BEFORE BAY OF PLENTY REGIONAL COUNCIL

UNDER	the Resource Management Act 1991 ("Act")
IN THE MATTER OF:	an application for resource consents (RM19-0663) to discharge contaminants to air from the Port of Tauranga
BY:	Genera Limited

STATEMENT OF EVIDENCE OF PETER JOHN CRESSEY ON BEHALF OF THE APPLICANT

Human Health

Qualifications and Experience

1. My full name is Peter John Cressey. I am a Science Leader at the Institute of Environmental Science and Research Ltd (**ESR**), where I am responsible for exposure and risk assessment for chemicals present in foods, the environment and consumer products. I have held this role since 1995.

2. I have a Bachelor of Science with Honours (first class) in chemistry. I have authored more than 100 client reports related to chemical safety, mainly for the Ministry of Health and the Ministry for Primary Industries (**MPI**) and have authored approximately 35 papers in peer-reviewed journals. I am a Fellow of the New Zealand Institute of Food Science and Technology. I am currently a member of the Joint FAO/WHO Expert Committee on Food Additives (**JECFA**). I am also currently a member of the Environmental Protection Authority's (**EPA**) Hazardous Substances and New Organisms (**HSNO**) committee.

3. I have read the Expert Witness Code of Conduct set out in Section 9 of the Environment Court's Practice Note 2023 and I agree to comply with it. I confirm that the issues addressed in this statement of evidence are within my area of expertise, except where I state I am relying on the specified evidence of another person. I have not omitted to consider material facts known to me that might alter or detract from my expressed opinion.

Scope of evidence

4. My evidence relates to the effects of the discharges proposed in the Air Discharge Permit Application RM19-0663 (**Application**) of Genera Limited (**Genera**) on human health arising primarily from methyl bromide (**MB**), ethanedinitrile (**EDN**) or phosphine (**PH3**) concentrations in air beyond the boundary of the Port of Tauranga (**POT**) as a result of fumigation activities at POT.

5. I have prepared two technical reports to inform Genera's application process. The primary report prepared for Genera, titled *Assessment of fumigants used in the treatment of timber (October 2019),* included:

    a) a summary of the toxicology, New Zealand exposure limits, regulatory assessments and health impact assessment of dispersion modelling at POT for MB;

    b) a review of recent epidemiological studies on adverse human health effects due to MB exposure;

c) an investigation of associations between MB exposure and motor neurone disease;

d) a summary of the toxicology and regulatory assessments for PH3; and

e) a summary of the toxicology and regulatory assessments for EDN.

6. I prepared an addendum to my primary report in July 2020, reviewing the health impact assessment of dispersion modelling at POT for MB, following expert conferencing by air dispersion modelling practitioners, convened by the EPA.[1] The expert conferencing resulted in an amended version of the Sullivan *et al.* (2018) report, as a consensus position of the modelling experts (Sullivan *et al.*, 2020). This amended version of the Sullivan *et al.* (2020) report was submitted to the Bay of Plenty Regional Council (**Council**) as further information on 31 July 2020.

Guideline exposure limits for fumigants

7. Health impact assessment of fumigant concentrations involves comparison of predicted or measured fumigant concentrations with health-based guidance concentrations such as tolerable exposure levels (**TELs**) and workplace exposure standards (**WES**). In order to fully characterise the potential human health impacts of a discharge to air, guidance concentrations should be available or derived for a range of exposure durations, such as very short-term (up to 1 hour), short-term (up to 24 hours) and chronic (lifetime) exposures. As a general principle, the exposure limits decrease with increasing duration of the assessed period.

8. It should be noted that the role of TELs and WES are quite different. TEL, established by the EPA, are for the protection of the general public, while WES, established by WorkSafe, are for the protection of workers. The Safe Work Instrument (SWI) developed by WorkSafe for use of EDN clarified that entry restrictions for workers not carrying out fumigation-related work will apply to the area where the prescribed WES for EDN is, or is likely to be, exceeded but not to the buffer zones in place to exclude members of the public (WorkSafe, 2020). That is, workers not carrying out fumigation-related work are still considered to be workers and not members of the general public.

