Government of Canada Gouvernement du Canada

Risk Management Approach

for

2-Mercaptobenzothiazole (MBT) and its Precursors

(from the Benzotriazoles and Benzothiazoles Group)

Environment and Climate Change Canada

Health Canada

March 2025

Canada

Summary of proposed risk management

This document outlines the proposed risk management actions for 2-mercaptobenzothiazole (MBT) and all substances that are precursors to MBT (herein referred to as MBT and its precursors), which have been found to be harmful to the environment.

Precursors to MBT are considered substances that contain an MBT moiety and that can degrade to MBT through any of various transformation pathways (for example, hydrolytic, redox, digestive or metabolic) at environmentally, industrially or physiologically relevant conditions (ECCC, HC 2025).

A non-exhaustive list of MBT and its precursors is presented in Annexes A and B of this document.

In particular, the Government of Canada is proposing to minimize the release of the MBT moiety to water bodies from the use of MBT and its precursors in the following industrial sectors with exposure of concern through the implementation of the following risk management instruments/tools:

1. **Tire and other rubber products manufacturing sector:** Developing release guidelines under section 54 of the *Canadian Environmental Protection Act, 1999* targeting the tire and rubber products manufacturing sector in order to reduce releases of multiple substances, including MBT and its precursors. The application of best management practices outlined in the *Code of Practice for the Environmentally Sound Management of Chemical Substances in the Chemicals, Plastics and Rubber Sectors* would also contribute to the risk management of MBT and its precursors. Other regulatory instruments (for example, pollution prevention planning notices) and non-regulatory instruments (for example, environmental performance agreements) may also be considered to achieve the risk management objective

2. **Metalworking fluids sector:** Continuing to monitor the potential usage of MBT and its precursors in the metalworking fluids sector in Canada to determine the need for any risk management action in the future

3. **Some mining industry subsectors**: Performing monitoring and surveillance activities in some subsectors of the mining industry to measure concentrations of MBT in industrial effluents and in surface water in the receiving environments once an analytical method has been developed. This will allow Environment and Climate Change Canada to determine what risk management measures should be developed, if any, for these facilities

The Government of Canada plans to collect and analyze data on the presence of MBT in surface water and sediments in order to establish a baseline environmental presence, and again, following implementation of risk management actions, to measure progress towards meeting the environmental objective.

Moreover, because certain data gaps remain, the following information should be provided (ideally on or before May 7, 2025), to the contact details identified in section 8 of this document, to inform risk management decision-making:

- General information:
    - Hydrolysis and degradation rate of benzothiazoles, including MBT and its precursors
    - Analytical methods for measuring MBT in industrial effluents
    - Concentrations of MBT in surface water near facilities that use MBT and/or its precursors
    - Best management practices and technologies in place, and efficiency of treatment methods at facilities in the industrial sectors with exposures of concern mentioned above that use MBT and/or its precursors
    - Socio-economic and technical impacts and benefits associated with the proposed risk management for these substances

- Tire and other rubber products manufacturing sector:
    - Information on the typical quantities of unreacted MBT and its precursors:
        - present in the product, including information on distribution within the components of the product
        - released in any effluents
    - Details on alternatives and feasibility of using alternative accelerators to replace MBT and/or its precursors in tire and other rubber products manufacturing

- Metalworking fluids sector:
    - Identification of users of MBT and its precursors in metalworking fluids
    - Socio-economic profile of the facilities that use MBT and its precursors
    - Information on the use of MBT and/or its precursors as a corrosion inhibitor in lubricants
    - Concentrations of MBT and/or its precursors in the final metalworking fluid product, and concentrations in effluent or emissions released to the environment;
    - Details on alternatives and feasibility of using alternatives to replace MBT and/or its precursors in the metalworking fluids sector as a corrosion inhibitor in lubricants

- Some mining industry subsectors:
    - Retention time of effluent in mine tailings storage facilities in certain subsectors of mining where MBT and/or its precursors are used
    - For mining facilities that use MBT and/or its precursors:
        - Percentage of the handled substances released to tailings ponds
        - Substance removal rates at onsite treatment systems before reaching tailings ponds
        - Substance removal rate in tailings ponds

The risk management actions outlined in this risk management approach document may evolve through consideration of assessments and risk management options or actions published for other Chemicals Management Plan substances as required, to ensure effective, coordinated, and consistent risk management decision-making.

Note: The above summary is an abridged list of actions proposed to manage these substances and to seek information on identified gaps. Refer to section 3 of this document for more complete details in this regard. It should be noted that the proposed risk management actions may evolve through consideration of additional information obtained from the public comment period, literature and other sources.

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1. Context

The *Canadian Environmental Protection Act, 1999* (CEPA) (Canada 1999) provides the authority for the Minister of the Environment and the Minister of Health (the ministers) to conduct assessments to determine if substances are toxic to the environment and/or human health as set out in section 64 of CEPA[1,2], and, if so, to manage the associated risks.

The substances listed in Annexes A and B, which present a non-exhaustive list of MBT and its precursors, are referred to throughout this document as “MBT and its precursors”. Precursors to MBT are considered substances that contain an MBT moiety and that can degrade to MBT through any of various transformation pathways (for example, hydrolytic, redox, digestive or metabolic) at environmentally, industrially or physiologically relevant conditions (ECCC, HC 2025).

The substances listed in Annex A are benzothiazoles included in the Benzotriazoles and Benzothiazoles Group assessment under the third phase of the Chemicals Management Plan (ECCC, HC 2025). The substances in the benzothiazoles subgroup all contain the MBT moiety. This moiety was identified as the key part of the molecule which may be released to the Canadian environment based either on direct use and release of MBT, or through indirect release owing to degradation of the parent compounds.

Annex B contains a non-exhaustive list of substances that were not assessed as part of the Benzotriazoles and Benzothiazoles Group but that contain the MBT moiety and therefore have the potential to release MBT to the environment.

