Decision: modified reassessment of methyl bromide

APP203660

11 AUGUST 2021

Environmental Protection Authority
Te Mana Rauhī Taiao

New Zealand Government

This decision has been amended for a technical error on the 17th of August 2021, between signing of the decision and the date of public release. The error identified relates to incorrect references and hyperlinks in Appendix D. These have now been corrected in this published version.

Chair's introduction

The 2010 decision on the reassessment of methyl bromide imposed a new overall management regime, which specified, amongst other things, that all methyl bromide fumigations be undertaken with recapture technology within a 10 year period. At that time, recapture technology was defined as a system in which the residual level of methyl bromide emitted following fumigation is less than 5 parts per million. The decision was based on evidence presented at that time that indicated that this recapture target was likely to be met within the 10 year period.

Between that decision and 2016 there has been a 50% increase in the volume of methyl bromide used in New Zealand for the purposes of quarantine and pre-shipment sanitation. In 2018, the EPA agreed there were grounds to reassess methyl bromide based on this increased use. An application for reassessment was received from STIMBR in 2019, which sought to amend the 2010 recapture definition and associated buffer zone controls. The EPA proceeded with a modified reassessment, with the scope limited to changes to controls associated with hazard classification, benefits, and controls on the use of methyl bromide.

The Committee is very aware that 11 years have now passed since the 2010 decision and that there are members of the public who consider that continued use of methyl bromide is unacceptable. However, revoking the approval for methyl bromide is outside the scope of this limited reassessment.

The Committee acknowledges that the 2010 recapture target is currently unachievable with existing recapture technology, and that maintaining the 2010 decision would result in significant economic and social impacts. However, the Committee considers that ongoing methyl bromide fumigations without any recapture are unacceptable. The Committee has therefore focused its decision on changes to the recapture definition and associated controls that are necessary to give effect to the 2010 decision.

Our decision is to approve the application to amend the recapture definition control for methyl bromide and the associated controls on use. The Committee has amended the recapture technology definition, with the level of recapture required now specified through a control. We have set a significantly higher recapture performance requirement than requested by the applicant, as we consider that industry must be encouraged to invest in strategies to reduce methyl bromide emissions.

The Committee considers that incremental steps towards higher recapture rates will be more achievable than a single target rate to be achieved in 5 or 10 years' time and will have the effect of reducing risks to negligible over that time. We have imposed controls that provide for incremental increases in recapture performance targets that allow time to upscale existing technology or implement improvements necessary to meet the increasing performance targets. The initial minimum and average targets reflect current recapture technology.

We have also imposed controls that require dosing to concentration, rather than volume, when calculating the amount of methyl bromide required to achieve the desired treatment concentration, and we have also imposed minimum buffer zones that must be adhered to.

We note the absence of evidence for successful recapture from ship's holds for the foreseeable future. The volume of gas used in ship's hold fumigations is significant, and even though these events do not occur often, they pose significant risks to human health and the environment. We have determined that the risks associated with ship's hold fumigations in the absence of recapture outweigh the benefits and so we have imposed a prohibition of ship's hold fumigations from 1 January 2023.

The Committee considers that the amended and additional controls provide a clear and structured pathway for industry to reduce the amount of methyl bromide emitted, and that these are necessary to give effect to the 2010 decision.

The Committee identified a need to drive research, innovation, and behaviour change to reduce methyl bromide emissions and search for feasible alternatives to methyl bromide. While acknowledging the efforts of industry, the Committee is disappointed at the slow progress in these areas. The Committee strongly supports a strategic approach to the reduction of methyl bromide use and acknowledges that recapture is just one of the tools needed to ensure reduction and ultimate elimination of methyl bromide emissions.

The Committee is extremely appreciative of the time and effort taken by all those involved in this reassessment process, particularly those who participated in the submissions and hearings processes. This has been a challenging task, made all the more difficult by the complexities brought about with Covid-19.

Nāku noa

Nā Dr Ngaire Phillips

Chair

Methyl Bromide Decision-making Committee, EPA

Contents

Executive summary

A substantially revised controls framework has been put in place that will protect human health and the environment from adverse effects associated with the continued use of methyl bromide for quarantine and pre-shipment fumigations. This pragmatic and evidence-based decision will allow the significant benefits associated with methyl bromide use to be realised whilst protecting human health and the environment from the risks arising from ongoing use.

The application

On 9 April 2019, an application to reassess methyl bromide was formally received. Under section 63 of the Hazardous Substances and New Organisms Act ("the Act"), the applicant, Stakeholders in Methyl Bromide Reduction Incorporated (STIMBR), applied to amend:

- the definition of recapture technology used in the additional controls in the 2010 approval; and
- the buffer zones specified by the 2010 reassessment decision associated with the use of methyl bromide for quarantine and pre-shipment (QPS) purposes.

On the basis that the 2010 recapture performance target (that is, the methyl bromide enclosed space headspace concentration is reduced to 5 ppm) is unachievable at present, the applicant requested that the recapture target should be specified as an 80% reduction in the headspace concentration from the end of the fumigation phase. Immediately prior to the hearing, the applicant changed their proposed recapture performance target from 80% to 30%.

The application for reassessment was formally received on 9 April 2019, publicly notified as a modified reassessment on 18 July 2019, and was open for submissions until 2 September 2019. A public hearing was held over five days, commencing on 11 August 2020, and adjourned on 17 August 2020. The hearing was formally closed on 7 July 2021.

During the reassessment process, the applicant requested four extensions to the 2010 decision recapture deadline. The latest recapture deadline is 28 February 2022 but is now superseded by this decision.

In making its decision, the Decision-making Committee ("the Committee") reviewed a significant amount of information including: the application, written submissions, oral presentations at the hearing, input from experts, advice from the Environmental Protection Authority staff, and outputs from air dispersion modelling.

Summary of decision

The Committee acknowledged the significant benefits to the New Zealand economy and society from the use of methyl bromide as a quarantine and pre-shipment fumigant. The Committee also acknowledged the concerns of Māori and the wider public regarding the health and environmental effects of methyl bromide use, as well as New Zealand's international obligations under the Montreal Protocol.

The Committee agreed that the 2010 recapture definition is currently unachievable, but considered that the core premise of the 2010 decision to achieve high levels of recapture needed to be maintained. The Committee decided to implement an amended framework of controls affecting the use of methyl bromide, on the basis that the beneficial effects associated with methyl bromide use are

significant, and that the adverse effects can be reduced to negligible with appropriate control measures.

Prohibition of ship's hold fumigation

From 1 January 2023, fumigation of ship's holds using methyl bromide will be prohibited, on the basis that there is no evidence that technology to recapture methyl bromide from ship's holds fumigations currently exists nor is it on the horizon. The health and environmental risks identified in respect of continued ship's hold fumigation without recapture outweigh any benefits of this use.

Notification of fumigation

The Committee decided to strengthen notification obligations for methyl bromide fumigation operations, to ensure that affected parties are able to manage the risks associated with neighbouring fumigation events.

Use of recapture technology

The Committee decided that incremental steps towards higher recapture rates will be more achievable than a single target rate set to be achieved in five or ten years' time, and will have the effect of reducing risks to people and the environment to negligible over that time.

- For fumigations of containers, (that is, enclosed spaces excluding fumigations under sheets, or ship's holds), the recapture performance for each fumigation increases from 80% (from 1 January 2023) to 99% (from 1 January 2031).
- For fumigations under sheets: the proportion of fumigations to have recapture technology applied increases from 50% (from 1 January 2022) to 100% (from 1 January 2025), minimum recapture performance increases from 30% (from 1 January 2022) to 99% (from 1 January 2035), and annual average recapture performance for a given site increases from 55% (from 1 January 2022) to 99% (from 1 January 2035).

Buffer zones

The Committee decided to impose buffer zones for use of methyl bromide, as they are considered to be an effective tool to manage the risks to people from associated exposure effects. Buffer zone values have been inferred from relationships between recapture levels and dose rates that were identified from the modelling results.

- For container fumigations, the buffer zone is 10 or 25 m, depending on container volume.
- For ship's hold fumigations, from 1 January 2022 until they are prohibited on 1 January 2023, the buffer zone is 900 m.
- For fumigations under sheets, the buffer zones range from 50 to 700 m, depending on dose rate and recapture performance.

Dosing to concentration

The Committee decided that, from 1 January 2024, at least half of fumigations of containers or under sheets must be dosed on the basis of measured headspace concentration, increasing to all fumigations from 1 January 2027. The Committee considered that the evidence presented indicated this is a practical and achieveable measure that can be readily implemented and would reduce the

amount of methyl bromide used for each operation, when compared to the volume-based practice currently employed.

Ventilation

The Committee decided that restrictions are necessary on how fumigated spaces are ventilated, in order to adress concerns identified in the air dispersion modelling. In regards to the ventilation of ship's holds (ahead of this use being prohibited), only one hold can be vented at a time with at least two hours between holds. Furthermore, for all types of fumigated spaces (that is, not limited to ship's holds), ventilation can only occur if the windspeed is at least 2 m/s.

Monitoring, recording and reporting

The Committee decided that, in order to monitor and manage the risks to human health, a number of operational parameters need to be recorded for each fumigation event and reported to the EPA. This information is intended to sit alongside the recording requirements specified by the Health and Safety at Work (Hazardous Substances) Regulations 2017 (HSWR). The information to be recorded includes operational details, as well as specific monitoring data and equipment details.

The Committee decided that an annual report summarising methyl bromide fumigation activities should be provided to the EPA to allow for verification of compliance. This report is to include information on recapture performance and other operational parameters, as well as developments in technology and processes to ensure that future recapture targets are met, and other actions taken to reduce methyl bromide emissions and use. Annual reports are to be provided to the EPA by 30 June each year for the preceding calendar year.

Notification of TEL_{air} exceedances

In the event that methyl bromide concentrations beyond the buffer zone exceed the TEL_{air}, the Committee decided that the relevant territorial authority needed to be notified within 24 hours. This will allow the territorial authority to respond to such an event in a timely manner, and to manage any health or environmental risks that could arise.

1. Background

1.1 Methyl bromide is used as a fumigant to treat a range of products (such as logs and fresh produce) before export to selected countries, for quarantine applications on imported goods, and for the management and eradication of small-scale incursions of potato wart in New Zealand. These are collectively known as quarantine and pre-shipment (QPS) uses.

1.2 Methyl bromide is an ozone-depleting substance that is subject to restrictions imposed by the Montreal Protocol. New Zealand is a signatory to the Montreal Protocol, which urges countries to reduce the use of ozone-depleting substances and use alternatives wherever possible.

1.3 Methyl bromide was approved under the Hazardous Substances and New Organisms Act 1996 ("the Act") on 29 October 2004 via the Hazardous Substances (Fumigants) Transfer Notice 2004. It has the Hazardous Substances and New Organisms (HSNO) Approval Number HSR001635.

1.4 Methyl bromide was reassessed in 2010 following an application by the Chief Executive of the Environmental Risk Management Authority (ERMA). The 2010 Decision-making Committee's ("the 2010 Committee") decision included the requirement to recapture methyl bromide by 2020. The 2010 Committee considered that recapture would allow for the continued use of methyl bromide and would therefore retain significant benefits.

1.5 The 2010 Committee considered that recapture would be consistent with the intent of the Montreal Protocol, reduce the risks of direct effects on people, and reduce the indirect effects on human health and the environment.

1.6 The recapture control introduced by the 2010 decision requires all methyl bromide fumigations to recapture methyl bromide to a level such that less than 5 parts per million (ppm) remains in the headspace of the treated enclosed space prior to venting. This requirement was due to become mandatory on 28 October 2020. This commencement date has been waived until 28 February 2022 as directed in Direction and Minute WGT039 (see paragraph 2.22 for details).

1.7 Stakeholders in Methyl Bromide Reduction Incorporated (STIMBR, "the applicant") applied to the Environmental Protection Authority (EPA) for grounds to reassess methyl bromide in 2017 (APP203465). The applicant provided evidence of a 50% increase in the use of methyl bromide between 2010 and 2016, and reviews of recapture progress. These grounds were considered sufficient to grant grounds to reassess methyl bromide by a Decision-making Committee on 5 April 2018.

1.8 The approval for HSR001635 was reissued under clause 4 of Schedule 7 of the Act on 19 July 2019 to apply EPA Notice controls. The reissued approval was subsequently amended to correct a technical error on 19 November 2019.

2. Process, consultation, and notification

Lodgement and formal receipt

2.1 The application to reassess methyl bromide was lodged on 25 March 2019. It was formally received on 9 April 2019. In the application, the applicant has requested that the approval be changed to clarify the current controls, specifically to reassess the feasibility of recapture technology and to refine the controls to:

- require recapture of 80% of methyl bromide remaining at the end of fumigations[1]
- extend by ten years the deadline for achieving recapture from ship's hold fumigations
- strengthen buffer zone requirements at the completion of the recapture.

Scope of application

2.2 The Chief Executive of the EPA considered the content of the application and decided to use the EPA's discretionary power in section 63A(1) of the Act to proceed with the application as a modified reassessment. The Chief Executive decided that the scope of the modified reassessment would be limited to an assessment of changes to controls, relating to the following:

- hazard classification
- benefits
- controls on the use of methyl bromide (within the scope of the Act and excluding those within the Health and Safety at Work regime).

2.3 As a modified reassessment, the outcome of this application may vary the EPA controls that are attached to a hazardous substance, or the description of a hazardous substance, or both; but it may not revoke an approval given to a hazardous substance (section 63A(2) of the Act).

2.4 Matters related to the scope of the reassessment, and the jurisdiction of the decision maker regarding their decision-making responsibilities, were raised during the public hearings. These are discussed further in Section 3.

Notification of application

2.5 The Chief Executive decided to not use the EPA's discretionary power in section 63A(4) of the Act to process the application without public notification. The application was, therefore, publicly notified in accordance with section 53 of the Act.

2.6 The application was publicly notified on 18 July 2019 and was open for submissions until 2 September 2019.

Decision-making Committee

2.7 The Decision-making Committee ("the Committee") was established on the 14 October 2019 and comprised of three members.

2.8 On 21 June 2021, the Committee issued a Direction and Minute WGT038, noting a change in their composition as the Chair became unavailable to continue in his role. The remaining two members continued, with one taking over the role of Chair.

Further information requests and time waivers for submissions

2.9 Prior to public notification of the application, further information regarding the effects of the substance was requested by the EPA. Information was requested from the applicant under section 52 of the Act and the time frame for public notification of this application was waived

[1] In its opening legal submission dated 11 August 2020 the applicant requested that its proposed minimum recapture target be amended to 30%. This is discussed further in Section 3.

under section 59 of the Act. The timelines for this time waiver were mutually agreed between the EPA and the applicant.

2.10 In addition, further information was requested, under section 58 of the Act, from the Ministry of Foreign Affairs and Trade, the Ministry for Primary Industries (MPI), and Bay of Plenty Regional Council (BOPRC).

2.11 At the end of the statutory submission period (29 August 2019), the EPA received two requests to extend the notification period: from BOPRC and Ngāti Ranginui Iwi Incorporated Society. In response, the EPA granted a two working day extension, until Monday 2 September 2019, to all submitters.

2.12 To enable the EPA to obtain sufficient information, including specialist air dispersion modelling, for the Committee to consider in its decision-making process, the EPA sought consent from the applicant to extend the time frame between the close of the public notification (submissions period) and the commencement of the hearing. The applicant did not consent to this request stating that it would be unduly prejudiced. The EPA considered that the applicant and other parties would not be unduly prejudiced and decided to extend the time frame to the week commencing 2 December 2019.

2.13 Prior to the hearing, the Committee requested further information from several parties on different occasions. This included a series of conferences between air dispersion modelling experts. To allow this information to be provided, and to negotiate disruptions associated with the impacts of the Covid-19 pandemic, the time frame between the close of the submissions period and the hearing was extended through to 11 August 2020.

2.14 As issues arose through the reassessment process, the Committee provided responses and directions by way of published Direction and Minutes. The applicant formally engaged with the Committee by way of memoranda, issued by the applicant's counsel. These documents are summarised in Appendix A.

Submissions

2.15 The submission period was open from 18 July 2019 through to 2 September 2019. There were 72 submissions received for this application.

2.16 Forty-three submitters supported the application, 23 were opposed to it, and six neither supported nor opposed the application.

2.17 The content of the submissions was summarised in the Staff Report, prepared by the EPA.

Hearing

2.18 A public hearing was held over five days, commencing on 11 August 2020, and adjourned on 17 August 2020.

2.19 Presentations from 22 submitters and their witnesses were heard over the five days of the hearing. A full list of presentations and presenters is included in Appendix B, and specific points raised by the presenters are discussed in Section 3.

Further information requests arising from hearing

2.20 Following the adjournment of the hearing, the Committee directed that additional modelling be conducted to assist with its deliberations.

2.21 Further modelling was provided to the Committee (and is discussed in more detail in Section 3). The EPA prepared two Update Reports that summarise this modelling.

Recapture deadline extensions

2.22 The control regarding recapture requirements set in the 2010 reassessment of methyl bromide, as reissued on 19 July 2019, was to take effect on 28 October 2020.