9. For MB, the non-occupational bystander exposure standards are TELs for exposure periods of up to 1 hour, up to 24 hours or over a chronic (lifetime) timeframe. The TELs for MB were derived by the EPA (which was, at the time, the Environmental Risk Management Authority (**ERMA**)) over a decade ago (ERMA, 2009) and are

[1] The current resource consent application and EPA's modified reassessment of MB were closely linked and the expert conferencing on air dispersion modelling was commissioned as part of the EPA's reassessment process.

substantially based on exposure limits derived by either the US Environmental Protection Agency (**USEPA**) or the California Environmental Protection Agency (**CEPA**).

10. The TELs for MB are derived from either human observational studies (1-hour) or laboratory animal studies (24-hour and chronic). The TELs may be expressed on either a volume basis (parts per billion = **ppb** or parts per million = **ppm**) or a mass basis (milligrams per cubic meter = **mg/m^3**). The 1-hour, 24-hour and chronic TELs for MB are 1000 ppb or 1.0 ppm (3.9 mg/m^3), 333 ppb or 0.333 ppm (1.3 mg/m^3) and 1.3 ppb or 0.0013 ppm (0.005 mg/m^3), respectively.

11. The TELs are derived from a no observed adverse effect level (**NOAEL**) or a lowest observed adverse effect level (**LOAEL**) in a human or animal study. Additional uncertainty factors are applied to account for: extrapolation from a LOAEL to a NOAEL, inter-species differences (for TELs based on animal studies) and intra-species differences. This approach is consistent with international best practice for the setting of exposure guideline levels and includes a suitable level of conservatism.

12. The occupational exposure standards for MB have recently (2021) been reviewed and updated by WorkSafe and include a time-weighted average (**TWA**) of 1 ppm (3.9 mg/m^3) and a short-term exposure limit (**STEL**) of 2 ppm (7.8 mg/m^3) (WorkSafe, 2021). The TWA is applicable to an 8-hour working day and the STEL is applicable to a 15-minute period. These values were adopted to align WorkSafe's standards with overseas jurisdictions. No ceiling WES was established by WorkSafe. It should be noted that the WES-TWA is the same as the 1-hour TEL (1 ppm).

13. The WorkSafe WESs and EPA TELs provide a largely consistent set of exposure limits and appear, in my opinion, appropriate for the management of human health risks associated with MB exposure.

14. For EDN, the EPA has derived only a chronic TEL of 0.034 ppm (0.072 mg/m^3), as a 24-hour average (NZEPA, 2018). The chronic TEL was based on the NOAEL for a 6-month rat inhalation study, with application of a 100-fold uncertainty factor. It should be noted that, as chronic EDN exposure is considered in terms of a 24-hour average, the TEL is effectively both a 24-hour and a chronic TEL. In addition, in their assessment of EDN, the EPA used acute exposure guideline limits (**AEGLs**), derived by the US National Advisory Committee for Acute Exposure Guideline Levels for Hazardous Substances for assessing short-term exposures (10 minutes to 8 hours) of non-occupational bystanders (general public) (NRC, 2014). The AEGL-1 values were in the range 1.0 to 2.5 ppm (2.1 to 5.3 mg/m^3), with a 1-hour AEGL-1 of 2.0 ppm. AEGL-1 is the airborne concentration (expressed as ppm or mg/m^3) of a substance

above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure. WorkSafe has derived a WES-TWA of 3 ppm (6.4 mg/m^3) and a WES-Ceiling of 5 ppm (10.6 mg/m^3) for EDN (Worksafe, 2018).

15. The EPA TEL and the AEGL-1 values provide a suitable set of guideline concentrations for assessing the potential impact of EDN discharges to air on non-occupational bystanders, while the WorkSafe WES values appear appropriate, in my opinion, for the occupationally exposed population.

