Te Mata Mushrooms Limited, Havelock North

Application for Consent to Discharge Contaminants to Air

Report to the Hawke's Bay Regional Council: June 2010

Ron Pilgrim Consulting, Wellington

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1. Introduction

1.1 Commission

Ron Pilgrim Consulting was commissioned by the Hawke's Bay Regional Council (the Council) to technically review the application to the Council by Te Mata Mushrooms Limited (the Company). The brief is to provide a report on any further information required under s92 of the RMA; appropriates of the methods used by the Company; and conclusions reached with regard whether the effects of the activity are likely to be more than minor.

1.2 Location of Activity and Environmental Setting

The following information, unless otherwise stated, is extracted from the Application document.

The company's site, which is located at 174 – Brookvale Road, Havelock North, is bounded by farmland to the east and a new housing development (Brookvale) recently rezoned from Rural is located to the south-west. As at February 2010, the nearest dwelling is located around 250 m to the southwest of the Company's site boundary, however, when the Brookvale development is completed a larger number of residential developments will be about 200 m Company's site boundary

1.3 Extent of Activities

The farm produces its own compost of approx 100 tonnes per week with Two Phase 1 Compost Bunkers, Two Phase 2 Pasteurisation Tunnels, 5 Spawn Rooms, and 19 growing rooms

The activity, which is labour intensive, has expanded over the years and currently employs 120 people, most of whom are engaged in the growing of the mushrooms and related activities.

1.4 Application and Current Consent

The following information, unless otherwise stated, is extracted from the Application document.

This application pursuant to s88 of the Resource Management Act (RMA) is re-consenting of an existing activity that has been operating since 1967 and is currently operating pursuant to their existing air discharge permit No: DP980233A granted in November 2001. This consent authorises the discharge of contaminants into air from a composting and mushroom growing operation and associated activities. It included conditions that required compliance with an environmental management plan, specific improvements to operations, and a log of complaints be maintained.

Condition 5 required enclosing of the two processing bunkers with installation of an effective ventilation system routed to a biofilter for odour emission control to be installed by 30 August 2002. The Company advises that compliance with the conditions of the consent was achieved.

1.5 Need for Further Information Pursuant to s92 of the RMA.

There is sufficient information in the application documentation that further information is not required.

Following preparation of the 1st draft Report, the site was visited on Wednesday 9 June 2010 and issues discussed with the Company's management who were very open and helpful.

2. Summary of Activities

2.1 Introduction

The activities are described in the application documentation which includes as Appendix 1 a detailed report by Beca Infrastructure dated 24 February 2010 prepared by Michele Dyer and reviewed by Tracy Freeman. Minor corrections have been made to this Report as a result of the site visit on 9 June 2010.

The activities that have the highest potential to emit odour are composting activities, and the wastewater treatment pond especially if anaerobic conditions occur since the treated effluent is recycled back to parts of the process with effluent surplus to requirements irrigated to land.

2.2 Composting Activities

2.2.1 Composting Processes

The following information is largely extracted from the Application document with some refinements as a result of discussion with the Company on 9 July 2010.

The Company manufactures around 120 tonnes per week of compost processed in two parallel batches at any time to provide the substrate on which mushrooms are grown. The stages of manufacturing the substrate are summarized below.

The raw materials for compost are straw, chicken litter and gypsum (calcium sulphate). Straw is kept on site on a gravel pad until it is required. Chicken litter is stored in a three-sided roofed bunker with a concrete floor with the open front facing south-south-west and generally sheltered from rain. Presumably gypsum, which is not odorous when dry or wet, is received in bulk and stored out of the weather.

- Preparation of Chicken Litter. Gypsum is mixed with chicken litter as it is required and stored in an adjacent bunker adjacent to the bulk chicken litter bunker, and consists of a concrete pad and three walls. A tarpaulin is used to cover the mix during rain.
- Preparation of Straw. Straw bales are first laid out on an outside concrete pad and then wetted with wastewater treatment plant effluent approximately 30 hours prior to processing or a for lesser time during hot weather.
- Mixing of Raw Materials. Chicken litter and gypsum are placed on top of the bales, bales are turned twice, and the mix is transported to one of two Phase 1 bunkers.
- Phase 1 Composting. The initial composting is for three days. Bunkers have a concrete floor, two concrete walls, and an insulated panel roof with the two end openings fitted with heavy tarpaulins to enable machinery access when required and to allow air entry for combust aeration but not be adversely affected by wind. The concrete floor has recessed channels which enable leachate drainage and aeration of the compost, and are hosed out weekly to prevent blockages. Air is blown through the compost to maintain aerobic conditions and this process is regulated by a combined oxygen and temperature probe located around 1.2 m deep in the pile and by temperature probes located in the head space near the bunker roof. The target compost oxygen content is 6 – 8% but is higher if airflow is increased to regulate compost temperature (presumably 70-80°C). Phase 1

Bunkers are continuously ventilated through a single collection point in the roof to a biofilter and the rate of ventilation is maintained to normally ensure slight negative pressure within each bunker.