Throughout this document, “MBT and its precursors” (that is, the substances listed in Annexes A and B) refers to MBT, its salts, and compounds containing MBT bonded to any chemical moiety through disulfide or sulfenamide bonds or bonded with methyl ester thiocyanic acid.

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[1] Section 64 of CEPA: *For the purposes of Parts 5 and 6 of CEPA, except where the expression “inherently toxic” appears, 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.*

[2] A determination of whether one or more of the criteria of section 64 are met is based upon an assessment of potential risks to the environment and/or to human health associated with exposures in the general environment. For humans, this includes, but is not limited to, exposures from ambient and indoor air, drinking water, foodstuffs, and products used by consumers. A conclusion under CEPA is not relevant to, nor does it preclude, an assessment against the hazard criteria specified in the *Hazard Product Regulations*, which are a part of the regulatory framework for the Workplace Hazardous Materials Information System for products intended for workplace use. Similarly, a conclusion on the basis of the criteria contained in section 64 of CEPA does not preclude actions being taken under other sections of CEPA or other Acts.

2. Issue

Health Canada and Environment and Climate Change Canada (ECCC) conducted a joint scientific assessment relevant to the evaluation of the Benzotriazoles and Benzothiazoles Group in Canada. A notice summarizing the scientific considerations of the assessment for these substances was published in the *Canada Gazette*, Part I, on March 8, 2025 (Canada 2025). For further information, refer to the assessment for the Benzotriazoles and Benzothiazoles Group.

2.1 Assessment conclusion

On the basis of the information available, the assessment concludes that MBT and its precursors (defined as 2-mercaptobenzothiazole, its salts, and compounds containing 2-mercaptobenzothiazole bonded to any chemical moiety through disulfide or sulfenamide bonds or bonded with methyl ester thiocyanic acid), including the substances in the benzothiazoles subgroup, are toxic under paragraph 64*(a)* of CEPA because they are 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 (ECCC, HC 2025).

The assessment also concludes that the substances in the benzothiazoles subgroup do not meet the criteria under paragraphs 64*(b)* or 64*(c)* of CEPA as they are not entering the environment in a quantity or concentration or under conditions that constitute or may constitute a danger to the environment on which life depends or a danger in Canada to human life or health (ECCC, HC 2025).

The assessment also determined that certain substances included among MBT and its precursors meet the persistence criteria but MBT and its precursors do not meet the bioaccumulation criteria, as defined in the *Persistence and Bioaccumulation Regulations* made under CEPA (Canada 2000).

The exposure sources of concern identified in the assessment are the potential releases of MBT and its precursors to water from the following activities:

- Use of MBT and/or its precursors as an accelerator in the vulcanization process in tire and other rubber products manufacturing
- Use of MBT and/or its precursors as a corrosion inhibitor in metalworking fluids
- Use of MBT and/or its precursors as a flotation reagent in some subsectors of the mining industry

As such, this document will focus on these activities and exposure sources (refer to section 5).

Upon exposure to water, the parent compounds are expected to degrade to MBT, which will largely remain in the water given its solubility; however, sorption to particulate matter is possible. In such cases, it would be expected that sorbed substances could settle to the sediment. Experimental toxicity data indicate that MBT has the potential to cause harm to aquatic organisms at low concentrations, such as effects on growth and development (ECCC, HC 2025).

Although a risk to human health has not been identified at levels of exposure considered in the assessment, there may be a concern if exposure to 2-benzothiazolesulfenamide, N-(1,1-dimethylethyl) (TBBS), 2-benzothiazolesulfenamide, N-cyclohexyl- (CBS), benzothiazole, 2,2'-dithiobis- (MBTS), MBT, 2(3H)-benzothiazolethione, sodium salt (SMBT), and 2-benzothiazolesulfenamide, N,N-dicyclohexyl- (DCBS) were to increase. As a result, these substances may be considered in future initiatives to track their commercial status or identify new uses or exposures. Monitoring of MBT in surface water and sediment which is planned as part of the ecological component of the performance measurement evaluation will also help track human exposures. Note that, in this case, surface water would be used as a surrogate for drinking water. Prior to monitoring, analytical methods will need to be developed.

2.2 Recommendation under CEPA

On the basis of the findings of the assessment conducted pursuant to CEPA, the ministers recommend that "2-mercaptobenzothiazole, its salts, and compounds containing 2-mercaptobenzothiazole bonded to any chemical moiety through disulfide or sulfenamide bonds or bonded with methyl ester thiocyanic acid" (that is, MBT and its precursors) be added to Part 2 of Schedule 1 to CEPA[3]. Addition of a substance to Schedule 1 to CEPA enables the Government to propose certain risk management measures under CEPA to manage potential ecological and human health risks associated with the substance.

Until regulations specifying criteria for the classification of substances that pose the highest risk are available, MBT and its precursors are recommended for addition to Part 2 of Schedule 1. Following the availability of the aforementioned regulations, the substances may be moved to Part 1 of Schedule 1, if applicable.

CEPA sets out a 2-track approach for managing risks.

Under subsection 77(3), the ministers are required to propose recommending the addition of a substance that poses the highest risk, as defined in paragraph (*a*),

[3] After an assessment of a given substance under Part 5 of CEPA, other than section 83, the ministers shall propose one of the following measures: take no further action with respect to the substance, add the substance to the List referred to in section 75.1 of the Act (unless the substance is already on that List), recommend the addition of the substance to Part 1 of Schedule 1 to CEPA (for substances that pose the highest risk) or recommend the addition of the substance to Part 2 of Schedule 1 to CEPA (for other CEPA-toxic substances).

(*b*) or (*c*), to Part 1[4] of Schedule 1 to CEPA and, in developing a proposed regulation or instrument respecting preventive or control actions, to give priority to the total, partial or conditional prohibition of activities in relation to the substance or to the release of the substance into the environment.

