining, quarrying, and oil and gas extraction	799	166	813	502	86	623	257
22	Utilities	74	44	59	39	53	66	10
31-33	Manufacturing	710	231	1 535	1 495	416	816	481
56	Administrative and support, waste management and remediation services	9	1	13	7		10	4
61	Educational services	14	4				9	
62	Health care and social assistance	2	1				1	
Total		**1 608**	**447**	**2 420**	**2 043**	**555**	**1 525**	**752**

Notes: The extrapolated number of stack-substance reports is calculated based on the number of US and Alberta stacks that would be required to report under proposed requirements divided by the number of US and Alberta stacks that would be required to report under current requirements, multiplied by the number of stack-substance reports submitted to NPRI in 2016 (Table 26) for each specific sector (Equation 3). This differs from the overall ratio used to calculate the extrapolated number of stack-substance reports in Table 12 and Table 13. Because of the different ratios used, the totals in this table are not directly comparable with the totals for the matching proposed requirements in Table 13.

The extrapolated number of stack-substance reports was derived based on the number of stack-substance reports submitted to the NPRI in 2016. For those sectors with no facilities submitting stack-substance reports to the NPRI in 2016, it was therefore not possible to extrapolate the number of stack-substance reports that might be required to be submitted under proposed requirements. Table 28 shows the ratio of the number of stack-substance reports required in the US and Alberta under

proposed requirements to the number required under current requirements, which indicate possible changes in the number of stack-substance reports required in Canada for sectors that have not submitted NPRI stack-substance reports in the past:

- Black cells indicate that no stack-substance reports were required under current and proposed requirements in the US and Alberta;
- Ratios of less than one indicate a decrease in the number of stack-substance reports required in the US and Alberta and indicate no change in reporting in Canada (these ratios indicate a decrease from zero reports submitted in Canada);
- Ratios of more than one indicate that more stack-substance reports were required to be submitted in the US and Alberta under proposed requirements. For example, facilities in the wholesale trade sector would be required to submit 4.2 times the number of stack-$PM_{2.5}$ reports under the proposed requirements; and
- Cells containing a plus sign (+) indicate that the number of stack-substance reports under current requirements was zero and that one or more stack-substance reports are required under proposed requirements, i.e., there is an increase in the number of required stack-substance reports that could not be quantified with a divisor of zero.

Many of the sectors for which no stack-substance reports were submitted to the NPRI represent activities that are not required to report to the NPRI (e.g., agriculture, construction, transportation). For example, facilities in the transportation and warehousing sector might have to submit 24 times the number of stack-PM_{10} reports based on facilities in the US and Alberta datasets. However, releases from transportation are not required to be reported to the NPRI, and warehouses would only be required to report if they met the release thresholds for CACs (if, for example, they were operating stationary combustion equipment for heating purposes). It is therefore unlikely that such an increase in the number of required stack-substance reports would occur among facilities in this sector reporting to the NPRI.

Table 28. Ratio of number of stack-substance reports required under proposed requirements to number of stack-substance reports required under current requirements, based on US and Alberta stack data

NAICS code	Sector	NO_2	SO_2	$PM_{2.5}$	PM_{10}	TPM	CO	VOC
11	Agriculture, forestry, fishing and hunting	0.3	1.0	3.5	3.8		1.0	
23	Construction			+	+		+	
41-42	Wholesale trade	0.6	0.2	4.2	2.0		0.8	5.0
44-45	Retail trade	+		+	+			+
48-49	Transportation and warehousing	46.6	0.3	65.5	24.0		55.5	20.5
51	Information and cultural industries	1.5		11.0	4.0		0.0	
52	Finance and insurance	0.0		0.5	0.0			
53	Real estate and rental and leasing	0.9	0.0	1.3	1.4		1.3	0.3
54	Professional, scientific and technical services	2.6	0.8	6.6	3.1		2.9	0.0
55	Management of companies and enterprises							
71	Arts, entertainment and recreation	+					+	
72	Accommodation and food services	0.5	0.5	1.5	1.3		0.0	
81	Other services (except public administration)			+	+			+
91-92	Public administration	2.2	1.2	3.4	3.7		1.9	+

5.1.2.2 Reporting of Grouped Stacks

If the proposed changes are implemented, ECCC would allow facilities to treat a group of stacks as a single stack for the purposes of stack reporting, in certain circumstances, to help reduce reporting burden. If a facility has received prior permission from a regulatory authority to group stacks for air dispersion modelling for the purposes of obtaining approval or a permit (e.g., Ontario's Environmental Compliance Approval), then the facility would be allowed to report for those stacks as a group to the NPRI.

If no prior permission has been obtained, ECCC will allow reporting of more than one stack as a group, provided the following conditions are met:

- Grouped stacks must be ≥15m and <50m in height. Stacks ≥50m in height cannot be grouped and will continue to be required to report individually. Stacks <15m in height do not need to be reported individually or in groups (releases from stacks that do not meet the height and/or stack release threshold would continue to be reported together as a total with point releases);
- The stacks must be within 100m of the approximate geographic centre of the group;
- Releases from the stacks must be approximately the same (±10% of the average releases from all stacks in the group);
- The stack height, inside diameter, exit temperature and exit velocity must be within ±20% of the average; and
- Total releases from the grouped "stack" must be compared to the stack air release threshold, rather than comparing the releases from each individual stack to the threshold.

How grouped stacks would be reported:

- The stack name would need to include the word "group" and the number of stacks included in the group;
- The average height, inside diameter, and exit temperature and velocity would be reported for the group;
- The geographic coordinates would be reported for the approximate centre of the group;
- A list of the stacks in each group, and information on their characteristics, provincial identification numbers and latitude and longitude would need to be provided to ECCC (by email instead of through the reporting software); and
- Total releases from each grouped "stack" would be reported through the reporting software or bulk upload.

Allowing similar stacks to be reported as groups could help to offset the increase in reporting burden that is expected to occur as a result of the proposed changes for some facilities. In some cases, grouping of stacks may lead to an increase in the number of stack-substance reports being required, since the total releases from all the stacks in the group is compared to the stack air release threshold, instead of releases from each individual stack being compared to the threshold. For example, a facility with six stacks that each release 5 tonnes of total VOCs would not have to report releases from the individual stacks, but if the stacks were grouped for a total of 30 tonnes of total VOC releases, the grouped "stack" would meet the 25 tonne stack air release threshold for total VOCs.

The US data set contains 221 198 stacks, ranging in height from 0.5 to 396 metres, at 33 153 facilities; 126 716 of these stacks at 25 797 facilities are ≥15m and <50m in height. Of the 15-50m stacks, 9 196 (4% of all US stacks) are at facilities that report for only one stack each, meaning that they are not candidates for grouping. The remaining 15-50m stacks (117 520 stacks at 16 601 facilities) are at

facilities reporting for more than one stack, i.e., 53% of US stacks could potentially be grouped and 64% of facilities could potentially benefit from the option to report for grouped stacks.

Stacks that have identical characteristics (height, diameter and exit temperature and velocity) are easiest to identify as being able to be grouped – 55 570 US stacks (44% of stacks 15-50m in height) share identical characteristics with at least one other stack. To determine if the remaining 61950 stacks 15-50m in height could be grouped, each would have to be evaluated to see if stack characteristics fall within 20% of the average. Note that this does not take into account the requirements that releases from grouped stacks must be ±10% of the average and that stacks must be within 100m of each other.

The facility with the greatest number of stacks in the NEI data set for each of the following four sectors was selected for evaluation:

- Petroleum refineries (NAICS 324110)
- Petrochemical manufacturing (325110)
- Iron and steel mills and ferro-alloy manufacturing (331110)
- Primary production of alumina and aluminum (331313)

Three facilities belonging to the motor vehicle manufacturing sector were also evaluated (two facilities in 336111 – Automobile Manufacturing and one facility in 336112 – Light Truck and Utility Vehicle Manufacturing).

Combined, these seven facilities reported for 1 674 stacks. When each stack's characteristics were evaluated, 439 could be grouped into 90 groups of 2 to 29 stacks (Table 29). About two thirds of the stack groups contain stacks that have identical characteristics. The detailed results of these evaluations are presented in Appendix 5.

Table 29. Number of stacks and stack groups at selected US facilities

Company and Facility Name	NAICS Code	Total number of stacks	Number of stack groups	Number of stacks in groups	Number of groups with stacks that have identical characteristics	Number of stacks in groups with identical characteristics
ExxonMobil Baytown Refinery	324110	508	19	108	12	58
Westlake Chemical Texas Operations	325110	575	9	25	7	19
US Steel Granite City Works	331110	93	7	18	7	18
Noranda Aluminum New Madrid	331313	108	12	28	9	22
Chrysler Warren Truck Assembly	336111	142	11	115	7	19
Ford Kansas City Assembly Plant	336111	119	20	85	9	24
Toyota Georgetown	336112	129	12	60	10	40
Total		**1674**	**90**	**439**	**61**	**200**

The possible reduction in reporting burden that could be achieved by allowing reporting of grouped stacks varies by CAC, by sector and between individual facilities within a sector, as indicated by a

decrease in the number of required stack-substance reports (by as much as half in a few cases) (Table 30; cells shaded in red indicate an *increase* in the number of stack-substance reports). The number of stacks required to report, however, increases in more than half the cases (Table 31, cells shaded in red) and, in some cases, the release quantities that are reported increase as well (see Table 54 through Table 60 in Appendix 5).

For one facility in the motor manufacturing sector (Chrysler-Warren), there is an increase in the number of stack-substance reports required for all CACs that are reported from stacks, indicating an overall increase in reporting burden (Table 30 and Table 58 in Appendix 5). Since reporting of stacks in groups would be optional, this facility could opt not to report for the groups identified in the analysis, so no increase in reporting burden would occur.

For all facilities, numerous additional calculations were required to determine if stacks could be grouped: averaging of stack height, diameter, exit temperature and velocity to determine if each stack fits within ±20% of the average for each of these characteristics; averaging releases by CAC and comparing the releases to determine if they are ±10% of the average; and determining whether the physical location of each stack is in close enough proximity other stacks. Also, a stack might be in one group for one CAC, another group for a different CAC and not in any groups for yet another CAC. It will be up to each facility to decide whether the increase in complexity and number of calculations required for grouped stack reporting would be worth the reduction in the number of stack-substance reports required to be submitted, and to decide whether to take advantage of the option to report for grouped stacks.

Table 30. Number of stack-substance reports with and without stack grouping, selected US facilities

		NO_2		SO_2		$PM_{2.5}$		PM_{10}		CO		VOCs	
Company	**NAICS Code**	**No grp.**	**Grp.**	**No grp.**	**Grp.**	**No grp.**	**Grp.**	**No grp.**	**Grp.**	**No grp.**	**Grp.**	**No grp.**	**Grp.**
ExxonMobil	324110	24	23	7	7	60	55	35	33	13	9	4	5
Westlake	325110	16	8	0	0	22	11	19	11	12	5	5	4
US Steel	331110	16	14	7	7	40	34	39	33	11	11	1	1
Noranda	331313	0	0	6	7	38	33	39	30	8	6	3	3
Chrysler	336111	1	2	0	0	1	9	0	2	0	0	0	5
Ford	336111	0	0	0	0	30	15	20	11	0	0	12	10
Toyota	336112	2	2	0	0	28	25	25	22	1	1	6	6

Table 31. Number of stacks with and without grouping, selected US facilities

		NO_2		SO_2		$PM_{2.5}$		PM_{10}		CO		VOCs	
Company	**NAICS Code**	**No grp.**	**Grp.**	**No grp.**	**Grp.**	**No grp.**	**Grp.**	**No grp.**	**Grp.**	**No grp.**	**Grp.**	**No grp.**	**Grp.**
ExxonMobil	324110	24	38	7	7	60	73	35	47	13	13	4	55
Westlake	325110	16	16	0	0	22	22	19	22	12	12	5	5
US Steel	331110	16	17	7	8	40	41	39	41	11	12	1	1
Noranda	331313	0	0	6	8	38	44	39	41	8	8	3	3
Chrysler	336111	1	55	0	0	1	107	0	78	0	0	0	96
Ford	336111	0	0	0	0	30	50	20	50	0	0	12	34
Toyota	336112	2	21	0	0	28	58	25	58	1	15	6	20

5.1.2.3 Exemptions for Certain Stacks

ECCC plans to provide guidance that releases from the following types of stacks will not have to be reported at the individual stack level:

1. Horizontal stacks,
2. Vertical stacks with rain caps, and
3. Vents from storage tanks.

Both horizontal stacks and vertical stacks with rain caps have little or no initial vertical velocity and there is virtually no plume rise from tanks. As such, releases from these types of stacks will be required to be reported to NPRI under the category of stack or point releases (along with releases from other stacks that do not meet thresholds and points), instead of at the individual stack level (see Figure 14 in Appendix 4). These exemptions are intended to help minimize the increase in reporting burden associated with the proposed changes.

During early engagement, ECCC received comments from stakeholders about the effects of buildings near stacks on air dispersion modelling. Buildings and other structures near relatively short stacks can have a substantial effect on local air dispersion modelling; however, this effect is less important in regional modelling. ECCC uses NPRI stack emissions data in regional AQ modelling, therefore, ECCC does not plan to exempt or add any special requirements for stacks near buildings.

5.1.2.4 Bulk Upload

There is a bulk upload schema that can be used to upload reports for multiple facilities for CACs and speciated VOCs without having to enter the data for each facility into the online reporting system. During early engagement, ECCC heard from stakeholders about the importance of incorporating changes to reporting requirements into the bulk upload schema. ECCC plans to update the bulk upload schema to reflect any changes to reporting requirements for CACs that are implemented for 2020.

5.2 Proposed Changes Requiring Reporting of Stack or Point Releases by Source

5.2.1 Proposed Changes and Rationale

Based on the analysis of the NEI data and the recommendations for changes received, ECCC is proposing to make the following three changes to reporting requirements for stack or point releases, beginning with the 2020 reporting year:

1. Require that stack or point release quantities of CACs be reported separately for combustion and non-combustion sources.
2. Require a basis of estimate to be reported for each combustion and non-combustion release quantity.
3. Require that the type(s) of fuel associated with combustion sources be reported.

The current and proposed reporting requirements are shown in flowcharts in Appendix 4 (Figure 13 and Figure 14).

In the absence of facility-reported SCCs and process-level data, requiring the reporting of quantities of releases separately by combustion and non-combustion sources as well as requiring reporting of the type(s) of fuel used will provide additional information to data users, particularly AQ modellers and inventory compilers. This additional information will help to reduce uncertainty in AQ modelling results

and inventories like the APEI and Black Carbon Inventory by eliminating the need to estimate the percentage of combustion emissions using fractions that may not accurately reflect actual conditions. This information could also be used for regulatory development and to improve the data that is used to meet international reporting obligations.

Restricting the requirement to report this additional information to only stack or point releases targets the majority of emissions (Table 17 and Table 18) and targets the release category with the biggest difference in combustion and non-combustion sources (Table 21).

Requiring the basis of estimate associated with each combustion and non-combustion quantity will provide information on the method used to estimate each reported release quantity, since the method used often varies from one source to another within a facility. This added contextual information will provide data users with a better indication of uncertainty associated with each reported release quantity.

5.2.2 Expected Impact of Proposed Changes

5.2.2.1 Facilities and Sectors

There are no proposed changes to the employee, activity and facility-wide CAC thresholds, so the changes are not expected to require any additional facilities to start reporting to the NPRI. The proposed changes will result in an increase in reporting burden on certain facilities with 10 or more employees, and certain facilities where activities to which the employee threshold does not apply take place, that report stack or point releases of CACs to the NPRI. Facilities with fewer than 10 employees are required to only report for combustion sources (with the exception of certain oil and gas facilities; see Figure 13 and Figure 14) and will therefore not be impacted by the proposed change. Facilities that only reported road dust emissions will not be impacted by the change, since all road dust is from non-combustion sources. It is unknown what the impact will be for facilities reporting TPM releases, since there were no TPM data in the data sets used in the analysis.

The number of facilities with 10 or more employees that reported stack or point releases of CACs to NPRI in 2016 is 2413, shown in Table 32 by CAC and by sector; some, but not all, of these facilities will be impacted by the proposed change to require reporting of combustion and non-combustion sources.

Table 33 shows the extrapolated number of facilities that would be required to report for both combustion and non-combustion sources of stack or point releases to the NPRI under the proposed changes by sector. These numbers were calculated by multiplying the percentage of US facilities that would be required to report for both combustion and non-combustion sources by CAC (Table 23) by the number of facilities reporting that CAC in each sector (Table 32). Each CAC report for the facilities in Table 33 would need to be calculated and reported separately for combustion and non-combustion sources. In many cases, facilities would estimate releases for combustion sources separately from non-combustion sources, and would already have the information at this level. Where facilities estimate emissions by measuring a release that may include both combustion and non-combustion sources (e.g., with CEMS on a stack with emissions from both combustion and other processes), prorating of emissions would be required. The number of impacted facilities varies by CAC, ranging from about 44 facilities being required to report for combustion and non-combustion sources of SO_2 stack or point releases, to about 399 facilities being required to report this breakdown for VOCs.

The majority of the impacted facilities are in the manufacturing sector. Table 53 in Appendix 3 shows the results for the manufacturing sectors by 4-digit NAICS code. The impacts vary depending on CAC and sector, with the highest increases in reporting burden in the following sectors:

- Sawmills and wood preservation (NAICS 3211)
- Veneer, plywood and engineered wood product manufacturing (3212)
- Pulp, paper and paperboard mills (3221)
- Basic chemical manufacturing (3251)

Table 32. Number of facilities that reported one or more criteria air contaminants to the NPRI by sector

NAICS code	Sector	NO_2	SO_2	$PM_{2.5}$	PM_{10}	CO	VOC
11	Agriculture, forestry, fishing and hunting	2	1	5	5	2	2
21	Mining, quarrying, and oil and gas extraction	260	161	327	323	250	206
22	Utilities	129	54	136	133	100	65
23	Construction	1	0	1	1	1	3
31-33	Manufacturing	582	357	1 120	1 140	590	1 028
41-42	Wholesale trade	4	3	51	50	4	8
48-49	Transportation and warehousing	14	5	82	90	11	28
51	Information and cultural industries	0	0	0	0	0	1
53	Real estate and rental and leasing	0	0	1	3	0	0
54	Professional, scientific and technical services	4	4	5	5	3	3
56	Administrative and support, waste management and remediation services	24	11	64	60	27	30
61	Educational services	19	11	19	19	14	7
62	Health care and social assistance	8	8	10	10	8	8
72	Accommodation and food services	0	0	0	0	0	0
81	Other services (except public administration)	0	0	17	14	0	8
91	Public administration	15	7	22	22	10	2
Total		**1 062**	**622**	**1 860**	**1 875**	**1 020**	**1 399**

Note: Does not include facilities only reporting TPM and facilities that only reported road dust.

Table 33. Extrapolated number of facilities that would be required to report separate quantities for combustion and for non-combustion sources

NAICS code	Sector	NO_2	SO_2	$PM_{2.5}$	PM_{10}	CO	VOC
11	Agriculture, forestry, fishing and hunting	<1	<1	<1	<1	<1	<1
21	Mining, quarrying, and oil and gas extraction	21	11	59	60	20	59
22	Utilities	10	4	25	25	8	19
23	Construction	<1	0	<1	<1	<1	<1
31-33	Manufacturing	47	25	202	211	48	293
41-42	Wholesale trade	<1	<1	9	9	<1	2
48-49	Transportation and warehousing	1	<1	15	17	<1	8
51	Information and cultural industries	0	0	0	0	0	<1
53	Real estate and rental and leasing	0	0	<1	<1	0	0
54	Professional, scientific and technical services	<1	<1	<1	<1	<1	<1
56	Administrative and support, waste management and remediation services	2	<1	12	11	2	9
61	Educational services	2	<1	3	4	1	2
62	Health care and social assistance	<1	<1	2	2	<1	2
72	Accommodation and food services	0	0	0	0	0	0
81	Other services (except public administration)	0	0	3	3	0	2
91	Public administration	1	<1	4	4	<1	<1
Total		**86**	**44**	**335**	**347**	**83**	**399**

5.2.2.2 Fuel Type

Information on the fuel type is proposed to be collected at the individual stack level for combustion releases (where stack reporting requirements are met) and for combustion releases from stacks that do not meet thresholds and points.