2.23 To continue exporting logs to India, industry is reliant on irrevocable letters of credit which vary from 90 to 180 days in duration. As India requires logs to be treated with methyl bromide before importation, the ongoing reassessment brought uncertainty beyond the recapture deadline. This uncertainty related to industry stating that it did not know what would be required of it in respect of recapture, and that it could not meet the recapture control that was due to come into force.

2.24 Consequently, on 14 May 2020, the applicant applied to waive the October 2020 deadline. The Committee issued Direction and Minute WGT015 on 1 July 2020, extending the time at which the recapture requirement was due to come into force until 28 April 2021.

2.25 On 21 October 2020, the applicant applied for another extension of the recapture deadline.

2.26 On 11 November 2020, the Committee issued Direction and Minute WGT026, extending the recapture deadline until 28 August 2021.

2.27 On 28 February 2021, the applicant applied for a third recapture extension deadline.

2.28 This was granted by the Committee on 1 March 2021 through Direction and Minute WGT030, extending the requirement for recapture until 28 November 2021.

2.29 A fourth extension was requested by the applicant on 28 May 2021.

2.30 On 21 June 2021 the Committee granted the waiver request through Direction and Minute WGT039, to give those exporting methyl bromide-treated logs to India with 180-day letters of credit certainty around the rules that would be required of them in New Zealand prior to export. The recapture control was extended to 28 February 2022, subject to the substantive reassessment decision.

Information available to the Committee

2.31 In reaching its decision, the Committee considered information from a variety of sources:[2]

- application form and associated appendices
- further information requests
- submissions
- expert input (pre-hearing, including Joint Witness Statements, modelling reports)
- EPA Science Memo
- EPA Staff Report
- hearing: witness statements, oral submissions, questions, responses and presentations by applicant, EPA staff, and submitters
- further information requested from EPA Staff and modelling experts after hearing
- two EPA Staff Update Reports

[2] All documents associated with this application can be found here:
https://www.epa.govt.nz/database-search/hsno-application-register/view/APP203660

- applicant's correspondence.

2.32 After considering all relevant information, the Committee decided that it had sufficient information to determine the outcome of this application. The Committee formally closed the hearing on 7 July 2021.

3. Key issues arising

3.1 The Committee notes a number of key issues are fundamental to the application. These issues are identified and discussed in subsequent paragraphs, highlighting the key aspects of each issue. The Committee's consideration of these issues is presented in Section 4.

Scope of the application

3.2 The Committee notes that there has been discussion regarding the scope of the application, and what the constraints are on the Committee concerning elements of the approval that fall within its section 63A decision-making responsibilities, namely:

- whether the applicant's change of position from the application (80% recapture to 30% recapture) is considered acceptable and within scope
- whether the Committee can revoke the approval.

3.3 On 10 August 2020, the applicant provided to the EPA an opening legal submission by the applicant's Counsel in advance of their hearing presentation. The applicant indicated that it was no longer seeking the outcomes set out in the application documents, and that it had revised its position as follows:

Shipping containers

A recapture standard of 80% of methyl bromide from all QPS fumigations of shipping containers by 28 April 2021

Log stacks

A recapture standard of 30% of methyl bromide from log stacks 24 months following the decision. This obligation would be stepped, applying to:

- 25% of log stacks within 6 months of the decision
- 50% of log stacks within 12 months of the decision
- 75% of log stacks within 18 months of the decision
- 100% of log stacks within 24 months of the decision

Ship's holds

A recapture standard of 50%, with the deadline extended by 10 years

Buffer zones

Changes to buffer zones were no longer sought.

3.4 The details of the opening legal submission were also stated in the applicant's opening presentation.

3.5 As the revision of the applicant's proposal was only provided to the Committee on the evening before the hearing, most submitters were first notified of these changes in the applicant's opening statement at the hearing. Accordingly, the submitters had prepared their presentations with the 80% recapture target in mind.

3.6 In its opening presentation at the hearing, the EPA described the scope of the reassessment being set by the pathway assessment, decided by the Chief Executive of the EPA. The scope of the reassessment was set as the substance's hazard classification, an assessment of benefits associated with methyl bromide use, and controls relating to the use of the substance.

3.7 Submitters on behalf of and associated with the Tauranga Moana Fumigant Action Group asserted that the applicant was unable to modify the scope of its application at such a late stage in the reassessment process. Submitters described how the Committee's decision must be within the bounds of what was proposed in application, and what the current recapture standard is.

3.8 Ngāi Tahu submitted that it would need an additional consultation period to consult on the applicant's changes with its iwi, citing section 63A(5) of the Act.

3.9 Ngāi te Rangi submitted that the application should not proceed as the consultation related to 80% recapture, rather than 30%.

3.10 The applicant was of the opinion that the Committee was entirely able to consider the revised proposal because the scope of the reassessment is set in the pathway determination, rather than the application form (in line with what was presented by the EPA and contrasting with the RMA which some other submitters cited). The applicant also suggested that an additional consultation period could be merited for submitters, including Ngāi Tahu, to reconvene and prepare further submissions.

3.11 Additionally, the applicant framed the scope of the decision as follows:

- The 2010 decision specifically states that risks are negligible to fumigation staff, occupational bystanders, and the public with recapture. There has been no material change in evidence relating to these risks since then.
- The only uncertainty in decision making relates to the air dispersion modelling.
- It is not the Committee's role to decide if current or past fumigations are compliant.
- The Committee must assume compliance when setting new controls.
- Ultimately the Committee must decide whether there is a recapture control that is achievable, that will not compromise the health and safety of people and communities, and will uphold New Zealand's international obligations.

Hazardous properties

3.12 The hazardous properties of methyl bromide, as classified in the 2010 reassessment decision, are:

2.1.1B, 6.1B (All), 6.1B (I), 6.1C (O), 6.6B, 6.8B, 6.9A (All), 8.2C, 8.3A, 9.1A (All), 9.1A (F), 9.2A, 9.3B, and 9.4A.

3.13 The applicant did not request a review of the hazard classification of methyl bromide. A review of the human health classifications was appended to the application, which concluded that methyl bromide was not a carcinogen and that there was insufficient new robust weight-of-evidence data to justify a re-evaluation of the carcinogenicity classification.

3.14 The EPA reviewed the information presented and concluded that there is insufficient evidence to support a change in carcinogenicity classification.

3.15 The EPA, however, recommended the following two changes in the classifications: addition of the respiratory irritation classification 6.1E (resp.) and the revision of the acute toxicity by

inhalation classification (6.1B to 6.1C). These revised classifications are consistent with those in the European Union and Japan, and with research that the applicant provided as part of its application.

3.16 Dr Melanie Miller submitted and spoke on the revision to the acute inhalation toxicity classification. Dr Miller submitted that the acute inhalation toxicity classification should remain at 6.1B based on her interpretation of cited research.

Adoption of GHS classifications

3.17 The EPA updated its classification system to adopt the 7th revision of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS) on 31 April 2021. As the reassessment was ongoing at the time, methyl bromide was not included in the general process to adopt GHS 7 classifications.

3.18 The Committee has therefore considered the changes to the classification scheme for methyl bromide. This aspect of the reassessment is under section 63C of the Act and a decision on the classification under that section can be made alongside the decision under section 63A.

3.19 The GHS equivalent of EPA's proposed classification is presented in Table 1.

Table 1 Proposed GHS classifications

Hazard	Current HSNO classification	EPA's proposed HSNO classification	GHS equivalent of EPA's proposed classification
Flammable gas	2.1.1B	2.1.1B	Flammable gas Category 2
Acute toxicity (oral)	6.1B	6.1C	Acute oral toxicity Category 3
Acute toxicity (inhalation)	6.1C	6.1C	Acute inhalation toxicity Category 3
Respiratory irritant	No	6.1E	Specific target organ toxicity – single exposure Category 3 respiratory tract irritation
Skin irritant/corrosion	8.2C	8.2C	Skin corrosion Category 1C
Eye irritant/corrosion	8.3A	8.3A	Serious eye damage Category 1
Mutagenicity	6.6B	6.6B	Germ cell mutagenicity Category 1
Reproductive/ developmental toxicity	6.8B	6.8B	Reproductive toxicity Category 2
Specific target organ toxicity	6.9A	6.9A	Specific target organ toxicity (repeated exposure) Category 1
Aquatic ecotoxicity	9.1A	9.1A	Hazardous to the aquatic environment acute Category 1
			Hazardous to the aquatic environment chronic Category 1

Hazard	Current HSNO classification	EPA's proposed HSNO classification	GHS equivalent of EPA's proposed classification
Soil organism ecotoxicity	9.2A	9.2A	Hazardous to soil organisms
Terrestrial vertebrate ecotoxicity	9.3B	9.3B	Hazardous to terrestrial vertebrates
Terrestrial invertebrate ecotoxicity	9.4A	9.4A	Hazardous to terrestrial invertebrates

3.20 More details of the translations of the HSNO classification to GHS 7 classifications can be found in Schedule 3 of the EPA Hazardous Substances (Hazard Classification) Notice 2020.

Health effects and the wider community

3.21 Dr Dave McLean, expert witness for the Soil & Health Association, had concerns about the long-term/chronic effects of methyl bromide, as he considered that there are some indications of carcinogenic and neurotoxic effects. Dr McLean was also concerned that exposure limits would be set based on acute effects, with no attempt to control for chronic effects.

3.22 The Tauranga Moana Fumigant Action Group and Clear the Air Mt. Maunganui submitted that they had concerns about the impacts on the local community, with the potential for catastrophic effects arising from a significant adverse incident. They also highlighted the proximity of the fumigation area in Tauranga to several sports fields, used by hundreds if not thousands of children, young people, and athletes each week.

3.23 Catherine Stewart was concerned there was no methyl bromide signage at Tauranga port, warning the community about methyl bromide use.

Impacts specific to Māori and Māori culture

3.24 In its opening presentation, the EPA identified issues to Māori from the use of methyl bromide. Marae and other community facilities are close to Tauranga port where most methyl bromide fumigation of logs takes place. Additionally, it was identified that Māori are highly represented in workplaces in which methyl bromide is used. The EPA also described how the requested change could adversely affect the ability of Māori to exercise their kaitiakitanga and guardianship roles, particularly if they don't know fumigations are happening.

3.25 The EPA also recognised that there is benefit to Māori-owned businesses who are in the forestry industry.

3.26 Joel Ngatuere of Whareroa Marae, which affiliates to Ngāi te Rangi, indicated that cultural rights such as Māoritanga, kaitiakitanga, manaakitanga, and whanaungatanga will be degraded if the current practise is continued. In relation to changing the recapture standard from that decided in 2010, the following whakataukī was cited:

Ko Rauru kī tahi, e kore te kupu e whati

which translates to "Rauru of the one word, never would that word be broken", and the interpretation provided is "stand by what you say". The submitter was indicating that the EPA should stand by the decision that was made in 2010.

3.27 Ngāi Tahu suggested that short-term gains that place costs on future generations should not be sought. The following whakataukī was cited in support of its position:

Mō tātou, ā, mō kā uri ā muri ake nei

The interpretation provided is "for us, and for the descendants after us".

International obligations and climate

3.28 The applicant stated that QPS use of methyl bromide is compliant with the Montreal Protocol, citing the exemption for such uses.

3.29 Clear the Air Mt Maunganui and Dr Olaf Morgenstern (witness for the Soil and Health Association) were concerned about the impact of methyl bromide on the climate and the ozone layer. Dr Morgenstern stated that methyl bromide contributes to ozone depletion which he claimed to be the leading cause of climate change.

3.30 Four submitters (Dr Miller, Tauranga Moana Fumigant Action Group, Guardians of the Sounds, and Nicole Smith) stated that New Zealand must consider international obligations under the Montreal Protocol, and that New Zealand should comply with the spirit as well as the letter of the treaty. These submitters considered that the current trend of increasing methyl bromide use in New Zealand is contrary to the Montreal protocol, while a recapture requirement is consistent with its intention.

3.31 The applicant responded by re-stating that the Protocol does not seek to stop international trade by prohibiting QPS uses of methyl bromide. Additionally, the applicant stated that a change in recapture standard would have no meaningful effect on the ozone layer, compared to the significant success of the Montreal Protocol to date.

Benefits

3.32 In the context of this modified reassessment, benefits are those that arise from changes to the current conditions for methyl bromide use specified in the 2010 reassessment decision.

3.33 The economic benefit resulting from modifying the recapture standard as specified in this application was quantified in the pre-hearing statement of evidence provided by the applicant's expert witness Kieran Murray, dated 27 July 2020. This statement of evidence is supplementary to the economic evaluation of the forestry sector authored by the New Zealand Institute of Economic Research and appended to the application form.

3.34 The economic benefit of continued methyl bromide use as presented by the applicant's expert was quantified to be $309 to $439 million per year, and $2.2 to 3.2 billion over ten years. This represents the loss of export value that would be avoided if the 2010 recapture standard was modified in accordance with the applicant's proposals. This economic benefit was expected to lie at the upper end of the range due to the economic uncertainties brought about by Covid-19.

3.35 The applicant's economic assessment described how methyl bromide was needed to access key markets (China, and India). Currently, 80% of logs are exported to China, 8% to India, and the remaining 12% to other countries. In 2018, 22% of all exported logs were treated with methyl bromide.

3.36 China accepts both methyl bromide and phosphine treatments, and ship's holds containing logs are treated with phosphine in transit. Consignments bound for China, however, may have logs stacked on deck, which are fumigated with methyl bromide under tarpaulins at the port before being loaded. In 2018, 18% of logs bound for China were treated with methyl bromide.

3.37 India requires methyl bromide treatment for all log consignments and does not accept any alternative phytosanitary measures. Consequently, most ship's holds of logs that are fumigated with methyl bromide are on ships destined for India. Rayonier Matariki Forests indicated that these exports are worth $250 million per annum, while Mr Murray suggested this value was $282.7 million in 2018.

3.38 Mr Murray described a number of consequences that he considered could result from maintaining the recapture standard set in 2010, given that it could not be achieved with current technology. Logs could no longer be top stowed on ships to China, and no logs could be exported to India. The effective price received from all log exports to China would be reduced by an estimated 10 to 20%. Lower effective prices would mean it would no longer be economically viable to harvest some forests, especially in areas distant from ports, which would decrease the income and decrease the employment in the forestry sector. An increase in unemployment would lead to an increase in benefit payments paid by the government, and a decrease in tax collected.

3.39 The position of the applicant was supported by several submitters from the forestry and horticultural sectors.

3.40 Submitters from the forestry sector (Rayonier Matariki Forests and Tenco Ltd) additionally suggested that if the use of methyl bromide was discontinued New Zealand would lose in international markets for higher value forest product exports.

3.41 United Fresh New Zealand submitted that if recapture standards that extend fumigation times were put in place, there would be a severe impact on the perishability of imported fruits and vegetables. The impact on shelf-life may make it uneconomic to import a diverse range of soft produce and consequently the diets of New Zealanders could be restricted. According to United Fresh, this would disproportionately affect children and older people (who represent large consumers of certain fruit types). Similarly, Pacifika would also be affected, due to the cultural significance of produce requiring methyl bromide fumigation (for example, coconuts, cassava, taro, giant yam, papaya, okra).

3.42 United Fresh New Zealand also noted that importing produce from the Pacific was important to their economies, and the New Zealand Fresh Produce Importers Association noted that imports of fresh produce contribute to important economic and health outcomes.

3.43 Additionally, the applicant quantified the economic benefit related to the export of apples stemming from a revised recapture control, based on the submission from T&G Global on this reassessment application. Japan is a critical market for apple exports, and requires all consignments of apples to be treated with methyl bromide to control codling moth. Accordingly, the decrease in value associated with a diversion of apples from Japan to other markets was estimated to between 1 to 10%. Over ten years, the benefit from apple exports to Japan was estimated to be between $3.9 and $18.1 million. New Zealand Apples and Pears indicated that this use accounts for less than 1% of methyl bromide use in New Zealand.

3.44 Fresh produce exporters T&G Global Ltd and New Zealand Apples and Pears also pointed out that Japan mandates the use of methyl bromide to fumigate apples before export, so continued use of methyl bromide is essential to maintain this market access. They noted the Japanese market is critical for the apple and pear industry.

3.45 The applicant did not dispute that there was benefit in the reduction of methyl bromide emissions, however, took the position that those benefits could not be appropriately quantified to incorporate in a regulatory decision on recapture standards.

3.46 A number of submitters (including MPI and Horticulture New Zealand) agreed that there were benefits to the biosecurity of New Zealand from the use of methyl bromide to treat incoming consignments for pests.

3.47 Mr Ngatuere of Whareroa Marae, the mana whenua in the area of the Port of Tauranga, submitted that there was no benefit from the continued use of methyl bromide to the marae and its community. Of the 90 people that live at the marae, 80% of them are under 10 or over 60 years old so are more sensitive to pollutants than the general population.

3.48 Dr Miller considered that the economic benefits associated with methyl bromide are provided by its use in QPS. She asserted that methyl bromide offers no value if there are alternatives available.

