



24th July 2017

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Dear Nick

Submissions on first draft of Organic Materials Guideline

The draft “Beneficial use of organic waste products on land” guideline was published for external review by stakeholders in December 2016. Five regional meetings were held to discuss the draft during February 2017, over 100 people attended. Twenty-three submissions from 36 individuals and organisations were subsequently received. The project Steering Group held a meeting to consider these submissions on 27 April 2017. Several of the responses raised issues regarding the management of microbial contaminants and I have been asked to respond.

The submissions are summarised in Table 1 below.

Table 1. Summary of submissions relating to management of microbial contaminants

Submitter	Detail
Water Care	Section 6.8 indicates that soil should be tested for <i>E. coli</i> . It is not clear why this is recommended. The site restrictions and exclusion periods have been shown to be adequately protective for pathogen management. This type of testing of the soil would not provide useful information for managing risks of pathogen exposure.
	Stock exclusions We recommend that the time period between biosolids application and stock access or harvest be reviewed. A 6-month exclusion period differs from regulations used in other countries (generally a 30-day exclusion period). A 6-month exclusion time is unnecessarily prohibitive and would not fit into current farming practices where a type B biosolids could otherwise be utilised.
Hutt valley DHB	We recommend that the wording in Section 6.8, page 23, around when soil should be tested pre application of organic waste materials is clarified as it is difficult to determine this from the text, for example, it appears to read that soil testing (for existing contamination and background <i>E. coli</i>) is only recommended prior to application of Type 1B and 2B materials. A table of recommended soil sampling pre and post application will provide clarity for each type of organic waste material. It will be important to emphasise that although the level of contaminant (chemical or pathogen) accumulation will be captured by post application monitoring, decisions about the appropriateness of the site being utilised for application are necessary prior to commencement. This type of risk assessment can take into consideration the current planned use of the site and consider potential impacts of future use in relation to likely levels of accumulated contaminants.

	These aspects could be added to the Land Application Site Management Plan and Nutrient Management Plan (Sections 7.2 and 7.3, page 30)
	Section 9.6, page 39, recommends background soil testing for <i>E. coli</i> concentrations. It would be useful to clarify if this guidance is intended for all types of organic waste material or only certain types. The section states 'If numbers of <i>E. coli</i> are found to be 100 fold higher than background counts, decisions about further restricted access or land-use should be made on a case-by-case basis after consultation with the local Medical Officer of Health (Health Act, 1956).' Regional Public Health would like to understand the evidence base of this recommended trigger level for notification to the Medical Officer of Health. Although useful to have a numerical trigger level, the risk will also depend on the proposed activities for the site and likely exposure risk

The following resources have been used to consider the points raised by the submitters in table 1 above:

- US EPA; US Environmental Protection Agency (1993) Part 503-Standards for the Use or Disposal of Sewage Sludge. Federal Register 58, 9387-9404.
- Western Australian guidelines for biosolids management (2012) Department of Environment and Conservation
- New South Wales Environmental Protection Agency (2000) Use and Disposal of Biosolids Products.
- Email conversations with Paul Darvodelsky (PSD Australia)

Below I have outlined the response to the submissions.

Stock withholding periods and site restrictions

The goal of site restrictions is to limit site activities such as harvesting and grazing until pathogens potentially present in biosolids have been reduced by environmental conditions such as temperature and UV.

The current Guidelines for the Safe Application of Biosolids to Land in New Zealand (2003) suggest a stock withholding period of 6 months after Grade B biosolids have been applied to "fodder crops, and pasture, orchards where dropped fruit is not harvested, turf farming, industrial or nonedible crops, crops that will be peeled or cooked before eating". This is a precautionary approach and was also suggested in the draft "Beneficial use of organic waste products on land" guideline (December 2016). One submitter has requested this time period be reviewed and reduced to 30 days.

There are very few New Zealand specific studies investigating microbial fate and survival in land applied biosolids. A study investigating the survival of *E. coli* and *Salmonella* spp. in biosolids applied to a *Pinus radiata* forest (Horswell et al., 2007) found that *E. coli* numbers did not reduce to background until 13 weeks after biosolids application during the Autumn/Winter in optimal conditions, but in the summer rapidly reduced by week 3. A PhD study undertaken by Jason Levitan, (2010) "Die-off of pathogens and assessment of risks following biosolids application in pine plantations" (Murdoch University) found that pathogen re-growth can occur if the conditions are right up to 1.5 years after biosolids were applied to forestry.