For other substances recommended for addition to Part 2 of Schedule 1 to CEPA, the ministers shall give priority to pollution prevention, and this could include regulatory measures such as regulations and pollution prevention planning notices, or non-regulatory measures such as environmental release guidelines, codes of practice, or environmental performance agreements, if warranted.

MBT and its precursors were found not to meet the criteria per subsection 77(3) for addition to Part 1 of Schedule 1 to CEPA.

The ministers have taken into consideration comments made by stakeholders during the 60-day public comment period on the draft screening assessment for benzotriazoles and benzothiazoles and the risk management scope for MBT and its precursors.

As the ministers finalize the recommendation to add “2-mercaptobenzothiazole, its salts, and compounds containing 2-mercaptobenzothiazole bonded to any chemical moiety through disulfide or sulfenamide bonds or bonded with methyl ester thiocyanic acid” to Part 2 of Schedule 1, a risk management instrument must be proposed within 24 months from the date of this recommendation. The instrument must be finalized within 18 months from the date it is proposed, as outlined in sections 91 and 92 of CEPA (refer to section 8 for publication timelines applicable to this group of substances). Adding a substance to Schedule 1 does not restrict its use, manufacture or import. Rather, it enables the Government of Canada to take enforceable risk management actions under CEPA.

2.3 Public comment period on the draft screening assessment and the risk management scope

The draft screening assessment for the Benzotriazoles and Benzothiazoles Group (ECCC, HC 2021a) and its associated risk management scope (ECCC, HC 2021b) summarizing the proposed risk management options under consideration at that time, were published on March 6, 2021. Industry and other

[4] Under subsection 77(3), a substance must be recommended for addition to Part 1 of Schedule 1 to CEPA when the substance is determined to be toxic and the ministers are satisfied that:

a) the substance may have a long-term harmful effect on the environment and
    i. is inherently toxic to human beings or non-human organisms, as determined by laboratory or other studies,
    ii. is persistent and bioaccumulative in accordance with the regulations,
    iii. is present in the environment primarily as a result of human activity, and
    iv. is not a naturally occurring radionuclide or a naturally occurring inorganic substance;
b) the substance may constitute a danger in Canada to human life or health and is, in accordance with the regulations, carcinogenic, mutagenic or toxic for reproduction; or
c) the substance is, in accordance with the regulations, a substance that poses the highest risk.

interested stakeholders were invited to submit comments on both documents during a 60-day comment period.

Comments received on the draft screening assessment and the risk management scope document were taken into consideration in the development of this document. A summary of responses to public comments received is available.

3. Proposed risk management

3.1 Proposed environmental objective

Proposed environmental objectives are quantitative or qualitative statements on what should be achieved to address the environmental concerns.

For these substances, the proposed objectives are focused on addressing the exposure sources of concern outlined in section 5 of this document. The proposed environmental objective for MBT and its precursors is to minimize the presence of MBT and its precursors in water bodies to levels below the predicted no-effect concentration (PNEC) for MBT of 2.1 µg/L.

3.2 Proposed risk management objective

Proposed risk management objectives set quantitative or qualitative targets to be achieved by the implementation of risk management regulations, instruments and/or tools for a given substance or substances.

The proposed risk management objective for MBT and its precursors applies to the following industrial sectors: the tire and other rubber products manufacturing sector, the metalworking fluids sector, and some subsectors of the mining industry. The proposed risk management objective is to minimize the release of MBT and its precursors in industrial effluents to levels that are protective of the environment, considering technical and socio-economic factors.

3.3 Proposed risk management actions

To achieve the proposed risk management objective and to work towards achieving the proposed environmental objective, the proposed risk management actions being considered for MBT and its precursors are outlined in the subsequent subsections.

Note that these proposed risk management actions are preliminary and subject to change. Following the publication of this document, additional information obtained from the public comment period and from other sources will also be

considered in the instrument selection and development process[5]. The proposed risk management actions may also evolve through consideration of assessments and risk management actions published for other CMP substances to ensure effective, coordinated, and consistent risk management decision-making.

3.3.1 Tire and other rubber products manufacturing sector

The proposed risk management action being considered is the development of release guidelines targeting the tire and rubber products manufacturing sector in order to reduce releases of multiple substances, including MBT and its precursors. The application of best management practices outlined in the *Code of Practice for the Environmentally Sound Management of Chemical Substances in the Chemicals, Plastics and Rubber Sectors* would also contribute to the risk management of MBT and its precursors. Other regulatory instruments (for example, pollution prevention planning notices) and non-regulatory instruments (for example, environmental performance agreements) may also be considered to achieve the risk management objective.

Release guidelines, under section 54 of CEPA, would set out recommended limits (expressed as concentrations or quantities) for releases of MBT and its precursors into the environment from works, undertakings or activities.

3.3.2 Metalworking fluids sector

ECCC will continue to monitor the potential usage of MBT and its precursors in the metalworking fluids sector in Canada to determine the need for any risk management action in the future. A study was completed in 2023 by ECCC which aimed to develop a sector profile for metalworking fluids users in Canada, including gathering information on the use of metalworking fluids and, more specifically, on MBT and its precursors. The information gathered allowed for the identification of key stakeholders and helped determine their economic profiles, key activities and use patterns of metalworking fluids with a focus on MBT and its precursors. The study identified low usage of MBT and its precursors of concern in Canada. However, several key data gaps still remain, which ECCC is currently in the process of addressing with the industry. ECCC will monitor the situation to determine the need for any risk management action.

3.3.3 Some mining industry subsectors

Once an analytical method has been developed, ECCC is proposing to perform monitoring and surveillance activities in some subsectors of the mining industry to measure concentrations of MBT in industrial effluents and in surface water in

[5] The proposed risk management regulation(s), instrument(s) or tool(s) will be selected using a thorough, consistent and efficient approach and take into consideration available information in line with the Government of Canada's Cabinet Directive on Regulation (TBS 2018a), the Policy on Regulatory Development (TBS 2018b), the Red Tape Reduction Action Plan (TBS 2012), and, in the case of a regulation, the *Red Tape Reduction Act* (Canada 2015).

the receiving environments. This will allow ECCC to determine what risk management measures should be developed, if any, for these facilities.