- Compost Mixing. After three days, compost is removed from the Phase 1 Bunker and placed on the composting slab for turning before being returned to the bunker for a further three days. The composting slab consists of a concrete slab in the open which is fitted with long air strips and the compost deposited in "windrows" along these aeration channels. Turning is carried out by machine within a day during which time air is blown through the windrows to maintain aerobic conditions. This ventilation air discharges direct to atmosphere. Following turning the compost is returned to the bunker for a further 3 days, and this cycle is repeated for around 13 days when half of the compost is removed, turned on the composting slab, extra water added as necessary, then transferred to one of the Phase 2 Tunnels for pasteurisation. On the following day the remaining half of the compost is removed, turned, watered as necessary, and transferred to the another Phase 2 Bunker.
- Pasteurisation. The two tunnels consist of a concrete floor, two walls, and roof. The end openings, which are open during filling (and emptying), are closed by sliding doors. Oxygen probes and temperature gauges are inserted into the compost at several points. Air in the Phase 2 Tunnels is recirculated at one end and a portion of the air is passively vented to atmosphere at the other end of the tunnel. There is also a roof top vent. Compost remains in the Phase 2 tunnels for around 5 days, following which it is removed using front-end loaders and processed into mushroom trays.

2.2.2 Wastewater Treatment Processes

Straw bales wetting is carried out on a concrete pad which is drained through recessed drain lines and back to the treatment plant.

All composting is carried out either within bunkers/tunnels equipped with leachate drainage or on the composting pad which is also equipped with leachate drainage through recessed drain lines back to the treatment plant.

Raw effluent is screened then aerated in a sump and circulated continuously through the storage pond but no effluent monitoring is carried out. The aeration process does generate foam and at times this can cover the local area but does not, we were advised on 9 June 2010, cause issues to neighbours.

The stored treated effluent is stored and recycled to wet the bales with occasional surplus applied to land within the Company's site.

2.2.3 Odour Minimisation and Control

2.2.3.1 Odour Minimisation

Odour minimisation is carried out by aeration of raw liquid effluent, and as a part of ensuring good product (compost) quality (controlled aeration of compost during the composting cycle). In addition, containment of ventilation air within the Phase 1 Bunkers and treatment of this odorous air in a biofilter is a major plank.

The primary mitigation measures are claimed by Beca to be the use of a biofilter to treat odours originating within the Phase 1 Bunkers, plus the use of odour control sprays.

On 9 July 2010, Company management advised that due to a spate of complaints their operating practices were reviewed. They found that for the first several hours of processing new compost in the Phase 2 tunnels that odour emission was higher than expected. They now increase the rate of aeration of the Phase 1 bunkers prior to loading out to the turning pad and also loading into Phase 2 tunnels, and they reduced aeration for several hours after compost is loaded into the Phase 2 tunnels. This has reduced the rate of odour emissions at the beginning of the Phase 2 activity.

2.2.3.2 Biofilter

Beca advises that the biofilter has a surface area of 144 m^2 and consists of graded bark having a depth of 1.75 m, with 0.25 m depth of washed river gravel as the air distribution system and to permit drainage. Maximum airflow is calculated from the fan specification curve as 20,250 Am^3/hour and the maximum loading is 80m^3/hour per m^3 of media. The fan speed is regulated by an electronic variable speed drive to keep the Phase 1 Bunkers at 38 to 40°C when the 'doors' are shut. The biofilter inlet temperature is read 2 to 3 times per day and ambient dilution air is added by manual duct adjustment at the biofilter inlet as required to maintain inlet temperature not exceeding 40°C. The biofilter media moisture is maintained at 50 to 70% (basis not stated) using an irrigation system and is tested weekly.

Beca noted that the biofilter loading (80m^3/hour per m^3 of media) exceeded that normally recommended for its type and duty – 20 - 40m^3/hour per m^3 of media. In spite of this, the biofilter was operating well and Beca has not recommended modifications to increase its capacity. Beca has, however, recommended that airflow not be increased unless the capacity is increased or 10 - 20% of soil is added to the bark media to increase its performance

The Company has recently fitted a water spray system upstream of the biofilter fan to humidify inlet air and, perhaps, act as an ammonia scrubber.

Visual inspection by Beca prior to reporting found that it appeared to be in good condition and damp under surface and was not emitting composting odours but only the light 'earthy' odours characteristic of a well operating biofilter. On 9 June 2010 the odour from a sample of the top media was light.

2.2.3.3 Odour Control Sprays

Odour control sprays are provided around the composting plant at many odour emission points that are not controlled by ventilation to the biofilter such as near the concrete turning pads, and around the Phase 1 bunkers and around the Phase 2 tunnels. "Super- Spice" is the odour neutralizing agent currently used and Beca understands that this was originally recommended by the Council.

Application of diluted Super Spice by fixed sprays occurs when compost is being unloaded, turned, and re-loaded and when the wind is blowing from the north-easterly sector.

The Company advised on 9 June 2010 that they have re-located the odour control sprays for the Phase 2 tunnels around the actual air vents to improve mixing of deodorising spray with odorous air.

Alternatives are discussed by Beca and the use of system based on chlorine dioxide gets a favorable mention, and the Company advised on 9 June 2010 that it is interested in its potential application.

