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Levin Landfill - Review of Resource Consent Conditions

Submitted to:
Horizons Manawatu Regional Council

REPORT

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Golder Associates

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1.0 INTRODUCTION

1.1 Background

In May 2002, the Horowhenua District Council (HDC) was granted resource consents from Horizons Manawatu Regional Council (Horizons) authorising the ongoing operation of the Levin Landfill. Several of the resource consents granted include a condition enabling Horizons to review consent conditions in accordance with Section 128 of the Resource Management Act (RMA). The resource consents which have a review condition include consents authorising:

- The discharge of solid waste to land (Consent 6009);
- The discharge of leachate to land (Consent 6010);
- The discharge of contaminants to air (Consent 6011);
- A contingency discharge permit to discharge liquid waste to land (Consent 7289), and
- The discharge of stormwater to land (Consent 102259).

The purpose of the review, as stated in the conditions, is to enable an assessment of the adequacy of monitoring conditions, and the effectiveness of the other conditions, in terms of the need to avoid, remedy or mitigate adverse effects on the environment arising from the Levin Landfill. [1]

The timeframes for review of the consent conditions are specified in the consents. The first review was initiated in April 2005.

1.2 Consent Review History

During 2005 and 2006 an initial review of the conditions attached to the Levin Landfill resource consents (August 2005) and two updates to the review (June 2006, October 2006) were produced by Kingett Mitchell Limited (Kingett Mitchell) under contract to Horizons. The updates to the review were produced in response to a report sent to Horizons by Montgomery Watson Harza NZ Limited (MWH) on behalf of HDC (MWH February 2006).

In February 2009 Golder Associates (NZ) Limited (Golder) was contracted by Horizons to repeat the review of consent conditions, taking into account:

a) A report from MWH (November 2008), which comments on the Kingett Mitchell report of June 2006.

b) A report by Tonkin and Taylor Ltd (January 2008), which reviews the operational and environmental impacts of the Levin Landfill on behalf the Parliamentary Commissioner for the Environment.

c) Concerns expressed by the Parliamentary Commissioner for the Environment in a report (August 2008) reviewing the environmental management of the Levin Landfill.

Since February 2009, a series of pre-hearing meetings involving the Neighbourhood Liaison Group (NLG), Ngati Pareraukawa, neighbouring landowners and other interested parties have been conducted. The minutes of these meetings have been recorded by Horizons staff. The issues raised during these meetings have, where possible, been addressed through agreement between Horizons, HDC and the attendees. This has been an iterative process leading to the version of the consent conditions that are attached to this report (Appendix B).

[1] This report is provided subject to the conditions presented in Appendix B attached to the report.

1.3 Purpose of this Report

This report contains a review of conditions attached to each of the resource consents listed in Section 1.1. As noted in Section 1.2, the conditions of the various consents have been modified through discussions and agreement between the various interested parties. As a consequence, this report primarily contains a discussion of technical issues raised in the reports listed in Section 1.2 and during the pre-hearing meetings. The solutions to technical issues agreed upon by the parties attending these meetings are identified and discussed.

This report has been produced for the purpose of:

- Clearly documenting and recommending changes to the Levin Landfill consent conditions,
- Documenting the reasons for changes to technical aspects of the consent conditions, and
- Identifying the objectives of those changes.

Some of the changes identified in the attached set of consent conditions in Appendix B have been developed through discussions during the pre-hearing meetings and do not relate to technical issues of landfill management, discharge monitoring and effects mitigation. As the discussions around these agreed changes are documented in the minutes from the various pre-hearing meetings and in letters between the interested parties, the reasons and objectives behind these changes have not necessarily been replicated in this report.

In addition to the changes discussed below, further changes to the conditions under review have been agreed to by each of the interested parties during or as a result of the pre-hearing meetings discussed in Section 1.2. The additional changes have been incorporated in the modified consent conditions attached as Appendix B to this report. The changes agreed to during these meetings have been reviewed and are considered by Golder to be acceptable from an environmental management viewpoint.

1.4 Report Structure

Section 2 of this report identifies the proposed changes to consent conditions that are recommended as a result of the review process. The changes to the conditions, as required by the review, focus on ensuring that:

a) Any existing or potential adverse effects that may arise from the landfill can be identified (i.e., through the refinement of monitoring programmes).

b) Existing or potential adverse effects that may become evident are addressed.

Where specific changes to the consent conditions are recommended, a discussion of the proposed consent conditions has been provided.

Section 3 of this report discusses specific conditions which have been reviewed and no changes have been recommended. In general, the lack of change reflects the conclusion that alteration of the consent condition is unlikely to significantly reduce the potential for adverse effects to arise and be detected. Potential costs and benefits associated with consent condition changes have also been considered,

If a condition has not been identified as requiring review (i.e., all relevant parties agree with the status quo) then it will not appear in Sections 2 or 3 of this document.

The proposed modified conditions for each of the resource consents listed above are contained in Appendix B, attached to this report.

2.0 CHANGES TO RESOURCE CONSENT CONDITIONS

2.1 Overview

The review of conditions attached to the resource consents listed in Section 1.1 provides a mechanism for specific resource consent conditions to be adapted to changing circumstances. Any change must be to improve the adequacy of monitoring and/or improve the effectiveness of the consent conditions, in terms of 'avoiding, remedying or mitigating' adverse effects that may arise from the landfill activity.

Operations at the landfill were in the past based on the disposal of waste to an unlined landfill area. Waste is no longer being disposed of to the unlined landfill areas and these areas have been capped. A lined landfill cell has been constructed at the site and further similar cells are planned. A detailed description of the landfill design and layout is not presented in this report. Discussions of aspects of the various landfill areas are presented where necessary to clarify the reasons for changing conditions.

There are considered to be two aquifers beneath the site that have the potential to transport contaminants off-site. For the purposes of this document, these aquifers are classed as a shallow, unconfined sand aquifer and a deep semi-confined gravel aquifer. Again, a detailed description of these aquifers is not presented in this report. Discussions of aspects of the hydrogeological characteristics and hydraulic behaviour of these aquifers are presented where necessary to clarify the reasons for changing conditions.

To date there is no evidence of adverse effects arising from the landfill operation, beyond the landfill site itself. This review has resulted in proposed changes to several aspects of site management. The general areas in which changes have been proposed include:

- Refinements to the environmental monitoring requirements for the Levin Landfill.
- Modification to landfill cap structures and monitoring.
- Evaluation and documentation of the meaning of the data obtained from the environmental monitoring program; from an effects perspective
- More clearly differentiating between the monitoring and management of the closed unlined landfill areas and the current and future lined landfill areas.

The purposes of these refinements are to:

1) Ensure that any potential or actual adverse effects arising in the future can be identified as early as practically possible.
2) Ensure that documentation is provided to the HDC, Horizons and the NLG on a regular basis clearly setting out what the monitoring results mean in terms of potential future effects.
3) Improving aspects of the management of closed landfill areas.

2.2 Discharge Permit 6010 – Discharge of Leachate to Land

2.2.1 Introduction

Discharge Permit 6010 authorises the discharge of landfill leachate onto and into land at the Levin Landfill.

Condition 30 of this discharge permit is the review condition. It states:

> *"The Regional Council may initiate a review of Conditions 3, 4, 11, 12, 13, 14, 24, 27, 28 and 29 of the Permit in April, 2003, 2005, 2010, 2015, 2020, 2025, 2030 and 2035. The reviews shall be for the purpose of:*
>
> *a) Assessing the adequacy of monitoring outline in Conditions 3 and 4 of this consent, and/or*

c) Assessing the effectiveness of Conditions 11, 12, 13, 14, 24, 27, 28 and 29 of this consent.

In avoiding, remedying or mitigating adverse effects on the environment surrounding the Levin Landfill.

The review of conditions shall allow for the

b) Modification of monitoring in Conditions 3 and 4 of this consent;

c) Deletion or changes to Conditions 11, 12, 13, 14, 24, 27, 28 and 29 of this consent; and

d) Addition to new conditions as necessary, to avoid, remedy or mitigate adverse effects on the environment surrounding the Levin Landfill."

Given the purpose of the review, changes to the conditions identified below have been recommended. The intent of these changes is to ensure that ongoing monitoring at the site is adequate to ensure that any adverse effects arising from the landfill can be identified through the monitoring undertaken.

2.2.2 Condition 3 – Structure

Discussion and Recommendations

It is proposed to modify the structure of Condition 3 to clarify the nature and the objectives of the monitoring wells at the site through:

- Distinguishing deep aquifer monitoring wells from shallow aquifer monitoring wells;
- Distinguishing compliance wells from early warning detection wells;
- Distinguishing background water quality monitoring wells from compliance and early warning detection wells.

This separation of functions is also recommended to enable other conditions to this consent to focus on specific groups of monitoring wells rather than applying to all monitoring wells.

2.2.3 Condition 3 – Further Monitoring Well Locations

Discussion

Existing monitoring wells that have previously been considered representative of 'background' conditions (i.e., wells F1, F2, F3 and D5) are all located at low points between the sand ridges. For both statistical and hydrogeological reasons, this collection of wells is unlikely to represent a good basis for characterisation of the background groundwater quality in the shallow aquifer or understanding the hydrogeological system in the area.

Of the four wells listed above, only D5 is not located down-gradient from a potential future leachate irrigation area. Although no irrigation of leachate is currently being undertaken or is immediately planned, this does not mean that leachate irrigation will not occur in the future. Condition 3 of Discharge Permit 6010 required monitoring wells F1, F2 and F3 to be positioned down flow from the proposed leachate irrigation areas. Consequently only D5 could potentially be considered a reliable long term monitoring point for characterisation of the background groundwater quality.

The elevation of the groundwater table in the shallow aquifer is probably partially controlled by the ground elevation at the low points between the stabilised dunes. Consequently, the vertical hydraulic gradient between the aquifers derived from water level data from these wells is not necessarily representative of the vertical hydraulic gradient beneath the sand ridges.

The documentation provided indicates there is only one existing set of monitoring points on the site possibly suitable to determine the hydraulic gradient between the shallow and deep aquifers beneath a sand ridge

(E1s and E1d). The top of the standpipe or casing for the E1 monitoring wells is at an elevation of about 20.91 mRL. All of the proposed leachate areas are located on sand ridges at elevations of above 30 mRL. Leachate irrigation onto a ridge is likely to increase any possible downward hydraulic gradient between the two aquifers. As the deep aquifer is utilised as a drinking water source, it is considered important to confirm the hydraulic gradient between the two aquifers beneath a ridge, and thereby clarify the risk of contamination of the deep aquifer.

A review of the groundwater flow and contaminant transport system beneath and surrounding the site, linked to a risk analysis for groundwater users and surface water impacts, is considered to be necessary. One outcome of the risk analysis may be a need to install further monitoring wells.

Recommendations

Golder recommends that a shallow up-gradient monitoring well, G1s, and a deep up-gradient monitoring well, G1d, be installed as groundwater quality and level monitoring wells. The intended purposes of these two wells are:

- Improved monitoring of background groundwater quality in both shallow (sand) and deep (gravel) aquifers;
- Improved monitoring of the hydraulic gradient within the deep aquifer; and
- Improved characterisation of the interaction between the two aquifers.

The location chosen to establish these wells should be on top of a sand ridge close to the southeastern boundary of the site. If this cannot be achieved within the site boundary, due to access difficulties or other reasons, locations off-site but close to this boundary should be considered.