3.3.4 Analytical method development

It is recognized that analytical methods for measuring and monitoring aquatic concentrations of MBT are required to determine if the proposed environmental and risk management objectives are met. Analytical methods can be used to quantitatively determine the concentration of a substance in a sample. Specific methods must be available to provide data that meets the needs of environmental protection and management programs carried out by ECCC. Therefore, ECCC is proposing to develop analytical methods to measure concentrations of MBT in surface water, sediment and industrial effluents.

3.4 Performance measurement and evaluation

Performance measurement evaluates the ongoing effectiveness and relevance of the actions taken to manage risks from toxic substances[6]. ECCC and Health Canada have developed a Performance Measurement Evaluation Strategy that sets out the approach to evaluate the effectiveness of actions taken on substances found toxic under CEPA. The aim is to determine whether human health and/or environmental objectives have been met and whether there is a need to revisit the risk management approach for those substances. Selection of a substance for performance measurement evaluation is conducted through readiness, prioritization and work planning as outlined in the Performance Measurement Evaluation Strategy. In evaluating progress and revisiting risk management, as warranted, these activities together will aim to manage risks effectively over time.

The Government of Canada may measure the effectiveness of the risk management actions and the progress towards meeting the risk management and environmental objectives for MBT and its precursors by collecting and analyzing data, such as releases of MBT from industrial effluents, and monitoring data on the presence of MBT in surface water and sediments.

When undertaken, the results of performance measurement and evaluation are used to inform whether further risk management action is warranted and are

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[6] Performance measurement can be performed at 2 levels:

- Instrument-based performance measurement evaluates the effectiveness of an individual instrument in meeting the specific risk management objectives that were set out when the risk management tool was designed. The results of performance measurement will help determine if additional risk management or assessment is needed (that is, evaluate whether risk management objectives have been met); and
- Substance-based performance measurement considers performance of all final risk management instruments applied to a chemical substance and relevant data or indicators of exposure to the environment or human health (that is, evaluate whether human health and/or environmental objectives have been met).

For more information on performance measurement evaluation (including Health Canada and ECCC's Performance Measurement Evaluation Strategy), please visit Performance measurement for toxic substances - Canada.ca.

made available to people in Canada along with recommendations for further action, if applicable.

3.5 Risk management information gaps

Interested stakeholders are invited to provide further information to inform risk management decision-making regarding MBT and its precursors, including the following:

- General information:
    - Hydrolysis and degradation rate of benzothiazoles, including MBT and its precursors
    - Analytical methods for measuring MBT in industrial effluents
    - Concentrations of MBT in surface water near facilities that use MBT and/or its precursors
    - Best management practices and technologies in place, and efficiency of treatment methods at facilities in the 3 industrial sectors with exposures of concern that use MBT and/or its precursors
    - Socio-economic and technical impacts and benefits associated with the proposed risk management for these substances

- Tire and other rubber products manufacturing sector:
    - Information on the typical quantities of unreacted MBT and its precursors:
        - present in the product, including information on distribution within the components of the product
        - released in any effluents
    - Details on alternatives and feasibility of using alternative accelerators to replace MBT and/or its precursors in tire and other rubber products manufacturing

- Metalworking fluids sector:
    - Identification of users of MBT and its precursors in metalworking fluids
    - Socio-economic profile of the facilities that use MBT and its precursors
    - Information on the use of MBT and/or its precursors as a corrosion inhibitor in lubricants
    - Concentrations of MBT and/or its precursors in the final metalworking fluid product, and concentrations in effluent or emissions released to the environment
    - Details on alternatives and feasibility of using alternatives to replace MBT and/or its precursors in the metalworking fluids sector as a corrosion inhibitor in lubricants

- Some mining industry subsectors:
    - Retention time of effluent in mine tailings storage facilities in certain subsectors of mining where MBT and/or its precursors are used
    - For mining facilities that use MBT and/or its precursors:

- Percentage of the handled substances released to tailings ponds
- Substance removal rates at onsite treatment systems before reaching tailings ponds
- Substance removal rate in tailings ponds

Stakeholders that have information to help address these gaps should provide it on or before May 7, 2025 to the contact details identified in section 8.

Data collection initiatives (such as section 71 surveys or informal data gathering) may be undertaken to collect additional information on MBT and its precursors to inform risk management decision-making, which could include MBT precursors that were not included in the benzothiazoles subgroup.

To provide more information on releases, disposals and recycling of MBT in Canada and support any risk management actions, ECCC may consider whether reducing the current reporting threshold for the National Pollutant Release Inventory (NPRI) would result in more comprehensive information on how much MBT is being released into the environment. This review could also look at redefining the current NPRI listing of MBT to include MBT precursors.

4. Background

4.1 General information on MBT and its precursors

Benzothiazoles are heterocyclic compounds that rarely occur naturally. All of the substances in the benzothiazoles subgroup contain the MBT moiety. Environmental releases of the MBT moiety may result from direct use and release of MBT, or through indirect release owing to degradation of the parent compounds, in which case the MBT moiety may remain in the water given its solubility (ECCC, HC 2025). As such, MBT and its precursors will all contribute to the exposure and environmental impact.

4.2 Current uses and identified sectors

4.2.1 Information gathering

Information gathering under section 71 of CEPA

Use and volume information for MBT and the other substances in the benzothiazoles subgroup was obtained in part through a CEPA section 71 survey (Canada 2017). Based on the data received, several follow-up voluntary questionnaires were sent out to relevant industry stakeholders.

Reportable activities and codes included manufacturing and import of mixtures, products and manufactured items above a specific threshold, North American

Industry Classification System (NAICS) codes, substance function codes, and consumer and commercial codes.