16. For PH3, the EPA (then ERMA) adopted a TEL_{air} derived by the USEPA of 0.0003 mg/m^3 (0.00022 ppm) and derived a ceiling TEL_{air} of 0.01 mg/m^3 (0.0072 ppm). The ceiling TEL_{air} was derived by the EPA (then ERMA) for application HSR5035 (CytecGas01) (ERMA, 2006). However, the basis for the derivation of the ceiling value is not included in the decision document and it is unclear how the value was derived. It should be noted that this application was the only instance in which the EPA/ERMA specified a ceiling TEL. The compilation of workplace exposure standards and biological exposure indices for New Zealand lists a WES-TWA concentration for PH3 of 0.3 ppm (0.42 mg/m^3) (WorkSafe, 2022a). The associated WES-STEL, a 15-minute weighted average, for PH3 is 1 ppm (1.4 mg/m^3). WorkSafe reviewed the WES in 2022 and proposed a revised WES-TWA of 0.05 ppm and a WES-Ceiling of 0.15 ppm, with no WES-STEL proposed (WorkSafe, 2022b). These WES are still at the consultation stage and have not yet been formally adopted.

17. The USEPA TEL adopted by the EPA is quite old and the chronic reference dose (**RfD** = 0.0113 mg/kg body weight per day) recently used for the assessment of phosphine-containing or phosphine-generating products (USEPA, 2013) was equivalent to an air concentration of 0.04 mg/m^3 in the rodent study. USEPA also derived an acute reference dose (**ARfD** = 0.018 mg/kg body weight per day), equivalent to an air concentration of 0.07 mg/m^3 in the rodent study.

18. The European Food Safety Authority (**EFSA**) has also evaluated a range of phosphine-generating compounds, applying an acceptable daily intake (**ADI**, equivalent to a RfD) of 0.011 mg/kg body weight per day, an acceptable operator exposure level (**AOEL**) also of 0.011 mg/kg body weight per day and an ARfD of 0.019 mg/kg body weight (EFSA, 2008). It should be noted that the USEPA and EFSA health-based guideline levels are near identical.

19. The US National Advisory Committee for Acute Exposure Guideline Levels for Hazardous Substances did not consider that there were appropriate data available to establish AEGL-1 values for PH3 (NRC, 2007).

20. ADIs, RfDs, ARfDs, etc. can be equated to air concentrations of PH3 by applying information on the body weights and inhalation rates of exposed humans. For chronic exposure, adults are usually considered to have a mean inhalation rate of 1 m^3/hour with a mean body weight of 70 kg (USEPA, 2011). Using these parameters, the EFSA ADI of 0.011 mg/kg body weight per day would equate to a lifetime mean air concentration of PH3 of 0.032 mg/m^3 (0.023 ppm). Using the same approach and applying the EFSA ARfD to a 24-hour period, the equivalent mean 24-hour air PH3 concentration would be 0.055 mg/m^3 (0.039 ppm).

21. Young children have higher inhalation rates relative to their body weight than adults and are, consequently, at greater risk from exposure to airborne toxicants than adults. Children in the age range 1-2 years are often considered as a high-risk group because they have a high inhalation rate relative to body weight, are independently mobile and have a high frequency of exploratory behaviours. For exposure assessment, this age group is usually considered to have a mean body weight of 11 kg and a mean inhalation rate of 8.0 m^3/day. On this basis the EFSA ADI and ARfD would equate to mean air concentrations of 0.015 (0.01 ppm) and 0.026 mg/m^3 (0.019 ppm), respectively.

22. For many airborne chemicals, Haber's Law[2] can be used to convert guideline concentrations for one time period (e.g. 24 hours) to a guideline concentration for a different time period (e.g. 8 hours). This is based on the concept that approximately equivalent doses of a chemical will elicit the same response over a range of exposure durations. For PH3, the CEPA has noted:

> "*For acute, subchronic and chronic toxicity, absolute air concentrations, not internal doses, were used to calculate margins of exposure. This course of action was based primarily on the observation that death occurred at approximately the same concentration regardless of laboratory species, suggesting that absorption, metabolism and distribution played secondary roles in mediating the toxicity of phosphine. In addition, many of the clinical signs of phosphine intoxication were consistent with a direct toxic interaction between gas and tissue (particularly lung)*" (CEPA, 2014).

[2] Haber's Law states that the incidence and/or severity of a toxic effect depends on the total exposure, i.e. exposure concentration (*c*) rate times the duration time (*t*) of exposure (*c x t*). This rule, within constraints, is often used in setting exposure guidelines for toxic substances.

