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January 21, 2019

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Sent to eccc.substances.eccc@canada.ca

Re: *Canada Gazette, Part I, Vol. 152, No. 44* — November 3, 2018, *Publication of final decision after screening assessment of 72 substances specified on the Domestic Substances List (paragraphs 68(b) and 68(c) or subsection 77(6) of the Canadian Environmental Protection Act, 1999*¹

To whom it may concern:

These comments were prepared in response to the above mentioned publication, at the request of the Canadian Network for Human Health and the Environment (CNHHE-RCSHE). The topic is of great importance to civil society organizations (CSOs), occupational health practitioners and researchers, workers and others in the public. Dorothy Wigmore prepared the attached table. Co-signatory Prevent Cancer Now and others would like to participate in a meeting to discuss the issues raised.

These comments focus on six issues that are interlinked. Many are concerns voiced by CSOs and others involved with the CMP process over the years. Many have not been addressed, although some may be partly dealt with by proposed CMP post-2020 activities.

To summarise, we believe that many of these chemicals were inaccurately and inappropriately assessed as being of "low concern"; instead, they should be the subject of further research, follow-up, flagging and prioritisation. We focus on some human health hazards identified in preparing these comments -- research that was limited by time, finances and lack of transparency in the available documents. Recommendations are summarised at the end of the letter.

¹ *Canada Gazette* Part I, Vol. 152, No. 44, November 3, 2018. <http://www.gazette.gc.ca/rp-pr/p1/2018/2018-11-03/pdf/g1-15244.pdf> Accessed Jan. 18, 2019.

Substance-specific details are provided in the attachment. This legal-sized document tabulates the CMP-published tables (with their Ecological Risk Classification of organic substances [ERC] and Threshold of Toxicological Concern [TTC] numbers). Additional information was collated chiefly from the Healthy Building Network's Data Commons (DC)² and the European Chemicals Agency (ECHA)³ websites. Both are free, authoritative, public sources that should be among the starting points for any chemical assessment. The Data Commons summarises international lists and reports, making it an easy way to get up-to-date information for much that is known about a chemical. It is linked to the more detailed Pharos database, which costs a small annual fee and can be tried for free for 14 days.

Information from the government document is in black with our additional information in brown. The two shaded rows indicate the glycol ethers that may be subject to SNAc requests.

1. Extent of use and presence in Canada – hazard/exposure determinations and implications

As stated in my recent comments regarding anthraquinones, and as others have said before, many CSOs involved in the CMP process have serious concerns about the accuracy of the lists compiled about which chemicals are imported, present or used in Canada. The tools that CMP staff use, including surveys and SNAc provisions, do not appear to provide comprehensive information about the presence and/or use of chemicals in the country.

This has serious implications for assessments, according to the *Science Approach Document: Ecological risk classification of organic substances*:⁴

*Changes in chemical quantity could result in significant changes in classification of exposure; i.e., the **exposure and risk-based classifications are highly sensitive to uncertainties in emission rate and use quantity estimates.** The ERC classification thus represents current exposure and risk in Canada and may not reflect future trends. This is primarily why use patterns of moderate concern substances not identified for more detailed assessment and all low risk substances with a high hazard classification are proposed to be tracked. Fluctuation of, and uncertainty with quantity in commerce are also primary*

² The Data Commons provides comprehensive hazard data for more than 100,000 chemicals. <https://commons.healthymaterials.net/> Accessed Jan. 18, 2019.

³ European Chemicals Agency. Search for Chemicals. <https://echa.europa.eu/information-on-chemicals> Accessed Jan. 18, 2019.

⁴ Environment and Climate Change Canada. *Science Approach Document: Ecological risk classification of organic substances*. July 2016. <https://www.ec.gc.ca/ees-ees/default.asp?lang=En&n=A96E2E98-1> Accessed Jan. 18, 2019.

reasons for approaching exposure classification as a probability of organism exposure using multiple metrics. (emphasis added)

Many of the chemicals on the list are reactive intermediates, which may also reappear at the “end of life” as hazardous decomposition products. The people most likely to encounter these chemicals, that are used in synthesis of final products, are workers. At the most recent Stakeholders’ Advisory Committee meeting, Health Canada staff confirmed that occupational hazards should not be ignored when assessing chemicals (see point 2). It is particularly true for this list of chemicals.

Another source of uncertainty (possibly related to the above) is that many of the subject chemicals likely have additional uses or functions of concern than those cited in the CMP document. Given time constraints, we could not investigate this systematically. However, when a GreenScreen assessment rated a chemical a LT-1 or LT-P1, a check in the ECHA and Healthy Building Network's DC materials often had multiple, likely-relevant uses not named in the CMP document. The attached table lists some examples in brown.

There also is no indication that the CMP assessments take advantage of the Canadian Centre for Occupational Health and Safety (CCOHS)⁵ databases. In particular, the data sheet database (<https://www.ccohs.ca/products/msds/>) has "instant access to more than 246,000 MSDSs provided directly from manufacturers and suppliers", and is designed for "Regulatory affairs personnel" amongst others. Data sheets may not typically be a primary source of information about product ingredients or their hazards, but previous CMP assessments have used them to identify uses of chemicals or their presence in the country. If the CCOHS database were/is searchable, it would be an invaluable source for information about use/presence and function/purpose of chemicals.

The CCOHS has compiled a lot of occupational health information in its 40 years as a federal Crown Corporation. As an early employee and user, I (DW) know that chemicals were a hot topic that generated research and documents. Those kinds of resources (e.g., responses to enquiries, chemical hazard hand-outs) could help to provide more comprehensive and accurate indications about the use and/or presence of particular chemicals. As a federal department corporation, it is a logical source of information for CMP chemical assessments.