According to information submitted in response to a CEPA section 71 survey, the substances in the benzothiazoles subgroup listed in Annex A were imported into Canada in 2015 in total quantities for MBT and SMBT ranging from 10,000 kg to 100,000 kg; and for TBBS, MBTS, DCBS, and CBS ranging from 100,000 kg to 1,000,000 kg (ECCC 2018). Additional data provided by stakeholders up to September 2021 during voluntary data gathering confirmed that the import range in 2015 for CBS ranged from 1,000,000 kg to 10,000,000 kg (ECCC 2021). None of the substances in the benzothiazoles subgroup listed in Annex A were reported to be manufactured in Canada above the reporting threshold of 100 kg for 2015 (ECCC 2018).

Major industrial uses of benzothiazoles include their use as: vulcanization accelerators in the manufacture of tire and other rubber products, corrosion inhibitors in metalworking fluids, and flotation reagents in some subsectors of the mining industry.

Information gathering from the Canadian Border Services Agency (CBSA)

Information on the import of MBT and its precursors was obtained from the CBSA. Data were received for imports between the years 2010 to 2020 under the Harmonized System (HS) code for “Compounds containing in the structure a benzothiazole ring-system (whether or not hydrogenated), not further fused”. Data analysis was focused on imports between the years 2015 to 2020. These data confirmed that the total quantities of benzothiazoles imported into Canada decreased from about 4,500,000 kg in 2015 to about 1,500,000 kg in 2020, which represents a reduction by 66.7%. Of these, on average 90% was imported by companies in the tire and other rubber products manufacturing sector. No mining facility was identified as an importer of these substances (CBSA 2021).

Information gathering through voluntary data collection initiatives

Between 2018 and 2021, ECCC worked in collaboration with the United States Tire Manufacturers Association and the Tire and Rubber Association of Canada to design and conduct a questionnaire to confirm usage by Canadian tire manufacturers of the 6 substances in the benzothiazoles subgroup included in the assessment. The information gathered included substances and volumes used in 2015, the form in which the substance was added into the process, percent of the substance in the material if it is in a mixture, wastewater treatment systems available, effluent flow rate and location of effluent discharged. All data reported is confidential.

In the summer of 2021, ECCC conducted a voluntary information gathering initiative to gather information on the manufacture, import and/or use in 2018 and 2019 of 14 MBT precursors listed in Annex B in Canada in 3 sectors of concern. Information was collected through a voluntary questionnaire that was sent out to

relevant industry stakeholders (ECCC 2021). In certain cases, follow-up questions were sent to stakeholders.

The questionnaire collected information on the quantities of these substances manufactured, imported or used in Canada in 2018 and 2019, and the intended use of the substances. The information collected indicates that CAS RN[7] 95-32-9 was imported and used in total quantities ranging from 1 kg to 1,000 kg in 2018, and from 1 kg to 100 kg in 2019; CAS RN 102-77-2 was imported and used in total quantities ranging from 250,000 kg to 2,000,000 kg in 2018, and from 150,000 kg to 1,000,000 kg in 2019; and CAS RN 3741-80-8 was imported and used in total quantities ranging from 1,000 kg to 10,000 kg in 2018 and 2019. Companies that reported this information confirmed that these substances are used as accelerators in the vulcanization of tire and other rubber products.

Additionally, CAS RNs 95-32-9, 102-77-2, and 68911-68-2 were reported to be used as corrosion inhibitors on vehicle parts in total quantities ranging from 1 kg to 100 kg in 2018 and 2019. CAS RN 117920-00-0 was imported and used in total quantities ranging from 100 kg to 1,000 kg in 2018 and 2019, but reporters stated that as end users of the material they are not aware of the intended use of the chemical in the product. CAS RNs 21564-17-0 and 32510-27-3 were imported in total quantities ranging from 1 kg to 100 kg in 2018 and 2019, their intended use was not reported.

None of the substances in the benzothiazoles subgroup listed in Annex B were reported to be manufactured in Canada in either 2018 or 2019 (ECCC 2021).

Information gathering from the NPRI

Since its addition to the NPRI, only a small number of facilities, primarily in the rubber sector, have reported for MBT. Among these, 1 facility has reported since 2003, while 2 others have reported since 2010 (NPRI 2022).

Reporting of MBT, mainly as disposals off-site and recycling, has been steadily declining, with 2.2 tonnes disposed off-site and 1.8 tonnes recycled in 2017, down to 0.4 tonnes disposed off-site and 1.4 tonnes being recycled in 2020. Releases to air have not been reported since 2013, with the largest air release of 6.7 tonnes being reported in 2012 (NPRI 2022).

4.2.2 Vulcanization accelerators

Based on submissions received in response to a CEPA section 71 survey (Canada 2017; ECCC 2018) and subsequent voluntary follow-up questionnaires, benzothiazoles are primarily used as process accelerators in the manufacturing of tires and other rubber products. Benzothiazoles may either be received as a bulk powder and weighed on site for various processes or received in pre-

[7] CAS RN: Chemical Abstracts Service Registry Number. The CAS RN is the property of the American Chemical Society, and any use or redistribution, except as required in supporting regulatory requirements and/or for reports to the Government of Canada when the information and the reports are required by law or administrative policy, is not permitted without the prior, written permission of the American Chemical Society.

weighed quantities. Facilities will often employ more than 1 accelerator to produce rubber products (including tires) and can include accelerators from the same or different chemical groups. A majority of the accelerators are expected to be chemically bound in the rubber after vulcanization. The remaining amount of unreacted substance is predicted to be less than 1% (Wagner et al. 2018).

4.2.3 Mineral flotation reagent

On the basis of data obtained through a CEPA section 71 survey (Canada 2017; ECCC 2018), SMBT is used as a flotation reagent in various mining applications. In the froth flotation process, the sodium salt will readily dissociate, yielding the MBT moiety. As such, the MBT moiety's physical-chemical properties will contribute towards the extraction of different ores by efficiently separating the mineral from the slurry.

