A Report prepared for the Bay of Plenty Regional Council

COMMENTS ON REPORTS RELATED TO AN APPLICATION FROM GENERA LIMITED FOR RENEWAL OF THEIR DISCHARGE PERMIT TO DISCHARGE CONTAMINANTS TO AIR (RESOURCE CONSENT 62719)

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1. INTRODUCTION: THE APPLICATION

Genera Limited (Genera) operates fumigation facilities at the Port of Tauranga, at sites on both the Tauranga (Sulphur Point) and the Mt Maunganui sides of the Port, and at 9 & 11 Maru Street. The operations are covered by a Discharge Permit permitting, subject to conditions, the discharge of contaminants to air (Resource Consent 62719), issued by the Bay of Plenty Regional Council on 24 May 2005. The Resource Consent has had changes to conditions approved by the Council on the 5 May 2014, 7 October 2016, 22 June 2017, 30 April 2018, 3 April 2019, and 24 April 2019. The contaminants involved are Methyl Bromide and Phosphine, which are used to fumigate logs under tarpaulins (sheets), logs in ship holds, timber under sheets, cargo in sheds and on-wharf under sheets, shipping containers and contents, and cargo in ship holds in the event of a biosecurity risk.

The Discharge Permit is due to expire on 30 April 2020. For Genera to continue to operate beyond the expiry date of the consent without the need to obtain express approval from Bay of Plenty Regional Council (BOPRC) to do so, Genera was required to apply to renew the consent prior to 31 October 2019. An application was made on the 29 October 2019, so that requirement has been satisfied. The application was accompanied by an Assessment of Environmental Effects (AEE) for the discharge of fumigants to air from the Port, prepared by Beca Limited (Beca). The AEE has eight Appendices with reports including some prepared by others, notably Golder Associates (NZ) Limited (Golder) and the Institute of Environmental Science and Research Limited (ESR).

Fumigation with methyl bromide in New Zealand is somewhat complicated in that it is subject to dual control – nationally under the Hazardous Substances and New Organisms Act via the Environmental Protection Authority (EPA) and regionally under the Resource Management Act via regional councils (in this case, the Bay of Plenty Regional Council). Alignment of requirements is an important consideration. This is particularly so regarding containment and capture of methyl bromide, commonly referred to as Recapture. This involves procedures and technology to mitigate discharges of methyl bromide to air.

Resource Consent 62719 has a condition (5C.1) with schedules to progressively increase the proportions of fumigations using Recapture. These schedules have, as indicated previously, been changed on various occasions in 2016, 2018, and 2019. For log and timber fumigations the condition requires recapture for 100% of fumigations by 31 July 2019. The condition does not differentiate between on-wharf and ship hold fumigation.

On the other hand, the Environmental Risk Management Authority (now the EPA) determined on 28 October 2010 (Determination HRC08002), amended on 17 June 2011, that recapture technology be used for 100% of fumigations using methyl bromide by 28 October 2020. This determination is currently being reassessed by the

EPA to amend the definition of “recapture technology”, and to possibly provide an exception for the fumigation of ship holds.

Genera has applied to the BoPRC to align the wording of condition 5C.1 with the EPA requirements, presumably including moving the date for the use of recapture for 100% of log and timber fumigations from 31 July 2019 to 28 October 2020. The processing of this application has not yet been finalised, although an Assessment and Recommendation on how this matter could be handled has been prepared by an independent Resource Management Act hearings Commissioner[1].

In the consent renewal application Genera proposes to include fumigants other than methyl bromide and phosphine that may be authorised by the EPA for use in New Zealand during the term of the consent (suggested to be 10 years). These additional fumigants include Ethanedinitrile, VaporMate (ethyl formate), Pestigas (a natural Pyrethrim), and artificial pyrethroids.

[1] van Voorthuysen, R., “Assessment and Recommendation Report regarding a request by Genera Limited for Council Approval to Implement Recapture on an Alternative Date pursuant to Condition 5C.1 of Consent 62719”, 23 July 2019

2. ENGAGEMENT

Kevin Rolfe Consulting Limited was engaged by the Bay of Plenty Regional Council on 4 December 2019 to:

- review the application for completeness;
- identify any further information required;
- review the peer review report of Atmospheric Science Global on the atmospheric dispersion modelling; and
- prepare a brief report on these topics.