Another source that should be used are reports from poison control centres and emergency rooms. US studies have showed that both can be valuable sources of information about injuries and illnesses not otherwise recorded, especially for

⁵ CCOHS is a federal departmental corporation reporting to the Parliament of Canada through the Minister of Employment, Workforce Development and Labour, and is governed by a tripartite Council of Governors representing governments (federal, provincial and territorial), employers, and workers.

workers. Likewise, despite their limitations, the workers' compensation boards across the country may have some useful information. (For more about potential sources of occupational health and hazard information, see the 2018 paper *Work-related deaths in Canada*, by Bittle, Chen and Hébert, reported by the CBC on January 11, 2019.⁶)

CSOs, trade unions/union federations and workers' organisations also can be useful sources of information about the presence of chemicals and their effects. For example, the Strategic Approach to International Chemicals Management (SAICM) Chemicals in Products Programme says they "can have important roles in advancing the exchange of chemicals in products information" and "in promoting the integrity and relevance of the chemicals in products information with which they work."⁷

Furthermore, the government's industry survey questions about chemical use or presence may be missing the mark, and there seems to be no independent mechanism to check what may be missing from responses. It is difficult to truly ascertain what chemicals are used or present in the country but there are better, more pointed, questions to ask and better ways to pull together the picture. There also doesn't seem to be a transparent method to provide details about survey and SNAc results in a way that the public can assess them; without that, it's difficult not to be suspicious that information is missing.

This is particularly true for this group of 72 chemicals, including the two glycol ethers for which the SNAc process is proposed. The *Gazette* notice says:

*since diglyme and triglyme are **considered to have human health effects of concern, there is suspicion that new activities that have not been identified or assessed** (emphasis added) could lead to diglyme and/or triglyme meeting the criteria set out in section 64 of CEPA....*

*A significant new activity can include an activity that has not been conducted with the substance in the past, or an **existing one with a different quantity or in different circumstances that could affect the exposure pattern of the substance** (emphasis added). The SNAc provisions trigger an obligation for a person (individual or corporation) to provide, and for the Government to assess, specific information about a substance when a person proposes to use the substance in a significant new activity.*

The emphasised phrases are connected to our point 4 and the recommendations.

⁶ <https://www.cbc.ca/news/canada/workplace-fatalities-deaths-under-reported-study-1.4973495>. Accessed January 20, 2019.

⁷ United Nations Environment Programme (2015) *The Chemicals in products programme*, p. 13. http://www.saicm.org/Portals/12/Documents/EPI/CiP%20programme%20October2015_Final.pdf. Accessed January 21, 2019.

2. Occupational hazards

CMP discussions and processes are said to be consistent with the precautionary principle, life cycle analyses or approaches, and protection of human health. These phrases are meaningless, however, without including occupational health and hazards. To date, a shortcoming of CMP assessments has been the exclusion of occupational hazards and workers' experiences (e.g., adverse events and epidemiology studies). Although changes are being discussed with provincial and territorial representatives, it remains a large gap that is a major reason for discordance between Canadian and international lists of hazardous chemicals. Post-2020 CMP plans presented at the November meetings recognised this shortcoming, and the government proposed adding "workplace exposures" and some type of recognition for those "exposed to higher levels of chemicals" on the job to an upcoming definition of "vulnerable populations."

It was not clear when or how this would be put in place and implemented. We recommend that, as legislative changes are said not to be necessary – this will entail finalization and implementation of a policy – workplace hazards and exposures be incorporated in assessments expeditiously. It is inappropriate to acknowledge that change is greatly needed, but to postpone its implementation. Other hazardous substances that were deemed to have low exposures for the general public must also be re-examined for workplace hazards and exposures.

One way to begin is to recognise that workers use consumer products (including cosmetics, cleaning products, air “fresheners,” and lubricants, amongst others) as part of their job. That means that volatile chemicals, including solvents, perfumes and fragrances, for example, need to be considered in a different light. All are possible sources of some chemicals on the list of "low concern." This is where the CCOHS database could be particularly useful. Furthermore, WHMIS 2015 coverage rules may extend to consumer products, following current discussions about having full disclosure for all products in the country. This fact and the CCOHS database(s) should be accounted for in CMP assessments of what chemicals are in the country and how they are used.

The attachment indicates that occupational hazards are likely an issue for a fair number of the 72 chemicals, either because they are consumer products that may be used on the job, or because of possible uses in the workplace. Reactive chemical intermediates (“building blocks” of chemical products) are typically highly hazardous, but are primarily workplace exposures.

3. Accuracy of exposure estimates

If the "known" uses of a chemical are not accurate, and occupational hazards are not considered, it is difficult to make accurate exposure estimates on which to base the assessment that these 72 chemicals are of "low concern".

It also is difficult to make accurate estimates without considering all possible routes of entry into the body. As noted in the table (again, this is the result of an *ad hoc*, not a comprehensive, review), there are a number of chemicals for which inhalation is likely. This is a common route of entry for job-related chemical hazards. Similarly, it is also common to have multiple entry routes, especially dermal and inhalation (e.g., lubricants, perfumes), which may not all have been taken into account.

The lack of transparency, complexities and uncertainties in the calculations and statements in the document raise many questions about the final assessment, especially when other authorities consider so many chemicals on the list to pose hazards to human or environmental health. (See point 4.) This is especially troubling, since the CMP document acknowledges:

31 substances associated with potential ecological effects of concern include those that are:

- *potential DNA and/or RNA binders,*
- *potential endocrine disrupting chemicals which target estrogen receptor signalling,*
- *possible substitutes for a substance in a high concern ERC group,*
- *moderate concern substances not associated with a high concern ERC group,*
- *substances having greater potential for local-scale exposures, or*
- *substances having high hazard but low current exposure according to ERC results.*

The potential effects and how they may manifest in the environment were not further investigated due to the low overall exposure to these substances.

Serious hazards such as genotoxicity and endocrine disruption (especially in light of low-exposure and non-monotonic effects), and other "high" hazard ratings, need to be acted upon in their own right. Uncertainties about exposure, and potential undetected increases in exposures, may pose risks for extended periods of time before actions are taken. The same applies to "local-scale exposures." These need further investigation. The public's health is not being protected, especially since the 13 carcinogens and others on the list likely have no thresholds at which effects may occur.