23. On the balance of available information, I consider that the EPA TEL_{air} appears overly conservative. Based on the acute and chronic health-based guidance values derived by USEPA and EFSA and providing protection for young children, 24-hour and chronic TELs of 0.02 and 0.01 ppm would be consistent with recent assessments and with the proposed WorkSafe WESs.

Buffer zones

24. 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 zones provide *inter alia* an area across which the concentration of any released fumigant will decrease to a concentration without appreciable risk to human health. “Without appreciable risk" means, based on the current knowledge, there is confidence that no harm will result, even after a lifetime of exposure.

25. Buffer zones specified by the EPA are generally based on air dispersion modelling and are intended to provide protection to the general public.

26. The magnitude of a buffer zone will depend on the toxicity of the fumigant, the amount of fumigant used, the residual amount of fumigant after processes such as recapture or neutralisation, and local meteorological conditions.

27. For MB and EDN, buffer zones are defined in the controls specified in EPA Approvals HSR001635 and HSR101529. The definition of buffer zones for these two fumigants was informed by dispersion modelling for the POT site.

28. For PH3, the EPA did not define specific buffer zones under Approvals HSR001632 (gas containing 20 g/kg PH3), HSR001634 (pellets containing 660 g/kg magnesium phosphide), HSR001636 (pellets containing 570 g/kg aluminium phosphide) or HSR007629 (CytecGas01) but included requirements under the *Health and Safety at Work (Hazardous Substances) Regulation 2017*, including Part 14, which includes particular requirements for fumigants. However, PH3 is not included amongst the specified fumigants for which buffer zones must be set.

29. The Applicant has proposed an outcome-based approach where “During ventilation non-occupational by-standers must be excluded from an area around the fumigation activity defined as being the distance from the fumigation target beyond which the control listed in EPA Approval HSR001636 (attached), or any subsequent approved reassessment of these controls, is not exceeded”.[3] In contrast, the authors of the

[3] From the Applicant’s proposed consent conditions

Technical Review appended to, and informing, the Section 42A Report (**s42A Report**) have specified particular buffer zones for different types of PH3 fumigation event. The basis for these proposed buffer zones is not informed by dispersion modelling or empirical observations. The Applicant's proposed condition allows for a more adaptive data-based approach.

Applicant's proposed consent conditions

30. The Applicant's proposed consent conditions have subsequently been superseded by conditions discussed by a planning expert conferencing (see paragraph 61 of my evidence). Comments on the Applicant's original proposed conditions are included here for completeness.

31. For MB, the Applicant's proposed consent conditions are expressed in terms of ensuring that MB concentrations are below the TELs derived by the EPA for 1-hour, 24-hour and annual exposure durations at points "beyond the landside boundaries of Port of Tauranga wharves or at or beyond a point 50 m seaward of any vessels berthed at the Port of Tauranga". The proposed conditions are directly aligned with the controls specified in EPA Decision: modified reassessment of methyl bromide APP203660 and Approval HSR001635.

32. For PH3, the proposed consent condition states that "During fumigation non-occupational by-standers must be excluded from an area around the fumigation activity defined as being the distance from the fumigation target beyond which the control listed in EPA approval HSR001636 (attached), or any subsequent approved reassessment of these controls, is not exceeded".

33. For EDN, the proposed consent condition states that the EPA chronic TEL (24-hour average, 0.034 ppm or 0.072 mg/m^3) should not be exceeded "at or beyond the landside boundaries of the Port of Tauranga wharves or at or beyond a point 50 m seaward of any vessel berthed at the Port of Tauranga". These proposed conditions are directly aligned with the controls specified in EPA Decision on application to import or manufacture EDN for release APP202804 and Approval HSR101529. The EPA and expert conferencing on TELs for EDN did not propose TELs for exposure periods shorter than 24 hours.

34. In my opinion, given the extensive and conservative nature of the EPA's risk assessments, these controls appear appropriate for the protection of public health.