The Western Australian (WA), New South Wales (NSW) and The US EPA Part 503 rule guidelines for biosolids management require only a 30 day withholding period for animals grazing. For lactating and new borns this is extended to 45 days in WA and 90 days in NSW. As an example, the WA withholding periods are shown below.

Table 14: Withholding periods (Western Australian guidelines for biosolids management (2012))

Table 14: Withholding periods

Activity	Withholding period for pathogen grade P2 and P3
Food crops that may be consumed raw but not in contact with biosolids	No fallen fruit is to be collected for human use.
All other food crops	Must not be harvested for 30 days after biosolids incorporation.
Animal feed and fibre crops	Must not be harvested for 30 days after biosolids application/incorporation.
Animal withholding periods	Animals must not be grazed on the site for 30 days after biosolids application/incorporation. ²³ Lactating (including milk for human consumption) and newborn animals should not be allowed to graze the site for 45 days after biosolids application. Poultry and pigs must not be grazed for at least one year on land subject to previous biosolids application; their feeding habits result in high levels of ingested soil.
Turf	Turf grown on land to which biosolids have been directly applied must not be harvested for at least one year after biosolids application/incorporation.
Forestry and timber plantations	Public access to forestry and timber plantation biosolids application areas should be restricted for 12 months.

²³ Source – NSW EPA Environmental Guidelines, 1997

For WA, NSW and US EPA, restrictions for turf are one year as opposed to 6 months in the NZ guideline. The accompanying literature to the WA, NSW and US EPA guidelines indicate this is due to the possibility that turf may be placed on a lawn or on land with high potential for public exposure. The US EPA Part 503 rule reduces this to 30 days if the turf will have restricted public access.

One major difference between the aforementioned guidelines and those in NZ (current and proposed) is that the NZ guidelines only specify vector reduction processes for Class B biosolids (Table 6.2 of current guidelines and Table 9.1 draft guidelines).

The processing of biosolids in the WA guidelines, P2 and P2, require “1.5 log reduction (pathogen count reduced by 1.5 orders of magnitude from start to finish of sludge treatment process) and >38% Volatile Solids Reduction”. The NSW EPA (2000) guidelines, for restricted use biosolids (equivalent to NZ Class B) must meet at least one pathogen reduction requirement and at least one vector attraction reduction requirement (Table 3-3 in NSW guideline). The US EPA (1993) guidelines specify “Processes to Significantly Reduce Pathogens (PSRPs)” reduce faecal coliform densities to less than 2 million CFU or MPN per gram of total solids (dry weight basis) and reduce Salmonella sp. and enteric virus densities in sewage sludge by approximately a factor of 10. Under Part 503.32(b)(3), sewage sludge meeting the requirements of these processes is considered to be Class B with respect to pathogens PSRPs. As an example the sludge processing suggested/required in the WA guidelines for biosolids management P2 and P3 are show in the exerts of Table 2 below. These treatment methods are more stringent than those specified in the Guidelines for the Safe Application of Biosolids to Land in New Zealand (2003) (Exert from Table 6.2).

Exert from Table 2: Approved treatment methods (Western Australian guidelines for biosolids management (2012))

