Approach for a Subset of Petroleum Substances Prioritized during Categorization

Environment and Climate Change Canada
Health Canada

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1. Introduction

As a part of the Chemicals Management Plan (CMP), the Government of Canada assesses and manages, where appropriate, the potential health and ecological risks associated with substances prioritized for action under the *Canadian Environmental Protection Act, 1999* (CEPA) (Canada 1999). This document addresses 83 petroleum substances which were identified as priorities for assessment as they met categorization criteria under subsection 73(1) of CEPA or were considered a priority based on other human health concerns (ECCC, HC [modified 2007]).

This document identifies the petroleum substances for which risk assessment activities can be considered as having already taken place under CEPA, and proposes that, as such, these substances not undergo further assessment at this time. In addition, proposed or future risk management actions stemming from previous assessments would be expected to also address certain substances in this document. Addressing these substances in this way will facilitate focusing attention on those substances or groups that have not yet been subject to assessment.

This follows on a previous activity (Environment Canada, Health Canada 2015), where 248 substances on the Domestic Substances List were associated with other risk assessment activities under CEPA and, as a result, were identified as not requiring further risk assessment at that time.

Additional risk assessment or risk management activities may be undertaken if new information becomes available on these substances as a result of: 1) identification of new hazard or exposure information which may impact previous risk analyses; 2) international activities; or 3) risk management activities including performance evaluation and subsequent changes to risk management.

2. Analysis

An analysis was undertaken to determine which of the petroleum substances that were previously identified as priorities are associated with risk assessment initiatives that have been completed in past under CEPA.

Information on various petroleum substances was collected through a mandatory survey conducted under section 71 of CEPA (Environment Canada 2015a) and a separate voluntary industry survey (Environment Canada 2015b) to determine industrial and consumer uses of these substances in Canada. Additionally, further searches of internal Health Canada on-line databases, external Health Canada contractor reports, and data from Health Canada partners were also conducted to determine if there were any consumer or industrial uses. Identified uses of the 83 substances in this document are not expected to result in greater exposures or risks than those that were previously characterized in their respective petroleum group screening assessments. As such,

substances are not expected to contribute additional concern to human health or the environment beyond those that have already been identified in assessment products of similar substances.

Based on their composition, physical-chemical properties and reported uses, a total of 83 substances were considered to fall within petroleum groups which have previously been addressed under CEPA. No further risk assessment activity will be undertaken on the following 83 substances at this time:

- 5 - aromatic extracts
- 12 - heavy fuel oils (HFOs)
- 8 - petrolatum and waxes
- 2- asphalt
- 53 - petroleum and refinery gases (PRGs)
- 3 - natural gas condensates (NGCs),

2.1 Aromatic extracts

Aromatic extracts are a class of substances derived from solvent extraction of crude oil vacuum distillation distillate and residual streams and contain a high level of aromatic compounds. These substances are consumed on-site at refineries, and are also transported in Canada via trains and trucks for use at industrial and commercial facilities. Petroleum-derived oils including aromatic extracts can be used as extender oils in the formulation of plastic and rubber products to achieve elasticity and make brittle materials soft and flexible. Extender oils are also a major ingredient in the production of vehicle tires, and are therefore found in crumb rubber (ECCC, HC 2017a).

Three distillate aromatic extracts (DAEs) were previously assessed and did not meet the criteria under paragraphs 64(*a*), (*b*) or (*c*) of CEPA[1] (ECCC, HC 2017a).

The five substances listed in Table 2-1 fall under the above definition of aromatic extracts and have similar uses to those previously assessed. As such, these substances will not undergo further risk assessment at this time.

[1] Under CEPA, the criteria for defining a chemical as toxic as set out in section 64 of the Act, where a substance is toxic if it is entering or may enter the environment in a quantity or concentration or under conditions that:
(*a*) have or may have an immediate or long-term harmful effect on the environment or its biological diversity;
(*b*) constitute or may constitute a danger to the environment on which life depends; or
(*c*) constitute or may constitute a danger in Canada to human life or health.