ECCC is not proposing to collect information on the quantities of fuel used, or fuel use at the process or equipment level. ECCC also is not proposing to collect information on the release quantities associated with each fuel type (see Figure 14). This will help to minimize the increase in reporting burden associated with the proposed changes, particularly for facilities that use produced as well as purchased fuels (e.g., refineries).

To simplify the reporting of fuel type associated with combustion sources, ECCC plans to implement a checklist of fuels where users would select all that apply from a list:

- Biomass
- Butane
- Coal
- Diesel or light fuel oil
- Gasoline
- Heavy fuel oil
- Kerosene
- Natural gas
- Other (specify)
- Propane
- Refinery fuel gas/still gas
- Waste

5.2.2.3 Bulk Upload

ECCC plans to update the bulk upload schema to reflect any of these changes to reporting requirements for CACs that are implemented for 2020.

5.2.2.4 Guidance for Reporting Facilities

Industry stakeholder early engagement input indicates that there will be a need for guidance for reporting facilities on what constitutes combustion and non-combustion sources. ECCC plans to prepare guidance on any changes to reporting requirements for CACs that are implemented for 2020.

5.3 Proposed Changes to Reporting Requirements for Speciated Volatile Organic Compounds

5.3.1 Proposed Changes and Rationale

Based on the recommendations received and analysis of data from Alberta and the US, ECCC is proposing to make five changes to the reporting requirements for speciated VOCs, beginning with the 2020 reporting year:

1. Increase the threshold requiring speciated VOCs to be reported for individual stacks from 5 tonnes of total VOCs to 25 tonnes of total VOCs.
2. Require that stack or point release quantities of speciated VOCs be reported separately for combustion and non-combustion sources.

3. Require that total VOCs released from stacks or points (other than individual stacks) be speciated separately from VOCs released from all other sources (storage or handling, fugitive, spills and other non-point). These speciated VOCs would be required to be reported separately by combustion and non-combustion sources.
4. Require that the basis of estimate be reported each time total VOCs are speciated.
5. Add "speciation profile" to the list of bases of estimate that can be used by facilities to estimate and report releases.

The current and proposed reporting requirements are shown in flowcharts in Appendix 4 (Figure 13 and Figure 14).

Currently, if 5 tonnes or more of Part 4 total VOCs are released from an individual stack, any quantity of any Part 5 speciated VOC released from that stack must be reported, provided that the facility-wide 1 tonne threshold for that individual speciated VOC is met. ECCC is proposing to increase the air release threshold for reporting Part 4 total VOCs for an individual stack from 5 tonnes to 25 tonnes (see Section 5.1.1); this same 25 tonne total VOC threshold would trigger reporting of speciated VOCs from that stack. No changes are proposed to the facility-wide air release threshold for total VOCs (10 tonnes) and no changes are proposed to the facility-wide threshold for speciated VOCs (1 tonne), so a stack that releases 25 tonnes or more of total VOCs would only have to report for those speciated VOCs that meet the facility-wide 1 tonne air release threshold.

The rationale for collecting data on speciated VOCs from facilities and at the individual stack level was established when reporting requirements for CACs and speciated VOCs were added to the NPRI in 2002.[33] National and regional AQ modelling requires speciated VOC information because different VOC species have different reactivities, ozone-forming potentials, volatilities, and aerosol-forming potentials. Collecting information on speciated VOCs released from combustion and non-combustion sources is also important, since speciation profiles can vary widely, depending on the source.

Currently, releases of total VOCs from the following sources are added together and then speciated (see Figure 13 in Appendix 4):

1. Stacks that are ≥50m in height but do not meet the stack air release threshold for reporting speciated VOCs (currently 5 tonnes of total VOCs)
2. Stacks that are <50m in height
3. Points
4. Storage or handling sources
5. Fugitive sources
6. Spills
7. Other non-point sources

ECCC is proposing to divide this so that total VOCs will be speciated for the first three sources (with the new height threshold of 15m and mass threshold of 25 tonnes) separately from the other four sources (see Figure 14). This will allow data on speciated VOC releases from combustion and non-combustion sources, and the fuel types associated with combustion sources, to be reported separately for all stacks and points.

[33] See the *Environment Canada Response to Recommendations of the Second Report of the NPRI Multi-stakeholder Work Group on Substances (2001-2002)* (February 2003), available on request at ec.inrp-npri.ec@canada.ca.

ECCC is proposing to require one basis of estimate be reported for each group of speciated VOCs. For example, if combustion and non-combustion releases of total VOCs are required to be reported for a stack, then one basis of estimate would be required to be reported for all of the speciated VOCs from combustion sources and a second basis of estimate would be required for all the speciated VOCs from non-combustion sources from that stack. The basis of estimate will provide an indication of uncertainty associated with the release quantity for data users.

Facilities are currently permitted to use one of the following methods of quantification (basis of estimate) for the purposes of reporting to the NPRI:

- Continuous emission monitoring,
- Predictive emission monitoring,
- Source testing,
- Mass balance,
- Published emission factors,
- Site-specific emission factors, and
- Engineering estimates

While speciation profile is not explicitly listed as a possible basis of estimate, profiles are permitted to be used and could be reported as site-specific or published emission factors.

ECCC is proposing to add speciation profiles as a basis of estimate in order to track specifically when this method is used, particularly since it is expected to be one of the most common bases of estimate reported for speciated VOCs.

5.3.2 Expected Impact of Proposed Changes

5.3.2.1 Facilities and Sectors

The proposed changes to decrease the stack height threshold and increase the stack air release threshold for total VOCs to 25 tonnes may cause a decrease in the number of stacks that are required to report for total VOCs [456 stack-substance reports extrapolated from US and Alberta data compared to 475 stack-substance reports submitted to NPRI in 2016 (Table 13)]. This change may result in a decrease in the number of stacks required to break down total VOCs into speciated VOCs.

Of the 475 stacks reporting total VOCs in 2016, 390 stacks at 139 facilities submitted reports for one or more speciated VOCs (shown by sector in Table 34), for a total of 2 144 stack-speciated VOC reports, with an average 5.5 speciated VOCs being reported for each stack. If the proposed changes to the stack height and stack air release thresholds are implemented, about 375 stacks are expected to be required to report one or more speciated VOCs. Given this, a total of about 2 063 stack-speciated VOC reports would be required (these would be required to be reported separately by combustion and non-combustion sources).

Table 34. Number of facilities that reported one or more speciated VOCs from individual stacks to NPRI in 2016

NAICS code	Sector	Number of facilities
21	Mining, quarrying, and oil and gas extraction	27
22	Utilities	15
31-33	Manufacturing	95
56	Administrative and support, waste management and remediation services	1
62	Health care and social assistance	1
Total		139

In order to be required to report for combustion and non-combustion sources of speciated VOCs, a facility must:

1. Have ≥10 employees (facilities with <10 employees only have to report for combustion sources, with some exceptions for facility type and activities, e.g., oil and gas facilities, incinerators);
2. Release ≥10 tonnes of total VOCs, facility-wide;
3. Release total VOCs from stacks or points;
4. Release ≥1 tonne of the speciated VOC, facility-wide; and
5. Release the speciated VOC from stacks or points.

In 2016, 1 003 facilities meeting the first three criteria above reported to the NPRI, shown by sector in Table 35. It is not possible to determine the number of facilities that currently report to the NPRI that would meet all five criteria, since VOCs are currently speciated for only two categories: (1) releases from individual stacks that meet thresholds and (2) releases from stacks that do not meet thresholds, releases from points, and releases from storage or handling sources, fugitive sources, spills and other non-point sources. Instead, based on NEI data that shows 28.5% of US facilities would be required to report total VOCs for combustion and non-combustion sources, the extrapolated number of facilities that might be required to report speciated VOCs for both combustion and non-combustion sources to the NPRI is 286 (Table 35). The number of facilities is likely to be lower, however, since this estimation does not take into account the 1-tonne facility-wide threshold for speciated VOCs.

Table 35. Extrapolated number of facilities that might need to report speciated VOCs from combustion and non-combustion sources

NAICS code	Sector	Facilities reporting stack or point releases of total VOCs; reporting ≥10 tonnes of total VOCs, facility-wide; with ≥10 employees	Extrapolated number of facilities that might need to report for both combustion and non-combustion sources of speciated VOCs
11	Agriculture, forestry, fishing and hunting	2	1
21	Mining, quarrying, and oil and gas extraction	160	46
22	Utilities	38	11
23	Construction	3	1
31-33	Manufacturing	751	214
41-42	Wholesale trade	7	2
48-49	Transportation and warehousing	19	5
51	Information and cultural industries	1	0
53	Real estate and rental and leasing	0	0
54	Professional, scientific and technical services	0	0
56	Administrative and support, waste management and remediation services	14	4
61	Educational services	0	0
62	Health care and social assistance	1	0
72	Accommodation and food services	0	0
81	Other services (except public administration)	7	2
91	Public administration	0	0
Total		**1 003**	**286**

5.3.2.2 Bulk Upload

ECCC plans to update the bulk upload schema to reflect any of the changes to reporting requirements that are implemented for 2020.

5.4 Proposed Change to Reporting of Particulate Matter

5.4.1 Proposed Change and Rationale

ECCC is proposing to make the following change to reporting requirements for PM, beginning with the 2020 reporting year:

1. Require an indication of whether stack or point release quantities of $PM_{2.5}$, PM_{10} and TPM include condensable PM.

The proposed reporting requirement is shown in the flowchart in Appendix 4 (Figure 14).

Knowing whether a reported quantity of PM releases includes CPM will help ECCC to more accurately estimate black carbon emissions for the Inventory (since black carbon occurs only in the filterable portion of PM). It will also help to meet international reporting obligations under the UN ECE CLRTAP, which has the long-term aim of standardized reporting of PM emissions, including both filterable and condensable components. Restricting this requirement to releases reported in the stack or point releases category is expected to collect the most amount of information while minimizing the increase in reporting burden, since the majority of CPM releases are expected to be in the stack or point releases category, as seen in the US data (Table 36).

Table 36. Releases of condensable particulate matter from US facilities as a percentage of total releases by release category

	Releases as a percentage of total releases
Stack or point releases	98.0
Storage or handling releases	0.6
Fugitive releases	1.1
Other non-point releases	0.3

5.4.2 Expected Impact of the Proposed Change

The number facilities that reported stack or point releases of PM to NPRI in 2016 are shown by sector in Table 37. The proposed change would impact these facilities, but only if their reported quantities of PM include condensable PM. ECCC plans to update the online reporting system and bulk upload schema to reflect this change to reporting requirements if it is implemented for 2020.

Table 37. Number of facilities reporting stack or point releases of particulate matter to the NPRI in 2016 by sector

NAICS code	Sector	$PM_{2.5}$	PM_{10}	TPM
11	Agriculture, forestry, fishing and hunting	4	3	2
21	Mining, quarrying, and oil and gas extraction	1 704	1 350	274
22	Utilities	232	219	52
23	Construction	10	9	9
31-33	Manufacturing	992	1 016	541
41-42	Wholesale trade	36	38	8
48-49	Transportation and warehousing	120	78	31
51	Information and cultural industries			
53	Real estate and rental and leasing	0	3	0
54	Professional, scientific and technical services	4	4	2
56	Administrative and support, waste management and remediation services	69	63	19
61	Educational services	22	22	7
62	Health care and social assistance	8	6	4
72	Accommodation and food services	1	1	0
81	Other services (except public administration)	11	9	0
91	Public administration	16	17	0
Total		**3 229**	**2 838**	**949**

Appendix 1 – Recommendations and Suggestions for Adjusting the NPRI Reporting Requirements for Criteria Air Contaminants

A1.1 Recommendations from Alberta Environment and Parks

A1.1.1 Stacks

Stack Height Threshold

The current NPRI stack-level reporting threshold of 50 metres (tall stacks) captures nearly all SO_2 emissions in Alberta and large quantities of the other CACs. However, there are a lot of 30 to 50 metre "medium" sized stacks that emit large amounts of substances such as NOx and CO. As these are smaller than the 50 metre NPRI stack reporting threshold, they are just being lumped in with all the other stack/point sources at a facility when being reported to the NPRI. The result of this is that during emissions processing for photochemical air modelling (for GEM-MACH[34] or CMAQ[35]), these medium sized stacks are treated as a single combined near-ground level release.

There are several large industrial facilities in Alberta that have only one or fewer stacks over 50 metres, but they often have several large emitting medium size stacks. A stack could be 48 metres and would currently only be reported to the NPRI combined with all the stack/point releases, even though it could be a fairly large source of NOx. The cumulative emissions from many medium size stacks at a facility all being modelled together as a single combined near-ground level release is a potential issue that may impact modelling results. This is one of the main reasons why NPRI data cannot be used for regulatory dispersion modelling in Alberta (although NPRI data are sometimes used for scaling of emissions and for small single source facilities that cannot be otherwise verified).

Even though photochemical modelling is done at much larger scales than regulatory dispersion modelling, and combines point sources into large grid cells, there is likely still some effect on the modelling results from the medium size stacks being treated as though they emit at lower levels of the atmosphere, and as a single point rather than numerous medium size stacks. As it is unlikely the NPRI will move to complete source level reporting, a way of at least partly addressing this issue is to consider lowering the stack reporting threshold to less than 50 metres.

In Alberta, there are around 4,000 stacks and point sources at 350 EPEA[36] approved industrial facilities. Of these, 485 stacks are between 30 and 50 metres in height. These stacks cumulatively emit around 20,000 tonnes of NOx a year. The range of annual NOx emissions from these stacks is 0 to 1,177 tonnes, with an average of 58 tonnes of NOx per stack. Figures 1 and 2 below show the number of EPEA approved stacks and NOx emissions for three stack height categories (stacks over 50 m, stacks 30 to 50 m, and stacks less than 30 m).

Alberta Environment would like to suggest that Environment Canada consider lowering the stack height reporting threshold to something along the lines of 30 metres. However, stack height should not be the only basis for reporting emissions from individual medium sized stacks. The NPRI currently includes additional stack-level reporting criteria for the 50 metre and taller stacks. Stack release thresholds of: 5

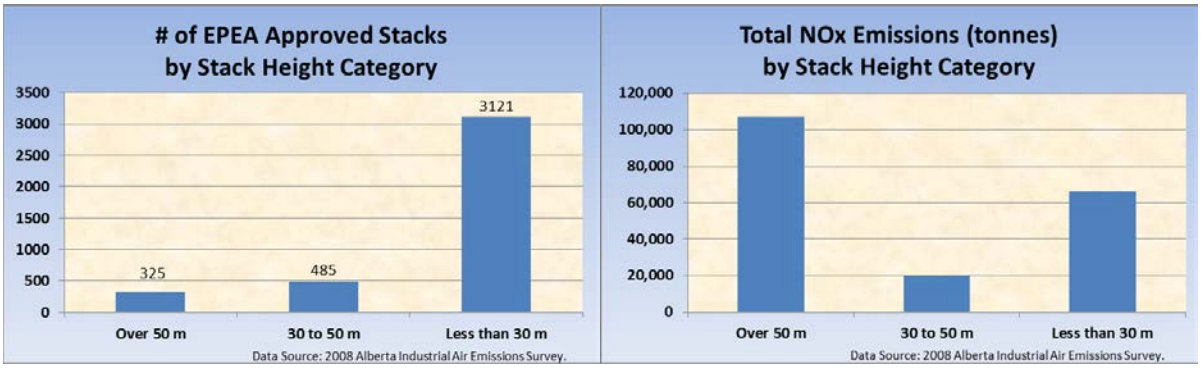
[34] The Global Environmental Multi-scale – Modelling Air quality and Chemistry (GEM-MACH) is an air quality forecast model.

[35] The Community Multiscale Air Quality Modeling System (CMAQ) is an air quality modelling system.

[36] Alberta's Environmental Protection and Enhancement Act (EPEA) and accompanying regulations set out in detail which activities require approvals and the process for obtaining them.

tonnes of NOx, SO_2, CO, VOC, TPM, 0.25 tonnes of PM_{10} and 0.15 tonnes of $PM_{2.5}$ are used. We also suggest that the same stack release thresholds also be used for the 30 to 50 metre stacks. This should ensure that medium sized stacks would not need to be reported individually if they do not typically emit very much.

The presence of measurement data could also be a criterion used to determine reporting at the stack level for the 30 to 50 metre stacks. There are several stacks in Alberta that are between 30 and 50 metres in height that have CEMS, and also some additional stacks that are required to carry out manual stack surveys. Facilities should also be required to report at the stack-level if they have measurement data (CEMS or stack surveys) for the stack for the reporting period.



Figures 1 and 2: Approved Stacks and NOx emissions by Stack Height Category.

Estimation Methods for Individual Stacks

Perhaps this is simply a limitation of the information provided in the public NPRI database, but currently only one estimation method is provided for the Stack/Point Release source category (for each pollutant) and no estimation methods are provided for the tall stack emissions. The stack/point release source category is often an amalgamation of several stacks, each of which may have been determined using a different estimation method (CEMS, stack sampling, mass balance, site specific emission factor, published emission factor, engineering estimate, etc.). As several estimation methods may have been used to determine part of the stack/point release total for a pollutant, the single estimation method being reporting becomes somewhat meaningless. Is the facility reporting the method used for the largest source, the method used for the majority of the point sources, or a method used for one random point source included in the stack/point source total?

As not all of the stack-level information is included in the public NPRI database, it could be that additional estimation methods are being reported for the tall stacks, but this is not currently clear. It is therefore suggested that along with the tall stack emissions, individual stack estimation methods be required for each tall/medium stack and pollutant release. Efforts should be made to capture representative estimation methods for all sources reporting each individual pollutant.

A1.1.2 Source Types

Source classification codes are critical for emissions processing, particularly for the assignment of appropriate temporal and chemical speciation profiles. There are about 900 stacks (across Canada) listed in the "Stacks" table of the 2013 NPRI database. None of these have Source Classification Codes, even though these are required by the SMOKE[37] emissions processor in order to generate the modelling

[37] Sparse Matrix Operator Kernel (SMOKE) Modeling System.

input files required by GEM-MACH and CMAQ. The 2010 Environment Canada SMOKE input files do have SCCs assigned for these stacks, most of which appear to be the general EPA/SMOKE SCCs rather than some kind of unique SCCs developed specifically by Environment Canada. These also appear to have been somewhat assigned by sector, rather than for each individual operation.

We assume that Environment Canada's emission processing and modelling staff are assigning SCCs to the NPRI stacks prior to emissions processing, but it is likely difficult for them to select the most appropriate code for so many stacks, coming from a wide range of different processes, equipment and industrial sectors. The industrial reporters should be in the best position to select an appropriate SCC for their individual tall/medium stacks. It is therefore suggested that facilities [be] required to report stack parameter information (height, diameter, exit velocity, exit temperature) and stack-level emissions also be required to select a SCC for these stacks.

The NPRI stack/point release source category is often an amalgamation of several stacks, each of which should really have an individual SCC. As the NPRI likely won't soon become a complete stack-level emissions reporting program, it is suggested that facilities be required to select a representative SCC for the largest emitting source included in their stack/point release category. This would likely be better than assigning default SMOKE SCCs for all the combined stack/point release sources included in the NPRI data.

