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TO Heather Neil

FROM N Selvarajah

SUBJECT **Environmental impact assessment of the proposed stock truck effluent treatment system by South Waikato District Council**

Introduction

This memo assesses (a) the most practicable options available for treating or disposing stock truck effluent in the South Waikato region and (b) the environmental impacts of the proposed effluent treatment system.

Effluent

The characteristics of the effluent are unknown. It is recommended that the effluent characteristics should be determined from a representative sample, which will allow comparison with milking shed effluent for which considerable information is available on effluent treatment. It is anticipated, however, that the stock truck effluent volume produced per animal will be less than at milking sheds due to the use of less water for washing the trucks. Consequently, the effluent is likely to have greater suspended solids, biochemical oxygen demand (BOD) and nutrient concentrations than the milking shed effluent.

The stock truck effluent report produced by Environment Waikato suggests that 10 litres/animal is produced during one transport event. This is only one fifth of that produced per day in a milking shed (about 50 litres/cow/day is produced in a milking shed). The estimate by South Waikato District Council (SWDC) indicates that following truck washing about 14 litres/animal/day of effluent is generated assuming 43 animals are transported in the truck and trailer (i.e. 600 litres per truck and trailer combined) during one transport event.

According to the SWDC estimates on a weekly basis (6 days per week) 40 truck and trailer units will discharge at the proposed Tapapa site and 100 units will discharge at the Puketirau Road holding tank. The Puketirau holding tank effluent will be transported to the Tapapa site for treatment. The SWDC estimates also indicate that a maximum volume of 14 cubic metres/day will be generated.

Options

Before considering available options for treating the effluent, the best approach is to minimise 'waste' generation. This can be done through practicing stock standing prior to transportation, proper animal handling and minimum use of washing water to wash the trucks. Despite the use of wise animal management practices before and during the transportation and minimal use of washing water, 'waste' generation is still inevitable. There are many options available to treat stock truck effluent:

(a) Two pond systems discharging into waterways

(b) Two pond systems discharging into soak holes - the proposed method of treatment by SWDC.

(c) Biogas production

(d) Direct application onto land

(e) Composting
(f) Dewatering followed by manure production
(g) Discharging into urban sewage treatment systems.

SWDC examined options (b), (d) and (g). It is out of scope of this memo to examine all the above options in detail, however, a brief introduction is provided on each option below.

(a) Two pond systems discharging into waterways

This system is similar to the existing dairy shed effluent pond systems. The major treatment process in this system is sedimentation of nutrients and solids.

Advantages:

1. Low maintenance required. Desludging is performed only every 5 years.

Disadvantages:

1. Discharge quality is often unacceptable due to high BOD, pathogens and nutrient levels. Poor quality discharges can affect surface water quality.
2. Odour.
3. Poor lining can result in pond seepage and hence deterioration of ground water quality.
4. Pathogens can be transmitted by birds from ponds to adjacent farming areas.
5. May not appeal aesthetically.
6. Compliance and effects monitoring are required and hence costly.

(b) Two pond system discharging into soak holes

It is similar to system (a) except that the discharge is further treated through soakage.

Advantages:

1. Relatively low maintenance required.
2. Surface water quality is virtually unaffected due to the use of a soakage area.

Disadvantages:

1. Poor lining and poor soakage can affect ground water quality.
2. Soakage area requires close attention. Sealing of soakage area can result in overland runoff of effluent.
3. Odour.
4. Pathogens can be transmitted by birds from ponds and soakage area to adjacent farming areas.
5. May not appeal aesthetically.
6. Compliance and effects monitoring are required and hence costly.

(c) Biogas production

Considering the low-volume-high-solids ‘waste’, it is feasible to generate substantial amounts of biogas (methane) from stock truck effluent. However, this option requires research to determine if it is economically viable.

Advantages:

1. Little or no environmental impact.
2. Source of energy.

Disadvantages:
1. High capital and running cost.

(d) Direct application onto land
Waste water can be directly applied onto land to grow grass, crops or trees.

Advantages:
1. Efficient way of 'waste' recycling. Animal 'wastes' have excellent fertiliser value.
2. When practised properly (with suitable nutrient and hydraulic loading rates), a land based system will have little or no impact on the environment.

Disadvantages:
1. Cannot be used onto pasture due to animal health reasons.
2. Requires continuous collection and spreading of waste water.
3. Wet weather conditions can hinder land application.

(e) Composting
Several organic recycling centres which produce compost from garden wastes require substantial amounts of water during dry periods. Stock truck effluent could not only provide sufficient moisture for composting during dry periods, but enhance the quality of composting by providing additional bacteria and nutrients.

Advantages:
1. Efficient way of 'waste' recycling.
2. Little or no environmental impact.
3. Pathogens are killed during composting.
4. Large amounts of stock truck effluent are produced during the period (February to April for cattle and December to January for sheep) which coincides with the peak demand for water required for composting.

Disadvantages:
1. The system is not applicable where organic 'wastes' are not recycled through composting.
2. Stock truck effluent has to be transported to the composting areas on a regular basis.

