Assessment of Effects - Discharges to Air from Methyl Bromide Fumigation

Prepared for UML

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Executive Summary

Urlich Milne Lawyers (UML) is applying to Bay Of Plenty Regional Council for resource consent for the discharge of contaminants to air from fumigation of logs at the Port of Tauranga (the Port). Quarantine conditions require that timber logs for export to some countries undergo specified pre-shipment fumigation treatment.

Beca Ltd (Beca) has been commissioned by UML to prepare an assessment of the environmental effects (AEE) of the discharge of fumigants to air at the Port.

Pre-shipment fumigation of logs currently takes place at the Port. UML proposes to use comparable fumigation procedures to those currently used at the Port. Fumigation will be carried out in either the holds of the bulk carrier vessels (bottom stow) or on-shore under tarpaulins and then loaded onto the bulk carrier (top stow).

In order to better the process, UML proposes to use forced ventilation procedures to improve the dispersion of pollutants during poor dispersion conditions. During forced ventilation one end of the sealed log row will be connected to a portable extraction fan unit and the residual fumigant will be discharged to air from a flue stack. UML also proposes to have the facility to mechanically ventilate ships’ holds.

The assessment of potential environmental effects is based on the results of past methyl bromide monitoring studies conducted during fumigations, and atmospheric dispersion modelling. Dispersion modelling indicates that forced ventilation can enhance pollutant dispersion relative to passive ventilation; particularly during low wind speed conditions. Dispersion modelling predictions have been compared to the tolerable exposure limits (TELs) defined in the HSNO Regulations for the protection of human health.

The total number of fumigations conducted at the Port during any period is controlled by external parties (i.e. log exporters) and is not expected to increase with the addition of a new fumigation service provider. Furthermore, a second fumigation service provider at the Port will have a positive effect as it is expected to introduce better environmental practice due to competition.

The conclusion of the assessment of effects is that off-site concentrations of methyl bromide can be limited to levels that do not exceed the TELs, provided the appropriate management and monitoring procedures are implemented. Under these conditions any potential adverse effect of discharges will be no more than minor.

This conclusion is based on the following:

- the appropriate separation distance between the closest sensitive receptors and the site fumigation activities;
- current monitoring results which demonstrate that no exceedances of the TEL have been recorded outside the Port boundary or at other New Zealand ports;
- methyl bromide levels will be continuously monitored during ventilations and these measurements will be used to inform the site’s management procedures as ventilation is occurring;
- the number of ventilations per hour will be managed using look-up tables;
- annual methyl bromide usage at the port and discharges to the atmosphere will not increase as a consequence of the proposed activity; and
- the modelling assumptions are highly conservative.

Overall it is considered that the granting of this application for resource consent would be consistent with the purpose and principles outlined in Part II of the Resource Management Act 1991.
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1 Introduction

1.1 Background

Quarantine conditions require that timber logs for export to specific countries undergo specified pre-shipment fumigation treatment. Urlich Milne Lawyers (UML) proposes to provide pre-shipment fumigation services on logs at the Port of Tauranga (the Port).

UML proposes fumigating logs both on-shore under tarpaulins and also in ship holds. After treatment the fumigated logs will be ventilated to air and the residual fumigant discharged to air. Logs may be fumigated with phosphine or methyl bromide. However, only methyl bromide will be discharged to air at the Port.

Phosphine fumigations occur only in the vessel’s cargo-holds and continue in-transit. Ventilation takes place at sea or just prior to berthing at the destination port.

Pre-shipment fumigations on logs currently take place at the Port. The fumigation service provider, Genera Ltd, is currently consented to discharge fumigants to air by the Bay of Plenty Regional Council (Consent Number 62719). UML will use comparable fumigation procedures to those currently used at the Port. In order to improve the process, UML proposes to use alternative forced ventilation procedures to improve the dispersion of pollutants during worst-case dispersion conditions.

Beca Ltd (Beca) has been commissioned by UML to prepare a resource consent application and an associated Assessment of Environmental Effects (AEE) of the discharge of fumigants to air at the Port.

1.2 Status of the activity

The discharge to air from a fumigation activity is classified as a discretionary activity under Rule 19 of the Bay of Plenty Regional Air Plan (Air Plan).

In addition to requiring resource consent under the Air Plan, methyl bromide usage is controlled under the Hazardous Substances and New Organism (HSNO) Act (1996). The controls cover the importation, transport, storage, use and disposal of methyl bromide. They include requiring:

- special license to possess methyl bromide
- compliance with a chronic TEL
- signs to be erected at the site where methyl bromide is used
- prior and post-notification of fumigation activities
- emergency plans
- personal protective equipment to be worn while working with the substance
- tracking of methyl bromide at all stages of its life cycle
- minimum buffer zones
- air quality monitoring, annual reports and notification.
1.3 Purpose

The purpose of this report is to provide an Assessment of Environmental Effects (AEE) to accompany an application for resource consent to discharge contaminants to air.

This AEE describes the environmental effects of the discharge of contaminants to air resulting from the proposed methyl bromide fumigation activities. This report describes:

- a summary of the proposed activity
- the nature of the discharges
- the receiving environment in terms of effects of the emissions from the site
- the mitigation measures
- an assessment of effects of the discharges
- proposed monitoring procedures
- the relevant statutory documents.
2 Site description

2.1 Site location

Log fumigation will occur at the Port of Tauranga, Tauranga City. The Port site and the surrounding area are shown in Figure 2-1. Fumigation activities will occur within specified areas of the Port.

2.2 Address, legal description and map reference

The specific site details are:

Address: Port of Tauranga

Legal description: Lot 1, DP 311509 and Crown Land (seabed), Block VI, Tauranga SD (Tauranga District)

Map Reference: At or about NZMS 260 U14: 910-887

(Fumigation areas are located approximately between U14: 911-989 to U14: 910-881)

2.3 Local land use activities and zoning

The Port is zoned Port Industry in the Tauranga City Plan. The land surrounding the Port is predominantly zoned as Port Industry, Industry and Rail. The Rail-zoned area forms part of the Mount Maunganui Branch Railway which services the port. The railway bisects the port area.

In the vicinity of the site there are numerous activities which also discharge contaminants to air. These include the following:

- The railway line and yard
- Ballance Agri-Nutrients fertiliser works
- Lawter Chemicals
- Inghams feed mill
- Palm kernel storage facility

Industrial premises are located on the boundary of the Port. Maximum methyl bromide concentrations will occur in the industrial area adjacent to the Port’s fumigation zones. Based on guidance provided by the Ministry for the Environment (MfE) these areas are considered to be of low sensitivity.¹

The nearest sensitive receptors to any of the port fumigation areas are the residential properties on Tawa Street, which are located approximately 380m to the east of the nearest log fumigation area, and 920m to the north east of berths #10 and #11 where ship hold fumigation occurs. Other sensitive areas include the Wareroa Marae located approximately 600m to the south of the port’s closest fumigation area, and the Blake Park sports fields located approximately 240m to the east of the closest fumigation area.

The nearest commercial zone to any of the Port’s fumigation areas is located on Phoenix Lane at the northern end of the port. The commercial zone is approximately 500m to the north of the nearest log fumigation area.

Cruise ships visiting Tauranga berth at the Port’s northernmost berth (berth #1). A cruise ship would be located approximately 750m to the north of the closest of the log fumigation areas, and approximately 1.5km from berths #10 and #11.

2.4 Topography

The topography of the area can influence wind flows and the dispersion of contaminants emitted from the site. Elevated terrain in proximity to an emission source may also lead to an impingement of the emission plume at raised locations and a potential for higher concentrations than at lower elevations.

The Port and surrounding area is relatively flat. No topographical features in the vicinity of the Port would be expected to affect the dispersion of methyl bromide outside the Port boundary.

Proximity to a coastline can also influence meteorological conditions. Coastal effects can include land/sea breezes regimes, and the channeling effect of wind flows along the coastline. These effects are discussed further below (Section 2.5).

2.5 Meteorological conditions

Weather conditions, particularly wind speed and direction, influence the dispersion of contaminants. The main meteorological factors which influence pollutant dispersion are wind speed and atmospheric stability.

The closest meteorological station to the site is at Tauranga Airport (NIWA Site ID number 1615), which is located approximately 1.2km to the southeast of the site. There are no significant topographical features between Tauranga Airport and the site. Wind data for Tauranga Airport is therefore likely to provide a very good representation of average wind conditions at the site.

Figure 2-2 shows the distribution of hourly average wind speed and direction measured at Tauranga Airport for 2009 - 2012. The wind rose shows that winds blow predominantly from the west to southwest. Strong winds come from all directions but most frequently from the west to southwest. The average wind speed recorded during the four year period was 3.8m/s and calm conditions (i.e. wind speeds less than 0.5m/s) account for less than 0.8% of time.

Meteorological conditions vary with respect to the time of day, which will influence pollutant dispersion. Day time (based on typical working hours of 8am to 5pm) and night time wind conditions are shown in Figure 2-3 and Figure 2-4. During the day time, the wind roses show higher average wind speeds and an increased frequency of northeast winds. During northeast winds, pollutants discharged from the fumigated logs will be transported away from the port’s eastern boundary where the potential exposure to the public is greatest.

When log rows are passively ventilated, the maximum downwind concentrations are expected to occur when the fumigated log row covers are removed during low wind speeds. However, most of the methyl bromide discharges will occur during the working day period when higher average wind speeds occur and dispersion conditions are more favourable.
Figure 2-2. Wind speed and wind direction distribution recorded at the Tauranga Airport meteorological monitoring station (2009 - 2012)

Figure 2-3. Day time (8am – 5pm) wind speed and wind direction distribution recorded at the Tauranga Airport meteorological monitoring station (2009 - 2012)
Figure 2-4. Night time (5pm – 8am) wind speed and wind direction distribution recorded at the Tauranga Airport meteorological monitoring station (2009 - 2012)

Figure 2-5 shows the average wind speed measured at the airport with respect to time of day and season. The figure similarly shows the higher average wind speed during the ‘working day’ compared with night time conditions. Higher average day time wind speeds occur in the summer and spring months compared with those in winter and autumn.

The diurnal wind speeds shown in Figure 2-5 indicate that wind speed generally increases during the working day. Therefore dispersion conditions are expected to improve during the working day.

At the Tauranga Airport monitoring station average hourly wind speeds of less than 3m/s occur for approximately 24% of day time hours (i.e. between 8am and 5pm). For approximately 52% of these hours (or 12% of all hours between 8am and 5pm) the wind direction is between 180° and 360° when methyl bromide discharges could potentially disperse towards the Port’s eastern boundary.

During low wind speed conditions UML will have the option to use forced ventilation procedures to improve pollutant dispersion (refer section 4.1.1).
2.6 Background air quality

Discharges of methyl bromide from the existing fumigation activities at the Port are the only known emission source of methyl bromide in the vicinity of the Port. During ventilation, site operators are required to monitor methyl bromide levels at or near the Port boundaries.

Summary methyl bromide monitoring reports submitted to the Environmental Protection Authority (EPA) for the years 2011, 2012 and 2013 indicate no breaches of the 1-hour average, 24-hour and annual average tolerable exposure levels (TELs) (refer section 4.4) have been measured at the Port of Tauranga perimeter during fumigation. However, there is no continuous monitoring of methyl bromide levels at the Port from which an accurate assessment of annual methyl bromide level can be currently assessed.
3 Description of the activity

3.1 Overview
Quarantine conditions require that timber logs for export undergo specified pre-shipment fumigation treatments. Pre-shipment fumigation services are currently provided at the Port of Tauranga by one other company (Genera Ltd). UML fumigation procedures will be comparable to those which currently occur at the Port. The total number of fumigations conducted at the Port during any period is controlled by external parties (i.e. log exporters) and will not increase with the addition of a new fumigation service provider.

UML proposes using alternative ventilation systems to improve the dispersion of methyl bromide and reduce potential off-site concentrations.

3.2 Fumigation procedure
Logs will be fumigated pre-shipment using either methyl bromide or phosphine. Fumigation will occur in either the holds of the bulk carrier vessels (bottom stow) or on-shore under tarpaulins with the logs then loaded onto the bulk carrier (top stow).

Bottom stow fumigations (in cargo holds):
Bottom stowed logs can be treated with both methyl bromide and phosphine. Each importing country has its own quarantine treatment requirements.

Bottom stowed logs treated with phosphine are ventilated while the vessel is in-transit, hence no phosphine gas is ventilated inside the port limits. Therefore, phosphine discharges have not been considered further in this assessment. Methyl bromide will be discharged to air within the port limits.

Bottom stowed logs are loaded into the vessel’s cargo holds untreated. Once loading is completed the cargo-holds are sealed and methyl bromide is used to fumigate the cargo in the holds.

Bottom stow fumigations with methyl bromide take place at berths #10 and #112. Under the Hazardous Substances (Classes 6, 8 and 9 controls) Regulations 2001, a 50m or 100m buffer zone needs to be maintained during fumigation (and ventilation), the distance depending on methyl bromide usage.

The volume of methyl bromide used in a bottom stow fumigation depends on the cubic capacity of the vessel’s cargo holds and the required treatment dosage. A typical bulk carrier vessel used to carry logs has a total cubic capacity of 40,000m³.

Methyl bromide used to fumigate bottom stow logs is ventilated into the atmosphere within the port limits. Under current procedures, methyl bromide is ventilated passively into the atmosphere, in almost all wind conditions, by the opening of the ship hold at the end of the fumigation period. To assist with dispersion in low wind speed conditions, UML proposes the use of a fan-forced ventilation system and flue stack to improve pollutant dispersion.

Top stow fumigations (under tarpaulins):
Logs are arranged in the log yard to form log rows. The size of each log row will vary due to differences in length, width and height. The number of log rows fumigated for a single vessel generally ranges between 15

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Only these two berths are equipped with the shore-side cranes required to load the bulk carriers with logs.
and 25 rows. The location of log rows within the designated fumigation zones may also vary, and log rows
designated to a specific vessel will not necessarily be located next to one another.

A minimum buffer distance of 50m is required for log row fumigation under tarpaulins (HSNO controls).

Log rows are currently fumigated in the Port’s designated fumigation areas (refer Appendix 1). Log
fumigations currently occur at the Port in zones #1, #2, #3 and #6, predominantly in zones #2 and #3.
Currently no log fumigations are permitted to occur closer than 100m from the port boundary.