Source Classification Codes should also be reported for the other NPRI source categories (storage and handling, fugitive releases, spills, other non-point releases). The non-point source categories could probably just have a standardized code assigned by default, based on the non-point source type and sector. The facilities reporting to the NPRI should be required to review and modify the default SCC for their other non-point source categories.

A1.2 Emissions Working Group Issues and Gaps

The Emissions Working Group (EWG) of the Canadian Council of Ministers of the Environment (CCME) has the mandate to advise on the compilation and reporting of national emission inventories, trends, and projections for air pollutants of concern for all jurisdictions in Canada. The Gap Analysis on Air Emissions Data study involved a survey of emission inventory experts and practitioners that are members of the EWG. A total of eleven (11) responses to the survey questionnaire were received. The results were analyzed and compiled to form the basis of the report. The report identifies a variety of issues, gaps, and provides suggestions for the EWG to consider in further developing emission inventories in Canada. The identified gaps and issues related to NPRI that are addressed in this proposal are listed below.

A1.2.1 Stacks

Lack of stack emissions and related parameter data: Air quality modelling is an important tool in the environmental management process. Among other uses, modelling links emission sources and receptors, and can be used to estimate the existing or future contribution to air concentrations from pollutant sources. These estimates can be linked to estimations of economic benefits (e.g., improved health). The AQMS[38] includes Airshed and Air Zone management, so air quality modelling is expected to increase in importance. Air quality modelling is already used in some jurisdictions (e.g., Newfoundland and Labrador, Ontario) for large industrial sources to demonstrate compliance with air quality standards established in environmental permits or approvals.

[38] Air Quality Management System (AQMS).

The emission source input data to support good air quality models are extensive. For facility emission sources, data includes activity data and process/equipment noted [below]. However, there are also data needed that characterize each stack or emission source. Data can include stack heights, temperatures, emission rates (hourly, daily, etc.), stack gas flow rates, pollutant concentrations, stack gas composition, specific source locations, and other data. While there are some stack data in the NPRI, for large stacks (e.g., higher than 50 metres), additional parameter data for small and large stacks would be useful to support air quality modelling.

A1.2.2 Facility Activity Data

Lack of facility activity data: Emissions data combined with appropriate facility activity data are quite useful for understanding emissions performance. Activity data can include fuel consumption data, production data, raw material use, and other facility data. For example, it would be useful to have data on the quantity of NOx and SO_2 emissions associated with the quantity of fuel consumed – say natural gas and fuel oil – for a particular facility and/or specific source. This type of information can be used to compare emissions per unit of fuel consumed between similar sources at the same or different facilities, which could in turn be used to better understand the NOx or SO_2 control performance from these sources. There could be many more additional uses for the activity data, including: benchmarking, establishing new performance standards, checking compliance with standards, checking emission inventory estimation methods, trends analysis, and developing better understandings of the relationships between emissions and facility activities that impact the environment.

A1.2.3 Process-Level Data

Lack of emissions data at the process or equipment level: There is a lack of comprehensive process and equipment emission source level data. For example, it would be useful to have data on the number and size of storage tanks containing hydrocarbon solvents and their associated emissions. Similarly, it would be useful to have data on the size and numbers of fuel combustion sources (e.g., boilers, heaters, natural gas fired compressors, etc.) that contribute to fuel combustion emissions. In conjunction with other information – such as controls already in place or lack of controls, this type of information can be used to develop estimates for emission reductions that could be achieved through management initiatives (e.g., regulations requiring controls). Source and equipment specific data are also useful in developing cost estimates of regulatory initiatives and the impact of adoption of emission reduction technologies or operating practices that regulations seek to achieve. Estimates of costs as well as benefits (e.g., health benefits associated with reduced emissions for improved air quality) are typically required in a regulatory development process. Inventory data are useful to support such economic analysis.

A1.3 Environment and Climate Change Canada's Air Quality Research Division

The NPRI provides key information on emissions from Canadian facilities that is needed for air-quality (AQ) modelling at Environment Canada at urban, regional, and global scales. These AQ model simulations support many EC operational, policy, and research activities, including (a) the twice-daily, 48-hour operational AQ forecasts made by EC's Regional AQ Deterministic Prediction System (RAQDPS: see http://weather.gc.ca/aqfm/index_e.html), (b) emissions scenario modelling to support national AQ policy formulation and AQ management, and (c) research activities related to criteria contaminants, mercury, and PAHs.

There are a number of changes that could be made to NPRI reporting requirements that would make the NPRI even more useful and more usable in support of AQ modelling activities within EC and other agencies.

A1.3.1 Stack Height Threshold

Recommendation: Reduce the 50-meter stack-height threshold for reporting emissions separately for individual smokestacks to a lower value.

Rationale: Emissions from a tall smokestack often disperse differently than surface-level emissions, but all NPRI emissions must be treated as surface-level emissions unless they are reported for individual smokestacks. The current stack-height threshold of 50 meters for reporting stack emissions will miss emissions from slightly shorter stacks. For example, of the 19 continuous emissions monitored required by the Alberta government in the Athabasca Oil Sands region, eight are installed on smokestacks with heights in the 30 to 50 meter range. And for the 2010 NPRI inventory, only 259 facilities out of 3,347 (i.e., 8) reported emissions for individual smokestacks. The following 14 large emitters did not report stack emissions in 2010:

NPRI	CO	NOX	SOX	PROV	COMP_NAME
5510	51,529		7,712	QC	ALCAN, ALMA
1071	50,530		6,551	QC	Aluminerie de Bécancour inc.
2788	49,036	287	5,489	BC	Rio Tinto Alcan, Kitimat
3406	31,836		3,211	QC	RIO TINTO ALCAN, Primary Metal, Arvida
3062	21,706		4,354	QC	ALCAN, Grande-Baie
4782	21,826		4,032	QC	Alcoa Aluminereie de Deschambault
2000	12,970	6,329	4,288	QC	ArcelorMittal Mines Canada
4024	16,204		7,778	NB	Xstrata Canada Corporation, Brunswick Smelter
5013	6,757	5,298	7,488	NL	Iron Ore Company of Canada, Carol Project
3057	14,104		2,336	QC	Rio Tinto Alcan
6237	11,547	4,233	481	QC	Chapais Energie
442	2,376	5,606	1,879	AB	Imperial Oil Resources, Cold Lake
2984	2,343	1,709	2,751	ON	U.S. Steel Canada Inc., Hamilton Works
4316	330	1,556	4,088	NL	NORTH ATLANTIC REFINING LP

A1.3.2 Process-Level and Activity Data

Recommendation: Require facilities to report Part 4 emissions by process type, including fuel used, and also the estimation method used to estimate these emissions.

Rationale: Individual facilities almost certainly have this information available already since facilities need to estimate their emissions at the process level in order to obtain their emissions at the facility level. Process-level emissions reporting has also been the reporting standard in the U.S. for many decades and is a U.S. EPA requirement. Having process-level emissions reported to the NPRI would provide many advantages. These include the development of a detailed black-carbon emissions inventory for Canada, improved reporting out to the UN ECE and other fora, improved design and development of emissions control scenarios (e.g., fuel used, boiler output, …), and improved emissions processing for AQ modelling. Process-level information can be used by emissions processing systems to infer VOC and PM composition, operating schedule, stack parameters, and other emissions characteristics when these were not reported directly to the NPRI.

Rationale: Different emissions estimation methods (e.g., CEM technology, emissions factors, best engineering judgement) have different levels of uncertainty. Inventory developers are frequently asked for inventory uncertainty estimates by policymakers. Type of emissions method and the magnitude of emissions based on each type can be used to calculate uncertainty estimates, which is one reason why the U.S. EPA requires this information to be reported. Such estimates of inventory uncertainty are also required to estimate the uncertainties associated with AQ model predictions.

A1.3.3 Condensable Particulate Matter

Recommendation: Expand reporting of PM emissions to include condensable PM emissions as well as filterable PM emissions.

Rationale: Many recent studies have shown that emissions of semi-volatile and intermediate volatility organic gases are important for PM formation but are not reported to the NPRI since they are not classified as either VOCs or as filterable PM. This same suggestion was made in 2002 as part of the effort to harmonize reporting to NPRI and to the Ontario Ministry of the Environment and Climate Change and was rejected at the time (see (http://ec.gc.ca/inrp-npri/default.asp?lang=En&n=7C716036-1). However, the U.S. EPA does require reporting of both condensable and filterable PM emissions, and in the latest U.S. inventory (2011, version 2), condensable PM emissions were reported for many source sectors, and overall, condensable $PM_{2.5}$ emissions were 30 as large as filterable $PM_{2.5}$ emissions.

A1.4 Joint Oil Sands Monitoring Program Emissions Inventory Compilation Report

A1.4.1 Stack Height Threshold

The 2010 ECCC Modelling Inventory utilizes the NPRI for its point source data. However, the NPRI only requires separate stack-level reporting for stacks greater than 50 metres tall. Emissions from stacks less than 50 metres in height are included in overall facility emissions but information about stack locations and release parameters is not required to be reported, even though smaller stacks can contribute significantly to the point source emission totals of some substances in the study area.

The CEMA[39] Inventory does have stack parameters and emissions for sources less than 50-m height for a region encompassing the study area. An example of the cumulative amount of emissions of NOx and SO_2 from the CEMA inventory, sorted according to stack height, is shown in Figure 3-1, below. As can be seen from the figure, a large proportion of the stack emissions of NOx (reported as NO_2) are from stacks less than 50 m in height. This gap related to smaller stacks was therefore addressed by using the CEMA Inventory point sources for the large industrial facilities located in the study area. The CEMA Inventory was sometimes updated based on NPRI data when necessary and appropriate. 2010 NPRI data were used for the remainder of the modelling domain.

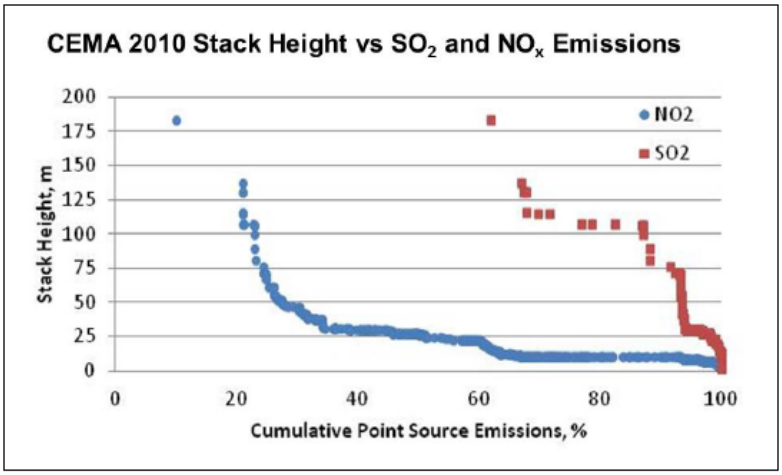


Figure 3-1. Cumulative emissions from point sources, for SO_2 and NO_x, CEMA 2010 Inventory.

[39] Cumulative Environmental Management Association (CEMA).

Emissions from stacks shorter than 10 metres outside of the study area are only included in the JOSM Inventory as part of facility totals, rather than as individual point sources. This is because they are not reported to the NPRI as individual sources. These sources may represent a significant portion of emissions and, where possible, they should be added to the JOSM Inventory as separate sources along with their actual stack release parameters so that they can be treated as elevated sources rather than as surface sources.

A.2.4.2 Source Classification Codes

Source Classification Codes for some oil sands sources may need to be improved, in that SCCs are at the moment all that are available to link specific facilities with profiles used to describe VOC speciation, temporal allocation, etc. The assignment of appropriate SCCs are thus critical for air modelling, as they are used for profile assignment. There is also a need for data collection at the process level for facilities, for linkage to process-specific SCCs. A formal review should be carried out and used to improve the assignment of SCCs to oil sands sources.

Appendix 2 – Detailed Results of the Stack Analysis

Table 38. Number of stacks as a percentage of the total number of stacks by sector, Canada, US and Alberta

NAICS code	Sector	Percentage of Stacks			
		Canada	Combined US and Alberta	Alberta	US
11	Agriculture, forestry, fishing and hunting	0.0	0.3	0.0	0.3
21	Mining, quarrying, and oil and gas extraction	27.2	15.3	70.9	14.4
22	Utilities	7.7	6.2	3.3	6.3
23	Construction	0.0	0.1	0.0	0.1
31-33	Manufacturing	62.4	58.7	25.2	59.3
41-42	Wholesale trade	0.0	3.9	0.0	4.0
44-45	Retail trade	0.0	0.4	0.0	0.4
48-49	Transportation and warehousing	0.0	7.2	0.3	7.3
51	Information and cultural industries	0.0	0.4	0.0	0.4
52	Finance and insurance	0.0	0.1	0.0	0.1
53	Real estate and rental and leasing	0.0	0.1	0.0	0.1
54	Professional, scientific and technical services	0.0	0.6	0.0	0.6
55	Management of companies and enterprises	0.0	0.0	0.0	0.0
56	Administrative and support, waste management and remediation services	0.9	1.2	0.1	1.2
61	Educational services	1.4	1.3	0.1	1.3
62	Health care and social assistance	0.4	1.2	0.1	1.2
71	Arts, entertainment and recreation	0.0	0.1	0.0	0.1
72	Accommodation and food services	0.0	0.1	0.0	0.1
81	Other services (except public administration)	0.0	0.6	0.0	0.6
91-92	Public administration	0.0	2.1	0.0	2.2

Table 39. Releases of criteria air contaminants from stacks by sector as a percentage of total releases from stacks, Canada, US and Alberta

NAICS code	Sector	Canada							US and Alberta						
		NO_2	SO_2	$PM_{2.5}$	PM_{10}	TPM	CO	VOCs	NO_2	SO_2	$PM_{2.5}$	PM_{10}	TPM	CO	VOCs
11	Agriculture, forestry, fishing and hunting	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.0	0.0	0.1
21	Mining, quarrying, and oil and gas extraction	10.2	36.4	21.5	20.8	19.0	4.6	22.0	10.7	6.4	7.1	7.6	36.6	7.7	15.6
22	Utilities	47.5	16.1	15.1	21.8	23.5	7.2	6.9	55.2	74.8	35.0	39.1	26.9	29.5	6.9
23	Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31-33	Manufacturing	41.4	47.4	63.3	57.3	57.4	88.1	69.0	24.7	17.8	53.3	48.6	36.5	57.6	67.6
41-42	Wholesale trade	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.4	1.1	0.0	0.1	1.2
44-45	Retail trade	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8
48-49	Transportation and warehousing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.8	0.0	1.7	1.2	0.0	2.6	6.1
51	Information and cultural industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
52	Finance and insurance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
53	Real estate and rental and leasing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
54	Professional, scientific and technical services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.1	0.1	0.0	0.2	0.1
55	Management of companies and enterprises	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
56	Administrative and support, waste management and remediation services	0.6	0.1	0.1	0.0	0.0	0.1	2.2	1.4	0.2	1.1	1.0	0.0	1.4	0.7
61	Educational services	0.3	0.0	0.1	0.0	0.0	0.1	0.0	0.3	0.3	0.3	0.3	0.0	0.3	0.1
62	Health care and social assistance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.1	0.0	0.2	0.1
71	Arts, entertainment and recreation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
72	Accommodation and food services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
81	Other services (except public administration)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.3
91-92	Public administration	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.1	0.3	0.3	0.0	0.2	0.3

Table 40. Descriptions of the scenarios evaluated to determine the best type of thresholds

Scenario number/ name	Description	Stack height threshold (m)	Stack air release threshold (tonnes)						
			NO_2	SO_2	$PM_{2.5}$	PM_{10}	TPM	CO	VOCs
1 (Current)	No changes to current requirements	50	5	5	0.15	0.25	5	5	5
2 (50m, 0x)	50m stack height threshold, remove current stack air release thresholds	50	0	0	0	0	0	0	0
3 (45m, 1x)	Reduce stack height threshold to 45m, no changes to current stack air release thresholds	45	5	5	0.15	0.25	5	5	5
4 (40m, 1x)	Reduce stack height threshold to 40m, no changes to current stack air release thresholds	40	5	5	0.15	0.25	5	5	5
5 (35m, 1x)	Reduce stack height threshold to 35m, no changes to current stack air release thresholds	35	5	5	0.15	0.25	5	5	5
6 (30m, 1x)	Reduce stack height threshold to 30m, no changes to current stack air release thresholds	30	5	5	0.15	0.25	5	5	5
7 (20m, 1x)	Reduce stack height threshold to 20m, no changes to current stack air release thresholds	20	5	5	0.15	0.25	5	5	5
8 (15m, 1x)	Reduce stack height threshold to 15m, no changes to current stack air release thresholds	15	5	5	0.15	0.25	5	5	5
9 (10m, 1x)	Reduce stack height threshold to 10m, no changes to current stack air release thresholds	10	5	5	0.15	0.25	5	5	5
10 (0m, 1x)	Remove stack height threshold, no changes to current stack air release thresholds	0	5	5	0.15	0.25	5	5	5
11 (50m or CEMS, 1x)	50m or CEMS installed, no changes to current stack air release thresholds	50	5	5	0.15	0.25	5	5	5
12 (40m or CEMS, 1x)	Reduce stack height threshold to 40m or CEMS installed, no changes to current stack air release thresholds	40	5	5	0.15	0.25	5	5	5
13 (30m or CEMS, 1x)	Reduce stack height threshold to 30m or CEMS installed, no changes to current stack air release thresholds	30	5	5	0.15	0.25	5	5	5
14 (30m, 5x)	Reduce stack height threshold to 30m, 5x current stack air release thresholds	30	25	25	0.75	1.25	25	25	25
15 (30m, 10x)	Reduce stack height threshold to 30m, 10x current stack air release thresholds	30	50	50	1.5	2.5	50	50	50
16 (30m, 20x)	Reduce stack height threshold to 30m, 20x current stack air release thresholds	30	100	100	3	5	100	100	100
17 (20m, 5x)	Reduce stack height threshold to 20m, 5x current stack air release thresholds	20	25	25	0.75	1.25	25	25	25
18 (20m, 10x)	Reduce stack height threshold to 20m, 10x current stack air release thresholds	20	50	50	1.5	2.5	50	50	50
19 (20m, 20x)	Reduce stack height threshold to 20m, 20x current stack air release thresholds	20	100	100	3	5	100	100	100
20 (15m, 5x)	Reduce stack height threshold to 15m, 5x current stack air release thresholds	15	25	25	0.75	1.25	25	25	25
21 (15m, 10x)	Reduce stack height threshold to 15m, 10x current stack air release thresholds	15	50	50	1.5	2.5	50	50	50
22 (15m, 20x)	Reduce stack height threshold to 15m, 20x current stack air release thresholds	15	100	100	3	5	100	100	100
23 (10m, 5x)	Reduce stack height threshold to 10m, 5x current stack air release thresholds	10	25	25	0.75	1.25	25	25	25
24 (10m, 10x)	Reduce stack height threshold to 10m, 10x current stack air release thresholds	10	50	50	1.5	2.5	50	50	50
25 (10m, 20x)	Reduce stack height threshold to 10m, 20x current stack air release thresholds	10	100	100	3	5	100	100	100
26 (0m, 5x)	Remove stack height threshold, 5x current stack air release thresholds	0	25	25	0.75	1.25	25	25	25
27 (0m, 10x)	Remove stack height threshold, 10x current stack air release thresholds	0	50	50	1.5	2.5	50	50	50
28 (0m, 20x)	Remove stack height threshold, 20x current stack air release thresholds	0	100	100	3	5	100	100	100
29 (30m, 50t trigger)	Reduce stack height threshold to 30m, trigger one at 50t, report all	30	50						
30 (30m, 75t trigger)	Reduce stack height threshold to 30m, trigger one at 75t, report all	30	75						
31 (30m, 100t trigger)	Reduce stack height threshold to 30m, trigger one at 100t, report all	30	100						
32 (15m, 50t trigger)	Reduce stack height threshold to 15m, trigger one at 50t, report all	15	50						