3.49 Clear the Air Mt Maunganui considered that some of the dire economic predictions are catastrophising and exaggerated, and that markets should be left to re-adjust.

3.50 Submitters opposed to a revision of the recapture controls also suggested that there would be benefits to human health in areas where methyl bromide was used if the current recapture standard was maintained. Additional benefit to the environment due to decreased exposure of the ozone layer to methyl bromide was also stated.

Progress on reducing methyl bromide emissions

3.51 MPI noted that non-QPS uses of methyl bromide have been eliminated in New Zealand. Global methyl bromide QPS use has remained steady over the past two decades.

3.52 The Committee noted that New Zealand QPS use of methyl bromide has increased by 50% between 2010 and 2016. This increase was the basis for the decision to grant grounds for reassessment.

3.53 Over the last 10 years, the applicant stated that it has spent $30 million on research and development for recapture technology and alternatives to methyl bromide that might enable emissions to be reduced.

3.54 The Tauranga Moana Fumigant Action Group, Clear the Air Mt Maunganui, and Andrew Parkinson commented on the lack of progress by industry to implement recapture, particularly for ship's hold fumigations.

3.55 The applicant believed that any advances in log stack recapture technology are likely to be incremental, and that there is no technology that exists or is in development that could enable any meaningful recapture of methyl bromide from ship's holds.

Alternative approaches

Strategies to reduce methyl bromide use

3.56 Genera Science & Innovation (Genera) presented an approach for reducing methyl bromide use, which involves a combination of strategies.

3.57 Genera views methyl bromide alternatives as the most effective way of reducing methyl bromide emissions. In their submission, Genera stated that as a result of the Chinese Government's acceptance of phosphine fumigations of logs in ship's holds in transit as an alternative to methyl bromide fumigation, over 50% of export logs that would have previously been fumigated with methyl bromide are now fumigated with phosphine. Other alternatives such as ethanedinitrile (EDN) are also being evaluated.

3.58 Recent changes in technology allow the measurement of the methyl bromide concentration in each fumigation space during application. This allows applying methyl bromide until the required concentration is achieved (dosing to concentration) when fumigating with methyl bromide, rather than determining the amount of methyl bromide to apply based on the empty volume of the fumigation space (dosing to volume). Genera estimated that adoption of this measurement method could reduce methyl bromide use by 12%. Genera noted that it may take one to two years for MPI to approve dosing to concentration for methyl bromide fumigations.

3.59 Genera has also estimated that lower dose fumigations could contribute to another 11% reduction in methyl bromide use, and has carried out trial fumigations to test the efficacy of lower doses. This approach will need acceptance by New Zealand's trading partners.

3.60 Overall, Genera estimated that levels of methyl bromide could be reduced by at least 97%, relative to having no controls or mitigation strategies in place at all.

3.61 MPI submitted that it has been negotiating with other countries over the past 10 years trying to reduce methyl bromide rates or get acceptance of alternatives.

Alternative log fumigants

3.62 Seven submitters discussed the use and availability of possible alternative log fumigants. Mr Parkinson, Port Blakely Ltd, and Tenco Ltd highlighted that there is a potential alternative fumigant (namely EDN) going through the HSNO assessment process currently. It was also noted that, should this fumigant be approved, it will take time to re-negotiate market access agreements that would allow for its use.

3.63 Both Dr Miller and MPI noted that the European Union uses sulfuryl fluoride treatment, though they also noted that this alternative has a very high global warming potential.

3.64 Phosphine was also identified as an alternative fumigant and is used for ship's hold fumigation of logs. However, logs transported on-deck (that is, one third of the total vessel shipment) either require methyl bromide treatment or must be destined for markets that do not require methyl bromide treatment. Rayonier Matariki Forests considered these markets to be well supplied, and unlikely to be able to accommodate the resultant increase of logs should methyl bromide no longer be a fumigation option. Don Hammond, a witness for the applicant, also noted that even if recapture of methyl bromide was not required, methyl bromide would not be the preferred treatment option in situations where phosphine can be used, as phosphine is cheaper. Furthermore, Rayonier Matariki Forests highlighted that moving to larger freight vessels where cargo was held entirely in the holds was not a reliable option, as those vessels infrequently visit New Zealand.

3.65 Genera indicated that, if India were to accept phosphine treatment of logs, then methyl bromide use could be reduced by between 100 and 150 tonnes per year.

3.66 Dr Miller requested that an online database of methyl bromide alternatives be set up, with provision for stakeholders to submit information for review and inclusion on said database.

Alternative phytosanitary practices for logs

3.67 The applicant provided some commentary on alternative phytosanitary practices.

3.68 The expert witness statement from Kieran Murray for the applicant indicated that 82% of logs exported in 2018 were treated with alternative methods to methyl bromide including phosphine fumigation and debarking. The applicant indicated that debarking capacity was able to accommodate up to around 40% of current exports.

3.69 China, the largest market for New Zealand log export, accepts debarking as a risk reduction measure. In the event of inefficacious debarking, China will treat the logs with methyl bromide, charging the cost back to the exporter. The applicant also suggested that China was the only market to accept debarking.

3.70 Several submitters discussed other treatment options.

3.71 EIM Research Pty Ltd (EIM) maintained that heat treatment was not practical for log-stacks and is better suited for small items.

3.72 Additionally, EIM believed debarking of logs introduces extra processing steps and costs and is not considered to be a completely effective pest control option, as results can be variable. Further, Rayonier Matariki Forests pointed out that debarking has limited capacity and is undertaken at only two locations in New Zealand.

3.73 Port Blakely Ltd indicated that debarking is not an accepted phytosanitary treatment for the Indian market. Furthermore, Port Blakely Ltd does not have the production scale to justify the use of alternative treatments.

3.74 Port Blakely Ltd also noted that relying on the receiving country to undertake fumigation could leave New Zealand exporters vulnerable to risks arising from changing attitudes in the receiving country. Additionally, Rayonier Matariki Forests suggested that market access negotiations to obtain acceptance of alternative treatment options can be slow.

3.75 The Tauranga Moana Fumigant Action Group indicated that processing of logs in New Zealand into timber for export should be considered as an alternative option to methyl bromide treatment for log exports. The applicant indicated that there was limited capacity for New Zealand to absorb the volume of wood that would otherwise be exported, and that New Zealand sawmills would not be able to profitably process the grades of wood that are exported.

Alternative phytosanitary practices for fresh produce treatment

3.76 T&G Global Ltd and New Zealand Apples and Pears highlighted that an integrated systems approach to achieve phytosanitary requirements that does not rely on use of methyl bromide is being pursued for market access of apples to Japan. A “systems approach” is an integrated system of methods to achieve the desired pest management standard through cumulative effects of the component methods employed in the system. New Zealand Apples and Pears speculated that a systems approach could be achievable in five years.

Recapture

Recapture definition

3.77 The recapture target, as set in the 2010 reassessment of methyl bromide, requires the headspace concentration of methyl bromide to be reduced to 5 ppm (that is, a specified concentration of methyl bromide). This approach means that compliance will ensure that known volumes of methyl bromide will be released upon venting.

3.78 The applicant’s proposal takes a different approach, in that that the recapture target should focus on the proportion by which the methyl bromide in the headspace is reduced, rather than specifying a required end concentration. The consequence of this is that there is no certainty offered about the quantity of methyl bromide that will be released upon venting.

3.79 The Guardians of the Sounds, Nicole Smith and Mr Parkinson requested that the EPA stay with the original (2010) definition of recapture.

3.80 However, the applicant stated that ERMA set the recapture control believing it was achievable rather than prohibitive, but considered that ERMA was wrong. Port Blakely Ltd commented that maintaining current recapture levels will result in effectively banning the use of methyl bromide, with resultant impacts on the forestry sector.

3.81 Ngāi Tahu, BOPRC, and Horticulture New Zealand supported the 80% recapture level initially applied for.

3.82 BOPRC preferred a defined concentration rather than a relative concentration for the recapture efficiency definition. It considered that some measurement would need to happen at the end of fumigation to confirm recapture, so it could just as easily be a concentration. It considered that this would provide greater clarity for operators and regulators.

3.83 BOPRC also stated that recapture requirements should be ambitious, to drive industry towards increased recapture rates.

3.84 MPI noted that recapture that could actually be achieved varies. It is affected by size and type of enclosure, type of recapture technology, amount of methyl bromide used and target end concentration, fumigated commodity, environmental factors (including moisture), and length of time of recapture.

Recapture technologies

3.85 Joe Falco (from Nordiko Quarantine Systems, an expert witness for Mr Parkinson), and EIM presented their technologies for the recapture of methyl bromide.

3.86 In contrast to the liquid-based recapture systems utilised by Genera, Nordiko's technology is an activated carbon system. Mr Falco submitted that Nordiko's activated carbon system is more efficient than a liquid-based system. Provided carbon filters are not saturated, only a single pass is needed to recapture 99% of the methyl bromide. A higher initial concentration of methyl bromide does not affect recapture efficiency, but it will saturate the filter faster. The filter will hold about 1 kg methyl bromide to 10 kg carbon, and the filter will also absorb moisture. The spent carbon is sent to an approved waste facility.

3.87 EIM stated that the volume of carbon that is needed to recapture gas in large volumes is underestimated, with implications for handling and disposal.

3.88 EIM discussed its Gas Destruction Unit, which uses a series of thermal oxidative processes followed by liquid scrubbing to destroy input gases, such as methyl bromide. For methyl bromide, the by-product would be sodium bromide. This system is especially suited to in-hold fumigation gas destruction that is integrated with the ship's features and equipment. Using this system, it could be possible to fumigate with methyl bromide in-hold and then initiate scrubbing for the duration of the voyage. However, current maritime law prevents travel with methyl bromide in the hold.

3.89 The applicant, however, considered that the only feasible methyl bromide recapture technology is that being used and further developed by Genera – which involves liquid scrubbing using its proprietary compound. The applicant further noted that the moisture content of logs reduces the efficiency of carbon-based recapture technologies. In addition, it contended that carbon-based recapture technologies generate an enormous amount of toxic waste (which is made bigger when recapturing from high-moisture commodities, as the carbon adsorbs water). The applicant also stated that other recapture technologies were either not technically or economically feasible, not amenable to port operations, not transferable from the recapture of methyl bromide from container fumigation to log stack fumigation, or had a combination of these issues.

3.90 In its submission Genera stated that despite best efforts to date, technology that could achieve the level of recapture specified by the 2010 decision does not currently exist. Genera discussed the technology developed to date, stating that an average of 60% recapture of methyl bromide from log stacks is currently achievable in commercial conditions, and that it is continuing its research and product development to improve this technology. Genera also stated that it did not think there would ever be technology that could meet the 5 ppm target.

3.91 In its submission, Guardians of the Sounds, however, did not believe industry when they said the technology does not exist.

Recapture from containers

3.92 The applicant maintained its request for a recapture standard of 80% for containers, to take effect in April 2021. Any higher standard may not be achievable in practice for all shipping container fumigations, and, even if theoretically achievable, would require more lead time to develop appropriate technology. Genera also submitted that while recapture to achieve a residual concentration of 5 ppm recapture is not feasible, 80% recapture can be achieved in containers now.

3.93 New Zealand Apples and Pears, Genera, and EIM stated that recapture to 5 ppm in containers of produce is commercially not viable, as the extended time exposed to methyl bromide at higher temperatures has a serious impact on the quality and shelf life of the fruit and vegetables being fumigated. New Zealand Apple and Pears stated that only Genera equipment is currently available, and T&G Global noted that bigger pumps are not the solution to suck out the air faster, as this will lead to infrastructure damage.

3.94 On the other hand, Mr Falco and EIM both stated that their technologies could achieve very high recapture levels in a very short period of time for containers (Nordiko – 5 ppm in one to two hours; EIM – 100 ppm in just over an hour).

3.95 The New Zealand Fresh Produce Importers Association supported differentiation of commodities around use patterns, meaning either an exemption or a different, more focused recapture target for the fresh fruit and vegetable market, pointing out that methyl bromide usage for fresh produce is less than 1% of total use.

3.96 T&G Global stated 80% recapture is currently possible in its purpose-built facility.

Recapture from log stacks

3.97 The applicant requested a recapture standard of at least 30% from log stacks. This was at the lower end of what it understands is achievable (80% recapture is achieved only sometimes, and is at the upper end of what is currently achievable). The applicant suggested that this should come into force 24 months after the decision, although a stepped obligation would be feasible: 25% of stacks within 6 months, 50% within 12 months, 75% within 18 months, and 100% of all stacks within 24 months. Genera agreed, stating that in its trials an average of 50% to 60% methyl bromide was recaptured from log stacks, with 30% being at the bottom end of what is possible, and 80% at the high end.

3.98 The applicant also mentioned the possibility of a more aspirational control that requires a minimum of 30% recapture from all log stacks, and an average of 55% recapture across all log stack enclosures.

3.99 The applicant made the point that recapture from log stacks is extremely difficult due to the complexity of the system and many variables being in play (stack size, moisture content of logs,

diffusion of logs, ambient temperatures, atmospheric changes within the log stack caused by log respiration, amount of bark on logs). Additionally, Genera pointed out that the size of stacks, and other port logistics, are outside its control.

3.100 The applicant stated that it was unclear when 80% efficiency would be achieved for log stacks.

3.101 Two submitters disagreed with the applicant. EIM opposed the applicant's initial 80% application, and also the revised 30% proposal. EIM stated that elimination of all toxic gases should be undertaken, and that greater than 80% efficiency would be achievable using its technology. Mr Falco also submitted that Nordiko could supply the requirements of recapture for New Zealand logs in a matter of 6 to 12 months, to a much greater recapture efficiency than 30%. While variations in the conditions would affect this, efficiency would likely be 80-90%.

Recapture from ship's holds

3.102 The applicant requested that a ship's hold recapture standard of 50% comes into force 10 years following the decision.

3.103 Both Ngāi Tahu and Ngāi te Rangi opposed the extension of the timeframe for the implementation of the recapture control for ship's holds. They stated that if the recapture control for ship's holds is to be modified, it should only be extended for five years.

3.104 Mr Falco and EIM both claimed their recapture technology could achieve recapture of methyl bromide from ship's holds in New Zealand within a much shorter time frame and to a higher efficiency. Mr Falco presented examples of successful recapture from large volume fumigations such as grain silos and houses. EIM indicated that it had success in destroying methyl bromide used in grain silos.

3.105 On the other hand, the applicant submitted that ship's holds are very difficult to recapture from, and there is no promising technology on the horizon. Further, the applicant stated that while Mr Falco and EIM made claims about their systems, they did not have the data to back up their statements, so the applicant would caution against buying into what it considered to be their unproven technologies. The applicant pointed out that grain silos are not representative models for ship's holds. Further, the applicant stated that while they may have similar volume, with ship's holds the methyl bromide must be evacuated from the top (as opposed to the bottom with grain silos), and the moisture content would be significantly higher when fumigating logs. Furthermore, while the density of methyl bromide assists in its distribution around the hold, this also makes it difficult to extract from the top of a ship's hold.

3.106 This view was supported by Tenco Limited, who submitted that ship's hold recapture is not commercially practical at this time.

3.107 In response to a question from the Committee, Genera commented that it had initiated a trial using a prototype ship's hold recapture system but had halted it after eight hours as it was not working. It was Genera's opinion that there is currently no technology that can successfully recapture methyl bromide from ship's holds.

3.108 BOPRC suggested a cap on the number of ship's hold fumigations performed monthly or yearly. While it could set this restriction themselves for the Port of Tauranga, the Council felt it would be good to have national standards/controls.

3.109 The applicant, however, was concerned that this suggested control could limit growth of the Indian market.

3.110 According to BOPRC, monitoring of a ship's hold release event shows that modelling seriously under-predicts real ship's hold post fumigation venting. For example, venting time used in the models developed for this reassessment comprises five holds vented sequentially, one to two hours per hold, whereas the reality is more likely to be two hours for all five holds. Ship's hold venting time restriction could be an additional useful control.

3.111 The applicant acknowledged that the modellers agreed that having a control on opening of ship hatches sequentially would be sensible. Slowing the opening of the holds (for example, one hold every hour, or one hold every two hours), would make the results of the air modelling look more manageable.

3.112 The applicant noted that fumigating an entire ship's hold worth of logs on shore, in addition to the logs later stowed on deck would be extremely difficult to complete within the maximum 48 hours allowed between fumigation and departure. Double handling of ship's hold logs adds cost.

Air dispersion modelling

3.113 Air dispersion modelling is a critical element of the risk assessment for the modified reassessment of methyl bromide, particularly in assessing the different levels of exposure and risks with varying degrees of recapture efficiency. This modelling allows for the assessment of different levels of exposure to methyl bromide across an area based on how the substance will concentrate, disperse, and move through the air when released from a fumigation event. Air dispersion modelling is a key factor in determining the size of buffer zones that are necessary and appropriate for different levels of recapture to ensure public safety.

3.114 Several experts were commissioned to model the dispersion of methyl bromide from log stack fumigations for the purposes of this reassessment including:

- Sullivan Environmental Consulting (SEC), commissioned by the applicant
- Todoroski Air Sciences (TAS), commissioned by the EPA
- Pattle Delamore Partners (PDP), commissioned by WorkSafe
- Golder Associates (Golder), commissioned by the applicant post hearing.