Most of the log fumigation zones at the Port are located more than 150m from the site boundary. However,
log row fumigation could potentially occur closer in the northern port fumigation area adjacent to berth #6
(zone #6), and in the port’s southern fumigation area (zone #2). Fumigation in zone #6 may occur 100m from
the boundary, and in zone #2 within 50m. The closest off-site property to zone 6 is the rail yard, and to zone
#2 an industrial tank farm. Both adjacent sites are low sensitivity receptors.

In addition to these areas UML also proposes to undertake fumigations in zone #4, subject to approval by
the Port of Tauranga. Zone #4 is located within 100m of the Port boundary and is not currently used for
fumigation purposes. Proposed fumigations in zone #4 will only occur in areas which are at least 50m from
the Port boundary and will therefore comply with the HSNO Act requirements.

Each log row is covered with a tarpaulin and a ‘water snake’ is used to achieve an airtight seal between the
tarpaulin and the fumigation pad. Methyl bromide is the only fumigant currently used for top stow
fumigations. Once the required time has passed, log rows which have been treated with methyl bromide are
ventilated to the atmosphere.

The total volume of methyl bromide used for a top stow fumigation depends on the following factors:

- required treatment dosage
- size of the cargo to be loaded as top stow on board the bulk carrier vessel
- stowage factor, which represents the ratio of space required to stow a unit of cargo under the tarpaulin in
  the log row.

A typical 40,000m³ bulk carrier will load approximately 8,000 Japanese Agricultural Standards (JAS) of top
stow cargo. The log rows’ length, width and height are measured by the fumigators to determine the volume
of space to undergo fumigation. A load of 8,000 JAS will typically occupy 15,200m³ of space.

Timing of top stow fumigations

Log rows typically remain ‘under gas’ for a period of 16-24 hours. Top stow fumigations are timed so that the
treated logs are ventilated and ready for loading by the time the bottom stow cargo has completed loading.
When bottom stow cargo is treated with methyl bromide, the ventilation of the top stow cargo is timed to not
coincide with the ventilation of the bottom stow cargo. Only once the bottom stow cargo has been ventilated
and deemed gas-free can loading of the top stow cargo commence.

Under current procedures, log rows at the Port are passively ventilated in almost all wind conditions by
peeling off the tarpaulin cover at the front and back of the row. UML proposes using both forced ventilation
and passive ventilation procedures (refer section 4.1). The forced ventilation procedure will provide improved
pollutant dispersion during worst case dispersion conditions.

Chemical dosages
Different export markets specify different chemical treatments and dosages. The two main markets for New Zealand logs are China and India. China will accept cargo fumigated with either phosphine or methyl bromide. India requires that methyl bromide is used to treat all cargo (bottom stow and top stow). Phosphine fumigation is slower and is carried out for the bottom stow cargo once the ship has sailed, due to the length of time required.

Top stow cargoes destined for China are treated exclusively with methyl bromide.

Dosage rates vary according to the temperature and log destination (refer Table 3-1).

Table 3-1. Summary of prescribed methyl bromide dosage and treatment duration

<table>
<thead>
<tr>
<th>Destination</th>
<th>Temperature</th>
<th>Dosage (g/m³)</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>&gt; 15°C</td>
<td>80</td>
<td>16 hours</td>
</tr>
<tr>
<td>China</td>
<td>5°C - 15°C</td>
<td>120</td>
<td>16 hours</td>
</tr>
<tr>
<td>India</td>
<td>&gt; 21°C</td>
<td>48</td>
<td>24 hours</td>
</tr>
<tr>
<td>India</td>
<td>16°C - 20°C</td>
<td>56</td>
<td>24 hours</td>
</tr>
<tr>
<td>India</td>
<td>11°C - 15°C</td>
<td>64</td>
<td>24 hours</td>
</tr>
<tr>
<td>India</td>
<td>10°C - 11°C</td>
<td>72</td>
<td>24 hours</td>
</tr>
</tbody>
</table>
4 Nature of the discharges

4.1 Discharges to air

Methyl bromide will be discharged to air during the ventilation of fumigated log rows and ship holds.

4.1.1 Ventilation of log rows

The ventilation of top stow cargo is timed so that it commences immediately prior to loading. UML proposes ventilating log rows using two different methods:

- Forced ventilation through a flue stack, and
- Passive ventilation, by lifting ends of the tarpaulin.

4.1.1.1 Forced log row ventilation

During forced ventilation one end of the sealed log row stack will be connected to a portable extraction fan unit and the other end to an air intake grill. The ventilation air will be discharged to air from a flue stack. The ventilation flow rate will be approximately 3m$^3$/s.

The flue stack is expected to be approximately 6m above ground level to provide adequate dispersion. The flue stack will typically be 2m higher than the log rows. The portable stack will be located as far as practicable away from the Port boundary and other sensitive receptors.

Each row will be mechanically vented for approximately 15-20 minutes. After this period the log rows will be passively ventilated. Emission testing conducted at Port Nelson in 2007\(^3\) using a comparable mechanical system, but at a lower air flow rate, indicates this ventilation period should be sufficient for most of the methyl bromide to be discharged to atmosphere during the forced ventilation.

Forced ventilation procedures will be used predominantly during low wind speed conditions to improve pollutant dispersion during worst case meteorological conditions. Dispersion modelling studies indicate forced ventilation can enhance pollutant dispersion relative to passive ventilation, particularly during low wind speed conditions (refer Appendix 4).

4.1.1.2 Passive log row ventilation

During passive ventilation the tarpaulin at each end of the log row will be lifted by approximately 1m above ground level.

Ambient monitoring conducted near ventilating log rows indicates that most of the immediately available methyl bromide is discharged over a period of five to 15 minutes when tarpaulins are completely removed from the fumigated log rows. However, UML’s proposed procedure of exposing only part of the ends of each log row during ventilation may extend the emission period by limiting the rate at which ambient air ventilates the log row.

\(^3\) Tent Fumigation Leakage Assessment – Port Nelson, March 2007. Reported prepared by SKM for Genera Ltd.
4.1.1.3 Frequency of log ventilations

The number of ventilations per hour will be managed by onsite fumigation personnel by referencing ‘look-up’ tables. The look-up tables will specify the maximum number of log rows in a group of six located in close proximity that may be ventilated per hour for each of the ventilation zones. The maximum number of logs in a group which may be ventilated per hour will be limited to six.

The tables have been designed to manage the hourly discharge rate from the ventilated log rows with regards to dispersion and emission conditions. The numbers of log rows that are allowed to be ventilated per hour have been specified so that 1-hour TEL concentrations are not predicted to be exceeded outside the Port boundary.

Maximum allowable ventilation rates in the look-up tables are defined with regards to the following factors:

- The method of ventilation (i.e. forced or passive ventilation)
- The log row’s methyl bromide dosage (g/m³) (refer Table 3-1)
- Wind speed category (i.e. 0 to 1.5 m/s, 1.5 to 3.5 m/s, 3.5 to 5 m/s, and >5 m/s)

Prior to each log row ventilation, wind speed measurements will be taken by onsite fumigation personnel to determine the wind speed category. It should be noted that the wind speed categories in the tables are defined relative to an anemometer height of 10 m above ground level.

The number of allowable log row ventilations in general decreases with increasing dosage rates and increases with increasing wind speed. During low wind speed conditions higher ventilation rates are generally associated with forced ventilation procedures.

Separate look-up tables have been developed for each of the Port’s fumigation areas. Ventilation rates in each fumigation area will vary based on the distance that separates the fumigation area from the Port’s nearest boundary. Therefore, for zone #3, which is further from the Port boundary than zone #4, the number of allowable ventilations is generally higher (assuming the same wind speed and dosage conditions).

The maximum number of ventilations per hour has been derived from dispersion model predictions. The number of ventilations specified in the table corresponds to the maximum number of ventilations that could occur and methyl bromide concentrations not exceed the one hour TEL outside the Port boundary. Ventilation limits are based on worst case dispersion (i.e. wind speed and direction) and discharge conditions (i.e. log row location and proximity to each other). Allowable ventilation limits in the tables have been based on the lowest number of ventilations predicted for wind speeds in the category. The defined discharge limits are therefore conservative. The look-up tables and methodology used in their construction is detailed in Appendix 5.

It should be noted that allowable number of ventilations in the tables does not vary with wind direction. Consequently the same number of allowable ventilations is defined for winds in the direction of the Port’s eastern boundary as for those away from it (i.e. towards the harbour). This approach simplifies ventilation procedures and provides assurance that concentrations outside the boundary would not exceed TEL limits as a consequence of changes in wind direction.

The number of log row ventilations that may occur in close proximity includes those that may be undertaken by other fumigation operators at the Port. UML will coordinate ventilation with other operators at the Port and will seek to conduct ventilations in areas where other operators are not ventilating during the same hour.
It is important to also note that additional groups of log rows (each group consisting of no more than six log rows) may also be ventilated during the same hour in other areas of the Port. The number of ventilations per hour in these areas will similarly be determined by the look-up tables. However, to avoid potential cumulative effects a minimum separation distance of 100m will be maintained between groups.

Onsite ventilation procedures will be detailed in the site management manual.

4.1.1.4 Monitoring of the release

During the discharge period, ambient methyl bromide concentrations will be continuously monitored and compared against the Workplace Exposure Standards (WES) and TEL criteria levels. The ventilation of rows will be managed accordingly so that levels do not exceed the criteria values. Management options include:

- Increasing the distances between discharge points, thereby increasing pollutant dispersion
- Increasing the time period between discharges
- Ceasing log ventilations (i.e. recovering log rows or turning off the mechanical ventilation system)

Procedures will be detailed in the site management manual.

Other uncontrolled discharges to air may also occur through leaks or tears in the tarpaulins or during strong winds when the tarpaulins break free from the ‘water snake’ seals which surround the logs. Fumigant operations are typically restricted to periods when winds speeds are below 25 knots (i.e.12.8m/s) to avoid such events. Uncontrolled releases are required to be documented and reported to the EPA.

4.1.2 Ventilation of ship holds

UML also proposes to mechanically ventilate ships’ holds. Each ship’s hold contains two man-ways. One man-way is generally located aft of the cargo hold and the second forward of the cargo hold. A mechanical axial blower will be placed on top of one of the two hold’s man-ways and a 4m plastic flue connected to the other. The flue will be approximately 8-9m above the surrounding ground level. The height of the discharge is designed to improve dispersion of the discharged methyl bromide.

During ventilation, fresh air will be forced into the hold by the blower, and the air in the hold forced out through the flue stack. The concentration of the methyl bromide discharged from the flue stack will decrease over time as more fresh air enters the hold and dilutes the hold air containing the residual methyl bromide. Each mechanical blower is expected to have an air flow rate of approximately 2.4m$^3$/s.

Ship’s holds are usually ventilated passively as the hold covers are increasingly opened over time. Ventilation rates will vary with regards to wind conditions and the rate at which the holds are opened*. The forced ventilation system is expected to provide a greater control on discharges compared to passively ventilated holds by controlling the hold’s air exchange rate. Discharges can also be stopped at any time during the ventilation procedures by turning off the fan unit.

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4.1.2.1 Duration and timing of release

The ventilation of each of the ship’s holds will occur until methyl bromide concentrations measured inside the hold are below 5ppm. Release rates from ship’s holds are typically very low\(^5\) and ventilation can occur up to 12 hours before concentrations are below the 5ppm level.

For cargoes being treated to Indian quarantine specifications, the log rows are usually ventilated six hours after the cargo holds commence ventilation. Therefore, discharges from the log rows will not occur at the same time as peak emissions from the ship holds occur. Thus there is not expected to be any significant cumulative effect of discharges from the holds and log rows on ambient methyl bromide levels.

4.2 Emission rates

The amount of methyl bromide emitted to the atmosphere during ventilation will vary according to the:

- volume of logs fumigated;
- fumigation dosage rate (refer Table 3-1); and
- amount of methyl bromide absorbed during the fumigation period.

The fumigant absorption rates would also be expected to vary with climatic conditions. Therefore, total methyl bromide emission rates would be expected to be variable even if dosage rates were known.

Quarantine requirements dictate that methyl bromide levels are to be ‘topped up’ if after a 24-hour treatment period concentrations reduce to below 30% fumigant initial dosage. The quarantine conditions indicate that fumigant levels are expected to decrease over time as they are absorbed by the log, but at least 30% of the dosage should remain to be discharged to the atmosphere during ventilation.

These levels are consistent with emission testing conducted at the Port Nelson\(^6\) in 2007 during which discharges from a fumigated timber stack were mechanically ventilated to air through a flue stack. The system used there is comparable to the portable mechanical ventilation system that is proposed by UML.

A summary of the measured methyl bromide emission rates during the ventilation period are shown in Figure 4-1. Methyl bromide emission rates were highest during the first 1.5 – 2 hours of the ventilation. During this period 31%- 37% of the initial dosage was estimated to have been discharged to air through the flue stack. The amount discharged during this period is comparable to quarantine conditions.\(^7\)

In the following 10-10.5 hours measured methyl bromide emission rates are comparatively low. The comparatively constant discharge rates during this period suggest that small quantities of the fumigant may be de-absorbing from the timber over time and then being discharged to air. Discharges during this period would not be expected to have a significant effect on downwind concentrations.

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\(^7\) Changes in the discharge rate during the first 1.5-2 hours decrease exponentially with time. This rate of change is consistent with the gradual dilution of a fixed amount of methyl bromide under the tarpaulin. Air from the outside mixes with the air under the tarpaulin and the increasingly diluted air is discharged to the atmosphere at constant rate.
Methyl bromide usage rates will also vary according to the dimensions of the treated log rows and quarantine dosage rates. For a typical 50m long log row, with a width of 5m and a height of 4m, methyl bromide dosages could be expected to vary between 48kg and 120kg (i.e. dosage rates of 48-120g/m³) and therefore discharges to air from a typical log row could be expected to be between 14kg to 36kg (assuming 30% of the dosage is emitted). Therefore the average emission rate per row for the year can be estimated to be 24kg. In 2013 the average dosage of a log row was reported to be 80kg.

Similarly, ship hold dosages could be expected to vary from 384kg to 576kg (assuming a hold volume of 8,000m³ and dosage rates of 48-72g/m³), and discharges to air to vary between 115kg to 173kg. However, the rate methyl bromide is discharged from the hold during ventilation is less certain.

The total reported usage of methyl bromide for the years 2012 and 2013 at the Port by the existing service provider (Genera Ltd) was 255t and 298t respectively. The total annual methyl bromide discharge can therefore be estimated to be approximately 77t and 89t (assuming 30% of the dosage is emitted).