2.3 Previous Process Improvements

Changes to processes and management practices recorded by Beca are as follows:

- Straw bales are wet for shorter periods in summer because of warmer ambient temperatures which reduces the odour of bales when broken open.
- Chicken litter is only received from suppliers who supply dry litter, and litter is no longer left over-night on top of broken bales.
- Compost is no longer left out over-night after chicken litter is mixed in.
- Mixing of compost is now done as windrows over aeration strips in the concrete pad and aeration during turning has reduced odour emission.
- In-bunker compost aeration, and bunker processing prevents over-wetting thus a less odorous compost.
- The blower oxygen set-point and the minimum fan runtime are increased during the 12 hours prior to compost being removed from bunkers.
- Since the Company has found that most odour from Phase 2 tunnels occurs within 2 to 3 hours after filling, during this time the re-circulating air fan speed is reduced and odour neutralizing sprays are operated around the vent.
- The biofilter fan is set to maximum speed when a bunker access cover is opened.
- The biofilter media moisture content is checked weekly and water spays applied if necessary thus drying out of media is now avoided (and the new inlet air humidifying system will also assist).
- Staff Training. Detailed instruction about air flow management and the odour control spray system are posted on the control room wall.

2.4 Inventory of Odour Emissions & Additional Mitigation Options

Table 6 of the Beca Report comprises odour sources, existing mitigation measures, likely impact of odour beyond site boundary now and after sub-division is completed, sensitivity of receiving environment, and 1st and 2nd level mitigation options. These are clearly presented and there is no need for us to summarise them.

2.5 Natural Gas-Fired Boiler

The Company operates a small (14.5 HP) natural gas-fired boiler to provide steam for sterilisation purposes.

A 14.5 HP boiler has a gross rate of heat release of around 142 kW (0.142 MW) and is a permitted activity pursuant to Rule 17 of the operative Resource Management Plan providing the conditions of the rule are complied with. There are no valid reasons why this boiler cannot meet the conditions of the rule.

3. Meteorology and Sensitivity of Receiving Environment

3.1 Meteorology

The Beca Report discusses the importance of meteorology in odour dispersion, and what is said is factual.

The analysis of wind patterns based on the Whakatu meteorological station and interpretation for the Company's location is also reasonable. Winds from the north-north-easterly and easterly direction will become increasing important as the Brookvale Estate develops.

We note that the Company has an anemometer located on-site but permanent records do not appear to be kept.

3.2 Sensitivity of Receiving Environment

The comments made in the Beca Report about how odour causes adverse effects, sensitivity to odour in rural environments, and sensitivity to odour in residential environments, are factual and well presented.

It is fair to say that the development of the Brookvale Estate will increase the sensitivity of the area to odour emissions from the Company's activities.

4. Comment

4.1 Composting Process

4.1.1 Raw Materials

Bales of straw in good condition and dry have no odour nuisance potential.

Raw chicken litter, providing it is received in a dry state, and raw and mixed litter if it is keep dry during storage will have only low odour nuisance potential beyond the Company's site. Receipt of good quality litter and keeping it dry appears to be the Company's aim. Photograph A1, which illustrates the chicken litter bulk storage bunker and the adjacent storage area of litter mixed with gypsum, indicates that spreading of material into the yard could cause an increase in background odour if the material gets wet and housekeeping is not good. While individual sources of such odour may not be important, they could be important collectively especially during warm and light wind conditions.

4.1.2 Bale Wetting

Spray wetting of bales by spraying, even when shrouded, has the potential to generate odour if the quality of the effluent is poor especially if the bales are kept wet too long before mixing with chicken litter, and if the surrounding yard area is not kept clean. The photograph under A1 illustrates not only the bale spraying area but, in the foreground, a large wetted area and extraneous solid material which could promote off-gassing of volatile odorous contaminants, and also the area may be difficult to keep clean.

Noted in 2008/2009 Compliance Report (Condition 8) that the alternative method of dunking bales was not successful and the spray wetting method was reinstated.

In Table 6.1 of the Beca Report, it is noted that bale wetting odour potential increases from low at the end of 2009 to moderate when the subdivision is completed. We agree with this assessment. Using only effluent of high quality, and minimising the extent of the wetted area, would significantly reduce odour nuisance potential. If this is not successful then containment of the bale spraying activity and ventilation to odour control equipment appears to be the only mitigation method that, if appropriately implemented, would reduce odour nuisance potential to minimal.

4.1.3 Mixing of Raw Materials

We do not see that this procedure has significant odour nuisance potential <u>if</u> the quality of the raw materials (including wetted straw) is good providing mixing then transfer to the Phase 1 Bunkers occurs relatively quickly. However, this may not always be the case.

If quality of raw materials and the quality of the effluent used for wetting bales if of marginal quality then containment of the mixing area with ventilation to odour control equipment may be necessary.

Ensuring that chicken litter is mixed with baled straw as soon as practicable, which now appears to be the case, should not cause odour nuisance.

4.1.4 Phase 1 Composting

The Phase 1 Bunkers appear to be well designed and operated and if negative pressure is maintained within the bunker sufficient to minimise fugitive emissions during normal wind conditions then their odour nuisance potential will be low.

