

Discharge of Treated Municipal Wastewater to Land – Matters of Control and Technical Support

Prepared for

Greater Wellington Regional Council

Prepared by

L E W E
Environmental
I m p a c t

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Greater Wellington Regional Council

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1 EXECUTIVE SUMMARY

The Greater Wellington Regional Council (“GWRC”) has included a policy preference in its proposed Natural Resources Plan (“NRP”) for municipal wastewater discharges to be to land, rather than to surface water. In order to realise this preference, GWRC wishes to consider changing the status of discharges of municipal wastewater to land from a Restricted Discretionary Activity to a Controlled Activity. The implication of this change would be to remove GWRC’s discretion to decline a consent application for such an activity, and to require the grant of a consent for such an activity provided it meets specified criteria. This change would substantially reduce costs, delays and uncertainty for applicants, potentially allowing resources to be applied to improving wastewater discharge outcomes rather than to regulatory procedures.

A set of provisions has been prepared, derived from the conditions applied by several regional councils and land treatment best management practices to several recent municipal wastewater land discharge projects, which have satisfied the requirements of regulators, consent applicants, and submitters. These provisions are proposed to be considered for promulgation as conditions or standards for a Controlled Activity in GWRC’s proposed NRP.

These provisions address the source of the material to be discharged, loading limits for key contaminants, limits to be imposed on the actual land application activity, and protective measures to be taken. Requirements are specified for a Site Investigation Report and an Operation and Management Plan.



2 INTRODUCTION

2.1 Purpose

This report is to provide advice to Greater Wellington Regional Council (“GWRC”) on the implications and opportunities for changing the status of the discharge of treated wastewater to land from Restricted Discretionary Activity, as proposed in the draft Natural Resources Plan (“NRP,”) to Controlled Activity status. In particular suggestions are made as to the provisions that could be applied if a Controlled Activity status was adopted.

2.2 Background

Municipal wastewater is a term for the collective discharges from a reticulated system of liquid wastes from premises where people are accommodated, entertained, or employed. While it includes the human wastes (“black water”) from lavatories, it also includes the much greater volume of “grey water” from baths, showers, kitchen sinks, laundries, and assorted trade wastes.

The collection, treatment and disposal of wastewater by and on behalf of communities is one of the key infrastructural requirements of a healthy and civilised society. Infrastructure for this purpose is normally installed and operated for communities by their respective Territorial Local Authorities (“TLA’s”), although there are also situations where property developers or facility owners may undertake some or all of this work. In this regard, there is no minimum size to be considered a municipal system, merely that it contains collected, or reticulated wastewater from more than one source, with primarily a domestic nature. See Appendix A; Definitions.

There is a range of options for designing and implementing reticulated sewers and wastewater treatment plants. These have been tested and proven in practice, and professional and technical services specialising in tailoring these to specific community or location requirements are well established. Discharge options, however, present their own set of challenges.

Historically, New Zealand sewer outfalls typically discharged to water, with virtually all settlements having been established close to the sea or to a river. These surface waterways have been seen as convenient disposal points for wastewater discharges. Before 1967, such discharges were authorised in processes that made no effective provision for public input to decision-making.

Two things have now changed in this regard. Wastewater discharges now come under a statutory requirement for regular re-authorisation through the Resource Management Act processes, which are open to full public participation. And there is now a widely held public view that wastewater discharges to water are not acceptable, or at least need to be reduced.

Wastewater cannot be abolished or be made to disappear; it has to be put somewhere. If the public do not want it in their rivers or the sea, then it must be applied to land; there is nowhere else to practicably put it.

GWRC, with its governance elected by and accountable to its regional community, is currently doing all they can to support the Waste Minimisation Strategy. They are wanting to be more proactive to the public preference for discharges of wastewater to water to be phased out, or at a minimum being reduced during critical times of the year. Its policy position is to promote the discharge of wastewater to land, in preference to discharging it to water. The activity status currently provided in the proposed NRP for land discharge of treated wastewater, as a Restricted Discretionary Activity, already goes further than most Regional Councils and goes some way in giving appropriate effect to this policy. GWRC is currently considering a more enabling activity



status, as a Controlled Activity to fully commit to the policy. In agreement with the District Health Board and Iwi, by taking a more enabling approach, treated wastewater can be more readily diverted from entering surface water bodies and further cleansed through land application.

A Controlled Activity status for discharges of treated wastewater to land would have the effect of ensuring that TLA's, and other private wastewater system operators, **will be granted consent to authorise their discharge**, provided only that the terms and conditions of the Controlled Activity are met. The advantage of this approach over continuation of the Restricted Discretionary Activity approach, is that it will reduce consenting costs, delays, and uncertainties, potentially enabling effort to be applied to improving the environmental performance of wastewater discharges, rather than being consumed in regulatory activity.

As GWRC **MUST** grant an application for a Controlled Activity, it needs to ensure that it can define the matters for control very clearly and prescriptively. GWRC has invited Lowe Environmental Impact Limited ("LEI") to provide advice on performance specifications for discharges of treated wastewater to land, which would inform the terms and conditions of a Controlled Activity for this purpose in the NRP.

2.3 Scope

This report describes both the policy and practical contexts within which GWRC has decided to consider extending Controlled Activity status to discharges of treated wastewater to land. It considers the implications of the various activity classes available to it for this purpose, and the principles driving the selection of conditions proposed.

The main body, and purpose, of the report is to recommend a suite of conditions that are suitable for consideration for inclusion as Controlled Activity provisions for the discharge to land of treated wastewater in GWRC's NRP.



3 SETTING THE SCENE

3.1 Definition of the Activity

The activity being considered here is the discharge of treated municipal wastewater by either low pressure spray irrigation or drip irrigation, from a municipal wastewater treatment plant ("WWTP,") into the wider environment.