Comments on human health aspects of submissions

35. I reviewed all submissions with a focus on matters related to human health. In addition to the acute and neurotoxic effects of MB, a number of submissions raised concerns regarding the potential for MB to cause cancer, motor neurone disease (**MND**) or immunological issues, such as allergy and asthma.

36. The carcinogenicity of MB has been considered by several expert bodies. The International Agency for Research on Cancer (**IARC**) evaluated MB in 1999 and concluded there is inadequate evidence in humans for the carcinogenicity of MB. The most recent evaluation was carried out by the US Agency for Toxic Substances and Disease Registry (**ATSDR**) (ATSDR, 2018). ATSDR noted that the USEPA had determined that MB is not a likely human carcinogen.

37. Several submitters referred to cancer clusters in the environs of POT. The US Centers for Disease Control and Prevention (**CDC**) have published guidelines for the investigation of cancer clusters (Abrams *et al.*, 2013). In the CDC definition of a cancer cluster it is stated that, except in rare circumstances, a cluster requires that the cancer cases are all of the same type. This does not appear to be the case in regards to the matters referred to by submitters.

38. A potential cluster of MND cases in workers at Port Nelson was investigated in 2005 (Kiddle, 2005). It was concluded that:

> "*Methyl bromide is used in greater amounts at other New Zealand ports and in much greater amounts elsewhere in the world. It has not been reported in the medical literature as being associated with MND and* ***no causal relationship between methyl bromide and MND has been established by this investigation****. Random occurrence or chance is the most likely explanation for the grouping of MND cases with a work history involving the Port Nelson area*".

39. I have reviewed more recent scientific literature. No studies have been published identifying an association between MB exposure and MND. While the umbrella analysis of Kamel *et al.* (2012) considered associations between MB exposure and MND, it found no significant association.

40. I have found no evidence that exposure to MB causes or promotes conditions mediated by the immune system, such as allergies and asthma.

41. The submission of Keira Williams states that "*Methyl bromide may damage the kidneys and affect the liver*". While effects on the liver and kidneys have occasionally

been reported in humans and animals exposed to high concentrations of MB, such effects do not always occur and have not been reported at exposure to concentrations likely to be experienced due to fumigation activities at POT.

42. The submission of Te Rangi Hou me Te Taiohi states, in relation to MB, that "*The injury shown in animal studies suggests there may be a risk to humans exposed to continued low-level concentrations of methyl bromide (including less severe adverse effects). In addition to the risk of continued low-level exposure, allowing the use of methyl bromide creates the ongoing risk of individuals being exposed to high-level concentrations of methyl bromide through containment issues/breaches, etc".* In response I note that the 24-hour and chronic TELs derived by the EPA, which are part of Genera's proposed resource consent conditions, are based on the NOAELs or LOAELs in animal studies, with application of inter- and intra-species uncertainty factors. This means that the TELs are a factor of 30 below the concentrations that had no effect on animals in short term and long-term studies. Consequently, human exposure to concentrations of MB below the TELs will be without appreciable risk to human health. Managing the risk of human exposure to high concentrations of MB is a major aim of the Applicant's proposed resource consent conditions.

Comments on Section 42A Officer's Report

43. I reviewed the s42A Report with respect to the management of risks associated with fumigation operations at POT and proposed occupational and non-occupational exposure limits. In addition, I also reviewed the Technical Review (*RM19-0663 Technical Review*), which informed much of the Officer's Report. I make the following observations.

MB

44. With respect to MB, the limits are those summarised in my brief of evidence, with the addition of a Ceiling/maximum value of 20 ppm. This ceiling value does not come from either the WorkSafe or EPA evaluations and has been sourced from the US Occupational Safety and Health Administration's limits for air contaminants. In its 2021 evaluation, WorkSafe noted that "The proposed **WES-STEL** of 2ppm (7.8mg/m^3) for methyl bromide is intended to protect exposed workers from potential peak concentrations initiating irritation effects". On this basis, I consider that the recommendation that "the ceiling values also be adopted as a requirement of the resource consent" requires further justification.