Scenario number/ name	Description	Stack height threshold (m)	Stack air release threshold (tonnes)						
			NO_2	SO_2	$PM_{2.5}$	PM_{10}	TPM	CO	VOCs
33 (15m, 75t trigger)	Reduce stack height threshold to 15m, trigger one at 75t, report all	15	75						
34 (15m, 100t trigger)	Reduce stack height threshold to 15m, trigger one at 100t, report all	15	100						
35 (0m, 50t trigger)	Remove stack height threshold, trigger one at 50t, report all	0	50						
36 (0m, 75t trigger)	Remove stack height threshold, trigger one at 75t, report all	0	75						
37 (0m, 100t trigger)	Remove stack height threshold, trigger one at 100t, report all	0	100						
38 (30m, ind. triggers)	Reduce stack height threshold to 30m, trigger one, report all, individual trigger thresholds for each CAC	30	0.5	25	0.005	0.5	50	0.5	50
39 (15m, ind. triggers	Reduce stack height threshold to 15m, trigger one, report all, individual trigger thresholds for each CAC	15	75	125	0.3	15	250	75	75
40 (0m, ind. triggers)	Remove stack height threshold, trigger one, report all, individual trigger thresholds for each CAC	0	125	250	5	15	250	125	125

Table 41. Stack coverage, release coverage, extrapolated number of stacks that would be required to report in Canada and number of stack air release threshold calculations for scenarios to determine the best type of threshold

Scenario number	Stack coverage							Release coverage							Extrapolated number of stacks that would be required to report in Canada								Increase in number of stack air release threshold calculations**
	NO_2	SO_2	$PM_{2.5}$	PM_{10}	TPM*	CO	VOCs	NO_2	SO_2	$PM_{2.5}$	PM_{10}	TPM*	CO	VOCs	NO_2	SO_2	$PM_{2.5}$	PM_{10}	TPM*	CO	VOCs	Total	
1	5.2	3.7	3.9	3.9	2.1	4.5	1.5	67.4	93.0	48.6	51.6	54.9	55.4	12.6	597	470	672	663	502	600	475	3 979	1.0
2	7.1	8.4	5.4	5.4	7.7	7.2	4.7	67.5	93.1	48.7	51.7	55.6	55.5	13.6	821	1 084	937	918	1 858	968	1 517	8 104	0***
3	6.0	4.0	4.7	4.7	2.6	5.2	1.7	69.8	94.0	52.3	54.6	77.6	58.0	14.2	692	508	807	796	625	691	537	4 656	1.2
4	7.0	4.4	5.7	5.8	2.7	6.0	1.9	72.0	95.1	56.1	57.9	77.7	60.6	16.3	809	565	992	978	643	802	630	5 419	1.6
5	7.7	4.6	6.6	6.6	3.2	6.5	2.2	73.8	96.0	58.9	60.4	79.8	64.9	18.2	882	597	1 146	1 130	775	877	711	6 120	1.9
6	9.2	5.2	8.7	8.8	3.9	7.8	2.7	76.5	96.9	64.0	65.3	82.4	69.0	22.5	1 057	667	1 507	1 489	951	1 045	875	7 590	2.6
7	12.9	6.1	14.0	14.1	5.7	10.8	3.9	82.3	98.6	74.3	75.1	89.2	81.9	32.2	1 479	786	2 421	2 399	1 383	1 454	1 273	11 196	5.2
8	15.3	6.6	18.1	18.2	6.4	13.0	5.4	85.1	99.0	81.0	81.2	91.8	85.7	41.2	1 763	846	3 142	3 096	1 541	1 743	1 744	13 875	7.9
9	20.3	7.1	25.7	26.0	7.1	17.4	8.2	91.2	99.3	90.4	90.4	94.1	91.1	58.2	2 335	915	4 462	4 416	1 717	2 328	2 646	18 820	14.3
10	28.9	7.6	34.3	33.3	7.4	24.4	11.9	98.0	99.6	98.6	98.5	95.4	97.4	85.2	3 330	976	5 945	5 668	1 788	3 275	3 866	24 848	24.0
11	6.7	3.9	5.0	4.9	2.8	5.4	1.6	70.8	93.7	52.8	54.5	56.9	58.2	14.2	768	507	871	840	669	730	543	4 927	1.3
12	8.0	4.6	6.5	6.4	3.3	6.6	1.9	73.7	95.5	58.3	59.5	79.6	62.0	17.6	917	589	1 127	1 095	801	883	667	6 080	1.8
13	9.8	5.3	9.2	9.2	4.1	8.2	2.6	77.7	97.2	65.3	66.3	83.7	69.8	23.8	1 131	684	1 598	1 567	1 004	1 104	898	7 985	2.8
14	5.5	3.5	5.6	5.5	1.8	4.2	0.8	75.1	96.6	63.2	64.4	79.5	67.1	16.6	631	449	972	938	432	561	255	4 239	2.6
15	3.9	2.9	4.3	4.1	1.3	3.0	0.4	73.3	96.2	62.1	63.3	77.6	65.3	12.3	450	373	737	701	317	397	117	3 091	2.6
16	2.7	2.4	3.2	3.0	1.1	2.0	0.1	70.7	95.5	60.4	61.4	75.6	62.4	7.8	314	308	549	511	255	263	41	2 240	2.6
17	6.8	3.9	8.2	8.0	2.4	5.2	1.1	80.0	98.1	72.8	73.3	84.9	79.2	23.5	785	503	1 413	1 356	581	704	364	5 706	5.2
18	4.7	3.2	5.8	5.6	1.5	3.6	0.5	77.7	97.6	70.9	71.4	80.9	76.7	17.5	545	408	1 010	957	361	476	166	3 923	5.2
19	3.1	2.5	4.1	3.9	1.2	2.2	0.2	74.1	96.8	68.3	68.6	78.5	72.8	11.1	360	327	709	660	282	300	59	2 697	5.2
20	7.6	4.1	9.9	9.7	2.5	5.9	1.4	82.3	98.4	78.8	78.8	87.0	82.2	29.1	876	525	1 722	1 649	616	786	456	6 632	7.9
21	5.2	3.3	6.9	6.6	1.6	3.8	0.6	79.6	97.9	76.5	76.3	82.9	79.2	21.4	595	421	1 197	1 128	388	513	201	4 442	7.9
22	3.3	2.6	4.7	4.4	1.2	2.4	0.2	75.5	97.0	73.1	72.7	80.2	74.9	13.9	383	333	815	754	299	317	74	2 975	7.9
23	9.2	4.2	12.7	12.5	2.7	7.0	2.0	87.2	98.6	87.0	86.7	88.6	86.0	39.6	1 058	543	2 209	2 134	643	936	636	8 159	14.3
24	6.1	3.3	8.4	8.1	1.6	4.2	0.8	83.8	98.0	83.7	83.1	84.2	82.0	28.6	705	428	1 464	1 382	396	568	270	5 215	14.3
25	3.8	2.6	5.5	5.2	1.3	2.5	0.3	78.7	97.1	79.1	78.3	81.5	76.9	18.7	441	336	946	877	308	332	102	3 342	14.3
26	11.0	4.3	15.2	15.0	2.8	8.4	2.9	91.5	98.9	93.8	93.4	89.7	89.6	58.1	1 265	558	2 643	2 549	669	1 127	923	9 735	24.0
27	7.0	3.4	9.7	9.5	1.7	4.7	1.2	87.0	98.3	89.6	89.0	85.0	84.2	42.5	806	435	1 689	1 612	414	627	403	5 986	24.0
28	4.2	2.6	6.1	5.8	1.3	2.6	0.5	80.8	97.3	84.0	83.0	82.1	78.2	27.5	480	339	1 059	988	317	348	149	3 679	24.0
29	5.1	6.2	3.2	3.2	8.9	5.2	3.2	74.0	96.6	53.8	56.1	80.5	66.8	19.2	584	790	562	548	2 158	694	1 050	6 386	2.6
30	4.2	5.1	2.7	2.7	7.5	4.2	2.7	72.7	96.3	51.1	53.9	79.8	65.7	17.6	479	653	466	454	1 823	568	858	5 301	2.6
31	3.7	4.5	2.4	2.4	6.1	3.7	2.3	71.7	96.1	49.0	52.2	78.5	64.8	16.3	420	575	413	401	1 488	498	747	4 543	2.6
32	6.9	8.2	4.5	4.5	16.7	7.1	4.4	80.6	98.5	60.9	62.5	88.8	81.3	29.9	798	1 057	776	757	4 042	948	1 439	9 818	7.9
33	5.4	6.5	3.5	3.5	13.6	5.5	3.5	78.5	98.2	56.5	58.8	86.9	79.5	26.5	624	834	610	594	3 303	741	1 119	7 824	7.9
34	4.6	5.6	3.0	3.0	11.0	4.7	2.9	76.9	97.8	53.7	56.5	85.1	78.1	24.1	531	713	523	509	2 660	630	946	6 512	7.9
35	9.6	10.7	6.2	6.2	23.9	9.7	6.2	88.4	99.0	66.0	67.4	91.4	87.4	52.0	1 100	1 379	1 083	1 055	5 795	1 307	2 002	13 722	24.0
36	7.1	8.0	4.6	4.6	19.1	7.2	4.5	84.9	98.5	60.4	62.5	89.2	84.3	43.7	811	1 032	799	778	4 624	963	1 458	10 466	24.0
37	5.7	6.6	3.8	3.7	15.0	5.8	3.6	82.3	98.2	57.0	59.5	87.4	82.2	38.3	660	852	653	636	3 637	784	1 179	8 402	24.0
38	14.2	16.6	12.7	12.7	17.6	14.3	9.4	76.7	97.1	64.1	65.5	83.4	69.3	23.6	1 629	2 134	2 209	2 158	4 254	1 923	3 049	17 356	2.6
39	14.0	16.4	14.8	14.6	25.3	14.1	9.7	83.1	98.6	80.5	79.7	86.9	83.7	33.6	1 606	2 111	2 571	2 485	6 130	1 895	3 132	19 928	7.9
40	6.8	8.0	5.8	5.8	13.6	6.9	4.6	81.9	97.4	80.6	79.4	79.8	82.5	38.4	781	1 027	1 012	986	3 303	924	1 496	9 529	24.0

Notes: * Results for TPM are based on Alberta stacks only. The US data sets did not include TPM data.
** This estimate is based on a hypothetical total of 10000 stacks at NPRI facilities in Canada.
*** 0 threshold calculations, but 2918 release quantities would still have to be calculated and reported.

Table 42. Stack coverage, release coverage and extrapolated number of stack-substance reports required with various stack height and stack air release thresholds – NO_2

Release threshold (tonnes)	Stack coverage				Release coverage				Extrapolated number of stack-substance reports required in Canada			
	10m	15m	20m	25m	10m	15m	20m	25m	10m	15m	20m	25m
0.15	48.4	31.4	23.5	17.6	92.5	85.9	82.8	79.6	5 563	3 616	2 707	2 020
0.25	45.1	29.9	22.6	17.0	92.5	85.9	82.8	79.6	5 184	3 437	2 595	1 953
0.3	43.7	29.2	22.1	16.7	92.5	85.9	82.8	79.6	5 032	3 362	2 545	1 921
0.5	39.6	27.0	20.7	15.8	92.4	85.9	82.8	79.6	4 557	3 101	2 381	1 821
0.75	36.5	25.3	19.7	15.2	92.3	85.9	82.8	79.6	4 195	2 910	2 261	1 749
1	33.9	23.7	18.6	14.6	92.3	85.8	82.7	79.6	3 899	2 729	2 143	1 675
1.5	30.5	21.7	17.3	13.7	92.1	85.7	82.7	79.6	3 503	2 499	1 991	1 578
2	27.9	20.2	16.3	13.0	92.0	85.7	82.6	79.5	3 210	2 323	1 875	1 498
2.5	26.1	19.1	15.5	12.5	91.9	85.6	82.6	79.5	3 000	2 193	1 785	1 440
3	24.6	18.1	14.8	12.1	91.7	85.5	82.5	79.4	2 828	2 078	1 705	1 387
5	20.3	15.3	12.9	10.7	91.2	85.1	82.3	79.3	2 335	1 763	1 479	1 230
7.5	16.9	13.1	11.2	9.5	90.6	84.7	81.9	79.0	1 945	1 504	1 284	1 090
10	14.7	11.5	10.0	8.6	90.0	84.3	81.6	78.8	1 688	1 324	1 146	985
15	12.0	9.6	8.5	7.4	88.9	83.6	81.0	78.3	1 380	1 108	977	854
20	10.3	8.4	7.5	6.6	88.0	82.9	80.5	77.9	1 187	969	863	762
25	9.2	7.6	6.8	6.1	87.2	82.3	80.0	77.5	1 058	876	785	697
30	8.3	6.9	6.3	5.6	86.4	81.7	79.5	77.1	955	796	720	643
40	7.0	5.9	5.4	4.8	85.1	80.6	78.6	76.3	808	676	618	557
50	6.1	5.2	4.7	4.3	83.8	79.6	77.7	75.5	705	595	545	492
60	5.4	4.6	4.2	3.8	82.5	78.6	76.8	74.7	621	525	486	442
70	4.9	4.2	3.9	3.6	81.5	77.7	76.1	74.1	563	478	446	409
75	4.7	4.0	3.7	3.4	81.0	77.3	75.7	73.8	536	456	426	393
80	4.5	3.8	3.6	3.3	80.5	76.9	75.4	73.6	513	439	412	380
90	4.1	3.6	3.3	3.1	79.6	76.2	74.7	73.0	474	408	383	357
100	3.8	3.3	3.1	2.9	78.7	75.5	74.1	72.5	441	383	360	336
125	3.3	2.9	2.8	2.6	76.7	74.1	72.8	71.3	376	334	317	297
150	2.8	2.5	2.4	2.3	74.8	72.5	71.4	70.1	325	293	279	264
175	2.5	2.3	2.2	2.1	73.1	71.2	70.2	69.1	285	264	253	242
200	2.2	2.1	2.0	1.9	71.6	70.0	69.1	68.0	257	240	231	221
250	1.9	1.8	1.7	1.7	69.2	67.9	67.2	66.2	218	206	200	191
300	1.6	1.6	1.5	1.5	66.9	65.9	65.3	64.5	187	179	175	169

Table 43. Stack coverage, release coverage and extrapolated number of stack-substance reports required with various stack height and stack air release thresholds – SO_2

Release threshold (tonnes)	Stack coverage				Release coverage				Extrapolated number of stack-substance reports required in Canada			
	10m	15m	20m	25m	10m	15m	20m	25m	10m	15m	20m	25m
0.15	21.0	17.2	14.7	12.6	99.6	99.2	98.8	98.0	2 698	2 207	1 886	1 616
0.25	18.7	15.5	13.5	11.6	99.6	99.2	98.8	98.0	2 407	1 996	1 730	1 494
0.3	17.8	14.9	12.9	11.2	99.6	99.2	98.8	98.0	2 291	1 909	1 660	1 442
0.5	15.5	13.1	11.5	10.1	99.6	99.2	98.8	98.0	1 988	1 683	1 481	1 298
0.75	13.7	11.8	10.5	9.3	99.5	99.2	98.8	98.0	1 763	1 517	1 354	1 199
1	12.6	10.9	9.8	8.8	99.5	99.2	98.8	98.0	1 614	1 407	1 263	1 126
1.5	11.0	9.7	8.8	8.0	99.5	99.2	98.8	97.9	1 417	1 250	1 136	1 022
2	10.0	8.9	8.2	7.4	99.4	99.1	98.7	97.9	1 283	1 148	1 049	947
2.5	9.2	8.3	7.6	6.9	99.4	99.1	98.7	97.9	1 183	1 066	977	886
3	8.6	7.7	7.1	6.5	99.4	99.1	98.7	97.9	1 099	995	915	833
5	7.1	6.6	6.1	5.6	99.3	99.0	98.6	97.8	915	846	786	724
7.5	6.2	5.9	5.5	5.1	99.2	98.9	98.5	97.7	801	752	705	653
10	5.7	5.4	5.1	4.7	99.1	98.8	98.5	97.7	727	691	652	608
15	5.0	4.8	4.6	4.3	98.9	98.7	98.4	97.6	642	616	586	550
20	4.5	4.4	4.2	3.9	98.8	98.6	98.2	97.5	582	561	536	505
25	4.2	4.1	3.9	3.7	98.6	98.4	98.1	97.4	543	525	503	475
30	3.9	3.8	3.7	3.5	98.5	98.3	98.0	97.3	505	491	471	447
40	3.6	3.5	3.4	3.2	98.2	98.1	97.8	97.1	457	447	431	411
50	3.3	3.3	3.2	3.0	98.0	97.9	97.6	96.9	428	421	408	389
60	3.1	3.1	3.0	2.8	97.8	97.7	97.4	96.7	398	393	381	365
70	2.9	2.9	2.8	2.7	97.6	97.5	97.2	96.6	375	371	361	347
75	2.9	2.8	2.8	2.6	97.5	97.4	97.2	96.5	368	363	355	340
80	2.8	2.8	2.7	2.6	97.4	97.3	97.1	96.4	360	356	348	334
90	2.7	2.7	2.6	2.5	97.3	97.2	96.9	96.3	347	343	337	324
100	2.6	2.6	2.5	2.5	97.1	97.0	96.8	96.2	336	333	327	316
125	2.4	2.4	2.3	2.3	96.6	96.5	96.4	95.8	307	305	300	291
150	2.2	2.2	2.2	2.1	96.2	96.1	95.9	95.4	285	283	280	271
175	2.1	2.1	2.1	2.0	95.8	95.7	95.6	95.0	269	267	264	257
200	2.0	2.0	2.0	1.9	95.4	95.4	95.3	94.7	256	255	253	247
250	1.8	1.8	1.8	1.8	94.6	94.6	94.5	94.0	232	231	230	226
300	1.7	1.7	1.7	1.6	94.0	93.9	93.8	93.4	215	215	214	210

Table 44. Stack coverage, release coverage and extrapolated number of stack-substance reports required with various stack height and stack air release thresholds – $PM_{2.5}$