4.2.4 Corrosion inhibitors in metalworking fluids

According to information acquired from a CEPA section 71 survey (Canada 2017; ECCC 2018), SMBT is used as a corrosion inhibitor in lubricants. From the responses received through follow-up questionnaires sent to importers, it is mainly used in metalworking fluids.

Metalworking fluids are oils and other liquids that are used to cool and/or lubricate metal work pieces when they are being machined, ground, milled, etc. (Canada 2019). Facilities that manufacture metal products or machinery, and those that are involved in the rebuilding and/or maintenance of these products use metalworking fluids.

Facilities in Canada may use metalworking fluids in operations such as corrosion preventive coating, heat treating, component manufacturing, adhesive bonding, and equipment repair and maintenance.

Use of SMBT in other types of lubricants for other applications including automotive, industrial, commercial, and institutional applications are less likely to result in releases to the environment as most spent lubricant products will be recycled and disposed of according to provincial requirements (ECCC, HC 2025).

5. Exposure sources of concern and identified risks

Releases of MBT to the Canadian environment are expected to occur during the industrial use stages. As explained in section 4.1, MBT releases could be from the direct use and release of MBT or from indirect release owing to degradation of the MBT precursors. Most releases to the environment are expected to occur primarily to water through wastewater treatment systems (WWTS), with some

releases to water directly from industrial sites. Releases of MBT to soil may occur from the application of biosolids from WWTS that receive wastewater containing MBT and its precursors (ECCC, HC 2025). The following subsections address exposure sources of concern.

5.1 Use as vulcanization accelerators in tire and other rubber products manufacturing

According to the assessment (ECCC, HC 2025), MBT and its precursors are used as accelerators in the vulcanization process in tire and other rubber products manufacturing. When used, these substances are reacted and are therefore chemically bound in the products. However, it is possible that a small percentage of the unreacted starting materials remain after the vulcanization processes. In addition, during tire and other rubber products manufacturing, MBT and its precursors may be released to wastewater from compounding, vulcanization and other processes. The wastewater may go through on-site treatment systems including an oil/water separator, a sedimentation tank, a biological treatment system or other treatment systems, followed by discharge to surface water or an off-site WWTS (ECCC, HC 2025).

5.2 Mining subsectors that use mineral flotation reagents

The exposure scenario presented in the assessment applies to some subsectors of the mining industry in Canada that use SMBT as a flotation reagent, to assist in effectively separating the desired ore particles. When used in water, SMBT dissociates to MBT. Assuming that not all MBT could effectively be used during mining operations, nor destroyed by existing treatment processes at a given mining site, the remnant wastewater containing MBT may be discharged to a tailings pond located at the mine site and then discharged to the environment after additional treatment through settling of particulate matter. MBT partitions between water and suspended particulate matter; therefore, some MBT will be discharged with the water, and a smaller proportion of MBT may settle with the particulate matter (Ni et al. 2008; ECCC, HC 2025).

5.3 Use as corrosion inhibitors in metalworking fluids

SMBT may be used as a corrosion inhibitor in various types of lubricants including metalworking fluids. The application of SMBT in metalworking fluids may result in releases to the environment when metalworking fluids are rinsed off from the metal surface during cleaning and finishing processes. In wastewater, SMBT will dissociate to produce MBT (ECCC, HC 2025).

6. Risk management considerations

6.1 Alternatives and alternate technologies

Suitability of alternative substances depends on the nature of the product and the performance characteristics desired by the manufacturer in the end-product as well as health, environmental, and socio-economic considerations.

Potential alternatives described in this section focus on the activities identified in section 2.1. It should be noted that alternatives have not been evaluated to determine whether they are safe and environmentally sustainable, and it is understood that not all alternatives may be appropriate or provide the equivalent result in quality or stability to a product.

MBT and its precursors are used as accelerators in the vulcanization of rubber, employed in both tire and other rubber products manufacturing facilities across Canada. There are several potential alternative accelerators available (Lanxess 2019). Potential substitutes include enamines, which are formed by the reaction of secondary amines with carbonyl compounds. They comprise a class of secondary accelerators used in vulcanization processes, in conjunction with primary accelerators such as thiazoles (Broussard et al. 2001, 2006).

Additionally, thiurams, including thioperoxydicarbonic diamide ($[H_2N)C(S)]_2S_2$), tetramethyl- (CAS RN 137-26-8, also known as TMTD), are commonly used as process regulators for the manufacture of solid and latex rubber products, and may be used as alternatives to MBT and its precursors in certain applications. TMTD was assessed as part of the Screening Assessment for the Thiocarbamates Group. The assessment concludes that TMTD meets the criteria under paragraph 64(*a*) of CEPA as it is entering or may enter the environment in a quantity or concentration or under conditions that have or may have an immediate or long-term harmful effect on the environment or its biological diversity (ECCC, HC 2021c). As a result, TMTD is not considered a suitable alternative.

In some subsectors of the mining industry, MBT and its precursors are used as flotation reagents. Potential alternatives are available (911Metallurgist 2022). Information on the chemical constituents of these products is not readily available.

Finally, MBT and its precursors are used as corrosion inhibitors in metalworking lubricants. A United States patent published in 2017 describes an invention relating to corrosion-inhibiting compositions that are useful for metalworking fluids (Anderson and Williams 2015). An alternate technology developed by the Fraunhofer Institute for Laser Technology (ILT) and RWTH Aachen University in Germany was designed to protect metal components against wear and corrosion (Fraunhofer ILT 2017). Many companies offer alternate products used for corrosion inhibition and metalworking.

In addition to alternative chemicals, investigation into process efficiency measures, end-of-pipe controls, and system improvements or innovation may assist in reducing releases of MBT and its precursors into the environment across all sectors identified.