3.115 During the course of the application, the EPA and the Committee became aware of two existing air dispersion reports for the Port of Tauranga, prepared by Beca Pty Ltd (Beca) and Golder.

3.116 The reports prepared by the experts, and the reviews of the reports are summarised in the EPA Staff Report and the two Staff Update Reports.

3.117 The quantitative air dispersion modelling undertaken for this reassessment models fumigation events at the Port of Tauranga. This location was chosen because most New Zealand methyl bromide fumigations take place there. The modelling experts agreed that the modelling results from the Port of Tauranga could be used qualitatively at the two other ports where methyl bromide fumigation of logs currently takes place (Northport and Napier).

3.118 The air dispersion modelling previously summarised in the EPA Staff Report will not be reproduced here, except for the final position reached by the EPA:

> 7.120 *A total of six air dispersion modelling reports have been reviewed in preparation of this report (in alphabetical order): Beca, 2015; Golder, 2019; PDP, 2020; SEC, 2018/2019, 2020; TAS, 2019.*
>
> 7.121 *All, except the PDP report, has been reviewed by air dispersion modelling experts on behalf of the EPA and/or BOPRC.*

7.122 *The modelling submitted by the applicant (that is, the SEC reports) contains critical errors.*

7.123 *As the Beca report modelled forced ventilation, as opposed to the active ventilation modelled in the other reports and more accurately reflects the current uses, it is not considered appropriate to use further in this application.*

3.119 At the hearing, TAS (on behalf of the EPA) presented the modelling undertaken for the reassessment. This work included three reports: a review of the 2018-19 SEC modelling, modelling based on SEC work, and a review of the SEC 2020 report.

The fundamental error identified by TAS in SEC's July 2020 report

3.120 In their review of the SEC 2020 report, TAS identified an error that it considered to be fundamental.

3.121 In its opening statement at the hearing, SEC did not dispute the error identified by TAS. SEC suggested, however, that this error was not fundamental and did not affect the findings significantly. SEC presented revised results of the erroneous modelling which showed a shift in the 100th percentile value of some boundary receptors to adjacent receptors 20 m away, and the mischaracterisation of two receptors out of 1500 in a test run. SEC underscored that conclusions drawn from the data would not have changed following the corrections.

3.122 Additionally, MPI suggested that the fumigation rates used in some of the modelling were not appropriate. For example, fumigation of ship's holds on vessels bound for India use rates of 64 or 72 g/m^3 of methyl bromide, rather than 120 g/m^3.

The reliance of the 100th percentile in proposing controls as presented in the EPA Staff report

3.123 The EPA described its reasoning for the use of the 100th percentile values from the modelling reports for buffer zone recommendations as presented in the EPA Staff report. The EPA determined that these values matched the monitoring data better than values relating to lower percentiles, and that these would accordingly represent more realistic scenarios.

3.124 SEC provided examples of best international practice for the use of percentiles to set standards. The examples showed regulators set air quality standards usually based on 98th to 99.9th percentile range and allowed for some exceedances.

3.125 SEC asserted that 100th percentile estimates overstate the exposure.

3.126 Dr David Fletcher, a statistician who presented as an expert witness for the applicant, gave a presentation on percentile reliability. Dr Fletcher indicated that in the case of SEC's modelling, the 98th percentile is reliable. Additionally, Dr Fletcher discussed how 99.99th percentiles can be quite different from the true value, and that the 95th, 98th, and 99th percentiles are more reliable than the 99.9th percentile when using a probabilistic Monte Carlo methodology.

3.127 MPI noted that the New Zealand guidelines (as set by the Ministry for the Environment) recommend using the 99.9th percentile instead of the 100th percentile for predicted ground-level concentrations of methyl bromide.

3.128 Atmospheric Science Global (ASG), the expert witness for the BOPRC (and who also reviewed some of the later modelling reports), agreed that the use of the 100th percentile was not appropriate and that the values were likely to include outliers or artefacts. ASG also suggested that the use of a 98th or 99.9th percentiles would not show massive exposure events, such as may occur for ship's hold ventilation.

Conservatism in modelling

3.129 SEC reaffirmed that the intent of the modelling was to conservatively represent model inputs while producing distributions of exposure that provide the probability of occurrence, and the magnitude of each adverse event. Aspects of the Monte Carlo analysis that contributed to its conservatism included: the model assumed that log stacks were emitting methyl bromide at a rate equivalent to the first hour of ventilation for all hours modelled (from 7.00 am to 7.00 pm), and it assumed that the operator is positioned downwind of the fumigation and is stationary for their entire eight-hour shift. SEC suggested that these two assumptions inflate the modelled exposures compared with real exposure by over ten-fold.

3.130 ASG agreed that modelling undertaken was conservative, and considered that conservatism was a positive attribute for models. ASG suggested that the SEC modelling was not realistic due to the assumption that methyl bromide emissions were occurring every single hour of the day. The SEC modelling also showed that the 1-hour, 8-hour, 24-hour, and annual tolerable exposure limits (TELs) had all been exceeded – ASG suggested that this was not the case as there were not enough events occurring with prolonged emissions for these criteria to be exceeded.

The relationship between modelling and monitoring

3.131 SEC described limitations of the paired total volatile organic compounds (TVOC) methyl bromide monitoring data. Inconsistencies of three samples out of the 47 obtained in the monitoring exercises performed by Golder and WorkSafe which exceeded the TEL were highlighted. For these three samples, the measured methyl bromide concentrations were greater than the TVOC. SEC noted that there was no clear explanation for these inconsistencies, and that it believed these samples were unreliable.

3.132 SEC suggested that the measured data should be compared with the modelled data to determine which modelling approach is the most realistic. That approach would provide an indication of the magnitude and probability of adverse events, as required by the HSNO (Methodology) Order. SEC indicated that its modelling was in the right ballpark and that other modelling estimated values that were too high. The deterministic modelling undertaken by TAS correctly provided an upper-bound estimate. However, in SEC's view this overstated the measurements and did not take the magnitude of probability into account.

3.133 WorkSafe advised that it has been undertaking a methyl bromide monitoring and modelling project, in which it has been taking measurements of methyl bromide concentration during fumigation events at the Port of Tauranga. Measurements of TVOC were taken using photoionisation detectors (PIDs), and methyl bromide concentration was measured using SUMMA cannisters.

3.134 PDP provided some commentary on the difference in measurements of TVOC using PID equipment and measurements of methyl bromide concentration, using SUMMA canisters. For lower concentrations of methyl bromide at the port, PIDs over-predict because they also pick up pinenes (terpenes from the oils of coniferous trees).

3.135 A number of submitters indicated that it was difficult to accurately predict where methyl bromide plumes go. The difference of a few degrees in wind direction makes a huge difference in whether the measuring equipment will be in the plume path or not.

Interpretation of modelling

3.136 SEC provided further detail on the difference between probabilistic and deterministic modelling. SEC clarified that the probabilistic (Monte Carlo) methodology was more appropriate for intermittent emission sources (such as port fumigation activities), and that deterministic modelling was more appropriate for constant emission sources (such as a smokestack that emits all year round). SEC used a Monte Carlo approach to simulate port operations in Tauranga.

3.137 SEC underscored that its models were not good for predicting specific spatial or temporal events (that is to say, predicting that a specific event will occur at a specific location), but were suitable for providing representative trends over a period of time.

3.138 SEC was of the opinion that there were no significant disagreements between the air dispersion experts. SEC suggested that it would be of value to the Committee to have general agreement between the modellers regarding the modelling approach.

3.139 ASG advised that the models used are very sensitive to input parameters, such as log size, location, and meteorology, and that the inputs used by the different modellers varied significantly.

3.140 PDP presented the results of one-minute time-step modelling and monitoring. These small time-steps provide visibility on the fluctuations of methyl bromide concentration within an hour. Relatively high concentrations of methyl bromide were predicted and measured at the beginning of a log stack ventilation event (once the tarpaulin is removed), and then fell rapidly as methyl bromide dispersed. PDP suggested that the one-minute modelling data could be used to inform a short-term exposure limit (STEL).

3.141 ASG suggested that a key issue was peak methyl bromide concentrations occurring on short timescales, and that modelling based on the 99.9th percentile was unable to capture this.

Further modelling requested

3.142 After the hearing, the Committee considered that a number of gaps in the available modelling needed to be filled in order for the Committee to be satisfied that it had sufficient information. Consequently, the Committee requested that further air dispersion modelling be carried out to address the data gaps. The applicant, as part of its feedback to that modelling, provided further modelling as well.

3.143 The TAS report (commissioned by the Committee), provided approximate buffer zones for a series of modelled scenarios (both log stack and ship's hold fumigations). The proposed buffer zones ranged from 45 m up to 1020 m.

3.144 TAS also investigated which wind conditions may be unsuitable for fumigations to occur. TAS considered that ventilation of methyl bromide should not take place below wind speeds of 2 m/s due to the poor dispersion and instability in wind directions.

3.145 As part of the feedback on the updated modelling by TAS, the applicant provided further modelling by SEC. As this report used a type of model which was not requested by the Committee, it was not considered further.

3.146 In addition, the applicant also provided further modelling by Golder. This modelling used the scenarios set up by TAS and made refinements to the operating conditions to provide options to mitigate any offsite effects of methyl bromide at the Port of Tauranga. The report generated maximum parameters (emission rate, stack size, maximum does, timing constraints) with which the 1-hour TEL would be met with a buffer zone of 100 m.

3.147 The Golder report was reviewed by TAS and ASG. During this process, an error was found in some of the figures presented by Golder. This error stemmed from a previously undetected error in the previous TAS modelling, and on which Golder's refinements were based. Both TAS and ASG agreed that this could be corrected by scaling the relevant figures resulting from the model by a factor of 2.43.

3.148 Upon being made aware of the error and the correction factor, the Committee directed the EPA to present corrected figures for the relevant log stack and maximum doses presented by Golder. This was done in the Staff Update Report 2.

Controls

3.149 The controls proposed by the EPA in the Staff Report were based on the applicant's initial application to revise the recapture definition to 80%, rather than 30% as described in its opening submissions. The EPA clarified that the recommendations on controls where recapture is not taking place are still valid, however, reconsideration was needed for scenarios in which recapture is taking place.

3.150 WorkSafe indicated that it could not use a Safe Work Instrument to address the matters that have been discussed in this reassessment, namely buffer zone and recapture requirements. This is because these matters are already addressed by regulations.

3.151 The applicant supported controls requiring incremental improvement over time, provided those controls are set so as to be achievable, but questioned whether the Committee had enough information to set a control of this nature at this time.

3.152 MPI stated that controls from the 2010 decision would have a significant negative impact on trade and biosecurity, and it would like controls that are economically and technically achievable. It also considered that they need to be able to accommodate all types of fumigations (including log stacks, containers, containers under cover, small stacks). MPI was concerned that smaller, non-log fumigations might not be feasible with the proposed controls (particularly buffer zones). Once recapture targets and controls were known, sufficient transition time would be required in order to procure equipment and train staff.

3.153 Genera submitted that controls proposed by the EPA in the Staff Report could not be practically implemented.

Buffer zones

3.154 WorkSafe stated that buffer zones that could be set by the EPA in the reassessment at hand would be supplementary to those in the Health and Safety at Work (Hazardous Substances) Regulations 2017 (HSWR).

3.155 The applicant stated that it was no longer seeking a change to buffer zones. The applicant submitted that buffer zones for human health are in the jurisdiction of WorkSafe. While the EPA can set buffer zones (separate to HSWR), the buffer zones proposed in the Staff Report (2 km) would be unworkable at any port in New Zealand. The applicant maintained that based on modelling and the evidence of Dr Mark Pemberton (an expert witness for the applicant), there would be no need for buffer zones to be any larger than those currently in place under HSWR.

3.156 BOPRC submitted that if large buffer zones are required for the venting of ship's holds, then ship's hold fumigation could simply not be allowed in port as there would be no way to exclude the public by more than 50 m from the ship. The International Maritime Organisation recommends that venting not be done in transit.

3.157 EIM stated that buffer zones should be specific to the fumigant and consistent throughout the entire fumigation period to take account of accidental or premature fumigant release.

TELs

3.158 Dr Miller supported larger buffer zones and short-term TELs.

3.159 ASG, on behalf of the BOPRC, discussed exposure limits and suggested a 15 minute STEL would be helpful as short-term peaks were an issue. ASG stated that the 8 h workplace exposure standard (WES) time-weighted average, as well as the 24 and annual TELs, are unlikely to be breached.

3.160 The applicant stated that TEL and WES are different. A WES is based on chronic exposure and applies to protect worker health. It is set by WorkSafe and is therefore out of the scope of this reassessment. The purpose of a TEL is to protect the public, and although the applicant also stated that the TEL would not apply within the buffer zone, buffer zones can be set such that TELs should not be breached.

Additional controls

3.161 Several submitters suggested a variety of additional fumigation controls.

3.162 Six submitters (Ngāi te Rangi, Mr Parkinson, Ms Stewart, the Tauranga Moana Fumigant Action Group, the Guardians of the Sounds, and the Soil and Health Association) wanted to see dedicated fumigation facilities, sited away from residential zones.

3.163 BOPRC suggested additional, more prescriptive, controls relating to the logistics of fumigation, for example limiting log stack size, recapture duration, and using a fresh scrubbing solution.

3.164 MPI suggested setting a control to limit the release of gas based on volume of gas released over time, rather than number of holds, or number of stacks.

3.165 The Guardians of the Sounds wanted to have a stenching agent put into methyl bromide canisters, so that it could be detected by smell.

3.166 BOPRC suggested restrictions to venting in certain atmospheric conditions (such as low/zero wind conditions or inversion layers).

Monitoring

3.167 BOPRC and WorkSafe commented on the issues surrounding monitoring for methyl bromide using PID, which measure TVOC, rather than methyl bromide specifically. This impacts on the practicality of monitoring controls.

3.168 WorkSafe also suggested that monitoring of methyl bromide emissions was difficult. The difference of a few degrees in any direction makes a huge difference in whether the monitor will be in the plume or not.

3.169 Portable Fourier-transform infrared spectrophotometer monitors were suggested by the BOPRC as potential alternative monitors, as they provide instant and accurate measurements that are specific to methyl bromide.

3.170 The Council further discussed other monitoring issues, such as monitor placement (monitoring results do not necessarily represent actual methyl bromide distributions, as monitors can easily miss peak concentrations), variability between different co-located or close monitors, effects of variable wind conditions, and the cost of different monitoring options.

3.171 The Council commented that better reporting and monitoring requirements are needed.

3.172 The Soil and Health Association pointed out that there is no monitoring for workers on gantry cranes, or other areas further away from the fumigation. The Tauranga Moana Fumigant Action Group was also concerned about worker impacts. The Group pointed out that while workers directly involved in fumigations were monitored and wore personal protective equipment, no other port workers were monitored or wearing similar personal protective equipment. It also supported specialised monitoring and more stations in general.

4. Consideration

Scope

4.1 The Committee considered that the scope of the application was clearly set out by the EPA Chief Executive in the pathway decision.

4.2 The Committee noted that the application (whether 80% or 30% recapture rate) did not limit its ability to set the controls that it considered appropriate within the prescribed scope.

4.3 The Committee also noted that four individual submitters wanted methyl bromide use discontinued. Other submitters were concerned for the health of people living near ports that fumigated with methyl bromide and were therefore against the proposed changes. Some pointed out that its use had been withdrawn overseas and wanted to see New Zealand follow suit. However, as this is a modified reassessment under section 63A(1) of the Act, the Committee noted that it has no power to revoke the approval.

4.4 Nonetheless, the Committee noted that it should not set controls that frustrate reasonable or authorised use of the substance. Any controls should be achievable and drive the changes necessary to ensure reduction or elimination of methyl bromide emissions, avoid impacts on the health and well-being of people, and on the environment, while realising the economic benefits associated with methyl bromide use.

4.5 The Committee also noted that its decision is focused on changes to the recapture definition and associated controls that are necessary to give effect to the 2010 decision to ensure achievable and practical outcomes. The Committee also identified a need to drive research, innovation, and behaviour change to reduce methyl bromide emissions and search for feasible alternatives to methyl bromide.

Matters in Part 2 of the Act

4.6 The Committee considered Part 2 of the Act and is confident that the amendments to the controls align with the purpose and the principles of the Act.

4.7 The Committee took into account the principles of the Treaty of Waitangi as required by section 8 of the Act. The Committee heard significant evidence from submitters in respect of Māori views on the continued use of methyl bromide and the impacts of that use on cultural rights such as kaitiakitanga and whanaungatanga. The Committee took account of this evidence when considering appropriate controls for the continued use of methyl bromide, including ensuring that adequate notification of fumigation events to neighbouring marae should take place.