It does not directly include either the production of wastewater by its community, or its reticulation through sewers to the WWTP, or even the operation of the WWTP itself; the activity in question is solely the discharge of the treated wastewater at the end of its managed journey. Having said that, there will be aspects of the composition and quantity of wastewater being generated by the community, and the manner in which it is treated in the WWTP, that will have a direct bearing on the circumstances and management of the discharge.

It includes only low pressure (less than 3.0 bars at the nozzle), low application height (less than 1.52 m) and low rate irrigation and does not include other forms of discharge, such as low pressure effluent dosing (LPED), rapid infiltration basins, border-dyke irrigation or other forms of flood irrigation, soak holes, or high pressure gun irrigation. These additional systems have greater uncertainty with their effects and operation and should be subject to a greater level of scrutiny during a consenting process.

The activity of discharging treated wastewater into any environment is addressed by s15(1) of the Resource Management Act 1991, which states as follows:

"No person may discharge any—

(a) contaminant or water into water; or

(b) contaminant onto or into land in circumstances which may result in that contaminant (or any other contaminant emanating as a result of natural processes from that contaminant) entering water; or

(c) contaminant from any industrial or trade premises into air; or

(d) contaminant from any industrial or trade premises onto or into land—

unless the discharge is expressly allowed by a national environmental standard or other regulations, a rule in a regional plan as well as a rule in a proposed regional plan for the same region (if there is one), or a resource consent."

In the absence of any provision to **allow** treated wastewater discharges in any national environmental standard, or regional plan whether operative or proposed, any such discharge must by law be authorised by a resource consent.

3.2 Options to Authorise Discharges of Treated Wastewater

As the regional council responsible for putting s15 into effect in the Wellington Region, GWRC has six options (as per s87A of the Act) to provide for the authorisation of wastewater discharges, by classing the activity within one or more of the following categories:

- A **Permitted Activity**, which must be carried out according to any conditions specified in any relevant regional plan, but which does not require a resource consent;
- A **Controlled Activity**, for which a resource consent is required, but which consent must be granted provided the activity complies with the requirements of the relevant regional plan;



- A **Restricted Discretionary Activity**, for which a resource consent is required, and where the consent authority's power to decline a consent, or to grant a consent and to impose conditions on the consent, is restricted to the matters over which discretion is reserved in the relevant regional plan;
- A **Discretionary Activity**, for which a resource consent is required, and where the consent authority has the power to decline or to grant the consent, subject to such conditions as it may see fit to impose;
- A **Non-Complying Activity**, for which a resource consent is required, and where the consent authority has the power to decline the consent, or to grant it only if it is satisfied that certain specified requirements are met; and
- A **Prohibited Activity**, for which a resource consent will not be granted, and the activity will not be authorised to take place.

GWRC needs to make provision in its NRP for discharges of treated wastewater to land within one or more of these six classes of activities. In doing so it needs to balance and enable each of the following principles:

- The inevitability that wastewater will be produced, and will need to be discharged, somewhere;
- The community preference, backed up by GWRC's own policy position, to promote the discharge of wastewater to land, in preference to discharging it to water;
- The need to ensure that the actual and potential adverse environmental effects of the activity are appropriately identified, quantified, avoided, remedied and mitigated; and
- The need to ensure that the costs, delays and uncertainties of the authorisation process are kept to a practical minimum, without compromising the quality of delivery on each of the other three principles here.

3.3 Implications of Permitted Activity Status

Making treated wastewater discharge to land a Permitted Activity would help to promote land discharge in preference to discharge to water. It would remove costs, delays and uncertainties. It would not, however, enable GWRC to effectively manage and be publicly accountable for the environmental protection requirement of a high profile activity, so this option must be considered inappropriate for this purpose.

3.4 Implications of Discretionary Activity Status

For the first 23 years of the life of the Resource Management Act, Discretionary Activity status has been used by councils as a fall-back provision for activities for which environmental protection prescriptions have not been prepared, reserving unspecified discretion to the consent authority to decide on consent applications on their merits and from first principles. For most of New Zealand, and for most municipal wastewater discharges, Discretionary Activity status has been the default activity class of choice.

However, while this approach enables appropriate environmental protection to be tailor-made to each instance, the costs, delays and uncertainties for TLA's seeking authorisation for their municipal wastewater discharges are now widely regarded with serious concern. This approach does nothing to give effect to the policy preference to give such discharges to land a priority over alternative discharges to water, and in some cases provides obstacles through unjustified and unsubstantiated perception. Accordingly, this option must be considered undesirable for creating an enabling intent of the community's preference of land application.



3.5 Implications of Non-Complying Activity Status

To allocate an activity to this class raises the bar for resource consenting even higher than it is for Discretionary Activities, and would do even less to promote land discharge of treated wastewater in preference to water discharges. Accordingly, this option must be considered inappropriate for this purpose.

3.6 Implications of Prohibited Activity Status

As noted above, wastewater needs to be discharged somewhere. Prohibiting the discharge would fly in the face of this reality, and accordingly, this option must be considered inappropriate for this purpose.

3.7 Implications of Restricted Discretionary Activity Status

This class of activity enables, and requires, movement away from the unspecified discretion of the Discretionary Activity, by specifying the matters upon which the consent authority will decide when considering whether or not to grant the consent. This enables the accumulated experience of the effectiveness of other similar resource consents to be grafted onto the consideration of the consent application in question.

It does nothing, however, to reduce costs, delays and uncertainties for consent applicants, and provides no means of giving effect to the policy favouring land discharge of wastewater over discharges to water. It is for these reasons that GWRC does not favour this option, but prefers to consider the only remaining option, being a Controlled Activity.