It is recommended that a review of the groundwater flow and contaminant transport system beneath and surrounding the site, linked to a risk analysis for groundwater users and surface water impacts, be undertaken. This should include confirmation of the locations of all groundwater abstraction wells within a 1.5 km radius of the site.

If a review of the groundwater system with respect to the principal receptors indicates the groundwater flow direction in the deep aquifer differs significantly from that in the shallow aquifer, or that downward hydraulic gradients between the two aquifers are present or can develop at the site, a review of the monitoring well system should be initiated to determine if the current system is sufficient to detect leachate plumes derived from the site.

2.2.4 Condition 3 – Monitoring Well Destruction

Discussion

The D series monitoring wells (representing early detection monitoring points) located close to the centre of the site are susceptible to burial or destruction due to ongoing site operations. It is clear that planned site layouts may change over time for a variety of reasons. In addition, accidents can also result in the destruction of monitoring wells. It appears that at least one monitoring well has been installed on site and subsequently buried or destroyed. Although it is preferable that all wells are established as long term monitoring stations, this is unlikely to be a realistic scenario for this site, without major changes to the waste storage area layout, decreased waste storage efficiency and potentially considerable increases in construction and monitoring costs.

Recommendations

- If an early detection well is likely to be destroyed or become otherwise inaccessible due to planned changes in landfill cell areas, replacement wells are to be constructed in positions agreed upon with Horizons. Replacement wells should be installed as close to the original well as reasonably possible and should preferably be capable of monitoring both shallow and deep aquifers. Monitoring of the existing and the new wells should overlap for as long a time period as possible;

- If site management planning indicates any monitoring well is likely to become buried or otherwise destroyed within the following year as a result of normal operations, this fact must be communicated to Horizons as soon as practicable.

Any future monitoring wells should be installed taking into account proposed or potential waste storage areas on the site and with one objective being a monitoring point with longevity. If new monitoring wells are established, due to practical reasons, with the clear intention that they would be decommissioned or buried at some later date, this intention should be communicated to Horizons prior to installation.

These recommendations are intended to encourage the construction of new or replacement early detection wells close to the waste disposal area. The objective is to enable the detection of a possible contaminant plume originating from a lined landfill area as early as practically possible. By extension, early detection of leachate losses increases the amount of time available to assess the potential impact of a plume and subsequently plan and initiate mitigation measures before the plume affects water quality at the compliance wells.

2.2.5 Condition 3 – Monitoring Parameters and Sampling Frequency

Discussion

From an economic point of view, there is no value to be gained from continuing an intensive sampling and analysis regime at a monitoring well where there is no indication of changing effects from leachate (unless background). Reducing the frequency of sampling or reducing the range of analysis parameters for each sample are two methods by which costs can be reduced in this area without also reducing the effectiveness of the groundwater monitoring regime.

Water quality sampling frequency should be allowed to decrease for individual monitoring wells provided water quality trends indicate:

- The groundwater at the sampling point is not being affected by leachate; or

- The groundwater is affected by leachate but there is no indication of a declining trend in water quality and trigger levels are not exceeded

If the sample results are variable, without a trend being evident, the reason for this should be determined rather than just reducing the sampling frequency as per the schedule. If problems such as poor sampling procedure or a poorly installed monitoring well exist, these issues can then be identified and corrected.

As the site layout will change over time, with the future layout of operational areas not yet finalized, the groundwater monitoring program also needs to reflect this uncertainty. If new areas are being utilised for waste storage, or leachate irrigation is initiated, the monitoring frequency for wells immediately down-gradient from the new activity should be intensified when indications of changes in the groundwater quality are detected. The sampling frequency can be reduced again, if and when it can be demonstrated that the concentration of contaminants in the groundwater is not consistently increasing.

Two years of quarterly sampling, or eight datasets, would cover two seasonal cycles. This is a reasonable period for adequate characterisation of seasonal changes in parameters at any particular site. Reductions in sampling and analysis frequency may be considered once the baseline water quality at the monitoring site

has been established. The existing dataset should, however, be taken into consideration when determining the monitoring frequency at existing wells.

If the existing monitoring program has produced sufficient data from individual monitoring points to fulfil the requirements permitting a reduction in sampling frequency, this reduction in sampling frequency, for most parameters, should be permitted to take place immediately. As analyses for the organic parameters defined in the comprehensive analysis list have not been undertaken in the past, groundwater samples should still be obtained for all wells and submitted for analysis for the organic parameters on the comprehensive parameters list for a two year period. A few additional parameters have been added to the indicator parameter list to ensure adequate characterisation of the groundwater during quarterly sampling rounds (refer Section 2.2.7).

Provided groundwater quality remains stable over the initial two year period, the reduction in the comprehensive analysis frequency to annual should result in a significant long term reduction in costs to the permit holder.

If three consecutive quarterly indicator sampling rounds show the groundwater at a particular monitoring well is affected by leachate, then annual sampling for pesticides/semi VOC should be initiated at that well. This has been provided for in Tables A and B of the reviewed consent conditions (Appendix B). In this situation, sampling may be scheduled to coincide with the ongoing monitoring program. Monitoring wells B1, B2 and B3, where leachate has already been detected, should be sampled for pesticides/semi VOC annually until it is shown that the groundwater at these locations is no longer being affected by leachate.

The leachate pond outlet water should be initially sampled six monthly for pesticides/semi VOC and if no pesticides/semi VOC's are detected the sampling should move to an annual basis. If pesticides/semi VOC's are not detectable in the collected leachate, it is very unlikely they would be detectable in the down-gradient groundwater. If this is the case, then it is considered unnecessary to monitor the down gradient wells for these contaminants. Conversely, if pesticides/semi VOC's are detected in the leachate collected from the lined landfill cells, any monitoring well in which leachate has been detected is to be tested for pesticides/semi VOC's on an annual basis.

If there is a possibility that the leachate detected in a monitoring well is derived from the unlined landfill, rather than the lined landfill cells, then annual sampling for pesticides/semi VOC's at that monitoring well should be initiated. This applies even if pesticides/semi VOC's are not detected in the leachate pond water. It is incumbent on the Permit Holder to demonstrate to Horizons' satisfaction that the source of the leachate is not the lined landfill.

Recommendations

Golder recommends:

- The initial sampling frequency for all monitoring points is to be set at quarterly for 2 years, or eight datasets;
- If the conditions permitting a reduction in comprehensive sampling frequency are met, either through review of the past data record or through future sampling and analysis, the sampling for comprehensive analyses can be reduced to an annual frequency; and
- The indicator analysis parameter list be expanded to include some metals and other parameters (refer Section 2.2.7).

In Table 1 it is recommended that annual pesticide/semi VOC analysis is undertaken on water obtained from all wells affected by leachate from the landfill. This broad definition for the wells that need to be tested for these parameters has been applied because there is no information on the presence of pesticides or semi-VOC's in the groundwater at the site to date. Applying specific target concentrations whereby the sampling frequency may increase therefore introduces a low risk that these concentrations may be exceeded in the

background water or for other reasons that landfill operations. More information is required before specific target concentrations can be defined.

Table 1: Summary of proposed groundwater monitoring parameters and frequency.

Location	Parameters and Frequency
All monitoring wells	Quarterly Comprehensive for 2 years *Subsequently, conditional* Annual Comprehensive Quarterly Indicator
All monitoring wells affected by leachate from unlined landfill.	Annual pesticide/semi VOC

2.2.6 Condition 3 – Comprehensive List for Water Analysis Parameters

Faecal Coliforms

Faecal coliforms are being retained in the comprehensive analysis list, although there was a request to replace this parameter with an analysis for E. Coli. The faecal coliform counts registered in groundwater from several monitoring wells have varied greatly over time. The reasons for retaining faecal coliforms in the comprehensive analysis list are:

- Consent 6009 permits the disposal of a range of biological material at the site, including offal, carcases, bio-solids, sludge and similar materials;
- During winter the groundwater table appears to intersect the ground surface between dunes;
- The immediate receiving environment for shallow groundwater discharges appears to be the Hokio Stream; and
- There appears to be a risk that deep groundwater directly down-gradient from the landfill is utilised for human and/or stock drinking water. This risk remains to be quantified.

The relevant ANZECC guideline relating to stock drinking water is:

- *Drinking water for livestock should contain less than 100 thermotolerant coliforms/100 mL (median value). (ANZECC, 2000, Sect. 9.3.3.2). There is no guideline based on E. Coli counts.*

The relevant New Zealand Ministry of Health drinking water standard is specified for E. Coli, however if faecal, presumptive or total coliforms are measured, the counts are to be treated as though they were E. Coli:

- *A Maximum Acceptable Value of less than 1 in 100 mL of sample (MoH, 2005).*

The NZ MfE recreational fresh water guidelines (MfE, 2003) invoke a series of guideline values for E. Coli concentrations, linked to infection risks which has been determined from Campylobacter infection statistics.

The ANZECC guidelines for recreational water quality defer to the MfE guidelines above.

Recommendation

Golder recommends that the analysis for faecal coliforms be retained in the comprehensive list of analysis parameters.

2.2.7 Condition 3 – Indicator List for Water Analysis Parameters

The main value in applying an indicator list of parameters to long term monitoring is the reduction in associated sampling, analysis and data evaluation costs. It is therefore considered important that the indicator list includes sufficient parameters to ensure that potential changes in groundwater quality can be detected.

Conservative tracers

Conservative tracers are considered the most important parameters in determining the extent of any contaminant plume from the landfill. In order to minimise the potential for errors and interpretation uncertainty, it is important to have two conservatively transported parameters with high solubility (i.e., chloride and boron) in the indicator list rather than just one.

Metals

All metals presented on the indicator parameter list are present in groundwater in the shallow aquifer at concentrations above the drinking water standard (MWH, 2000). Given the present lack of a risk assessment for the Levin Landfill, we consider these parameters as fundamental monitoring parameters for an indicator list. Zinc has been removed from the recommended indicator parameter list because the behaviour of zinc is considered to be adequately covered by other parameters and the concentrations have not been observed to approach the drinking water Maximum Acceptance Value (MAV).

Nutrients

Determination of nutrient loads to receiving waters requires evaluation of a full suite of nitrogen parameter analyses, sulphate and dissolved reactive phosphate.

Ammonia and nitrate should be included in the Indicator Parameter list for the following reasons:

- The current lack of a clear determination of fate for nitrogen compounds within the upper aquifer;
- The limited understanding of the interaction between the shallow and deep aquifers;
- The conservative nature of total nitrogen transport within a confined aquifer;
- The use of the deep aquifer as a drinking water source;
- The potential for nitrate and nitrite compounds to easily exceed drinking water MAV's down-gradient from the site; and
- The lack of a risk evaluation for the site.

The dissolved reactive phosphate and total organic carbon analyses have been removed from the indicator parameter list. These parameters are, however, provided for in the comprehensive list of water analysis parameters. The reduced list of parameters has been incorporated in the recommended conditions, together with the conditional provision for increased monitoring frequency using the comprehensive list of parameters.

Recommendations:

Golder recommends:

- Two conservatively transported contaminants with high solubility that are generally detected in landfill leachate (i.e., chloride and boron) are applied in the indicator list rather than only one.
- All metals detected in shallow aquifer groundwater at concentrations above the drinking water standard should be incorporated in the Indicator Parameter list. The recommended list in Table F (Appendix B) has been adapted to reflect this recommendation.

- Ammonia and nitrate should be included in the Indicator Parameter list.