Table 2-1. Five petroleum substances that fall within the scope of the Distillate Aromatic Extracts (DAE) screening assessment.

CAS RN	DSL Name
64742-03-6	Extracts (petroleum), light naphthenic distillate solvent
68782-99-0[a]	Extracts (petroleum), heavy clarified oil solvent, condensed-ring-arom.-contg.
68783-03-9	Extracts (petroleum), light clarified oil solvent, condensed-ring-arom.-contg.
68814-89-1	Extracts (petroleum), heavy paraffinic distillates, solvent-deasphalted
90641-09-1[a]	Extracts (petroleum), light paraffinic distillate solvent, hydrotreated

[a]These substances were not identified under subsection 73(1) of CEPA but were included in this document as they were considered a priority based on other human health concerns.

2.2 Heavy fuel oils (HFOs)

Heavy fuel oils (HFOs) are a group of complex petroleum mixtures that serve as blending stocks in final heavy fuel products or as intermediate products of distillate or residue derived from refinery distillation or cracking units. The final fuel product usually consists of a mixture of HFOs as well as higher-quality hydrocarbons as diluents. HFOs are composed of aromatic, aliphatic and cycloalkane hydrocarbons, typically in the carbon range of C_{20} to C_{50} (Concawe 1998). They have previously been identified as having industrial or commercial use in such applications as potash processing, and for use as viscosity adjusters in asphalt emulsion road maintenance products (ECCC, HC 2016a).

HFOs have been assessed under the petroleum sector stream approach as site restricted (stream 1; i.e., not expected to be transported off petroleum facility sites in which they are produced) substances (Environment Canada, Health Canada 2011), industry restricted (stream 2; i.e., transported between industrial facilities and used on-site) substances (Environment Canada, Health Canada 2013a), as fuels (steam 3) (Environment Canada, Health Canada 2014), and as substances in products (stream 4) (ECCC, HC 2016a). HFOs in these assessments did not meet the criteria under paragraphs 64(*a*), (*b*) or (*c*) of CEPA (Environment Canada, Health Canada 2011, 2013a, 2014; ECCC, HC 2016a).

The 12 substances listed in Table 2-2 fall under the above definition of heavy fuel oils and have similar uses to those previously assessed. As such these substances will not undergo further risk assessment at this time.

Table 2-2. Twelve petroleum substances which fall within the scope of the Heavy Fuel Oils (HFO) screening assessments.

CAS RN	DSL Name
64742-78-5	Residues (petroleum), hydrodesulfurized atmospheric tower

64742-86-5	Gas oils (petroleum) hydrodesulfurized heavy vacuum
68187-58-6	Pitch, petroleum, aromatic
68333-26-6	Clarified oils (petroleum), hydrodesulfurized catalytic cracked
68410-00-4	Distillates (petroleum), crude oil
68512-62-9	Residues (petroleum), light vacuum
68607-30-7	Residues (petroleum), topping plant, low-sulfur
68955-36-2[a]	Residues (petroleum) steam-cracked resinous
69013-21-4	Fuel Oil, pyrolysis
70592-79-9	Residues (petroleum), atm. tower, light
129893-08-9[a]	Residues (petroleum), vacuum, hydrocracked, vacuum distn. residues
129893-09-0	Residues (petroleum), vacuum, hydrocracked, vacuum gas oil fraction

[a]These substances were not identified under subsection 73(1) of CEPA but were included in this document as they were considered a priority based on other human health concerns.

2.3 Petrolatum and wax substances

Petrolatum and wax substances are found in industrial and marketplace products including in cosmetics, personal care products, lubricants, household cleaning products, adhesives and sealants, and paints and coatings (ECCC, HC 2016b).

Three petrolatum and waxes were previously assessed and did not meet the criteria under paragraphs 64(a), (b) or (c) of CEPA (ECCC, HC 2016b).

The eight substances listed in Table 2-3 fall under the above definition of petrolatum and waxes and have similar uses to those previously assessed. As such, these substances will not undergo further assessment at this time.