3.8 Implications of Controlled Activity Status

Making treated wastewater discharge to land a Controlled Activity would help to promote land discharge in preference to discharge to water. It would significantly reduce costs, delays and uncertainties to consent applicants. It would enable GWRC to specify a suite of consent conditions derived from other successful land discharge consents, that would meet the environmental protection requirement, and that would enable a land discharge proposal to proceed if it could be shown to meet those specified conditions.

Where a proposal is not able to meet the specified conditions, it can still proceed to be considered by default as a Discretionary Activity, but the side-stepping of substantial consenting costs by the former option would provide a strong incentive to consent applicants to come up with a project design that will meet the Controlled Activity conditions.

A Controlled Activity status for municipal wastewater discharges to land is GWRC's preferred option for assisting with encouraging municipal wastewater discharges to land, especially as it can meet all four of the principles listed in Section 3.2 above; indeed, it is the only option that can do so.



4 CONTROLLED ACTIVITY PROVISIONS

4.1 General

This section of this report proposes a suite of standard provisions that is capable of meeting the needs for most discharges of treated wastewater to land. It describes first the Policy and Objective framework within which the discharge to land is preferred. It describes principles that have been used in arriving at the proposed provisions, and it then specifies a provision along with a commentary on the issues and implications of each proposed provision as appropriate.

A number of numeric standards have been proposed below. These standards reflect what has typically been accepted around New Zealand and in some cases internationally as conditions on resource consents. It is appreciated that some standards below may seem overly restrictive, but they reflect the ability for a potential activity to be carried out in all conditions possible and locations in the Region. Should the standards not be met, it does not necessarily imply the resulting effects will be unacceptable, or greater than minor, but rather further work is required by the applicant to demonstrate the effects are no more than minor.

4.2 Policy and Objective Framework

Enabling discharges of treated wastewater to land as a Controlled Activity needs to be justified in terms of Policies and Objectives.

4.2.1 Proposed Plan Provisions

The Draft Natural Resources Plan for the Wellington Region ("NRP") proposes a regulatory framework with the following key provisions in relation to municipal wastewater discharges.

Objective RP.053: *Discharges of **wastewater** to land are promoted over discharges to fresh water and coastal water.*

Policy LW.P77: Wastewater discharges.

*The adverse effects on Maori and community values from the discharge of **wastewater** containing human effluent from community **wastewater** systems to fresh or coastal water shall be avoided by:*

*(a) discharging to land as an alternative to discharging to fresh or coastal water, while recognising other alternatives arrived at in consultation with **mana whenua** and communities may be acceptable, and*

(b) establishing and implementing priorities, including key milestones and dates for reducing discharges to fresh or coastal water, and

(c) including within resource consents conditions that identify how these effects will be fully avoided over the lifetime of the consent, including:

(i) where appropriate, specifying high groundwater table levels when discharges to water may occur from treatment plants instead of discharging to land, and key milestones and dates for reducing such discharges to water, and

*(ii) specifying high rainfall events when discharges (overflows) to water may occur from **wastewater** networks together with priorities, key milestones and dates for reducing such discharges, and*

*(d) meeting freshwater objectives and **limits** for contaminants established within the **whaitua** chapters (chapters 7-11) of the plan.*



Policy LW.P95: Biosolids and treated wastewater to land

The adverse effects on surface and groundwater and on soil from the application of **biosolids** or treated **wastewater** to land shall be minimised. The application of **biosolids** shall be managed in accordance with Guidelines for the safe application of biosolids to land in New Zealand, 2003.

Rule LW.R73: Application of treated wastewater to land – restricted discretionary activity

The discharge of treated **wastewater** onto or into land, and the associated discharge of odour is a restricted discretionary activity provided the following conditions are met:

- (a) the discharge is not located within a **community drinking water supply protection area** as shown on Map 30 and Map 31, and
- (b) the **field capacity** of the soil is not exceeded.

Matters for discretion

1. Application rate, volume and location including in relation to:
 - (a) the infiltration rate
 - (b) presence of subsurface drainage
 - (c) the **field capacity** of the soil
 - (d) nutrient capacity of the soil
2. The nature of the contaminants in the discharge and the extent of treatment prior to discharge
3. Effects of contaminants on the long-term health of the soil resource
4. Storage period and volume for deferred irrigation during periods of prolonged wet weather
5. Odour and spray drift
6. Public access restrictions to disposal fields and any other restriction required for public health purposes
7. Adverse effects on groundwater, **surface water bodies** and the coastal marine area
8. Monitoring and maintenance requirements of the treatment and disposal system.

Note: Permission may be required from the relevant city or district council in respect of the Building Act 1992 or other legislation or bylaws.

4.2.1 Fit of Controlled Activity Status to Proposed Plan Provisions

The intent of Objective RP.O53 is unequivocal; there is to be promotion of land discharge of treated municipal wastewater in preference to discharges to surface water.

Policy LW.P77 (a) backs up the Objective by seeking to avoid adverse effects on surface water environments by discharging wastewater to land as an alternative to surface water discharges.

Policy LW.P95, addressing wastewater discharges to land, only goes as far as requiring the minimisation of adverse effects of such activities on surface water, groundwater, and soil.

Rule LW.R73 makes land discharge of treated municipal wastewater a Restricted Discretionary Activity. While this is in line with the approach of most regional councils, it does nothing to actively promote the discharge to land over the discharge to water; it merely raises an alternative set of hurdles for a prospective discharge proposal to negotiate.