This is yet another example of potential adverse outcomes of decision-making based solely on risk assessments, especially without scientifically appropriate non-threshold, and precautionary accounting of hazards. It leads to the kinds of experiences common in workplaces, where government inspectors say that it doesn't matter if someone is getting sick from working with a chemical; all that counts is that the occupational exposure limit is not exceeded or that "manufacturer's instructions" are followed. It doesn't matter either if the air sampling was badly or incorrectly done, the occupational exposure level (OEL) is

old and out of date, or it was set for outcomes different from those being observed in an individual or groups of people.

Finally, the rapid screening tools used in these assessments should be clearly and transparently justified and explained: why and how the tools are used, their limitations, and the meaning of the results.

Relying on the Threshold of Toxicological Concern (TTC) approach for health effects of hazardous chemicals is not justified. This was the subject of public hearings in the EU in 2011, where serious concerns were raised about the science/data behind the TTC approach, assumptions made, and the results of using it.⁸ Critics said "many chemicals in the industry database itself show toxic effects below this 'safe' TTC derived level." Investigation revealed conflicts of interest among the scientists promoting the TTC approach in the European Food Safety Agency (EFSA).⁹ In 2007, Stockholm Convention expert committees also were concerned about the use of this approach for persistent organic pollutants (POPs):¹⁰

"While monitoring levels above critical body burdens or internal toxic doses clearly indicate a risk, the fact that current measured concentrations are below these triggers should in no case be interpreted as a confirmation of the absence of risk, particularly in the assessment of POPs and POPs candidates."

In addition, the expert committee noted that *"...there was a problem with comparing levels of toxicity determined in lab animal species and determining what was likely happening to different species in the environment."*

More recently, cumulative effects of multiple related or unrelated chemicals were addressed in a 2018 paper, where Takehiko Nohmi pointed out:¹¹

... it is suspected that detectable carcinogenic risk may appear when people are exposed to multiple DNA-reactive genotoxic carcinogens, even below the TTC.

⁸ Muilerman, H. *Letter to the EU Commissioner for Health and Consumer Policy, Mr. Dalli, re. Threshold of Toxicological Concern*. https://www.pan-europe.info/old/News/PR/110830_Letter%20Mr.%20Dalli%20%20TTC%2030%2008%2011.doc. Accessed Jan. 18, 2019

⁹ Pesticide Action Network Europe. *A Toxic Mixture? Industry bias found | EFSA working group on risk assessment for toxic chemicals*. <https://www.pan-europe.info/sites/pan-europe.info/files/public/resources/reports/pane-2011-a-toxic-mixture-industry-bias-found-in-efsa-working-group-on-risk-assessment-for-toxic-chemicals..pdf> Accessed Jan. 18, 2019

¹⁰ World Health Organization (WHO) and United Nations Environment Programme (UNEP). 2007. POPRC.3 Meeting Report. <http://www.pops.int/TheConvention/POPsReviewCommittee/Meetings/POPRC3/POPRC3ReportandDecisions/tabid/348/Default.aspx> Accessed Jan. 18, 2019.

¹¹ Nohmi, Takehiko (2018) "Thresholds of genotoxic and non-genotoxic carcinogens", *Toxicol. Res.*, 34(4) 281-290

... synergistic effects may occur, depending on the combination of chemicals. Although chemicals are regulated by different authorities depending on their intended use, e.g., food-related chemicals, industrial chemicals, air pollutants, pharmaceuticals and the impurities, simultaneous exposure to these chemicals is unavoidable. Currently, there is no effective approach to evaluate genotoxic and carcinogenic risk from exposure to low doses of multiple DNA-reactive genotoxic carcinogens.

The TTC does have some clear constraints, according to Dr. Susan Barlow and others writing in industry-affiliated documents. One is that exposure assessments must be credible and sound; the method should not be used if exposures are "uncertain or worst case exposure cannot be estimated"¹². It is not clear that this is true for any of the chemicals on the "low concern" list.

These concerns/limitations intertwine with previous points, and the following one.

4. Other sources say differently

Given earlier comments, it is highly relevant and particularly concerning that other sources reach different conclusions than those in the CMP document.

As the attached table shows, ECHA, other authorities, and even chemical manufacturers, consider many of these chemicals to be hazardous. As the summary table below indicates, a fair number of them are serious hazards for aquatic environments or people. (When more than 60 percent of the 72 chemicals are considered toxic to the aquatic environment elsewhere, how can they not be so in Canada?)

¹² Susan Barlow (2019) personal communication; Barlow, Susan (2006) *Threshold of toxicological concern (TTC). A tool for assessing substances of unknown toxicity present at low levels in the diet*, International Life Sciences Institute (ILSI Europe); Barlow, Susan (2015) *TTC – Non-cancer oral databases*. <http://ilsilife.org/europe/wp-content/uploads/sites/3/2016/05/Barlow-Non-cancer-databases-EUROTOX-CEC-TTC-2015-final-for-website.pdf>; Canady, Richard, et. al. (2013) "Determining the applicability of Threshold of Toxicological Concern approaches to substances found in foods", *Crit. Rev. Food Sci. Nutr.* 53(12): 1239–1249. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3809586/>. All accessed January 21, 2019

Hazard Information	Number of the 72 chemicals that other authorities consider to be hazardous or to pose suspected hazards
GreenScreen LT-1	6
GreenScreen LT-P1	26
GreenScreen LT-UNK with DK EPA rating	15
Toxic to aquatic environment (DC, ECHA)	45
Carcinogen (DC, ECHA)	13
Repro toxin (DC, ECHA)	13 (including diglyme and triglyme)
Genotoxin (DC, ECHA)	5
Sensitiser (DC, ECHA)	21

The Danish EPA is a key source for aquatic toxicity and up-to-date modelled assessments. Their results are included in the DataCommons (DC) and Pharos databases, but were not used in the GreenScreen assessments. (They were added to the DC only a few months ago.)

Clearly, many of the 72 chemicals that the government says are of “low concern” are hazards to human health or to the environment. It's difficult to understand the assessment when so many are *considered to have human health effects of concern* and toxic environmental effects, and there is reasonable *suspicion that new* (or current, ongoing) *activities .. have not been identified or assessed* (to borrow phrases rationalising the SNAc option for the glycol ethers).