This is the report on those topics. It is prepared as a series of comments on, respectively, the Beca Assessment of Environmental Effects (AEE); the Golder Atmospheric Dispersion Modelling (which is provided as Appendix D to the AEE); the peer review report on the atmospheric dispersion modelling of Atmospheric Science Global; and the ESR report on an Assessment of Fumigants (which is provided as Appendix F to the AEE). The first two are labelled as preliminary comments as there are to be requests for more information under section 92 of the Resource Management Act.

This report then provides Conclusions and Recommendations on those matters, especially to provide the information required by the two first items listed above as topics of engagement (that is, the completeness of the application and to identify further information that is required).

The views expressed in this report are based solely on the information provided. In particular, the report is prepared without the benefit of a visit to the Genera site including the possibility to witness fumigation operations. Such a visit is likely for early next year[2]. The author is however very familiar with the activities generally carried out in the Tauranga/Mt Maunganui area and the geography of the area.

[2] Email of 2 December 2019 from David Greaves, Enspire

3. PRELIMINARY COMMENTS ON THE BECA ASSESSMENT OF ENVIRONMENTAL EFFECTS

Section 88 of the Resource Management Act (RMA) establishes the requirements regarding an application for a resource consent. Schedule 4 of the RMA sets out the information required to accompany an application, including an Assessment of Environmental Effects (AEE). Genera engaged Beca to prepare an AEE for activities from the Port, and this has been received. It is noted that the activities carried out at 9 & 11 Maru Street are not included in the AEE. This needs to be queried.

The fumigation activities carried out by Genera are far removed from the usual activities requiring a Discharge Permit to discharge contaminants to air under the RMA. Those usual activities involve manufacturing or processing at a factory or a similar facility. Unusual features of the Genera activities include:

- They are carried out at more than one site (with twenty legally-defined on-wharf sites at the Port alone).
- They currently involve two different fumigants, and that may increase to at least five in the future.
- Discharges to air are intermittent (when fumigation is carried out).
- The quantities of discharges to air vary greatly from activity to activity, whether they be logs and timber under tarpaulins or in ship holds, cargo in sheds or on-wharf, etc.
- The use of mitigation technology is not absolute.

As with many AEEs accompanying an application for a Discharge Permit to discharge contaminants to air, the Genera AEE relies heavily on atmospheric dispersion modelling. That aspect of the application is discussed in the next section of this report.

A primary input to atmospheric dispersion modelling is the discharges quantities. The unusual features of the Genera activities make estimation of those quantities difficult. Hence it is appropriate that the atmospheric dispersion modelling be done for a series of activity scenarios, involving both typical and worst-case situations. Typical situations may involve a single activity (such as fumigation of logs under tarpaulins or in ship-holds), whereas worst-case situations may involve more than one activity going on at the time.

Another important aspect of atmospheric dispersion modelling is the meteorological conditions. Again, a scenarios approach, both typical and worst-case, could be used. The locations of sensitive receptors, such as residential areas, are a consideration in determining worst-case situations.

A primary air quality management matter consideration are measures to avoid, remedy, or mitigate adverse effects on the environment. Three are relevant to this application:

- Reduced fumigation activity
- Substitution of fumigants
- Recapture technology and alternatives

The AEE shows (at Figure 4-1) that there has been a significant decrease in recent months in the quantity of log and timber fumigations. This decrease is mainly due to the impact of the installation of a log-debarker at Murupara, in addition to the debarker at the Port. This situation is not well explained in the AEE, including whether decreases will be a continuing trend in the future.

The substitution of Phosphine for Methyl Bromide has greatly reduced the quantity of Methyl Bromide used. Phosphine is permitted for fumigating logs and timber for export to China, but not to India. China is a much larger market. Because, unlike Methyl Bromide, Phosphine is not an ozone-depleting substance, and hence it is not subject to the requirements of the Montreal Protocol on Substances that Deplete the Ozone Layer, fumigation in the holds of ships heading for China are now done in international waters. Again, this situation is not well explained in the AEE. For example, are there prospects for India to permit the use of Phosphine?