4.8 The Committee considered all of the evidence it was provided throughout the reassessment process in the making of its decision, including the evidence from community groups, iwi, workers, industry, and experts. In considering all of this evidence, the Committee has taken into account the need for caution in managing adverse effects where there is scientific and technical uncertainty about those effects (section 7 of the Act). In this reassessment, there were points of

disagreement and uncertainty in technical scientific evidence. In these cases, the Committee has taken a precautionary approach as provided for in section 7 of the Act in setting controls to manage the adverse effects.

Hazard classification

4.9 The Committee has read the applicant's information, the EPA Staff Report and Update Report, and the EPA Science Memo. The Committee also heard from a submitter, Dr Melanie Miller, about the inhalation toxicity classification.

4.10 Having considered the submitted evidence, the Committee was of the opinion that the human health and environmental classifications in the EPA Staff Report and the GHS classifications in the EPA Staff Update Report are appropriate.

Health effects and the wider community

4.11 The Committee acknowledged that there are very strong views amongst some members of the wider community, especially in relation to potential effects on health and well-being.

4.12 The Committee has been presented with diverse views on this matter, but does not consider that it has been presented with any compelling evidence supported by the medical profession that demonstrates chronic human health effects associated with methyl bromide exposure of either workers or the public.

Impacts specific to Māori and Māori culture

4.13 The Committee acknowledged that the continued fumigation activities at the port of Tauranga are impacting on mana whenua ability to exercise their kaitiakitanga and guardianship roles.

International obligations and climate

4.14 The Committee acknowledged that there is public concern about the effects of methyl bromide on the ozone layer, and that some members of the public believe New Zealand is not fulfilling its international obligations under the Montreal Protocol.

4.15 The Committee noted that New Zealand's obligations in respect of the Montreal Protocol have been implemented into domestic law through the Ozone Layer Protection Act 1996. However, the Committee considered that all the available evidence indicates that the continued, long-term use of methyl bromide without recapture will have significant environmental impacts.

4.16 The Committee noted that even though QPS uses are permitted under the Montreal Protocol, the overall intent is the reduction and ultimately a phase out of methyl bromide in favour of other QPS treatments. The Committee agreed that the current recapture control is consistent with the intention of the Montreal Protocol and that the decision of this Committee should reflect that intention.

Benefits

4.17 The Committee agreed that there are economic and societal benefits to maintaining the use of methyl bromide, at least until a viable and accepted alternative is available. However, those benefits must be considered against the costs and risks.

Progress on reducing methyl bromide emissions

4.18 The Committee agreed that the lack of progress in further refining recapture technology to meet the 2010 recapture definition is disappointing, especially given the evidence of the funds spent. The lack of progress for ship's holds was especially concerning, considering the anticipated progress on achieving this presented to the 2010 Committee.

Alternative approaches

4.19 The Committee applauded the progress that is being made on alternative approaches that avoid the need for methyl bromide fumigation and would like to see much greater focus and effort placed in this area, as recapture of methyl bromide is not the only way of reducing methyl bromide emissions.

4.20 While not the subject of controls that the Committee can set, the Committee would like to encourage parties to continue negotiations with international trade partners to reduce and where possible eliminate the use of methyl bromide, and explore acceptance of alternative, efficacious processes. This responsibility does not rest solely with methyl bromide users and includes all other parties that benefit from methyl bromide treatment of commodities. The Committee strongly supports a strategic approach to the reduction of methyl bromide use and acknowledges that recapture is just one of the tools needed to ensure reduction and ultimate elimination of methyl bromide emissions.

Operational considerations

4.21 The Committee acknowledged that given the evidence of the present state of recapture technology, the 2010 recapture target is currently unachievable. Maintaining the 2010 decision would result in significant economic and social impacts, as methyl bromide use compliant with the 2010 decision is not currently possible.

4.22 However, the Committee considered that ongoing methyl bromide fumigations without any recapture are unacceptable, and that future use must ultimately achieve a high recapture performance standard in order to protect the health of workers, the health of the public, and the environment.

4.23 The Committee has considered the various views and evidence on this matter and has developed a workable framework of controls for methyl bromide reduction through recapture and dosing strategies. This framework consists of a definition of recapture technology, a requirement to dose to concentration, and an incremental schedule that increases recapture performance requirements.

4.24 In creating this framework of controls, the Committee identified a responsible person or party with the obligation of satisfying the control requirements. Where the Committee considered the responsible party is the person conducting a business or undertaking (PCBU), the Committee has relied on the Health and Safety at Work Act 2015 definition of PCBU.

Definition of recapture technology

4.25 The Committee considered that the HSWR definition of recapture technology is appropriate:

> **Recapture technology** means a system that mitigates methyl bromide emissions from fumigation enclosures.

4.26 Whereas the 2010 decision specified the level of recapture as part of the definition of recapture technology, the Committee considered that for the purposes of the Act, the level of recapture required should be specified through a control.

4.27 The Committee accepted that the recapture technology used by Genera is the only viable technology available at this time. None of the other technology providers presented convincing evidence to support their claimed recapture of methyl bromide from logs.

Ship's holds

4.28 The Committee heard no evidence of technology on the horizon to recapture methyl bromide from ship's holds. The volume of gas used in ship's hold fumigations is significant, and even though these events do not occur often, they pose significant risks to human health and the environment. The Committee considered these risks are unacceptable without effective recapture. Therefore, the Committee considered that ship's hold fumigations should be phased out completely by 1 January 2023.

Dosing to concentration

4.29 Upon consideration of the information before it, the Committee considered that the approach of "dosing to concentration" is a practical and achieveable measure that can be readily implemented, which will have the effect of reducing methyl bromide use for individual fumigation events, in comparison to the common current approach of "dosing by volume". The Committee considered that this control should come into force in two years, to allow time for industry to obtain any necessary approvals.

Performance targets

4.30 The Committee was of the view that recapture from containers of at least 80% is achievable now based on the information that it was presented. Higher recapture rates are expected to be possible with improved technologies. Furthermore, the Committee considered that it is practical to recapture methyl bromide from all container fumigations.

4.31 The Committee was of the view that the applicant's proposed recapture rate of 30% for logs under tarpaulins is achievable and is therefore appropriate as an initial minimum recapture target. Indeed, industry has demonstrated that much higher rates (up to 80%) have been achieved. Therefore, the Committee considered that a higher initial annual average recapture performance for logs can be also set. This is an average for a given site for a calendar year (that is, not averaged nationally or regionally). This should have the effect of driving performance above the minimum specified standard.

4.32 The Committee considered it important to set a significantly higher recapture performance requirement than requested by the applicant, as the Committee considered that industry must be encouraged to invest in strategies to reduce methyl bromide emissions (such as higher performance recapture and the use of alternative treatments), and that the approach to on-going reduction of methyl bromide emission must be conscientious and responsible, ultimately honouring the intent of the 2010 decision.

4.33 The Committee acknowledged that implementing recapture technology immediately for all fumigations under sheets is not feasible. The Committee considered that incremental steps towards higher recapture rates will be more achievable than a single target rate to be achieved in five or ten years' time and will have the effect of reducing risks to people and the environment to negligible over that time. Increasing the amount of recapture can be achieved in two ways:

through increasing the number of fumigation events that are recaptured, and increasing the total amount of methyl bromide recaptured from each event.

4.34 The Committee considered Table 2 and Table 3 to be an appropriate schedule of implementation and performance targets. The Committee wanted to ensure that by 1 January 2022, 50% of all fumigations under sheets use recapture technology that achieves a minimum of 30% methyl bromide recapture. Furthermore, across a site, an annual average of 55% methyl bromide recapture must be achieved. These three performance parameters (event recapture proportion, minimum recapture, and annual average recapture performance) increase incrementally such that from 1 January 2035 all fumigation events implement recapture technology at 99% recapture.

Table 2 Performance criteria of recapture technology for every methyl bromide fumigation event in containers

Start date	Minimum recapture (%)
01 January 2023	80%
01 January 2027	90%
01 January 2031	99%

Table 3 Performance criteria of recapture technology for methyl bromide fumigations under sheets

Start date	Event recapture proportion (%)	Minimum recapture (%)	Annual average recapture performance (%)
01 January 2022	50	30	55
01 January 2023	75	40	60
01 January 2025	100	50	65
01 January 2027	100	60	75
01 January 2029	100	70	85
01 January 2031	100	80	95
01 January 2033	100	90	99
01 January 2035	100	99	99

Buffer zones

4.35 The Committee considered that the air dispersion modelling provided has been valuable and has indicated a need for buffer zones to protect both workers and the public as well as indicating the size of buffer zones necessary under specific conditions.

4.36 The Committee has heard from experts regarding what percentile value is appropriate to use in modelling estimated exposure and consequently in determining appropriate buffer zones. The

Committee considered the data generated from modelling represented by the 99.9th percentile to be the best balance of precaution and accuracy.

4.37 As the size of the necessary buffer zone is directly related to the quantity of methyl bromide being released from an operation, the Committee noted that any prescribed minimum buffer zones should take into account the level of recapture that is being achieved as well as the methyl bromide dose level that is used. This should incentivise industry to seek operational improvements that result in smaller buffer zones.

4.38 The Committee heard that log stack size also affects the quantity of methyl bromide released. However, as the operator has no control of size and location of log stacks to be fumigated, the Committee does not consider that log stack size should be linked to the buffer zone size. Taking a precautionary approach, the Committee considered that the buffer zone values should be based on the largest log stack size modelled.

4.39 The Committee considered that buffer zones are an effective tool to manage the risks to people. Buffer zone values have been inferred from relationships between recapture levels and dose rates that were identified from the modelling results.

4.40 The Committee considered the minimum buffer zones in Table 4 to be appropriate to manage the identified risks to human health for fumigations under sheets. The Committee noted that HSWR requires that the TEL_{air} for methyl bromide is not exceeded beyond the boundary of the buffer zone, which may require the buffer zone to be larger than the minimum specified in these controls in some situations. The Committee considers that this HSWR requirement should be set in the HSNO buffer zone control as well, in order to manage the risks in a similar way.

4.41 The Committee considered that modelling indicated that the current buffer zones for containers are adequate.

4.42 Furthermore, modelling has indicated the need for much larger buffer zones for ship's hold fumigations than previously considered. In order to manage the risks to people and the environment, the Committee considered that a 900 m buffer zone for ship's hold fumigations is necessary, noting that this will only have effect until ship's hold fumigations are phased out.

4.43 Acknowledging the operational logistics of implementing these revised buffer zones, the Committee considered that these obligations should commence on 1 January 2022.

Table 4 Minimum buffer zones for methyl bromide fumigation under sheets

Minimum recapture (%)	Minimum buffer zone: dose rate ≤ 40 g/m^3 (m)	Minimum buffer zone: 40 g/m^3 < dose rate ≤ 72 g/m^3 (m)	Minimum buffer zone: 72 g/m^3 < dose rate ≤ 120 g/m^3 (m)
No recapture	210	515	700
30	155	380	520
40	135	335	455
50	120	290	395
60	100	245	335
70	80	200	270
80	65	155	210
90	50	110	150
99	50	70	95

4.44 The Committee considered that these buffer zones should be set under section 77A of the Act, rather than the provisions in the EPA Hazardous Property Controls (HPC) Notice. The HPC provisions for buffer zones relate to protection of downwind areas only, whereas HSWR defines buffer zones for methyl bromide use as extending in all directions from the enclosed space being fumigated. The Committee considered that extending the buffer zone in all directions is the preferred option, as it addresses the variability of atmospheric conditions and provides greater consistency and protection to those that may be affected by methyl bromide fumigations.

Ventilation

4.45 The air dispersion modelling also identified high risk scenarios associated with venting methyl bromide under still or low wind conditions, which result in greater potential adverse effects arising from poor dispersion of the methyl bromide plume. The Committee considered that predictability of travel of the vented plume is a key factor in managing the risks associated with the ventilation phase of the fumigation event. Therefore, the Committee considered that ventilation should not occur when windspeeds are less than 2 m/s.

4.46 The air dispersion modelling identified that a key factor in managing the risks associated with ventilation of ship's holds is to ensure that only one hold is vented at a time, and that sufficient time is given to allow for dispersion of the vented methyl bromide. The Committee considered that this restriction is necessary as a control until ship's holds fumigation is phased out.

Notification of fumigation

4.47 Additionally, the Committee felt that parties that may be affected by fumigation need to be notified of an upcoming fumigation operation. The Committee acknowledged that there are current notification requirements under HSWR but considered that for the purposes of the Act there should be a control which requires notification of the applicable territorial authority, neighbouring marae, and other neighbouring community facilities in order to ensure that these parties are able to manage the risks associated with fumigation events.

Monitoring, recording, and reporting

4.48 The Committee acknowledged that there are current monitoring, recording, and reporting requirements under HSWR. These are in place to manage the risks to workers, as required under the Health and Safety at Work Act.

4.49 However, for the purposes of the Act, to verify and ensure compliance with EPA controls, the Committee considered that operational parameters need to be recorded for each fumigation event and reported to the EPA in order to monitor and manage the risks to human health identified in this reassessment process. This information is intended to sit alongside the HSWR recording requirements, and therefore should be subject to similar retention and inspection provisions.

4.50 The information recorded should include:

- operational details and parameters of the fumigation (such as date, time, location, quantity)
- headspace methyl bromide concentrations
- wind speed data
- exposure measurements
- technical specifications of the monitoring equipment used.

4.51 The Committee felt that certain parties need to be notified of exceedances of the TEL_{air}. The Committee acknowledged the current TEL_{air} exceedance notification requirements under HSWR but considered that this should be supplemented by notification to the applicable territorial authority. The Committee also considered that the territorial authority should be notified as a matter of urgency (within 24 hours). This is so that the health and environmental risks that arise from such events can be responded to in a timely manner and managed by the relevant territorial authority.

4.52 The Committee noted that under HSWR, the annual reporting requirement would not be triggered if recapture was occurring down to 5 ppm. However, under the Act, the Committee considered that the reporting requirements should apply to all methyl bromide fumigations, regardless of the level of recapture given the stepped approach the Committee has set out in the controls and the risks identified with not recapturing to 5 ppm.

4.53 Additionally, the Committee considered there is a need for annual reporting on both the operational parameters as well as on technology and process developments to ensure that future recapture targets are met, and other actions taken to reduce methyl bromide emissions and use. This expands on what the 2010 decision required, namely: a report on progress in introducing recapture technology.

4.54 The Committee considered that the annual report should be provided to the EPA to allow for verification of compliance.

Risks, costs, and benefits summary

4.55 The Committee has considered both the risks and benefits of methyl bromide highlighted in the 2010 full reassessment, as well as the risks and benefits raised in this modified reassessment as they relate to the recapture control.

4.56 Given that the 2010 controls cannot be effectively implemented, workers, the public, and the environment would be exposed to non-negligible risks associated with continuation of the current conditions for methyl bromide use. With the revised controls framework in place the risks to workers, the public, and the environment can be reduced to a negligible level.

4.57 The Committee acknowledged that it has heard evidence of methyl bromide use having significant benefits for New Zealand, particularly economic benefits.

4.58 The Committee acknowledged that the amended controls may create additional cost to industry. However, the Committee considered this to be appropriate to manage the risks of ongoing methyl bromide use.

4.59 With the revised controls framework in place, the Committee considered that the benefits associated with methyl bromide use outweigh the adverse effects.

5. Decision

5.1 Pursuant to section 63A of the Act, the Committee considered and approved this application to amend the recapture definition control for methyl bromide and the associated controls on use. In doing so, the Committee applied all the relevant sections of the Act, including those set out in Part 2, and clauses of the Methodology, as detailed in Appendix C.

5.2 The Committee was satisfied with the classifications proposed in the Staff Report. Furthermore, pursuant to section 63C of the Act, the Committee has approved changes to the classification scheme for methyl bromide to adopt GHS classifications. The final hazard classification for methyl bromide under GHS is presented in Table 1.

5.3 Between 2010 and 2016, methyl bromide use has increased by 50%. Given that the 2010 recapture definition is currently unachievable, the Committee has amended the controls associated with recapture so that any risks associated with the use of methyl bromide are negligible, and benefits of use are retained.

5.4 The Committee considered that the amended controls are more likely to achieve the intended outcome than the controls specified by the 2010 decision, as they provide a clear and structured pathway for industry to reduce the amount of methyl bromide emitted. The amended and additional controls imposed by this decision serve to manage the risks associated with the ongoing use of methyl bromide as industry progresses through that pathway.

5.5 In making its decision, the Committee took into account best international practices and standards for the safe management of hazardous substances.

5.6 Consequently, the Committee has applied the controls presented in Appendix D to methyl bromide (HSR001635) in order to appropriately manage the risks.

5.7 For the avoidance of doubt, this decision supersedes the waiver decision of the Committee dated 21 June 2021.

Signed by: Dr Ngaire Phillips *Date*: 11 August 2021

Chair, Decision-making Committee
Environmental Protection Authority

Appendix A. Summary of correspondence to and from the Committee

This table is intended to assist the reader to follow the chain of correspondence and responses and is presented so that it is clear how the various components of the correspondence relate to each other.

