Ministre de l'Environnement,
du Changement climatique
et de la Nature

Minister of the Environment,
Climate Change
and Nature

Ottawa (Ontario), Canada K1A 0A6

DEC 2 9 2025

Mr. Bob Miller, Jr.
Vice President, Global Product Stewardship
Albemarle Corporation
bob.miller@albemarle.com

Dear Mr. Miller:

This letter is in response to your Notice of Objection and request to establish a board of review to the publication of the proposed Prohibition of Certain Toxic Substances Regulations, 2022 (proposed Regulations), which was received by Environment and Climate Change Canada on July 13, 2022. The proposed Regulations were published in the *Canada Gazette*, Part I, on May 14, 2022.

I have carefully considered all the issues in your Notice of Objection, including those dealing with the nature and extent of the danger posed by decabromodiphenyl ethane (DBDPE) and the other questions and considerations that you brought to my attention. In my opinion, your Notice of Objection and the subsequent information you have provided, including information provided during the meeting with departmental officials on July 29, 2025, does not raise sufficient uncertainty or doubt in the science underlying the proposed Regulations that would warrant the establishment of a board of review under subsection 333(1) of the *Canadian Environmental Protection Act, 1999*. Therefore, I am denying your request, and I will not establish a board of review. The reasons for my decision are explained below and in the Annex to this letter.

Responses to comments in your Notice of Objection related to the outcomes of the screening assessment for DBDPE, which concluded that there is a risk of harm to the environment due to the persistence and widespread occurrence of DBDPE in the environment along with the potential for bioaccumulation and toxicity of its transformation products, are provided in the Annex.

The comments in your Notice of Objection regarding the development of the proposed Regulations have been considered alongside other comments received on these regulations. The specific points you have raised on the proposed

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Regulations and how they will be addressed are also summarized in the Annex to this letter. Your Notice of Objection raised specific concerns on the proposed exemptions for DBDPE, and to address these concerns, the proposed timeline of the DBDPE exemptions will be extended by an additional 10 years (i.e. extended from 5 years to 15 years for new products and from 20 years to 30 years for replacement parts) and the scope of these exemptions will be broadened to include all manufactured items and additional intermediate materials. This extended timeline will allow all stakeholders additional time for the research and development of alternatives, testing and certification, and transitioning their manufacturing and supply chains. Broadening the scope of the DBDPE exemptions will help to reduce the risk of prohibiting critical components, reduce the need to apply for permits under the proposed Regulations for non-exempted parts, and reduce compliance burden of stakeholders throughout the supply chain.

Please note that the comments on the proposed Regulations will be summarized in the Regulatory Impact Analysis Statement that will be published with the final *Prohibition of Certain Toxic Substances Regulations, 2025* (2025 Regulations) in the *Canada Gazette*, Part II, which describe how these matters have been addressed.

I appreciate your bringing your concerns to my attention. Please accept my best regards.

Yours truly,

The Honourable Julie Dabrusin, P.C., M.P.

Att.

Annex

Minister of Environment and Climate Change Canada
Detailed Responses to Notice of Objection Comments

1) The following provides a summary of comments related to "*Introduction*" as provided in your Notice of Objection and the analysis of the information you have provided:

In your Notice of Objection, you commented that alternative risk management measures not resulting in virtual elimination would be sufficient to address DBDPE risk of harm.

The DBDPE screening assessment concludes that DBDPE is toxic, persistent and results predominantly from human activities and that DBDPE is expected to contribute to the formation of persistent, bioaccumulative and inherently toxic transformation products, such as lower brominated diphenyl ethanes, in the environment. As such, at the time the risk management approach for DBDPE was published, DBDPE met the criteria outlined in the Government of Canada's Toxic Substances Management Policy for virtual elimination from the environment (Canada, 1995).