Release threshold (tonnes)	Stack coverage				Release coverage				Extrapolated number of stack-substance reports required in Canada			
	10m	15m	20m	25m	10m	15m	20m	25m	10m	15m	20m	25m
0.15	25.7	18.1	14.0	10.9	90.4	81.0	74.3	68.5	4 462	3 142	2 421	1 883
0.25	21.3	15.4	12.1	9.6	89.8	80.6	74.1	68.3	3 688	2 675	2 099	1 662
0.3	19.8	14.5	11.5	9.1	89.5	80.4	73.9	68.2	3 431	2 518	1 991	1 585
0.5	15.7	11.9	9.6	7.8	88.3	79.7	73.4	67.8	2 724	2 064	1 663	1 346
0.75	12.7	9.9	8.2	6.7	87.0	78.8	72.8	67.3	2 209	1 722	1 413	1 156
1	10.9	8.6	7.2	5.9	85.8	78.0	72.1	66.9	1 887	1 497	1 242	1 025
1.5	8.4	6.9	5.8	4.9	83.7	76.5	70.9	65.9	1 464	1 197	1 010	844
2	7.1	5.9	5.1	4.3	82.0	75.2	70.0	65.2	1 234	1 030	879	744
2.5	6.2	5.2	4.5	3.9	80.5	74.1	69.1	64.5	1 067	906	781	668
3	5.5	4.7	4.1	3.5	79.1	73.1	68.3	63.9	946	815	709	613
5	3.9	3.4	3.0	2.7	74.6	69.4	65.3	61.5	668	589	524	466
7.5	2.8	2.5	2.3	2.1	70.0	65.4	62.0	58.8	487	435	396	360
10	2.2	2.0	1.9	1.7	66.4	62.4	59.4	56.6	388	351	324	299
15	1.6	1.5	1.4	1.3	60.6	57.5	54.9	52.6	274	254	236	220
20	1.2	1.1	1.1	1.0	55.9	53.2	51.0	49.0	209	195	183	171
25	1.0	0.9	0.8	0.8	51.8	49.6	47.7	45.9	165	156	147	138
30	0.8	0.7	0.7	0.7	48.4	46.4	44.9	43.3	136	129	122	115
40	0.6	0.5	0.5	0.5	43.1	41.5	40.2	39.0	99	94	90	86
50	0.4	0.4	0.4	0.4	38.9	37.7	36.6	35.7	76	74	71	68
60	0.3	0.3	0.3	0.3	35.2	34.1	33.3	32.7	60	58	56	55
70	0.3	0.3	0.3	0.3	32.0	31.1	30.5	30.0	48	47	45	45
75	0.3	0.2	0.2	0.2	30.8	29.9	29.3	28.9	44	43	42	41
80	0.2	0.2	0.2	0.2	29.8	28.9	28.5	28.1	41	40	39	38
90	0.2	0.2	0.2	0.2	27.7	26.9	26.5	26.1	35	34	33	33
100	0.2	0.2	0.2	0.2	26.0	25.3	25.0	24.7	31	30	30	29
125	0.1	0.1	0.1	0.1	21.9	21.3	21.0	20.7	22	21	21	21
150	0.1	0.1	0.1	0.1	18.9	18.2	18.0	17.7	16	16	16	15
175	0.1	0.1	0.1	0.1	16.7	16.0	15.8	15.6	13	13	12	12
200	0.1	0.1	0.1	0.1	14.6	14.0	13.9	13.7	10	10	10	10
250	0.0	0.0	0.0	0.0	11.8	11.4	11.4	11.2	8	7	7	7
300	0.0	0.0	0.0	0.0	9.5	9.2	9.2	9.0	5	5	5	5

Table 45. Stack coverage, release coverage and extrapolated number of stack-substance reports required with various stack height and stack air release thresholds – PM_{10}

Release threshold (tonnes)	Stack coverage				Release coverage				Extrapolated number of stack-substance reports required in Canada			
	10m	15m	20m	25m	10m	15m	20m	25m	10m	15m	20m	25m
0.15	30.4	20.8	15.9	12.2	81.4	81.4	75.2	69.7	5 168	3 532	2 698	2 074
0.25	26.0	18.2	14.1	11.0	81.2	81.2	75.1	69.6	4 416	3 096	2 399	1 870
0.3	24.3	17.2	13.4	10.5	81.1	81.1	75.0	69.5	4 136	2 923	2 283	1 784
0.5	19.9	14.4	11.4	9.1	80.6	80.6	74.6	69.2	3 392	2 455	1 944	1 549
0.75	16.5	12.2	9.8	7.9	80.0	80.0	74.2	68.9	2 800	2 078	1 673	1 350
1	14.3	10.8	8.8	7.2	79.4	79.4	73.8	68.6	2 427	1 838	1 500	1 221
1.5	11.1	8.7	7.2	6.0	78.2	78.2	72.9	67.9	1 885	1 485	1 230	1 014
2	9.3	7.5	6.3	5.2	77.2	77.2	72.1	67.3	1 578	1 269	1 068	890
2.5	8.1	6.6	5.6	4.7	76.3	76.3	71.4	66.8	1 382	1 128	957	804
3	7.2	6.0	5.1	4.4	75.5	75.5	70.8	66.4	1 231	1 021	873	740
5	5.2	4.4	3.9	3.4	72.7	72.7	68.6	64.6	877	754	660	575
7.5	3.8	3.3	3.0	2.7	69.6	69.6	66.0	62.6	642	564	507	453
10	3.0	2.7	2.4	2.2	67.0	67.0	63.8	60.8	511	456	415	377
15	2.2	2.0	1.8	1.7	63.0	63.0	60.4	57.7	367	335	309	284
20	1.7	1.5	1.4	1.3	59.6	59.6	57.3	55.0	284	262	245	227
25	1.3	1.3	1.2	1.1	56.7	56.7	54.6	52.6	230	214	201	187
30	1.1	1.1	1.0	0.9	54.2	54.2	52.5	50.6	194	181	172	161
40	0.9	0.8	0.8	0.7	50.4	50.4	48.8	47.4	148	140	133	126
50	0.7	0.7	0.6	0.6	47.1	47.1	45.8	44.6	119	114	108	103
60	0.6	0.6	0.5	0.5	44.4	44.4	43.3	42.4	100	96	91	88
70	0.5	0.5	0.5	0.4	41.8	41.8	40.8	40.1	84	80	77	76
75	0.5	0.4	0.4	0.4	40.5	40.5	39.7	39.1	77	74	72	70
80	0.4	0.4	0.4	0.4	39.6	39.6	39.0	38.4	72	70	68	67
90	0.4	0.4	0.4	0.3	37.6	37.6	37.1	36.5	63	61	60	59
100	0.3	0.3	0.3	0.3	36.2	36.2	35.8	35.2	57	56	55	54
125	0.3	0.2	0.2	0.2	32.0	32.0	31.6	31.1	43	41	41	40
150	0.2	0.2	0.2	0.2	28.9	28.9	28.6	28.1	34	33	33	32
175	0.2	0.2	0.2	0.1	25.9	25.9	25.6	25.2	27	26	26	25
200	0.1	0.1	0.1	0.1	23.9	23.9	23.7	23.3	23	22	22	21
250	0.1	0.1	0.1	0.1	20.2	20.2	20.1	19.8	17	16	16	16
300	0.1	0.1	0.1	0.1	17.4	17.4	17.4	17.2	13	12	12	12

Table 46. Stack coverage, release coverage and extrapolated number of stack-substance reports required with various stack height and stack air release thresholds – TPM

Release threshold (tonnes)	Stack coverage				Release coverage				Extrapolated number of stack-substance reports required in Canada			
	10m	15m	20m	25m	10m	15m	20m	25m	10m	15m	20m	25m
0.15	37.2	30.3	25.5	20.4	98.1	95.3	92.1	86.9	9 001	7 345	6 174	4 932
0.25	32.9	27.8	23.6	18.9	98.0	95.2	92.1	86.8	7 953	6 720	5 716	4 580
0.3	30.7	26.3	22.6	18.0	98.0	95.1	92.0	86.8	7 424	6 367	5 460	4 359
0.5	25.4	22.2	19.2	15.5	97.7	95.0	91.9	86.7	6 147	5 381	4 641	3 743
0.75	21.9	19.3	16.7	13.4	97.5	94.7	91.7	86.5	5 293	4 659	4 051	3 241
1	19.1	17.0	14.8	11.8	97.2	94.5	91.5	86.4	4 615	4 104	3 584	2 862
1.5	15.1	13.3	11.7	9.6	96.6	93.9	91.0	86.0	3 664	3 215	2 836	2 325
2	12.2	10.5	9.3	7.5	96.0	93.4	90.5	85.6	2 959	2 545	2 246	1 814
2.5	10.7	9.2	8.2	6.7	95.6	93.0	90.2	85.4	2 580	2 237	1 990	1 612
3	9.3	8.3	7.3	5.9	95.1	92.7	89.9	85.1	2 246	1 999	1 761	1 427
5	7.1	6.4	5.7	4.5	94.1	91.8	89.2	84.5	1 717	1 541	1 383	1 101
7.5	5.5	5.0	4.7	3.8	93.0	90.8	88.5	84.0	1 339	1 207	1 127	925
10	4.5	4.2	4.0	3.3	92.0	90.0	87.8	83.4	1 101	1 013	969	793
15	3.3	3.2	3.1	2.5	90.2	88.6	86.4	82.3	810	784	740	616
20	2.8	2.7	2.6	2.2	89.1	87.5	85.4	81.7	687	661	625	537
25	2.7	2.5	2.4	2.1	88.6	87.0	84.9	81.3	643	616	581	502
30	2.5	2.4	2.2	1.9	88.0	86.4	84.3	80.6	599	572	537	458
40	2.0	1.9	1.7	1.6	85.9	84.3	82.3	79.5	476	449	423	388
50	1.6	1.6	1.5	1.3	84.2	82.9	80.9	78.1	396	388	361	326
60	1.5	1.4	1.3	1.2	83.0	81.8	79.8	77.2	352	343	317	291
70	1.3	1.3	1.2	1.2	82.2	81.0	79.3	76.9	326	317	299	282
75	1.3	1.3	1.2	1.2	82.2	81.0	79.3	76.9	326	317	299	282
80	1.3	1.3	1.2	1.1	81.9	80.7	78.9	76.6	317	308	291	273
90	1.3	1.3	1.2	1.1	81.9	80.7	78.9	76.6	317	308	291	273
100	1.3	1.2	1.2	1.1	81.5	80.2	78.5	76.2	308	299	282	264
125	1.1	1.1	1.0	0.9	79.0	77.8	76.1	73.8	264	255	238	220
150	1.1	1.0	0.9	0.9	78.5	77.3	75.6	73.2	255	247	229	211
175	1.0	0.9	0.9	0.8	77.0	75.8	74.8	72.5	238	229	220	203
200	0.8	0.7	0.7	0.7	72.1	70.9	69.9	68.4	185	176	167	159
250	0.6	0.6	0.6	0.5	68.2	67.0	67.0	65.5	150	141	141	132
300	0.5	0.5	0.5	0.5	65.9	65.9	65.9	64.4	132	132	132	123

Table 47. Stack coverage, release coverage and extrapolated number of stack-substance reports required with various stack height and stack air release thresholds – CO

Release threshold (tonnes)	Stack coverage				Release coverage				Extrapolated number of stack-substance reports required in Canada			
	10m	15m	20m	25m	10m	15m	20m	25m	10m	15m	20m	25m
0.15	44.9	29.7	22.5	16.8	92.7	86.7	82.7	76.9	6 013	3 980	3 015	2 257
0.25	41.3	27.9	21.3	16.1	92.7	86.7	82.7	76.9	5 540	3 734	2 854	2 154
0.3	39.9	27.1	20.7	15.7	92.7	86.7	82.7	76.9	5 355	3 629	2 781	2 107
0.5	36.2	24.9	19.4	14.8	92.6	86.7	82.7	76.9	4 847	3 334	2 594	1 983
0.75	32.9	22.9	18.1	14.0	92.6	86.6	82.6	76.8	4 411	3 074	2 424	1 875
1	30.5	21.5	17.0	13.3	92.5	86.6	82.6	76.8	4 086	2 876	2 283	1 785
1.5	27.1	19.4	15.6	12.4	92.3	86.4	82.5	76.8	3 634	2 598	2 088	1 658
2	24.7	17.8	14.4	11.6	92.1	86.3	82.4	76.7	3 311	2 391	1 937	1 560
2.5	22.9	16.7	13.6	11.1	92.0	86.2	82.4	76.7	3 074	2 242	1 827	1 486
3	21.3	15.7	12.9	10.6	91.8	86.1	82.3	76.6	2 861	2 108	1 732	1 419
5	17.4	13.0	10.8	9.1	91.1	85.7	81.9	76.4	2 328	1 743	1 454	1 216
7.5	14.4	11.0	9.3	7.9	90.4	85.2	81.6	76.1	1 931	1 472	1 247	1 064
10	12.4	9.6	8.2	7.1	89.6	84.7	81.2	75.8	1 663	1 284	1 105	954
15	9.8	7.8	6.8	6.0	88.3	83.7	80.5	75.2	1 316	1 047	916	801
20	8.1	6.6	5.9	5.2	87.1	82.9	79.8	74.6	1 088	891	790	698
25	7.0	5.9	5.2	4.7	86.0	82.2	79.2	74.1	936	786	704	627
30	6.2	5.3	4.8	4.2	85.1	81.5	78.6	73.6	825	706	639	570
40	5.0	4.4	4.0	3.7	83.4	80.2	77.6	72.8	668	589	542	490
50	4.2	3.8	3.6	3.2	82.0	79.2	76.7	72.0	568	513	476	435
60	3.7	3.4	3.2	2.9	80.9	78.2	75.8	71.3	500	458	427	391
70	3.3	3.0	2.9	2.7	79.7	77.2	75.0	70.6	440	408	384	356
75	3.1	2.9	2.7	2.5	79.0	76.7	74.5	70.2	412	386	364	338
80	2.9	2.8	2.6	2.4	78.5	76.3	74.1	69.8	391	369	348	324
90	2.7	2.5	2.4	2.3	77.7	75.6	73.5	69.3	359	340	323	303
100	2.5	2.4	2.2	2.1	76.9	74.9	72.8	68.7	332	317	300	282
125	2.1	2.0	1.9	1.8	75.2	73.4	71.4	67.4	282	273	259	244
150	1.9	1.8	1.7	1.6	73.8	72.0	70.1	66.3	249	241	230	220
175	1.6	1.6	1.5	1.5	72.4	70.7	68.9	65.2	221	215	206	198
200	1.5	1.5	1.4	1.4	71.1	69.7	68.0	64.3	200	197	189	182
250	1.3	1.3	1.2	1.2	69.0	67.6	66.0	62.4	170	168	161	155
300	1.1	1.1	1.1	1.0	67.2	65.8	64.3	60.8	148	147	141	136

Table 48. Stack coverage, release coverage and extrapolated number of stack-substance reports required with various stack height and stack air release thresholds – VOCs

Release threshold (tonnes)	Stack coverage				Release coverage				Extrapolated number of stack-substance reports required in Canada			
	10m	15m	20m	25m	10m	15m	20m	25m	10m	15m	20m	25m
0.15	34.3	20.5	13.9	10.5	67.7	46.8	35.8	29.4	11 088	6 624	4 503	3 396
0.25	30.3	18.3	12.5	9.5	67.5	46.6	35.8	29.3	9 820	5 909	4 037	3 084
0.3	28.9	17.5	11.9	9.2	67.4	46.6	35.7	29.3	9 361	5 650	3 864	2 961
0.5	24.9	15.2	10.5	8.1	66.9	46.3	35.6	29.2	8 062	4 913	3 384	2 629
0.75	21.9	13.4	9.2	7.2	66.4	46.0	35.4	29.0	7 099	4 340	2 989	2 340
1	19.8	12.2	8.4	6.6	65.9	45.7	35.2	28.9	6 416	3 952	2 730	2 143
1.5	16.8	10.5	7.2	5.7	64.9	45.1	34.8	28.6	5 436	3 385	2 345	1 852
2	14.5	9.1	6.4	5.1	63.8	44.5	34.3	28.2	4 690	2 948	2 058	1 635
2.5	12.8	8.1	5.7	4.6	62.7	43.9	33.9	27.9	4 133	2 625	1 848	1 473
3	11.5	7.3	5.2	4.2	61.7	43.3	33.6	27.7	3 709	2 378	1 689	1 357
5	8.2	5.4	3.9	3.2	58.2	41.2	32.2	26.6	2 646	1 744	1 273	1 033
7.5	6.0	4.0	3.0	2.5	54.5	38.9	30.6	25.4	1 946	1 309	981	801
10	4.7	3.2	2.5	2.0	51.3	36.9	29.3	24.3	1 525	1 047	802	663
15	3.2	2.2	1.7	1.4	46.2	33.5	26.8	22.3	1 038	722	563	466
20	2.4	1.7	1.4	1.1	42.6	31.1	25.0	20.7	792	558	441	365
25	2.0	1.4	1.1	0.9	39.6	29.1	23.5	19.5	636	456	364	302
30	1.6	1.2	0.9	0.8	36.8	27.2	22.1	18.4	515	375	305	254
40	1.1	0.8	0.7	0.6	32.4	24.2	19.7	16.4	368	272	224	188
50	0.8	0.6	0.5	0.4	28.6	21.4	17.5	14.5	270	201	166	137
60	0.6	0.5	0.4	0.3	25.8	19.3	15.7	13.1	210	155	129	107
70	0.5	0.4	0.3	0.3	23.7	17.6	14.3	11.9	172	124	103	87
75	0.5	0.4	0.3	0.3	22.9	17.1	13.9	11.6	160	116	96	81
80	0.4	0.3	0.3	0.2	22.0	16.4	13.3	11.0	145	106	87	73
90	0.4	0.3	0.2	0.2	20.0	15.0	12.1	10.1	119	87	71	59
100	0.3	0.2	0.2	0.2	18.7	13.9	11.1	9.2	102	74	59	49
125	0.2	0.2	0.1	0.1	15.7	11.7	9.3	7.7	71	51	41	34
150	0.2	0.1	0.1	0.1	13.7	10.4	8.2	6.8	54	40	31	26
175	0.1	0.1	0.1	0.1	12.2	9.3	7.3	6.1	43	32	25	21
200	0.1	0.1	0.1	0.1	11.0	8.5	6.7	5.6	36	27	21	18
250	0.1	0.1	0.0	0.0	8.8	6.9	5.4	4.4	24	19	14	12
300	0.1	0.0	0.0	0.0	7.1	5.7	4.4	3.6	17	13	10	8

Appendix 3 – Detailed Results of the Combustion and Non-Combustion Sources Analysis

Table 49. Number of facilities as a percentage of the total number of facilities by sector, Canada and US

NAICS code	Sector	Percentage of Facilities	
		Canada	US
11	Agriculture, forestry, fishing and hunting	0.7	1.2
21	Mining, quarrying, and oil and gas extraction	54.2	13.4
22	Utilities	5.5	9.0
23	Construction	0.3	0.7
31-33	Manufacturing	28.6	38.8
41-42	Wholesale trade	2.4	4.7
44-45	Retail trade	0.0	2.1
48-49	Transportation and warehousing	4.8	5.8
51	Information and cultural industries	0.0	3.8
52	Finance and insurance	0.0	0.3
53	Real estate and rental and leasing	0.1	0.9
54	Professional, scientific and technical services	0.1	1.1
55	Management of companies and enterprises	0.0	0.0
56	Administrative and support, waste management and remediation services	1.9	3.6
61	Educational services	0.4	1.5
62	Health care and social assistance	0.2	2.4
71	Arts, entertainment and recreation	0.0	0.3
72	Accommodation and food services	0.0	0.6
81	Other services (except public administration)	0.3	5.9
91-92	Public administration	0.4	3.9

Table 50. Releases of criteria air contaminants by sector as a percentage of total releases, Canada and US

NAICS code	Sector	Canada							US						
		NO_2	SO_2	$PM_{2.5}$	PM_{10}	TPM	CO	VOCs	NO_2	SO_2	$PM_{2.5}$	PM_{10}	TPM	CO	VOCs
11	Agriculture, forestry, fishing and hunting	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.1	0.3	0.5	0.0	0.1	0.0	0.0
21	Mining, quarrying, and oil and gas extraction	47.7	31.1	36.7	47.6	24.0	34.5	9.1	1.6	10.1	24.7	6.9	10.3	47.7	31.1
22	Utilities	26.4	26.0	7.8	7.7	4.4	1.3	55.1	78.1	30.8	28.2	29.0	5.0	26.4	26.0
23	Construction	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0
31-33	Manufacturing	22.2	42.8	53.9	42.6	70.6	53.4	25.9	19.2	53.6	41.5	58.5	73.7	22.2	42.8
41-42	Wholesale trade	0.0	0.0	0.2	0.6	0.0	5.3	0.1	0.0	0.5	0.9	0.1	2.6	0.0	0.0
44-45	Retail trade	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0
48-49	Transportation and warehousing	3.0	0.0	0.5	0.9	0.6	4.4	6.9	0.0	1.6	1.0	2.6	5.1	3.0	0.0
51	Information and cultural industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
52	Finance and insurance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
53	Real estate and rental and leasing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
54	Professional, scientific and technical services	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.3	0.1	0.1	0.2	0.1	0.0	0.0
55	Management of companies and enterprises	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
56	Administrative and support, waste management and remediation services	0.3	0.1	0.4	0.3	0.3	0.8	1.6	0.3	1.8	1.9	1.7	1.5	0.3	0.1
61	Educational services	0.2	0.0	0.1	0.1	0.1	0.0	0.4	0.3	0.3	0.2	0.3	0.1	0.2	0.0
62	Health care and social assistance	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.1	0.2	0.1	0.0	0.0
71	Arts, entertainment and recreation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
72	Accommodation and food services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
81	Other services (except public administration)	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.1	0.1	0.0	0.4	0.0	0.0
91-92	Public administration	0.1	0.0	0.1	0.1	0.0	0.0	0.4	0.1	0.5	0.6	0.2	0.4	0.1	0.0

Notes: US data includes only those sources or activities that would be reportable to the NPRI. Canada and US data do not include road dust.