Table 2-3. Eight petroleum substances which fall within the scope of the petrolatum and wax screening assessment.

CAS RN	DSL Name
63231-60-7	Paraffin waxes and Hydrocarbon waxes, microcryst.
64742-42-3	Hydrocarbon waxes (petroleum), clay-treated microcryst.
64742-43-4	Paraffin waxes (petroleum), clay-treated
64742-51-4	Paraffin waxes (petroleum), hydrotreated
64742-60-5[a]	Hydrocarbon waxes (petroleum), hydrotreated microcryst.
8001-75-0[a]	Ceresin
68153-22-0	Paraffin waxes and Hydrocarbon waxes, oxidized
90669-78-6	Slack wax (petroleum), clay-treated

[a]These substances were not identified under subsection 73(1) of CEPA but were included in this document as they were considered a priority based on other human health concerns

2.4 Asphalt and oxidized asphalt

Asphalt and oxidized asphalt are complex combinations of high molecular weight organic compounds; carbon numbers are predominantly greater than C25 with high carbon-to-hydrogen ratios. They are residual substances derived from the high temperature vacuum distillation of petroleum. Asphalt and oxidized asphalt are used predominantly in the construction of roads and in roofing materials, but they have minor uses in adhesives and sealants, paints and coatings, and other miscellaneous consumer products (ECCC, HC 2017b).

Asphalts and oxidized asphalts were previously assessed and did not meet the criteria under paragraphs 64(*a*), (*b*), or (*c*) of CEPA (ECCC, HC 2017b).

The two substances listed in Table 2-4 fall under the above definition of asphalts and have similar uses to those previously assessed. As such, these substances will not undergo further assessment at this time.

Table 2-4. Two petroleum substances which fall within the scope of the asphalt and oxidized asphalt screening assessment.

CAS RN	DSL Name
64742-07-0	Raffinates (petroleum), residual oil decarbonization
64741-56-6	Residues (petroleum), vacuum

2.5 Petroleum and Refinery Gases (PRGs)

PRGs comprise a category of saturated and unsaturated petroleum light hydrocarbons with carbon numbers in the range of C1 to C8, but predominantly from C1 to C5, which are gaseous at environmentally relevant temperatures and quickly disperse in the atmosphere if they are released to the environment. The C_5 and higher components of these PRGs that are liquid at ambient temperatures have high vapour pressures, so evaporate readily. Petroleum and refinery gases are produced by refineries, upgraders and natural gas processing facilities (Environment Canada, Health Canada 2013b) and their compositions vary depending on the source of the crude oil, bitumen or natural gas, as well as the process operating conditions and processing units involved.

Forty site-restricted PRGs were assessed under Stream 1 of the petroleum sector stream approach (PSSA) (Environment Canada, Health Canada 2013b) . An additional four industry-restricted PRGs were assessed as part of Stream 2 of the PSSA (Environment Canada, Health Canada 2014b). Two PRGs found within consumer products (also known as liquefied petroleum gases; LPGs) were previously assessed in Stream 4 of the PSSA (ECCC, HC 2017c). The substances in all three streams were

found to meet the criteria under paragraph 64(*c*) of CEPA. The substances were concluded not to be meeting the criteria under paragraphs 64(*a*) or (*b*) of CEPA.

These assessments considered gaseous releases of substances from petroleum facilities, during transportation of the substances, and during consumer use. The risk to human health was identified for those living in the vicinity of petroleum refineries and upgraders that emit these gases. The source of the risk was the contribution to overall 1,3-butadiene concentrations in ambient air as a result of fugitive releases of these gases from the petroleum facilites. Due to the exposure characterization methodology employed, the previously published assessments integrated exposures from all PRGs present at a petroleum facility and were not specific to any particular CAS RN or group of CAS RNs (i.e., site-restricted, industry-restricted, or marketplace product PRGs). As such, the identification and quantification of risk leading to the conclusions under paragraph 64(*c*) of CEPA were attributable to all emissions from gas streams in petroleum facilities, including any contributions from the 53 PRGs considered in this report for which 1,3-butadiene, if present, is also considered to be the high hazard component. Accordingly, any risk management action implemented (Environment Canada, Health Canada 2013c, 2014c) to address the previously assessed PRGs will also serve to reduce potential risks from these additional PRGs. The proposed *Regulations Respecting Reduction in the Release of Volatile Organic Compounds (Petroleum Sector)* published in Canada Gazette (GOC 2017) are intended to address emissions of PRGs.