Total methyl bromide usage at the Port is dictated by export requirements. The total quantity of fumigant used at the Port (and amount discharged to the atmosphere) would not increase as a consequence of an additional fumigation service provider (i.e. UML).
4.3 Effect of the discharges

Methyl bromide is an odourless and colourless gas. Methyl bromide is identified as a hazardous air pollutant in Appendix 3 of the Regional Air Plan.

The Environmental Risk Management Authority (now the EPA)'s reassessment of methyl bromide (2010) concluded that adverse health effects were primarily associated with the inhalation of relatively low concentrations, which can cause the destruction of the nasal epithelium. Observed acute effects at low concentrations include nausea, anorexia, dizziness and headaches.⁹

At significantly higher concentrations damage to the central nervous system has been observed after industrial accident exposures. Animal studies suggest that at high concentrations, methyl bromide may also be associated with reproductive toxicity, developmental effects, and mutagenicity.

Methyl bromide is also identified as an ozone depleting substance under the Montreal Protocol on Substances that Depletes the Ozone Layer (UNRP ozone Secretariat 2000). For New Zealand to meet its obligation under the protocol, the ERMA reassessment sets a 10 year period before the use of methyl bromide recapture technology will be mandatory (i.e. before 2021).

4.4 Air quality criteria

The HSNO Act defines Tolerable Exposure Limits (TELs), which are limits that are not to be exceeded outside the fumigation buffer area. The TELs are designed for the protection of public health. The one-hour average, 24-hour average and annual average TELs are presented in Table 4-1.

The TEL criteria limits have been set at concentrations substantially lower than those at which adverse health effects have been observed. The one-hour TEL criterion is based on the OEHHA acute Reference Exposure Level (REL)¹⁰ and incorporates an uncertainty factor of 60. The 24-hour and annual average TELs are based on USEPA derived limits and similarly incorporate uncertainty factors of 30 and 100 respectively¹¹⁻¹². The TELs are therefore conservative and do not represent a health effects threshold.

Other criteria include the Workplace Exposure Standards (WES). The time weighted 8-hour average WES for methyl bromide is 5ppm (19mg/m³). The WES applies only to areas within the Port.

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¹⁰ Ibid


Table 4-1. EPA TELs for methyl bromide

<table>
<thead>
<tr>
<th>Averaging period</th>
<th>Concentration Limit (ppm)</th>
<th>Concentration Limit (mg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual</td>
<td>0.0013</td>
<td>0.005</td>
</tr>
<tr>
<td>24-hour</td>
<td>0.33</td>
<td>1.3</td>
</tr>
<tr>
<td>1-hour</td>
<td>1</td>
<td>3.9</td>
</tr>
</tbody>
</table>
5 Assessment of environmental effects

5.1 Assessment overview

The assessment of potential environmental effects is based on the results of past methyl bromide monitoring conducted during log and ship fumigations, and predictive atmospheric dispersion modelling.

As fumigation with methyl bromide is an existing activity at the Port, the results of past monitoring has been used to assess existing methyl bromide levels when log rows and ship holds are ventilated using existing methods. The focus of the assessment is whether the activity complies with the TELs at the Port boundary. The people with the greatest risk of adverse effects are the workers who handle and use methyl bromide on a daily basis. These effects are managed through the Workplace Exposure Standards, which have significantly higher exposure thresholds and are controlled by health and safety legislation. While there are other businesses and staff who work inside the Port boundary, the minimum buffer distances and monitoring specified in the HSNO controls within the site are designed to protect those workers.

Dispersion modelling techniques have been used to assess the effect of the applicant’s proposed ventilation procedures, and to show the relative effectiveness of the proposed forced ventilated procedures compared to existing passive ventilation.

5.2 Review of previous monitoring

A comprehensive review of methyl bromide monitoring in New Zealand was prepared by Dr Bruce Graham in 2009. The review was conducted on behalf of the ERMA as part of the methyl bromide reassessment programme. The review compiled and assessed the reported methyl bromide levels recorded during the ventilation of log rows, ship holds, container and timber stacks.

5.2.1 Monitoring of log rows

The maximum one-hour average concentration reported for log row ventilations at distances of 50m (i.e. minimum buffer distance) and greater was less than 0.2ppm, or approximately 20% of the 1-hour average TEL criterion of 1ppm (or 3.9mg/m³). Recorded one-hour average concentrations were also less than the 24-hour average TEL of 0.333ppm (or 1.3mg/m³).

Higher one-hour concentrations were recorded when monitoring occurred closer to the log row. The maximum one-hour average concentration reported was 5.4ppm, approximately 25m from a series of ventilated log rows. The monitor was moved to multiple locations during the hour so that it was also downwind of the ventilated log row. Concentrations would be expected to be less than 1ppm at 100m from the log row as the plume disperses in the environment.

5.2.2 Monitoring of ship holds

Reported one-hour average methyl bromide levels measured during ship hold ventilations similarly showed a decrease in concentration levels with increasing distance from the ship. At distances of 100m, concentrations were reported to be less than 0.25ppm for all but one of the monitoring programmes considered in the review.
The highest one-hour average concentration at distances of 100m from the hold was reported to be 1.35ppm, or 35% higher than the 1-hour TEL criterion. However, concentrations would be expected to have decreased rapidly with increasing downwind distance. At the Port of Tauranga, ships at berths #10 and #11 are approximately 380m from the closest port boundary, so additional dispersion would reduce concentrations further. Concentrations at this distance would be expected to be below the TEL criterion.

It was suggested that the higher than normal concentrations recorded during this ship fumigation may be associated with the ship holds being completely opened in one movement and thereby ventilating the hold faster than what normally occurs when the holds are opened in stages.

Overall, the previous monitoring of ship ventilation indicates methyl bromide concentrations are unlikely to exceed TEL criteria limits outside the Port when ship holds are passively ventilating.

5.2.3 Summary monitoring reports submitted to the EPA since 2011

One outcome of the methyl bromide reassessment programme was that fumigation sites are now required to submit annual reports to the EPA which summarise methyl bromide usage and any breaches of the TELs criteria levels. No exceedances of the one-hour, 24-hour and annual TELs have been reported at any of the sites where log rows and ship holds are fumigated since 2011 when the first year reports were submitted to the EPA.13. Although limited information is provided in the summary reports, the reported compliance with TEL levels during ventilation is generally consistent with the monitoring reported in Dr Graham’s review.

5.2.4 Genera Ltd Consent Audit Report

More recent monitoring occurred in August 2014 at the Port of Tauranga and in July 2014 at Northport, Marsden Point as part of Genera’s consent audit14.

Monitoring at the Port of Tauranga occurred when nine row log rows were ventilated over a 2.5 hour period. Continuous monitoring occurred at three fixed sites over a ventilation period. Methyl bromide levels were only recorded at one of the monitoring sites and only during the first hour when the first four log rows were ventilated. The average concentration recorded at the site was approximately 2-3 ppm (i.e. 7.8-11.7 mg/m³). The monitoring site was located approximately 60m from the fumigation area. The monitoring suggests that concentrations could exceed the TEL close to the fumigation area when multiple log rows are ventilated in the same hour.

However, a number of limitations and uncertainties associated with the photo ionisation detector (PID) monitoring devices used were identified in the report (especially an assumed zero drift of the detectors which had a significant effect on the results). Due to these uncertainties, the report does not draw any conclusions regarding compliance with the TELs. The report recommended the future coupling of PID monitoring with the laboratory analysis of air samples taken during the monitoring period to provide greater certainty.

13 http://www.epa.govt.nz/about-us/monitoring/methyl-bromide-reports/read_mbr_reports/Pages/default.aspx

Assessment of Effects - Discharges to Air from Methyl Bromide Fumigation

Monitoring was also conducted at Northport during the ventilation of a bulk carrier destined for India. The exported logs were dosed at 64g/m³. The holds of the vessel were passively ventilated over approximately a 2-3 hour period during moderate to light winds. Methyl bromide levels were monitored using both PID instrumental and canister sampling methods.

Concentrations measured at monitoring sites located 50m from the vessel varied between 2.3 to 3.1 ppm (comparable results were obtained from the canister samples and the PIDs when ‘zero adjusted’). At downwind distances comparable to those which separate the vessels at Tauranga Port from the closest boundary (i.e. 360m) lower concentrations would be expected. Dispersion modelling predictions indicate that maximum concentrations at 360m from the vessel would be expected to be 16-18% of concentrations measured 50m from the vessel, or less than 0.56ppm (or 2.2 mg/m³).

Pollutant concentrations were measured from a canister sample 100m from the vessel. The three hour concentration at the monitoring site was reported to be 0.024ppm (2.4% of the TEL). The low concentration recorded at the site may possibly be due to the apparent upwind location of the site from the vessel.

However, the results of the monitoring programme indicate that methyl bromide concentrations associated with ventilation of ship holds are unlikely to exceed TEL limits outside the Port of Tauranga when passively ventilated. Similarly, based on the monitoring, methyl bromide concentrations are expected to be below the WES criterion of 50m from the ventilated vessel.

Dispersion modelling predictions indicate that the UML proposed forced ventilation system will improve pollutant dispersion. Therefore, based on the available monitoring data, downwind concentrations from ships’ holds that are forced ventilated would also be expected to be lower than TEL criteria limits.

Monitoring summary

It is acknowledged that the nature of the very short, intermittent releases of methyl bromide at varying locations makes it difficult to monitor the plume, even at close range. However, based on the best data available, all reports indicate that current fumigation procedures at NZ ports have not been found to exceed TEL criteria levels outside the methyl bromide buffer zones.

UML’s proposed mechanical ventilation systems are expected to improve fumigant dispersion during worst case meteorological conditions (refer Section 5.3.3 and Appendix 4). Therefore, the current monitoring results indicate that if appropriate ventilation management and monitoring procedures are implemented methyl bromide levels associated with the proposed fumigation operation would not be expected to exceed TEL criteria levels beyond the Port.

5.3 Dispersion modelling assessment

5.3.1 Dispersion modelling details

Ground level concentrations were predicted using the AUSPLUME dispersion model developed by the Victoria Environmental Protection Agency. AUSPLUME is widely used in New Zealand and Australia as a regulatory dispersion model. AUSPLUME is an appropriate model in circumstances where complex terrain is unlikely to have a significant effect on pollutant dispersion, as is the case in this instance.

15Total hold space of 46,287m³, and fumigated with 2,964kg of methyl bromide.
A limitation of AUSPLUME (and most other regulatory models) is that it is unable to accurately simulate sub-hourly variations in source emission rates and dispersion conditions. Discharges from the ship’s holds and log rows, in particular, decrease rapidly over time. The effect that these variations have on downwind concentrations cannot be accurately simulated. For this assessment it has been necessary to assume that discharges are constant over a one-hour period. This approach will provide a conservative assessment of 1-hour average concentrations.

Pollutant dispersion was simulated using a one-year meteorological input file representative of conditions at the Port.

Downwash effects of the surrounding log rows have been incorporated into the modelling using the PRIME algorithm recommended by the Ministry for the Environment (MfE)\(^\text{16}\). The PRIME algorithm provides a conservative prediction of ground level concentrations close to structures.

Details of the modelling inputs are provided Appendix 2.

### 5.3.2 Modelled log row emission scenarios

The number of log rows ventilated per hour will vary with respect to the fumigation zone, dosage and method of ventilation. The maximum number of ventilations specified in the look-up tables controls the hourly emission rate from each fumigation zone to levels that are not predicted to exceed the TEL levels outside the Port boundary. Although the number of allowable ventilations per hour varies between dosages, similar maximum one-hour average concentrations would be predicted for other dosages when ventilated at their allowable limits.

Seven emission scenarios have been modelled corresponding to each of the fumigation zones (and sub-zones). Maximum one-hour concentrations have assumed the modelled log rows in each zone are fumigated at a dosage rate of 80g/m\(^3\), and 30% of the fumigant is discharged to air. The number of ventilations per hour in each of the zones has been set to the maximum allowable number defined in the look-up tables.

The ventilated log rows in each of the fumigation zones have been assumed to be located at the point closest to the Port boundary where maximum off-site concentrations are likely to occur.

Forced ventilation will generally be used during low wind speeds to increase the number of ventilations per hour. However, there may also be circumstances when only a small number of log rows need to be ventilated during low wind speeds and passive ventilation procedures are adequate.

It has been assumed in each of the emission scenarios that forced ventilation procedures are used at wind speeds less than 3.5m/s in order to maximise ventilations during low wind speeds, and passive ventilation procedures at wind speeds greater than 3.5m/s. The exception is for zone #2A (assuming a 50m buffer distance) where forced ventilation is assumed to occur at wind speeds up to 5m/s and passive ventilation at higher wind speeds. The look-up tables allow no passive ventilation to occur in zone #2A (50m buffer) at wind speeds lower than 5m/s. The number of modelled ventilations per hour with regards to fumigation zone and wind speed conditions is shown in Table 5-1. The shaded areas correspond to log rows which are forced ventilated.

Table 5-1. Summary of modelled log row ventilation rates

<table>
<thead>
<tr>
<th>Wind Speed Category Range (m/s)</th>
<th>Zone 1</th>
<th>Zone 2A (50m buffer)</th>
<th>Zone 2A (100m buffer)</th>
<th>Zone 2B</th>
<th>Zone 3</th>
<th>Zone 4</th>
<th>Zone 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 1.5</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>1.5 to 3.5</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>3.5 to 5</td>
<td>6</td>
<td></td>
<td>2</td>
<td>5</td>
<td>4</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>&gt; 5</td>
<td></td>
<td></td>
<td></td>
<td>6</td>
<td>5</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

In the dispersion model the ventilated log rows are assumed to be located adjacent to each other. The same log row configuration was used to derive the look-up tables and represent worst case emission conditions. The actual separation distances between groups of log rows are expected to be the same or greater.

Since the ventilation of log rows will occur primarily during the day time, the modelling has assumed discharges only occur between 8am and 5pm. The model has also assumed that discharges from the log row occur continuously at a constant rate of 24kg/hour through the simulated year between these hours. Therefore, predicted maximum one-hour average methyl bromide concentrations assume the log rows are being ventilated during worst case dispersion and source configuration conditions. This approach provides a conservative assessment of downwind concentrations.

A summary of the model assumptions are:

- Each of the simulated log rows in the model has been assumed to be 50m long, 5m wide and 4m in height (i.e. a total volume of 1000m³)
- Log rows are 1m apart
- The dosage rate of 80g/m³ is based on China’s summer quarantine conditions
- 30% of the total dosage (i.e. 24kg of methyl bromide per log row) is discharged to air during the first hour of ventilation (refer section 4.2)
- To represent discharges during passive ventilation, each end of the log row has been represented as a volume source
- The ventilation flue stack has been modelled as a point source with a stack height of 6m and discharge rate of 3m³/s.