4.1.5 Transfer of Compost to and from Composting Slab, and Mixing

Transfer from the Phase 1 Bunkers to and from the composting slab by front-end loader has significant odour nuisance potential during loader extraction, during transport to the composting of slab due to out-gassing of odour from the warm disturbed compost, and replacement in the bunker. This part of the activity is essentially uncontrolled. Although the actual mixing process is equipped with forced aeration it is essentially also uncontrolled and has significant odour nuisance potential. Increasing the rate of aeration in the Phase 1 Bunkers for some hours prior to loading out compost will reduce odour nuisance potential.

Beca suggests (Table 6.1) that the 2nd level improvement option is to provide an extra bunker so that compost can be mixed without being outside and also to provide additional bunker ventilation and enclose the front end to minimise odour emission during bunker to bunker transfers including active ventilation of Phase 2 Tunnels to avoid fugitive emissions during filling. I generally support this approach but note that movement by front-end loader compromises any comprehensive odour control option.

Ideally, the transfer of compost from a Phase 1 Bunker for mixing, the mixing process, compost replacement, and also transfer to Phase 2 Tunnels, should ideally be fully contained and continuously ventilated to high efficiency odour control equipment (generally, a large well operated biofilter). To reduce the cost of the containment and the rate of ventilation air extraction, such containment should be made as small as possible consistent with the ability to carry out the operations. In this respect, perhaps, a drum mixer and a more flexible method of extracting then returning compost to bunkers may be possible. Irrespective, the cost of such an upgrade will be high, especially since the activity is existing which limits design flexibility.

4.1.6 Transfer of Compost from Phase 2 Tunnels

The Phase 2 stage is called pasteurisation. During this process ammonium (NH_4^-) is converted to nitrates and other more useable forms of nitrogen. Pasteurisation also kills bugs such as mites, but does not sterilise the compost.

The Beca Report Table 6.1 does not refer to the operation of Phase 2 Tunnels except for their filling (high odour potential) and their emptying (low odour potential). From our experience, the Phase 2 stage after filling and until emptying does not have high odour potential but at this stage we are reluctant to say that odour nuisance potential is low. It may be that its odour nuisance potential is relatively low but can be additive to other relatively low potential odour sources which could have nuisance potential beyond the Company's site especially during adverse meteorological conditions.

4.2 Wastewater Transfer and Treatment

4.2.1 Use, Collection, and Transfer of Wastewater

The use of treated effluent is a commendable recycling initiative.

If the wastewater pond becomes anoxic then the odour of wastewater will increase and could significantly add to odour emissions from the bale wetting process especially when collecting in the yard area, and when breaking open bales.

It would be useful to build up information on the pond effluent dissolved oxygen concentrations.

4.2.2 Effluent Aeration Sump

The Beca report considers that the odour nuisance potential of this sump is generally low but this a rating of possibly moderate in relation to the residential sub-division if issues with the effluent pond occurred.

If effluent was anoxic due to its high organic loading and if aeration was unable to cope then aeration will strip out dissolved volatile odorous contaminants into air and add to odour nuisance potential of the pond.

4.2.3 Effluent Pond

If the aeration process is unable to keep the effluent aerobic then odour emission from the pond and aeration sump could, as stated in the Beca Report, cause moderate to moderately high odour nuisance potential.

We also agree with the Beca Report that monitoring of dissolved oxygen in the pond is required followed by review of the wastewater treatment plant if the D.O level is found to be less than 1 mg/litre.

4.3 Biofilter

The capacity of the biofilter must be close to its limit although during inspection by Beca it was operating well and appeared to be well maintained. Volumetric flow, however, should not be increased. The high loading placed on the biofilter will degrade the bark media more quickly that if the loading rate was lower and media quality should be carefully reviewed annually and replaced as necessary. Media pH should also assessed on a regular basis (at least every three months) and either liming carried out to keep pH more alkaline than around 6 units or limestone chips incorporated into the media.

Having the fan equipped with a variable speed drive, and the proposed installation of an inlet gas humidifier, are excellent initiatives.

In respect to the use of an inlet gas humidifier, unless this is well designed and controlled to act only as a humidifier it could cause flooding of the gravel distribution system and flooding of the lower media if the drainage section of the biofilter is under-designed. Consequently, the use of the humidifier as a scrubber to remove ammonia may cause the drainage section to overload.

4.4 Use of Odour Neutralising Agent

Although we have no specific experience with "Super Spice", from the description in the Beca Report it appears to be a standard odour neutralising agent consisting of high molecular weight monomers, essential oils, and other compounds including a "highlight" (perfume). Our experience rests with Epoleon, Air Repair, and Ecolo.

The use of odour neutralising agents is popular because of low capital cost and moderate operating cost compared with more traditional odour control programmes. Their effectiveness is seldom demonstrated by

solid scientific evaluation but you occasional see references to their ability to substantially reduce the concentration of contaminants such as hydrogen sulphide in air, and more frequently when the agent is applied directly to solids and liquids. We have not found their use to be effective when sprayed in accordance with the vendor's recommendations into ambient air to neutralise odour as a gas phase reaction. This is not surprising since it will be very difficult to intimately mix odorous air with neutralising agent (or with any other de-odorising agent) to be effective.

In a paper by Fleer *et al* (2002) [1], the authors evaluated a number of odour neutralizing agents for the control of odour associated with the manufacture of glass wool insulation, vehicle tyres, animal by-products plant, a broiler farm, and a municipal solid waste landfill, based on dynamic dilution olfactometry data. The evaluations included direct application to odorous surfaces, use in a water scrubber, and sprayed into air. In each instance, either minimal or nil reduction in source odour level was observed.