The 53 substances listed in Table 2-5 fall within this definition of PRGs and were determined to be produced in, and/or imported into, Canada. As such, these substances will not undergo further assessment at this time.

Table 2-5. Fifty-three petroleum substances which meet the classification of PRGs.

CAS RN	DSL Name
68307-98-2	Tail gas (petroleum), catalytic cracked distillate and catalytic cracked naphtha fractionation absorber; Petroleum gas
68308-05-4	Tail gas (petroleum), gas recovery plant de-ethanizer; Petroleum gas
68308-27-0[a]	Fuel gases, refinery
68409-99-4	Gases (petroleum), catalytic cracked overheads; Petroleum gas
68475-58-1	Alkanes, C2-3; Petroleum gas
68475-59-2	Alkanes, C3-4; Petroleum gas
68476-29-9	Fuel gases, crude oil of distillates; Petroleum gas
68476-40-4	Hydrocarbons, C3-4; Petroleum gas
68476-44-8	Hydrocarbons, C>3
68477-35-0	Distillates (petroleum), C3-6, piperylene-rich; Petroleum gas
68477-65-6	Gases (petroleum), amine system feed; Refinery gas
68477-70-3	Gases (petroleum), C2-3; Petroleum gas
68477-79-2	Gases (petroleum), catalytic reformer, C1-4-rich; Petroleum gas

68477-81-6	Gases (petroleum), C6-8 catalytic reformer; Refinery gas
68477-82-7	Gases (petroleum), C6-8 catalytic reformer recycle, hydrogen rich; Refinery gas
68477-83-8	Gases (petroleum), C3-5 olefinic-paraffinic alkylation feed; Petroleum gas
68477-90-7	Gases (petroleum), depropanizer dry, propene-rich; Petroleum gas
68477-91-8	Gases (petroleum), depropanizer overheads; Petroleum gas
68477-92-9	Gases (petroleum), dry sour, gas-concn-unit-off; Refinery gas
68477-94-1	Gases (petroleum), gas recovery plant depropanizer overheads; Petroleum gas
68477-95-2	Gases (petroleum), Girbotol unit feed; Petroleum gas
68478-21-7	Tail gas (petroleum), catalytic cracked clarified oil and thermal cracked vacuum residue fractionation reflux drum; Petroleum gas
68478-26-2	Tail gas (petroleum), catalytic reformed naphtha fractionation stabilizer; Petroleum gas
68478-27-3	Tail gas (petroleum), catalytic reformed naphtha separator; Refinery gas
68478-28-4	Tail gas (petroleum), catalytic reformed naphtha stabilizer; Refinery gas
68478-30-8	Tail gas (petroleum), hydrodesulfurized straight-run naphtha separator; Refinery gas
68478-33-1	Tail gas (petroleum), saturate gas recovery plant, C1-2-rich; Petroleum gas
68513-14-4	Gases (petroleum), catalytic reformed straight-run naphtha stabilizer overheads; Refinery gas
68513-19-9	Gases (petroleum), reformer effluent low-pressure flash drum off; Refinery gas
68513-66-6	Residues (petroleum), alkylation splitter, C4-rich; Petroleum gas
68527-15-1	Gases (petroleum), oil refinery gas distn. Off; Refinery gas
68606-26-8	Hydrocarbons, C3; Petroleum gas
68606-34-8	Gases (petroleum), depropanizer bottoms fractionation off; Petroleum gas
68783-06-2	Gases (petroleum), hydrocracking low-pressure separator; Refinery gas
68783-07-3	Gases (petroleum), refinery blend; Petroleum gas
68783-61-9[a]	Fuel gases, refinery, sweetened
68783-62-0[a]	Fuel gases, refinery, unsweetened
68783-64-2	Gases (petroleum), catalytic cracking; Petroleum gas
68783-65-3	Gases (petroleum), C2-4, sweetened; Petroleum gas
68814-47-1[a]	Waste gases, refinery vent
68814-90-4	Gases (petroleum), platformer products separator off; Refinery gas