This is a serious concern for workers. Their protection requires hazard information. Like others in "the public," protection also requires accurate and comprehensive information about the presence and uses of the chemicals in Canada, and a review of whatever epidemiological literature, grey literature or other hazard information exists about them.

5. Flagging/following up

There is no public plan to flag or follow up on any of the chemicals (other than the two glycol ethers). There needs to be a publicised, transparent and effective process to do both for all these chemicals (except horehound oil, for which there seems to be no data).

Data gaps are common but no excuse for inaction; there are well-established approaches to deal with them, including the precautionary principle set out in CEPA. Various authors have written about how to implement the principle or incorporate it in a regulatory context (e.g., the WHO document, *The precautionary principle: protecting public health, the environment and the future of our children*, edited by Marco Martuzzi and Joel A. Tickner, or Philippe Grandjean's piece, "Science for precautionary decision-making"¹³ in the 2013 *Late lessons from early warnings: science, precaution, innovation*).

6. Onus and responses

CSOs and others concerned and knowledgeable about chemical hazards and risks face serious limitations and disadvantages when attempting to respond to CMP assessments. This is particularly true when assessments cover a multitude of chemicals assessed behind closed doors using opaque and potentially very technical methods. We also are completely at a loss if use/presence data collection methods are ineffective and omit occupational contexts.

The government effectively places the onus on those making comments about its assessments to determine if undisclosed activities, methods and assumptions are effective, accurate, scientific, and comprehensive, and if a final assessment truly protects the health of people and our environments. That takes time, a wide range of specific knowledge (about technical and process topics) and commitment, as well as transparent processes and information. It's difficult, especially without adequate funding.

Given those kinds of limitations, these comments only address issues in general. Still, they raise serious questions and concerns about the assessments of these chemicals. The experience also makes it clear that the onus needs to be on the government to provide more complete information about its methods, data sources, analysis and rationale, in a transparent way, using clear language.

The government also needs to establish a system to provide further financial and other support for CSOs (and other members of the public with limited funds) to respond to assessments and other CMP requests for comments. This could be similar to that given to groups participating in environmental impact assessments. (This also would be one effective response to the CMP staff's request for improved public participation.)

Public participation also requires full responses to comments and meetings (sometimes) in a reasonable time after comments are submitted. In this case, we need more information about the methods, processes and results, as well as follow-up plans.

¹³ <https://www.eea.europa.eu/publications/late-lessons-2/late-lessons-chapters/late-lessons-ii-chapter-26>. Accessed January 20, 2019.

7. Recommendations

Many of the recommendations are consistent with those of the 2017 Standing Committee report about CEPA.

1. Issue a SNAC for both of the two glycol ethers and use the mandatory information gathering provisions under CEPA 1999 for each substance on the attached table when the GreenScreen assessment is an LT-1 or LT-P1, or if the Danish EPA assessment indicates a hazard, since the GreenScreen ratings did not incorporate that information.
2. For more accuracy and better public protection, implement inclusion of occupational hazards and workers' experiences in the SNAC and other information-gathering activities for these chemicals, and in future assessments.
3. For these requests, and in the future, expand the activity and methods used to obtain information regarding what is present, imported or used in Canada, including occupational settings. Reach out to CCOHS, poison control centres and workers' compensation boards. Unions, workers' organisations and CSOs also can be helpful.
4. In concert with the above recommendation, evaluate the effectiveness and completeness of all (voluntary and mandatory) requirements to provide information about existing and new chemicals. Prepare a public report about all the processes, what information is collected (and what's not) and how well this process and resulting decisions help to provide information about chemical hazards, and to reduce the use of and exposures to toxic chemicals in Canada.
5. Make good use of the DataCommons, Pharos database, Danish EPA and ECHA details (e.g., Annex III inventory of suspected hazards) for information about hazards and use/function of chemicals, as well as screening tools and assessments by other authorities.
6. Improve flagging and follow-up processes (most could be automated) so that regular reviews of sources such as ECHA and the DataCommons databases are carried out and used to inform the need for chemical (re-) evaluation. Also re-assess when interested parties such as CSOs bring forward information and/or relevant questions.
7. Provide short, clear/plain language summaries or abstracts of technical documents, with transparent explanations of the assumptions made, data sources, methods and final assessments.
8. Respond to these comments and organise a meeting with NGOs in the next few months to discuss the issues raised. (The CNHHE could be engaged to arrange the meeting.)
9. Support individuals and CSOs to provide effective and informed analyses and comments regarding chemicals assessment and management, similar

to the model that has been used to support intervenors in environmental impact assessments.


10. Establish a database inventory of chemicals in commerce (that could be extended to non-CEPA chemicals such as pesticides), and routinely compare it to recognised chemicals hazard databases, as well as lists of a large suite of endocrine activity indicators (e.g., The Endocrine Disruption Exchange/TEDX) and screening tools. This resource could be used for early “flagging” of concerns, public (including occupational) hazard and health surveillance and research, and performance measurement of the CMP.

Please do not hesitate to ask, if you have any uncertainties or questions regarding this submission.

Sincerely



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Meg Sears PhD
Chair, Prevent Cancer Now

c.c. Liz Smith, CNHHE

**Substances of "low concern" using ERC and TTC approaches, CMP screening assessment
November, 2018 CMP document with comments**