6.2 Socio-economic and technical considerations

Socio-economic factors have been considered in the selection process for a regulation or instrument respecting preventive or control actions, and in the development of the risk management objective as per the guidance provided in the Treasury Board Policy on Regulatory Development (TBS 2018b).

In addition, socio-economic factors will be considered in the development of instruments and tools to address the risk management objective, as identified in the Cabinet Directive on Regulation (TBS 2018a), the Red Tape Reduction Action Plan (TBS 2012) and the *Red Tape Reduction Act* (Canada 2015).

7. Overview of existing risk management

7.1 Related Canadian risk management context

7.1.1. Federal risk management

The NPRI is Canada's legislated, publicly accessible inventory of pollutant releases (to air, water, and land), disposals and recycling. Over 7,000 industrial, commercial and institutional facilities across Canada report to the NPRI on more than 320 substances (NPRI 2021a).

MBT (CAS RN 149-30-4) has been on the NPRI substance list since 1999, with a 10 tonne manufacture, process, or otherwise use reporting threshold, and a 1% or greater concentration reporting threshold except for by-products (NPRI 2021b).

7.2 Pertinent international risk management context

7.2.1 The United States

MBT (CAS RN 149-30-4) is found under section 313 of the *Emergency Planning and Community Right-to-Know Act* (EPCRA), requiring facilities that exceed a manufacturing, processing, or use threshold for this substance to report information on their releases to the environment and other waste handling practices to government authorities annually (US EPA 2022a).

MBT is subject to data reporting requirements by any manufacturer, importer or user, under the *Code of Federal Regulations* (CFR), Title 40: Protection of Environment, Part 716: Health and Safety Data Reporting, because it is listed under Section 716.120: Substances and listed mixtures to which this subpart applies (US EPA 2022b).

Two substances, SMBT (CAS RN 2492-26-4) and thiocyanic acid, (2-benzothiazolylthio)methyl ester (CAS RN 21564-17-0) can be found on the list of Inert Ingredients in Pesticide Products under the *Federal Insecticide, Fungicide, and Rodenticide Act* (US EPA 2022c, 2022d, 2022e). This list aims to regulate substance usage in registered pesticide products in the United States. Additionally, the CFR, Title 40: Protection of Environment, Part 180: Tolerances and Exemptions for Pesticide Chemicals Residue in Food, Section 180.288 establishes allowable tolerances for residues of thiocyanic acid, (2-benzothiazolylthio)methyl ester (CAS RN 21564-17-0) as a fungicide in or on several food commodities (US EPA 2022f).

Under the CFR, Title 40: Protection of Environment, Part 136: Guidelines Establishing Test Procedures for the Analysis of Pollutants, there are methods of detection for thiocyanic acid, (2-benzothiazolylthio)methyl ester (CAS RN 21564-17-0) (US EPA 2022g). This substance is further regulated under Part 455: Effluent Guidelines for Pesticide Chemicals, along with 2(3H)-benzothiazolethione, zinc salt (CAS RN 155-04-4) because they are listed in Table 1 of Part 455 - List of Organic Pesticide Active Ingredients (US EPA 2022e, 2022h, 2022i).

Thiocyanic acid, (2-benzothiazolylthio)methyl ester (CAS RN 21564-17-0) and 2(3H)-benzothiazolethione, zinc salt (CAS RN 155-04-4) are regulated under Section 304 of the *Clean Water Act* (CWA), which requires the United States Environmental Protection Agency (US EPA) to develop guidelines for releases and standards for classes and categories of point sources to support the National Pollution and Discharge Elimination System (NPDES) permits program (US EPA 2022e, 2022h). Furthermore, thiocyanic acid, (2-benzothiazolylthio)methyl ester (CAS RN 21564-17-0) is found within the Permit Compliance System which tracks NPDES surface water permits issued under the CWA (US EPA 2022e).

Thiocyanic acid, (2-benzothiazolylthio)methyl ester (CAS RN 21564-17-0) can be found within the Emergency Response Notification System, a database containing information on notifications of oil discharges and releases of hazardous chemicals (US EPA 2022e).

7.2.2 The European Union

A persistence, bioaccumulation and toxicity assessment under the Registration, Evaluation, Authorisation, and Restriction of Chemicals (REACH) regulation was completed for DCBS (CAS RN 4979-32-2). The conclusion, published on July 23, 2018, identifies DCBS as a very persistent and very bioaccumulative (vPvB) substance and consequently fulfills the criteria for a substance of very high concern in need of follow-up regulatory actions (ECHA 2018). Such actions are

currently under development and may include harmonized classification and labelling of DCBS as vPvB to communicate these properties in a transparent, officially recognized way. Such a classification might also trigger measures under other legislations (Federal Institute for Occupational Safety and Health 2022).

In Germany, MBT (CAS RN 149-30-4) was evaluated by the Federal Institute for Occupational Safety and Health through the Community rolling action plan. It was determined that restrictions and other community-wide measures are preventative measures to reduce potential risks (ECHA 2014). MBT is a candidate for Regulatory Management Option Analysis.

MBT is listed as not approved as an active ingredient in pesticides under *Regulation* (EC) No 1107/2009 (European Commission 2009, 2022).

Thiocyanic acid, (2-benzothiazolylthio)methyl ester (CAS RN 21564-17-0) is registered as an active substance in biocidal products under the *Biocidal Products Regulation* (European Commission 2012).