Modelled discharge parameters are detailed in Appendix 2.

### 5.3.3 Predicted log row concentrations

#### 5.3.3.1 1-hour average predictions

A summary of the maximum (99.9 percentile) 1-hour average methyl bromide concentrations (mg/m³) predicted outside of the Port boundary for the modelled emission scenarios is shown in Table 5-2. Predicted maximum 1-hour average concentration contours for each of the modelled emission scenarios are shown in Appendix 3.
Table 5-2. Predicted maximum one-hour methyl bromide concentrations (mg/m$^3$) outside the Port boundary

<table>
<thead>
<tr>
<th>Receptors</th>
<th>Zone 1</th>
<th>Zone 2A (50m buffer)</th>
<th>Zone 2A (100m buffer)</th>
<th>Zone 2B</th>
<th>Zone 3</th>
<th>Zone 4</th>
<th>Zone 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum outside boundary</td>
<td>3.13</td>
<td>3.31</td>
<td>3.51</td>
<td>3.12</td>
<td>3.37</td>
<td>3.30</td>
<td>3.51</td>
</tr>
<tr>
<td>TEL Criteria Concentration</td>
<td>3.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5-2 shows maximum 1-hour average concentrations are not predicted to exceed the one-hour TEL outside the Port boundary if the maximum number ventilations per hour were to occur during worst case dispersion conditions. The maximum predicted concentrations outside the Port boundary for any of the modelled emission scenarios is 3.5mg/m$^3$ or 90% of the 1-hour average TEL of 3.9mg/m$^3$.

The results of the modelling indicate that methyl bromide levels decrease rapidly with distance from the fumigation area. At the most affected residential property, predicted 1-hour concentrations are less than 1mg/m$^3$, or 26% of the TEL. Maximum concentrations at Blake Park sports fields are predicted to be less than 1.3mg/m$^3$, or 33% of the TEL.

5.3.3.2 24-hour average predictions

Log rows that have been fumigated for export can be located anywhere within the port’s fumigation areas. The spatial distribution of log rows within the fumigation areas and the sequencing will influence 24-hour average methyl bromide concentrations. Accounting for these effects in the model is highly problematic.

However, it is possible to show that the 24-hour hour TEL criterion would not be exceeded if maximum 1-hour concentrations do not exceed the 1-hour TEL criterion and log row ventilations within a period of 8 hours\textsuperscript{1}. For a typical top stow volume of 15,000m$^3$ the average log row ventilation rate over an eight hour period would need to be about two log rows per hour (assuming each log row is approximately 1000m$^3$). Generally, ventilation rates would be greater than this.

It is possible that ventilation rates could be lower than two log rows per hour and ventilations may occur over more than eight hours. But even in these instances it would be highly unlikely that methyl bromide concentrations would result in an exceedance of the 24-hour TEL criterion. Even slight changes in wind speed and direction and the locations where ventilations occur in the Port will reduce pollutant levels.

A highly conservative assessment of potential maximum 24-hour concentrations can be derived from the maximum 24-hour concentrations predicted outside the boundary for the zone #4 and zone #2A (assuming a 50m buffer distance) emission scenarios. Both scenarios assume a single log row is ventilating to air 50m from the boundary. The predicted maximum 24-hour average concentrations for each scenario assume the same log row is ventilating to air every hour of the nine hour working day for the simulated year. The maximum 24-hour concentrations at the Port boundary (i.e. 50m from the ventilated log row) is predicted to

\textsuperscript{1} The maximum 24-hour average concentration at the boundary can be calculated by multiplying the maximum 1-hour concentration of 3.9mg/m$^3$ by the 8 hour ventilation period and then dividing by the 24-hour averaging period (i.e. 1.3 = 8*3.9/24)
be 0.95mg/m³ for the zone #4 scenario and 0.82mg/m³ for zone #2A. Both concentrations are predicted to be less than 72% of the 24-hour TEL of 1.3mg/m³.

Maximum 24-hour concentrations are predicted to decrease rapidly with distance from the boundary. At 20m from the boundary (i.e. 70m from the ventilated log row) the predicted maximum concentration is 0.62mg/m³, or 48% of the TEL.

The results indicate that methyl bromide levels are not predicted to exceed the 24-hour TEL criterion outside the plant boundary even when extreme discharge conditions are simulated. The results also indicate that 24-hour concentrations would be expected to be substantially less than the TEL at locations where the public may be exposed to methyl bromide over the ventilation period.

5.3.4 Predicted ship hold concentrations

5.3.4.1 Ship hold model assumptions

The monitoring of methyl bromide concentrations during ship ventilation in New Zealand ports indicates pollutants would not be expected to exceed TEL and WES criteria levels given the separation distance between vessels berthed at the Port of Tauranga and the Port boundary.

Monitoring at New Zealand Ports has only been conducted when the fumigated vessels are passively ventilated (i.e. when the hold doors are open to the atmosphere).

No reliable estimates of hold discharge rates could be identified in the literature, therefore accurately predicting ambient methyl bromide concentrations is problematic. However, ventilation rates from ship holds are expected to be relatively low. Downwind concentrations measured during the Northport monitoring programmes (refer section 5.2.4) indicate that discharges to air will occur over several hours when passively ventilated.

Discharges from the holds using forced ventilation are expected to be more constant than those associated with the passive ventilation, as the air flow rate in the hold will be constant and controlled. Discharges from the holds may also occur over a longer period of time using the forced ventilation method due to a lower air flow vented into the hold by the blower when compared with possible air flow rates through the holds when passively ventilated.

The modelling approach used assessed the relative effect that the proposed UML forced ventilation methods will have on maximum downwind concentrations compared to passive ventilation. Discharges from a vessel with five holds, each with a capacity of 8,000m³ (i.e. total capacity of 40,000m³) have been modelled. Generally, only one ship hold will be forced ventilated at a time. Maximum 1-hour concentrations have been predicted assuming the ship hold is forced ventilated and also passively ventilated.

A summary of the model assumptions are:

- The maximum dosage rate of 72g/m³ is based on India (winter). Note: ship holds destined for China do not use methyl bromide. Lower emission rates would be expected with lower dosages (i.e. 64g/m³, 54g/m³ and 48g/m³)
- 30% of the fumigant is discharged to air over the ventilation period
- The quantity of methyl bromide discharged per hold is 172.8kg and total ship discharge is 864kg
- The average hourly emission rate is 72kg/hour
- Ship ventilations have been assumed to occur over a 12 hour period
- For the assessment of all five ships are assumed to be continuously ventilating to air through a flue stack over the simulated year.
The modelled emission rate of each hold is estimated to be 14.4kg/hour over the ventilation period (i.e. a fifth of the total average hourly emission rate), and the total discharge from the ship to be 72kg/hr. Maximum 24 hour average concentrations have been calculated by predicting maximum 12-hour average concentrations and then dividing the results by a factor of 2 to account for the 24-hour averaging period.

These modelling assumptions are conservative as they assume that worst case dispersion conditions occur throughout the limited hours when a hold is ventilated.

A summary of the modelled source emission parameters is presented in Appendix 2.

5.3.4.2 1-hour average modelling predictions

Predicted maximum (99.9 percentile) 1-hour average methyl bromide concentrations associated with the forced ventilation of the ship are shown in Figure 5-1. The green concentration contour line in the figure corresponds to the 1-hour TEL concentration of 3.9mg/m³.

The results of the modelling indicate that even if the ship hold were to be ventilated during worst case dispersion conditions predicted concentrations would not exceed the one-hour TEL outside the Port boundary. The maximum predicted concentration at the Port boundary is 2.9mg/m³, or 83% of the TEL.

The maximum 1-hour concentration predicted at the nearest residential receptor is 1.13mg/m³, or 32% of the TEL.

Maximum 1-hour average concentrations are not predicted to be less than 19mg/m³ beyond the ship. The results indicate that exceedances of the 8-hour average WES of 19mg/m³ is unlikely, particularly in areas of the Port where people could potentially be exposed for extended periods of time (e.g. offices).
A comparison of predicted maximum 1-hour concentrations when the five ship holds are passively ventilated and forced ventilated is shown in Figure 5-2. The figure shows predicted maximum concentrations with increasing easterly distance from the ship (i.e. toward the Port boundary). The Port boundary is located approximately 380m downwind of the ship hold.

The results of the modelling show that maximum 1-hour concentrations are predicted to be lower for the proposed mechanical ventilation system when compared to passively ventilated discharges from a ship’s hold. The relative differences in predicted concentrations are greatest close to the ship. At distances of 100m, 200m and 380m downwind of the ship’s hold maximum 1-hour concentrations for a forced ventilated ship’s hold are predicted to be 36%, 55% and 68% of the maximum concentration predicted for the passively ventilated hold.

The results of the modelling indicate that the proposed ventilation procedure will likely improve dispersion during worst case meteorological conditions compared to the passive ventilation procedures that are normally used at the Port. The modelling indicates the proposed forced ventilation method reduces maximum methyl bromide levels during ventilation.

However, it should also be noted that the predicted maximum concentrations for the passively ventilated ship’s hold are significantly higher than those which have been reported during monitoring. The results suggest the model is likely to be conservative and predictions are likely to be higher than what would actually occur.
5.3.4.3 24-hour average modelling predictions

Predicted maximum 24-hour average methyl bromide concentrations associated with discharges from the ventilation of five ships’ holds over a 12 hour period are shown in Figure 5-3. The green concentration contour line in the figure corresponds to the 24-hour TEL concentration of 1.3mg/m³.

Maximum 24-hour average concentrations are not predicted to exceed the TEL outside the Port boundary. The maximum 24-hour concentration predicted at the port boundary is 0.57mg/m³, or 44% of the TEL. At the most affected residential receptor where exposures over a 24-hour period could potentially occur, maximum 24-hour average concentrations are predicted to be 0.17 mg/m³, or 13% of the TEL.
5.4 Summary of effects

The modelling indicates that the proposed use of forced ventilation methods during low wind speeds is predicted to reduce maximum 1-hour methyl bromide concentrations below existing levels, both for ship holds and log row ventilations. The proposed activity will use best available technology to minimise the effects of the discharges. Discharge rates will also be managed by limiting the number of ventilations per hour to levels that are appropriate to environmental and source conditions.

The area adjacent to the Port boundary contains industrial sites, located on Port zoned land. In reality, at these locations it is unlikely that a person would be stationary and therefore exposed to the modelled ambient concentrations for a period of an hour, and certainly not for a period of 24 hours. The receiving environment has a low sensitivity and there are no sensitive receptors within 350 metres of the Port boundary.

If appropriate management and monitoring procedures are implemented, off-site concentrations can be limited to levels that do not exceed the TEL criteria limits. Under these conditions any potential adverse effect of discharges will be no more than minor. This conclusion is based on the following:

- the appropriate separation distance between the closest sensitive receptors and the site fumigation activities;
- current monitoring results which demonstrate that no exceedances of the TEL have been recorded outside the Port boundary or at other NZ ports;
- TEL criteria levels have been conservatively based;
- methyl bromide levels will be continuously monitored during ventilations and these measurements will be used to inform the site’s management procedures as ventilation is occurring;
- the number of ventilations per hour will be managed to levels that are appropriate to environmental and source conditions;
- the proposed method will have the ability to stop log row and ship discharges during forced ventilation,
- annual methyl bromide usage at the port and discharges to the atmosphere will not increase as a consequence of the proposed activity; and
- the modelling assumptions are highly conservative.
6 Consultation and consideration of affected persons

Consultation with tangata whenua occurred with the following iwi and hapū entities:

- Te Runanga o Ngai Te Rangi Iwi Trust
- Ngati Ranginui Iwi Society Incorporated
- Ngati Pukenga ki Tauranga Iwi Trust
- Ngai Tukairangi Hapu Trust
- Ngati Kuku Environmental Management Unit

All iwi and hapū voiced their disapproval for the use of methyl bromide as a fumigation agent based on environmental and health and safety concerns. However, their views regarding the project are generally neutral concerning the proposed air discharge resource consent application. Tangata whenua are genuinely interested in the proposed benefits offered by the applicant, particularly improvements in the methyl bromide dispersion methods.

The key iwi and hapū groups have prepared cultural statements on the perceived impacts of the proposal on their culture and the environment. The applicant has received four cultural statements from the five iwi and hapū groups consulted. All groups gave conditional support to the project. The recommendations are summarised as follows:

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conditional support while the UML investigates alternatives</td>
<td>UML will work with the industry to investigate methyl bromide alternatives</td>
</tr>
<tr>
<td>Ventilation technology is applied by UML</td>
<td>UML will apply the use of ventilation technology for low wind conditions to assist with dispersal</td>
</tr>
<tr>
<td>Improve health and safety procedures</td>
<td>UML will apply sound health and safety procedures to ensure a safe work environment</td>
</tr>
<tr>
<td>Manage potential environmental impacts</td>
<td>UML will carefully manage any potential environmental impacts</td>
</tr>
<tr>
<td>Maintain adequate buffer zones</td>
<td>UML have considered and will apply adequate buffer zones particularly for low wind conditions</td>
</tr>
<tr>
<td>All Port of Tauranga staff are aware of methyl bromide health and safety regulations</td>
<td>UML will work with the Port of Tauranga to ensure other Port workers are aware of methyl bromide health and safety regulations and procedures</td>
</tr>
<tr>
<td>Safety badges or alarm sensors to other working crews within vicinity</td>
<td>UML will continuously monitor methyl bromide levels during at or near the buffer zone during ventilations.</td>
</tr>
<tr>
<td>UML to provide a full copy of the consent application</td>
<td>A copy of the lodged resource consent application will be forwarded to iwi and hapū</td>
</tr>
<tr>
<td>Formalise relationship with iwi, and investigate employment opportunities</td>
<td>UML will meet with iwi and hapū at the commencement of operations to assess opportunities for iwi and hapū</td>
</tr>
<tr>
<td>UML to report to iwi</td>
<td>UML will provide all monitoring reports and data to iwi on an annual basis</td>
</tr>
</tbody>
</table>

Since UML commissioned cultural statements, there have been internal and personnel changes within Ngati Kuku which has limited the engagement of UML and Beca with the hapū. UML and Beca have endeavoured to engage with Ngati Kuku on completing a statement, with no response. The meetings held between Ngati Kuku and UML indicated the hapū’s relative comfort with the resource consent application and were supportive of UML and the industry investigating alternatives before methyl bromide is phased out. They were also interested in the use of new technology to assist with dispersal of the gas.
The cultural statements received by UML are included in Appendix 7.