CAS RN	Chemical Name	ERC Hazard	ERC Exposure	ERC Classification	TTC value (µg/kg bw/day)	Environmental intake estimate (µg/kg bw/day)	Direct exposure estimate (µg/kg bw/day)	Direct exposure scenario	Human health high hazard ^a	Question assessment
60-24-2	Ethanol, 2mercapto-	low	low	low	30	1.04E-4	0.74	Food packaging	Skin sensitiser	LT-P1; on 46 hazard lists; NZ: skin sensitiser; ECHA: may be toxic if swallowed, fatal on skin, very toxic to aquatic life
77-47-4	1,3-Cyclopentadiene, 1,2,3,4,5,5-hexachloro-	high	low	low ^{a,b}	0.0025	3.42E-5	n/a	n/a	Fatal if inhaled	LT-1; on 10 restricted lists including building materials, problematic flame retardants (GSPI); EU GHS: very toxic to aquatic life with long lasting effects
78-67-1 ^b	Propanenitrile, 2,2'-azobis [2-methyl-	low	moderate	low	1.5	5.32E-3	0.0006	Food packaging		LT-P1; CA SCP Candidate List; GHS: very toxic to aquatic life with long lasting effects (ECHA)
79-74-3	1,4-Benzenediol, 2,5 bis (1,1-dimethylpropyl)-	high	low	low ^{a,b}	30	1.32E-6	n/a	n/a		LT-P1; REACH: reported very toxic to aquatic life
85-42-7 ^b	1,3-Isobenzofurandione, hexahydro-	low	low	low	1.5	6.86E-4	n/a	n/v	Endocrine disruptor Respiratory sensitiser	LT-1; CA SCP Candidate List; ECHA: ED, respiratory sensitiser; SIN list

CAS RN	Chemical Name	ERC Hazard	ERC Exposure	ERC Classification	TTC value (µg/kg bw/day)	Environmental intake estimate (µg/kg bw/day)	Direct exposure estimate (µg/kg bw/day)	Direct exposure scenario	Human health high hazard ^a	Question assessment
87-66-1 ^b	1,2,3-Benzenetriol	low	low	low	0.0025	6.92E-5	n/a	n/a	Possible carcinogen, genotoxin, respiratory sensitiser	LT-P1; GHS (EU): suspected to cause genetic defects, respiratory sensitiser, cancer; on Canadian and EU cosmetic ban lists
92-70-6 ^b	3-Hydroxy-2-naphthoic acid	moderate	low	low ^d	1.5	6.92E-4	n/a	n/a	Suspected carcinogen Skin sensitiser	LT-P1; Suspected carcinogen (DK EPA*); skin sensitiser; ECHA: harmful to aquatic life with long lasting effects
101-37-1 ^b	1,3,5-Triazine, 2,4,6-tris(2-propenyloxy)-	moderate	low	low	1.5	3.86E-3	n/a	n/a		LT-P1; ECHA: toxic to aquatic life with long lasting effects; EU GHS: avoid release to the environment
103-24-2	Nonanedioic acid, bis(2-ethylhexyl) ester	low	low	low	30	5.57E-3	n/a	n/a		LT-UNK
111-55-7 ^b	1,2-Ethandiol, diacetate	low	low	low	0.0025	6.31E-5	n/a	n/a	In biodiesel fuel? (Data Commons); many other uses in ECHA	LT-UNK

CAS RN	Chemical Name	ERC Hazard	ERC Exposure	ERC Classification	TTC value (µg/kg bw/day)	Environmental intake estimate (µg/kg bw/day)	Direct exposure estimate (µg/kg bw/day)	Direct exposure scenario	Human health high hazard ^a	Question assessment
111-96-6 ^b	Ethane, 1,1'-oxybis [2-methoxy-	low	low	low	30	6.92E-5	n/a	n/a	Yes ^b Repro toxin	LT-1; On 8 restricted lists (including for textiles); in glycol ether family of repro toxins of concern to workers; ECHA: GHS H360: May damage fertility or the unborn child; SIN list
112-49-2 ^b	2,5,8,11-Tetraoxadodecane	low	low	low	0.0025	6.92E-4	n/a	n/a	Yes ^b Repro toxin	LT-1; repro toxin (ECHA, others); SIN list, CA SCP Candidate List; EU ban in cosmetics; leather processing restricted lists; in glycol ether family of repro toxins of concern to workers
120-11-6	Benzene, 2-methoxy-1-(phenylmethoxy)-4-(1-propenyl)-	low	low	low	1.5	1.65E-6	0.014	Flavouring agent	Suspect genotoxin	LT-P1; suspected to cause genetic defects (DK EPA); very toxic to aquatic life with long lasting effects (DK EPA)
120-24-1	Benzeneacetic acid, 2-methoxy-4-(1-propenyl) phenyl ester	low	low	low	30	8.12E-7	0.0042	Flavouring agent	Suspect genotoxin	LT-P1; suspected to cause genetic defects (DK EPA); very toxic to aquatic life with long lasting effects (DK EPA)

CAS RN	Chemical Name	ERC Hazard	ERC Exposure	ERC Classification	TTC value (µg/kg bw/day)	Environmental intake estimate (µg/kg bw/day)	Direct exposure estimate (µg/kg bw/day)	Direct exposure scenario	Human health high hazard ^a	Question assessment
121-91-5	1,3-Benzenedicarboxylic acid	low	low	low	30	6.91E-2	0.050 (adults) 8.61 (infant)	Food packaging	Variety of uses cited in Data Commons and ECHA, including job-related ones	LT-UNK; very toxic to aquatic life (DK EPA)
122-68-9	2-Propenoic acid, 3-phenyl-, 3-phenylpropyl ester	low	low	low	30	1.57E-6	25 0.52	Fragrance Flavouring agent		LT-P1; very toxic to aquatic life with long lasting effects (DK EPA)
122-79-2 ^b	Acetic acid, phenyl ester	low	low	low	0.0025	8.98E-7	0.00014	Flavouring agent		LT-P1; very toxic to aquatic life (DK EPA, ECHA)
126-33-0 ^b	Thiophene, tetrahydro-, 1,1- dioxide	low	low	low	0.0025	6.91E-4	n/a	n/a	Variety of uses cited in Data Commons and ECHA, including job-related ones Repro toxin	LT-UNK; Category 2 repro GHS hazard (Japan); may damage fertility or the unborn child (ECHA); Minnesota Chemicals of High Concern list
132-65-0	Dibenzothiophene	moderate	low	low	0.0025	8.76E-4	n/a	n/a	In cosmetics? Carcinogen Possible endocrine disruptor	LT-1; on 7 restricted lists, including CA SCP Candidate List; carcinogen (MAK 1); potential ED; PBT (US EPA); ECHA/GHS: very toxic to aquatic life with long lasting effects
133-14-2	Peroxide, bis (2,4-dichlorobenzoyl)	high	low	low ^{a,b}	0.0025	6.45E-6	n/a	n/a	Repro toxin	LT-P1; may damage fertility or the unborn child (ECHA,DK EPA)