2.2.8 Condition 4 – Soil Analysis Parameters

Discussion

It is currently not planned to irrigate leachate collected from the lined landfills onto soils at the site. The existing consent does however provide for this activity at the site.

Contaminants discharged during the irrigation of leachate onto soils at the site have the potential to become concentrated in the soils. If leachate irrigation is to start or is taking place, soil sampling should be undertaken to ensure any build up of contaminants in the soils is detected and monitored. An initial six monthly soil sampling schedule is recommended to enable seasonal variations of contaminant concentrations in the soil to be evaluated prior to a reduction in sampling frequency. At least one round of sampling should also be undertaken at any planned irrigation area prior to the start of irrigation in order to provide baseline soil chemistry information.

Chloride should be added to the elemental parameter suite because of the potential for salt to become concentrated in the soil during summer and remobilised during winter. This seasonal effect may influence chloride concentrations in the groundwater and induce anomalous variations in groundwater quality at down-gradient monitoring wells.

Two soil sampling points should be identified for each proposed leachate irrigation area, with the locations selected in areas where the volume of water applied is at or near a maximum. A third sampling point should be selected at a low point outside and down-flow from the irrigation area. The objective of selecting the third sampling point is to determine whether metals or salts become concentrated in the soils associated with the low points between the dunes, mainly as a consequence of groundwater transport of contaminants and their subsequent deposition through evaporation of groundwater. It is suggested that soil sampling points should be chosen close to the wells to be utilised for monitoring groundwater quality down-gradient from the planned irrigation area (e.g. F1, F2 and F3) for convenience.

If pesticides and semi-volatile organic compounds are present in concentrations below the screen detection limit in the collected leachate during the previous two sampling rounds, it is not considered necessary to test the irrigated soils for these parameters.

Recommendations

Golder recommends that:

- Two soil monitoring points be established within any irrigation area planned to be brought into use and a further soil monitoring point be established at a low point outside and down-flow from the irrigation area, prior to the start or irrigation.
- Soil sampling and analysis be initiated at least six months prior to the start of leachate irrigation at the site.
- Chloride is added to the analysis parameter list for soils.

2.2.9 Condition 11 – Surface water quality reporting

Discussion

Condition 11 requires the Permit Holder to report to Horizons on the significance of any water quality exceedences of the Australian and New Zealand Environment and Conservation Council Water Quality

Guidelines (ANZECC, 2000) for Livestock Watering. Golder considers that there is no reason to change this condition where it relates to shallow groundwater.

Several of the monitored parameters currently exceed the ANZECC guidelines for stock drinking water in the Hokio Stream upstream from the landfill. Condition 11 should be modified to require reporting of declines in water quality between the upstream and downstream monitoring points.

Recommendation

Golder recommends that any decline in surface water quality between the upstream (HS1) and downstream (HS3) monitoring points within Hokio Stream be reported to Horizons together with an assessment of the significance of the results.

2.2.10 Condition 11 – Monitoring data evaluation

Discussion

During pre-hearing meetings it became clear that there were four fundamental questions that were at the focus of the NLG concerns and other interested parties. These questions were:

1) What does the groundwater quality monitoring data collected at the site actually mean?

2) If the contaminant concentrations that are being detected down-gradient from the landfill continue to increase, at what point should action be taken to protect the Hokio Stream?

3) What mechanism is in place to enable Horizons to actually enforce the instigation of remediation action?

4) What remediation actions are available that may be suitable for this site?

These questions were linked in the objective of preventing the water quality in Hokio Stream from deteriorating as a result of leachate discharges from the Levin Landfill rather that responding to an observed deterioration in the stream water quality.

Through recommended additions to Condition 11, the onus can be put on the Permit Holder to address questions 1 to 3 in the annual compliance reports

Question 4 is not able to be addressed acceptably through changes in the existing consent conditions or the addition of new consent conditions. The actual nature of any remedial action cannot be determined until the crucial contaminant or collection of contaminants has been identified. Pre-empting any decision on the design of a groundwater remedial system is poor practice and likely to result in unacceptable results.

In the case of the Levin Landfill, Golder considers that the groundwater monitoring program is sufficient to identify potential changes in the down-gradient groundwater quality, based on our current understanding of future landfill cell areas at the site. However, the fact that groundwater quality may meet specific guideline values or concentration limits does not automatically indicate that water quality in the Hokio Stream would not be affected.

The preferred risk management methodology should be to maintain an ongoing assessment of contaminant mass loads being transported in the groundwater toward the Hokio Stream. The calculation of mass loads is used to support the evaluation of the effects of contaminant discharges from many groundwater systems to surface water bodies. These calculations are a very useful tool for the management of contaminated sites to ensure compliance with conditions on discharge permits. Mass loads are, however, rarely applied as conditions of consent. The reasons for this are:

- Absolute concentrations are generally preferred as these are easier to document in consent compliance reports and easier for the regulatory authority to review. The concentrations applied to the consent

conditions may not have any practical significance, although normally there is some specific objective in defining the specified concentrations. In the case of the Levin Landfill, for example, the water quality in the groundwater is linked to the ANZECC stock water guidelines (Condition 11a).

- Monitoring wells are often positioned some distance from the receiving water body. The methodology for the calculation of contaminant mass loads using data from the monitoring wells is open to discussion and challenge.

- The concentration of contaminants detected at monitoring wells may change between the monitoring wells and the receiving water body. In addition, the mass load calculated as passing the monitoring wells can differ significantly from that discharging to the receiving water body. Changes in concentration or mass load can be due to dilution, adsorption of contaminants onto soil or rock, contaminant breakdown and precipitation, amongst other processes.

Questions 1 and 2 above, concerning the meaning of the groundwater monitoring data, can be approached through ensuring that the Permit Holder is required to calculate and document the contaminant mass loads being transported in groundwater toward Hokio Stream in the annual report to Horizons. In the same annual report, the meaning of the mass loads for future water quality in Hokio Stream and ongoing compliance with consent conditions can be discussed. These requirements are considered to be reasonable from both environmental management and risk minimisation viewpoints.

In several places the text in the existing consent conditions state that should water quality exceed certain guideline values “the Permit Holder shall report to the Regional Council as soon as practicable on the significance of the result and, where the change can be attributed to landfill leachate, consult with the Regional Council to determine if further investigation or remedial measures are required.” There are, however, no specific requirements in the existing or proposed conditions to date that require the design or instigation of remediation measures. In addition, there is no provision for the Horizons to enforce the design and instigation of remediation measures.

A staged approach to intensified modelling, reassessment of the data, improvement of water quality projections and communication with Horizons is considered reasonable in follow-up to identification of a possible issue. In response to questions 2 and 3 above, the staged approach can also incorporate clear steps by which Horizons can require mitigation measures to be assessed and potentially instigated.

Staging of the assessment and review approach may appear to have considerable delays between identification of a possible issue and instigation of actions to mitigate the potential effects. Allowance for reasonable time intervals between different stages of the assessment, design of remedial action and instigation of that action needs to be taken into account to ensure the work is completed to a high standard.

It has also needs to be taken into account that the transport of contaminants in groundwater in this area is not a rapid process. An allowance of reasonable time to practically achieve the staged response to issues that may arise should not affect the ability of suitable mitigation measures to be applied and the consequent avoidance of effects to the Hokio Stream or groundwater users.

Recommendations

Golder recommends that:

- The Permit Holder be required to include in the annual report to Horizons an assessment of contaminant mass loads being transported in the groundwater downstream from the landfill, the likely source of the contaminants and what this contaminant load may mean for water quality in the Hokio Stream. This recommendation is incorporated in the proposed Condition 11b.

- A staged approach to further investigations and groundwater modelling be required should a potential issue with ongoing compliance with consent conditions related to the quality of the water in Hokio Stream be identified. This recommendation is incorporated in the proposed Condition 11e.

- Should the staged assessment process continue to indicate groundwater quality and contaminant mass loads in the groundwater present an issue with respect to the water quality in Hokio Stream, a clear staged approach to identifying mitigation measures and instigating these measures should be incorporated in the consent conditions. This recommendation is incorporated in the proposed Condition 11e.

2.2.11 Condition 12 – Deep aquifer water quality

Discussion

The information provided to Golder to date does not conclusively demonstrate that the hydraulic gradient between the deep gravel aquifer and the shallow sand aquifer is predominantly upward. There are reasons to believe that the reverse may be occurring locally, with the areas beneath sand dune crests potentially having a significant downward hydraulic gradient. If this is the case, the application of leachate to dune crests is likely to raise the groundwater table within the shallow aquifer and consequently increase any existing downward hydraulic gradient between the two aquifers. This is a reasonable scenario for potential contamination of the deep aquifer with leachate from the landfill. No compelling evidence refuting this scenario it has been presented to Golder to date.

Recommendation

Golder recommends that Condition 12 be modified to include the reporting of water quality from all existing and future monitoring wells screened in the deep aquifer against Ministry of Health drinking water standards.

2.2.12 Condition 13 – Private water well sampling

Discussion

Golder has been advised that background sampling and analysis of water from groundwater abstraction wells within a 1.5 km radius of the landfill has been undertaken in the past. To date, however, the necessity to monitor the water quality in groundwater abstraction wells used by surrounding landowners has been poorly defined.

The permit holder must obtain written approval from relevant land owners to sample private bores. It is unclear as to whether this has occurred in the past. Similarly, the results of such monitoring should be communicated not only to Horizons but to the relevant land owner.

Although it is suggested that water samples be obtained from bores up-flow from the landfill for background characterisation purposes, this sampling is not considered necessary as a general consent condition. There is no reason to believe that contaminants transported by groundwater would spread in an up-flow direction and ongoing monitoring of up-gradient wells for background water quality is not considered necessary.

Golder suggests that sampling be undertaken on a regular basis from those private water bores that are located down gradient or cross gradient of the landfill. It is considered important to detect any decrease in drinking water quality that may be a consequence of leachate entering groundwater. Should mitigation measures be required at any stage, the need for these measures should be identified before the bore water quality no longer meets drinking water standards for any parameter.

Recommendation

Golder recommends that:

- The Permit Holder be responsible for the sampling and analysis of the groundwater from private groundwater wells within a 1.5 km radius of the site. A written invitation from the bore owner to access the site should be obtained prior to sampling.
- Sampling of private wells should be limited to bores located down-flow or across-flow from the landfill.
- The Permit Holder should be required to communicate the results of the analyses to the well owners as well as to Horizons.

2.2.13 Condition 14 – Refuse compaction parameters

It is not considered necessary to apply the compaction parameters to closed landfill areas, or to refuse already in place, due to the difficulty in determining the refuse density with any degree of certainty in retrospect. Golder considers that calculation of the refuse density of the operational landfill is best done based on surveys of the landfill area and the soil borrow areas on an annual basis. If the calculated density of the landfill waste does not meet the specification in Condition 14 during one particular year, this should lead to changes to the waste compaction procedures for subsequent years.

2.2.14 Condition 15 – Landfill cap design

Discussion

The current cap design for the closed unlined landfill is not considered to be industry "best practice" for the following reasons:

- The cap is apparently constructed of crushed and compacted weathered gravel. This composition would not necessarily encourage run-off although it would act to reduce potential erosion of the cap.
- Ponding of surface water occurs locally on top of the landfill, which suggests the compacted capping material does have the capacity to limit infiltration during rain events. The extent to which infiltration is limited may however vary across the landfill.
- The existing cap probably does not greatly encourage the ongoing development of a deep soil horizon, which could be useful in reducing infiltration through increasing evapotranspiration losses.
- The appearance of wild pine growth on the top of the landfill does not encourage either ongoing monitoring or management of the surface to cope with waste settlement. The development of a tree cover across the landfill would also reduce the ease with which the form of the landfill cap could be monitored and, if necessary, modified. Tree root systems affect the integrity of the cap and potentially increase infiltration.