UML has also undertaken consultation with the Port of Tauranga. The Port has indicated that they do not consider themselves to be significantly affected by UML’s proposal, provided UML operates according to the Port’s official fumigation procedures and within appropriate statutory regulations. A letter detailing the Port’s approval of the UML application is also included in Appendix 7.

7 Monitoring

Under the HSNO Act, UML is required to monitor methyl bromide concentrations during ventilations. Monitoring is also required to be conducted in accordance with the Act which specifies data collection, record keeping and annual reporting requirements. UML proposes to conduct monitoring at the port in accordance with guidelines published by the EPA.  

Monitoring will occur at the start of every ventilation period and will be carried out by suitably qualified persons, and use appropriate quality assurance, control procedures and monitoring equipment. The monitoring will be used to manage discharges from the fumigated holds and log rows so that methyl bromide emission do not exceed the TEL at any location beyond the plant boundary.

Visual monitoring of the port fumigation buffer zone will be undertaken during ventilation to ensure workers at the Port do not enter the area. The fumigation areas will be appropriately signposted in accordance with HSNO act requirements.

A visual inspection of the tarpaulin log covers for holes and tears through which fugitive emissions may occur will be undertaken prior to fumigation. Tarpaulins will be individually numbered for identification. The tightness of water seals will also be visually inspected during fumigation.

Other fumigation and ventilation equipment will be inspected and maintained in accordance with manufacturer’s specifications.

8 Mitigation

UML is currently exploring methyl bromide recapture technology options and plans to have recapture technology operating at the Port as it becomes available. Ventilation procedures will change in accordance with the chosen recapture technology.

---

9 Consideration of alternatives

Methyl bromide is widely considered the ‘Gold Standard’ fumigant by industry and quarantine organisations across the globe. Methyl bromide is unique in that it:

- Effectively controls all life stages of insects
- Reacts relatively quickly (<24hrs)
- Has inert characteristics, i.e. it does not damage most commodities undergoing treatment.

The Montreal Protocol, which aims to reduce methyl bromide usage internationally, acknowledges that no other fumigant is able to perform the same function as methyl bromide. Consequently the Montreal Protocol exempts methyl bromide usage for all pre-shipment and quarantine treatments in all countries.

In New Zealand, STIMBR (Methyl Bromide Replacement) continues to conduct research on methyl bromide replacements for log fumigations. Currently this organisation is conducting research on treatment with ethanedinitrile (EDN) and ozone.

However, importing countries are often reluctant to change their treatment requirements. The importing country will often require extensive datasets supporting the new treatment, a process that can take many years or even decades. There is currently no acceptable alternative to methyl bromide for logs exported to India and China (with the exception of phosphine for bottom stow logs bound for China).

The EPA is also likely to require the physical capture of any new fumigant proposed for use. Existing scrubbing systems for new fumigants may or may not exist. The development of scrubbing systems for new treatments may take years and require significant investment.

Scrubbing systems for small-scale methyl bromide fumigations are commercially available. Most scrubbing systems for methyl bromide use either activated carbon or a liquid solution to capture the fumigant gas. No suitable scrubbing system is currently available for bulk log fumigations with methyl bromide.

It is unlikely that the small-scale systems which are currently available may be scaled up for bulk log fumigations. In order to be commercially viable a new scrubbing system for bulk log fumigations with methyl bromide must be:

- Able to capture the fumigant gas relatively quickly (Est. <45mins for a log row and <6 hours for a cargo hold)
- Mobile so that it can be moved to log rows and cargo holds situated at different locations within the port.
- Economical: i.e. use a small amount of chemical or substrate to capture a large quantity of fumigant gas (The smaller systems are not economical when scaled up. The large volume of methyl bromide used on bulk log fumigations means that the volume of chemical or substrate required to scrub the fumigant is not economically viable)
- Environmentally friendly: i.e. the end products must be stable, inert and easily disposed of using common waste disposal methods
- Financially viable: i.e. the technology option is affordable.

Research continues in New Zealand and other countries into a viable system for the capture of methyl bromide from bulk log fumigations.
10 Statutory assessment

10.1 Resource Management Act 1991

Section 5
Part 2 of the Act sets out the purpose and principles of the Act. The purpose of the Act is the sustainable management of natural and physical resources. Sustainable management is defined in section 5 as:

Managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic and cultural well-being and for their health and safety while:

a) Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonable foreseeable needs of future generations; and

b) Safeguarding the life supporting capacity of air, water, soil and ecosystems; and

c) Avoiding, remedying, or mitigating the adverse effects of activities on the environment.

Comment
The assessment of effects of the proposed activity indicates that the discharges to air are likely to have less than minor adverse effects on the environment and will be adequately avoided and mitigated. The activity is therefore consistent with section 5 of the Act.

Section 6
Section 6 of the Act sets out the matters of national importance. There are no matters of national importance that are considered to be affected by this proposal.

Section 7
Section 7 of the Act requires particular attention to be had to a number of other matters. Those matters most relevant to this proposal are:

c) The maintenance and enhancement of amenity values

f) Maintenance and enhancement of the quality of the environment.

Comment
The proposed will not enhance amenity values or the quality of the environment; neither does it degrade the existing environment to any significant degree. The proposal is therefore considered to be consistent with section 7 of the Act.

Section 8
Section 8 of the Act requires those exercising functions under the Act to take into account the principles of the Treaty of Waitangi. It is considered that this proposal is not in conflict with the principles of the Treaty as the area is already highly modified.
Section 15
Section 15 (1)(c) of the RMA prohibits the discharge of any contaminant from industrial or trade premises into air unless the discharge is allowed by a rule in a regional plan or relevant proposed plan, resource consent, or by regulations. The proposed fumigant procedure at the Port falls within the definition of trade and industrial premises in the Act.

Section 104
Section 104 requires a consent authority to have regard to the following when considering an application for a resource consent which is subject to Part 2 of the Act.

a) any actual and potential effects on the environment of allowing the activity; and

b) any relevant provisions of –

   i. a national environmental standard:

   ii. other regulations:

   iii. a national policy statement:

   iv. a New Zealand coastal policy statement:

   v. a regional policy statement or proposed regional policy statement:

   vi. a plan or proposed plan: and

   c) any other matter the consent authority considers relevant and reasonable necessary to determine the application.

Comment
The assessment of effects described in this report has taken into account the relevant matters listed in section 104. No other matters are considered to be relevant or reasonably necessary to determine the application.

10.2 Bay of Plenty Regional Policy Statement
The Regional Policy Statement for the Bay of Plenty (RPS) provides an overview of resource management issues in the region and directs how the resources of the Bay of Plenty are to be managed. The policy statement is an umbrella document that provides the framework for the Regional Plans. The second generation RPS became operative on 1 October 2014.

The objectives and policies of the RPS with regard to air quality that are relevant to this proposal are:

Objective 1: The adverse effects of odours, chemical emissions and particulates are avoided, remedied or mitigated so as to protect people and the environment.

Policy AQ2A: Managing adverse effects from the discharge of odours, chemicals and particulates Protect people’s health and the amenity values of neighbouring areas from discharges of offensive and objectionable odours, chemical emissions and particulates.
Comment

The mitigation measures proposed by UML will adequately manage any adverse effects on people’s health and amenity values resulting from the use of fumigants. This proposal is therefore considered to be consistent with the RPS.

10.3 Bay of Plenty Regional Air Plan

The Air Plan became operative in December 2003. It was amended in August 2012 to incorporate the requirements of the National Environmental Standards for Air Quality.

Objectives and policies

The relevant objectives and policies of the Air Plan are as follows:

Objective 1: Maintain and protect high air quality in the Bay of Plenty region and in instances or areas where air quality is degraded, to enhance it by specifically addressing discharges into air of gases, particulates, chemicals, agrichemicals, combustion and odour.

Comment

The proposal is not expected to have any adverse effects on air quality in the region that are more than minor.

Objective 2: Avoid, remedy or mitigate the adverse effects of all discharges of contaminants into air on the environment which includes the effects on: ecosystems, human health and safety, crops and livestock, amenity values, cultural values, the mauri of natural and physical resources and the global environment.

Comment

The discharge to air associated with the use of fumigants will be mitigated such that any adverse effects on the environment including human health and amenity values will be less than minor. No adverse effects are expected to result on ecosystems, crops and livestock, cultural values or the mauri of natural and physical resources.

Policy 1(a): Significant adverse effects of discharges of contaminants into air should be avoided.

Policy 1(b): Adverse effects of discharges into air of contaminants that cannot be practicably avoided should be remedied or mitigated.

Comment

The discharge of contaminants into air cannot at present be avoided completely but the mitigation measures proposed by UML will result in the effects being less than minor. UML is exploring recapture technology options which will provide more effective mitigation of any discharges to the atmosphere.

Policy 2: When the effects of discharges of contaminants into air are not adequately understood or are unknown, the discharges should be avoided, and if the discharges cannot reasonably be avoided, they should be monitored so that the effects become known, understood and effectively managed.
Comment

Methyl bromide levels will be continuously monitored during discharge.

*Policy 4: Promotion of the use of the best practicable option approach including the efficient use of resources e.g. raw materials and energy, whenever it is the most efficient and effective means of preventing or minimising adverse effects on air quality.*

Comment

UML proposes to use the best practicable options currently available to control and disperse discharges to air during fumigation. Recapture technology will be used when a practicable option can be identified.

Overall the proposal is considered to be consistent with the objectives and policies of the Air Plan.

Rules

Rule 19 (z) classifies the discharges to air from any activity that cannot comply with the conditions set out in Permitted Activity Rules and which is not a controlled activity or a prohibited activity as discretionary activity for which consent is required.

10.4 National Environmental Standards for Air Quality

None of the NESAQ regulations place restrictions on the granting of this consent.
11 Conclusion

UML proposes to undertake log fumigation activities at the Port of Tauranga. The main discharge to air will be methyl bromide when log rows and ships’ holds are ventilated to the atmosphere. The amount of methyl bromide discharged to air will depend on quarantine requirements and the volume of logs treated.

Log fumigation services are currently provided by Genera Ltd at the port. Discharges to air from services by Genera Ltd are consented by the BOPRC (Consent Number 62719).

The assessment of environmental effects was based on the following:

- Discharges to air from UML fumigation services will be comparable to those provided by Genera. The total amount of fumigations required is controlled by external parties (i.e. log exporters) and will not increase with the addition of a new fumigation service provider.
- The available monitoring at the port and at other NZ ports indicate that current fumigation procedures do not cause methyl bromide levels to exceed WES or TEL air quality criteria, but there is a risk of elevated concentrations when multiple log rows are ventilated in close proximity to each other.
- Dispersion modelling methods indicate that the forced ventilation procedures proposed by UML would improve dispersion relative to existing passive ventilation during worst case dispersion conditions.
- The number of log row fumigations will be controlled so that concentrations will not exceed TEL limits outside the port boundary.
- The forced ventilation system should provide greater control of discharges than the existing passive ventilation procedures.

The effect of discharges from the log row fumigations are expected to be no more than minor, assuming appropriate management and monitoring procedures are implemented at the site and these procedures are able to respond to changing meteorological and discharge conditions.
Appendix 1

Port Log Row Ventilation Zones
This map contains data derived in part or wholly from sources other than Beca, and therefore, no representations or warranties are made by Beca as to the accuracy or completeness of this information.

Map intended for distribution as a PDF document.
Scale may be incorrect when printed.
Contains information sourced from LINZ.
Crown Copyright Reserved.

Legend
- Port Boundary (approx.)
- Rail
- State Highway
- Ownership - Port of Tauranga
- Cadastral Boundaries

Fumigation Areas
1
2
3
4
6

Tauranga Port
Overview 1

Client: UML
Project Name: Air Discharge Consent Application
Drawing No: AQ-GIS-4215362-002
This map contains data derived in part or wholly from sources other than Beca, and therefore, no representations or warranties are made by Beca as to the accuracy or completeness of this information.

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Legend
- Port Boundary (approx.)
- Rail
- State Highway
- Ownership - Port of Tauranga
- Cadastral Boundaries

Fumigation Areas
1
2
3
4
5
6

Tauranga Port
Overview 2

Client: UML
Project Name: Air Discharge Consent Application
Drawing No: AQ-GIS-4215362-002
Appendix 2

Dispersion Modelling Inputs
Model selection

Atmospheric dispersion modelling techniques were used to assess the effect of discharges from the ventilated log rows and ship’s holds. Ground level concentrations were predicted using the AUSPLUME dispersion model developed by the Victoria Environmental Protection Agency. AUSPLUME is widely used in New Zealand and Australia as a regulatory dispersion model. AUSPLUME is an appropriate model in circumstances where complex terrain is unlikely to have a significant effect on pollutant dispersion, as is the case in this instance.

However, discharges from the log rows and ship’s holds are expected to decrease rapidly over time. The effect these changes in emission rates have on 1-hour average pollutant concentrations cannot be directly simulated using AUSPLUME or other similar regulatory models. For the modelling assessment, log row and ship’s hold discharges are assumed to be constant over the emission period. This approach will give a conservative assessment of 1-hour average concentrations. Predicted concentrations would be expected to be higher than would be likely to occur if these effects were to be incorporated into the model.

Potential effects have been assessed by comparing predicted downwind concentrations against the TEL concentration limits (refer Table 4-1)

Meteorological data

Accurate atmospheric dispersion modelling requires good meteorological information that is representative of dispersion conditions near an emission source in a format that can be used by the dispersion model. For this assessment a one-year meteorological input file for AUSPLUME was constructed using the TAPM (‘The Air Pollution Model’) meteorological model. TAPM, developed by Commonwealth Scientific and Industrial Research Organisation (CSIRO), is a sophisticated computer model that consists of coupled diagnostic meteorological and air pollution components that predict the air flows important to local scale air pollution, such as sea breezes, against a background of larger scale synoptic meteorological patterns (Hurley, 1999).

One of the primary functions of the TAPM model’s design is the provision of high quality meteorological data for dispersion models, such as AUSPLUME, where suitable onsite information is not available. Validation studies conducted by CSIRO show that TAPM can accurately predict localised meteorological conditions.

Hourly average wind speed and direction recorded at the Tauranga Airport meteorological monitoring station were assimilated into the model predictions.