The Objective and two relevant Policies provide a clear guide as to where GWRC intends to steer municipal wastewater discharges in future. However, the Rule cited does nothing to contribute to the achievement of the Objective or Policies. The costs associated with the establishment and operation of a land discharge system offer no incentive to encourage municipal operators to



volunteer a land discharge approach, so mere “promotion” must be considered unlikely to achieve the Objective or Policies.

In order for the NRP to offer a mechanism for the achievement of the Objective and Policies in question, there should be a clear consenting process advantage to applicants as an incentive to at promote land discharge options as their lead alternative. The proposed change of status of land discharges of municipal wastewater from Restricted Discretionary Activity to Controlled Activity offers this incentive.

4.3 Principles

- a) Numeric standards are required rather than narrative standards, as they are capable of measurement and specification, and questions regarding compliance can be answered definitively. Where a numeric standard cannot be applied, then a defined narrative standard is to be applied.
- b) The provisions proposed here are derived from conditions that have been successfully applied to land discharge consents in several regions. They are provisions that have met the requirements of the respective regional councils, of consent applicants, and of submitters on consent applications. Having met that diversity of requirements, and having evidently satisfied all involved parties, such provisions are proposed here as similarly being capable of meeting the needs of a wide diversity of interests.
- c) There are other issues relating to the discharge of treated wastewater to land that lie outside the control of GWRC and the Resource Management Act. Fonterra, for example, applies strict limits to how much of what is permitted to be applied to land from which they will collect milk. Some contaminants in trade wastes in particular have the potential to be considered under HAIL provisions as contributing to the contamination of land. While these are real issues to be addressed, they should be dealt with through rules related to contaminated land management.
- d) There are contaminants of emerging concern, whose fate in the environment is not yet fully understood. Numbers of pharmaceutical products, disinfectants, antibiotics, and other products are suspected, although not yet conclusively proven, to have residual and harmful effects after their release. There is the potential for land application of wastewater containing these materials to cause issues which may need further remediation at some time in the future. However, it is considered that confining a wastewater discharge to a specified land application site still offers far better future management options in respect of such contaminants than the current (and only practical alternative) discharges to water. A condition is proposed to allow GWRC to have these assessed in the future once more in known.
- e) The provisions proposed here are primarily intended to meet the needs of predominantly residential communities. Residential, or predominantly domestic wastewater has been well studied and its characteristics are well known, so conditions to enable discharges for this purpose are able to be established with a satisfactory degree of certainty. Where a proposed discharge cannot meet the proposed provision, perhaps due to the inclusion of trade wastes, or the comparative unsuitability of the land available to receive the discharge for example, then that particular proposal would need to be considered as a Discretionary Activity.
- f) There is considered to be large advantage to TLA’s and developers alike, in having Controlled Activity provisions available as a template to which a wastewater discharge upgrade can be designed, with the certainty that the required consent will be granted. From a consent applicant’s point of view, this is a very attractive alternative to first designing an upgrade, and then trying to negotiate agreement on consent conditions, with the costs, delays and uncertainty involved.



4.4 Proposed Provisions for Controlled Activity

4.4.1 General

The following section sets out matters that GWRC may choose to implement a Standard for or exercise Control over. A brief commentary is also provided, along with wording of a condition where appropriate. We note and acknowledge that some of the suggested conditions relate to information to be provided with an application, and therefore may not be appropriate as conditions of consent.

4.4.2 Source

Condition:

The material that applies to this activity is limited to municipal wastewater, which has no less than 90 % of its source flow from residential origins. The quality available for discharge shall be demonstrated to be of at least a secondary treatment standard, and where needed by provisions elsewhere, be of a tertiary standard and have concentrations of nutrients and numbers of pathogens reduced.

Commentary:

There is a degree of certainty with the composition of municipal wastewater and its resulting effects. If industrial or commercial wastes form a larger portion than 10 %, then the certainty of effects is reduced, and the proposal should require greater scrutiny. The portion of flowrate from municipal sources may include a minimal volume from reticulation inflow and ingress.

4.4.1 Land Use

Condition:

No wastewater application to publicly accessible areas, and where the application area borders a publically accessible area signage shall be erected warning of the public health risk of coming into contact with wastewater.,

The land owner and/or tenants of areas using irrigating wastewater must advise all visitors of potential risk of coming into contact with wastewater through a site induction process that shall be made available to GWRC's Regulatory Manager on request.

Commentary:

Care is needed to ensure that the risks of the public and workers who come into contact with wastewater are not exposed to unnecessary risk. This starts with knowing the nature of the activity and that there is a potential risk. Guidance is then needed for people visiting the irrigation site.

4.4.2 Effluent Quality

Condition:

The discharged effluent shall meet the following criteria:

- The concentration of Soluble Carbonaceous five days Biochemical Oxygen Demand (ScBOD₅) must not exceed 30 mg/L in more than 8 out of 12 consecutive samples, or 50 mg/L in more than 2 out of 12 consecutive samples;
- The concentration of Total Suspended Solids must not exceed 50 mg/L for more than 8 out of 12 consecutive samples, or must it exceed 80 mg/L in more than 2 out of 12 consecutive samples.



Commentary:

Certainty of effects can be provided by specifying the quality the effluent discharged. The parameters above are typical of secondary BOD and TSS values and the E.coli levels will likely require some tertiary treatment. No restrictions for nitrogen and phosphorus are considered necessary as in many land application system the loading (amount applied annually) is critical and not the concentration; of which conditions below cover nitrogen and phosphorus loading.

4.4.3 Application Method

Condition:

The application method shall be either subsurface or surface drip irrigation or low pressure spray irrigation systems with nozzles pressure less than or equal to 3 bars and nozzles less than or equal to 1.52 m above the ground surface.