(f) Dewatering followed by manure production
Dewatering of stock truck effluent can be performed using relatively simple techniques that are already available. The water removed from the effluent can be reused many times for washing purposes. Recycled `waste' water can be safely discharged onto a soakage area since this water is likely to have low nutrient levels. Such waters may contain high bacterial levels. Ground soakage can filter these bacteria effectively. Solids removed from the effluent can be further dried and can be sold as organic fertiliser.

Advantages:
1. Minimal water use for washing.
2. Efficient way of 'waste' recycling.
3. Little or no environmental impact.

Disadvantages:
1. High capital and running cost.

(g) Discharging into urban sewage treatment systems

Stock truck effluent can be incorporated into urban sewerage systems for treatment and the treated effluent can be discharged into waterways. Generally, stock truck effluent volumes are unlikely to cause a significant loading problem to the sewage treatment system. However, the addition of stock truck effluent into the existing sewage treatment system may result in significant increases in BOD and nutrient loadings.

Advantages:

1. Convenient.
2. With little extra cost it can be accommodated into the sewage treatment system.
3. Highly preferred over systems (a) and (b). This is because there is no need for construction of additional treatment pond systems.
4. Sewage treatment plant has full time operators on-site hence low probability for system malfunctions.
5. No complaints about odour, pathogen spreading and poor aesthetics arising from a two pond system.
6. No additional monitoring required for treated effluent quality.

Disadvantages:

1. Most treated sewage effluent has a high loading of BOD, nutrients and bacteria and hence will have some effects on surface water quality.

The proposed system (b) vs. other systems

Effects of the proposed system

System (b) is preferred over system (a) due to little or no impact on the surface water. However, system (b) has many potential disadvantages which will need to be overcome. For example providing wire netting over the pond and soakage area will prevent birds' access to effluent. If odour is a problem suitable aeration can suppress the odour. To reduce sealing of soak holes either aeration or suitable bacterial cultures (bioremediation) can be used in the ponds to solubilise suspended solids. Use of a clay liner and proper compaction will minimise pond seepage. If the treatment site is not visually appealing, tall hedges could be planted to obstruct the exposure of the treatment site.

The system requires regular monitoring of the soakage area for effective infiltration. Odour needs to be monitored, and when required, aeration should be provided.

If the system is managed as described above it is likely to cause only a small environmental impact, if there is any. Organic carbon, bacteria, ammoniacal nitrogen and phosphorus will be filtered by soil in the soakage area. Nitrate nitrogen produced from ammoniacal nitrogen during the oxidation process can, however, leach beneath the soakage area. Considering the topography of the site underground water movement will be downhill through the Selwyn scenic reserve towards the Waiohotu stream. If nitrate enters ground water through the soakage area it is likely to reach this stream. The stream can be monitored for nitrate levels on a quarterly basis (upstream and downstream of the treatment site) for any effects. Although nitrate nitrogen is expected to reach the stream following filtration, from an environmental viewpoint this is considered to be minor compared to discharging treated effluent directly into waterways. This is because most biologically treated effluent contains a substantial proportion of BOD, bacteria, nitrogen (total-N, ammoniacal-N and nitrate-N) and phosphorus.

Information provided by the applicant

It appears that the applicant has not examined systems (c), (d), (e) and (f). Considerable amount of time and expense have gone into investigating the proposed system. System (g) has received some attention. The reason provided by the applicant's consultant to not adopt system (g) was that incorporating stock truck effluent into the existing sewage treatment system would result in poor quality effluent due to overloading with BOD. It must be emphasised that the BOD estimate made by the applicant's consultant for stock truck effluent may be overestimated. According to this estimate 155.6 kg BOD/day will be generated from 100 truck units per week. However, the estimate made by SWDC indicates that there will be 140 truck units per week. Thus the BOD produced from 140 truck units should be 217.8 kg/day. It appears that the above estimate assumes the animals transported are cattle and that they excrete 0.25 kg BOD/day. According to the NZAEI Agricultural Waste Manual this amounts to 25% of that excreted in the paddock. Considering most trucks transport cattle after giving 1-3 hours of standing time this figure appears to be very high.

Assuming 0.1 kg BOD/cow/day is produced in the milking shed the cow equivalence for 217.8 kg BOD/day will be 2178 cows. This means the pond systems required should be 7.26 times greater than the proposed pond size (the proposed pond systems are designed to receive effluent equivalent to the amount of dairy shed effluent produced by 300 cows).

There is no information available on the stock truck effluent quality. It is vital to assess some representative samples of stock truck effluent in the South Waikato region so that appropriate selection of systems or design of a system can be made. It is inappropriate to use values obtained from the NZAEI Agricultural Waste Manual.

Conclusions and recommendations

The SWDC should be praised for its effort to overcome the existing stock truck effluent problem by providing an effluent disposal site and treatment facility. If managed as described in this memo, the proposed system is unlikely to cause any adverse effects.

On the other hand, the applicant has not examined some of the most practicable options to treat or dispose stock truck effluent. Some of these systems could be less costly and use of such systems could avoid certain management problems associated with the proposed system.

It is important that the effluent characteristics should be determined without which selection and/or design of a suitable system is not possible