The meteorological input file was developed for the year 2011. The AUSPLUME input was extracted from the TAPM model output at the approximate location of Tauranga Airport meteorological monitoring station. The predicted distribution of wind speed and wind direction for the simulated meteorological year is shown in Figure A - 1. A comparison with Figure 2-2 shows the modelled wind distribution is representative wind flows of those measured between 2009 and 2012.
Terrain and receptor networks

Terrain elevations were not included in the model as the site is comparatively flat and will not have a significant effect on pollutant dispersion.

A 500m x 500m Cartesian receptor grid with receptors at 10m spacing in both the north/south and east/west directions) was defined in the model.

Modelled discharge parameters

Log row ventilation model parameters

Table A - 1 shows the mechanically ventilated log row dispersion model source parameters. The potential downwash effects of log rows were also incorporated into the model using the PRIME algorithm.

Table A - 1. Summary of log row emission parameters when ventilated from a flue stack

<table>
<thead>
<tr>
<th>Discharge Parameter</th>
<th>Flue Stack</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stack height</td>
<td>6m</td>
</tr>
<tr>
<td>Stack diameter</td>
<td>0.65m</td>
</tr>
<tr>
<td>Discharge velocity</td>
<td>9.0m/s</td>
</tr>
<tr>
<td>Discharge temperature</td>
<td>20°C</td>
</tr>
<tr>
<td>Methyl bromide emission rate</td>
<td>24kg/hr</td>
</tr>
</tbody>
</table>
Table A-2 shows the passively ventilated log row dispersion model source parameters. Emissions from the log row were simulated as two volume sources representing each of the covered ends.

<table>
<thead>
<tr>
<th>Discharge Parameter</th>
<th>Log Row West End</th>
<th>Log Row East End</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source height</td>
<td>0.5m</td>
<td>0.5m</td>
</tr>
<tr>
<td>Source length</td>
<td>5m</td>
<td>5m</td>
</tr>
<tr>
<td>Initial vertical dispersion</td>
<td>0.25m</td>
<td>0.25m</td>
</tr>
<tr>
<td>Initial horizontal dispersion</td>
<td>1.25m</td>
<td>1.25m</td>
</tr>
<tr>
<td>Methyl bromide emission rate</td>
<td>12 kg/hour</td>
<td>12 kg/hour</td>
</tr>
</tbody>
</table>

**Ship hold ventilation model parameters**

For the assessment, discharges from the ventilated ship were assumed to occur over a 12 hour period. The ship was assumed to have five holds, each with a capacity of 8,000m³. The logs were assumed to be fumigated at the maximum dosage rate of 72g/m³ and 30% of the dosage was assumed to be discharged to the atmosphere. Predicted maximum 1-hour and 24-hour average concentrations have assumed all of the five holds are discharging continuously at 14.4kg/hour for the simulated year.

Table A-3 show the mechanically ventilated hold dispersion model source parameters for each flue stack discharge. Table A-4 shows the passively ventilated hold dispersion model source parameters. The discharge has been modelled as an elevated area source. The potential downwash effect of the ship (assumed to 174m log and 28m wide) was incorporated into the model.

<table>
<thead>
<tr>
<th>Discharge Parameter</th>
<th>Flue Stack</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stack height</td>
<td>9m (above ground level)</td>
</tr>
<tr>
<td>Stack diameter</td>
<td>0.65m</td>
</tr>
<tr>
<td>Discharge velocity</td>
<td>9m/s</td>
</tr>
<tr>
<td>Discharge temperature</td>
<td>15°C</td>
</tr>
<tr>
<td>Methyl bromide emission rate</td>
<td>14.4kg/hour</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Discharge Parameter</th>
<th>Open Hold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source height</td>
<td>5m (above ground level)</td>
</tr>
<tr>
<td>Source length</td>
<td>20m</td>
</tr>
<tr>
<td>Source width</td>
<td>20m</td>
</tr>
<tr>
<td>Initial vertical dispersion</td>
<td>2.5m</td>
</tr>
<tr>
<td>Methyl bromide emission rate</td>
<td>14.4kg/hour</td>
</tr>
</tbody>
</table>
Appendix 3

Predicted Log Row Concentration Contour Plots
Figure A - 2. Predicted maximum 1-hour average methyl bromide concentrations (mg/m³) for ventilations in zone #1
Figure A - 3. Predicted maximum 1-hour average methyl bromide concentrations (mg/m³) for ventilations in zone #2A (50m buffer)
Figure A - 4. Predicted maximum 1-hour average methyl bromide concentrations (mg/m3) for ventilations in zone# 2A (100m buffer)
Figure A - 5. Predicted maximum 1-hour average methyl bromide concentrations (mg/m$^3$) for ventilations in zone #2B
Figure A - 6. Predicted maximum 1-hour average methyl bromide concentrations (mg/m³) for ventilations in zone #3
Figure A - 7. Predicted maximum 1-hour average methyl bromide concentrations (mg/m$^3$) for ventilations in zone# 4
Figure A - 8. Predicted maximum 1-hour average methyl bromide concentrations (mg/m³) for ventilations in zone #6
Appendix 4

Comparison of Mechanical and Passive Ventilation Procedures
Log Row Ventilation

Comparisons of predicted methyl bromide concentrations with increasing distances for a passively ventilated and forced ventilated log row for different wind speeds are shown in Figure A - 2 to Figure A - 4. The figures shows maximum one-hour concentrations predicted outside the port’s eastern boundary associated with discharges from a single log row oriented in an east-west direction and located 50m to the west of the port boundary. The hourly emission rate is assumed to be 24kg/hour. The same log row configuration was used in the construction of the look-up tables and is shown in Appendix 5. Downwind concentrations have been predicted for the constant wind speed of 1.5m/s, 3.5m/s and 5m/s.

The dispersion modelling predictions show lower maximum one-hour average concentrations are predicted for forced ventilation procedures for all of the modelled wind speeds. However, the results show the effectiveness of forced ventilation procedures is greatest during low wind speed conditions and when in closer proximity to the port boundary. For example, for the modelled wind speeds of 1.5m/s, 3.5m/s and 5m/s, the predicted concentrations for forced ventilated are 19%, 43% and 53% of levels predicted for passive ventilation at the port boundary and 49%, 74% and 83% at a 100m from the boundary.

Figure A - 9. Predicted maximum 1-hour average methyl bromide concentrations (mg/m$^3$) outside the Port boundary for a wind speed of 1.5m/s
Assessment of Effects - Discharges to Air from Methyl Bromide Fumigation

Figure A - 10. Predicted maximum 1 hour average methyl bromide concentrations (mg/m$^3$) outside the Port boundary for a wind speed of 3.5m/s

Figure A - 11. Predicted maximum 1-hour average methyl bromide concentrations (mg/m$^3$) outside the Port boundary for a wind speed of 5m/s
Appendix 5

Ventilation Rate ‘Look-Up’
Tables
Appendix 6

Comparison of Predicted and Modelled Concentrations
Introduction
The performance of the log row modelling assumptions was assessed by comparing predicted concentration against those recorded during ventilation. For the assessment, the predicted 1-hour methyl bromide concentrations were compared against those measured during the ventilation of nine log rows at the Port of Tauranga in 7 August 2014. The modelling parameters have been derived from information provided in the Genera Ltd audit report.

Scenario Description
On 7 August 2014 nine log rows were ventilated over approximately a 2.5 hour period at the Port. Four log rows were ventilated during the first hour and five in the remaining 1.5 hours.

During the ventilation period methyl bromide levels were monitored continuous at three monitoring site located approximately 60m to 150 m from the ventilating log row. iBID MX6 PID instruments were used to measure pollutant levels at each site. The monitoring site locations are shown in Figure A - 16 and Figure A - 17.

However, due to what appears to be instrumentation calibration issues, valid (unadjusted) methyl bromide concentrations were only recorded at one of the monitoring sites (site 2), and only during the first hour of the ventilation when the first four log rows were ventilated. The recorded methyl bromide levels (in ppm) measured at the site during the ventilation period is shown Figure A - 15.

During the first hour, the average methyl bromide concentration recorded at the site can be estimated from the figure to be between 2-3 ppm (i.e. 7.8-11.7 mg/m³). The figure indicates that effectively no methyl bromide was recorded at the site for the remaining 1.5 hours when a further five log rows were ventilated.

![Methyl bromide concentrations (ppm) recorded at monitoring site 2 during the ventilation period. Sourced from Genera Ltd 2014 audit report.](image)

Modelling Method
1-hour average concentrations have been predicted both for the first hour of ventilation when the first four log rows were ventilated (emission scenario 1) and also for the second hour when five log rows are ventilated (emission scenario 2). Log row emission rates, and source configurations have been derived from the audit.
report. Meteorological inputs for each of the modelled scenario have been based on the wind speed and wind direction measurements that were taken at the nearby BOPRC Tawa St ambient air monitoring site during the ventilation period. Neutral atmospheric stability has been assumed for both of the emission scenario hours.

The location of the log rows within the Port are defined with respect to the ventilation area and their row number. The first log row is located at the southern end of the fumigation area. However, since the width of logs vary it is not possible to define the exact location of each log row based on their row number. For the modelling assessment the location of row 45 has been estimated based on the information provided in the audit report and a review of aerial photos. The location of the other log rows have been defined with respect to row 45 assuming each log row has a width of 5m and is separated by 1m.

The volume of each log row has been estimated from the dosage provided in the audit report assuming a dosage rate of 120g/m³. The length has been derived from the volume assuming a width of 5m, and height of 4.5m.

Modelled emission rates assume that 30% of the dosage is discharged to air in the hour of ventilation. The same emission rates assumption was used to characterise emission rate in the assessment. Methyl bromide is assumed to be passively discharged from both ends of the modelled log rows. A summary of the emission parameters is shown in Table A - 12 and Table A - 13.

### Table A - 12. Summary of log row parameters for the 1st hour of ventilation (emission scenario 1)

<table>
<thead>
<tr>
<th>Time</th>
<th>Log Row</th>
<th>Dosage (kg)</th>
<th>Estimated Emission Rate (kg/hr)</th>
<th>Estimated Log Row Length (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:20</td>
<td>B45</td>
<td>133</td>
<td>40</td>
<td>45</td>
</tr>
<tr>
<td>9:40</td>
<td>B41</td>
<td>101</td>
<td>30</td>
<td>41</td>
</tr>
<tr>
<td>9:50</td>
<td>B39</td>
<td>156</td>
<td>47</td>
<td>56</td>
</tr>
<tr>
<td>10:15</td>
<td>B36</td>
<td>148</td>
<td>44</td>
<td>45</td>
</tr>
</tbody>
</table>

### Table A - 13. Summary of log row parameters for the 2nd hour of ventilation (emission scenario 2)

<table>
<thead>
<tr>
<th>Time</th>
<th>Log Row</th>
<th>Dosage (kg)</th>
<th>Estimated Emission Rate (kg/hr)</th>
<th>Estimated Log Row Length (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30</td>
<td>A32</td>
<td>85</td>
<td>26</td>
<td>31</td>
</tr>
<tr>
<td>10:55</td>
<td>A35</td>
<td>103</td>
<td>31</td>
<td>38</td>
</tr>
<tr>
<td>11:05</td>
<td>A45</td>
<td>152</td>
<td>46</td>
<td>56</td>
</tr>
<tr>
<td>11:25</td>
<td>A46</td>
<td>180</td>
<td>54</td>
<td>67</td>
</tr>
<tr>
<td>11:35</td>
<td>A47</td>
<td>171</td>
<td>51</td>
<td>63</td>
</tr>
</tbody>
</table>
Predicted Concentrations

One hour average methyl bromide concentrations predicted for emission scenario 1 and emission 2 are shown in Figure A - 16 and Figure A - 17. The location of the monitoring site 2 where valid methyl bromide levels were measured is shown in the figures by a red cross. The other two monitoring sites are shown by the red crosses. The located of the modelled log rows are shown by blue lines.

Table A - 14 summarises predicted 1-hour average concentrations measured during the ventilation period at each of the monitoring sites.

<table>
<thead>
<tr>
<th>Monitoring Site</th>
<th>Predicted 1-hour concentrations (mg/m$^3$)</th>
<th>Measured 1-hour average concentrations (mg/m$^3$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Emission Scenario 1</td>
<td>Emission Scenario 2</td>
</tr>
<tr>
<td>Site 1</td>
<td>0.1</td>
<td>6.0</td>
</tr>
<tr>
<td>Site 2</td>
<td>13.4</td>
<td>14.7</td>
</tr>
<tr>
<td>Site 3</td>
<td>7.5</td>
<td>1.8</td>
</tr>
</tbody>
</table>

The table shows methyl bromide concentrations predicted at site 2 were comparable but higher than those measured at the site during the first hour of ventilation. However, predicted concentrations during the second hour of the ventilation period were significant higher than those recorded at the site. The results of the monitoring during the second hour of ventilation are therefore difficult to explain unless the modelled rows during for emission scenario 2 or wind conditions during ventilation were significantly different from those modelled.

Lower concentrations were predicted at the other monitoring site during both hours of the ventilation. Methyl bromide concentration at the predicted levels should have been detectable by the PIDs at sites 1 and 3.

However, the predicted contour plots indicate that the emission plumes from the ventilated log rows are comparatively narrow and the concentration decreases rapidly with lateral distance from the plume centreline. Therefore significantly lower concentrations could potentially have occurred at site 1 and 3 if the emission plume was narrower than that predicted. In addition the variability of wind directions during the 1 hour ventilation period as each of the log row are ventilated may have resulted in a slightly different emission plume to that predicted and lower pollutant levels at the two sites.

Summary

Based on the comparison of predicted and observed concentrations at site 2 the dispersion modelling methodology used to predicted downwind methyl bromide concentration during log row ventilations is expected to be conservative. Predicted concentrations are expected to be higher than what are likely to occur.
Figure A - 16. Predicted one-hour average methyl bromide concentration (mg/m³) for emission scenario 1 (wind speed 2.4m/s, wind direction 273°)
Figure A - 17. Predicted one-hour average methyl bromide concentration (mg/m) for emission scenario 2 (wind speed 3.1m/s, wind direction 260°)
Appendix 7

Consultation
UML Application to discharge chemicals (methyl bromide) at the Port of Tauranga

Ngati Pukenga ki Tauranga - Cultural Statement

Resource consent applicant

UML

Description of proposal

UML proposes to apply for a discretionary activity air discharge resource consent from the Bay of Plenty Regional Council to discharge chemicals into the atmosphere under Rule 19 of the Operative Regional Air Plan 2003.