Upon the coming into force of the *Strengthening Environmental Protection for a Healthier Canada Act* (S.C. 2023, c. 12) in June 2023, the virtual elimination provisions of CEPA were replaced with a new regime that remains risk based. In developing a proposed regulation or instrument respecting preventive or control actions in relation to substances added to Part 1 of Schedule 1 of the Act, priority will be given to the total, partial or conditional prohibition of activities in relation to the substance or of releases of the substance into the environment. For substances added to Part 2 of Schedule 1, priority will be given to pollution prevention actions, which may include prohibition, when managing risks posed by those substances.

An Order adding DBDPE to Part 2 of Schedule 1 to the *Canadian Environmental Protection Act, 1999* was published in the *Canada Gazette*, Part II, on February 26, 2025.

As indicated in the risk management approach for DBDPE, the environmental objective for DBDPE is to reduce its concentrations in the Canadian environment to the greatest extent practicable, and the risk management objective for DBDPE is to achieve the lowest level of release of the substance into the Canadian environment, taking into account social, economic and technical matters.

The high importation volumes of DBDPE into Canada, along with information on its uses, indicate potential for widespread release into the Canadian environment. Aquatic exposure to DBDPE is expected through activities such as formulation, either directly to receiving surface water or to a wastewater treatment system that discharges its effluent to a receiving surface water body. In addition, products containing DBDPE have the potential to release DBDPE at various stages of their lifecycle, including use (see house dust studies referred to in Section 10.1.1.2 and Appendix D of the DBDPE screening assessment) and disposal. Once released into the environment, DBDPE will be found

mainly in sediment and soil, where it may persist for long periods of time, resulting in DBDPE build-up, as seen by rapid doubling times in sediment in the Great Lakes.

Given the above, a regulatory prohibition is the best approach to meet the risk management objective for DBDPE, which is to achieve the lowest level of release of the substance into the Canadian environment, taking into account social, economic and technical matters.

2) The following provides a summary of comments related to "*The Conclusions of the Final Screening Assessment upon which the Proposed Risk Management Measures for DBDPE rely is not Supported by the State of the Science*" as provided in your Notice of Objection and the analysis of the information you have provided:

2A) In your Notice of Objection, you referenced 50 studies provided during the assessment process and new studies (i.e. 336-hour study modelling the photolytic degradation of DBDPE within high impact polystyrene ("HIPS") in the Canadian environment and 2,000-hour study extending the modelling of the photolytic degradation of DBDPE within HIPS and polypropylene (PP)) generated since the publication of the screening assessment which you stated that either does not support the conclusion of the assessment or provides sufficient justification to reconsider its conclusion. In addition, wavelengths of light used in some studies cited by ECCC in the assessment were different (includes UVC region) than those in the most recent studies (e.g. 336-hour and 2000- hour studies include only UVA and UVB region) which could impact the results and interpretation.

All experimental studies submitted (including the 50 studies provided during the assessment process), aside from the 336-hour and this 2,000-hour photodegradation study (published in May 2021 and February 2022, respectively, following the publication of the screening assessment), were considered in development of the screening assessment by weighing their reliability and relevance. Those studies that were reliable and relevant to evaluating the risks posed by DBDPE to the environment were included as outlined in the final screening assessment. Thus, the information presented in these 50 studies was either considered in the final screening assessment or has no impact on the regulatory conclusion reached in the final screening assessment for DBDPE.

With regards to the 336-hour and 2,000-hour photodegradation studies, while the applied weathering conditions appear reasonable for simulation of environmental conditions and the quality of the 2,000-hour study was deemed sufficient by a submitted data quality evaluation report, these studies represent only one specific type of release scenario with limited relevance to overall DBDPE environmental release and fate. DBDPE has been found in the Canadian environment and around the world.

Evidence from studies with DBDPE adsorbed to solid matrices such as soil or sediment are most relevant to the fate of the substance in the natural environment. Moreover, the photolytic study cited in the screening assessment (i.e., that utilized high-pressure mercury lamp) is considered to be environmentally relevant with the main radiation wavelengths in the visible spectrum of blue and green after lamp stabilization. As an additive brominated flame retardant that is blended with the polymer product (rather than a reactive flame retardant chemical bonded to the polymer product), there is the possibility of release of DBDPE from these products to the environment. In addition, DBDPE may be released to air or dust by volatilization or abrasion of product containing the substance and then deposited to soil or water. Thus, the information presented in these photodegradation studies with DBDPE present within a polymer matrix has no impact on the regulatory conclusion reached in the DBDPE screening assessment.