Commentary:

The two application methods that are acceptable are considered be able to be managed to reduce environmental effects, such as turning off during unacceptable climatic events (rainfall and wind), have good distribution uniformity, create less aerosols and wind drift, can be automated, can be linked to soil moisture, and can apply low application rates and depths.

4.4.4 Hydraulic Loading and Efficiency

Condition:

The Hydraulic loading rate shall not exceed 5 mm/hr, or 15 mm/application event and can only occur when soil moisture deficit is greater than the application event.

The application shall not result in significant ponding (areas of ponded effluent on the ground surface greater than 10 square meters for a period greater than 12 hours) or runoff (visible overland flow).

The Distribution Uniformity (Christiansen Uniformity) of spray irrigation systems shall be greater than or equal to 80%. Drip irrigation emitters shall be at a minimum spacing of 0.6 m x 1 m.

Commentary:

This application rate is considered to be within the capacity of many soil types. There are soils (e.g. sands) that could receive a higher loading rate, but to meet Controlled Activity standard they should be not greater than as specified. The irrigation event can occur whenever there is sufficient soil moisture deficit and is not restricted by a defined irrigation return period.

Ponding on the soil surface should be avoided as this can result in redistribution of wastewater and drainage down soil macropores or runoff that may enter surface water.

Requiring a minimum distribution uniformity results in the treated wastewater being spread evenly. Drip irrigation does not have as high a uniformity as spray irrigation, thus it is important to space the drippers as close together as practicable; drippers along the row of 0.6 m is a standard manufacturers' spacing for wastewater dripline. See appended definitions.

4.4.5 Nitrogen Loading

Condition:

The nitrogen loading rate of the wastewater applied shall not exceed the limits for the land uses:

- Mown without grass removal or grazed 150 kg N/ha/y; and
- Cut, harvested and removed 300 kg N/ha/yr.



Commentary:

The nitrogen loading rate in residential wastewater is much lower than that of farm dairy effluent, for which a nominal 150 kg N/ha/y limit is widely used. A comparable loading limit should be specified for the sake of consistency, but other parameters will be limited to an extent that nitrogen loading is unlikely to get anywhere near the proposed limit. At a loading rate of 150 kg N/ha/y, and where applied in multiple application events under a deficit irrigation regime, there is greater potential that the nitrogen will be utilised by actively growing plants.

Other animals are considered similar to sheep and suitable for grazing wastewater applied pastures and crops, such as goats, alpacas, llamas, horses, deer and beef stock.

Loading land application systems at the nitrogen loading rates proposed above and under a deficit irrigation operating regime will ensure other contaminants in the wastewater will not be of sufficient quantity to be of concern and soil imbalances will not occur, e.g. BOD, TSS, sodium, and heavy metals.

4.4.6 Phosphorus Loading

Condition:

The phosphorus loading rate of the wastewater applied shall not exceed the limits for the land uses:

- Mown without grass removal or grazed 30 kg N/ha/y; and
- Cut, harvested and removed 50 kg N/ha/yr.

Commentary:

The proposed limit is an agronomic application rate, at which rate normal pastoral production on suitable soils can be expected to sustain a balance which will prevent the accumulation of a surplus of phosphorus. There are situations where a higher P loading rate will be proposed, but this brings the issue of site life and subsequent remediation into consideration, as well as the prospect of phosphorus through-flow to groundwater once capacity has been saturated. These matters may be capable of satisfactory management, but are considered to be beyond the provisions of a Controlled Activity. Such situations, if the applicant is not prepared or able to reduce the P loading rate to within the recommended limit, should default to consideration as Restricted Discretionary Activities.

4.4.7 Actively Growing

Condition:

Application must be onto actively growing vegetation which is not dormant. Application shall not be onto fallow land or areas that have no vegetative growth.

Commentary: Application onto bare soil has the potential to lead to leaching losses as a result of vegetation not taking up nutrients and water at the time of wastewater application. It is acknowledged that some nutrients will remain in the soil without vegetation, but with no growing vegetation the potential for leaching losses increases. See appendices for definitions.

4.4.8 Pathogens

Condition:

The pathogen concentration in wastewater shall have been reduced to a level commensurate with its having been treated to a tertiary level before discharge for surface application and secondary level for subsurface irrigation, and shall not exceed an Escherichia C (E.coli) concentration of 2,000 cfu/100mL.



Commentary:

There are human pathogens present in raw wastewater, and there is a risk that these may spread beyond the land application site, posing a risk to public health. There are three options for the satisfactory management of health risks arising from pathogens in wastewater.

The wastewater can be sterilised at the WWTP by such means as ultraviolet exposure. This measure could potentially be required, with a limit set on *E.coli* concentration in the effluent. However, such treatment may not necessarily be warranted by the sensitivity of the environment into which the wastewater is to be discharged.

Alternatively, protection of other sites near the discharge site may be provided by the observation of appropriate buffer distances (see 4.3.8 below.) Spray irrigation will be the usual means of applying the wastewater to land, and requiring a specified minimum separation of not only the irrigator but also the applied wastewater from adjoining sensitive environments may be seen to reduce the likelihood of a public health risk beyond the application site boundary.

Additionally, the potential spread of pathogens in air into sensitive receiving environments may be controlled by specification of irrigation spray droplet sizes, and by specifying wind circumstances in which irrigation may (or alternatively must not) occur. These controls are addressed in 4.3.13 below.

It is considered that imposing a blanket requirement for UV irradiation may be a more onerous imposition than will be warranted for most situations and that buffer margins and wind and spray droplet size limitations may be all that is warranted for pathogens. Should circumstances, such as large buffer distances and no close downgradient bores be the case, then the applicant will need to apply for a discretionary activity consent. It is also noted that it would be unlikely that this rule would be utilised in a catchment that is used for potable drinking water supplies.