The cap structure as described in the Landfill Management Plan Part B is also not industry "best practice" for the following reasons:

- The use of "composted greenwaste and / or sand" indicated in the landfill management plan could encourage future managers of the landfill to use sand as a remedial material for observed settlement as this is the most readily available material at the site. As sand is highly permeable and subject to rapid erosion, it is not suitable as a landfill cap by itself.
- Industry "best practice" requires some form of cap that reduces the rate of rainfall infiltration to a landfill and, in addition, requires that the permeability of that cap is tested and therefore quantified. There is no requirement for testing of the cap material in the existing management plan and therefore no quality control system to confirm the cap is suitable for the intended purpose.

Industry "best practice" relates the cost of the landfill cap construction back to the types of material stored. This is essentially a cost benefit analysis linked to the nature of the likely contaminants that may leach from the waste and their projected concentrations.

Although it should be accepted that waste segregation during the period of the old landfill operation was probably very limited, the construction of a very low permeability and highly engineered cap on top of the landfill is difficult to justify given the observed quality of the groundwater down-gradient from the closed landfill area.

Recommendations:

Golder recommends that:

- Rather than clearing and recapping the entire landfill, the cap of the closed unlined landfill area should be surveyed on a regular basis. The survey should not only include the topography of the cap but also the nature of the vegetation cover and identification of any areas of erosion.
- Where degradation and compaction of the material in the landfill results in the shape of the landfill cap changing to the extent that it no longer meets the design conditions presented in Condition 15, additional capping material should be imported to modify the cap form to meet the design parameters.
- Any material added to the closed landfill cap should be compacted to ensure the new material has a permeability of 1 x 10^{-7} m/s prior to the addition of topsoil.

2.2.15 Condition 31 – Landfill cap design

The addition of Condition 31 to Resource Consent 6010 has been requested by the Permit Holder. In effect, this proposed condition provides for Horizons to initiate a review of the proposed Condition 11 at any time. This condition is considered reasonable and provides additional flexibility within the consent to deal with unforeseen issues that may arise.

2.3 Discharge Permit 6009 – Discharge of Solid Waste

This discharge permit authorises the discharge of solid waste to land at the Levin Landfill.

Condition 31 of this discharge permit is the review condition. It states:

> *"The Regional Council may initiate a review of Conditions 2,8,14, 28 and 29 of the Permit in April, 2003, 2005, 2010, 2015, 2020, 2025, 2030 and 2035. The reviews shall be for the purpose of:*
>
> *a) Assessing the adequacy of the management plan outlined in Conditions 14 and 29 of this consent; and/or*
>
> *b) Assessing the effectiveness of Conditions 2, 8 and 28 of this consent.*
>
> *in avoiding, remedying or mitigating adverse effects on the environment surrounding the Levin Landfill.*
>
> *The review of conditions shall allow for the*
>
> *c) Modification of the management plan outlined in Conditions 14 and 29 of this consent;*
>
> *d) Deletion or changes to Conditions 2, 8 and 28 of this consent; and*
>
> *e) Addition to new conditions as necessary*
>
> *to avoid, remedy or mitigate adverse effects on the environment surrounding the Levin Landfill."*

As there is no evidence of adverse effects arising from the discharge of solid waste to land at the landfill, the recommended changes to consent conditions, or the landfill management plan, are relatively minor. These changes have been recommended in response to suggestions by MWH, to take into account the current operational status of the landfill and the availability of landfill lining materials within a reasonable transport distance of the landfill site.

2.3.1 Condition 14 – Closed landfill aftercare management plan

The closed unlined landfill area may be subject to different aftercare management to that applicable to the lined landfill cells. This differentiation between the two areas should be clarified in Condition 14. One objective is to allow the Permit Holder more flexibility in dealing with aftercare issues that may arise. This also provides Horizons with more clarity with respect to how the two landfill areas may be differently managed. The changes to Condition 14 also reflect the recommended changes to Condition 15 of Resource Consent 6010.

2.3.2 Condition 28b – landfill cell liner.

Discussion

MWH has indicated that "to the best of their knowledge there is no geosynthetic clay liner (GCL) on the market in New Zealand that will meet a required permeability of less than 1×10^{-11} m/s" (P.Landmark, pers comm.). This specification matches the specification for a landfill liner provided in the landfill guidelines produced by the Centre for Advanced Engineering in Christchurch (CAE 2000). Enquiries by Golder indicate that there is no GCL material commercially available in New Zealand that meets this specification.

In theory, an increased GCL permeability of 2×10^{-11} m/s or 3×10^{-11} m/s would effectively meet the criteria provided in the CAE specification, provided the thickness of bentonite in the layer is increased by a corresponding ratio. This increase in thickness would effectively balance the difference in permeability. In practicality, this would apparently still require the purchase of customised liner material from overseas at a consequent cost premium.

For practical reasons it is therefore considered acceptable for the GCL liner material to be constructed to meet a permeability target of 3×10^{-11} m/s. This reduction in the stringency of the condition should be accompanied by some form of quality control on the part of the supplier. For example, a requirement that the supplier's quality control procedures demonstrate at least 95% of the liner material would be at or below this permeability.

It is considered reasonable to allow some flexibility to Condition 28, to take into account the possible availability of new materials and design practice. This flexibility could be introduced through an additional condition allowing for changed liner design provided agreement on the design is reached, in writing, between the Permit Holder and the consent authority. It is presumed that any design changes would be reviewed by the independent engineer referred to in Condition 27.

Recommendation

Golder recommends that:

- The minimum specifications for the landfill liner should be relaxed slightly to take into account the commercial availability of liners here in New Zealand.
- A provision be incorporated in the conditions for quality control documentation by the suppliers identifying the minimum proportion of the liner that can be expected to meet the new design specifications.

2.3.3 Condition 28c – landfill liner material

Golder recommends that a change in the wording of Condition 28c from ". . . (high density polyethylene, HDPE, 1.5 mm thick, or polypropylene, PP, 1.0 mm thick)." to (high density polyethylene, HDPE, with a *minimum* thickness of 1.5 mm, or polypropylene, PP, 1.0 mm thick)" be incorporated. This change would be acceptable should an application under s127 of the RMA be lodged by the Permit Holder as Golder does not consider that such a change modifies the management of potential effects on the environment from the landfill.

2.3.4 Leachate accumulation

In their recent report into the management of the Levin Landfill, Tonkin and Taylor Limited have suggested the monitoring of leachate pressures above the landfill liner. The hydraulic pressure within the landfill is one factor influencing the possible rate of seepage loss through the GCL, should the HDPE or PP sheet be damaged. The report states "typically the design requirement for leachate head is limited to <300 mm to minimise the risk of leakage even in the event of liner defects being present."

Golder suggests that this monitoring process would be worth initiating in the first available lined landfill cell, although attaching this monitoring to the consent as a condition is not seen as justified. If the leachate does build up within the landfill, this may be an indication that the liner is working correctly, with the build up of leachate being an issue of the landfill design in general, an indicator of problems with the leachate drainage system or simply a consequence of an unusually wet winter. In addition, the hydraulic pressure within the landfill can be influenced by the waste compaction and settling process. If the hydraulic pressure exceeding "300 mm" develops within an operational landfill, a practically viable mitigation measure is difficult to envisage. At the same time, there may be no effect from this pressure build-up and consequently no need for mitigation at that stage.

It also needs to be understood that attaching a condition of leachate pressure monitoring to the landfill would also imply replacing the monitoring system if it failed. This process is not seen as being practically achievable once the landfill cell is in place without risking the integrity of the liner.

The value in monitoring the pressure of leachate within the landfill would come from being able to determine the efficiency of the drainage system within closed cells of the lined landfill at minimising the build-up of pressure within the landfill. Analysis of this information could potentially be used to support landfill design modifications if these were considered necessary. Eventually, this information could also be used to support design modifications for the landfill cap, if these were considered necessary.

2.4 Discharge Permit 6011 – Air Discharge Permit

This discharge permit authorises the discharge of landfill gas, odour and dust to air at the Levin Landfill.

Condition 7 of this discharge permit is the review condition. It states:

> *"The Regional Council may initiate a review of Conditions 3 and 6 of the Permit in April, 2003, 2005, 2010, 2015, 2020, 2025, 2030 and 2035. The reviews shall be for the purpose of:*
>
> *a) Assessing the effectiveness of Conditions 3 and 6 of this consent.*
>
> *in avoiding, remedying or mitigating adverse effects on the environment surrounding the Levin Landfill.*
>
> *The review of conditions shall allow for the*
>
> *b) Changes to Conditions 3 and 6 of this consent;*
>
> *c) Addition to new conditions as necessary.*
>
> *to avoid, remedy or mitigate adverse effects on the environment surrounding the Levin Landfill."*

Discussion

The design capacity of the New Levin Landfill is slightly over 1,000,000 m^3, which can accept a refuse volume of about 690,000 t. As such it is not covered by the National Environmental Standard (SR 2004/309) or associated amendments, which is the relevant regulation controlling landfill gas emission in New Zealand.

The only existing, or proposed structure within the landfill boundary is the pump shed for the leachate irrigation system. The design and ongoing operational practice for this structure should take into account the potential for accumulation of landfill gas within the building through the incorporation of adequate ventilation systems. This can be taken into account in the Landfill Management Plan through the addition of further Health and Safety guidance with respect to landfill gas.

The risk of landfill gas sourced from the landfill accumulating in a closed environment, with the possible exception of the pump house, is considered to be low. Although there is no regulatory necessity for the landfill gas to be monitored, the monitoring of existing monitoring wells may be tested for gas as a precautionary measure. The testing may be undertaken following a schedule that matches the groundwater sampling schedule at each well. This testing would also provide baseline data should the proposed storage capacity of the Levin Landfill be increased at any stage in the future.

The potential for gas derived from landfill leachate to be generated and transported within the lower aquifer is considered to be low. This potential should however, be evaluated in the proposed site risk assessment.

Recommendations

Golder recommends that:

- Condition 3 incorporate a requirement that gas monitoring be undertaken on existing groundwater monitoring wells.
- Condition 3 requires that any buildings on the site be adequately ventilated.
- Condition 6a incorporate a requirement that records be kept of the landfill gas monitoring program and that these records be made available to Horizons on a quarterly basis.

2.5 Discharge Permit 7289 – Contingency Discharge of Liquid Waste

2.5.1 Introduction

This discharge permit authorises the discharge of liquid waste onto and into land at the Levin Landfill only as a contingency to normal disposal.

Condition 19 of this discharge permit is the review condition. It states:

> *"The Regional Council may initiate a review of Conditions 5, 9, 12 and 17 of the Permit in April, 2003, 2005, 2010, 2015, 2020, 2025, 2030 and 2035. The reviews shall be for the purpose of:*
>
> *a) Assessing the adequacy of the monitoring conditions outlined in Conditions 5 and 17 of this consent, and/or*
>
> *b) Assessing the effectiveness of Conditions 9 and 12 of this consent.*
>
> *In avoiding, remedying or mitigating adverse effects on the environment surrounding the Levin Landfill.*
>
> *The review of conditions shall allow for the*
>
> *c) Modification of monitoring outlined in Conditions 5 and 17;*
>
> *d) Changes to Conditions 9 and 12 of this consent; and*

e) *Addition to new conditions if necessary.*

To avoid, remedy or mitigate adverse effects on the environment surrounding the Levin Landfill."