Pathogen grade	Approved treatment methods *1	Maximum pathogen levels ²	Other conditions
	Other accepted processes		Process verification requirements
Grade P2 Low pathogen levels with some regrowth potential	Composted at >53°C for 5 days or >55°C for 3 days	<i>E. coli</i> ² – less than 1,000 counts per gram of dry final biosolids Strongyloides & Hookworm (viable Ova) <1 per 50 grams of dry final biosolids (only required north of the 25 th parallel)	Final biosolids do not generate offensive odours when coupled with management controls Weed seed controls may be needed in agricultural or landscape applications Compost may need to be matured to ensure toxic organic compounds do not subsequently affect plant growth
	Heated to 70°C for 1 hour and then dried to >90% solids		Final biosolids do not generate offensive odours when coupled with management controls Final product to be kept dry until applied
	Digested, heated to 70°C for 1 hour and then dried to >75% solids		Final biosolids do not generate offensive odours when coupled with management controls, and with a volatile solids reduction of >38%
	Aerobic thermophilic digestion (55-60°C for 10 continuous days), and a total solids reduction of >50%		Process verification requirements
Other accepted processes, e.g. storage where safety can be demonstrated			
Grade P3 Low- Medium pathogen levels with some regrowth potential	Anaerobic digestion ≥15°C for ≥60 days	<i>E. coli</i> ² – less than 2,000,000 counts per gram of dry final biosolids Strongyloides & Hookworm (viable Ova) <1 per 50 grams of dry final biosolids (only required north of the 25 th parallel)	Final biosolids do not generate offensive odours when coupled with management controls, and with a volatile solids reduction of >38%
	Aerobic digestion at ≥20°C for ≥40 days or at ≥15°C for ≥60 days		Lime amended biosolid (LAB) product is applied within 7 days
	Addition of lime so that pH is maintained at >12 for >3 hours		Final biosolids do not generate offensive odours when coupled with management controls Weed seed controls may be needed in agricultural or landscape applications
Aerobic composting at >40°C for ≥5 days, including at least 4 hours at >55°C. Process control as per AS 4454–2003			
	Mesophilic anaerobic digestion at 35°C ± 3°C for ≥15 days	Minimum pathogen reduction of 1.5 log reduction through digestion (pathogen count reduced by 1.5 orders of magnitude from start to finish of sludge treatment process)	Trigger value <i>E. coli</i> – less than 2,000,000 counts per gram of dry final biosolids, with a volatile solids reduction of >38%
	Other accepted processes		1.5 log reduction (pathogen count reduced by 1.5 orders of magnitude from start to finish of sludge treatment process) and >38% Volatile Solids Reduction

Exert from Table 6.2: Recommended controls for stabilisation Grade B biosolids, depending on end use (Guidelines for the Safe Application of Biosolids to Land in New Zealand (2003))

Land use	VAR requirement (see Table 4.1)	Recommended controls
<p>Fodder crops and pasture, orchards where dropped fruit is not harvested, turf farming, industrial or nonedible crops, crops that will be peeled or cooked before eating</p>	<ul style="list-style-type: none"> ■ Mass of volatile solids in biosolids shall be reduced by a minimum of 38%; or ■ SOUR @ 20°C < 1.5 g/m³ for liquid sludges from aerobic processes; or ■ pH > 12 @ 25°C for at least 2 hours and pH > 11.5 for 22 more hours. ■ Storage/exclusion period. 	<p>May be applied immediately. Plus Soil incorporation (see section 6.11). Plus Fruit and turf should not be harvested or pastures grazed for at least 6 months after applications. Plus Crops that will be peeled or cooked should not be harvested for at least 6 months after application.</p> <p>Store or lagoon for at least 1 year prior to application Plus Soil incorporation (see section 6.11). Plus Fruit and turf should not be harvested or pastures grazed for at least 6 months after applications. Plus Crops that will be peeled or cooked should not be harvested for at least 6 months after application. May be applied immediately.</p>

Table 9.1 of draft “Beneficial use of organic waste products on land”

Table 9-1 Application methods and exclusion times for type 1B and 2B products

Requirement	Land Use			
	Salad crops, fruit or other crops for human consumption that may be eaten unpeeled or uncooked	Public amenities, sport fields, public parks, golf courses, play grounds, and land reclamation	Fodder crops and pasture ¹ , turf farming, orchards where dropped fruit is not harvested, industrial or non-edible crops, crops that will be peeled or cooked before eating	Forest, trees or bush scrubland
One of those indicated below before application to land:				
Reduction of the mass of volatile solids by ≥ 38 %	✓	✓	✓	✓
SOUR @ 20°C ≤ 1.5 g/hr/m ³ for liquid biosolids from aerobic processes	✓	✓	✓	✓
pH ≥ 12 @ 25°C for ≥ 2 hours and pH ≥ 11.5 for 22 more hours	✓	✓	✓	✓
Store for ≥ one year	✓	✗	✓	✓
Store for ≥ six months	✗	✓	✗	✗
All of those indicated below after application to land:				
Soil incorporation undertaken within 1 day of the product application, except for application to forested land	✓	✓	✓	✗
An exclusion time ≥ 1 year before salad crops, fruit or other crops for human consumption that may be eaten unpeeled or uncooked are sown	✓	✗	✗	✗
Restrict public access until full vegetative cover is established on the discharge site.	✗	✓	✗	✗
No grazing or harvesting of crops, turf or fruit for ≥ 6 months	✗	✗	✓	✗
Restrict public access for six months and fence and sign buffer zones	✗	✗	✗	✓