CBS (CAS RN 95-33-0), MBTS (CAS RN 120-78-5), MBT (CAS RN 149-30-4), morpholine, 4-(2-benzothiazolylthio)- (CAS RN 102-77-2), and thiocyanic acid, (2-benzothiazolylthio)methyl ester (CAS RN 21564-17-0) are officially recognized in the European Union (EU) as skin sensitizing and considered hazardous substances to the environment. For these reasons, they are subject to the Classification, Labelling and Packaging (CLP) Regulation, and by extension, they are listed as hazardous substances in the EU Ecolabel Regulation (they are restricted substances for which an Ecolabel cannot be awarded), the Marine Environmental Policy Framework Directive, the End-of-Life Vehicles Directive, and the Waste Framework Directive (Annex III) (ECHA 2022a). Mineral fertilizers containing any of these substances as a plant nutrient or as a chelating or a complexing agent are subject to requirements under the Fertiliser Regulation (European Commission 2019; ECHA 2022b).

2-Benzothiazolesulfenamide, N-(2-benzothiazolylthio)-N-(1,1-dimethylethyl)- (CAS RN 3741-80-8) is considered a hazardous substance to the environment; therefore, it is subject to the CLP Regulation, and by extension, it is listed as a hazardous substance in the EU Ecolabel Regulation (it is a restricted substance for which an Ecolabel cannot be awarded), the Marine Environmental Policy Framework Directive, the End-of-Life Vehicles Directive, and the Waste Framework Directive (Annex III) (ECHA 2022a).

7.2.3 Risk management alignment

Canada is partially aligned with the United States and the EU because these jurisdictions have taken or are considering taking some actions to address environmental concerns from some of these substances, such as reporting and developing guidelines for environmental releases. However, at this time, Canada would be the only jurisdiction to propose risk management action to address releases of MBT and its precursors from industrial sources.

8. Next steps

8.1 Public comment period

Industry and other interested stakeholders are invited to submit comments on the content of this document or other information that would help to inform decision-making (such as outlined in section 3). Please submit additional information and comments prior to May 7, 2025.

Comments and information submissions on the risk management approach should be submitted to the following address:

> Substances Management Information Line
> Chemicals Management Plan
> Environment and Climate Change Canada
> Gatineau, Quebec K1A 0H3
> Telephone: 1-800-567-1999 (in Canada) or 819-938-3232
> Fax: 819-938-3231
> Email: substances@ec.gc.ca

Companies who have a business interest in MBT and its precursors are encouraged to identify themselves as stakeholders. The stakeholders will be informed of future decisions regarding MBT and its precursors and may be contacted for further information.

Stakeholders and members of the public who are interested in being notified of CMP publications are invited to subscribe for the latest news on the CMP. Stakeholders and members of the public who would like to receive CMP Publication Plans on a quarterly basis by email, can contact: substances@ec.gc.ca.

Following the public comment period on the risk management approach, the Government of Canada will initiate the development of the specific risk management instruments, where necessary. Comments received on the risk management approach will be taken into consideration in the selection and development of these instruments. Consultation will also take place as instruments are developed.

When the first regulation or instrument respecting preventive or control actions is published or a statement identifying the first such regulation or instrument is published in relation to MBT and its precursors, a statement outlining the estimated timeframe for the development of subsequent proposed regulations or instruments will be made available.

8.2 Timing of actions

Electronic consultation on the risk management approach: March 8, 2025 to May 7, 2025. This should include the submission of public comments and/or information on MBT and its precursors.

Publication of responses to public comments on the risk management approach: Concurrent with the publication of the proposed instruments.

Publication of the proposed instruments: At the latest, 24 months from the date on which the ministers recommended that MBT and its precursors be added to Schedule 1 to CEPA.

Consultation on the proposed instruments: 60-day public comment period starting upon publication of each proposed instrument.

Publication of the final instruments: At the latest, 18 months from the publication of each proposed instrument.

These are planned timelines and are subject to change.

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Annex A. MBT and MBT precursors included in the benzothiazoles subgroup

CAS RN	Domestic Substances List Name (Common Name)	Acronym
95-31-8	2-Benzothiazolesulfenamide, N-(1,1-dimethylethyl)	TBBS
95-33-0	2-Benzothiazolesulfenamide, N-cyclohexyl-	CBS
120-78-5	Benzothiazole, 2,2’-dithiobis-	MBTS
149-30-4	2(3H)-Benzothiazolethione (2-Mercaptobenzothiazole)	MBT
2492-26-4	2(3H)-Benzothiazolethione, sodium salt	SMBT
4979-32-2	2-Benzothiazolesulfenamide, N,N-dicyclohexyl-	DCBS

Annex B. Non-exhaustive list of MBT precursors not included in the benzothiazoles subgroup

The table below is a non-exhaustive list of MBT precursors found on the Domestic Substances List (DSL). Further exploration of the DSL may lead to the identification of additional MBT precursors. In addition, there may be other substances containing the MBT moiety that are new to Canada (not shown).

CAS RN	Substance Name
95-29-4	2-Benzothiazolesulfenamide, N,N-bis(1-methylethyl)-
95-32-9	Benzothiazole, 2-(4-morpholinyldithio)-
102-77-2	Morpholine, 4-(2-benzothiazolylthio)-
155-04-4	2(3H)-Benzothiazolethione, zinc salt
3741-80-8	2-Benzothiazolesulfenamide, N-(2-benzothiazolylthio)-N-(1,1-dimethylethyl)-
7778-70-3	2(3H)-Benzothiazolethione, potassium salt
21564-17-0	Thiocyanic acid, (2-benzothiazolylthio)methyl ester
22405-83-0	Zinc, dichloro[2,2’-dithiobis[benzothiazole]]-, (T-4)-
32510-27-3	2(3H)-Benzothiazolethione, copper salt
38456-45-0	2(3H)-Benzothiazolethione, compd. with N-ethylethanamine (1:1)
65605-47-2	2(3H)-Benzothiazolethione, compd. with N-butyl-1-butanamine (1:1)
65605-48-3	2(3H)-Benzothiazolethione, compd. with N,N-diethylethanamine (1:1)
68911-68-2	Amines, C12-14-tert-alkyl, compds. with 2(3H)-benzothiazolethione
117920-00-0	Amines, C16-22-tert-alkyl, compds. with 2(3H)-benzothiazolethione (1:1)