CAS RN	Chemical Name	ERC Hazard	ERC Exposure	ERC Classification	TTC value (µg/kg bw/day)	Environmental intake estimate (µg/kg bw/day)	Direct exposure estimate (µg/kg bw/day)	Direct exposure scenario	Human health high hazard ^a	Question assessment
288-88-0 ^b	1H-1,2,4-Triazole	low	low	low	1.5	1.18E-4	1.2	Product available to consumers (lubricant)	Inhalation? Repro toxin	LT-P1; banned in EU cosmetic products; suspected of reprotoxicity (GHS: NZ, EU, REACH)
614-45-9 ^b	Benzene carboperoxoic acid, 1,1- dimethylethyl ester	low	low	low	0.0025	8.68E-5	0.005 (amortized) 28 (per event) ^c	Product available to consumers (tube adhesive)	Inhalation? Skin sensitiser	LT-P1; aquatic hazard (Japan GHS 1; ECHA); skin sensitiser (GHS: Japan 1)
632-51-9	Benzene, 1,1',1'',1'''-(1,2-ethenediylidene)tetrakis-	low	low	low	1.5	1.18E-6	n/a	n/a		LT-UNK; Very toxic to aquatic life with long lasting effects (DK EPA)
793-24-8	1,4-Benzenediamine, N-(1,3-dimethylbutyl)- N'-phenyl-	moderate	high	moderate ^e	1.5	1.65E-1	n/a	n/a	Lots of uses in Data Commons Skin sensitiser	LT-P1; three restricted lists (including CA SCP Candidates List); hazardous to the aquatic environment (GHS: Japan, 1; ECHA); may cause allergic skin reaction (ECHA)
2379-79-5	Anthra [2,3- d]oxazole-5,10- dione, 2-(1-amino-9,10-dihydro-9,10-dioxo-2- anthracenyl)-	high	low	low ^{a,b}	0.0025	3.42E-5	n/a	n/a		LT-UNK; very toxic to aquatic life with long lasting effects (DK EPA)
3006-86-8	Peroxide,cyclohexylidene-bis [(1,1-dimethylethyl)	moderate	low	low ^f	1.5	1.95E-2	0.0014	Food packaging		LT-P1; may cause long lasting harmful effects to aquatic life (ECHA)

CAS RN	Chemical Name	ERC Hazard	ERC Exposure	ERC Classification	TTC value (µg/kg bw/day)	Environmental intake estimate (µg/kg bw/day)	Direct exposure estimate (µg/kg bw/day)	Direct exposure scenario	Human health high hazard ^a	Question assessment
3081-14-9	1,4-Benzenediamine, <i>N,N'</i> -bis(1,4-dimethylpentyl)-	high	low	low ^{a,b}	1.5	1.20E-4	n/a	n/a	Skin sensitiser	LT-P1; May cause an allergic skin reaction (DK EPA, REACH); very toxic to aquatic life with long lasting effects (DK EPA, ECHA)
3327-22-8 ^b	1-Propanaminium, 3-chloro-2-hydroxy- <i>N,N,N</i> -trimethyl-, chloride	moderate	low	low ^g	0.0025	6.93E-4	0.0020	Food packaging	Suspect carcinogen	LT-P1; suspected to cause cancer, harmful to aquatic life with long lasting effects (ECHA)
3851-87-4	Peroxide, bis(3,5,5-trimethyl-1-oxohexyl)	moderate	low	low	30	3.51E-5	n/a	n/a	Skin sensitiser	LT-UNK; skin sensitiser (DK EPA, ECHA); very toxic to aquatic life with long lasting effects (DK EPA)
5285-60-9	Benzenamine, 4,4'-methylenebis[<i>N</i> -(1-methyl propyl)-	high	low	moderate ^e	1.5	2.54E-4	n/a	n/a	Skin sensitiser Suspected genotoxin, carcinogen	LT-P1; Minnesota list; skin sensitiser (DK EPA, ECHA); suspected for genetic effects, cancer (ECHA)
6858-49-7	Propanedinitrile, [[4-ethyl[2- [[(phenylamino) carbonyl]oxy]ethyl]amino]-2-methylphenyl]methylene]-	high	low	low ^{a,b}	0.0025	3.42E-5	n/a	n/a	Suspected genotoxin, carcinogen, repro toxin, skin sensitiser	LT-UNK; CA SCP Candidate List; suspected repro toxin, mutagen, skin sensitiser, hazardous to aquatic environment (ECHA)

CAS RN	Chemical Name	ERC Hazard	ERC Exposure	ERC Classification	TTC value (µg/kg bw/day)	Environmental intake estimate (µg/kg bw/day)	Direct exposure estimate (µg/kg bw/day)	Direct exposure scenario	Human health high hazard ^a	Question assessment
8001-04-5 ^b	Musks	low	low	low	1.5	1.03E-6	0.0042	Flavouring agent	Used in Avon spray/ perfume products (HPD) Inhalation issues	Is this synthetic? No records in Data Commons, ECHA
13082-47-8	Xanthylum, 9-(2-carboxyphenyl)-3,6-bis (diethylamino)-, hydroxide	high	low	low ^{a,b}	0.0025	3.42E-5	n/a	n/a	Suspected carcinogen, mutagen	LT-UNK; suspected carcinogen, mutagen (ECHA)
13472-08-7 ^b	Butanenitrile, 2,2'-azobis [2-methyl-	low	moderate	low ^h	1.5	5.33E-3	0.51	Food packaging		LT-UNK
15791-78-3	9,10-Anthracenedione, 1,8-dihydroxy-4-[[4- (2-hydroxyethyl)phenyl amino]-5-nitro-	high	low	low ^{a,b}	0.0025	3.42E-4	n/a	n/a	Suspected carcinogen, mutagen	LT-UNK; suspected carcinogen, mutagen, respiratory sensitiser (ECHA)
19720-45-7	9,10-Anthracenedione, 1,4-bis[[2-methylpropyl amino] -	high	low	low ^{a,b}	1.5	2.08E-6	n/a	n/a	Suspected carcinogen	LT-UNK; CA SCP Candidate List; suspected carcinogen (DK EPA)
21652-27-7	1H-Imidazole-1- ethanol, 2-(8- heptadecenyl)-4,5-dihydro-, (Z)-	high	low	low ^{a,b}	1.5	3.42E-3	n/a	n/a		LT-P1; very toxic to aquatic life with long lasting effects (ECHA); at least one company has indicated that the substance classification is affected by impurities or additives (ECHA)
26266-77-3	1-Phenanthrenemethanol, dodecahydro-1,4a-dimethyl-7-(1-methylethyl)-	low	low	low ^g	30	1.18E-6	n/a	n/a		LT-UNK; Banned in HC cosmetic hotlist?