There is the also the possibility that Ethanedinitrile (EDN) will be approved for use in New Zealand. A review by Graham Environmental Consulting Ltd[3] considered different use scenarios and compared them with air quality criteria, finding most to be acceptable. WorkSafe requires more information about certain risks and available mitigation measures before they can determine what requirements they will put on the use of EDN. Again, the AEE has left this matter inconclusive. Is resolution likely?

Recapture technology is an important consideration. The author of this report was impressed by the coverage of Recapture technology, including the more useful concepts of Recapture and Destruct and Recapture and Reuse of Methyl Bromide, in a recently revised report by Jack Armstrong[4]. Such information, especially as further developments may occur, should feed into this application process.

It is pleasing that consultation is taking place, including with the Iwi/Hapu of the area, and especially given the proximity of the Whareroa Marae. The designated contact person for Iwi/Hapu matters, Julien Huteau, has been supplied with documents, but his response is not recorded. This is another matter that the AEE should clarify.

[3] Graham, B., "Review of an Assessment of Ethanedinitrile for Log Fumigation", a report to the Environmental Protection Authority, April 2018

[4] Armstrong, J., "Revised Review of Proposed Concepts and Technologies to Recapture and/or Destroy Residual Methyl Bromide (MB) after Log Fumigations at New Zealand Ports", a report prepared for the Stakeholders in Methyl Bromide Reduction (STIMR) Board, June 2019

4. PRELIMINARY COMMENTS ON THE GOLDER ATMOSPHERIC DISPERSION MODELLING

Appendix D to the AEE is a report[5] by Golder Associates (NZ) Limited (Golder) on the atmospheric dispersion modelling of methyl bromide from the Genera activities. The report is labelled Rev. 2., although Rev. 1 is not referred to. The peer review of the atmospheric division modelling by Atmospheric Science Golder, referred to the next section of this report, provides that information, viz, that Golder originally produced a report on atmospheric dispersion modelling in July 2019.

The key assumptions that Golder used in the latest modelling were:

- A maximum methyl bromide usage of 450 kg/hr and 150,000 kg/year.
- The use of recapture achieves an 80% reduction of the headspace methyl bromide available at the end of the fumigation period.
- Recapture is undertaken on 80% of log stacks ventilated in an hour.
- Ships holds are ventilated sequentially with one hold per two hours.

This is quoted as to be Genera's future operation situation, but, with the potential developments that are referred to the previous section of this report, such as, the quantity of fumigation may continue to decrease, methyl bromide may be increasingly replaced by other fumigants, and recapture technology may develop and be more increasingly used, those assumptions may not be correct. Only Genera can answer that and include it in this application.

The Beca report, at Table 5 page 32, compares the model assumptions used by Golder with methyl bromide fumigation practice and concludes the model assumptions are conservative. For example, with the decrease in the number fumigations being carried out the maximum methyl bromide usage may be 69 kg/hr, rather than 450 kg/hr.

The atmospheric dispersion modelling for methyl bromide uses the CALMET meteorological datasets for the Tauranga and Mt Maunganui area, developed by Atmospheric Science Global and provided by the Bay of Plenty Regional Council. CALMET was run for the years 2014, 2015, and 2016. The dispersion modelling was done using CALPUFF (version 7.2.1). 1-hour, 24-hour, and annual average concentrations were predicted, and compared with the air quality criteria for methyl bromide of 1ppm, 0.333ppm, and 0.0013 ppm, respectively.

[5] ------, "Technical Air Quality Assessment", Golder Associates (NZ) Limited, a report submitted to Genera Limited, October 2019

Isopleths (contour maps) are provided as an Appendix to the Golder report for the following scenarios:

- Maximum 1-hour average, for log stack fumigation only
- Maximum 1-hour average, for ship hold fumigation only
- Maximum 1-hour average, for both log stack and ship hold fumigation
- Maximum 24-hour average, for log stack fumigation only
- Maximum 24-hour average, for ship hold fumigation only
- Maximum 24-hour average, for both log stack and ship hold fumigation
- Maximum annual average, for both log stack and ship hold fumigation
- 99th percentile 1-hour average, for log stack fumigation only with 80% Recapture
- 99th percentile 1-hour average, for log stack fumigation with 80% Recapture and ship hold fumigation
- 99th percentile 24-hour average, for log stack fumigation only with 80% Recapture
- 99th percentile 24-hour average, for log stack fumigation with 80% Recapture and ship hold fumigation