UML will undertake on-shore and in cargo fumigation of logs at Port of Tauranga using methyl bromide. Methyl bromide fumigation of logs is required by the two main log export markets of China and India.

Methyl bromide is to be ventilated from the ship’s cargo holds using a forced ventilation method to improve dispersion. Log rows are generally ventilated passively. During periods of low wind speeds, UML propose to employ a new mechanical ventilation method to assist with chemical dispersal from the log rows.

Iwi/Hapu

Ngati Pukenga ki Tauranga Moana

Area of interest

Te Awanui – Tauranga Harbour and immediate environs

Cultural association

In line with other iwi and hapu of Tauranga Moana, Ngati Pukenga has a kaitiaki obligation to safeguard Te Awanui in terms of any harmful discharges to earth, water or air.

Cultural effects

The iwi concern is in the potential for a negative impact from the release of methyl bromide into the Te Awanui environment. While we understand that methyl bromide is a pre-requisite for the export of logs to China and India to combat bark beetles, nevertheless we are keen to discharge our
Cultural Statement: For air discharge resource consent to discharge chemicals into the atmosphere

Resource consent applicant

UML

Description of proposal

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Iwi/Hapu

Ngai Tukairangi Hapu
Area of interest

The rohe of Ngai Tukairangi extends from Mauao throughout the Mount Maunganui peninsula including the Matapihi peninsula. Other shared interest areas include Te Papa, Sulphur Point and Otumoetai. This map was collated in 2014 for the Ngai Tukairangi, Ngati Tapu Hapu Management Plan.
Cultural association

The following table describes some of the significant sites of Ngai Tukairangi that are located around the vicinity of the Port of Tauranga. All water and land resources within this area are highly significant to hapu and are expected to be protected from any potential impacts as a result of the use of methyl bromide.

<table>
<thead>
<tr>
<th>SITE NAME</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mauao</td>
<td>Mauao and Te Awanui are highly significant and iconic places for Ngai Tukairangi and many hapu in Tauranga Moana. This is often expressed in pepeha “Ko Mauao te maunga, Ko Te Awanui te moana.”</td>
</tr>
<tr>
<td>Mauao peninsula</td>
<td>Relative to the all whenua of the Mount Maunganui peninsula.</td>
</tr>
<tr>
<td>Te Awanui</td>
<td>This is the name of the waterway within the inner Tauranga harbour and is now presently used to describe the entire harbour area.</td>
</tr>
<tr>
<td>Te Paritaha</td>
<td>Traditional mataaitai gathering area now a reclaimed land area known as Sulphur Point.</td>
</tr>
<tr>
<td>Moturiki</td>
<td>This significant island is located near Mauao.</td>
</tr>
<tr>
<td>Motuotau</td>
<td>Significant island near Mauao.</td>
</tr>
<tr>
<td>Hopukiore</td>
<td>Significant lookout point on the Mount Maunganui peninsula.</td>
</tr>
<tr>
<td>Te Papa</td>
<td>This is the traditional name for the previous landblock located within the Tauranga city area.</td>
</tr>
<tr>
<td>Otamataha</td>
<td>This is a traditional site located within the Te Papa peninsula. Many of our tupuna lie in the urupa that now resides there.</td>
</tr>
<tr>
<td>Taumata Kahawai</td>
<td>This is a significant battle site that is now covered over by a netball court in the central Tauranga city district previously called Te Papa. This was once a lookout site for the presence of kahawai entering the harbour.</td>
</tr>
</tbody>
</table>

Cultural effects

All effects described within the cultural statement are considered cultural effects. Any impacts caused by methyl bromide within proximity of the listed significant sites can be considered a cultural effect.
Environmental effects

Of the utmost concern environmentally, is that methyl bromide is an ozone depleting substance.

The Methyl Bromide Reassessment Committee of the Environmental Risk Management Authority stated that “in relation to the ozone depleting properties of methyl bromide the Committee noted that the only method of managing this is to require a ban of the substance or recapture. As there is no alternative to methyl bromide at present, banning the substance was not considered an appropriate option”. However, the Committee are of the view that requiring recapture within a 10 year timeframe is appropriate and necessary for New Zealand to meet its obligations under the Montreal Protocol and to manage the indirect effects that the use of methyl bromide poses to human health and the environment due to its ozone depleting properties (Environmental Risk Management Authority, 2010).

New Zealand has an obligation under the Montreal Protocol to; “refrain from use of methyl bromide and to use non-ozone depleting technologies wherever possible. Where methyl bromide is used, Parties are urged to minimise emissions and use of methyl bromide through containment and recovery and recycling methodologies to the extent possible.” (Environmental Risk Management Authority, 2010).

The Environmental Protection Authority (EPA) has stipulated that methyl bromide should not be used after 2021 without systems to recover and recycle the gas. However fumigators may seek an extension to the phase-out timeframe (Kegley, 2013).

In light of the health and environmental impacts from the use of methyl bromide Ngai Tukairangi recommends that UML honours the Montreal Protocol to discontinue its use by 2021 and to implement a suitable programme prior to 2021. The hapu recommends that current regulations on the use of methyl bromide at the Port of Tauranga are uplifted to a standard that improves upon the impacts on health and environmental damage regardless of what is dictated by the EPA.

Methyl bromide is moderately toxic to aquatic organisms. However, when applied properly, methyl bromide is not expected to enter surface waters via run-off or erosion, therefore poses little risk to aquatic species and it is not highly toxic to most plants (Extension Toxicology Network, 1993). Ngai Tukairangi therefore, expects appropriate management mechanisms to be implemented to ensure that there are no environmental effects on the marine and terrestrial environments.

Social effects

The health and safety issues associated with the use of methyl bromide is likely the most significant issue for Ngai Tukairangi. As a potentially life threatening carcinogenic substance this could have severe health impacts on our people that either work or live near the vicinity of the port. It is expected that health and safety regulations are improved upon as a result of the success of this resource consent application. It is expected that all employees working on the wharves of the Port of Tauranga are aware of the health and safety issues relative to the use of methyl bromide. This includes all other staff that are potentially at risk near the buffer zones of the port.

Any other comments

Due to the sensitivity of this resource consent application, Ngai Tukairangi representatives have not been provided with much of the specific detail of this resource consent application. Two meetings regarding this application were attended where information was shared verbally. However, it has been difficult to make a thorough assessment of this application without full disclosure of information. The cultural statement template that was provided
indicates requirements similar to the extent of a Cultural Impact Assessment, although the obligation was only to provide a Cultural Statement. It has been difficult to ascertain how much time, energy and information should be allocated to this task. Therefore, this statement is provided based on the brief descriptions we have received from the applicant and the statement has been kept brief as a result of this.

Under normal circumstances this level of information exchange and assessment would not be acceptable to Ngai Tukairangi. However, now that a copy of the Assessment of Environmental Effects has been viewed, in this case, the hapu have agreed to provide a cultural statement with conditional support. Ngai Tukairangi find the impacts of methyl bromide to be highly significant and are expecting further follow up to the outcomes of this statement and the resource consent application.

Recommendations

1. That recapture and recycle technologies are investigated and implemented prior to the expiry of the protocol.

2. That ventilation technologies described by the applicant for ship's cargo holds and log rows are applied and outlined in the resource consent application.

3. That the currently applied health and safety regulations are improved upon and stated within the resource consent application.

4. That any potential impacts on the environment are effectively managed by the applicant and stated in the resource consent application.

5. That buffer zones are increased as indicated by UML and included in the resource consent application.

6. That monitoring of health and safety regulations is carried out frequently to ensure that these are met by staff carrying out the use and application of methyl bromide.

7. That all staff that work on the wharves of the Port of Tauranga are aware of the methyl bromide health and safety regulations and protected from the health impacts of its use when working in or near by fumigation areas.

8. That UML provide full disclosure of the resource consent application.

Position on proposal

Ngai Tukairangi provides conditional support to UML's proposal, provided that recommendations provided by Ngai Tukairangi are considered within the resource consent application.
Reference List


Acknowledgement

I am authorised by Ngai Tukairangi Hapu to submit this report on behalf of Ngai Tukairangi Hapu

Signature: ........................................................................................................

Date: ........................................................................................................
Cultural Statement Template

Resource consent applicant

UML

Description of proposal

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UML will undertake on-shore and in cargo fumigation of logs at Port of Tauranga using methyl bromide. Methyl bromide fumigation of logs is required by the two main log export markets of China and India.

Methyl bromide is to be ventilated from the ship’s cargo holds using a forced ventilation method to improve dispersion. Log rows are generally ventilated passively. During periods of low wind speeds, UML propose to employ a new mechanical ventilation method to assist with chemical dispersal from the log rows.

Iwi/Hapu

Ko Mauao te Maunga
Ko Te Awanui te Moana
Ko Takitimu te Waka
Ko Tamatea Arikinui te tangata
Ko Ngati Ranginui te Iwi

Ngati Ranginui Inc Soc

Ngati Ranginui Iwi Society Incorporated has a mandate to promote the cultural, environmental, social and economic well-being and interests of its members.

Area of interest

Ngati Ranginui is one of the main mana whenua iwi belonging to Tauranga Moana. Based on the 2006 census, the estimated population of Ngati Ranginui was 7,647. The Ngati Ranginui area of interest extends from Nga Kuri a Wharei (Waihi Beach), north of Tauranga, inland to the summit of Mount Te Aroha, extending south-east along the Kaimai Range to Puwhenua and extending south to the Mangorewa River. From the Mangorewa River the boundary extends north-east to Otanewainuku and to coastal Wairakei. The area of interest includes, Mauao (Mount Maunganui), Te Awanui (Tauranga Harbour) and the Athenree Crown Licensed Forest.
Cultural association

Through the Settlement process, the Crown recognised the following Ngāti Ranginui hapū: Ngāti Te Wai, Pirirākau, Ngāti Taka, Wairoa hapū (Ngāti Rangi, Ngāti Pango, Ngāti Kahu), Ngāti Hangarau, Ngāi Tamaraawaho, Ngāi Te Ahi and Ngāti Ruahine.

The Ngāti Ranginui hapū within the jurisdiction of Tauranga City Council are Ngati Kahu, Ngāti Hangarau, Ngai Tamaraawaho, Ngati Ruahine and Ngai Te Ahi. Ngati Ranginui iwi Society Incorporated supports the autonomy and independence of constituent hapū in resource management issues and their relationships with Tauranga City Council and government agencies. Each hapū retain their tino rangatiratanga and kaitiakitanga over their respective natural taonga and most actively participate in resource management processes within their rohe.

Protecting the mauri and intrinsic value of the environment is of utmost importance to Ngati Ranginui iwi and hapū. The assertion of te tino rangatiratanga and kaitiakitanga within the RMA framework is an inherent one that Ngati Ranginui Iwi and their constituent Hapu take seriously. The protection of people and their physical or spiritual wellbeing is also of the utmost importance to Ngati Ranginui Iwi and Hapu. Ngati Ranginui considers the natural waterways and the Tauranga harbour as taonga having significant natural and cultural values associated with them. The significance of waterways and the Tauranga harbour is linked to the identity of Ngati Ranginui, its hapū and people. Ngati Ranginui will continue to actively protect their relationship with these taonga. Ngati Ranginui is concerned with the secondary contamination of waterways by runoff from operations at the Port of Tauranga.

Cultural effects

Ngati Ranginui does not distinguish between environmental and cultural effect. Ngati Ranginui considers people to be part of the environment and that any potential threat to the environment would be no lesser threat to cultural values.

Environmental effects

Ngati Ranginui does not support the use of methyl bromide or phosphine and the residual discharge to the environment by operation conducted at the Port of Tauranga, the cargo holds of vessels or any other industrial sight. Ngati Ranginui understands that methyl bromide is ozone depleting gas and a carcinogenic compound therefore hazardous to the environment including people. Ngati Ranginui supports the requirement by ERMA to phase out the use of methyl bromide by 2021 or alternatively, the introduction of technologies to recapture or neutralise the gas.

Ngati Ranginui will provide conditional support this particular application for consent by the Simplus Group/UML pending mutually agreed consent conditions and or side agreement favourable to a meaningful ongoing relationship between Ngati Ranginui and UML. And that those conditions also reflect improved environmental and operational standards proposed.

Recommendations

That UML formalise a relationship with Ngati Ranginui Inc Soc.

That UML clearly outline a full range of improved environmental and operational standards proposed as part of the application, to be included in the consent.

That UML agree to provide safety badges or alarm sensors to other working crews within a distance of the fumigation operations where there is a possibility they could become exposed to methyl bromide.
That UML agree to provide employment opportunity to Ngati Ranginui people where practicable.

That UML demonstrate to local Iwi by way of yearly report, improved environmental and operational standards are maintained.

**Position on proposal**
Conditional Support

**Acknowledgement**

I am authorised by the *Board of Ngati Ranginui Iwi Inc Soc* to submit this report on behalf of *Ngati Ranginui Iwi Inc Soc*.

Signature: …
..............................................................

Date: …15/1/2015..............................................................
Resource consent applicant
UML

Description of proposal
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Iwi/Hapu
Ngai Te Rangi

Area of interest
Mai Nga Kuri a Wharei ki Wairakei,

Cultural association
Te Awa o Tukorako, Te Marae me te papakainga o Whareroa, Te Kohanga Reo o Whareroa, Waikorire

Cultural effects
Our hapu and iwi have very strong views on the use of methyl bromide particularly from an environmental and health and safety perspective. From a cultural perspective the proximity of the log fumigation activity both in and around the port to our marae, kohanga reo and papakainga at Whareroa is detrimental, culturally, spiritually and physically.

The marae is our cultural hub where we undertake our customs and rituals, therefore exposure to these chemicals affects our ability to maintain our cultural practices in a safe environment.

Our people collect kaimoana and fish in close proximity to the activity also. Our ability to continue these cultural practices is also compromised.

Environmental effects
The literature around the use of methyl bromide is vast. We are not scientists per se. We know that this mixture of chemicals is toxic to the environment, including all forms of life, but especially for humans and animals – marine and on land.

Unfortunately in the pursuit of fiscal returns, the environment takes second priority to the profits of the global conglomerate and the GDP of NZ and its economy.
We believe that an innovative technique proposed by UML to diminish the adverse effects of the dispersal of the chemicals into the atmosphere is a step in the right direction.

Recommendations

The applicant UML, should continue to work within the industry & with the NZ EPA to find a solution to the use of these chemicals by diminishing the adverse effects resulting from the dispersal of these chemicals.