Discussion with the Company on 9 June 2010 indicated that they were aware of the limitations of odour neutralizing agents such as Super-Spice especially if not intimately mixed with odorous air, or if used in excess (perfume smell could be offensive). Providing the odour of the neutralising agent is not discernable beyond the boundary of the Company's site there is no actual harm for the Company continuing to spray Super Spice into odorous air streams but we doubt that it will have a significant measurable positive effect on odour concentrations. However, in any case, the Company's employees should not think that the use of "Super Spice" is an alternative to employing sound operating practices and other odour minimising practices and this, we believe, is the case.

4.5 Chlorine Dioxide

Chlorine dioxide is a powerful odour oxidizing agent and there is no doubt that with proper application the use of chlorine dioxide will substantially reduce the concentration of odorous contaminants in an odorous air stream. Since chlorine dioxide is not a chlorinating compound the odorous trihalomethanes and other chlorinated organics will not be generated in the presence of ammonia and amines. Since chlorine dioxide is highly explosive, for smaller applications, chlorine dioxide is normally generated by acidification of sodium chlorite (stabilized chlorine dioxide). However, to optimise its effectiveness and minimise operating cost, odorous air is best treated in the gas phase within a confined area (for example, within a duct) and not by spraying into ambient air.

4.6 Meteorological Records

It is useful to have an on-site meteorological station located in an area that is representative of wind low through the site activities without being unduly influenced by buildings and trees.

The Company now has a new anemometer and its software enables the keeping and processing of data.

A permanent record of meteorological processed data should be kept for evaluation purposes.

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[1] Fleer, F.E., Ormerod, R., & Pollock, T. Odour Neutralising Agents – Fact or Fallacy? CAZANZ International Clean Air Conference. 2002.

4.7 Sensitivity of Receiving Environment

Development of the Brookvale Estate will increase the sensitivity of the area to odour emissions from the Company's activities. Having said this, it should be expected by occupiers of the new residential developments that moving closer to rural activities will increase the likelihood of experiencing at times normal odours from rural activities.

4.8 Ability of Company to Substantially Upgrade Odour Mitigation Measures

The operations were established in 1967 and is presently owned and operated by the second generation members of the two families who started the business over 40 years ago. The Company is one of the six members of the Commercial Mushroom Growers Federation N.Z (with the largest grower (Meadow Mushrooms) not being a member).

The raw materials for manufacturing compost, and energy, are sourced locally. Spore is sourced from Australia, and peat medium is sourced from Southland. With around 120 employees, the activity is very labour intensive. Consequently, much of the operating costs is spent in the Hawke's Bay Region.

Produce is sold within the North Island, mainly to Supermarkets which are the largest retail outlet but prices are very competitive.

Having evaluated the processes on 9 June 2010, it is apparent to us that the capital cost of containing the complete composting activity including spray irrigating baled straw in a manner that would enable appropriate process ventilation, and providing a substantial increase in biofiltration capacity to de-odorise ventilation air, would be very expensive. A partial alternative of re-organising processing activities to reduce the additional containment and ventilation required would also be expensive given that the activities are existing and would need to be re-built.

An alternative, if a new consent is granted, is to optimise the current activities and their management.

5. Compliance and Complaints Reports

5.1 Compliance Reports and Incidence Inspections

5.1.1 Compliance Report 2009/2010 Grade Date 19 February 2010

The Environmental Grade was 3 (moderate non-compliance) with a Technical Grade of 1 (compliance). The 2008/2009 grades were Environmental 4 (significant non-compliance) and Technical 1 (compliance).

The overall comment was as follows. "There has been a reduction in the number of complaints in the last year and in the severity of these odour events. Some new control measures have been introduced. It has not been determined which measures have been effective in controlling odour. An abatement Notice regarding odour remains in effect."

In respect to Condition 8 (There shall not be offensive or objectionable odour beyond the boundary of the site.) the reporting officer stated on 19 February 2010 that for the reporting year there have been nine complaints of which four were found to be not a problem and in the other five cases the odour dissipated within approximately 1 hour. Further to this one complainant has recorded several incidences of odour events. These are recorded on the file."

In respect to Condition 9 (providing surrounding neighbours with Company contact details), the reporting officer noted that there has now been significant residential development in the area and there are now too many residents to maintain a list of affected persons.

In respect to Condition 10 (in the event that offensive or objectionable odour beyond the site a written report from the Company is required indicating likely cause and measures to avoid, remedy or mitigate any adverse effect), the reporting officer comments as follows. "As none of the complaints were verified by Council officers, no written report was required."

It appears, subject to the vagarities of meteorological factors, that while residential development continues to increase in the area, the number of official complaints during 2009 decreased and that none of the complaints were able to be verified by Council officers. Presuming that complaints were genuine and that they did relate to the Company's activities, it appears that either odour events were of relatively short duration and/or that unfavorable meteorological conditions were replaced by favourable conditions.

5.1.2 Complaint Records

We have reviewed the complaint records provided by the Council from 31 January 2007 with emphasis on the records commencing January 2009.