EDN

45. With respect to EDN, the limits are those summarised in my brief of evidence, with two amendments. The s42A Report recommends that the WorkSafe WES-Ceiling be applied to the public (non-occupational bystanders) and port workers not involved in fumigation. An exceedance of the ceiling value at points away from the site of fumigation would suggest substantially higher concentrations in the immediate environs of the fumigation site. However, it should be reiterated that the WES-Ceiling was derived for the protection of workers, not the general public. The WES-Ceiling (5 ppm) is largely consistent with the AEGL-1 values (1.0-2.5 ppm) used for the characterisation of short-term exposure of non-occupational bystanders in the EPA evaluation. The authors of the Technical Review, whose opinions inform the s42A Report concluded that "the imposition of a ceiling value and 8-hour WES-TWA, along with a 24-hour WES-TEL is necessary to ensure health effects are avoided". The ceiling and WES-TWA were originally included in Genera's proposed conditions. However, the planning expert conferencing and associated JWS (see paragraph 61 of my evidence) agreed that these limits are for the purpose of protecting fumigation staff and the agreed revised condition only specifies the chronic TEL, established by the EPA. I concur with this decision. It is uncertain what is meant by a "24 hour WES-TEL" but it does not appear appropriate to define a 24-hour workplace exposure standard. The EPA chronic TEL is already specified as a 24-hour average and therefore is effectively both a chronic and a 24-hour TEL.

PH3

46. With respect to PH3, the s42A Report is somewhat confusing and appears to recommend that the existing WorkSafe WES should be replaced, and that the new STEL (0.0072 ppm) should be lower than the proposed TWA (0.05 ppm). There is no precedent for a short-term exposure limit being lower than a longer-term exposure limit. WorkSafe reviewed the WES in 2022 and proposed a WES-TWA of 0.05 ppm and a WES-Ceiling of 0.15 ppm and these values are correctly noted at other points in the s42A Report. These WES are still the subject of consultation and have not yet been adopted by WorkSafe. The Technical Review, informing the s42A Report, attributes this WES-STEL value to an ESR letter, written by myself. At that time, ESR activities were focussed on risks to non-occupational bystanders and the text quoted in the Technical Review ("Given the extremely steep dose-response relationship for phosphine, it is probably prudent to consider the NZEPA ceiling TEL as an appropriate exposure limit for all short-term exposure durations") reflects this. Clarification from the s42A Report author in the course of the hearing could resolve this point.

47. I concur with the comment in the PH3 section of the s42A Report that "any conditions of the resource consent should utilise the latest information on concentration levels". The EPA TEL_{air} appears inconsistent with subsequent assessments of the toxicity of PH3. Based on the acute and chronic health-based guidance values derived by USEPA and EFSA and providing protection for young children, 24-hour and chronic TELs of 0.02 and 0.01 ppm would be consistent with recent assessments and with the proposed WorkSafe WESs.

Cumulative effects

48. The s42A Report notes that "*The Reviewers have recommended that in the absence of any evidence as to the potential cumulative effects, a precautionary approach should be taken with regard to simultaneous ventilation. It is considered that conditions of consent could be imposed to ensure this requirement is met*" in reference to simultaneous fumigations with combinations of MB, PH3 and EDN. Cumulative effects are generally considered when exposure is to multiple chemicals sharing the same mode of action. There is currently no evidence that MB, PH3 and EDN have the same mode of action and substantial evidence that the fumigants act by quite different modes of action. On this basis, the controls separately applied to each fumigant should be sufficient for the protection of public health.

Comments on Section 42A Officer's proposed conditions

49. In addition to the s42A Report, the reporting officer drafted a proposed set of conditions. These were prepared separately to the Applicant's proposed conditions. The following points relate to aspects with potential human health implications in the s42A Report's proposed conditions. It should be noted that these conditions have subsequently been the subject of planning expert conferencing and my comments on the pre-conferencing conditions are included here for completeness.

50. **Condition 3.1: The Consent Holder shall ensure that no more than one fumigation event is ventilated at a time so as to avoid potential cumulative effects.**

It is unclear whether this refers to fumigation events for the same fumigant or different fumigants. If the same fumigant, then the air quality limits in both sets of proposed conditions will apply to the sum of contributions from the various fumigation events and the risks to human health will be no greater than for a single fumigation event. If this condition refers to events involving different fumigants then the lack of similarity in the modes of action of the different fumigants argues against cumulative effects

and the controls applicable to each fumigant should be sufficient for protection of human health.