Table 5 Chronological summary of correspondence to and from the Committee

Date	Reference	Regarding	Subject summary
12 November 2019	MoCftA-1		The applicant requested the start of the hearing to be deferred to provide more time for preparation of written statements and requested expert conferencing between air dispersion modellers.
13 November 2019	MoCftA-2		The applicant confirmed attendance at the hearing and provided a list of witnesses.
18 November 2019	WGT001	MoCftA-1 MoCftA-2	The Committee requested further information under s58 (monitoring data). The Committee also delayed the hearing from the initial proposed dates.
25 November 2019	MoCftA-3	WGT001	The applicant sought clarity on WGT001.
28 November 2019	WGT002	MoCftA-3	The Committee provided clarity on WGT001, directed expert conferencing to take place, and requested further information (under s58) from Genera and BOPRC.
3 December 2019	MoCftA-4	WGT001 (para 15a) WGT002 (para 19a)	The applicant provided monitoring information in respect of Tauranga Port, Napier Port, and Northport.
5 December 2020	MoCftA-5	WGT002 (para 19b)	The applicant nominated an expert to be involved in expert conferencing.
20 December 2019	WGT003	WGT002	The Committee confirmed arrangements for expert conferencing and requested further information (under s58) from the applicant and Genera.
8 January 2020	WGT004	WGT003	The Committee sought availability confirmations for amended expert conferencing dates.
13 January 2020	WGT005	WGT004	The Committee confirmed the date for expert conferencing.
21 January 2020	MoCftA-6	WGT002 (para 9)	The applicant proposed an amendment to the scope of the expert conferencing.
28 January 2020	WGT006	MoCftA-6	The Committee amended the scope of the expert conferencing.
31 January 2020	MoCftA-7	WGT003	The applicant requested an extension to the information provision deadline.
5 February 2020	WGT007		The Committee released the Joint Witness Statement after expert conferencing, instructed the experts to reconvene for further conferencing and to produce a report with parameters and inputs for further modelling.
5 February 2020	WGT008		The Committee instructed the applicant to prepare a new modelling report, in line with factors agreed upon in expert conferencing, and to inform the Committee of the time required to do this.
14 February 2020	MoCftA-8	WGT008	The applicant provided an indication of time required to prepare the new modelling report and raised a concern over the timing of further expert conferencing.
25 February 2020	WGT009	MoCftA-7 MoCftA-8	The Committee noted receipt of information from Genera, WorkSafe and the applicant. The Committee directed the EPA to share WorkSafe's monitoring results with experts, the experts to agree on the date for further expert conferencing, and the applicant to circulate additional information with experts and EPA, at least 5 days prior to further expert conferencing.
2 March 2020	MoCftA-9		The applicant requested direction from the Committee on its ability to issue an interim decision regarding the recapture deadline.

Date	Reference	Regarding	Subject summary
10 March 2020	WGT010	MoCftA-9	The Committee directed the EPA to provide it with advice regarding statutory options to resolve the current recapture timeframe, and subsequently circulate the advice to parties.
27 March 2020	MoCftA-10		The applicant noted its position regarding the recapture deadline.
31 March 2020	WGT011	MoCftA-10	The Committee released the Joint Witness Statement after the second round of expert conferencing and requested further information (under s58) from BOPRC, Genera, and Golder. The Committee directed the applicant and other parties to confirm delivery date of requested information.
9 April 2020	MoCftA-11	WGT011 (para 9e)	The applicant requested a variation to the deadline for confirming delivery date of requested information.
24 April 2020	MoCftA-12	WGT011 (para 9e)	The applicant provided information on the time required to complete new modelling, on the basis that input data is not available to them in the required form.
4 May 2020	WGT012	WGT011 MoCftA-12	The Committee acknowledged receipt of information from BOPRC, Genera, and the applicant. The Committee acknowledged delays in completing of modelling due to CALMET data not being available. The Committee directed the EPA to discuss a possible meeting with the applicant and BOPRC.
14 May 2020	MoCftA-13		The applicant requested the Committee delay the requirement to apply recapture technology to methyl bromide fumigations from 28 October 2020 to 28 April 2021.
2 June 2020	WGT013	MoCftA-13	The Committee directed the EPA to publish and receive comments from submitters on the application to waive the recapture requirement.
4 June 2020	MoCftA-14		The applicant requested the Committee to issue amended hearing procedures in advance of the hearing and sought clarification on related timing and other hearing matters.
4 June 2020	WGT014	WGT012	The Committee directed experts to consider the specified, provided questions and to provide a Joint Witness Statement by 19 June 2020. The Committee directed the EPA not to accept two late submissions.
16 June 2020	MoCftA-15	MoCftA-12 WGT012	The applicant updated the Committee on the timing of the air dispersion modelling report availability.
17 June 2020	MoCftA-16	MoCftA-13 WGT013	The applicant responded to recapture timeframe waiver application comments.
1 July 2020	WGT015	MoCftA-13 MoCftA-16	The Committee waived the timeframe for recapture requirements, now due to take effect 28 April 2021.
16 July 2020	WGT016	MoCftA-14	The Committee confirmed the timing of the hearing and expectations.
27 July 2020	MoCftA-17	WGT016	The applicant confirmed the filing of evidence and sought confirmation as to whether the Committee wishes to question the authors of the toxicology and ecotoxicology reports.
29 July 2020	WGT017	MoCftA-17	The Committee responded to the applicant's question and issued directions regarding a late submission and two late submissions of evidence.
31 July 2020	WGT018	WGT016	The Committee accepted two late submissions of evidence.
31 July 2020	MoCftA-18	WGT016	The applicant requested additional time to present its case at the hearing.
4 August 2020	WGT019	MoCftA-18	The Committee directed that the scheduled time of the applicant's presentation is maintained, but that the applicant's right of reply is extended, that the hearing schedule is adjusted to accommodate submitters' request to present on specific days, and that the EPA publish the updated hearing schedule.
5 August 2020	MoCftA-19	WGT019	The applicant requested clarity from the Committee on WGT019.
6 August 2020	WGT020	MoCftA-19	The Committee provided a response to the applicant.
12 August 2020	WGT021	WGT016	The Committee declined a request for late submission of evidence.

Date	Reference	Regarding	Subject summary
21 August 2020	WGT022		The Committee requested a summary of air dispersion modelling information in response to discussion points raised at the hearing.
28 August 2020	WGT023	WGT022	The Committee requested further modelling to be undertaken for specific scenarios.
14 September 2020	MoCftA-20	WGT023	The applicant noted several issues it identified in response to WGT023.
28 September 2020	WGT024	MoCftA-20	The Committee provided a response to TAS, clarifying the scope, and directed requirements for modelling and associated peer review. The Committee also responded to the issues raised in MoCftA-20.
21 October 2020	MoCftA-21		The applicant requested a second s59 time extension so that recapture technology will apply to methyl bromide from 28 October 2021.
29 October 2020	WGT025	MoCftA-21	The Committee directed the EPA to publish and receive comments from submitters on the second application to waive the recapture requirement.
9 November 2020	MoCftA-22	MoCftA-21 WGT025	The applicant responded to the comments provided by submitters on the applicant's second time waiver application.
11 November 2020	WGT026	MoCftA-21	The Committee approved the application for a time extension, setting the date for the recapture control to take effect for 28 August 2021 (rather than 28 October 2021, as requested).
3 December 2020	WGT027	WGT023 WGT024	The Committee directed the EPA to publish the TAS air dispersion modelling, and the SEC and ASG reviews. Parties would have ten working days to review and provide comment.
3 December 2020	MoCftA-23	WGT027	The applicant requested access to the modelling files used by TAS to prepare the air dispersion modelling described in WGT027. The applicant requested that the ten working days for review of the modelling would begin from when the applicant received the modelling files.
10 December 2020	WGT028	MoCftA-23	The Committee directed the EPA to make the TAS modelling files available to the applicant, and to any other submitters (or their nominated expert witnesses) on request, and extended the time available for submitters to provide comment to 22 January 2021.
13 January 2021	MoCftA-24	WGT028	The applicant requested an extension to the comment period on the TAS modelling to 29 January 2021.
15 January 2021	WGT029	MoCftA-24	The Committee directed that comments from parties are due by 29 January 2021, and that the EPA is to continue to provide the TAS modelling files to interested parties upon request. No further extensions should be expected.
29 January 2021	MoCftA-25	WGT027 WGT028 WGT029	The applicant provided its comments on the TAS modelling, and reports from SEC and Golder.
18 February 2021	MoCftA-26		The applicant requested a third s59 time extension so that recapture technology would apply to methyl bromide from 28 November 2021.
1 March 2021	WGT030	MoCftA-26	The Committee issued a direction that the current recapture control is to take effect on 28 November 2021.
8 March 2021	WGT031	MoCftA-25	The Committee directed the EPA to provide a summary of the latest air dispersion modelling by TAS, SEC, and Golder, indicating how these reports could affect any potential buffer zones related to methyl bromide.
14 April 2021	WGT032	WGT031	The Committee directed that the Golder report be independently reviewed by TAS and ASG, and directed Golder to provide the modelling files directly to the reviewers. The Committee requested the recapture reports produced separately by MPI and Genera be provided to it, and directed that comments received by the EPA from BOPRC be made available on the EPA website.
14 April 2021	MoCftA-27	WGT032	The applicant sought clarity on why only the Golder report is to be independently reviewed, and not the SEC report. Additionally, the applicant sought the opportunity to comment on the monitoring works from WorkSafe and the EPA's Update Report.

Date	Reference	Regarding	Subject summary
21 April 2021	WGT033	MoCftA-27	The Committee directed the EPA to provide the additional information on its website and directed that feedback from all parties was to be received by close of business on 6 May 2021.
5 May 2021	MoCftA-28	WGT033	The applicant requested access to four monitoring reports from the WorkSafe monitoring programme that it could not find on the EPA's website.
6 May 2021	WGT034	MoCftA-28	The Committee directed the EPA to collate the four monitoring reports requested in MoCftA-28 with the other reports available (or direct parties to the relevant part of its website), and directed that feedback from all parties on the additional information is due by 13 May 2021.
12 May 2021	MoCftA-29	WGT033 WGT034	One of the applicant's air dispersion experts identified an error in the TAS modelling report. The applicant asked for the deadline for comments to be delayed until the modelling errors are corrected.
17 May 2021	WGT035	MoCftA-29	The Committee acknowledged that TAS confirmed an error with the EPA in their own modelling which affected the subsequent work by Golder. The Committee directed the EPA to provide an updated report to correct the identified errors in specific tables. ASG, SEC, and TAS were to review this updated report by close of business 18 May 2021. The Committee declined the applicant's request for an extension to the deadline for comments.
18 May 2021	MoCftA-30	WGT035	The applicant requested an extension to the deadline for review and asked the Committee to reconsider its request to extend the deadline for comments.
20 May 2021	WGT036	MoCftA-30	The Committee extended the deadline for review and for comments until 21 May 2021.
21 May 2021	MoCftA-31		The applicant provided comments on the Update Report.
28 May 2021	MoCftA-32		The applicant requested a fourth s59 time extension so that recapture technology would apply to methyl bromide from 28 February 2022.
3 June 2021	MoCftS		The Tauranga Moana Fumigant Action group sought clarification around the granting of the time waivers for recapture.
10 June 2021	WGT037		The Committee directed the EPA to provide the WorkSafe/PDP report to it and make it available on the EPA website. Parties to the reassessment were to provide their comments on the report by 25 June 2021.
10 June 2021	MoCftA-33	MoCftS	The applicant responded to the issues raised by the Tauranga Moana Fumigant Action Group.
21 June 2021	WGT038		The Committee advised of a change in its composition.
21 June 2021	WGT039	MoCftA-32	The Committee issued a direction that the current recapture control is to take effect on 28 February 2022, subject to a decision on the reassessment.
25 June 2021	MoCftA-34	WGT037	The applicant provided comments on the PDP report.
7 July 2021	WGT040		The Committee directed that the hearing is closed as of 7 July 2021.

Appendix B. List of hearing presentations

Transcripts of the hearing can be found on the EPA website.[3]

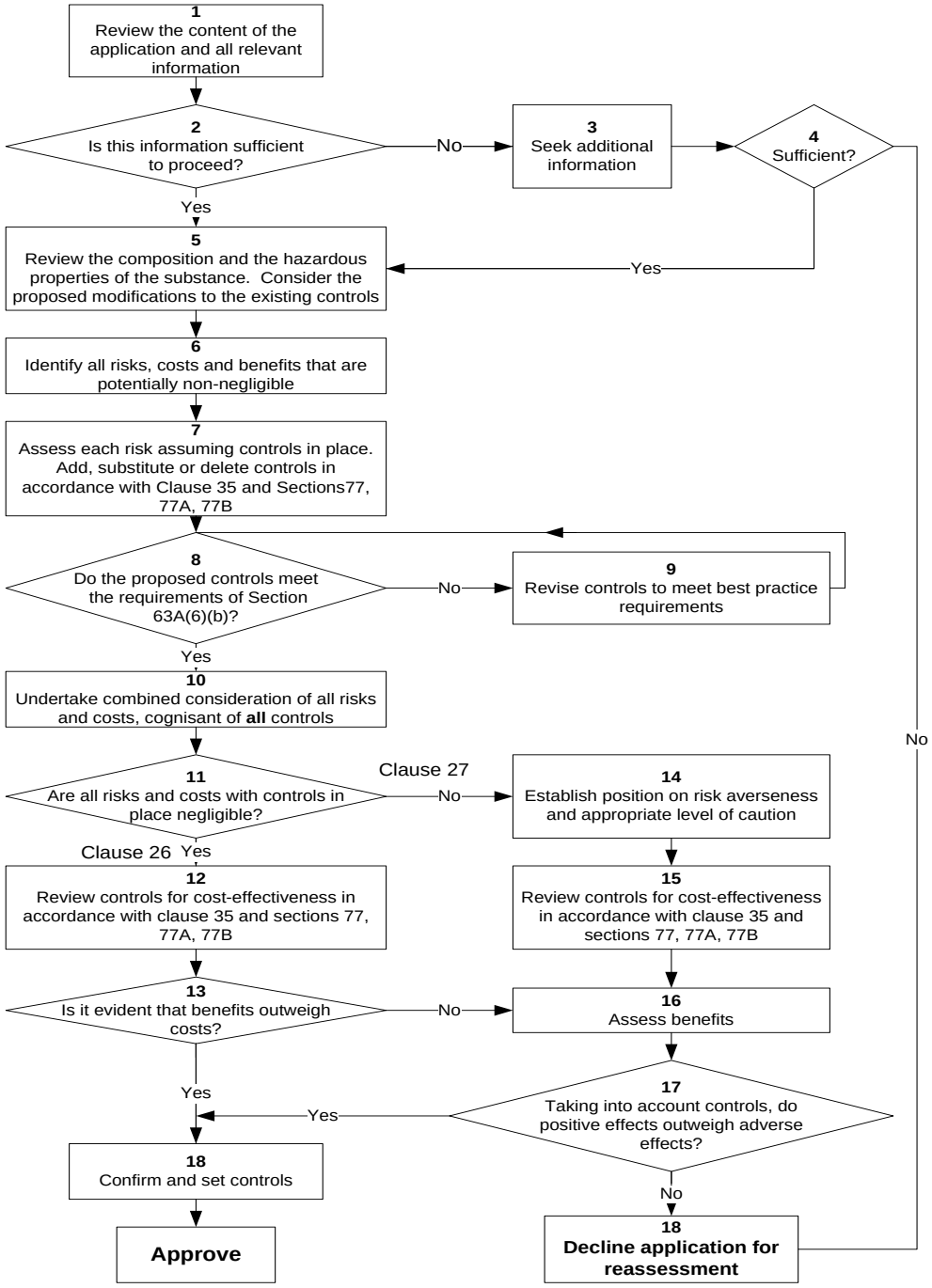
Presentation	Submitter	Presenters
11 August 2020		
Applicant presentation	STIMBR	Morgan Slyfield Don Hammond (witness) Dr Jack Armstrong (witness) Dr David Sullivan (witness) Dr David Fletcher (witness) Dr Mark Pemberton (witness) Kieran Murray (witness)
EPA presentation	EPA	Ben Deeble Lee Bailey Aleks Todoroski (witness)
WorkSafe presentation	WorkSafe	Paul Moenboyd Philippa Gibson Chris Bender (witness)
12 August 2020		
Submission 127536	Rayonier Matariki Forests	Chris Rayes
Submission 127540	United Fresh NZ Inc	Anne-Marie Arts
Submission 127580	T&G Global Ltd	Duncan Park
13 August 2020		
Submission 127571	Genera Science & Innovation (on behalf of Genera Ltd)	Mark Dewdney Matt Hill David Baker
Submission 127599	Bay of Plenty Regional Council	Sam Weiss Jennifer Barclay (witness)
Submission 127577	Tenco Ltd	Mark Bendall
Submission 127544	Ngāi Tahu	Stephanie Dijkstra
Submission 127546	Clear the Air Mt Maunganui	Emma Jones
Submission 127550	Ngāi te Rangi	Joshua Gear Joel Ngatuere (witness)
Submission 127574	Nicole Smith (individual)	Nicole Smith
Submission 127594	Catherine Stewart (individual)	Catherine Stewart

[3] https://www.epa.govt.nz/public-consultations/decided/reassessment-of-methyl-bromide/hearing/

Presentation	Submitter	Presenters
Submission 127565	Andrew Parkinson (individual)	Andrew Parkinson Joe Falco (witness) Mark Wassung (witness)
Submission 127593	Tauranga Moana Fumigant Action Group	Michael Sharp Kate Barry-Piceno (witness) Aubrey Wilkinson (witness)
14 August 2020		
Submission 127588	Soil & Health Association	Steffan Browning Dr Dave McLean (witness) Dr Olaf Morgenstern (witness)
Submission 127591	Horticulture New Zealand	Leanne Stewart
Submission 127590	Dr Melanie Miller (individual)	Dr Melanie Miller
Submission 127542	Guardians of the Sounds	Peter Beech
Submission 127587	New Zealand Fresh Produce Importers Association	Kevin Nalder
Submission 127589	Ministry for Primary Industries	Peter Thomson Paul Hallett Shane Olsen
17 August 2020		
Submission 127576	Port Blakely Ltd	Philip Taylor (via email)
Submission 127555	New Zealand Apples and Pears	Gary Jones Danielle Adsett Dr Rachel Kilmister
Submission 127552	EIM Research Pty Ltd	Kevin Bartolo
Applicant right-of-reply	STIMBR	Morgan Slyfield Dr Jack Armstrong (witness) Dr David Fletcher (witness) David Sullivan (witness)

Appendix C. Decision path for modified reassessment for amendments to hazardous substance approvals: application made and determined under section 63A

For proper interpretation of the decision path, it is important to work through the flowchart in conjunction with the explanatory notes.