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26544-38-7	2,5-Furandione, dihydro-3-(tetrapropenyl)-	low	low	low ^f	1.5	5.64E-4	n/a	n/a	Suspected skin sensitiser, repro toxin	LT-UNK; may cause long lasting harmful effects to aquatic life, allergic skin reaction (ECHA); aquatic toxin (DK EPA); suspected repro toxin (DK EPA)
27193-86-8	Phenol, dodecyl-	high	low	low ^{a,b}	0.0025	5.68E-5	n/a	n/a	Suspected skin sensitiser, repro toxin	LT-UNK; may be skin sensitiser (DK EPA); very toxic to aquatic life (DK EPA, ECHA); suspected of damaging fertility or the unborn child (ECHA)
28173-59-3	Carbonic acid, 2-[(1-amino-9,10-dihydro-4-hydroxy-9,10-dioxo-2-anthracenyl)oxy] ethyl phenyl ester	high	low	low ^{a,b}	0.0025	3.42E-4	n/a	n/a	Possible carcinogen Skin sensitiser	LT-UNK; possible carcinogen, skin sensitiser (DK EPA); very toxic to aquatic life with long lasting effects (DK EPA, ECHA)
28777-98-2 ^b	2,5-Furandione, dihydro-3-(octadecenyl)-	low	high	low ^f	1.5	1.11E-1	0.15	Food packaging	Repro toxin Possible respiratory, skin sensitiser	LT-UNK; may damage fertility or unborn child (DK EPA); may be respiratory and skin sensitiser (ECHA)
28984-69-2	4,4(5H)-Oxazolidimethanol, 2(heptadecenyl)-	high	low	low ^{a,b}	1.5	3.42E-4	1.1	Product available to consumers (anti-freeze/de-icing)	Inhalation hazard?	LT-UNK; harmful to aquatic life with long lasting effects (ECHA);

CAS RN	Chemical Name	ERC Hazard	ERC Exposure	ERC Classification	TTC value (µg/kg bw/day)	Environmental intake estimate (µg/kg bw/day)	Direct exposure estimate (µg/kg bw/day)	Direct exposure scenario	Human health high hazard ^a	Question assessment
29036-02-0	Quaterphenyl	high	low	low ^{a,b}	0.0025	1.12E-3	n/a	n/a	Suspected carcinogen, mutagen	LT-UNK; on ECHA Annex III inventory: suspect bioaccumulative, carcinogen, aquatic toxin, mutagen; not readily biodegradable
29350-73-0	Naphthalene, decahydro-1,6- dimethyl-4-(1-methyl-ethyl)-, [1S (1α,4α,4aα,6α,8aβ)]-, didehydro deriv.	low	low	low	30	9.17E-7	0.00071	Flavouring agent	Perfume (Data Commons); inhalation issues	LT-P1; may be fatal if swallowed or inhaled (ECHA); very toxic to aquatic life with long lasting effects (DK EPA)
32072-96-1 ^b	2,5-Furandione, 3-(hexadecenyl)dihydro-	low	high	low ^f	1.5	1.11E-2	0.55	Food packaging	Suspected repro toxin, skin sensitiser	LT-UNK; suspected of damaging fertility or the unborn child (DK EPA); may be skin sensitiser (ECHA)

CAS RN	Chemical Name	ERC Hazard	ERC Exposure	ERC Classification	TTC value (µg/kg bw/day)	Environmental intake estimate (µg/kg bw/day)	Direct exposure estimate (µg/kg bw/day)	Direct exposure scenario	Human health high hazard ^a	Question assessment
38640-62-9 ^b	Naphthalene, bis (1-methylethyl)-	moderate	low	low	0.0025	9.99E-4	n/a	n/a	Carcinogen Carcinogen report about in vitro testing of food contact materials (Pub Med); many other uses, including those where inhalation likely (Data Commons); liquid at 20C (ECHA)	LT-1; on 8 restricted lists including CA SCP Candidate List, EPA hazardous air pollutant and building materials; carcinogen (MAK 1); fatal if swallowed, very toxic to aquatic life with long lasting effects (ECHA); precautions under REACH include <i>do not breathe the dust, fume, gas, mist, vapours or spray; avoid release to the environment</i>
53894-23-8	1,2,4-Benzenetricarboxylic acid, triisononyl ester	low	low	low	30	3.42E-2	n/a	n/a		LT-UNK; may cause long lasting harmful effects to aquatic life (ECHA)
61788-72-5 ^b	Fatty acids, tall-oil, epoxidized, octyl esters	high	low	low ^{a,b}	1.5	5.38E-6	n/a	n/a		LT-UNK
61789-01-3 ^b	Fatty acids, tall-oil, epoxidized, 2- ethylhexyl esters	high	low	moderate ^e	1.5	5.27E-4	n/a	n/a		LT-UNK; serious eye and skin irritation (ECHA)
61790-28-1	Nitriles, tallow	low	high	low	0.0025	3.38E-4	n/a	n/a		LT-P1; very toxic to aquatic life, harmful to aquatic life with long lasting effects (ECHA)