Some comments on the results: First, the modelling only relates to discharges of methyl bromide. Although the dispersion of other fumigants will be the same, the discharge quantities and the air quality criteria will differ. Second, given the regular use of Recapture only those scenarios are relevant. Third, given the intermittent nature of the Genera activities and the variable discharge rates, the maximum, rather than 99th percentile, results are more valid. Fourth, the utility of the annual average modelling is questionable. It would be useful to have shorter term, say, 10-minute average predictions.

The results clearly show that ship hold fumigation is the predominant source of discharges leading to highest predicted concentrations, some in excess of air quality criteria beyond the boundary of the site, and that the greatest possible use of Recapture is an essential air quality management consideration.

An important document in respect to air quality management of the Genera activities is the Fumigation Management Plan (FMP)[6]. It is described as a 'living document' that will be updated and amended as circumstances require. The changes that have occurred since April 2019 in the nature of the Genera activities should require an update to the FMP.

[6] Frentz, K., "Fumigation Management Plan", Beca Limited, a report preferred for the Bay of Plenty Regional Council on behalf of Genera Limited, 26 April 2019

5. COMMENTS ON THE ATMOSPHERIC SCIENCE GLOBAL PEER REVIEW

Atmospheric Science Global Limited (ASG) has written a report[7] which, inter alia, peer reviews the latest (October 2019) atmospheric dispersion modelling carried out by Golders. ASG has, like Golder, been involved in this matter for some months. This latest report follows one in October 2019 on modelling carried out by Golders in July 2019.

ASG notes the changes (decreases) to the discharge quantities between the earlier modelling and the latest modelling, plus the addition of the possible use of other fumigants. Specific mention is also made of the assumption of sequential opening of ship holds, two hours apart and over-night.

Concerns are expressed that the discharge rates may be under-estimated. These concerns are valid. An example is the venting of ship holds. It is unlikely that the release rate will be evenly distributed over the two hours of ventilation, with a much higher initial rate expected. Also, there is doubt expressed about the percentage of the fumigant dose that will be released.

ASG is justifiably concerned that some details of the methods used in the modelling, and no control files or hourly discharge files, are supplied. This clearly makes a peer review of the modelling incomplete.

ASG advocates the use of the maximum, rather than the 99th percentile, values for reporting the results of the modelling for this application. Valid reasons for that view are given. The variable discharge rates from the Genera activities make it quite different from usual activities, and hence the generally prevailing use of the 99th percentile does not apply.

[7] Barclay, J., "Review of (Beca, latest Golder modelling and ESR) Genera Air Assessment for Fumigant Release at the Port of Tauranga", Atmospheric Science Global Limited, prepared for the Bay of Plenty Regional Council, December 2019

6. COMMENTS ON THE ESR REPORT ON ASSESSMENT OF FUMIGANTS

Attached as Appendix F to the AEE is a report by ESR[8] which provides, essentially, a literature survey of the health effects of fumigants (methyl bromide, phosphine, and cyanogen – commonly referred to as Ethanedinitrile). Whilst there is nothing especially wrong with the information in the report, it being not dissimilar to the previous work of the author of this report on the development of Air Quality Guidelines both internationally, as the Air Quality Management Specialist with the World Health Organization, and locally in New Zealand for the Ministry for the Environment, and then reviews of the National Environment Standard for Air Quality for the Minister for the Environment, the ESR report does not provide specific criteria relevant to assess the results of atmospheric dispersion modelling for this particular application.

An important first point is that the primary issue under consideration in this application for the renewal of a Discharge Consent under the Resource Management Act (RMA) is the air quality impacts on the general population from discharges of contaminants to air. Hence, whilst reference to the health effects of occupational exposures to those contaminants usefully inform the potential toxicological effects of those contaminants, the setting of appropriate criteria to assess air dispersion modelling, must take into account that it is all members of the community – including infants and the elderly, living in the nearby sensitive localities – and not just healthy workers, that are the population of interest. Air quality criteria based on worker exposures are a matter for other legislation, such as the Health and Safety at Work Act, and not directly the consideration of this application under the RMA.