Table 51. Criteria air contaminant releases from US facilities, by release category and by reportable and non-reportable sources

	Release Category	Releases reportable to NPRI (tonnes)						Releases not reportable to NPRI (tonnes)					
		NO_2	SO_2	$PM_{2.5}$	PM_{10}	CO	VOCs	NO_2	SO_2	$PM_{2.5}$	PM_{10}	CO	VOCs
1	Stack or point releases	2 929 458	3 806 189	189 806	300 965	2 294 599	538 527	6 947	91	309	573	1 363	9 052
2	Storage or handling releases	1 864	898	7 246	30 759	11 914	48 871	1	0	0	0	0	424
3	Fugitive releases	4 415	3 505	20 662	101 204	9 589	172 269	0	0	0	0	0	7 607
4	Spills												
5	Other non-point releases	7 796	5 116	9 611	18 374	8 777	77 854			102	239		155
6	Road dust from unpaved roads												
7	Vehicles							191 085	16 336	6 534	28 715	420 048	48 555
8	Agriculture									4	4		33
9	Natural sources												
10	Oil and gas exploration and drilling												294
11	Road dust from paved roads												
12	Construction and demolition							9	0	31	74	3	15
13	Fuel storage							3	0	8	13	3	6 167
14	Fuel transportation and marketing							0	0	0	0	0	2 125
15	Residential fuel combustion												
16	Transport of chemicals and bulk materials												
17	Open burning, forest fires							80	41	455	640	1 295	121
18	All other non-reportable activities							1	0	1	1	6	48
	Total	2 943 534	3 815 708	227 325	451 302	2324880	837522	198 127	16 469	7 445	30 259	422 718	74 595

Notes: The NEI data sets used in the analysis did not include releases for spills, road dust from paved and unpaved roads, natural sources, residential fuel combustion and transport of chemicals and bulk materials.

Table 52. Criteria air contaminant releases from US facilities, by release category, reportable and non-reportable sources and combustion and non-combustion sources

Release Category		Reportable	Releases from combustion sources (tonnes)						Releases from non-combustion sources (tonnes)					
			NO_2	SO_2	$PM_{2.5}$	PM_{10}	CO	VOCs	NO_2	SO_2	$PM_{2.5}$	PM_{10}	CO	VOCs
1	Stack or point	Not reportable	6 895	90	217	451	1 274	658	52	1	92	122	88	8 394
		Reportable	2 706 679	3 546 140	119 148	185 443	1 518 714	154 948	222 779	260 049	70 658	115 522	775 885	383 579
2	Storage or handling	Not reportable							1	0	0	0	0	424
		Reportable							1 864	898	7246	30 759	11 914	48 871
3	Fugitive	Not reportable							0	0	0	0	0	7 607
		Reportable	223	23	143	169	533	430	4 192	3 482	20 519	101 035	9 056	171 840
5	Other non-point	Not reportable									102	239		155
		Reportable							7 796	5 116	9 611	18 374	8 777	77 854
7	Vehicles	Not reportable	191085	16336	6534	28715	420 048	48 555						
8	Agriculture	Not reportable									4	4		33
10	Oil and gas exploration and drilling	Not reportable												294
12	Construction and demolition	Not reportable							9	0	31	74	3	15
13	Fuel storage	Not reportable							3	0	8	13	3	6 167
14	Fuel transportation and marketing	Not reportable							0	0	0	0	0	2 125
17	Open burning, forest fires	Not reportable	80	41	455	640	1 295	121						
18	All other non-reportable activities	Not reportable							1	0	1	1	6	48
	Total		**2 904 963**	**3 562 631**	**126 497**	**215 417**	**1 941 865**	**204 713**	**236 698**	**269 546**	**108 273**	**266 144**	**805 734**	**707 404**

Table 53. Number of facilities the reported to the NPRI and extrapolated number of facilities that would be required to report for both combustion and non-combustion sources of stack or point releases, by manufacturing sector

NAICS code	Sector	Number of facilities that reported the substance to NPRI in 2016						Extrapolated number of facilities that would have to report combustion and non-combustion sources of stack or point releases					
		NO_2	SO_2	$PM_{2.5}$	PM_{10}	CO	VOC	NO_2	SO_2	$PM_{2.5}$	PM_{10}	CO	VOC
3211	Sawmills and wood preservation	85	25	142	144	97	121	6.9	1.8	25.6	26.6	7.9	34.5
3261	Plastic product manufacturing	8	5	35	33	7	97	0.6	0.4	6.3	6.1	0.6	27.6
3221	Pulp, paper and paperboard mills	76	61	76	76	71	77	6.2	4.3	13.7	14.1	5.8	21.9
3251	Basic chemical manufacturing	59	40	69	70	57	53	4.8	2.8	12.4	13.0	4.6	15.1
3212	Veneer, plywood and engineered wood product manufacturing	45	10	59	60	53	49	3.6	0.7	10.6	11.1	4.3	14.0
3231	Printing and related support activities	2	1	3	1	1	42	0.2	0.1	0.5	0.2	0.1	12.0
3118	Bakeries and tortilla manufacturing	3	3	10	8	3	38	0.2	0.2	1.8	1.5	0.2	10.8
3219	Other wood product manufacturing	15	4	37	37	19	31	1.2	0.3	6.7	6.8	1.5	8.8
3363	Motor vehicle parts manufacturing	3	1	46	42	5	29	0.2	0.1	8.3	7.8	0.4	8.3
3328	Coating, engraving, cold and heat treating and allied activities	8	3	21	20	5	26	0.6	0.2	3.8	3.7	0.4	7.4
3241	Petroleum and coal product manufacturing	24	22	40	39	30	25	1.9	1.6	7.2	7.2	2.4	7.1
3371	Household and institutional furniture and kitchen cabinet manufacturing	1		14	15	1	25	0.1	0.0	2.5	2.8	0.1	7.1
3364	Aerospace product and parts manufacturing	6	2	18	18	9	23	0.5	0.1	3.2	3.3	0.7	6.6
3329	Other fabricated metal product manufacturing			18	17	1	22	0.0	0.0	3.2	3.1	0.1	6.3
3313	Alumina and aluminum production and processing	16	13	25	24	14	20	1.3	0.9	4.5	4.4	1.1	5.7
3252	Resin, synthetic rubber, and artificial and synthetic fibres and filaments manufacturing	11	9	15	16	11	18	0.9	0.6	2.7	3.0	0.9	5.1
3315	Foundries	7	5	35	34	7	18	0.6	0.4	6.3	6.3	0.6	5.1
3255	Paint, coating and adhesive manufacturing	1	1	4	4	1	18	0.1	0.1	0.7	0.7	0.1	5.1
3112	Grain and oilseed milling	17	11	37	37	17	17	1.4	0.8	6.7	6.8	1.4	4.8
3259	Other chemical product manufacturing	10	7	17	17	12	17	0.8	0.5	3.1	3.1	1.0	4.8
3121	Beverage manufacturing	8	7	13	13	6	17	0.6	0.5	2.3	2.4	0.5	4.8

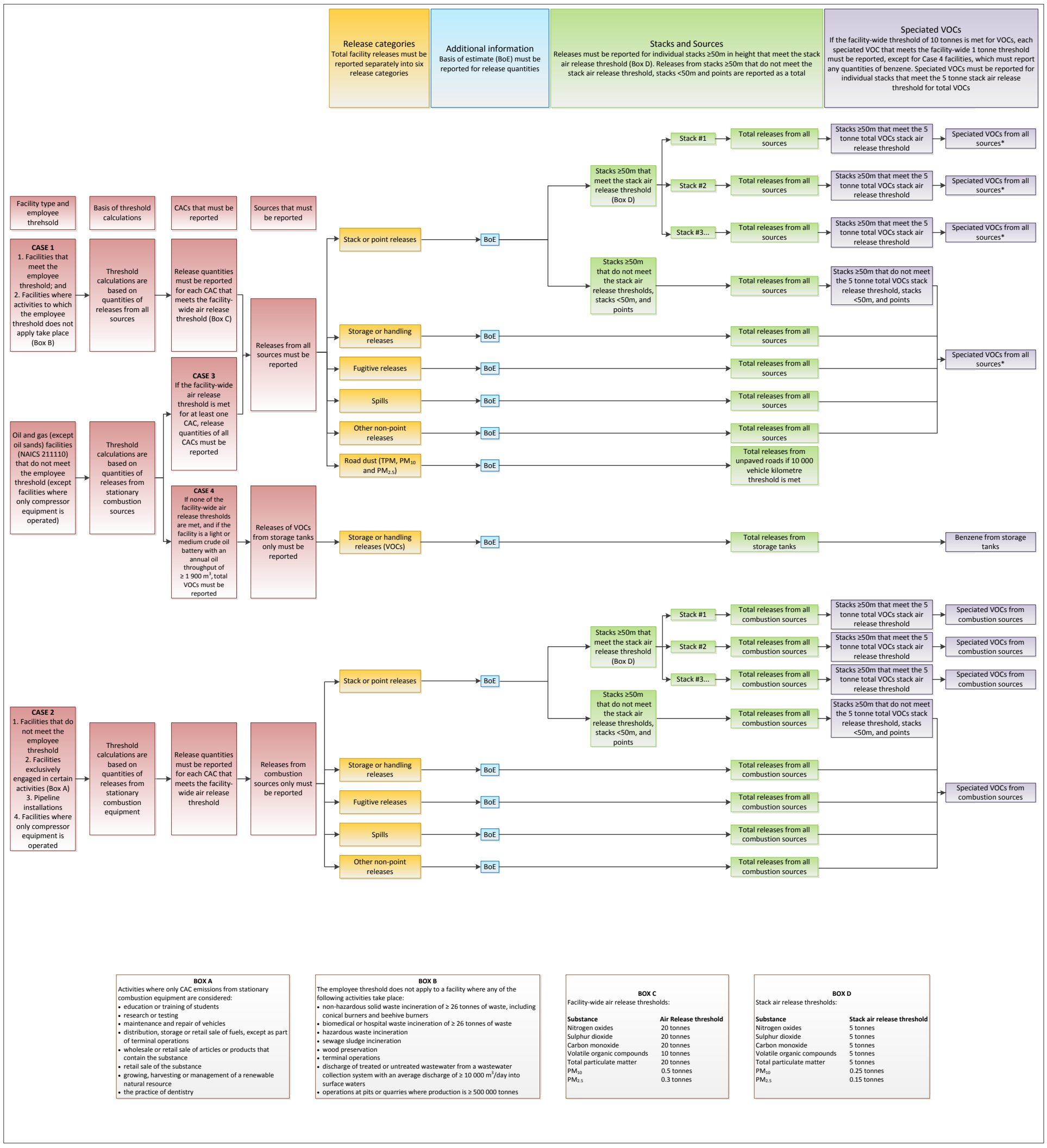
NAICS code	Sector	Number of facilities that reported the substance to NPRI in 2016						Extrapolated number of facilities that would have to report combustion and non-combustion sources of stack or point releases					
		NO_2	SO_2	$PM_{2.5}$	PM_{10}	CO	VOC	NO_2	SO_2	$PM_{2.5}$	PM_{10}	CO	VOC
3254	Pharmaceutical and medicine manufacturing	4	3	5	5	4	17	0.3	0.2	0.9	0.9	0.3	4.8
3273	Cement and concrete product manufacturing	22	20	54	68	21	15	1.8	1.4	9.7	12.6	1.7	4.3
3262	Rubber product manufacturing	6	4	9	8	5	14	0.5	0.3	1.6	1.5	0.4	4.0
3222	Converted paper product manufacturing	2		4	4	1	14	0.2	0.0	0.7	0.7	0.1	4.0
3399	Other miscellaneous manufacturing	6	7	10	12	7	12	0.5	0.5	1.8	2.2	0.6	3.4
3312	Steel product manufacturing from purchased steel	2		12	14	1	12	0.2	0.0	2.2	2.6	0.1	3.4
3372	Office furniture (including fixtures) manufacturing	1		8	7		11	0.1	0.0	1.4	1.3	0.0	3.1
3119	Other food manufacturing	10	7	27	27	9	10	0.8	0.5	4.9	5.0	0.7	2.9
3361	Motor vehicle manufacturing	8	1	9	11	8	10	0.6	0.1	1.6	2.0	0.6	2.9
3311	Iron and steel mills and ferro-alloy manufacturing	18	14	19	19	17	9	1.5	1.0	3.4	3.5	1.4	2.6
3274	Lime and gypsum product manufacturing	17	10	19	19	15	8	1.4	0.7	3.4	3.5	1.2	2.3
3339	Other general-purpose machinery manufacturing	1	1	3	3	1	8	0.1	0.1	0.5	0.6	0.1	2.3
3314	Non-ferrous metal (except aluminum) production and processing	11	10	17	17	8	7	0.9	0.7	3.1	3.1	0.6	2.0
3253	Pesticide, fertilizer and other agricultural chemical manufacturing	9	3	10	11	8	7	0.7	0.2	1.8	2.0	0.6	2.0
3369	Other transportation equipment manufacturing	1		5	3	1	7	0.1	0.0	0.9	0.6	0.1	2.0
3323	Architectural and structural metals manufacturing			8	9		7	0.0	0.0	1.4	1.7	0.0	2.0
3272	Glass and glass product manufacturing	4	3	7	7	3	6	0.3	0.2	1.3	1.3	0.2	1.7
3279	Other non-metallic mineral product manufacturing	9	5	18	18	8	5	0.7	0.4	3.2	3.3	0.6	1.4
3116	Meat product manufacturing	8	4	14	14	7	5	0.6	0.3	2.5	2.6	0.6	1.4
3321	Forging and stamping	3	3	7	9	3	5	0.2	0.2	1.3	1.7	0.2	1.4

NAICS code	Sector	Number of facilities that reported the substance to NPRI in 2016						Extrapolated number of facilities that would have to report combustion and non-combustion sources of stack or point releases					
		NO_2	SO_2	$PM_{2.5}$	PM_{10}	CO	VOC	NO_2	SO_2	$PM_{2.5}$	PM_{10}	CO	VOC
3327	Machine shops, turned product, and screw, nut and bolt manufacturing	3	3	3	3	3	5	0.2	0.2	0.5	0.6	0.2	1.4
3114	Fruit and vegetable preserving and specialty food manufacturing	8	6	12	12	7	4	0.6	0.4	2.2	2.2	0.6	1.1
3362	Motor vehicle body and trailer manufacturing			4	3	1	4	0.0	0.0	0.7	0.6	0.1	1.1
3324	Boiler, tank and shipping container manufacturing			1	1		4	0.0	0.0	0.2	0.2	0.0	1.1
3133	Textile and fabric finishing and fabric coating						4	0.0	0.0	0.0	0.0	0.0	1.1
3115	Dairy product manufacturing	2	4	13	19	2	3	0.2	0.3	2.3	3.5	0.2	0.9
3359	Other electrical equipment and component manufacturing			3	2		3	0.0	0.0	0.5	0.4	0.0	0.9
3331	Agricultural, construction and mining machinery manufacturing			1	1		3	0.0	0.0	0.2	0.2	0.0	0.9
3111	Animal food manufacturing	11	9	48	55	11	2	0.9	0.6	8.6	10.2	0.9	0.6
3113	Sugar and confectionery product manufacturing	4	2	13	13	4	2	0.3	0.1	2.3	2.4	0.3	0.6
3256	Soap, cleaning compound and toilet preparation manufacturing	1	2	5	4	1	2	0.1	0.1	0.9	0.7	0.1	0.6
3353	Electrical equipment manufacturing	1				1	2	0.1	0.0	0.0	0.0	0.1	0.6
3365	Railroad rolling stock manufacturing			1	1		2	0.0	0.0	0.2	0.2	0.0	0.6
3334	Ventilation, heating, air-conditioning and commercial refrigeration equipment manufacturing				1	1	2	0.0	0.0	0.0	0.2	0.1	0.6
3332	Industrial machinery manufacturing						2	0.0	0.0	0.0	0.0	0.0	0.6
3344	Semiconductor and other electronic component manufacturing						2	0.0	0.0	0.0	0.0	0.0	0.6
3117	Seafood product preparation and packaging	1	1	1	1	1	1	0.1	0.1	0.2	0.2	0.1	0.3

NAICS code	Sector	Number of facilities that reported the substance to NPRI in 2016						Extrapolated number of facilities that would have to report combustion and non-combustion sources of stack or point releases					
		NO_2	SO_2	$PM_{2.5}$	PM_{10}	CO	VOC	NO_2	SO_2	$PM_{2.5}$	PM_{10}	CO	VOC
3159	Clothing accessories and other clothing manufacturing	1	1	1	1	1	1	0.1	0.1	0.2	0.2	0.1	0.3
3326	Spring and wire product manufacturing	1	1	1	1	1	1	0.1	0.1	0.2	0.2	0.1	0.3
3336	Engine, turbine and power transmission equipment manufacturing	1		3	3		1	0.1	0.0	0.5	0.6	0.0	0.3
3351	Electric lighting equipment manufacturing		1				1	0.0	0.1	0.0	0.0	0.0	0.3
3322	Cutlery and hand tool manufacturing			1	1		1	0.0	0.0	0.2	0.2	0.0	0.3
3162	Footwear manufacturing						1	0.0	0.0	0.0	0.0	0.0	0.3
3325	Hardware manufacturing						1	0.0	0.0	0.0	0.0	0.0	0.3
3333	Commercial and service industry machinery manufacturing						1	0.0	0.0	0.0	0.0	0.0	0.3
3391	Medical equipment and supplies manufacturing						1	0.0	0.0	0.0	0.0	0.0	0.3
3271	Clay product and refractory manufacturing	1	2	6	6	2		0.1	0.1	1.1	1.1	0.2	0.0
3122	Tobacco manufacturing			1	1			0.0	0.0	0.2	0.2	0.0	0.0
3335	Metalworking machinery manufacturing			1	1			0.0	0.0	0.2	0.2	0.0	0.0
3131	Fibre, yarn and thread mills			1				0.0	0.0	0.2	0.0	0.0	0.0
3341	Computer and peripheral equipment manufacturing			1				0.0	0.0	0.2	0.0	0.0	0.0
Total		**582**	**357**	**1 120**	**1 140**	**590**	**1 028**	**47.1**	**25.3**	**201.6**	**210.9**	**47.8**	**293.0**