The difficulty having officers who are not permanently located in the immediate area verifying complaints about odour that are sporadic and may only light to moderate intensity is well illustrated. However, the inability to be able to verify during 2009 that odours complained about were at times "offensive and objectionable" is problematic. Having said this, our experience over may years is that generally for every recorded complaint there are often many more people who are adversely affected but do not complain unless personally contacted. Of course, this general rule may not be applicable in respect to this specific situation. The complaint records initially provided to us ceased at 28 September 2009, but in an email

dated 16 June, Simon Moffitt advised us that due to a number of complaints being received (from one complainant) that were unable to be verified (probably because odour event was of short duration), the complainant was advised to complete an odour diary, but they could still phone the hotline to complain if an odour was severe and likely to be able to be verified.

Since 28 September 2009, the information provided by Mr Moffitt indicated the following:

Email Contact and Odour Diary:

- Email - 10 November 2009. Not many instances of mushroom smells and when they occurred only of short duration.
- Email - 5 January 2010. Wafts of mushroom compost in the morning but short duration.
- Email – 22 January 2010. Odour previous night was foul and odour diary attached – see table below for 21 January 2010.
- Email - 13 April 2010. Complainant thinks that situation may be improving. Sometimes note odour in morning around 7:45 – 8 am but has not lingered too long.

Odour Diary: 27 May 2009 to 12 April 2010 Inclusive

DATE	TIME	WIND DIRECTION	WIND SPEED	ODOUR STRENGTH	OFFENSIVE -NESS	DESCRIPTION	1. COMMENTS
							1.1.
27/5/09	7.30 am		0	5	5	Sewerage	
29/5/09	8.00 am		0	3	3	Foul mushroom smell	Also smelt as grandson walked to HNHS about 8.30 am
10/6/09	7.30 am-5.00 pm approx	NE	?	5	5	Foul sewer type smell	Hung around HNHS all day
11/6/09	8.00 am-9.00 am	-	?	2	2	Mild compost smell	disappeared
14/7/09	4.00-4.30 pm	[illegible]	[illegible]	3	5	Disgusting sewerage	Maybe due to previous rain
28/7/09	1.00-4.15 pm	[illegible]	Very little	5	5	Offensive	Was at HNHS at lunchtime when students were outside for lunch. Grandson came home and said students were complaining.
14/8/09	All day	NW	Light breeze	5	5	Disgusting sewerage	I have four HNHS students visiting complaining about the smell at their school all day. One boy says it was so bad he was coughing. The teachers were complaining too.
23.11.09	7.45 am	NE	Light breeze	3	3		Unmistakeable but not the worst – left for work.
23.11.09	6.25 pm	NE	Average	5	5	sewerage	Didn't last long – wind blew it somewhere else

DATE	TIME	WIND DIRECTION	WIND SPEED	ODOUR STRENGTH	OFFENSIVE -NESS	DESCRIPTION	1. COMMENTS
			breeze				
20.1.10	All day on and off	NE	Light breeze	2	2	Slightly foul	Showery day
21.1.10	From about 7 pm onwards	NE	No wind	5	5	Disgusting sewerage	Rained most of day so inside – may have been around during day?? Had door open due to humidity and seeing visitors off
27.1.10	About 4.30	N	Light breeze	4	5	Sewerage	Damp moist weather but not raining
28.1.10	7 am	-	No wind	2	2	compost	Cloudy and humid
29.1.10	8 am	-	No wind	5	5	Offensive and foul	Had to close doors and windows on a sunny morning but it didn't last long. It moved across to Woodlands drive where my son lives. Husband picking up grandchild and their family could smell it. When he returned no smell at home, so it is a cloud of smell that sometimes hangs about and other times drifts.
22.3.10	7.45 am	NW	Very little breeze	5		Very offensive but don't know how long it lasted	Leaving for work, so not sure how long it lasted or where the drift went
12.4.10	7.45 am	NW	Very little breeze	3		Distinctive odour	Left for work, but don't think it would have lasted too long.

6. Best Practicable Option and Case Study

6.1 Best Practicable Option

The RMA provides for imposing as a condition of consent adoption of the "best practicable option."

If consent is granted, the Hearing Committee may, pursuant to section 108 of the RMA, impose conditions on the consent holder. Conditions can include (section 108(2)(e)), "subject to subsection (8), in respect of a discharge permit ... to do something that would otherwise contravene section 15 (relating to the discharge of contaminants) ... a condition requiring the holder to adopt the best practicable option to prevent or minimise any actual or likely adverse effect on the environment of the discharge and other discharges (if any) made by the person from the same site or source."

The term "best practicable option" is defined in section 2(1) of the Act as follows:

"best practicable option, in relation to a discharge of a contaminant or an emission of noise, means the best method for preventing or minimising the adverse effects on the environment having regard, among other things, to—

(a) the nature of the discharge or emission and the sensitivity of the receiving environment to adverse effects; and

(b) the financial implications, and the effects on the environment, of that option when compared with other options; and

(c) the current state of technical knowledge and the likelihood that the option can be successfully applied."

Section 108(8) provides that before deciding to grant a discharge permit ... to do something that would otherwise contravene section 15 (relating to the discharge of contaminants) ... subject to a condition described in subsection (2)(e), the consent authority shall be satisfied that, in the particular circumstances and having regard to—

(a) the nature of the discharge and the receiving environment; and

(b) other alternatives, including any condition requiring the observance of minimum standards of quality of the receiving environment—

the inclusion of that condition is the most efficient and effective means of preventing or minimising any actual or likely adverse effect on the environment.