There also needs to be a global commitment to developing innovation in this field to halt the use of these chemicals altogether and to find alternative methods to ameliorate the adverse effects for Papatuanuku, Ranginui and Tangaroa.

Position on proposal

Ngai Te Rangi conditionally supports the application whilst the applicant considers alternatives to the use of Methyl Bromide for the fumigation of logs for export to China and India.

Acknowledgement

I am authorised by Ngai Te Rangi iwi to submit this report on behalf of Ngai Te Rangi.

Donna Poka, Manager, Resource Management Unit.
Te Runanga O Ngai Te Rangi Iwi Trust.
19 Kohitatea 2015.
kaitiaki obligations through receiving assurances that specific safety measures will be in use governing the use of methyl bromide for fumigation purposes.

We believe this is particularly important given the fact that apart from exceptional circumstances such as those touched on in this application; methyl bromide was effectively phased out of use in this country in 2005.

While we are not particularly happy about the use of a banned chemical agent we agree on the basis that the active investigation of alternative fumigation methods will from part of the applicants future operations here in New Zealand and Tauranga in particular. Any consent approval should incorporate this proviso.

Environmental effects

There is strong evidence available that shows that methyl bromide is an ozone depleting gas and can be harmful to human health. By default any discharge to air must have a negative environmental effect. As mentioned earlier, from our perspective we would like to be assured that the applicant is looking for less harmful ways of meeting their export obligations in respect of logs from the Port of Tauranga.

Social effects

The health and safety aspects have been mentioned earlier in this statement as have our requirements in this regard.

Any other comments

From our preliminary discussions our understanding is that the applicant will be able to provide improved environmental outcomes through competition. We would appreciate knowing exactly how that is to occur and over what time period.

Recommendations

• That UML provide a clear description of the proposed safety operating procedures whilst conducting fumigation activities using methyl bromide.
• That UML and the consent authority provide a monitoring plan and procedures to be followed in the case of an accidental discharge
• That UML and the consent authority provide regular activity reports at specific times e.g. quarterly
• That UML demonstrate that it is actively investigating fumigation or other methods that would lead to the elimination of the use of methyl bromide.
• That the consent authority receives regular updates on progress in this respect.

Position on proposal

Conditional support provided the recommendations outlined previously are able to be implemented.
Acknowledgement

I am authorised by Ngati Pukenga ki Tauranga to submit this report on behalf of the Iwi.

Signature:

Date: 14 January 2015

Buddy Mikaere
Consultant
Ngati Pukenga ki Tauranga Environmental Unit
PO Box 141
COROMANDEL 3506
Office: + 64 7 8667915
Mob: + 64 21 384620
buddy@manataiao.com
www.buddymikaere.com
10 November 2014

Dylan Makgill  
Team Leader Consents  
Bay of Plenty Regional Council  
PO Box 364  
Whakatane 3158

Dear Dylan

UML SUBMISSION TO THE BAY OF PLENTY REGIONAL COUNCIL FOR AN AIR DISCHARGE RESOURCE CONSENT

Aric Jana (UML representative) met with the Port of Tauranga on 2 October 2014 to discuss the UML application for an Air Discharge Resource Consent with the Bay of Plenty Regional Council.

A detailed overview of the proposed fumigation activities involving Methyl Bromide and Phosphine was presented to the Port. The Port of Tauranga is familiar with existing fumigation activities performed on logs involving Methyl Bromide and Phosphine, which occur within the port limits. Discussions relating to a modelling study performed by Beca Group on Methyl Bromide use within the Port of Tauranga were also had.

The Port of Tauranga is not significantly affected by UML’s proposed fumigation activities, provided that UML operate according to the Port’s official fumigation procedures [http://www.port-tauranga.co.nz/images.php?oid=2735](http://www.port-tauranga.co.nz/images.php?oid=2735), and operate within the appropriate statutory regulations.

Yours sincerely

Rowan Johnstone  
PORT ENGINEER
Appendix 8

Proposed Consent Conditions
Appendix 8: Proposed Consent Conditions

4 Fumigation Restrictions

4.1 The consent holder shall ensure that weather conditions at fumigation sites are actively monitored and that real time meteorological information is used to manage the fumigation activity.

4.2 The fumigation of log rows shall be carried out in accordance with the look-up tables, which specify the maximum number of log row fumigations that are permitted during an hour, and when forced ventilation methods shall be used.

4.3 A separation distance of 100 metres shall be maintained between groups of log rows (six or less rows per group).

4.5 Covering of goods for fumigation shall not take place if the wind speed is in excess of 25 knots.

4.6 The consent holder shall ensure that the tarpaulins used for fumigation are maintained in good working condition without any rips or tears, to the satisfaction of the Chief Executive of the Regional Council or delegate.

5 Emission Controls

5.1 Fumigants must be under the control of an approved handler pursuant to Hazardous Substances and New Organisms Act 1996 (or any subsequent updates of that Act) at all times. Only approved handlers or an approved trained person working under the direct supervision of an approved handler may handle and use fumigants.

5.2 All persons discharging fumigants shall ensure that:

a) The fumigant is discharged in a manner that does not contravene any requirement specified in the manufacturer’s instructions.

b) The use of fumigants complies with The Control and Safe Use of Fumigants - parts one, two and three, referenced HSNOCOP31 prepared by the Pest Management Association of New Zealand or any subsequent updates of that code.

c) The fumigant use must not result in any harmful concentration of fumigant beyond the boundary of the subject property or into water.

5.3 The permit holder shall prepare, maintain and comply with an appropriate Emergency Management Plan for all operations within one month of the consent being granted. The plan shall be to the satisfaction of the Chief Executive of the Regional Council or delegate (see Advice Note 1). The Emergency Management Plan shall as a minimum include, but not necessarily be limited to, the following:

- A list of all staff employed by UML including their training qualifications related to fumigation, with dates these were obtained/completed and their expiry.
- Emergency contact details
- Contingency plan details
- Material Safety Data Sheet
- Details on the location and volumes of methyl bromide stored
- All related approvals e.g. location certificates
- Standard operating procedures for all types of fumigation operations carried out
• All meter calibration certificates

5.3.1 Each year for the duration of this consent, during the month of May, the consent holder shall submit to the Regional Council an updated version of their Emergency Management Plan to the satisfaction of the Chief Executive of the Regional Council or delegate.

5.3.2 The consent holder shall ensure that only appropriately authorised UML employees with the necessary PPE are allowed into the Risk Area as defined in Appendix 2 of the Fumigation Procedures for the Port of Tauranga - Version One 03/05/2011, or any superseded version of this document.

5.3.3 All persons shall be excluded from any fumigation area where the methyl bromide concentration may be above the workplace exposure standard (WES) value, unless they are wearing appropriate respiratory protective equipment.

5.3.4 The consent holder shall monitor Methyl Bromide levels downwind of fumigation events at the nearest corresponding Port boundaries to ensure compliance with this condition. Levels shall be measured at the location determined to be the ‘worst case’. Monitoring shall continue every 3 minutes from the start of ventilation until the exposure level is below 1 ppm for at least 15 minutes.

5.3.5 Monitoring shall occur in a directly downwind direction at the edge of the buffer zone and the Port boundary. Where the edge of the buffer zone in the downwind direction is over water, the monitoring location should be the point on land at the edge of the buffer zone.

5.5 Log stack and timber fumigation shall occur no closer than 50 metres to the Port boundaries.

5.5.1 No fumigation may occur at any time within 200m of a passenger cruise ship.

5.6 Fumigation signage is required at three locations. These are:

a) Points of access to the Port of Tauranga
b) The boundary of the monitored safety zone
c) Next to or on the products being fumigated

5.6.1 The consent holder shall erect and maintain prominent signs at every point of access to the Port of Tauranga. These signs shall clearly display, as a minimum, the following information:

• State that fumigation may be taking place
• State the name of the fumigant
• The international sign for toxic substances (Skull and crossbones)
• The name of the fumigation operator
• Provide 24 hour contact details for the operator

5.6.2 The consent holder shall ensure the boundary of the monitored safety zone (previously defined) is clearly marked. This may include the use of flags, warning tape and cones.

The following shall apply:
(i) Signage should be displayed at a minimum height of 1m on a self-supporting stand and displayed in a prominent position.

(ii) Signage should remain in place until levels of methyl bromide remain under 5ppm for at least 15 minutes.

(iii) While venting additional signage must be prominently displayed with the wording “Danger Poisonous Gas Release in progress” and be associated with a flashing light.

(iv) Additional warning signs shall be prominently displayed next to or on the products being fumigated.

(v) All information shall be displayed in an outwards direction so it can be seen by people approaching the fumigation area.

5.6.3 All signage must be displayed and maintained to the satisfaction of the Chief Executive of the Regional Council or delegate.

5.7 Notwithstanding conditions 5.1 to 5.6 the consent holder shall ensure that all provisions of the HSNO Act (as amended by the 2010 Environmental Risk Management Authority (ERMA) Decision referenced HRC08002, (now superseded by Environmental Protection Agency (EPA)) shall be complied with.

5.8 For the avoidance of doubt, where inconsistencies exist between the conditions of this consent, “The Control and Safe Use of Fumigants” - parts one, two and three, prepared by the Pest Management Association of New Zealand, or any subsequent updates of that code, or the Hazardous Substances and New Organisms Act 1996 as amended by the 2010 Environmental Risk Management Authority (ERMA) Decision referenced HRC08002, then the most stringent provision shall apply.

5A Monitoring

5A.1 The consent holder shall as a minimum implement the following measures to ensure that accuracy of the monitoring of methyl bromide and phosphine use under this consent:

- Only use equipment which is recommended for the application intended.
- Calibrate all equipment, at least as frequently as recommended by the manufacturer.
- Return all meters used for reading methyl bromide levels to the supplier every 6 months for calibration or demonstrate to the satisfaction of BOPRC that calibration performed is to the same standard as performed by the manufacturer.
- Submit to Regional Council all calibration certification on request.
- Keep a detailed equipment calibration log and make this available on request.
- Ensure all staff who use monitoring equipment are trained in its use, with records of training made available to Bay of Plenty Regional Council staff upon request.
- Keep a clear record of all locations used for fumigation and corresponding monitoring.
- Once a year in March (or as directed by Bay of Plenty Regional Council) UML shall carry out ambient air sampling followed by laboratory analysis in combination with PIDs to determine the extent to which background VOCs may be influencing methyl bromide monitoring results.
5B** Reporting**

5B.1 The consent holder shall keep accurate records for every fumigation event. The data to be recorded is to include:

a) Date and time of each application and ventilation to atmosphere
b) Type of fumigation event e.g. logs under tarpaulin
c) Amount of Methyl Bromide and Phosphine applied
d) Accurate location of where Methyl Bromide was applied and ventilated, including using GPS coordinates, reference to map locations.
e) Capacity (or dimensions) of the enclosed space fumigated
f) Name of person/s using Methyl Bromide.
g) Exposure levels for each monitoring location
h) The type and identifying features e.g. serial number, for equipment used for monitoring exposure levels.
i) The volumes of methyl bromide and phosphine used monthly

5B.2 The consent holder shall keep accurate records of all complaints made by the general public to UML related to fumigation. This shall be made available on request of the Chief Executive of the Regional Council or delegate.

5B.3 The consent holder shall, every month after of the issue of the review, submit to the Regional Council reporting of Methyl Bromide use under this consent (see Advice Notes 1 and 4).

5B.4 All records, reports and data collected as required by the HSNO requirements for Methyl Bromide reporting to the EPA as amended by the 2010 Environmental Risk Management Authority (ERMA) Decision E shall be made available to the Regional Council on request.

5B.5 No later than 30 June for each year for the duration of this consent (following the review) the consent holder shall submit to the Regional Council annual reporting of MB use as per the HSNO requirements for Methyl Bromide reporting to the EPA as amended by the 2010 Environmental Risk Management Authority (ERMA) Decision under s67A of the HSNO Act on June 2011.

5B.6 If there is a significant change in the consent holder’s process or its inputs that will result in a change in the adverse effects of the activity on the environment (the environment defined under the RMA (1991)) then the consent holder shall immediately and in writing inform the Chief Executive of the Regional Council or delegate (Advice Note 1).

5B.7 The consent holder shall advise the Bay of Plenty Regional Council (Advice Note 1 and 2):

- Immediately, via the Regional Council’s Pollution Hotline of any exceedences of Methyl bromide or phosphine concentration required by the conditions of this consent and/or the HSNO Act as amended by the 2010 Environmental Risk Management Authority (ERMA) Decision under s67A of the HSNO Act on June 2011.
- Within 24 hours of any complaints about the fumigation activity with the details of complaint
- Immediately, of any uncontrolled release of Methyl Bromide or phosphine.
5B.8 The consent holder shall notify Bay of Plenty Regional Council at least 12 hours in advance of ship holds being fumigated for the purposes of undertaking compliance inspections.

5C **Recapture**

5C.1 The consent holder shall implement the effective recapture of Methyl Bromide associated with all fumigation under this consent in accordance with the following schedule, to the satisfaction of the Chief Executive of the Regional Council or delegate (see Advice Note 3);

- 15% of all log and timber fumigations by 30 April 2016
- 40% of all log and timber fumigations by 30 April 2018
- 100% of all log and timber fumigations by 30 April 2019

The consent holder may, subject to prior written approval by Bay of Plenty Regional Council, implement recapture on alternative dates to those specified in this schedule, as dictated by availability of appropriate technology. This shall be to allow for continuous development of recapture technology, and operationalising such technology as practicable to facilitate continuous improvement, to ultimately comply with recapture requirements imposed by the EPA. In the absence of an agreed alternative (for all or some of these dates) recapture implementation must comply as detailed in the above schedule.

5C.2 The consent holder ensure that all recapture material that is unable to be re-used is disposed of at an appropriately authorised facility, to the satisfaction Chief Executive of the Regional Council or delegate

5C.3 The consent holder shall report to the Bay of Plenty Regional Council annually on progress in introducing recapture technology as required by this consent. This report is to be provided no later than 31 October each year and be to the satisfaction of the Chief Executive of the Regional Council or delegate.

6 **Review of Permit Conditions**

The Regional Council may, within six months of any impact, compliance or environmental investigation report carried out by the Regional Council which shows an adverse environmental effect, serve notice on the permit holder under s.128(1)(a) of the Resource Management Act 1991 of its intention to review the conditions of this permit. The purpose of such a review is to assess the need for further monitoring of discharges from the sites, and to impose monitoring and discharge control conditions if appropriate.