Explanatory notes

Item 1:	**Review the content of the application and all relevant information** Review the application, the E&R Report, and information received from experts and that provided in submissions (where relevant) in terms of section 28(2) of the Act and clauses 8, 15, 16 and 20 of the Methodology. While section 63A is not mentioned in section 53 (public notification), sections 63A(4) and (5) provide discretion for the HSNO decision maker to consider public notification (cf section 53(2)) and guidance re consultation where an application is not publicly notified.
Item 2:	**Is this information sufficient to proceed?** Review the information and determine whether or not there is sufficient information available to make a decision.
Item 3:	**(if 'no') Seek additional information** If there is not sufficient information then additional information may need to be sought under section 52 or 58 of the Act. If the applicant is not able to provide sufficient information for consideration then the application is not approved. In these circumstances the HSNO decision maker may choose to decline the application, or the application may lapse.
Item 4	**Sufficient?** When additional information has been sought, has this been provided, and is there now sufficient information available to make a decision? If the HSNO decision maker is not satisfied that it has sufficient information for consideration, then the application for reassessment must be declined (see item 18).
Item 5:	**(if 'yes' from item 2 or from item 4) Review the composition and the hazardous properties of the substance, and the proposed modifications to the existing controls** Review the composition of the substance, its hazardous properties, and the existing suite of controls on the substance. The level of detail for this review will depend on the nature of the application for modified reassessment. In most cases a detailed review will not be required. Consider the proposed modifications to the existing controls.

Item 6:	**Identify all risks, costs and benefits that are potentially non-negligible[4]** The modified reassessment process concentrates on a specific aspect of the approval (section 63A(1)(a)). All risks, costs and benefits that are potentially non-negligible need to be identified. However, emphasis should be placed on effects that are expected to change as a result of the proposed changes to controls. Costs and benefits are defined in the Methodology as the value of particular effects. However, in most cases these 'values' are not certain and have a likelihood attached to them. Thus costs and risks are generally synonymous and may be addressed together. Examples of costs that cannot be considered as risks are one-off direct financial costs incurred by applicants that cannot be considered as 'sunk' costs (see footnote 1). Where such costs arise they will considered in the same way as risks, but their likelihood of occurrence will be more certain. Identification is a two-step process that scopes the range of possible effects (risks, costs and benefits).	
	Step 1:	Identify all possible risks and costs (adverse effects) and benefits (positive effects) associated with the approval of the substance(s), and based on the range of areas of impact described in clause 9 of the Methodology and sections 5 and 6 of the Act[5]. Consider the effects of the substance through its lifecycle (clause 11) and include the likely effects of the substance being unavailable (sections 29(1)(a)(iii) and 29(1)(b)(iii)). Relevant costs and benefits are those that relate to New Zealand and those that would arise as a consequence of approving the application (clause 14). Consider short term and long term effects. Identify situations where risks and costs occur in one area of impact or affect one sector and benefits accrue to another area or sector; that is, situations where risks and costs do not have corresponding benefits.
	Step 2:	Document those risks, costs and benefits that can be readily concluded to be negligible[6], and eliminate them from further consideration. Note that where there are costs that are not associated with risks some of them may be eliminated at this scoping stage on the basis that the financial cost represented is very small and there is no overall effect on the market economy.

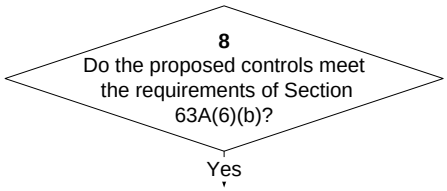
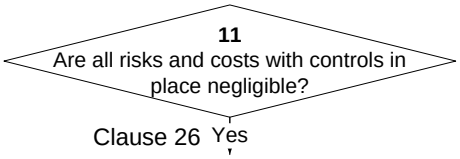
[4] Relevant effects are **marginal effects**, or the changes that will occur as a result of the substance being available. Financial costs associated with preparing and submitting an application are not marginal effects and are not effects of the substance(s) and are therefore not taken into account in weighing up adverse and positive effects. These latter types of costs are sometimes called 'sunk' costs since they are incurred whether or not the application is successful.

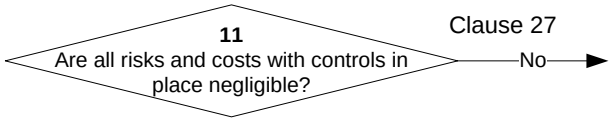
[5] Effects on the natural environment, effects on human health and safety, effects on Maori culture and traditions, effects on society and community, effects on the market economy.

[6] Negligible effects are defined in the Annotated Methodology as "Risks which are of such little significance in terms of their likelihood and effect that they do not require active management and/or after the application of risk management can be justified by very small levels of benefits.

Item 7:	**Assess each risk assuming controls in place. Add, substitute or delete controls in accordance with clause 35 and sections 77, 77A and 77B of the Act.** The assessment of potentially non-negligible risks and costs should be carried out in accordance with clauses 12, 13, 15, 22, 24, 25, and 29 to 32 of the Methodology. The assessment is carried out with the default controls in place. Assess each potentially non-negligible risk and cost estimating the magnitude of the effect if it should occur and the likelihood of its occurring. Where there are non-negligible financial costs that are not associated with risks then the probability of occurrence (likelihood) may be close to 1. Relevant information provided in submissions should be taken into account. The distribution of risks and costs should be considered, including geographical distribution and distribution over groups in the community, as well as distribution over time. This information should be retained with the assessed level of risk/cost. This assessment includes consideration of how cautious the HSNO decision maker will be in the face of uncertainty (section 7). Where there is uncertainty, it may be necessary to estimate scenarios for lower and upper bounds for the adverse effect as a means of identifying the range of uncertainty (clause 32). It is also important to bear in mind the materiality of the uncertainty and how significant the uncertainty is for the decision (clause 29(a)). Consider the HSNO decision maker's approach to risk (clause 33 of the Methodology) or how risk averse the HSNO decision maker should be in giving weight to the residual risk, where residual risk is the risk remaining after the imposition of controls. See EPA report 'Approach to Risk' for further guidance.[7] Where it is clear that residual risks are non-negligible and where appropriate controls are available, add substitute or delete controls in accordance with sections 77 and 77A of the Act to reduce the residual risk to a tolerable level. If the substance has toxic or ecotoxic properties, consider setting exposure limits under section 77B. While clause 35 is relevant here, in terms of considering the costs and benefits of changing the controls, it has more prominence in items 12 and 15. If changes are made to the controls at this stage then the approach to uncertainty and the approach to risk must be revisited.
Item 8:	**Do the proposed controls meet the requirements of Section 63A(6)(b)?** Consider whether the proposed controls meet best international practices and standards for the safe management of hazardous substances. This includes the full suite of proposed controls including existing controls and modified controls.
Item 9:	**(if 'no' from item 8) Revise controls to meet best practice requirements** If the controls do not meet the best international practice criteria, then modify the controls so that they do meet them.

[7] http://www.epa.govt.nz/Publications/Approach-to-Risk.pdf

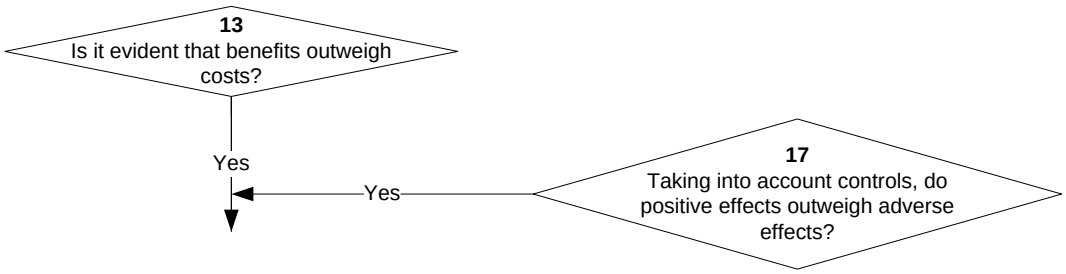
Item 10:	 **(if 'yes' from item 8) Undertake combined consideration of all risks and costs, cognisant of proposed controls** Once the risks and costs have been assessed individually consider all risks and costs together as a 'basket' of risks/costs. If it is feasible and/or appropriate, this may involve combining groups of risks and costs as for Clause 34 of the Methodology. The purpose of this step is to consider synergistic effects and determine whether these may change the level of individual risks.
Item 11:	**Are all risks and costs with controls in place negligible?** Looking at individual risks in the context of the 'basket' of risks, consider whether any of the residual risks (costs) are negligible.
Item 12:	 **(if 'yes' from item 11) Review controls for cost-effectiveness in accordance with clause 35 and sections 77, 77A and 77B** Where all risks are negligible the decision must be made under clause 26 of the Methodology. Consider the cost-effectiveness of the proposed individual controls and exposure limits. Where relevant and appropriate, add, substitute or delete controls whilst taking into account the view of the applicant, and the cost-effectiveness of the full package of controls.

Item 13:	**Is it evident that benefits outweigh costs?** Risks have already been determined to be negligible (item 9). In the unusual circumstance where there are non-negligible costs that are not associated with risks they have been assessed in item 7. Costs are made up of two components: internal costs or those that accrue to the applicant, and external costs or those that accrue to the wider community. Consider whether there are any non-negligible external costs that are not associated with risks. If there are no external non-negligible costs then external benefits outweigh external costs. The fact that the application has been submitted is deemed to demonstrate existence of internal or private net benefit, and therefore total benefits outweigh total costs[8]. As indicated above, where risks are deemed to be negligible, and the only identifiable costs resulting from approving an application are shown to accrue to the applicant, then a cost-benefit analysis will not be required. The act of an application being lodged will be deemed by the HSNO decision maker to indicate that the applicant believes the benefits to be greater than the costs. However, if this is not the case and there are external non-negligible costs then all benefits need to be assessed (via item 16).
Item 14:	 **(if 'no' from item 10) Establish HSNO decision maker's position on risk averseness and appropriate level of caution** Although 'risk averseness' (approach to risk, clause 33) is considered as a part of the assessment of individual risks, it is good practice to consolidate the view on this if several risks are non-negligible. This consolidation also applies to the consideration of the approach to uncertainty (section 7).
Item 15:	**Review controls for cost-effectiveness in accordance with clause 35 and sections 77, 77A and 77B** This constitutes a decision made under clause 27 of the Methodology (taken in sequence from items 10, 13, 14 and 15). Consider (a) whether any of the non-negligible risks can be reduced by varying the controls in accordance with section 77 and 77A of the Act, and (b) the cost-effectiveness of the controls. Where relevant and appropriate, add, substitute or delete controls whilst taking into account the view of the applicant, and making sure that the benefits of doing so outweigh the costs. As for item 6, If the substance has toxic or ecotoxic properties, consider exposure limits under section 77B.

[8]Technical Guide 'Decision making' section 4.9.3. Where risks are negligible and the costs accrue only to the applicant, no explicit cost benefit analysis is required. In effect, the HSNO decision maker takes the act of making an application as evidence that the benefits outweigh the costs. See also Protocol Series 1 'General requirements for the Identification and Assessment of Risks, Costs, and Benefits'

Item 16:	**(if 'no' from item 13, or in sequence from item 15) Assess benefits** Assess benefits or positive effects in terms of clause 13 of the Methodology. Since benefits are not certain, they are assessed in the same way as risks. Thus the assessment involves estimating the magnitude of the effect if it should occur and the likelihood of its occurring. This assessment also includes consideration of the HSNO decision maker's approach to uncertainty or how cautious the HSNO decision maker will be in the face of uncertainty (section 7). Where there is uncertainty, it may be necessary to estimate scenarios for lower and upper bounds for the positive effect. An understanding of the distributional implications of a proposal is an important part of any consideration of costs and benefits, and the distribution of benefits should be considered in the same way as for the distribution of risks and costs. The HSNO decision maker will in particular look to identify those situations where the beneficiaries of an application are different from those who bear the costs[9]. This is important not only for reasons related to fairness but also in forming a view of just how robust any claim of an overall net benefit might be. It is much more difficult to sustain a claim of an overall net benefit if those who enjoy the benefits are different to those who will bear the costs. Thus where benefits accrue to one area or sector and risks and costs are borne by another area or sector then the HSNO decision maker may choose to be more risk averse and to place a higher weight on the risks and costs. As for risks and costs the assessment is carried out with the default controls in place.
Item 17:	**Taking into account controls, do positive effects outweigh adverse effects?** In weighing up positive and adverse effects, consider clause 34 of the Methodology. Where possible combine groups of risks, costs and benefits or use other techniques such as dominant risks and ranking of risks. The weighing up process takes into account controls proposed in items 5, 7 (9), 12 and/or 15. Where this item is taken in sequence from items 14, 15 and 16 (i.e. risks are not negligible) it constitutes a decision made under clause 27 of the Methodology. Where this item is taken in sequence from items 11, 12 and 13 (i.e. risks are negligible, and there are external or public costs) it constitutes a decision made under clause 26 of the Methodology.
Item 18:	**(if 'no' from item 4 or item 17) Decline application for reassessment** (from item 4) The Act is silent on the situation if there is insufficient information to consider the application. However, sections 55-61 (section 63A(3)) are deemed to hold, therefore the HSNO decision maker concludes that the application for reassessment may be declined if there is insufficient information. (from item 17) The HSNO decision maker may decline the application under section 63A(6) after taking into account the effects of the substance and best international practices and standards. Section 63A(2)(b) notes that this modified reassessment process cannot result in an approval to import or manufacture the substance being revoked. Therefore, if the process results in a 'decline' decision, then the result is that the modified reassessment of the substance is not approved, and the existing controls remain in force.

[9] Clause 13 of the Methodology

Item 19:	 **(if 'yes' from items 13 or 17) Confirm and set controls** Controls have been considered at the earlier stages of the process (items 5, 7 (9), 12 and/or 15). The final step in the decision-making process brings together all the proposed controls, and reviews them for overlaps, gaps and inconsistencies. Once these have been resolved the controls are confirmed.

Appendix D. Controls applying to methyl bromide

EPA controls

Control code	EPA Notice	Control description
LAB	EPA Labelling Notice 2017	Requirements for labelling of hazardous substances
PKG	EPA Packaging Notice 2017	Requirements for packaging of hazardous substances
SDS	EPA Safety Data Sheet Notice 2017	Requirements for safety data sheets for hazardous substances
DIS	EPA Disposal Notice 2017	Requirements for disposal of hazardous substances
HPC-1	EPA Hazardous Property Controls Notice 2017 Part 1	Hazardous Property Controls preliminary provisions
HPC-2	EPA Hazardous Property Controls Notice 2017 Part 2	Certain substances restricted to workplaces only
HPC-3	EPA Hazardous Property Controls Notice 2017 Part 3	Hazardous substances in a place other than a workplace
HPC-4A	EPA Hazardous Property Controls Notice 2017 Part 4A	Site and storage controls for class 9 substances
HPC-4B	EPA Hazardous Property Controls Notice 2017 Part 4B	Use of class 9 substances
HPC-4C	EPA Hazardous Property Controls Notice 2017 Part 4C	Qualifications required for application of class 9 pesticides

HSNO additional controls and modifications to controls for all uses of methyl bromide

Control code	HSNO Act	Control
TEL	Section 77B	The following tolerable exposure limits in air (TEL_{air}) values apply to methyl bromide. 1-hour TEL_{air} – 1 ppm or 3.9 mg/m^3 24-hour TEL_{air} – 0.333 ppm or 1.3 mg/m^3 Chronic TEL_{air} (annual average) – 0.0013 ppm or 0.005 mg/m^3

HSNO additional controls and modifications to controls for soil fumigation of potato wart uses of methyl bromide

Control code	HSNO Act	Control
Application rate	Section 77 variation to HPC Notice clause 50	The maximum application rate of this substance is 380 grams of methyl bromide per square metre of soil.