51. **Condition 8.2: (MB) The MSZ shall be sized to ensure that the maximum exposure level at its boundary is no greater than 1ppm.**

This proposed condition is substantially more conservative than the WES-TWA (1 ppm) and the WES-STEL (2 ppm) for MB and the rationale for this is unclear. The Condition is also inconsistent with Condition 8.3, which specifies a concentration of 5 ppm at the boundary of the MSZ, as an indicator for retention of signage and coning after full uncovering of the fumigated space.

52. **Condition 8.7 (MB) Fumigation activities shall not be undertaken within the following setback distances from cruise ships docked at the Port:**

- **under sheets – 300 metres**
- **containers – 100 metres**

The setback is a buffer zone and these buffer zones are in excess of the maximum buffer zones specified by the EPA in Approval HSR001635 for recapture rates of 90% or greater. In my opinion, no rationale has been provided for this increased level of protection.

53. **Condition 8.10 Air quality standards (MB).**

As noted in paragraph 44 of my evidence, the Ceiling/max value of 20 ppm was adopted by the reviewers from a different jurisdiction and I consider it to be more appropriate to use air quality standards specified by New Zealand regulatory agencies.

54. **Condition 9.1 Buffer (PH3).**

While the s42A Report and the supporting Technical Review correctly identify that no buffer zone dimensions have been specified for PH3 fumigation by either EPA or WorkSafe, the buffer zones proposed in the s42A Report are speculative and the adaptive approach proposed by the Applicant appears more consistent with the EPA Approvals for phosphine-producing substances, stating “Applicators must develop a Fumigation Management Plan that shall include an appropriate monitoring plan that will confirm that nearby workers and bystanders are not exposed to levels above the allowed limits during application, fumigation and aeration”.

55. **Condition 9.7 (PH3).**

This is effectively a repeat of Condition 8.7 and, as noted in paragraph 52 of my evidence, no rationale for greater buffer zones to cruise ships than to non-occupational bystanders is provided.

56. **Condition 10.8 (EDN).**

This is effectively a repeat of Condition 8.7 and, as noted in paragraph 52 of my evidence, no rationale for greater buffer zones to cruise ships than to non-occupational bystanders is provided. In this case, the buffer zone to cruise ships proposed is a factor of six greater than the buffer zone for protection of non-occupational bystanders.

57. **Condition 10.10 Air quality standards (EDN).**

The proposed air quality standards for EDN specify that the EPA's TEL be applied at the MSZ boundary. In my opinion, this is inappropriate as the TEL is specified for the protection of non-occupational bystanders and should be applied at the buffer zone boundary. A 1-hour TEL of 1 ppm is further specified in the proposed conditions. The derivation of a 1-hour TEL is not described in either the s42A Report or the Technical Review. There is some discussion in the Technical Review of expressing the 24-hour TEL (0.034 ppm) as a 1-hour equivalent (0.82 ppm) and the 1-hour TEL may be this value rounded to one significant figure. If it is considered that a 1-hour TEL is required, in my opinion, the 1-hour AEGL-1 of 2.0 ppm used in the EPA assessment would be more appropriate.

Comments on Tonkin & Taylor review of Section 42A Officer's Report

58. Dylan Vernall and Jenny Simpson of Tonkin & Taylor Ltd produced a report entitled *Detailed Technical Review of the Bay of Plenty Technical Review of the Genera Limited Resource Consent Application RM19-0663* (**the T&T review)**, dated 24 March 2023 for the Bay of Plenty Regional Council. The scope of the review included:

- The interaction between the Hazardous Substances and New Organisms Act 1996 (HSNO Act), Health and Safety at Work Act 2015 (HSW Act) and the Resource Management Act 1991 (RMA) in relation to risk to people's health from exposure to airborne contaminants from fumigation activities;
- The application of the Workplace Exposure Standards (WES) and Tolerable Exposure Limits (TEL) (and other controls such as buffer distances and monitoring), including the appropriateness of applying controls developed specifically for one fumigant to other fumigants; and

- Comments on the suggested conditions of consent.