4.4.9 Trade Wastes

Condition:

The discharge shall contain no more than 10% trade wastes. This shall be based on daily dry weather flow, averaged over a calendar year,

Commentary:

Trade wastes pose the risk of including heavy metals and other contaminants in quantities that have the potential to cause unacceptable cumulative effects on the receiving land or effects during irrigation. The Controlled Activity is intended to provide for predominantly residential wastewater; and wastewater flows involving more than a nominal percentage of dry weather flow being sourced as trade wastes will need to be considered through the default Discretionary Activity provision.

4.4.10 Buffer Distances

Condition:

There shall be exclusion buffer margins between any wetted area of the land application site and features or activities as follows:

- Spray Irrigation:
 - 50 m from any watercourses, wetlands, public roads and property boundaries; and
 - 150 m from any Marae, schools, shops, playgrounds, water supply bore, places of work or residential dwelling not on the application property.
- Drip Irrigation:
 - 5 m from any watercourses, wetlands, public roads and property boundaries; and
 - 150 m from any bore used for potable supply.



Commentary:

These distances are generally arbitrary, and are conservatively based on distances specified in several other granted consents or Plan Change 3 of the Wairarapa Combined District Plan. They are typically used by councils and accepted by organisations and the community for the protection of individual parties, the general public and the environment.

4.4.11 Groundwater

Condition:

There shall be a minimum depth to groundwater of at least 1 m below the point of application.

Commentary:

Passage through soil allows the attenuation of pathogens and renovation of nutrients. The depth is arbitrary, and is conservatively greater than distances specified in several other granted consents and standards.

4.4.12 Deficit Irrigation

Condition:

A deficit irrigation system will be required for the application of treated wastewater to land.

Commentary:

Deficit irrigation requires that the depth of wastewater applied to the land on any occasion will not result in the soil moisture exceeding field capacity at that time and forcing drainage to occur. By requiring the irrigation to be deficit only, means the potential problems of surface ponding, run-off and excess drainage are significantly reduced or avoided, ensuring that the effects of the wastewater discharge are confined to the application site, and do not extend beyond the site. While it is possible to operate a sustainable non-deficit discharge regime, the design and management input is higher than for a deficit system and should be considered as a Discretionary Activity.

Managing a deficit irrigation system will require either soil moisture to be monitored via in-situ moisture sensors, and/or by a daily water balance using climatic data.

4.4.13 Water Supply Protection (NES)

Condition:

The discharge is not located within a community drinking water supply protection area as shown on Map 30 and Map 31, and as addressed in Policy LW. 63 of the draft NRP.

Commentary:

The National Environmental Standard for Sources of Human Drinking Water (2007) imposes a duty on regional councils to protect drinking water quality for supplies servicing more than 500 people. Under the NES, limitations on permitted activity rules (such as for onsite septic systems) are set, for activities upstream of a water supply intake that may detrimentally affect the quality of the water supply to the extent that it would not meet the drinking water standard or if these standards are already not met, not increase the concentration of a determinand by more than "a minor amount."

GWRC has a responsibility to assess the risk of contamination of drinking water quality by a discharge to land. The main contaminants of concern in respect of wastewater discharges are nitrate, pathogens (virus/bacteria), heavy metals and contaminants of emerging concern. The application of a separation distance (based on the plausible transport time of a contaminant) between wastewater discharge sites and drinking water sources will avoid adverse effects of the discharge on drinking water quality. Separation distances have been calculated by GNS, which



has modelled capture zone delineation for GWRC to enable implementation of the NES, based on the best available information. These capture zones are termed “drinking water protection areas” in the regional plan, and serve as buffer areas around drinking water supplies serving more than 500 people. Discharges of treated wastewater to land within these drinking water protection areas will not be authorised as a Controlled Activity.

4.4.14 Air Quality

Condition:

There shall be no discharge of odour from the application of treated wastewater to land that causes an effect beyond the application property boundary that is deemed to be offensive or objectionable by a GWRC compliance officer.

The maximum time wastewater shall remain in any sealed reticulation pipe from the treatment plant to the furthestmost irrigation nozzle is not to exceed 24 hours.

Commentary:

Odour is one of the more likely perceived potential adverse environmental effects of land application of wastewater. In addition to the appropriate selection of sites for wastewater application, there is a range of operational options available to a wastewater plant operator to avoid propagation of unpleasant odours into sensitive environments. Odour is usually associated with hydrogen sulphide which is formed under anaerobic conditions (lack of air). Long pressure pipelines can therefore be an issue, whereas pipelines that have air above the free water surface and occasional manholes, such as gravity collection systems, are much less of an issue. Pressure mains that remain idle for several hours can also be an issue and flushing may be necessary in these situations, however, this more complicated management requirement is beyond the scope of a Controlled Activity consent. There are a range of operational practices available that can be used to mitigate the effects.

It is also noted that secondary treated municipal wastewater will have a low organic strength and malodorous compounds in low concentrations. Therefore the potential for odour generation is limited. Further, the limitation of industrial wastes to a maximum of 10 % of the flow discharged and specifying a maximum time in sealed reticulation will also limit the potential for odour generation.

4.4.15 Wind and Droplets

Condition:

The application of wastewater to land by spray irrigation shall have automated shut off controls so that there **shall be no irrigation** when the wind speed 10 minute average exceeds 6 m/s.

The nominal droplet size delivered by wastewater irrigation infrastructure shall not have a volume median diameter less than 1,700 micron metres or an equivalent volume mean diameter.

Commentary:

Using irrigation equipment that delivers droplets greater than the specified median size minimises the generation of aerosols and reduces the potential for spray drift, which have the capacity to distribute odours and pathogens beyond the application area and buffers.