2B) In your Notice of Objection, you provided a third-party review in 2020 by Dr. Gobas, updated in 2022, on the available scientific reports relating to DBDPE, as well as the draft and final screening assessments for DBDPE. You stated that the 2020 review by Dr. Gobas concluded that:

i) decaBDE is not a good read-across substance for the purpose of estimating the rate of potential debromination of DBDPE;

ii) guidelines and recommendations for applying a read-across approach exist but were not adequately followed by ECCC in the screening assessment;

iii) the screening assessment does not include evidence to substantiate that lower-form DBDPE products enter the environment in a quantity or concentration that have or may have an immediate or long-term harmful effect.

Regarding conclusions i) and ii), please refer to the responses to points 3A and 3C (below).

In response to conclusion iii), ECCC acknowledges that the parent structure DBDPE is highly persistent, highly insoluble in water, and highly sorptive to particulate matter while also having the potential to cause reproductive effects at high concentrations to earthworms as well as effects on plant survival and growth. As a result of these properties, DBDPE will accumulate in the environment and become a significant source of lower brominated transformation products, which have properties that suggest they are more bioaccumulative and hazardous than the parent structure DBDPE itself. Robust modelled aquatic toxicity data for potential DBDPE debrominated transformation products suggest effects at low concentrations in the range of water solubility of these transformation products. In addition, the presence of DBDPE debromination products in

wastewater treatment system pond sediments near a DBDPE manufacturing plant in the U.S have been confirmed. Considering DBDPE is a high-volume substance in Canada and that its levels are known to be increasing in the environment (as seen in Great Lakes sediment), and that DBDPE in aqueous solutions or adsorbed to solid surfaces such as sand, sediment, or dust is susceptible to various naturally occurring debromination processes, the pool of potential lower brominated transformation products are environmentally significant. Therefore, it is concluded that DBDPE meets the criteria set out 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.

2C) In your Notice of Objection, you referenced new information generated since the publication of the screening assessment, a National Academy of Sciences, Engineering, and Medicine report (the "NAS" Report), that suggests that decabromodiphenyl ether (decaBDE) is not an appropriate analogue for decabromodiphenyl ethane (DBDPE).

With regards to comments pertaining to the "NAS" Report, please refer to the responses to point 3C stated below on the suitability of decaBDE as an analogue for DBDPE.

In addition, the physical-chemical and toxicological information presented in the "NAS" Report suggests that there are substances, other than DBDPE (e.g., pentaBDE and octaBDE), that are more comparable to decaBDE with respect to a particular set of properties considered by NAS, but it does not suggest that DBDPE is incomparable to decaBDE, nor does it suggest that some metabolites formation processes between these two substances are significantly different. It is also worth noting that these subclasses of organic flame retardant substances were developed by NAS for the purpose of assessing risk to human health, and therefore, may not have considered the behaviour of these substances in the environment when forming the subclasses. Thus, the "NAS" Report finding does not directly apply to the use of decaBDE for read-across to DBDPE in the screening assessment.

As mentioned in the response to point 3C (below), it is noted that some differences in molecular makeup, dimensions, and configurations exist between DBDPE and decaBDE that may affect the manner in which these molecules interact with their environment, however, these differences are well within what is typical for analogue – target differences found in regulatory risk assessments as evidenced by three different jurisdictions making this choice (i.e., selecting decaBDE as a suitable analogue for DBDPE) in their 2007 (UK), 2019 (Canada) and 2024 (Sweden) evaluation reports on DBDPE.

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2D) In your Notice of Objection, you referenced new information generated since the publication of the screening assessment, a GreenScreen Risk Assessment for DBDPE, that suggests that decaBDE is not an appropriate analogue for DBDPE.