An important second point is the nature of the fumigation processes. The discharges to air from fumigation are not continuous, such as those from a factory, but can occur only when the fumigation processes are being carried out. The atmospheric dispersion modelling should reflect that aspect.

A third factor is that the exposures of concern are those over a short-term duration (that is, acute exposures), with inhalation being the exposure pathway. The air quality criteria to assess the results of the atmospheric dispersion modelling should be based on this. In many respects the atmospheric dispersion modelling requirements are similar to those for odour – that is, occasional short-term exposures.

The air quality criteria to assess the results of the atmospheric dispersion modelling should be that for acute exposures, up to a maximum of 24-hour averaging times. The Environmental Risk Management Authority – ERMA (now the Environmental Protection Authority - EPA) has determined Tolerable Exposure Limits (TELs) for Methyl Bromide, and the EPA has proposed a TEL for Ethanedinitrile.

[8] Cressey, P.: "Assessment of Fumigants Used in the Treatment of Timber", the Institute of Environmental Science and Research Limited (ESR), July 2019

What are required as criteria for assessment of atmospheric dispersion modelling from fumigation using Methyl Bromide, Phosphine, and Ethanedinitrile are concentrations for, say, 24-hour, 60-minute, and 10-minute exposures. The ESR report has the data to derive those. Such conventions as a power law [$C_2/C_1 = (T_1/T_2)^n$, where C is the concentration, T is the averaging time, and n is an exponent, of typical value 0.2 - 0.3) could be used to do so[9]. Various approaches to derive air quality criteria from toxicological data are outlined in the Environmental Services Australia report[10] which led to Ambient Air Quality Guidelines for hazardous air contaminants in New Zealand.

The criteria should apply at any location beyond the boundary of the Genera site.

[9] The two ERMA criteria for 24-hour (0.333ppm) and 1-hour (1ppm) exposures to methyl bromide suggest an exponent of about 0.35.

[10] Chiodo, J. and Rolfe, K., "Health effects of eleven hazardous air contaminants and recommended evaluation", Environmental Services Australia, a report prepared for the Ministry for the Environment, Air Quality Technical Report 13, October 2000, available at https://www.mfe.govt.nz/sites/default/files/11-hazardous-air-oct00_0.pdf

7. CONCLUSIONS

Is the application complete? The answer is clearly 'no'. This report identifies shortcomings in the coverage of the AEE and supporting documents in the areas of:

- Whether the application is also for a continuation of fumigation activities at 9 & 11 Maru Street
- The reduced fumigant activities and the likelihood such reductions will continue
- The substitution of other fumigants for Methyl Bromide
- Developments in Recapture technology and alternatives
- Whether the consultation, especially with Iwi/Hapu have been resolved
- The chosen scenarios for the atmospheric dispersion modelling
- The air quality criteria and the averaging times to assess the results of the atmospheric dispersion modelling
- The currency of the Fumigation Management Plan

On the other topics included in this report, the views of ASG on shortcomings in the modelling are supported. The toxicological information in the report by ESR is sound, as far as it goes, but it needs to go the final step of developing air quality criteria for acute exposures (down to an averaging time of say, 10-minutes) to the three contaminants involved – Methyl Bromide, Phosphine, and Ethanedinitrile.

8. RECOMMENDATIONS

The author of the report has seen an email[11] with a draft letter of request under section 92 of the RMA for further information to support this application. Those matters are generally supported.

What needs to be added are the various shortcoming identified in this report. In particular, there needs to be more information about:

- The reduced fumigant activities and the likelihood such reductions will continue
- The substitution of other fumigants for Methyl Bromide
- Developments in Recapture technology and alternatives
- The chosen scenarios for the atmospheric dispersion modelling
- The air quality criteria and the averaging times to assess the results of the atmospheric dispersion modelling

Most of those items will probably need to be provided by Genera, rather than by their consultants.

[11] Email of 6 December 2019 from David Greaves, Enspire