Not irrigating when the wind blows at moderate speeds, is a reasonable requirement for the operation of a wastewater irrigation system. It provides a pragmatic connection between managing windspeed and droplet size, whereby limiting the movement of large droplets as the wind gets up.



The sprinkler nozzle height and pressure are also relevant to producing minimal aerosols and spray drift and this is covered under Section 4.4.4.

4.4.16 Soil Suitability (Investigation and Design Report)

Control:

The provision of a Site Investigation and Design Report, which shall include as a minimum:

- a) The suitability of the soil of the application site to receive treated wastewater as assessed by a suitably qualified and experienced person, and reported as a Site Investigation and Design Report as specified in Appendix A. The Site Investigation and Design Report is to be submitted to GWRC with the application;
- b) Soil saturated hydraulic conductivity is shown to be greater than 10 mm/hr;
- c) Soil water holding capacity is shown to be greater than 30 mm;
- d) A map showing soil unit boundaries, and soil textural and structural changes.
- e) Details on how High Risk soils (Houlbrooke & Monaghan, 2009)¹, or soils classified as Category 5 and 6 in AS/NZS1547:2012 will be avoid from irrigation; and
- f) Details on existing soil concentrations and the potential cumulative effects when irrigated with wastewater, and in particular the effects of existing soil concentrations of nutrients and metals, and the addition of other soil amendments, wastes and fertilisers.

Commentary:

A suitably qualified and experienced person could be one who meets a published specification, such as a recognised tertiary qualification in soil science and not less than 5 years' professional experience. Or alternatively the discretion to approve such a person could be made to rest with GWRC.

The Site Investigation and Design Report needs to be available to GWRC for assessment before the consent application is considered; it will be this report that will establish the extent to which several of the matters of control are met by the proposal. If the report is insufficient, then the application could be rejected under s88, or alternatively, clarification or further information sought via s92.

High risk soils may be the best or the only soils available to receive wastewater in some locations. However, these should fall to be considered as Discretionary Activities, and should not lower the performance requirement for all other land applications of treated wastewater. It is noted that mapping of high and low risk soils has variability and often mapped soil polygons contain more than the stated soil group.

4.4.17 Operation and Management Plan

Control:

The provision of an Operation and Management plan, reviewed annually before the anniversary of the grant of the Consent, which shall include as a minimum:

- a) A description of the discharge system, including a site map indicating the location of discharge infrastructure and monitoring sites;
- b) The intended operating and maintenance procedures, including how the system will be operated and maintained to meet the requirements of the conditions of the activity;
- c) Measures to ensure that the wastewater being discharged is not odorous;

¹ Houlbrooke, D J; Monaghan R M (2009): The influence of soil drainage characteristics on contaminant leakage risk associated with the land application of farm diary effluent. Environment Southland.



- d) On-site responsibilities, including operation of the discharge facility, operation of the soil moisture monitoring or balance system, operation during high winds;
- e) Key operational matters, including daily, weekly and monthly maintenance checks and keeping of a maintenance register to record the details of all maintenance events or any systems malfunction;
- f) A contingency plan in the event of system malfunctions or breakdowns;
- g) Details of signage warning of the public health risk of coming into contact with wastewater, particularly in publically accessible areas or where the application site borders a publically accessible area
- h) Details of site induction procedures to warn any person that may come into contact with the wastewater about the potential risks of doing so;
- i) How changes in wastewater composition and volume are to be managed;
- j) Procedures for recording and responding to any complaints; and
- k) Procedures for the annual review of the Operation and Management Plan to incorporate any proposed changes to the management of the activities.

Commentary:

Describing management and operation is a key factor in ensuring the proposed activity will be undertaken in accordance with the Controlled Activity provisions and the effects will be no more than minor. To have confidence that appropriate management will be employed the Operation and Management Plan should be evaluated with the application and the granting of the consent should be dependent on its adequacy.

4.4.1 Monitoring and Reporting Plan

Control:

The provision of a Monitoring and Reporting plan, reviewed annually before the anniversary of the grant of the Consent, which shall include as a minimum procedures covering all aspects of the activity to demonstrate compliance with the conditions, including:

- a) monitoring of the discharged wastewater quality for BOD5, TSS, TN, TP and E.coli;
- b) continuous flow monitoring of the discharged wastewater;
- c) soil moisture monitoring (if used rather than a daily water balance);
- d) the intended program for soil quality, chemical, hydraulic and structural monitoring, vegetation assessment, surface water quality monitoring, groundwater quality monitoring;
- e) details of surface and groundwater monitoring to be undertaken;
- f) record keeping of the land application area used each day, application depth and climatic conditions;
- g) records of land management, including grazing and harvesting frequency, including drymatter and nutrient removal where appropriate;
- h) the location of monitoring sites detailed on site maps;
- i) details of the frequency of sampling and reporting;
- j) measures to ensure reporting requirements are met;
- k) A record of all complaints received;
- l) A record of infrastructure modifications; and
- m) Details of who will undertake the monitoring and procedures to be used.

Commentary:

The operation of a land treatment scheme associated with the exercise of this rule should not have a significant adverse effect on the receiving environment. The assessment of such an effect can only be demonstrated through appropriate monitoring, of which the monitoring shall be dependent on the potential risk of an effect. It should be noted that with the proposed hydraulic loading and nutrient rates, monitoring requirements may be minimal.