Changes to Conditions 5 and 9 are recommended in order to ensure the ongoing effectiveness of these conditions. No other changes to consent conditions are recommended.

2.5.2 Condition 5 – notification procedure

As the existing Condition 5 is set out, it is intended as a requirement to notify Horizons of the disposal of liquid waste at the landfill after the fact. In some cases notification of the Council can be performed in advance where temporary closure of other disposal facilities for maintenance is to occur or has occurred

Golder has been advised that no liquid waste has been disposed of to ground at the closed landfill area since it was closed in May 2004.

Golder suggests that Condition 5 be amended to ensure notification of Horizons is undertaken as soon as practically possible, given the current availability of:

- Mobile phones;
- A pollution hotline as well as normal hours calling lines to Horizons.

In most cases, this should result in almost immediate notification of Horizons following the site operator or Permit Holder becoming aware that waste is to be deposited at the site under this consent. A written record of the call should be made at the time by the person making the call.

Recommendation

Golder recommends that Condition 5 be amended to read "The Permit Holder shall notify the Regional Council's Manager Resource Use and the Neighbourhood Liaison Group as soon as practically possible after receiving notification of the intention to dispose of waste at the landfill under the terms of this consent."

2.5.3 Condition 9 – Liquid waste disposal within lined landfill areas.

Discussion

At present the disposal of liquid waste at the site may be performed within either the lined or the unlined landfill areas. Although the disposal of liquid waste at the landfill is understood to be rare, the unlined area is not suitable for the disposal of liquid waste due to the availability of a lined landfill area nearby. This will naturally impact on the rehabilitation of the landfill areas; however this is unavoidable under the existing conditions.

Recommendation

Golder recommends that Condition 9 be modified to emphasise the disposal of liquid waste within lined landfill areas if possible.

2.6 Discharge Permit 102259 – Discharge of Stormwater

2.6.1 Introduction

This discharge permit authorises the discharge of stormwater at the Levin Landfill. All conditions attached to this discharge permit are subject to review.

In order to ensure the effectiveness of consent conditions, and the adequacy of monitoring and associated reporting, changes to Conditions 10 and 16 have been recommended.

2.6.2 Condition 10 – stormwater management

The original text of Condition 10 had poor sentence structure and was therefore unclear.

Golder recommends that Condition 10 be modified to read "Where it is practical and economical to do so, the Permit Holder shall ensure that within the operational landfill cell the minimum amount of stormwater shall be allowed to come into contact with refuse. This shall be affected by constructing impermeable barriers, diversion drains or bunds on the side slopes and within the base of the landfill"

2.6.3 Condition 16 - reporting

It is recommended that monitoring data is made available to Horizons as soon as possible. As such, Condition 16 should be modified by adding "The annual report shall be supplemented by the raw water quality analysis data being forwarded to the Regional Council *as soon as practically possible* following the receipt of laboratory analysis certificates".

3.0 OTHER MATTERS

3.1 Overview

As a result of the review process that has been carried out there are a range of other matters that have been identified, and at times discussed, for which changes to consent conditions have not been recommended as it is considered that they do not fall within the scope of the review condition. These matters have been identified below and an analysis of the attributes, or otherwise, of the suggested changes and/or comments, from a technical perspective, have been provided.

With regards to these matters, we note that if the Permit Holder decides to proceed with a change of conditions along the lines proposed then we acknowledge that Section 127 of the RMA enables them to do so. Utilisation of this provision of the RMA is considered an appropriate mechanism for the implications of such changes to be considered.

3.2 Discharge Permit 6010 – Discharge of Leachate

3.2.1 Conditions 5 and 9: Reporting frequency

Neither Condition 5 nor Condition 9 of Discharge Permit 6010 is subject to review. However, given the apparent issues that have arisen with communications related to this landfill, it is recommended that:

a) Under Condition 5, the results of the monitoring completed under Conditions 3 and 4 of this Permit should be reported to Horizons on a quarterly basis, as soon as they become available to the HDC, rather than by 31 August each year.

b) The reporting required under Conditions 11 and 12 on the significance of the results would therefore occur after the reporting of the results themselves.

c) The Permit Holder should report the results of the monitoring to the NLG on a more frequent basis than once each year, as a way of increasing public confidence in the good intentions of the Permit Holder and as a tool by which more regular formal communication can be encouraged.

3.2.2 Existing landfill cap

Guidelines for landfill closure in New Zealand state: "If the existing landfill is unlined and the risk of impacting on the receiving environment is high a final cap having a relatively low infiltration rate is necessary to reduce the quantity of leachate generated to minimise potential impacts" (NZMfE, 2001).

The CAE guidelines for landfill management states the final cover should consist of a minimum of compacted earth layer at least 600 mm thick with a maximum hydraulic conductivity of $1x10^{-7}$ m/s. There appears, however, to be little justification for complete restructuring of the existing landfill cap (i.e., 1,000 mm of material of which 700 mm is a mixture of compacted sand and composted green waste), for the following reasons:

- Remediation, performed in accordance with existing consent conditions, is already substantially complete, with the refuse assumed to be in a stable condition, capped and revegetation initiated;
- The groundwater analysis records reviewed do not indicate declining water quality down-gradient from the existing landfill, although the groundwater is impacted by leachate;
- There appears to be no indication of leachate effects on Hokio Stream, and
- The economic and environmental costs associated with importing clay for a landfill cap do not appear to be balanced by a potential significant gain in water quality at the nearest receiving water environment, the Hokio Stream.

The management of the landfill cap is however an ongoing process. Irrespective of the degree of compaction achieved during the operational period of the landfill, it is to be expected that the landfill will continue to undergo settlement. The changes in the cap surface need to be monitored to ensure that ponding of water on the top of the cap does not become an issue, or that desiccation and cracking of the cap result in an increase in water entering the landfill.

Without taking into account the available groundwater monitoring data, it would appear that the risk of affecting the receiving environment would be high. Given, however, the available monitoring records that cover a period of at least 8 years, the actual effects from the existing landfill to date appear to be negligible. There is no clear reason to expect that this situation would deteriorate substantially in the future.

To expand on the monitoring issue, both past and future, it is important to recognise that the proposed Condition 11b and Condition 12 are considered suitably stringent for the purposes of Horizons.

As far as Golder are aware, the management of the unlined landfill has to date not resulted in exceedance of consent groundwater quality conditions. Provided the conditions are considered by Horizons to be stringent enough, the onus is on the Permit Holder to extend this record of compliance into the future.

The management of the unlined landfill to comply with the existing and proposed consent conditions is subject to a cost benefit analysis by the Permit Holder. Liability for the unlined landfill did not end with closure, so any analysis must clearly take into account short, medium and long term costs and risks. These risks would normally be reviewed by the Permit Holder whenever the conditions of consent are changed and especially where the conditions of consent become more stringent.

3.2.3 Lined landfill cap

The question of the most appropriate type of landfill cap for different situations is being debated at length overseas. In terms of the planned lined landfill, the following points are fundamental to deciding on a cap structure.

- Installation of a low permeability clay layer for the cap is associated with considerable costs, both in direct economic terms and also in environmental terms, due to the necessity of importing clay from off

site and physically compacting it. Although the costs to the ratepayer can be spread across the life of the landfill, this leads to the question of cost benefit.

- A 50 mm (assumed) soil layer installed on top of a compact and relatively impermeable clay layer may suffer from erosion problems, especially during the initial revegetation stage, as the soil moisture capacity is likely to be easily exceeded during moderate rain events.

- Compacted clays do not offer a large volume of bioavailable water. During summer, water available to vegetation on top of the landfill is likely to be limited to that contained in the soil layer. In contrast, a thicker more permeable cap with better moisture retention capacity and greater moisture bioavailability is likely to reduce runoff and increase infiltration into the landfill. The moisture available to the vegetation cover is however likely to be greater and consequently improve the long term outcome for the site. It should be noted that unweathered sand does not necessarily have a particularly great moisture retention capacity. The current landfill management plan requires the use of compacted sand or composted green waste for the main cap layer, a mixture of which is likely to provide a good moisture retention capacity.

- The landfill liner required under discharge permit 6009, Condition 28 is considered to be suitable to protect the underlying groundwater from direct infiltration of leachate, provided it is correctly constructed. Consequently, increased infiltration of rainwater to the landfill should only result in increased volumes of water discharging to the drainage system and the necessity to dispose of this water.

- The only clear potential gain from changing the cap structure appears to be limiting the leachate volume to be disposed of. If leachate disposal is through irrigation onto defined irrigation areas, this would be monitored on a real time or short delay basis in order to ensure consent conditions with respect to irrigation rates are met. Excessive infiltration rates should be almost immediately identified and the irrigation operations changed accordingly.

- During some periods of the year leachate may also be irrigated onto lined landfill cells that have been closed and rehabilitated, with the objective of increasing soil moisture levels and thereby encouraging plant growth.

- It is understood that at this stage HDC do not plan to dispose of leachate by irrigation to land on-site. Should this irrigation however go ahead at some point in the future and the volume of leachate reporting to the drainage system not be able to be disposed of on-site without exceeding consent conditions, mitigation measures can be instigated with almost immediate effect. These options include:

  - Off-site disposal (currently planned);
  - Increased irrigation area;
  - Installing a low permeability cap in retrospect; and
  - On-site treatment of the leachate.

- Consents have been applied for by the HDC to permit the disposal of leachate off-site, via a pipeline linking to the regional waste water treatment system.

The above considerations indicate a full review of possible landfill cap structures is not necessary. Golder however supports a recommendation from MWH that optimisation of a phytocap for the lined landfill, with one focus being moisture availability to the vegetation on a seasonal basis, should receive further study.

The management of the lined landfill to comply with the existing and proposed consent conditions is, as with the unlined landfill area, subject to a cost benefit analysis by the Permit Holder. In the case of the lined landfill the Permit Holder has much greater control of the environmental effects and a much wider range of mitigation measures that may be applied if the volume or quality of the leachate proves to be unmanageable. The sustainability of the approach taken to capping the landfill will become apparent through evaluation of

the monitoring records within a couple of years of closure of the first landfill cell. As soon as adequate data becomes available the Permit Holder could be expected to re-evaluate the existing consents and the leachate management process.

The essential point here is that mitigation measures for the lined landfill can be instigated with almost immediate effect. If the irrigation of leachate proves to result in consent condition exceedance the mitigation measures could potentially include a temporary or permanent stop to leachate irrigation at the site and retrospective modification of the cap design.

If the HDC were to apply to change the existing consent conditions with respect to the design of the landfill cap, it is recommended that a detailed risk analysis be considered.

3.3 Potential Landfill Expansion

3.3.1 Introduction

It appears that the HDC is now considering a landfill expansion to the final extent of the landfill based on Plan A provided by MWH with the original consent application. It is understood that such an expansion would be the subject of a consent application process. However, given the purpose of this document, it is considered that comment on the matters identified below are relevant in terms of the information contained within this report.

3.3.2 Consent 6010 – Discharge of Leachate

The locations and objectives of the monitoring well system at the site would have to be reviewed. It is important to install further monitoring wells, along the western site boundary in particular, well in advance of the landfill extension being constructed.