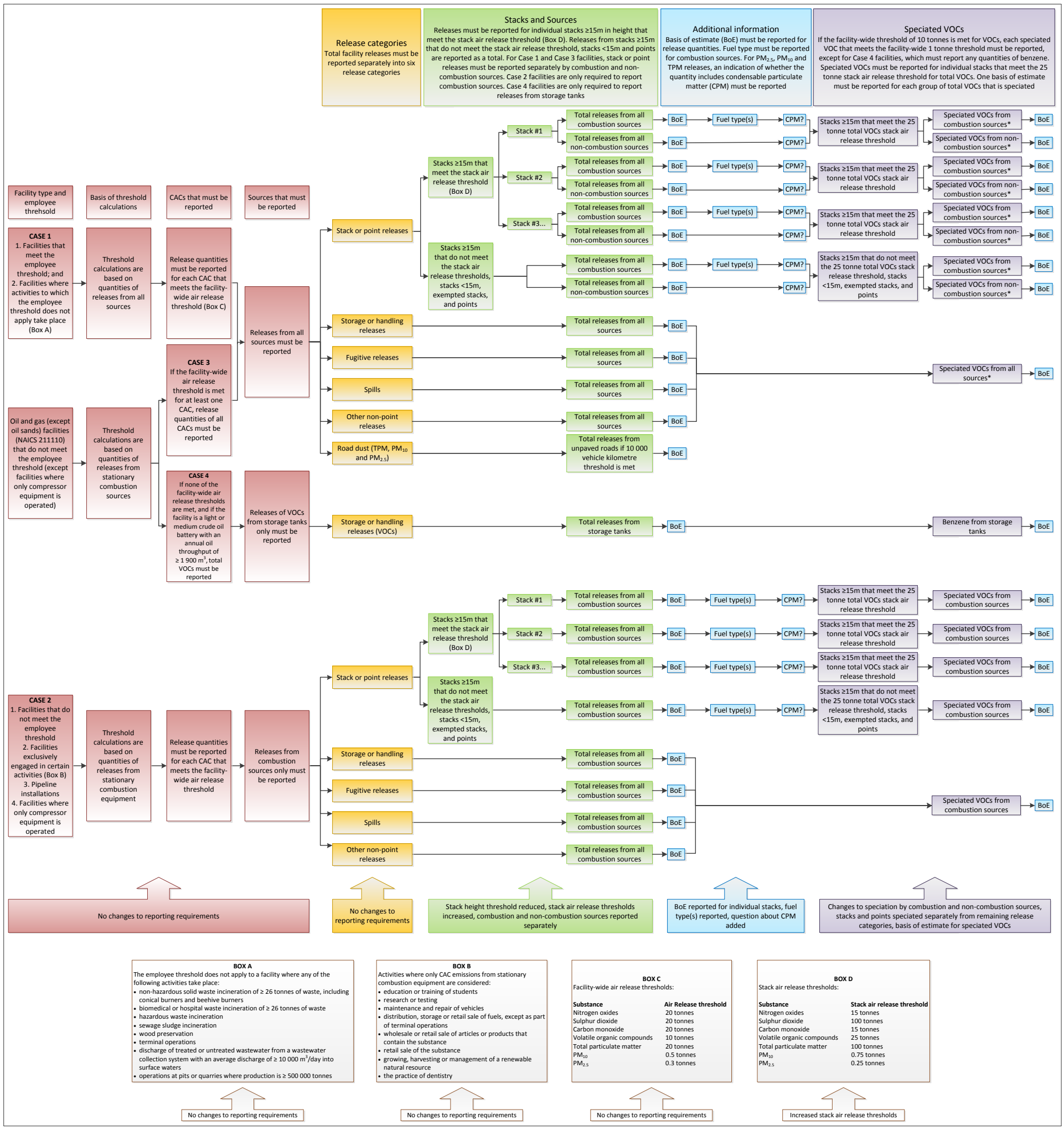
Appendix 4 – Flowcharts Showing Current and Proposed Reporting Requirements

Figure 13. Current reporting requirements for criteria air contaminants and speciated VOCs



* Case 3A facilities that release 10 tonnes or more of total VOCs must report for each speciated VOC that is released in a quantity of 1 tonne or more. Releases of benzene must be reported, regardless of the 1 tonne threshold. Case 3B facilities that release less than 10 tonnes of total VOCs must report releases of benzene and do not need to report for other speciated VOCs.

Figure 14. Proposed reporting requirements for criteria air contaminants and speciated VOCs



* Case 3A facilities that release 10 tonnes or more of total VOCs must report for each speciated VOC that is released in a quantity of 1 tonne or more. Releases of benzene must be reported, regardless of the 1 tonne threshold. Case 3B facilities that release less than 10 tonnes of total VOCs must report releases of benzene and do not need to report for other speciated VOCs.

Appendix 5 – Detailed Results of the Stack Grouping Analysis

Petroleum Refineries

In 2014, 116 petroleum refineries reported releases of CACs from 8287 stacks to the NEI, ranging from one stack per facility to one facility reporting for 508 stacks, with an average of 71 stacks per facility.

ExxonMobil's Baytown, Texas Refinery (Facility ID 4924411) reported releases of CACs from 508 stacks. Of the 508 stacks, 49 are ≥50m in height and would need to be reported individually (13 of these would not meet the stack air release thresholds for any CACs). 312 stacks are <15m in height and total releases from these stacks would be reported along with stacks that do not meet the height or stack air release thresholds, and points. The remaining 147 stacks are candidates for possible grouped reporting.

Based on the proposed requirements, this facility would be able to create 19 grouped "stacks" (including 109 individual stacks) for reporting, the majority of which (11) would be groups of two stacks, with two large groups of 23 and 29 stacks. Table 54 shows the number of stack-substance reports that would be required if reporting of grouped stacks is not allowed and if it is, calculated using the proposed stack air release thresholds. Slightly fewer NO_2, $PM_{2.5}$, PM_{10} and CO stack-substance reports would be required if reporting of grouped stacks were allowed. Reporting of grouped stacks would not change the number of stack-substance reports required for SO_2 and would actually increase the number of stack-substance reports required for total VOCs (the additional "stack" is a group of 29 stacks, each releasing a small quantity of total VOCs that collectively meet the 25 tonne stack air release threshold).

Even though the number of required stack-substance reports is generally lower (which might benefit facilities by slightly offsetting the increase in reporting burden caused by the proposed changes), the proportion of stack releases reported by individual or grouped stacks increases for NO_2, $PM_{2.5}$, PM_{10} and VOCs, possibly providing a benefit for modellers using the data.

Table 54. Stack reporting for ExxonMobil's Baytown Petroleum Refinery

	NO_2	SO_2	$PM_{2.5}$	PM_{10}	CO	VOCs
Number of stack-substance reports with no grouped stack reporting	24	7	60	35	13	4
Number of stack-substance reports with grouped stack reporting (number of stacks)	23 (38)	7 (7)	55 (73)	33 (47)	9 (13)	5 (55)
Total releases from individual stacks with no grouping	996	1 052	140	179	2 058	178
Total releases from individual and grouped stacks	1 056	1 052	142	181	2 058	302
Total facility releases from stacks	1 648	1 989	439	554	2 231	784

Petrochemical Manufacturing

In 2014, 131 petrochemical manufacturing facilities reported releases of CACs from 9125 stacks to the NEI, ranging from one stack per facility to one facility reporting for 575 stacks, with an average of 70 stacks per facility.

Westlake Chemical Corporation's Texas Operations (Facility ID 4941511) reported releases from 575 stacks. Only one of the stacks is ≥50m in height and 518 of the stacks are <15m in height, leaving 56 stacks that could possibly be grouped. Twenty-five of these stacks can be grouped into 9 groups of 2 to 4 stacks (Table 55). Allowing the reporting of grouped stacks would decrease the number of individual stack-substance reports required for all CACs (except SO_2 which was not reported as released from stacks), without changing the total quantities of CACs reported by stacks (except slightly increasing the quantity of PM_{10}).

Table 55. Stack reporting for Westlake Chemical Corporation's Texas Operations

	NO_2	SO_2	$PM_{2.5}$	PM_{10}	CO	VOCs
Number of stack-substance reports with no grouped stack reporting	16	0	22	19	12	5
Number of stack-substance reports with grouped stack reporting (number of stacks)	8 (16)	0 (0)	11 (22)	11 (22)	5 (12)	4 (5)
Total releases from individual stacks with no grouping	1 154	0	39	37	683	283
Total releases from individual and grouped stacks	1 154	0	39	39	683	283
Total facility releases from stacks	1 298	20	49	52	941	663

Iron and steel mills and ferro-alloy manufacturing

In 2014, 121 iron and steel mills and ferro-alloy manufacturing facilities reported releases of CACs from 1592 stacks to the NEI, ranging from one stack per facility to one facility reporting for 93 stacks, with an average of 13 stacks per facility.

Granite City (Illinois) Works of United States Steel Corp (Facility ID 8191211) reported releases from 93 stacks. Ten of the stacks are ≥50m in height (two of which did not report any CAC releases and two of which did not meet the stack air release thresholds for any CACs). Of the 93 stacks, 29 are <15m in height, leaving 54 stacks that could be grouped. Of these 54 stacks, 18 could be grouped into 7 groups of 2 to 4 stacks, reducing the number of stack-substance reports for NO_2, $PM_{2.5}$ and PM_{10} and not having an impact on the number of SO_2, CO and VOCs reports (Table 56).

Table 56. Stack reporting for Granite City Works of United States Steel Corp

	NO_2	SO_2	$PM_{2.5}$	PM_{10}	CO	VOCs
Number of stack-substance reports with no grouped stack reporting	16	7	40	39	11	1
Number of stack-substance reports with grouped stack reporting (number of stacks)	14 (17)	7 (8)	34 (41)	33 (41)	11 (12)	1 (1)
Total releases from individual stacks with no grouping	1 278	1 027	447	477	6 334	26
Total releases from individual and grouped stacks	1 278	1 027	448	478	6 334	26
Total facility releases from stacks	1 303	1 211	565	596	6 386	134

Primary production of alumina and aluminum

In 2014, 15 alumina and aluminum production facilities reported releases of CACs from 480 stacks, ranging from one to 108 stacks, with an average of 32 stacks per facility.

Noranda Aluminum Inc.'s New Madrid, Missouri facility reported for 108 stacks, one of which is ≥50m in height and 50 of which are <15m, leaving 57 stacks that could possibly be grouped. Twenty-eight of these stacks can be grouped into 12 groups of 2 to 5 stacks. Grouping would require an extra two stacks to report for SO_2 in a group, slightly increasing the quantity of SO_2 reported by individual stacks/groups (Table 57). There would be no change for NO_2 and VOCs reporting and a slight decrease in reporting burden for $PM_{2.5}$, PM_{10} and CO, with no decrease in the quantities reported by individual stacks/groups.

Table 57. Stack reporting for Noranda Aluminum Inc.'s New Madrid facility

	NO_2	SO_2	$PM_{2.5}$	PM_{10}	CO	VOCs
Number of stack-substance reports with no grouped stack reporting	0	6	38	39	8	3
Number of stack-substance reports with grouped stack reporting (number of stacks)	0 (0)	7 (8)	33 (44)	30 (41)	6 (8)	3 (3)
Total releases from individual stacks with no grouping	0	4 674	161	323	21 282	126
Total releases from individual and grouped stacks	0	4 771	162	324	21 282	126
Total facility releases from stacks	22	4 772	164	327	21 300	140

Motor vehicle manufacturing

In 2014, 64 motor vehicle manufacturing facilities reported to NEI for 2070 stacks, ranging from 1 to 169 stacks per facility, with an average of 32 stacks being reported per facility.

Ford's Wayne Complex in Michigan (Facility ID 7885011, NAICS 336111) reported for 169 stacks, but no releases were reported from 94 of these stacks. Chrysler's Warren (Michigan) Truck Assembly (Facility ID 8227511, NAICS 336112) reported for 142 stacks and only 2 of those had no reported releases of CACs; the Chrysler facility was therefore evaluated instead of the Ford facility.

Of the 142 stacks at the Chrysler facility, only 2 are <15m in height and none are ≥50m, leaving 140 stacks that could possibly be grouped. 115 of these stacks can be grouped into 12 groups of 2 to 54 stacks each. For this facility, grouping of stacks would cause an increase in reporting burden for NO_2, $PM_{2.5}$, PM_{10} and VOCs and a corresponding increase in quantities reported at the individual stack/group level (Table 58). Given that reporting of grouped stacks is being proposed as an option, not a requirement, a facility in this situation might opt to not report for any of the grouped stacks.

Given the results for the Chrysler facility, two additional motor vehicle manufacturing facilities were evaluated:

- Ford's Kansas City, Missouri Assembly Plant (Facility ID 7369111, NAICS 336111), 119 stacks, all of which reported for at least one CAC, 115 of which are between 15 and 50m in height (i.e., candidates for possible grouping) and none of which are ≥50m. Of the 115 candidates for grouping, 85 could be grouped into 20 groups of 2 to 13 stacks. When these stacks are grouped, there is a decrease in the number of stack-substance reports required for $PM_{2.5}$, PM_{10} and VOCs

(the other three CACs are not released from stacks ≥15m), there is a slight increase in the quantities of reported PM_{10} and there is a significant increase in the quantities of reported VOCs (Table 59). The number of stacks also increases for $PM_{2.5}$, PM_{10} and VOCs.

- Toyota's Georgetown, Kentucky manufacturing facility (Facility ID 7203211, NAICS 336111), 129 stacks, 26 of which did not report for any CACs, 83 of which are between 15 and 50m in height and none of which are ≥50m. Of the 83 stacks, 60 can be grouped into 12 groups of 2 to 15 stacks. When these stacks are grouped, there is no change in the number of stack-substance reports for NO_2, CO and VOCs and a slight decrease in the number of stack-substance reports for $PM_{2.5}$ and PM_{10} (SO_2 was not reported) (Table 60). While the number of stack-substance reports decreases or stays the same for all reported CACs, the number of stacks increases for all CACs and the release quantities increase for NO_2 and CO.

Table 58. Stack reporting for Chrysler's Warren Truck Assembly facility

	NO_2	SO_2	$PM_{2.5}$	PM_{10}	CO	VOCs
Number of stack-substance reports with no grouped stack reporting	1	0	1	0	0	0
Number of stack-substance reports with grouped stack reporting (number of stacks)	2 (55)	0 (0)	9 (107)	2 (78)	0 (0)	5 (96)
Total releases from individual stacks with no grouping	21	0	0.38	0	0	0
Total releases from individual and grouped stacks	37		6.94	4.81	0	790
Total facility releases from stacks	89	0	9	10	70	937

Table 59. Stack reporting for Ford's Kansas City Assembly Plant

	NO_2	SO_2	$PM_{2.5}$	PM_{10}	CO	VOCs
Number of stack-substance reports with no grouped stack reporting	0	0	30	20	0	12
Number of stack-substance reports with grouped stack reporting (number of stacks)	0 (0)	0 (0)	15 (50)	11 (35)	0 (0)	10 (34)
Total releases from individual stacks with no grouping	0	0	49	44	0	472
Total releases from individual and grouped stacks	0	0	49	48	0	608
Total facility releases from stacks	91	1	50	56	76	812

Table 60. Stack reporting for Toyota's Georgetown facility

	NO_2	SO_2	$PM_{2.5}$	PM_{10}	CO	VOCs
Number of stack-substance reports with no grouped stack reporting	2	0	28	25	1	6
Number of stack-substance reports with grouped stack reporting (number of stacks)	2 (21)	0 (0)	25 (58)	22 (58)	1 (15)	6 (20)
Total releases from individual stacks with no grouping	47	0	58	104	24	698
Total releases from individual and grouped stacks	58	0	58	104	34	709
Total facility releases from stacks	70	0	70	132	60	1 585

Appendix 14

Revised air pollutant changes for CACs and speciated VOCs – Presentation at the NPRI Multi-Stakeholder Work Group meeting

June 2019

REVISED AIR POLLUTANT CHANGES

CACs and speciated VOCs

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Outline

- Purpose
- ECCC's revised proposed changes to requirements
  - Stack height threshold
  - Stack air release thresholds
  - Exempted stacks – stack exit temperature threshold
  - Reporting of grouped stacks
- Clarifications
- Next steps

Purpose

- A main theme in the comments submitted was that the 15m stack height threshold will require releases to be reported from individual stacks that do not have significant plume rise, which would not provide additional data of value for air quality modelling
- Based on the comments, revisions to ECCC's proposed changes are shown in the following slides
- ECCC is seeking stakeholder input on the revised proposed changes
- Clarifications in response to some common comments received are also provided

Stack height threshold

- ECCC originally proposed lowering the stack height threshold from 50 metres to **15** metres (February 2019 Consultation Document)
- ECCC is now proposing lowering the stack height threshold from 50 metres to **25** metres

Stack air release thresholds

- Revised proposed stack air release thresholds:

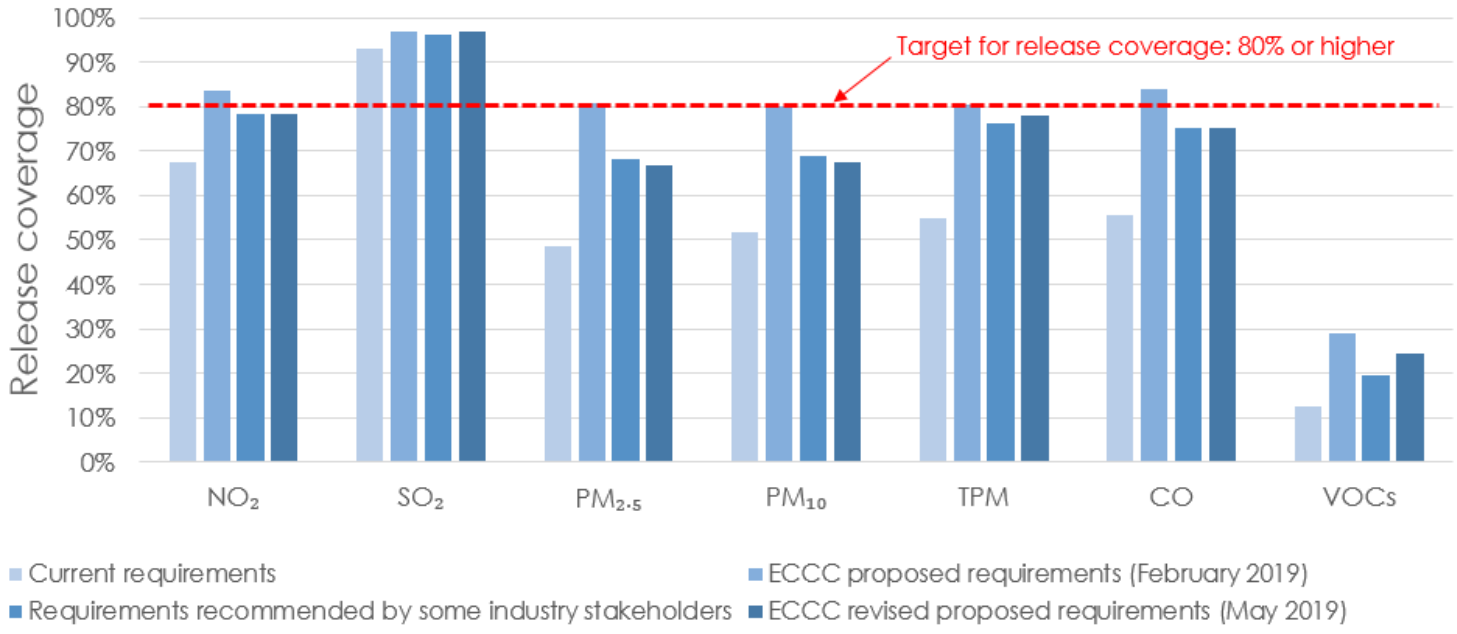
CAC	2018 (current) stack air release threshold (tonnes)	February 2019 proposed stack air release threshold (tonnes)	Revised proposed stack air release threshold (tonnes)
NO_2	5	15	**15**
SO_2	5	100	**50**
$PM_{2.5}$	0.15	0.25	**1**
PM_{10}	0.25	0.75	**2**
TPM	5	100	**50**
CO	5	15	**15**
Total VOCs	5	25	**10**