In regards to the comment on the GreenScreen Risk Assessment for DBDPE, the report indicates that the structural differences between DBDPE and decaBDE may lead to biological/metabolic differences between the two substances, leading to different GreenScreen scores for certain toxicological endpoints (e.g., developmental neurotoxicity – human health). The report does not consider the potential to use decaBDE as an analogue to support debromination pathways of transformation in the environment. Refer to the response to 3C. Thus, the GreenScreen Risk Assessment for DBDPE report findings do not contradict the use of decaBDE for read-across to DBDPE as was done in the screening assessment.

2E) In your Notice of Objection, you referenced the ECCC report "Polybrominated Diphenylethers in Fish and Sediment: Canadian Environmental Sustainability Factors" and state:

i) DBDPE does not meet the criteria for listing under Schedule 1 of CEPA due to the lack of established long-term trends for decaBDE.

It is not clear how the lack of established long-term trends for decaBDE is relevant to the determination that DBDPE meets the criteria for toxicity set out in section 64 of CEPA. Monitoring data, including established long-term trends if available, may be a line of evidence, among several, in the characterization of exposure in the risk assessment of a substance. However, long term trends are not specifically part of the criteria for toxicity as set out in section 64 of CEPA and are not required to determine whether a substance meets these criteria.

ii) If DBDPE were truly degrading in the environment, relevant monitoring data for the compounds analyzed would be expected to demonstrate the increasing presence of substances of concern in the environment.

The substances of concern that were mentioned in the final screening assessment include products of debromination from DBDPE, namely polybrominated diphenyl ethanes with <10 bromines. These substances have not been subject to targeted surveillance and monitoring under the Chemicals Management Plan (CMP). However, the lack of surveillance and monitoring cannot be taken as an indication that they do not occur in the Canadian environment. When measured, the presence of such DBDPE debromination products has been confirmed, for example, in

wastewater treatment system pond sediments near a DBDPE manufacturing plant in the U.S.

3) The following provides a summary of comments related to "*Final Screening Assessment for DBDPE Ignores the Weight of the Evidence*" as provided in your Notice of Objection and the analysis of the information you have provided:

3A) The conclusion reached in the Final Screening Assessment that DBDPE has the potential to transform into lower brominated products that could pose a risk to aquatic organisms conflicts with the proper application of the weight-of-evidence approach and has not been substantiated.

The assessment of DBDPE draws on the available empirical, modelling, and scientific information for DBDPE. In the absence of certain data on DBDPE, information on its close analogue, decaBDE was used to evaluate certain properties of DBDPE and its potential to cause adverse effects in the environment including breaking down to lower brominated products. A weight of evidence approach is applied with consideration of multiple lines of evidence, and some uncertainty associated with data gaps in the assessment warranted application of precaution. Thus, weight of evidence, precaution and impact of uncertainty have all been considered in decision-making.

3B) It is referenced in the Final Screening Assessment that DBDPE photolysis in natural waters, soils and bio-solids is expected to be limited because of DBDPE's low water solubility, particle adsorption behavior, as well as light attenuation by humic materials and that these references by the ECCC screening assessment question the suitability of photodegradation concerns and is inconsistent with the proposed ban.

The available empirical evidence presented in the screening assessment illustrates that lower brominated congeners are likely formed from transformation of DBDPE under various environmental conditions and processes which can include photodegradation. In terms of environmental exposures, photodebromination studies of DBDPE in aqueous solutions with humic acids, or evidence from studies with DBDPE adsorbed to solid surfaces such as sand or sediment or dust are relevant to the fate of the substance in the natural environment. Considering that DBDPE is a high-volume substance and has been detected in the Canadian environment at increasing concentrations in some instances, such as in the sediment of the Great Lakes, an element of precaution is applied for the consideration of its debromination and comparison to that of decaBDE. The slow dehalogenation of the bromine atoms on the rings to lower more bioaccumulative forms as well as generation of oxidized metabolites, which are likely non-polar and polar narcotic substances, may pose greater risk to the environment as they may persist in the environment and accumulate to high levels within organisms

over time. Robust modelled aquatic toxicity data for potential DBDPE debrominated transformation products also suggest adverse effects at low exposure concentrations in the range of water solubility of these transformation products.