59. I am in general agreement with the conclusions of the T&T review, where they are within my area of expertise, in particular, the appropriate application of WES and TEL. The commentary in the T&T review on *Additional monitoring criteria recommend in the Technical Review* (section 4.6) is largely consistent with my own comments on the s42A Report.

60. With respect to section 4.6.4 of the T&T Review (EDN) and the discussion of a potential 1-hour investigative limit, although the EPA did not specify a 1-hour TEL in its evaluation of EDN, AEGL-1 values were used in the characterisation of short-term exposure for non-occupational guidelines. In my opinion, if a 1-hour investigative trigger level was considered necessary, the 1-hour AEGL-1 value of 2 ppm would be more appropriate than the value proposed in the s42A Report and discussed in the T&T Review.

Comments on the Joint Witness Statement (JWS) in relation to planning

61. Expert conferencing on planning was carried out on 20 March 2023, with participants representing the Applicant and Bay of Plenty Regional Council. The expert conferencing discussed the proposed conditions and prepared a Joint Witness Statement (JWS). The JWS considered each of the proposed conditions and either identified an agreed position or identified an area of disagreement. In the case of areas of disagreement, options for the consent condition were noted by each of the two parties.

62. I consider that only one area of disagreement is within my area of expertise. This is in relation to proposed condition 3.1 “The Consent Holder shall ensure that no more than one fumigation event is ventilated at a time so as to avoid potential cumulative effects”. I have presented my opinion on this issue in paragraphs 48 and 50 of my evidence and concur with the Applicant’s proposal that this proposed condition be deleted.

Conclusions in relation to health risk to the public beyond the buffer zone (the POT boundary)

63. For MB, the proposed conditions agreed by the planning expert conferencing and documented in the associated JWS are directly aligned with the controls specified in EPA Decision: modified reassessment of methyl bromide APP203660 and Approval HSR001635. The TELs included in the controls have been appropriately derived and

compliance with the proposed conditions will result in negligible public health risks for the public beyond the buffer zone.

64. For PH3, the proposed conditions agreed by the planning expert conferencing and documented in the associated JWS specify concentrations of PH3 to not be exceeded at the buffer zone boundary. These include the EPA TEL_{air} of 0.00022 ppm and a ceiling/max concentration of 0.15 ppm. As previously noted, this TEL appears to be highly conservative. Paragraph 47 of my evidence suggests alternative 24-hour and chronic TELs (0.02 and 0.01 ppm, respectively) that are more consistent with recent regulatory assessments conducted by EFSA and USEPA. The ceiling/max value of 0.15 ppm has been proposed as a revised ceiling-WES for PH3 by WorkSafe, however, this WES have not yet been adopted.

65. For EDN, the proposed conditions agreed by the planning expert conferencing and documented in the associated JWS are directly aligned with the controls specified in EPA Decision on application to import or manufacture EDN for release APP202804 and Approval HSR101529. The EPA controls specify a chronic TEL (24-hour average, 0.034 ppm or 0.072 mg/m^3) for EDN. The EPA and expert conferencing on TELs for EDN did not propose TELs for exposure periods shorter than 24 hours, although shorter duration exposure limits (AEGL-1) were used in the EPA assessment. Given the high acute toxicity of EDN, a TEL or equivalent for periods of exposure shorter than 24 hours is appropriate. The 1-hour AEGL-1 of 2.0 ppm (4.2 mg/m^3) appears appropriate.

66. In my opinion, the proposed conditions agreed by the planning expert conferencing and documented in the associated JWS are closely aligned to the controls specified in the relevant EPA decisions and are, therefore, supported by detailed assessments of risks to human health and the environment. These proposed conditions appear entirely appropriate for the protection of public health from exposures associated with fumigation activities at POT. In some instances, conditions proposed in the s42A Report are more stringent than EPA controls. While, on occasions, territorial authorities may specify a higher level of protection than national authorities, this should be justified on the basis of risk. In my opinion, no such justification has been provided in this case.

Peter John Cressey

17 April 2023

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