The BPO not only takes into account the nature of the discharge and the sensitivity of the receiving environment, but also the financial implications.

We accept that the positive environmental effects of the Company's operations are very significant – they produce a well sought-after product using raw materials largely provided from the region and employ a large number of people who live locally. The flow-on effects of the Company's local and regional

expenditure will also be very significant. They are appropriately located in respect to the zoning of the land they occupy.

However, it is practicable to extend the existing process control by largely containing remaining potentially significant odour generating activities and ventilate to efficient odour control equipment, albeit at a high capital cost and a significant operating and maintenance cost. The Company has already enclosed and ventilated to a biofilter the Phase 1 Bunkers and carried out other improvements which have obviously reduce odour nuisance potential. However, the layout of activities does not appear to easily lend itself to further logical process containment and this will add to the cost of significant additional mitigation.

6.2 Case Study - N.Z. Mushrooms Limited (W 060/2007)

This interim Environment Court decision relates to New Zealand Mushrooms Limited, Morrinsville, which carries on a composting activity very similar to that carried on by Te Mata Mushrooms Limited but does not include Phase 2 processing (this is carried out at the mushroom growing site). The issue was chronic odour effects on adjacent activities in the rural zone –dwellings on farms located around 350 m, 630 m, and 860 m from the composting yard.

The Court found that the composting operation undertaken discharged unpleasant odours which had an adverse effect at a chronic level on its neighbours, the homes and regular working areas are well away from the site boundary. The odour effect was found to be offensive and objectionable when assessed from the standpoint of ordinary reasonable persons exposed to it under those circumstances. In addition, if the effect did not fall into the offensive and objectionable category, in the Court's view it was adverse to a significant degree. (Page 58 of decision.)

The benefits of the activity on the region were fully understood by the Court and undisputed, and the Court recognized that without the composting facility it was unlikely that there would be any mushroom growing in Morrinsville and elsewhere in the region (pages 60 and 61).

The Court referred to the decision in *Ravensdown Fertiliser Co-operative Limited v Smith* where the Court permitted the ongoing operation of a longstanding fertilizer works notwithstanding that it would continue to emit hydrogen sulphide odours. The Court acknowledged there would be a continuing situation of occasional odour detectable beyond the works but the extent of such odour will not be so noticeable and unpleasant that a significant adverse effect could reasonably be said to exist as regards to Ravensdown residents. The Court also signaled that if its expectations about there being no significant adverse effects were shown to be wrong then the matter would have to be revisited insofar as the installation of expensive scrubber equipment was concerned.

The Court also referred to other decisions. In *Winstone Aggregates and Others v Matamata Piako District Council* the Court indentified principles that were relevant in the case. They were:

- "In every case activities should internalize their effects unless it is shown they cannot do so.
- There is a greater expectation of internalizing their effects of newly established activities than of older activities.

- Having done all that is reasonably achievable, total internalisation of effects within the site boundary will not be feasible in all cases and there is no requirement in the RMA that that must be achieved."

The second decision the Court referred to was *Wilson and Rickerby v Selwyn District Council* where the Court derived the following principles from earlier decisions:

- That the test for odour is objective.
- There is a duty to internalise adverse effects as much as reasonably possible.
- That it is accepted that in respect to odour the concern is to ensure that odour levels beyond the boundary are not unreasonable (being the same as offensive or objectionable or significant adverse effects).
- That in assessing what is reasonable one must look into the context of the environment into which the odour is being introduced as well as the planning and other provisions (location).

In the case of N.Z. Mushrooms the most important consideration was the 3rd point in Wilson and Rickerby (That it is accepted that in respect to odour the concern is to ensure that odour levels beyond the boundary are not unreasonable (being the same as offensive or objectionable or significant adverse effects)). (Pages 62 & 63.)

It was accepted by the Court that the present air extraction used in the composting (Phase 1) bunkers could not adequately capture odour during the bunker to bunker transfer process nor can it capture odour from the compost at all while it is outside the bunkers. (Page 66.)

The Court accepted that the operation of Cresta located at Pukekawa, which is undertaken in a fully enclosed facility, was economically viable and practical, but the Cresta operation is substantially smaller than N.Z. Mushrooms at about 1/3rd of the production level and operates on a completely different system for loading the bunkers. The Court did assume that the enclosure system at Cresta is successfully eliminating odour problems because Cresta had recently renewed its resource consents and had sign-off from all of its neighbours enabling that to happen. (Page 66.)

The Court considered the issue of what the best practicable option to ensure that offensive and objectionable odour did not escape the site would be. Although lesser mitigation measures would probably achieve some improvement and would cost less than enclosure, the Court was not satisfied thay would achieve the bottom line identified (the 3rd point of *Wilson and Rickerby*). (Page 68.)