The division of monitoring wells into compliance wells and early detection wells proposed for Condition 3 can take into account such a large shift in proposed activity at the site. Further consideration as to which wells are designated compliance wells and which can be considered early detection wells is, however, necessary. Given the continuing long term requirement for waste storage space and the general difficulty in consenting new storage areas, we suggest some preliminary evaluation of the maximum possible storage capacity at the site and potential refuse storage layout could be done, with existing and new compliance wells identified and planned on the assumption that the storage capacity will at some stage be utilised.

The concept of compliance wells remains valid, however given the very small distances from the edge of the landfill area to the site boundary, some compliance wells are very likely to be doubling as early warning wells.

Given the proposed size of the landfill and its closeness to the site boundary, we consider it very important the understanding of the local groundwater regime is improved. Compliance wells should be located inside the site boundary, however the potential for narrow contaminant plumes to develop and expand off-site undetected is clear.

3.3.3 Consent 6011 – Air Discharge Permit

The proposal outlined by MWH to extend the landfill by a further 850,000 m^3 capacity shifts the scale of the landfill into one that requires landfill gas monitoring as identified in Section 3.4 of this document.

It is recommended that the applicant provides an assessment of the implications of such an extension with respect to the Horizons Manawatu Regional Plan when seeking consent for any proposed landfill expansion.

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APPENDIX A

Report Limitations

REPORT LIMITATIONS

This Document has been provided by Golder Associates (NZ) Ltd ("Golder") subject to the following limitations:

(i). This Document has been prepared for the particular purpose outlined in Golder's proposal and no responsibility is accepted for the use of this Document, in whole or in part, in other contexts or for any other purpose.

(ii). The scope and the period of Golder's Services are as described in Golder's proposal, and are subject to restrictions and limitations. Golder did not perform a complete assessment of all possible conditions or circumstances that may exist at the site referenced in the Document. If a service is not expressly indicated, do not assume it has been provided. If a matter is not addressed, do not assume that any determination has been made by Golder in regards to it.

(iii). Conditions may exist which were undetectable given the limited nature of the enquiry Golder was retained to undertake with respect to the site. Variations in conditions may occur between investigatory locations, and there may be special conditions pertaining to the site which have not been revealed by the investigation and which have not therefore been taken into account in the Document. Accordingly, additional studies and actions may be required.

(iv). In addition, it is recognised that the passage of time affects the information and assessment provided in this Document. Golder's opinions are based upon information that existed at the time of the production of the Document. It is understood that the Services provided allowed Golder to form no more than an opinion of the actual conditions of the site at the time the site was visited and cannot be used to assess the effect of any subsequent changes in the quality of the site, or its surroundings, or any laws or regulations.

(v). Any assessments made in this Document are based on the conditions indicated from published sources and the investigation described. No warranty is included, either express or implied, that the actual conditions will conform exactly to the assessments contained in this Document.

(vi). Where data supplied by the client or other external sources, including previous site investigation data, have been used, it has been assumed that the information is correct unless otherwise stated. No responsibility is accepted by Golder for incomplete or inaccurate data supplied by others.

(vii). The Client acknowledges that Golder may have retained subconsultants affiliated with Golder to provide Services for the benefit of Golder. Golder will be fully responsible to the Client for the Services and work done by all of its subconsultants and subcontractors. The Client agrees that it will only assert claims against and seek to recover losses, damages or other liabilities from Golder and not Golder's affiliated companies. To the maximum extent allowed by law, the Client acknowledges and agrees it will not have any legal recourse, and waives any expense, loss, claim, demand, or cause of action, against Golder's affiliated companies, and their employees, officers and directors.

This Document is provided for sole use by the Client and is confidential to it and its professional advisers. No responsibility whatsoever for the contents of this Document will be accepted to any person other than the Client. Any use which a third party makes of this Document, or any reliance on or decisions to be made based on it, is the responsibility of such third parties. Golder accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this Document.

APPENDIX B

Proposed Consent Conditions

APPENDIX A
Levin Landfill Consent Conditions revised

The Decisions

Note: *For the purposes of clarification these Permits relate to:*

*The **existing Levin landfill** defined as at or about Area A on Figure 1, attached to and forming part of these Permits.*

*The **proposed Levin lined landfill** defined as at or about Area B on Figure 1, attached to and forming part of these Permits.*

Determination – Discharge Permit 6010

Consent is granted to the Horowhenua District Council to discharge landfill leachate onto and into land at the Levin landfill, Hokio Beach Road, Levin, legally described as Lot 3 DP 40743 Blk II Waitohu Survey District, for a term expiring 35 years from the commencement of the consent subject to the following conditions:

1. Charges, set in accordance with Section 36(1)c of the Resource Management Act 1991, and Section 690 A of the Local Government Act 1974, shall be paid to the Regional Council for the carrying out of its functions in relation to the administration, monitoring and supervision of this resource consent and for the carrying out of its functions under Section 35 (duty to gather information, monitor, and keep records) of the Act.
   [**Note**: Section 36(1)c of the Act provides that Council may from time to time fix charges payable by holders of resource consents. The procedure for setting administrative charges is governed by Section 36(2) of the Act and is currently carried out as part of the formulation of the Council's Annual Plan.]

General Conditions – Discharge leachate to ground

2. Landfill leachate shall not contaminate adjoining land.

3. The Permit Holder shall commence the following monitoring programme:

Table A: Landfill Groundwater Monitoring Locations, Parameters, and Frequency – Deep Aquifer Wells

Location	Parameters and frequency
C2dd, E1d, E2d and any other future deep monitoring well unless installed for background monitoring purposes.	Quarterly comprehensive for 2 years. *Subsequently, conditional* Annual comprehensive Quarterly indicator.
G1d and any other future deep monitoring well installed for background monitoring purposes.	Quarterly comprehensive for 1 year *Subsequently* Annual comprehensive Quarterly indicator
All monitoring wells where indicator parameters show leachate influence over 3 consecutive sampling rounds.	Annual pesticide / semi VOC

Table B: Summary of Landfill Groundwater Monitoring Locations, Parameters, and Frequency – Shallow Aquifer Wells.

Location	Parameters and frequency
C1, C2, C2ds, D4 B1, B2, B3s, E1s, E2s and any other shallow **Compliance** monitoring well installed in the future.	Six monthly comprehensive for 2 years Quarterly indicator *Subsequently, conditional* Annual comprehensive Quarterly indicator
D5, F1, F2, F3 and any other shallow monitoring well installed to monitor **leachate irrigation areas** in the future.	Six monthly comprehensive for 2 years Quarterly indicator *Conditional* Annual comprehensive Quarterly indicator
G1s and any other shallow **Background** monitoring well installed in the future.	Quarterly comprehensive for 1 year *Subsequently, conditional* Quarterly indicator
D1, D2, D3r, D6, and any other **Early Detection** wells installed in the future.	Quarterly comprehensive for 2 years *Subsequently, conditional* Annual comprehensive Quarterly indicator
All monitoring wells where indicator parameters show leachate influence over 3 consecutive sampling rounds.	Annual pesticide/ semi VOC

Groundwater levels are to be measured and recorded routinely during each sampling procedure.

Conditions: A reduction in sampling frequency at any groundwater monitoring point is conditional on:

A. Completion of the initial monitoring program;

B. Good consistency of groundwater sample analysis results, or a clearly identified reason for inconsistent results that excludes the contaminant source being landfill operations, stored waste or leachate;

C. No decline in groundwater quality as determined from indicator parameter trends over a period of four consecutive sampling rounds.

D. If a well being monitored on a conditional frequency becomes non-compliant with condition C, the monitoring frequency for that well should return to the initial monitoring frequency until conditions B and C are again being fulfilled.

Sampling frequency for the shallow monitoring wells installed to monitor proposed leachate irrigation areas as defined in Table B may begin on the conditional basis, however the frequency is to revert to the unconditional frequency if leachate irrigation begins and continue from that date as if the monitoring well had been newly installed.

If site management planning indicates any early detection monitoring well is likely to become buried or otherwise destroyed within the following year as a result of normal operations:

E. This must be communicated to the regional council as soon as practicable;

F. A replacement well is to be constructed in a position agreed upon with Horizons Regional Council;

G. The replacement well should be installed in a position suitable to act as a early detection well and be classed as an early detection well; and

H. The replacement well should be constructed as a nested well (or two separate wells) with screens positioned in both shallow and deep aquifers.

Table C: Other Water Monitoring Locations, Frequencies and Parameters.

Location	Parameters and frequency
HS1, HS2, HS3	Quarterly comprehensive for 2 years *Subsequently, conditional* Six monthly comprehensive Quarterly indicator
Leachate Pond Outlet	Quarterly comprehensive for 2 years Six monthly pesticide / semi VOC *Subsequently, conditional* Six monthly comprehensive Quarterly indicator Annual pesticide / semi VOC

Conditions: A reduction in sampling frequency at the Hokio Stream monitoring locations is conditional on:

I. Completion of the initial 2 year monitoring program;

J. Good consistency of water sample analysis results, or a clearly identified reason for inconsistent results that excludes the contaminant source being landfill operations, stored waste or leachate;

K. No decline in water quality between monitoring sites HS1 and HS3 as determined from indicator parameter trends over a period of four consecutive sampling rounds.

L. If the Hokio Stream monitoring locations are being sampled on a conditional frequency and become non-compliant with condition K, the monitoring frequency for all three monitoring locations should return to the base case intensive monitoring until conditions J and K are again being fulfilled.

Conditions: A reduction in sampling frequency at the leachate pond outlet is conditional on:

M. Completion of the initial 2 year monitoring program;

N. Good consistency of water sample analysis results, or a clearly identified reason for inconsistent results;

O. No decline in water quality over a period of four consecutive sampling rounds.

P. If the leachate pond outlet is being sampled on a conditional frequency and become non-compliant with condition O, the monitoring frequency should return to the base case intensive monitoring until conditions N and O are again being fulfilled.

If existing analysis records indicate that the water quality at a monitoring location complies with the requirements permitting a shift to a conditional sampling schedule, this may be done immediately. If the site complies, sampling for these parameters can be instigated following the base schedule while sampling for the other parameters can be continued based on the conditional schedule.

Locations: (Unless otherwise stated, locations are described on Figure 4, attached to and forming part of this consent).

Table D: Monitoring Point Locations.

Monitoring group	Monitoring point	Location
Shallow groundwater	B1	
	B2	
	B3s	
	C1	
	C2	
	C2ds	
	D1	
	D2	
	D3r	
	D4	
	D5	Lined landfill area groundwater bore
	D6	Lined landfill area groundwater bore
	E1s	
	E2s	
	F1	Groundwater bore downflow from irrigation area
	F2	Groundwater bore downflow from irrigation area
	F3	Groundwater bore downflow from irrigation area
	G1s	South Eastern boundary of the site (proposed location)
Deep groundwater	C2dd	
	E1d	
	E2d	
	G1d	South Eastern boundary of the site (proposed location)
Stream	HS1	Hokio Stream – upstream of landfill (Refer Fig. 2)
	HS2	Hokio Stream – alongside landfill (Refer Fig. 2)
	HS3	Hokio Stream at or about 50 metres downstream of landfill property boundary (Refer Fig. 2)
Soils	Refer Condition 5	In land disposal area
Leachate		Pond outlet

Parameters: The comprehensive and indicator parameter lists referenced in Tables A, B and C are presented in Tables E and F.