HSNO additional controls and modifications to controls for other quarantine and pre-shipment uses of methyl bromide

Definitions

For the purpose of this approval—

1-hour exposure level means the average exposure level for each 60-minute time period from the start of ventilation until the end of the buffer zone period.

24-hour exposure level means the average exposure level for each 24-hour time period from the start of ventilation until the end of the buffer zone period.

Annual exposure level means the total of 24-hour exposure levels recorded over a calendar year and averaged over 365 days.

Annual average recapture performance means the average reduction of methyl bromide per fumigation event for which recapture technology is used, for a given site at which quarantine or pre-shipment fumigation occurs using methyl bromide (that is, not averaged nationally or regionally) for a calendar year.

Buffer zone means, in relation to an area being fumigated, an area extending outward in all directions from the perimeter of each enclosed space being fumigated to the relevant distance.

Buffer zone period means, in relation to the application of methyl bromide, the period starting when methyl bromide is first applied to an enclosed space and ending when the specified recording of data is no longer required in relation to that application.

Container means anything used to contain methyl bromide during fumigation, except a ship's hold or sheet.

Discharge means the unintentional release of methyl bromide into open air.

Dosed to concentration means applying sufficient methyl bromide into the enclosed space to achieve a specified headspace concentration.

Enclosed space means a container, a ship's hold, or the space under a sheet.

Event recapture proportion means the percentage of fumigation events for which appropriate recapture technology must be used, at each location of use, for a calendar year.

Fumigation event means the fumigation of one enclosed space.

Fumigation under sheets means fumigation carried out under sheets of plastic, tarpaulins, or other materials having a low mass transfer coefficient for the fumigant being used.

Minimum recapture means the minimum reduction of methyl bromide from the maximum amount of methyl bromide in the enclosed space that must be achieved for a fumigation event.

PCBU has the meaning defined in section 17 of the Health and Safety at Work Act 2015.

Recapture technology means a system that mitigates methyl bromide emissions from fumigation enclosures.

Site means in relation to the use of methyl bromide on land, an area of land within a workplace where methyl bromide is used and (regardless of whether the area is bisected by a road or right of way) that—

(a) consists of—

(i) a single allotment or other legally defined parcel of land that is the smaller of—

(A) an allotment or parcel held in a single certificate of title:

(B) an allotment or parcel for which a separate certificate of title could be issued without the further consent of the relevant local authority; or

(ii) 2 or more adjoining legally defined parcels of land held together in 1 certificate of title in such a way that the lots cannot be dealt with separately without the further consent of the relevant local authority; or

(iii) 2 or more adjoining certificates of title that are—

(A) subject to a condition imposed under section 37 of the Building Act 2004 or section 240 of the Resource Management Act 1991; or

(B) held together in such a way that they cannot be dealt with separately without the further consent of the relevant local authority; and

(b) contains—

(i) for land subdivided under the cross lease or company lease systems (other than strata titles),—

(A) a building or buildings used for residential or business purposes with any accessory building, plus any land exclusively restricted to the users of that building; or

(B) a remaining share or shares in the fee simple creating a vacant part of the whole for future cross lease or company lease purposes; and

(ii) for land subdivided under the Unit Titles Act 2010 (other than strata titles), a principal unit or proposed unit on a unit plan together with its accessory units, and includes—

(A) for strata titles, an area of land comprised in underlying certificate of titles, immediately before subdivision; and

(B) an activity that occupies more than 1 adjoining allotment, whether held in single legal title or multiple titles, and for the purpose of compliance with any rules that

specify a level of effect at the boundary or that specify capacities or discharge quantities, the total area of land occupied by that activity, the boundary of which is the boundary around that area of land.

Ventilate means the release of methyl bromide into the atmosphere, and **ventilation** has a corresponding meaning.

Control code	HSNO Act	Control
Prohibition of ship's hold fumigation	Section 77A	(1) From 1 January 2023, no person may apply methyl bromide for the fumigation of ship's holds. (2) From 1 January 2023, the PCBU with management or control of quarantine or pre-shipment fumigation using methyl bromide must ensure that fumigation of ship's holds using methyl bromide does not occur.
Notification of fumigation	Section 77A	(1) From 1 January 2022, a PCBU with management or control of quarantine or pre-shipment fumigation using methyl bromide must notify the PCBU's intention to carry out a fumigation event to— (a) the relevant territorial authority; and (b) neighbouring marae and neighbouring community facilities. (2) The PCBU must ensure that the notifications referred to in subclause (1) are made not less than 24 hours before the start of the fumigation event.
Use of recapture technology	Section 77A	(1) From the relevant start date specified in **Table A** or **Table B**, a PCBU with management or control of quarantine or pre-shipment fumigation using methyl bromide must ensure that methyl bromide is not applied unless— (a) recapture technology is used; and (b) the recapture technology used is— (i) capable of achieving the performance criteria for the relevant circumstance of use specified in **Table A** or **Table B**; and (ii) used in a manner that will achieve the specified performance criteria for the relevant circumstance of use. (2) From the relevant start date specified in **Table A** or **Table B** for a given circumstance of use, a PCBU with management or control of quarantine or pre-shipment fumigation using methyl bromide must ensure that— (a) the event recapture proportion is achieved or exceeded; and (b) the annual average recapture performance is achieved or exceeded. (3) For avoidance of doubt, the relevant minimum recapture values specified in **Table A** and **Table B** apply to each fumigation event

Control code	HSNO Act	Control
		for containers and fumigations under sheets respectively. The minimum recapture performance must not to be averaged between events, by location, by operator, or nationally; nor by time across any of these groupings.
Dosing to concentration	Section 77A	(1) For fumigation under sheets— (a) from 1 January 2024, the PCBU with management or control of quarantine or pre-shipment fumigation using methyl bromide must ensure that a minimum of 50% of fumigations events carried out in a calendar year are dosed to concentration; and (b) from 1 January 2027, the PCBU with management or control of quarantine or pre-shipment fumigation using methyl bromide must ensure that all fumigation events are dosed to concentration. (2) For fumigation of containers— (a) from 1 January 2024, the PCBU with management or control of quarantine or pre-shipment fumigation using methyl bromide must ensure that a minimum of 50% of fumigations events carried out in a calendar year are dosed to concentration; and (b) from 1 January 2027, the PCBU with management or control of quarantine or pre-shipment fumigation using methyl bromide must ensure that all fumigation events are dosed to concentration.
Ventilation	Section 77A	(1) A PCBU with management or control of quarantine or pre-shipment fumigation using methyl bromide must ensure that ventilation of any fumigation event only occurs when wind speed is at least 2 m/s. (2) Until 1 January 2023 when it becomes prohibited, when ventilating ship's holds after a fumigation event, the PCBU must ensure that there is a two hour time gap between the venting of individual ship's holds.
Requirement to keep records	Section 77A	(1) A PCBU with management or control of quarantine or pre-shipment fumigation using methyl bromide must ensure that accurate records are kept, for each application, of the data specified in this control. (2) If recapture technology is used, the data required is— (a) the date and time of each application, recapture, and ventilation; and (b) the amount of methyl bromide applied, recaptured, and ventilated; and (c) the location where methyl bromide was applied, recaptured, and ventilated; and

Control code	HSNO Act	Control
		(d) the type of enclosed space into which methyl bromide was applied; and (e) the capacity of the enclosed space; and (f) the name of each worker using methyl bromide and the physical address of the worker's workplace; and (g) the amount of methyl bromide in the enclosed space's head space at the end of the fumigation phase; and (h) the amount of methyl bromide in the enclosed space's head space at the end of the recapture phase; and (i) the wind speed and direction every 3 minutes at the location during active ventilation; and (j) the wind speed and direction every hour during periods where passive ventilation occurs; and (k) for each monitoring location, individual exposure level values, and 1-hour, 24-hour, and annual average exposure levels; and (l) for each monitoring location, the type, substances measured, limit of detection, and location of the monitoring equipment used to record the exposure levels. (3) If recapture technology is not used, the data required is— (a) the date and time of each application and ventilation; and (b) the amount of methyl bromide applied; and (c) the location where methyl bromide was applied and ventilated; and (d) the wind speed and direction every 3 minutes at the location during ventilation; and (e) the type of enclosed space into which methyl bromide was applied; and (f) the capacity of the enclosed space; and (g) the name of each worker using methyl bromide and the physical address of the worker's workplace; and (h) the amount of methyl bromide in the enclosed space's head space at the end of the fumigation phase; and (i) the wind speed and direction every hour during periods when passive ventilation of methyl bromide desorbing from logs occurs; and (j) for each monitoring location, individual exposure level values, and 1-hour, 24-hour and annual average exposure levels; and

Control code	HSNO Act	Control
		(k) for each monitoring location, the substances measured by the monitoring equipment, and the equipment's limit of detection for each substance. (4) For each discharge of methyl bromide during fumigation, the data required is— (a) the date and time of each discharge; and (b) the approximate amount of methyl bromide discharged; and (c) the location where methyl bromide was discharged; and (d) the approximate wind speed and direction at the location when the discharge occurred; and (e) where the discharge occurred from; and (f) the reason why the discharge occurred; and (g) the capacity of the enclosed space; and (h) the name of each worker using methyl bromide and the physical address of the worker's workplace. (5) The PCBU must ensure that the data required to be recorded by this control is recorded every 3 minutes from the start of ventilation until the exposure level is below 0.05 ppm for at least— (a) 15 minutes, where 7 kg or more of methyl bromide is applied in a 1-hour period; or (b) 3 minutes, where less than 7 kg of methyl bromide is applied in a 1-hour period. (6) The PCBU must ensure that the records required by subclause (1) are— (a) kept for not less than 7 years after the date of the fumigation event to which they relate; and (b) made available for inspection during that period.
Notification of TEL_{air} exceedance	Section 77A	A PCBU with management or control of quarantine or pre-shipment fumigation using methyl bromide must— (a) notify the relevant territorial authority as soon as practicable and within 24 hours if— (i) the 1-hour exposure level exceeds the 1-hour TEL_{air} value for methyl bromide; or (ii) the 24-hour exposure level exceeds the 24-hour TEL_{air} value for methyl bromide; and (b) include in the notification— (i) the source of that exceedance; and (ii) the exposure value(s) that exceed the appropriate TEL_{air} value: and

Control code	HSNO Act	Control
		(iii) the individual monitoring values that were used to generate each relevant 1-hour or 24-hour exposure level.
Annual reporting	Section 77A	(1) A PCBU with management or control of quarantine or pre-shipment fumigation using methyl bromide in the preceding calendar year must provide an annual report to the Environmental Protection Authority by 30 June each year. (2) The annual report must contain the following information for each calendar year: (a) the number of quarantine or pre-shipment fumigations using methyl bromide carried out at the site; and (b) the total amount of methyl bromide applied at the site; and (c) the types of enclosed spaces to which methyl bromide has been applied; and (d) the types of equipment used to carry out the monitoring of methyl bromide, including details of the substances measured by the monitoring equipment, and the equipment's limit of detection for each substance; and (e) the annual exposure level at the site; and (f) the approximate total quantity of methyl bromide discharged; and (g) the number of notifications made as a consequence of the control titled "Notification of TEL_{air} exceedance", identified by each monitoring location; and (h) the number of times the exposure levels exceeded the TEL_{air} value; and (i) if a breach of a TEL_{air} value has occurred then the annual monitoring report must contain— (i) an outline of what risk mitigation measures have been or are being taken; (ii) the source of that breach; and (iii) the exposure value(s) that exceed the appropriate TEL_{air} value; and (iv) the individual monitoring values that were used to generate that averaging time exposure value for comparison with the TEL; and (j) any accidents or other issues related to non-compliance with these controls or with any of the applicable requirements in the Health and Safety at Work (Hazardous Substances) Regulations 2017; and (k) for each fumigation event—

Control code	HSNO Act	Control
		(i) the amount of methyl bromide in the enclosed space's head space at the end of the fumigation phase; and (ii) the amount of methyl bromide in the enclosed space's head space at the end of the recapture phase if recapture technology has been used; and (iii) the amount of methyl bromide recaptured if recapture technology has been used; and (l) the annual average recapture performance for the site; and (m) the event recapture proportion for the site. (3) The annual report must detail progress towards the reduction of methyl bromide emissions, including— (a) technology and process developments to ensure that future recapture targets are met; and (b) other actions taken to reduce methyl bromide emissions and use.
Buffer zones	Section 77A	(1) From 1 January 2022, for fumigation under sheets, a PCBU with management or control of quarantine or pre-shipment fumigation using methyl bromide must set a buffer zone for each fumigation that is equal to or more than the relevant distance in **Table C** for the relevant dose rate of methyl bromide. (2) For fumigation of containers of up to 77 m^3 in volume the PCBU must set a buffer zone for each fumigation that is equal to or more than 10 m. (3) For fumigation of containers equal to or greater than 77 m^3 in volume the PCBU must set a buffer zone for each fumigation that is equal to or more than 25 m. (4) From 1 January 2022 until it is prohibited on 1 January 2023, for fumigation of ship's holds, the PCBU must set a buffer zone for each fumigation that is equal to or more than 900 m. (5) The PCBU must ensure that— (a) no member of the public is in the buffer zone during the buffer zone period; and (b) the buffer zone is kept under observation; and (c) the buffer zone is sufficiently large to ensure that the TEL_{air} for methyl bromide is not exceeded beyond the boundary of the buffer zone.

Table A. Performance criteria of recapture technology for every methyl bromide fumigation event in containers

Start date	Minimum recapture (%)
1 January 2023	80%
1 January 2027	90%
1 January 2031	99%

Table B. Performance criteria of recapture technology for methyl bromide fumigations under sheets

Start date	Event recapture proportion (%)	Minimum recapture (%)	Annual average recapture performance (%)
1 January 2022	50	30	55
1 January 2023	75	40	60
1 January 2025	100	50	65
1 January 2027	100	60	75
1 January 2029	100	70	85
1 January 2031	100	80	95
1 January 2033	100	90	99
1 January 2035	100	99	99

Table C. Minimum buffer zones for methyl bromide fumigation under sheets

Minimum recapture (%)	Minimum buffer zone: dose rate ≤ 40 g/m^3 (m)	Minimum buffer zone: 40 g/m^3 < dose rate ≤ 72 g/m^3 (m)	Minimum buffer zone: 72 g/m^3 < dose rate ≤ 120 g/m^3 (m)
No recapture	210	515	700
30	155	380	520
40	135	335	455
50	120	290	395
60	100	245	335
70	80	200	270
80	65	155	210
90	50	110	150
99	50	70	95

HSW requirements

Advisory Note: These requirements are not set for the substance but apply in their own right under the HSW (Hazardous Substances) Regulations 2017 according to the classification of the substance. They are listed here for information purposes only.

Control code	Regulation Part	Description
HSW1	Part 1	Application
HSW2	Part 2	Labelling, signage, safety data sheets, and packaging
HSW3	Part 3	General duties relating to risk management
HSW4	Part 4	Certified handlers and supervision and training of workers
HSW5	Part 5	Emergency management
HSW8	Part 8	Controls applying to all class 1 to 5 substances
HSW10	Part 10	Class 2, 3 and 4 substances
HSW11	Part 11	Controls relating to adverse effects of unintended ignition of class 2 and 3.1 substances
HSW13	Part 13	Class 6 and 8 substances
HSW14	Part 14	Fumigants
HSW15	Part 15	Gases under pressure
HSW16	Part 16	Tank wagons and transportable containers
HSW17	Part 17	Stationary container systems
SWI14-1		Health and Safety at Work (Hazardous Substances—Modified Requirements for Specified Fumigants) Safe Work Instrument 2017

Appendix E. List of abbreviations

ASG	Atmospheric Science Global
Beca	Beca Pty Ltd
BOPRC	Bay of Plenty Regional Council
EDN	ethanedinitrile
EIM	EIM Research Pty Ltd
EPA	Environmental Protection Authority
ERMA	Environmental Risk Management Authority
g	gram
Genera	Genera Science & Innovation
GHS	Globally Harmonised System of Classification and Labelling of Chemicals
h	hour
HSNO	Hazardous Substances and New Organisms
HSW	Health and Safety at Work
HSWR	Health and Safety at Work (Hazardous Substances) Regulations 2017
kg	kilogram
km	kilometre
m	metre
MPI	Ministry of Primary Industries
PCBU	person conducting a business or undertaking
PDP	Pattle Delamore Partners
PID	photoionisation detector
ppm	parts per million
QPS	quarantine and pre-shipment
s	second
SEC	Sullivan Environmental Consulting
STEL	short-term exposure limit
STIMBR	Stakeholders in Methyl Bromide Reduction
TAS	Todoroski Air Sciences
TEL	tolerable exposure limit
TVOC	total volatile organic compounds
WES	workplace exposure standard

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