4.4.1 Review

Conditions:

Greater Wellington Regional Council may serve notice of its intention to review the conditions of this consent, in accordance with the conditions of this resource consent and Sections 128 of the Resource Management Act 1991, during the period March to September each year, for the purposes of:

- (a) requiring review of monitoring of the discharge or its effects;
- (b) dealing with any adverse or cumulative effects on the environment which may arise from the exercise of this consent that is not addressed by conditions of consent or the Operation and Management Plan or trade waste bylaws;
- (c) assessing whether a number of emerging contaminants should be monitored in the soil, herbage or groundwater, and if required, which ones, taking into account the degree of certainty about the fate and risk to the environment from these contaminants;
- (d) introduction of contaminants loading limits and treatment requirements to manage adverse and cumulative effects not foreseen at the time the consent was granted; or
- (e) complying with the requirements of a regional plan.

Commentary:

As technology changes and our understanding of environmental effects change, there may be a need to reassess the appropriateness of conditions of consent. A review conditions is considered appropriate for this. This especially applies to emerging contaminants.

With regard to emerging contaminants, it is considered that these contaminants could be monitored in the soil, herbage or groundwater at some stage in the future when more is known about their fate in the environment, and at what concentrations they present a risk. The review requirements should allow for the implementation of a limit based on information that becomes available about maximum loading rates.



5 SUMMARY

GWRC wishes to provide for the discharge of treated municipal wastewater to land as a Controlled Activity in its Natural Resources Plan. This is to replace the currently proposed provision for this activity to be a Restricted Discretionary Activity. The reason for this proposed change of activity status is to give effect to its stated policy preference for land discharge of wastewater as an alternative to discharges to surface water. Controlled Activity status would effectively provide a template for land discharge system designers, removing the costs, delays and uncertainties that arise from Discretionary Activity status.

After addressing the Policy and Objective framework and principles observed, this report has proposed a number of provisions for Controlled Activity status. These provisions address the source of the material to be discharged, loading limits for key contaminants, limits to be imposed on the actual land application activity, and protective measures to be taken. Requirements are specified for a Site Investigation Report and an Operation and Management Plan.

The provisions proposed reflect the complete suite of consent conditions that have been applied in recent years to resource consents granted in several regions of New Zealand to authorise land discharge of treated municipal wastewater. These provisions are proposed as a basis upon which GWRC may decide to regulate such discharges in future as Controlled Activities.



Appendix A

Definitions

Actively Growing Vegetation:

Vegetation that is not dormant and is taking up moisture and nutrients. This will occur during the growing season, which is defined as when potential evapotranspiration exceeds 1 mm/d for a period of at least one week without ground frosts occurring. Ground cover of vegetation should be greater than 90 % unless specifically targeting vine or row crops.

Application Depth: The depth of applied irrigation per pass. This is usually what is applied in one day (mm/d) but in some situations, irrigation is pulsed on to reduce the potential for ponding, and the irrigation depth in this case is the depth per pulse.

Application Rate: The intensity that the irrigation is applied at, in mm/hour. This needs to account for sprinkler overlap.

Deficit Irrigation Regime: Designing, operating and monitoring the irrigation system so that an irrigation event does not result in the soil moisture going above field capacity.

Distribution Uniformity (DU): Is the ratio of the average depth of irrigation water applied minus the average deviation from this depth, divided to the average depth applied, as would occur with sprinkler patterns overlapped, expressed as a percent.

Emerging Contaminants: Any synthetic or naturally occurring chemical, substance or microbial contaminant whose presence and significance were not previously detected (or were found in far lesser concentrations) in the environment but have the potential to cause adverse ecological and(or) human health effects, such as pharmaceutical products, disinfectants, antibiotics, antibiotic resistant genes, some viruses, hormones or endocrine disruptors.

Fallow Land: Land that is not in use and no vegetation is active. It is land that is usually part of a cropping rotation that has been ploughed and is awaiting sowing.

Field Capacity: This refers to the water content in the soil after drainage has ceased. Above field capacity, water applied either rapidly drains through the soil profile or ponds on the surface.

High Pressure Spray Irrigation: Systems designed with residual pressure at the nozzle greater than 30 m water head. The sprinklers are usually spaced further apart and rely on pressure to distribute the irrigation rather than a higher number of sprinklers. This results in greater trajectory into the air and potential for a higher number of smaller sized droplets.

Irrigation Event: This is the depth of application per return period cycle. In most cases it equals the irrigation depth as it occurs over one day but in some cases where irrigation is not so automated, sprinklers can be set up to receive application depths over two days, then shifted – in this case, the event is the sum of the two days' irrigation.

Low Pressure Spray Irrigation: Irrigation at a pressure less than 30 m water head (300 kPa or 3 bars).

Municipal Wastewater: Liquid waste (and liquids containing waste solids) from predominantly domestic and commercial premises, including, but not limited to; human effluent, grey water (household wastewater from kitchens, bathrooms and laundries) and sullage. It can contain minor input from industrial activities



Residential Wastewater: Wastewater that is primarily of domestic origin. It comes from domestic houses or commercial work places where the wastewater is also of domestic origin, i.e. toilet, kitchen, laundry and bathroom wastes. It does not contain any wet industrial discharges or stormwater.

Return Period: The period in days between irrigation event applications.

Saturated Hydraulic Conductivity: Hydraulic conductivity is the rate of water movement through the soil. In soils this is usually expressed as mm/hr or m/d. Saturated Hydraulic Conductivity relates to the rate of movement when measured within free standing water, i.e. ponded water..

Sealed Reticulation: This this document it refers to pressure mains, or full flow gravity mains, where there is no air layer above the liquid in the pipe.

Soil Moisture Deficit: When the soil moisture is below field capacity. See also Deficit Irrigation Regime.

Water Holding Capacity: This is the depth of water held in the soil between wilting point and field capacity. It is also referred to as Available Water or Profile Available Water.

Wilting Point: This refers to the level of soil moisture at which plants can no longer extract moisture, and thus wilt.