3C) DBDPE is very different scientifically and structurally than decaBDE. Thus, the use of decaBDE as a proxy for DBDPE in computer modelling to draw this conclusion of potential breakdown products in the absence of any supporting studies is not appropriate and based on faulty assumptions given their different molecular structures.

The use of analogues and read-across in risk assessment, much like decaBDE is used in the DBDPE screening assessment, is well established and internationally recognized. Canada's approach to the use of analogues and read-across in risk assessment[1] is consistent with OECD Guidance[2] and the approaches used in other jurisdictions, including by the European Chemicals Agency (ECHA)[3].

DecaBDE is considered to be a suitably close analogue for DBDPE given the high degree of structural and functional similarities between the two substances, and the availability of relevant empirical information. In addition to Canada, the United Kingdom (UK) in 2007 and Sweden in 2024 utilized decaBDE as an analogue substance in their respective assessments of the target substance DBDPE[4].

Structural and functional similarities between substances have typically translated to similarities in environmental fate, behaviour, and other properties. It is noted that some differences in molecular makeup, dimensions, and configurations exist between DBDPE and decaBDE that may affect the manner in which these molecules interact with their environment; however, these differences are well within what is typical for analogue - target differences found in regulatory risk assessments.

The abundance of empirical data on decaBDE also factored into its selection as the most appropriate analogue for DBDPE. Expert judgement is applied in this process, where chemical properties, fate, or behaviour of decaBDE is read-across to DBDPE on a case-

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[1] https://www.canada.ca/en/health-canada/services/chemical-substances/fact-sheets/analogues-read-across-risk-assessment.html.
[2] OECD, *Guidance on Grouping of* Chemicals, 2d ed., 13 April 2017: https://www.oecd.org/en/publications/guidance-on-grouping-of-chemicals-second-edition_9789264274679-en.html.
[3] ECHA, Read-Across Assessment Framework (RAAF), 2017: https://echa.europa.eu/documents/10162/17221/raaf_en.pdf/614e5d61-891d-4154-8a47-87efebd1851a.
[4] Environmental risk evaluation report: 1,1'-(Ethane-1,2-diyl)bis[penta-bromobenzene] by United Kingdom Environment Agency (2007) and Substance Evaluation Conclusion and Evaluation Report for 1,1'-(ethane-1.2-diyl)bis[pentabromobenzene] (DBDPE) by Sweden (2024).

by-case (e.g., per endpoint or property) basis rather than in an absolute manner, and by taking into consideration the suitability and comparability of these attributes.

4) The following provides a summary of comments related to "*Proposed Risk Management Measures May Lead to Severe Risk to Public Health and Safety*" as set out in your Notice of Objection and the analysis of the information you have provided:

4A) In your Notice of Objection, you commented that DBDPE is used as a flame retardant to meet critical flammability standards and safety requirements in products including consumer devices, appliances, airplanes, motor vehicles and electronic and electrical equipment.

Flame retardant substances are generally used to meet performance-based flammability requirements. These requirements do not specify what chemical flame retardants need to be used; rather they may require a product or component to pass a laboratory test such as a cigarette smolder or open flame ignition test (ASTM 2014). Using chemical flame retardants such as DBDPE in products is one of the ways by which companies can meet flammability requirements for their products. Alternate substances as well as non-chemical-based alternatives may also be used to replace the use of DBDPE as a flame retardant in various applications.

In addition to the concerns you have raised in your Notice of Objection, a number of similar comments were received during the public comment period for the proposed Regulations. To address these concerns, the proposed timeline of the DBDPE exemptions will be extended by an additional 10 years (i.e. extended from 5 years to 15 years for new products and from 20 years to 30 years for replacement parts) and the scope of the DBDPE exemptions will be broadened to include all manufactured items and additional intermediate materials. This extended timeline will allow all stakeholders additional time for the research and development of alternatives, testing and certification, and transitioning their manufacturing and supply chains. Broadening the scope of the DBDPE exemptions will help to reduce the risk of prohibiting critical components, reduce the need to apply for permits under the Regulations for non-exempted parts, and reduce compliance burden of stakeholders throughout the supply chain.