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61790-29-2	Nitriles, tallow, hydrogenated	low	low	low ^f	0.0025	9.09E-4	n/a	n/a		LT-P1; very toxic to aquatic life with long lasting effects (ECHA)
64754-95-6	Castor oil, hydrogenated, lithium salt	low	low	low	1.5	3.42E-3	n/a	n/a		LT-UNK
64800-83-5	Benzene, ethyl(phenylethyl)-	low	low	low	0.0025	1.02E-4	n/a	n/a	Suspected skin sensitiser	LT-UNK; very toxic to aquatic life with long lasting effects (DK EPA); suspected bioaccumulative, skin sensitiser (ECHA)
68082-35-9	Fatty acids, soya, epoxidized, Me esters	high	low	low ^{a,b}	1.5	6.11E-7	n/a	n/a		LT-UNK
68139-89-9	Fatty acids, tall-oil, maleated	high	low	moderate ^e	1.5	5.66E-4	n/a	n/a	Suspected skin sensitiser	LT-UNK; may be skin sensitiser (ECHA)
68140-48-7	Ethanone, 1-[2,3-dihydro-1,1,2,6-tetramethyl-3-(1-methylethyl)-1H-inden-5-yl]-	low	low	low	1.5	2.30E-4	n/a	n/a	Suspected repro toxin Used in perfumes (Data Commons), also in other consumer and work-related products, (ECHA)	LT-P1; suspected to affect fertility or unborn child (DK EPA); very toxic to aquatic life with long lasting effects (DK EPA, ECHA)
68398-19-6	Benzene, ethyl (phenylethyl)-, mono-aryl ethyl deriv.	low	low	low	1.5	1.05E-4	n/a	n/a		LT-UNK; very toxic to aquatic life with long lasting effects (DK EPA)

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68442-69-3	Benzene, mono-C10- 14-alkyl derivs.	low	low	low ^g	1.5	5.60E-5	n/a	n/a		LT-P1; very ecotoxic in the aquatic environment (NZ GHS); may be fatal if swallowed, very toxic to aquatic life (ECHA)
68515-60-6	1,2,4-Benzene tricarboxylic acid, tri-C7-9- branched and linear alkyl esters	low	low	low	30	1.05E-4	n/a	n/a		LT-UNK
68603-15-6	Alcohols, C6-12	low	low	low	30	3.42E-5	n/a	n/a	Used in pesticides, cleaning products (Tide)	LT-UNK; registered pesticide (EPA); very toxic to aquatic life, causes serious eye irritation (ECHA)
68783-36-8	Fatty acids, C16-22, lithium salts	high	low	moderate ^e	1.5	3.42E-2	n/a	n/a		LT-UNK
68784-12-3	2,5-Furandione, dihydro-, mono-C15- 20-alkenyl derivs.	low	high	low ^f	1.5	1.11E-1	0.59	Food packaging	Possible skin sensitiser Found in paper products including tissues, feminine hygiene products, nappies, books, magazines, wall-paper (ECHA)	LT-UNK; may be skin sensitiser, harmful to aquatic life with long lasting effects (ECHA)

CAS RN	Chemical Name	ERC Hazard	ERC Exposure	ERC Classification	TTC value (µg/kg bw/day)	Environmental intake estimate (µg/kg bw/day)	Direct exposure estimate (µg/kg bw/day)	Direct exposure scenario	Human health high hazard ^a	Question assessment
68784-26-9	Phenol, dodecyl-, sulfurized, carbonates, calcium salts, overbased	low	low	low	1.5	3.42E-1	1.2	Product available to consumers (lubricant)	Suspected repro toxin Worker hazard likely; used in fragrances and air fresheners (ECHA)	LT-UNK; suspected to damage fertility, unborn child (GHS, Australia, ECHA); may cause long lasting harmful effects to aquatic life (ECHA)
68909-18-2	Pyridinium, 1-(phenylmethyl)-, Et Me derivs., chlorides	low	low	low	1.5	1.68E-1	n/a	n/a	Water treatment products (ECHA)	LT-UNK; very toxic to aquatic life with long lasting effects (ECHA)
68916-97-2	Horehound oil	low	low	low	0.0025	1.08E-6	n/a	n/a		No records in the Data Commons or ECHA
68955-53-3	Amines, C12-14- <i>tert</i> -alkyl	low	low	low ^g	30	1.11E-4	n/a	n/a	Skin sensitiser	LT-P1; fatal if inhaled, very toxic to aquatic life with long lasting effects, skin sensitiser (ECHA)
71486-79-8 ^b	Benzenesulfonic acid, mono-C15-30- branched alkyl and di-C11-13- branched and linear alkyl derivs., calcium salts, overbased	low	moderate	low ^g	1.5	3.42E-2	n/a	n/a	Lubricants and greases (ECHA) so issue for workers	LT-UNK
73984-93-7	1,3,4-Thiadiazole- 2(3 <i>H</i>)-thione, 5-(<i>tert</i> -dodecyldithio)-	high	low	low ^{a,b}	1.5	3.42E-5	n/a	n/a		LT-UNK

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80584-90-3	1 <i>H</i> -Benzotriazole-1-methanamine, <i>N,N</i> -bis(2-ethylhexyl)-4- methyl-	high	low	low ^{a,b}	1.5	1.12E-4	0.9	Product available to consumers (lubricant)	Suspected carcinogen Skin sensitiser	LT-P1; suspected carcinogen (DK EPA); toxic to aquatic life with long lasting effects, skin sensitiser (ECHA)
125328-64-5	Nitriles, rape-oil, hydrogenated	low	moderate	low	0.0025	1.99E-3	n/a	n/a		LT-UNK; not on ECHA list
174333-80-3	Benzaldehyde, 2-hydroxy-5-nonyl-, oxime, branched	high	low	low ^{a,b}	1.5	1.34E-3	n/a	n/a	Repro toxin Skin sensitiser	LT-UNK; may damage fertility or the unborn child (1B), very toxic to aquatic life with long lasting effects, skin sensitiser (ECHA)

^b This substance was not identified under subsection 73(1) of CEPA, but was included in this assessment as it was considered a priority based on other human health concerns or ecological concerns.

* Danish EPA assessments are modeled and not included in the GreenScreen assessments, according to the Data Commons

Prepared January 4, 2019
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