The Court did not think that the RMA requires that there be an absolute guarantee that mitigation measures are successful. Where there is doubt it may be appropriate to use s128 so that mitigation measures can be re-visited. If consent was to be grated then it must be on the basis that the site is enclosed to the extent required to achieve a level of odour capture which ensures there are no offensive and objectionable odours discharged beyond the boundary. The Court did not necessarily mean to enclose the whole operation – it means to enclose the bunker to bunker transfer operation to the extent necessary which is required together with associated measures such as increasing the capacity of the air extraction system and probably the biofilter. (Page 69.)

The Court proposed to give N.Z. Mushrooms until 31 October 2007 (or an extension for a limited time) to report back to the Court and other parties whether or not it is agreeable to proceed on the basis of the necessary required degree of enclosure. If the Company has formed the view that enclosure in whatever form is not a viable option for it then the appeals against grant of air discharge consent and bunker expansion would be allowed. In addition, the Court indicated to the Company that if it was prepared to enclose its facilities to the necessary extent the Court accepts it would be appropriate for the relevant consents to be granted on a longer term basis that is presently the case. (Pages 69 & 70.)

I am uncertain as to the current situation with N.Z. Mushrooms. In a Press article dated 15 December 2008, the Company reported they will close their Morrinsville operations at the end of 2010 as a managed exit because of the cost of upgrading and 160 jobs will be lost to the region. In a press article dated 10 February 2009, Environment Waikato was reported to have stated that it supports a bit by N.Z. Mushrooms to continue operating until the end of 2010. The Company was also reported as saying that the extension of operation to the end of 2010 was to enable its Christchurch operation (Meadow Mushrooms) to expand its Canterbury site and for the Morrinsville Company to source its compost from there. This would allow the Company to retain mushroom growing in Morrinsville and its 160 jobs.

7. Effects of Activity More Than Minor

Based on our evaluation of information provided in the application for consent, and on our experience with composting activities, there are elements of the Company's activities that currently have moderate to significant odour nuisance potential.

However, we are surprised, even accounting for often favourable meteorological conditions, that given the presence of dwellings to the west of the site and increasing development of residential to the south-west, that the rate of complaint is as low as it is.

However, in our opinion, it is inevitable that with increasing residential development to the south-west that substantiated complaint about objectionable odour will increase unless nuisance odour events are maintained at a low level.

8. Processing of Application

The Council has the opportunity to process the application for an air discharge permit as non-notified, limited notification, or fully notified.

Obviously, processing the application as non-notified is not appropriate so the only options are limited notification or full notification. Given the extent of the increasing residential development in the area and that complaints often came from people a hundred metres or more further west of the nearest residential neighbours on Arataki Road, it is difficult to draw a boundary for limited notification.

Our recommendation is to process the application as fully notified and for the Council to limit individual notification to people located within a radius that encompasses the most distant validated complainant.

9. Possible Consent Conditions if Consent is Granted

9.1 Standard Conditions

Standard conditions such as the current Conditions 1, 2, 8, 9, 10, 11, and the review condition, should be applied as currently undated as the case may be.

In particular, the review condition should be available on an annual basis.

9.2 Potential Nuisance Odour Generating Activities

Potential nuisance generating activities, either specifically or cumulatively, are as follows:

- Receipt, storage, and use of chicken litter that is not of good quality.
- Storage of chicken litter that is wet or becomes wet during storage.
- Holding of straw bales for an excessive time after wetting with wastewater effluent.
- Using partially anaerobic wastewater to wet bales.
- Holding of chicken litter/gypsum mix on top of straw bales for an excessive time prior to mixing, and holding for an excessive time after mixing before placement in the Phase 1 Bunkers.
- Failure to ensure proper aeration of compost in Phase 1 bunkers to maintain aerobic conditions.
- Failure to ensure proper ventilation of Phase 1 bunkers to maintain slight negative pressure.
- Failure to maintain biofilter in optimal condition and/or overloading of biofilter.
- Failure to increase rate of aeration of Phase 1 Bunker compost for around 12? hours prior to removal to the mixing pad or direct to Phase 2 Tunnels.
- Transport of compost by Front-end Loader from Phase 1 Bunkers to and from mixing pad and from the mixing pad to Phase 2 Tunnels.
- Failure to adequately aerate compost on mixing pad during the turning process.
- Failure to aerate new compost load in Phase 2 Tunnels relatively slowly during the first several hours of the pasteurisation process.
- Insufficient aeration of wastewater.
- Wetting of mixing pad area and adjacent areas with wastewater especially if it is partially anaerobic.
- Dropping of compost during transfer onto the yard areas especially if they are wet from wastewater.
- Failure of odour neutralizing sprays to effectively reduce odours.
- Unsatisfactory housekeeping.

In theory, specific conditions should be applied to each of these activities but at a significant risk of becoming over-prescriptive. The alternative is to refer to the Environmental Management Plan (EMP) as does Condition 3 of the current consent. The current consent also includes the relevant sections of the EMP as Appendix 1 of the consent.

On balance we prefer the current approach of Condition 3 referring to the EMP but question whether if relevant sections are included as an Appendix to the consent whether this is locked in and, in effect, becomes a part of Condition 3 and cannot be easily amended.

Our preference is to have some general prescriptive conditions relating to odour minimisation measures which are legally enforceable as well as Condition 3 which refers to the EMP but is not included as a part of the consent.

9.3 Other Recommended Conditions

Formulation of other conditions is best left to after submissions from notifying the application are evaluated.

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