4B) In your Notice of Objection, you provided comments that due to the lack of available alternatives for DBDPE in some products and that without suitable alternatives, increased flammability of products will create health and safety risks.

Please refer to the response to point 4A (above) respecting the extended timeline for, and broadened scope of the DBDPE exemptions.

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5) The following pertains to the subsequent information that was provided via a presentation at a meeting with ECCC officials on July 29, 2025:

5A) At the July 29, 2025 meeting representatives from Albemarle presented information on a new hydrolysis study conducted (unpublished) showing hydrolytic stability of DBDPE.

The stated results of this study as presented on July 29, 2025 in a virtual meeting, demonstrating that DBDPE does not appreciably hydrolyze under the conditions of this study is consistent with the DBDPE screening assessment, which indicates that DBDPE does not include functional groups expected to undergo hydrolysis and model results that indicate no hydrolysis.

5B) At the July 29, 2025 meeting representatives from Albemarle presented information on a new extraction study showing no DBDPE was detected after 90 days at 50 degrees Celsius in water at a limit of detection of 5 ppb (µg/L).

The stated results of this study as presented on July 29, 2025 in a virtual meeting, demonstrating that DBDPE did not leach out of the material when compared with a potential alternative flame retardant chemical (Ammonium Polyphosphate or APP). It should be noted that the solubility limit of DBDPE is very low (~10^{-2}-10^{-4} µg/L) and detection limit in this study appears to be above it at 5 ppb (µg/L), and effectively may not allow the detection of any DBDPE in the study that leached out to the water solubility limit. Despite this the DBDPE screening assessment did conclude that environmental release of the substance from plastic polymers via leaching is considered possible, albeit low.

5C) At the July 29, 2025 meeting representatives from Albemarle presented information on the UV degradation work highlighting the lack of photodebromination and photooxidation of DBDPE when compared with decaDBE. This now published study (Mathur, R.S. et al. *Chemosphere*, 2023, 20, 138063) was initially submitted as a unpublished manuscript by Albermarle with the NoO on July 13, 2020 and again in a letter from NAFRA in March 2023.

Please refer to the response provided for comment 2A.

5D) At the July 29, 2025 meeting representatives from Albemarle presented information on the mammalian toxicity, environment persistence and bioaccumulation potential for DBDPE indicating it was non-hazardous, no degradation was observed via aerobic or anaerobic pathways and no bioaccumulation was occurring for DBDPE in the environment.

This information generally aligns with and/or does not contradict any lines of evidence and conclusions presented in the DBDPE screening assessment relating to these properties. The results of sediment and soil chronic toxicity testing presented in the DBDPE screening assessment indicate that DBDPE appears to have the potential to cause effects only at high exposure concentrations to reproduction of earthworms as well as plant survival and growth, while no effects were observed for sediment organisms. No overtly toxic effects were found in wildlife, although DBDPE may affect enzyme activity in some test species. DBDPE meets the persistence criteria, but not the bioaccumulation criteria as set out in the Persistence and Bioaccumulation Regulations of CEPA.

5E) At the July 29, 2025 meeting representatives from Albemarle presented information the carbon footprint of DBDPE versus alterative flame retardants and the properties of some potential regrettable alternative flame retardants

This information is not directly relevant to the DBDPE screening assessment conclusions and thus would not impact any aspects of the assessment. Please also refer to the response to point 4A (above) respecting alternatives to DBDPE and the extended timeline for, and broadened scope of the DBDPE exemptions. In addition, it is not specified which alternatives industry should transition to as it is contingent upon industry to identify and transition to appropriate alternatives. To support industry and stakeholders in their transition to safer alternatives, a summary of flame retardant assessments and management conducted under the *Canadian Environmental Protection Act, 1999* has been published.