Table E: Comprehensive Analysis List.

Type	Parameters
Characterising	pH, electrical conductivity (EC), alkalinity, total hardness, suspended solids
Oxygen demand	COD, BOD
Nutrients*	NO_3-N, NH_4-N, DRP, SO_4
Metals*	Al, As, Cd, Cr, Cu, Fe, Mg, Mn, Ni, Pb, Zn
Other elements	B, Ca, Cl, K, Na
Organics	Total organic carbon, total phenols, volatile acids
Biological	Faecal coliforms

*Analyses performed for nutrients and metals are for dissolved rather than total concentrations.

Table F: Indicator Analysis List.

Type	Parameters
Characterising	pH, EC
Oxygen demand	COD
*Nutrients	NO3-N, NH4-N
*Metals	Al, Mn, Ni, Pb
Other elements	B, Cl

*Analyses performed for nutrients and metals are for dissolved rather than total concentrations.

Schedule: The sampling regime defined in Tables A to C shall be undertaken based on the following schedule:

Q. The first samples for all parameters shall be taken in July 2010.

R. Quarterly monitoring referred to in Tables A and B shall be carried out in January, April, July and October.

S. Six monthly monitoring referred to in Tables A and B shall be carried out in April and October.

T. Annual monitoring referred to in Table A shall be carried out in April.

4. The Permit Holder shall monitor soils in the irrigated areas. The first soil samples from an irrigation area shall be taken in the first year that leachate is irrigated to land in that area and shall be taken prior to irrigation. Thereafter, samples shall be taken on the schedule provided in Table H.

Table H: Soil Monitoring Locations and Parameters.

Location	Parameters and frequency
All soil sampling locations.	Background prior to irrigation Six monthly metals and other elements for 2 years Annual pesticide / semi VOC *Subsequently, conditional* Annual metals and other elements

Parameters: The analysis parameters applied for soil monitoring are presented in Table I:

Table I: Irrigated Soil Analysis List.

Type	Parameters
Metals	Al, As, Cd, Cr, Co, Hg, Ni, Pb, Zn
Other elements	Cl, B
Organics	Pesticides to screen concentrations Semi-volatile organic compounds

Schedule: The sampling regime defined in Table H shall be undertaken based on the following schedule:

A. Six monthly monitoring referred to in Table H shall be carried out in April and October.

B. Annual monitoring referred to in Table H shall be carried out in April.

The first samples required by the schedule in Table H shall be taken during April or October immediately following the start of irrigation, whichever comes first.

Soil sample sites shall be chosen in consultation with the Regional Council. Soil samples shall be obtained from two locations within each leachate irrigation area, with the sampling locations separated by at least 50 m. In addition, a soil sample shall be obtained from one location down gradient from each leachate irrigation area, with the sampling point selected at a low point between dunes. Each soil sample shall consist of a continuous soil core obtained from the surface to a depth of 0.2 m.

Conditions: A reduction in soil sampling frequency for the sites located within a leachate irrigation area, based on the mean of the analysis results for the two sites, is conditional on:

C. Completion of the initial 2 year monitoring program;

D. Good consistency of soil sample analysis results;

E. No continuous increase in contaminant concentrations in soils as determined from parameter trends for the majority of the metals tested over four consecutive sampling rounds.

F. If a leachate area being monitored on a conditional frequency becomes non-compliant with condition E, the monitoring frequency for that area should return to the base case intensive monitoring until conditions D and E are again being fulfilled.

G. Pesticides or semi-volatile organic compounds being below the screen detection limits in the leachate collected from the lined landfill during the previous two sampling rounds.

5. The results of monitoring under Conditions 3 and 4 of this Permit shall be reported to the Regional Council by 31 August each year for the duration of this Permit.

6. The Permit Holder shall ensure the above monitoring programme is undertaken by either the Regional Council, or, an independent organisation approved by the Manager Resource Use of the Regional Council.

7. The Permit Holder shall inform the Neighbourhood Liaison Group of the identity of the organisation carrying out the monitoring.

8. The Permit Holder shall meet the costs of the monitoring.

9. The Permit Holder shall report the results of the monitoring to the Neighbourhood Liaison Group by 31 August each year for the duration of the Permit.

10. If a laboratory is used for water quality analyses which do not have independent accreditation for the parameters measured, then on each sampling occasion duplicate samples from a least one sampling location shall be analysed by a laboratory with independent accreditation for the parameters measured. Continued analysis by the unaccredited laboratory shall be at the discretion of the Regional Council.

11. a) Should any shallow aquifer groundwater and surface water parameters tested for under Condition 3 of this consent exceed the Australian and New Zealand Environment and Conservation Council Water Quality Guidelines (2000) for Livestock Watering, the Permit Holder shall report to the Regional Council as soon as practicable on the significance of the result and, where the change can be attributed to landfill leachate, consult with the Regional Council to determine if further investigation or remedial measures are required.

b) Should any surface water parameters tested for under Condition 3 of this consent indicate a decline in water quality between monitoring points HS1 and HS3, as referred to in Table D, the Permit Holder shall report to the Regional Council as soon as practicable on the significance of the result and, where the change can be attributed to landfill leachate, consult with the Regional Council to determine if further investigation or remedial measures are required.

c) In the event that a report is submitted to the Regional Council pursuant to Conditions 11(a) or 11(b) and the Regional Council has determined that further investigation or remediation measures are required, then:

(i) the Regional Council may require the Permit Holder to develop a mitigation or remediation plan.

(ii) In the event that the Regional Council determines that a mitigation or remediation plan is required, the Regional Council shall advise the Permit Holder of this requirement in writing within two months of receiving the Condition 11(a) or 11(b) report.

(iii) Within six months of receipt of advice in writing from the Regional Council pursuant to Condition 11(c)(ii), the Permit Holder shall submit a mitigation or remediation plan to the Regional Council for approval.

(iv) Any mitigation or remediation plan prepared in accordance with Condition 11(c) shall include a timetable for implementation.

(v) Following approval of a mitigation or remediation plan prepared in accordance with Condition 11(c) (iii), if the Regional Council determines that the adverse effects of the landfill activity itself on the shallow groundwater aquifer or surface water will be more than minor, the Regional Council shall require the Permit Holder to implement the plan within the timeframe specified in the timetable for implementation required by Condition 11(c) (iv).

d) The Permit Holder shall annually review the data derived from the groundwater monitoring program and evaluate contaminant mass load projections for discharges from the landfill to the Hokio Stream. The contaminant mass load projections shall be based primarily, but not exclusively, on the monitoring data obtained for the "B" and "C" series bores indicated in Table D of this discharge permit. The annual report required under Condition 5 shall include the following information:

i) A summary of the methodology used to calculate the mass load projections,

ii) The calculated mass loads transported in the groundwater and comparable mass loads in the Hokio Stream,

iii) An analysis of the implications of the mass load calculations with respect to ensuring discharges from the landfill would not result in a decline in the water quality in the Hokio Stream under Condition 3.

e) Should the groundwater parameters tested for under Condition 3 of this consent, and subsequent evaluation and indicative assessment of contaminant mass loads under Condition 11(d) of this consent indicate that contaminants sourced from either the closed or active areas of the Levin Landfill are likely to result in a future decline in the water quality of the Hokio Stream, as defined under Condition 3, then:

(i) the Permit Holder shall include in the annual report required by Condition 5 an analysis of the significance of the result.

(ii) The Regional Council may at any time require the Permit Holder to undertake further investigations and/or conduct a detailed assessment of mass loads to evaluate the actual likelihood of a future decline in water quality of the Hokio Stream as a result of landfill activities as measured under Condition 3. The Permit Holder shall provide a report to the Regional Council documenting the further investigations undertaken or the methodology, procedure and outcomes of the detailed assessment.

(iii) If the work required under Condition 11(e)(ii) discloses an actual likelihood of a future water quality decline of the Hokio Stream as a result of landfill activities, and the Regional Council determines that this decline in water quality would constitute a more than minor effect on the water quality of the Hokio Stream, the Regional Council shall require the Permit Holder to develop a mitigation or remediation plan.

(iv) For the purposes of quantifying whether the adverse effects of the landfill activity itself on the water quality of the Hokio Stream will be more than minor, any determination made by the Regional Council may be independently peer reviewed, at the request of either the NLG or the Permit Holder, by an appropriately qualified and experienced person. The request for a peer review must be lodged with the Regional Council within a period of one month following the determination by the Regional Council.

The peer reviewer shall prepare a detailed report which analyses the determination of adverse effects made by the Regional Council, and provide clear recommendations as to whether implementation of a mitigation or remediation plan is required for the purposes of adopting the best practicable option to remove or reduce the more than minor adverse effect on the water quality of the Hokio Stream. This report shall be completed within a period of three months of the request for a peer review.

Should a peer review of the determination be undertaken, the Regional Council shall take into account the outcome of the review in again determining whether this decline in the water quality of the Hokio Stream would constitute a more than minor effect on the water quality of that stream.

(v) In the event that the Regional Council determines that a mitigation or remediation plan is required, the Regional Council shall advise the Permit Holder of this requirement in writing within two months of receiving the annual report.

(vi) Within six months of receipt of advice in writing from the Regional Council pursuant to Condition 11(e)(v) the Permit Holder shall submit a mitigation or remediation plan to the Regional Council for approval.

(vii) Any mitigation or remediation plan prepared in accordance with Condition 11(c) or Condition 11(e)(v) shall include a timeframe or threshold for implementation.

(viii) Following the completion of the mitigation or remediation plan, if the Regional Council determines that the potential adverse effects of the landfill activity itself on the water quality of the Hokio Stream, as monitored under Condition 3, continue to be more than minor, the Regional Council shall require the Permit Holder to implement the plan within the timeframe specified in the timetable for implementation required by Condition 11(c)(vii) or alternatively when the threshold identified is triggered.

[Advice Note: Condition 11 may be subject to a review pursuant to s 128 (1)(a) of the Resource Management Act 1991 (see Condition 31) and it is anticipated such a review will occur in the event of disagreement by either the Permit Holder or NLG with any determination of the Regional Council in relation to condition 11(a) – (e)]

12. Should any parameters tested for under Condition 3 of this consent from the deeper gravel aquifer (bores identified as C2dd, E1, E2, the proposed G1d and any other monitoring bore intersecting the deep gravel aquifer), exceed the requirements of the Ministry of Health's Drinking Water Standards for New Zealand 2000, the Permit Holder shall report to the Regional Council as soon as practicable on the significance of the results and, where the change can be attributed to landfill leachate, consult with the Regional Council to determine if further investigation or remedial measurers are required.

13. Sampling of the groundwater wells within a 1.5 km radius down-flow or across-flow from the landfill property boundary is to be carried out by the Permit Holders representative upon receiving a written invitation from the bore owners. The frequency of sampling is to be decided through discussion between the bore owner and the Permit Holder. Initial analyses from individual bores are to be tested for the parameters in the Comprehensive Analysis List in Condition 3. Subsequent testing may be performed based on the Indicator Analysis List in Condition 3. Should analysis of water obtained from any groundwater wells used for human drinking water show concentrations of parameters which exceed the requirements of the Ministry of Health's Drinking Water Standards for New Zealand 2000, or repeated sampling from a specific bore indicates a decrease in water quality, the Permit Holder shall report to the Regional Council and the bore owner as soon as practicable on the significance of the results. Where the exceedance or decreasing water quality can be attributed to landfill leachate,

the Permit Holder shall consult with the Regional Council and the bore owner to determine if further investigation or remedial measures are required.