68911-59-1	Gases (petroleum), hydrotreated sour kerosine flash drum; Refinery gas
68919-01-7	Gases (petroleum), distillate unifiner desulfurization stripper off; Refinery gas
68919-03-9	Gases (petroleum), fluidized catalytic cracker scrubbing secondary absorber off; Refinery gas
68919-05-1	Gases (petroleum), light straight run gasoline fractionation stabilizer off; Petroleum gas
68919-07-3	Gases (petroleum), platformer stabilizer off, light ends fractionation; Refinery gas
68919-12-0	Gases (petroleum), unifiner stripper off; Refinery gas
68952-80-7	Tail gas (petroleum), straight-run naphtha hydrodesulfurizer; Refinery gas
68955-28-2	Gases (petroleum, light steam-cracked, butadiene conc.; Petroleum gas
68955-34-0	Gases (petroleum), straight-run naphtha catalytic reformer stabilizer overhead; Petroleum gas
68989-88-8	Gases (petroleum), crude distn. and catalytic cracking; Refinery gas
71329-37-8[a]	Residues (petroleum), catalytic cracking depropanizer, C4-rich
87741-01-3	Hydrocarbons, C4; Petroleum gas

[a]These substances were not identified under subsection 73(1) of CEPA but were included in this document as they were considered a priority based on other human health concerns.

2.6 Natural Gas Condensates (NGCs)

NGCs are defined as complex combinations of hydrocarbons that condense or separate from the gaseous phase into the liquid phase during production at wellheads; in natural gas processing plants; in gas pipelines for production, gathering, transmission and distribution; and/or in straddle plants along the main gas pipelines. NGCs consist of hydrocarbons with carbon numbers primarily between C5 and C15 (ECCC, HC 2016c). In addition, this definition encompasses all liquids derived from natural gas distillates that fall primarily within this carbon range.

Natural gas condensates, as a group, were previously assessed by Environment and Climate Change Canada and Health Canada (ECCC, HC 2016c), and were found to meet the criteria under paragraphs 64(*a*) and (*c*) of CEPA. The substances were concluded not to be meeting the criteria under paragraph 64(*b*) of CEPA. NGCs have been proposed to be added as a group to Schedule 1 of CEPA (ECCC, HC 2016d).

The three substances listed in Table 2-6 fall within the definition of this group, and will be addressed by any subsequent risk management measures that are developed for this substance group. As such, these substances will not undergo further assessment at this time.

Table 2-6. Three petroleum substances which meet the classification of NGCs

CAS RN	DSL Name	DSL Description
129893-21-6	NGCs, C4-12 distillate	A complex combination of hydrocarbons separated from natural gas condensates, distillation feed by fractionation. It consists mainly of hydrocarbons in the range of C4 to C12 and hydrogen sulphide.
129893-22-7	NGCs, C5-12 distillate	A complex combination of hydrocarbons produced in the fractionation of natural gas condensates, distillation feed. It consists of hydrocarbons with carbon numbers in the range of C4 to C30, predominantly saturated aliphatic hydrocarbons with carbon numbers in the range of C5 to C12; and boiling in the range of approximately 20°C to 200°C (68°F to 392°F).
68425-31-0	Gasoline (natural gas), natural	A complex combination of hydrocarbons separated as a liquid from natural gas liquids and/or natural gas condensates from which ethane, propane, butane and possibly pentane have been extracted. It consists of hydrocarbons having carbon numbers predominantly in the range of C5 through C8. It is a liquid at atmospheric temperature and pressure.

3. Overall summary

The 83 substances in this document will not undergo further risk assessment at this time given previous assessment activities.

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