The current and draft New Zealand guidelines do not specify any log reduction in pathogens for Grade B biosolids. Recommended controls for stabilisation of Grade B biosolids are given in Table 6.2 of the guideline (or 9.1 of the draft) and focus on vector attraction reduction only; pathogen reduction is facilitated by land management controls (e.g. withholding periods).

The limited New Zealand specific literature suggests that the time taken for natural attenuation to occur, and for microbial contaminants to reach background will depend on a number of variables which can't be easily controlled. Hence the precautionary 6 month withholding period. This variability is born out in the WA guidelines where site monitoring is suggested in some circumstances:

“Depending upon the location of the application site, regulatory agencies may request monitoring at the site by the supplier for a specified period. Monitoring after application is to ensure that there are no adverse effects on public health or the local environment.”

It should also be noted that climatic conditions differ between countries and factors that influence microbial die-off, such as hot dry weather, may be more common in some countries

than in others. For example a 30 day withholding period in the summer in Western Australia may facilitate rapid die-off of any pathogens remaining in the biosolids, whereas a cool wet summer in NZ may not.

Due to the paucity of NZ specific data on pathogen die-off in biosolids application sites, it is likely sensible to default to the current 6 month stock exclusion unless evidence can be provided to indicate that pathogens have died off more rapidly. This could be shown by conducting site monitoring for *E. coli*. *Escherichia coli* is recommended for soil monitoring, control samples (i.e. from an adjacent site that has not had any biosolids applied to it) should be taken before application and at the end of the restraint period to determine 'background' *E. coli* numbers as these may fluctuate naturally (with season), high background levels could also indicate input from feral animals, or from birds. If numbers of *E. coli* are found to be 100 fold higher than background counts, decisions about further restricted access or land-use should be held with the consenting authority.

Based on the single NZ study (Horswell et al., 2007), a 3 month stock exclusion followed by testing to ensure that there has been no cumulative increase in microorganisms due to biosolids application could be recommended in the guidelines.

Background soil testing for *E. coli* concentrations

A phone conversation was held with Dr Jill McKenzie, Medical Officer of Health Hutt Valley DHB (HVDHB) regarding their submission (Table 1). The concern regarding background testing for *E. coli* was not related to the testing per-se, more the suggestion to consult with the local Medical Officer of Health. The HVDHB felt this was inappropriate and that this should be dealt with in the Resource Consent in monitoring requirements for the site. This is a reasonable suggestion.

Recommendations:

There is not enough evidence or scientific studies to reduce the stock exclusion to 30 days in line with other international guidelines. Stabilisation processes and climatic conditions are different to those in the current NZ biosolids guidelines and in the proposed guidelines.

There is also not enough evidence to reduce the stock exclusion to less than 6 months unless it can be proven that there are no adverse public health impacts (i.e. no pathogens remaining in the sludge). Possible wording could be:

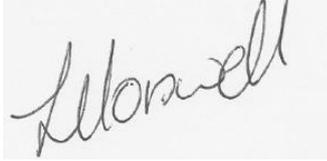
*“Depending upon the location of the application site, and the biosolids treatment method, stock exclusion may be lifted after 3 months if *E. coli* monitoring at the site indicates there are no adverse effects on public health or the local environment.”*

The possible reduction in stock exclusion and site monitoring would need to be incorporated into a resource consent.

The information in this report and the recommendation should be discussed by the Steering Group to come up with a final recommendation.

If you have any questions regarding the matters dealt with in this letter please do not hesitate to contact me.

Kind regards

A handwritten signature in black ink on a light grey background. The signature is cursive and appears to read 'Jacquie Horswell'.

Jacqui

Dr Jacquie Horswell PhD

Programme Leader: Centre for Integrated Biowaste Research