Stack and release coverage with revised proposed thresholds

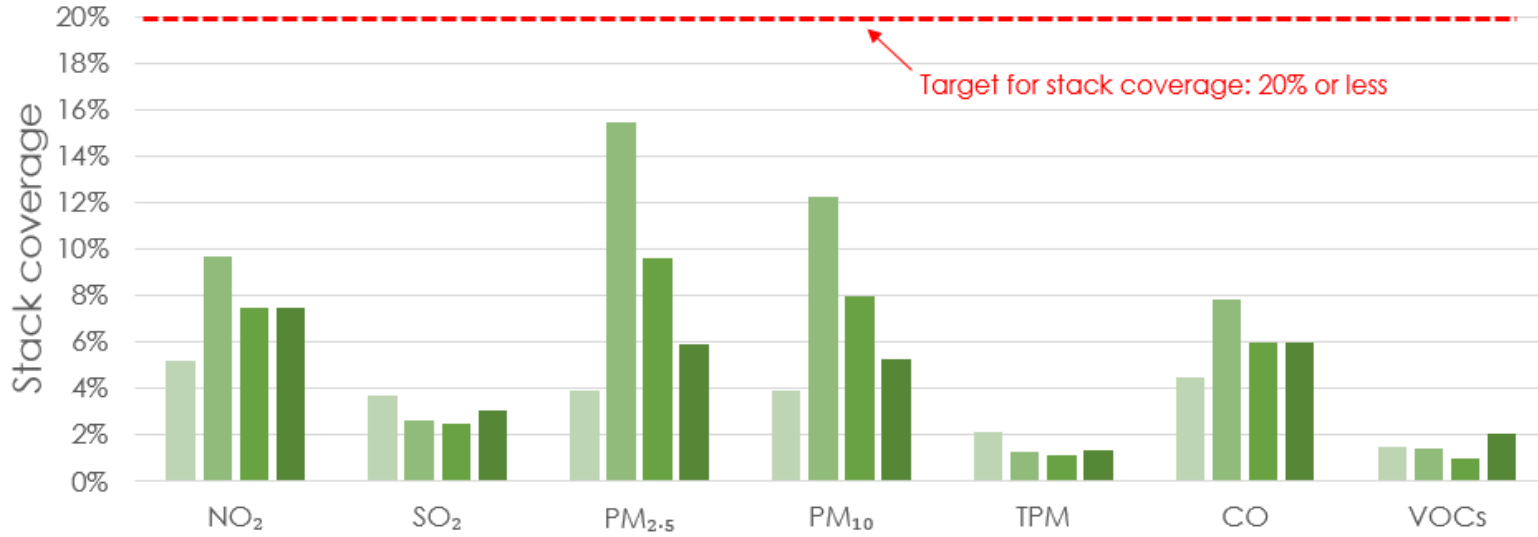
Revised proposed stack height threshold	**25m**						
Percentage of stacks screened out at this stack height threshold	85.1%						
	NO_2	SO_2	$PM_{2.5}$	PM_{10}	TPM	CO	VOCs
Curent NPRI stack air release thresholds (tonnes)	5	5	0.15	0.25	5	5	5
Revised proposed stack air release thresholds (tonnes)	**15**	**50**	**1**	**2**	**50**	**15**	**10**
Proposed requirements - stack coverage	7.4%	3.0%	5.9%	5.2%	1.3%	6.0%	2.0%
Proposed requirements - release coverage	78.3%	96.9%	66.9%	67.3%	78.1%	75.2%	24.3%
Proposed requirements - extrapolated number of stack-substance reports	854	389	1025	890	326	801	663
Proposed requirements - TOTAL number of stack substance reports	4948						
Current requirements - stack coverage	5.2%	3.7%	3.9%	3.9%	2.1%	4.5%	1.5%
Current requirements - release coverage	67.4%	93.0%	48.6%	51.6%	54.9%	55.4%	12.6%
Current requirements - number of stack-substance reports (NPRI, 2016)	597	470	672	663	502	600	475
Current requirements - TOTAL number of stack-substance reports (NPRI, 2016)	3979						

Based on the combined US and AB datasets

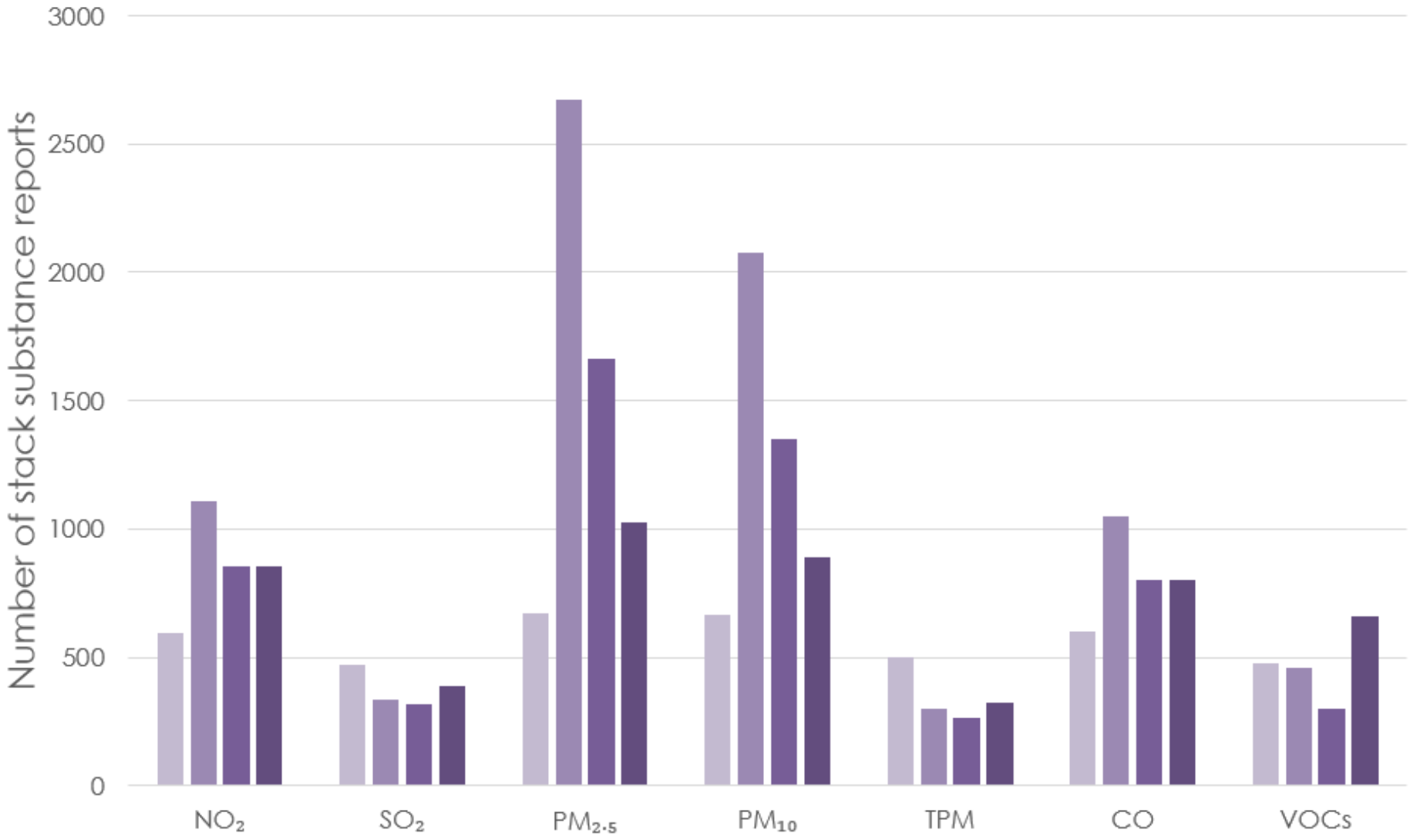
Release Coverage



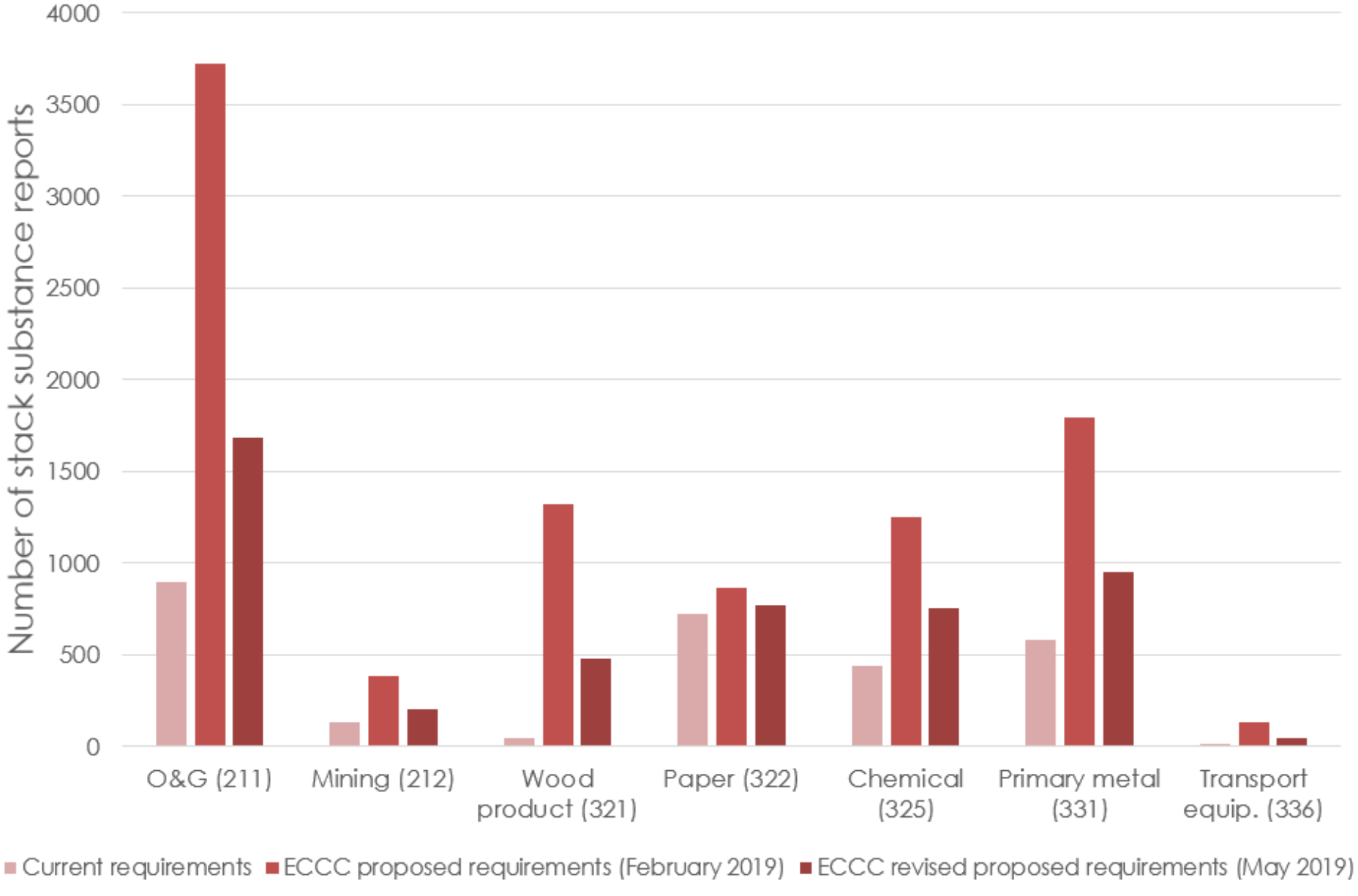
Stack Coverage



Number of Stack-Substance Reports by CAC



Number of Stack-Substance Reports by Sector



Stack air release threshold – speciated VOCs

- Currently, VOCs must be speciated for each stack ≥50m in height that releases ≥5 tonnes of total VOCs
- February 2019 Consultation Document proposes that VOCs must be speciated for each stack ≥15m in height that releases ≥25 tonnes of total VOCs
- Revised proposed requirements: VOCs must be speciated for each stack ≥25m in height that releases ≥10 tonnes of total VOCs
- The new proposed requirements are expected to require less than 200 additional stacks to report speciated VOCs

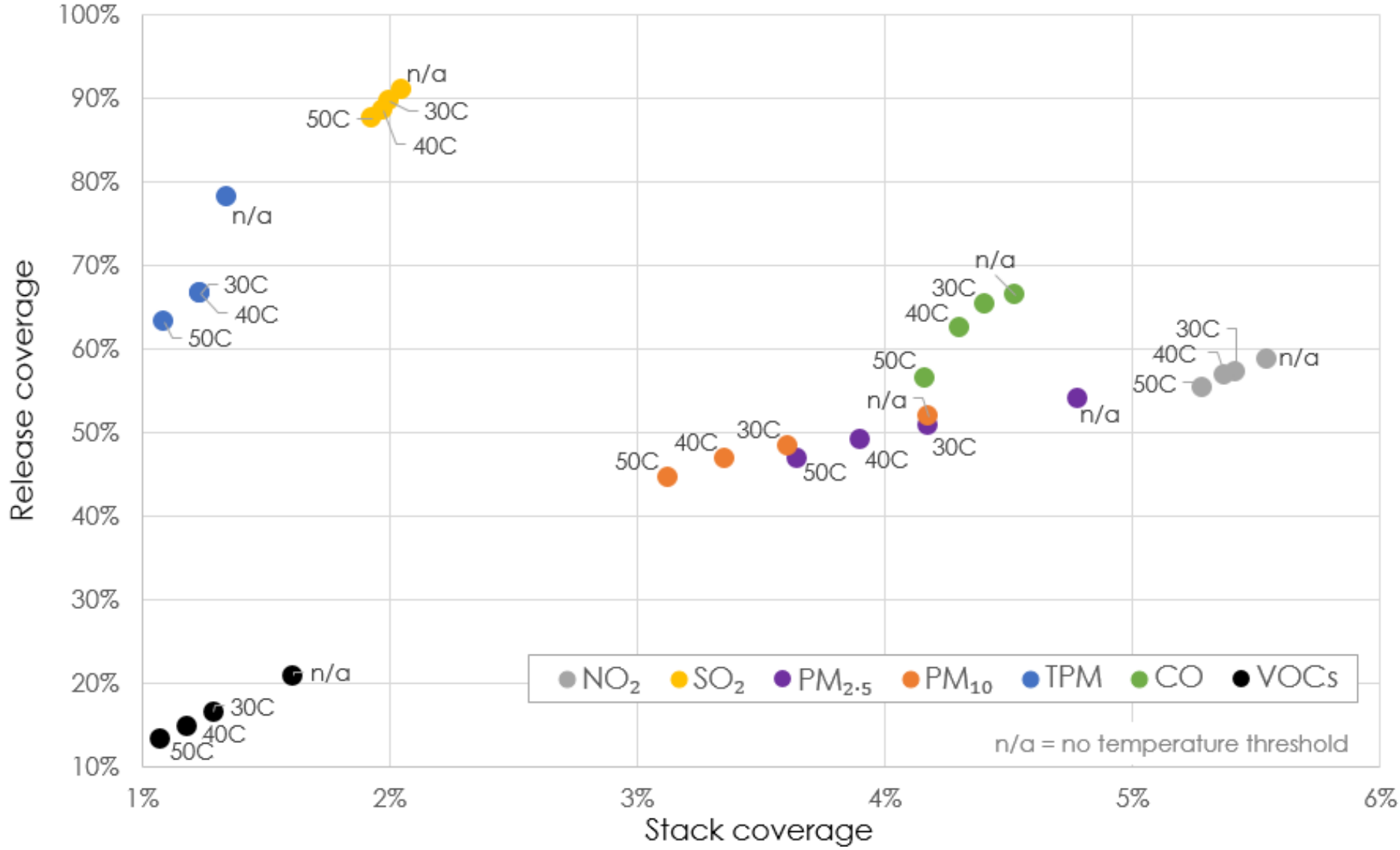
Revised proposed exempted stacks

- Stacks with little or no initial vertical velocity will not need to report, for example,
  - Horizontal or non-vertical stacks (e.g., gooseneck shape)
  - Vertical stacks with rain caps
  - Stacks/vents from storage tanks
  - Stacks with an average annual exit temperature of 50° Celsius or less
- Releases from exempted stacks still need to be reported, just not at the individual stack level
- Would a stack exit velocity threshold be helpful?

Effect of a temperature threshold

- US and Alberta data for stacks with exit temperatures were used
  - All 3 707 AB stacks had temperatures
  - 225 191 US stacks were used in the original stack analysis, but only 216 712 had exit temperatures
- Using a stack height threshold of 25m and the new proposed stack air release thresholds (slide 5), stack and release coverage were calculated with no exit temperature threshold and with temperature thresholds of 30, 35, 37, 40, 45 and 50° C

Effect of a stack exit temperature threhsold



Results of temperature threshold analysis

- Only results in small reductions in the number of extrapolated stack-substance reports (31 total)
- Is a temperature threshold a good tool to screen out stacks without having to do release calculations, i.e., could this reduce burden of calculations, not just burden of reporting?
- Is the reduction in burden beneficial when weighed against increasing the complexity of reporting requirements with the addition of another threshold?

CAC	Extrapolated number of stack-substance reports	
	No temperature threshold	50°C threshold
NO_2	854	851
SO_2	389	389
$PM_{2.5}$	1025	1014
PM_{10}	890	880
TPM	326	325
CO	801	799
Total VOCs	663	659

Revised proposed reporting of grouped stacks

- Stacks can be reported as groups:
  - If a facility has received prior permission from a regulatory authority to group stacks for air dispersion modelling for the purposes of obtaining approval or a permit; or
  - If all of the following conditions are met:
    - Grouped stacks must be ≥25m and <50m in height. Stacks ≥50m in height cannot be grouped and will continue to be required to report individually. Stacks <25m in height do not need to be reported individually or in groups (releases from stacks that do not meet the height and/or stack release threshold would continue to be reported together as a total with point releases);
    - The stacks must be within 250m of the approximate geographic centre of the group;
    - Releases from the stacks must be approximately the same (±35% of the average releases from all stacks in the group);
    - The stack height, inside diameter, exit temperature and exit velocity must be within ±35% of the average; and
    - Total releases from the grouped "stack" must be compared to the stack air release threshold, rather than comparing the releases from each individual stack to the threshold

Clarification – combustion and non-combustion sources

- ECCC is still proposing to require reporting of stack or point releases separately by combustion and non-combustion sources
- Some facilities may not know or be able to calculate releases separately for some processes
- Some facilities may be able to prorate emissions but may lack confidence in the results
- In these cases, facilities will be permitted to report total releases from combustion and non-combustion sources together

Clarification – fuel type

- ECCC is still proposing to add the requirement to report on fuel types
- Information on fuel type is important for reducing uncertainty in modelling and inventory results
- ECCC is not proposing that releases be reported separately according to each fuel type
- ECCC is proposing a check list of fuels (Annex 1) where facilities can select all the fuels that apply for each combustion release quantity
- There are uncertainties associated with this, but it is expected there will be less uncertainty than the current method

Clarification – condensable particulate matter

- ECCC is still proposing to ask reporting facilities if their estimated PM releases include condensable particulate matter (CPM)
- CPM is not required to be reported to NPRI
- ECCC is not proposing to require reporting of CPM
- ECCC is not proposing to ask reporting facilities if they are releasing CPM
- If a facility does not know whether their PM estimates include CPM, they will be allowed to indicate this

Next steps

- Discussion at the Work Group Meeting June 11-12, 2019
- Comments on revised proposed changes will be accepted until June 27, 2019
- Comments and recommendations received will be considered as ECCC makes a decision on the proposed change
- Publication of the 2020-2021 Gazette Notice with new requirements planned for early 2020
- First year to which new requirements would apply: 2020

QUESTIONS & DISCUSSION

Annex 1: Proposed check list of fuel types

- Biomass
- Butane
- Coal
- Diesel or light fuel oil
- Gasoline
- Heavy fuel oil
- Kerosene
- Natural gas
- Other (specify)
- Propane
- Refinery fuel gas/still gas
- Waste

Reporting facilities will be able to check all that apply.

Thank you!

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