14. Any currently active and future lined landfill area shall be closed and remediated by:

    a) Compacting refuse to such an extent and consistent with CAE guidelines of 600-800 kg/m^3, to ensure post closure settlement is minimised as far as practicable; and

    b) Grading to a final slope of less or equal to 1V:3H (1 in 3) on any face; and

    c) Ensuring the landfill cap incorporates a layer at least 700 mm thick with a permeability of not less that 1 x 10(-7) m/s, or has a material and layer structure that reduces rainwater infiltration to the waste to an equivalent extent; and

    d) Establishing and maintaining a grass or tussock vegetation cover on the capped landfill, unless it can be demonstrated to the Regional Council's satisfaction that a different vegetation cover can produce clear benefits through reducing infiltration to the covered waste. Any vegetation cover should be consistent with an ongoing capacity to monitor and maintain the ongoing integrity of the landfill cap.

    In-situ refuse density shall be determined through annual calculation based on information derived from topographic surveys of the landfill and borrow areas, and from weighbridge records. The survey shall be carried out within one month of the anniversary of the previous survey.

Specific Conditions – discharge leachate to ground from existing landfill

15. The Permit Holder shall close and remediate the existing unlined landfill by April 2011 by:

    a) Grading to a final slope on the landfill faces and caps of between 1V:3H (1 in 3) and 1V:40H (1 in 40);

    b) Ensuring the final landfill surface is sloped to promote run-off toward the outside of the landfill footprint and prevent surface water ponding on the landfill cap;

    c) Ensuring the landfill cap incorporates a layer at least 700 mm thick. All material added to the existing cap to bring the thickness up to 700 mm, or for future cap maintenance purposes, is to have a permeability of not greater than 1 x 10(-7) m/s.

    d) Establishing and maintaining a grass or tussock vegetation cover on the capped landfill consistent with an ongoing ability to monitor and maintain the integrity of the landfill cap. The vegetation is to be managed to exclude tree species that can potentially develop root systems capable of disrupting the landfill cap and thereby enhancing rainwater infiltration; and

    e) Monitoring the landfill cover on an annual basis to identify areas of differential settlement slope stability issues, erosion and changing vegetation patterns, including a topographic survey to ensure Conditions 15(a) to (d) continue to be met.

    f) The Permit holder shall submit an annual report to the Regional Council by 31 August each year for the duration of this Permit documenting the condition of the unlined landfill and any maintenance carried out during the previous year. The annual report shall address but not be limited to those aspects listed in Conditions 15(a) to (e) above. The annual report shall include a plan of the unlined landfill specifically documenting the shape of the closed landfill and any changes during the previous year. [The annual report can be written in conjunction with the annual report required as part of Condition 14 for Consent Number 6009]

    The area of the existing landfill to be remediated is defined as Area A on Figure 1 attached.

16. Within one month following the remediation of the Levin landfill, the Permit Holder shall report in writing to the Regional Council of the Permit Holder's compliance with Conditions 14 and 15 of this permit.

Specific Conditions – Discharge leachate to ground from lined landfill

Environmental Effects

17. There shall be no disposal of leachate sludge from the pond onto irrigation areas. Leachate sludge shall be disposed of in accordance with Condition 26 of consent number 6009 and Condition 18 of consent number 7289.

18. The rate of application of leachate irrigated to land shall not exceed 200 kg Nitrogen/hectare per year.

19. There shall be no ponding or runoff of leachate on or beyond the irrigation areas.

20. Subject to Condition 19 of this permit, application of leachate on to soil shall not exceed 50 millimeters per day. Notwithstanding, the maximum rate of application shall not exceed 5 millimetres per hour.

21. There shall be no discharge of offensive or objectionable odour at or beyond the legal boundary of the Levin Landfill property as shown on Figure 1 resulting from leachate irrigation.

22. Should the quality of leachate being irrigated exceed the STV parameters set out in the Australian and New Zealand Environment and Conservation Council Water Quality Guidelines (2000) for metals in Irrigation Water the Permit Holder shall report to the Regional Council as soon as practicable on the significance of the result and in consultation with the Regional Council determine if further investigation or remedial measures are required.

Process Management

23. The daily volume of leachate irrigated to land shall be metered and recorded.

24. The Permit Holder shall make regular and at least weekly, inspections of the irrigation system, including pumps, pipes, irrigators and vegetation to ensure that the system is operating efficiently and that vegetation is in good health.

25. The Permit Holder shall have carried out the works described in Condition 14 (a) to (d) of this permit rehabilitate:

    a. Any lined landfill area within four months following the closure of that lined landfill area, if the landfill area is closed before 35 years from the granting of this consent.

    b. Any lined landfill area before 35 years from the granting of this consent.

    [**Note**: “lined landfill area” is defined as a distinct “cell” or stage of the landfill.]

Monitoring and Reporting

26. A plan of the leachate irrigation system shall be prepared to the satisfaction of the Regional Council’s Manager Resource Use nine months prior to placement of refuse on the lined landfill. The plan shall include:

    a. A map showing areas to be irrigated;

    b. Design of the recirculation, treatment and irrigation systems;

    c. Contingency measures in case of failures in the irrigation system;

    d. Criteria for installing aerators in the leachate pond;

    e. Assessment of options for recirculating leachate over the lined landfill;

    f. Assessment of groundwater profile beneath the irrigation area and effects leachate irrigation will have on groundwater;

g. Groundwater and soil monitoring programme, including a map showing sampling locations; and

h. Any other relevant matter.

27. The Permit Holder shall keep a log of:

a. The dates and times of leachate irrigation;

b. The total volume of leachate irrigated daily;

c. The volumes of leachate irrigated to specific areas;

d. Weather and ground conditions during irrigation;

e. Observations made during the weekly inspections of the pump, irrigation system and irrigation areas; and

f. Repairs and maintenance carried out on the irrigation system.

Copies of this log shall be forwarded to the Regional Council's Manager Resource Use on 28 February and 31 August of each year that the irrigation system is operated.

28. The Permit Holder shall inspect the landfill for leachate break out, settlement and other adverse environmental effects at least once per month until such time as discharge of refuse to the landfill ceases. Thereafter, the frequency of inspection shall be determined in consultation with the Regional Council.

29. The Permit Holder shall record the date, time, observations and any remedial action as a result of Condition 28. The record shall be made available to the Regional Council on request.

Review

30. The Regional Council shall initiate a publically notified review of Conditions 3, 4, 11(a) – (e), 12, 13, 14, 24, 27, 28 and 29 of this Permit in April, 2015, 2020, 2025, 2030 and 2035 unless the Neighbourhood Liaison Group (NLG) agrees that a review is unnecessary. The reviews shall be for the purpose of:

a. assessing the adequacy of monitoring outlined in Conditions 3 and 4 of this consent, and/or

b. assessing the effectiveness of Conditions 11(a) – (e), 12, 13, 14, 24, 27, 28 and 29 of this consent,

in avoiding, remedying or mitigating adverse effects on the environment surrounding the Levin Landfill.

The review of conditions shall allow for the:

c. modification of monitoring outlined in Conditions 3 and 4 of this consent;

d. deletion or changes to Conditions 11(a) – (e), 12, 13, 14, 24, 27, 28 and 29 of this consent; and

e. addition of new conditions as necessary,

to avoid, remedy or mitigate adverse effects on the environment surrounding the Levin Landfill.

31. The Regional Council may initiate a publically notified review of Conditions 11 (a) – (e) of this Permit at any time outside those reviews required by Condition 30. The review shall be carried out pursuant to section 128 (1)(a)(i) of the Resource Management Act 1991 and shall be for the specific purpose of:

a. Assessing the need and appropriateness of implementing a mitigation or remediation plan as the best practicable option to remove or reduce any adverse effect on the water quality of the Hokio Stream.

The review of conditions shall allow for the:

b. Deletion or changes to Conditions 11(a) – (e) of this consent;

c. Addition of new conditions as necessary, to avoid, remedy or mitigate adverse effects on the environment surrounding the Levin Landfill.

The review of conditions shall have regard to:

d. The nature of the discharge and the receiving environment; and

e. The financial implications for the applicant of including that condition; and

f. Other alternatives, including a new condition requiring the observance of minimum standards of quality of the receiving environment, having regard to the need to be satisfied that including that condition is the most efficient and effective means of removing or reducing that adverse effect.

Determination – Discharge Permit 6009

Consent is granted to the Horowhenua District Council to discharge solid waste to land at the Levin landfill, Hokio Road, Levin, legally described as Lot 3 DP 40743 Blk II Waitohu Survey District, for a term expiring 35 years from the commencement of the consent subject to the following conditions:

1. This permit does not authorise the disposal of liquid waste to land at the Levin Landfill.

   Liquid waste is defined as:

   Septic tank waste, grease trap waste, sewage and any material that contains free liquids.

   The presence of free liquids may be determined by either of the following methods, whichever is most practicable at the time:

   i. The "Paint Filter Test"; or

   ii. Material which may be loaded, transported and deposited at the landfill without the risk of free liquid seeping from the material, and without the risk of having the deposited material flow under gravity down any slope on the landfill shall be deemed to not contain free liquids.

General Conditions – Discharge Solid Waste to Land

2. The Permit Holder shall take all practicable measures to avoid the discharge of waste from within the landfill to surrounding land. To this end, the Permit Holder shall ensure:

   a. The amount of refuse exposed at any one time is confined in dimension to 800 square metres of tipping face; and

   b. Exposed refuse is covered at the end of each day that refuse is received at the landfill.

3. If refuse is discharged from within the active landfill areas to land outside the legal boundary of the landfill property, the Permit Holder shall ensure that such waste is cleared and removed to the landfill as soon as practicable.

4. The Permit Holder will monitor the landfill at least once every two weeks for the build up of litter, paper and other deposits outside the active landfilling areas, and remove such material as required.

5. The Permit Holder shall regularly inspect for the presence of vermin, birds and other pests take appropriate measures to control them.

6. The Permit Holder shall regularly inspect the landfill for noxious weeds, and take appropriate measures to control those noxious weeds.

Hazardous Material

7. The Permit Holder shall not allow the disposal of waste of an explosive, flammable, reactive, toxic, corrosive or infectious nature, to an extent that the waste poses a present or future threat to the environment or the health and the safety of people.

8. The Permit Holder shall develop and implement a procedure for the landfill operator, such that potentially hazardous material, as listed in Annex 1 attached to and forming part of this permit, will not be accepted for disposal at the Levin landfill without specific authorization. The Operations Manager of the Horowhenua District Council, or some other designated person, is able at their discretion to accept quantities of such wastes. The waste shall be accompanied by a Hazardous Waste Manifest, as listed in Annex 1, which will form part of the permanent record and shall be reported by the Regional Council by 31 August each year for the term of this Permit.

9. The Permit Holder shall maintain a secure facility for any small quantities of hazardous waste, pending a decision on treatment, disposal or transfer to another facility.

10. Hazardous waste stored at the facility described in Condition 9 shall be stored in a sealed and bunded area to avoid adverse effects from spills.

11. Any hazardous waste accepted for disposal shall be disposed within an adequate volume of mature refuse, in accordance with Centre for Advanced Engineering's Landfill Guidelines (2000).

Monitoring and Reporting

Specific Conditions – Discharge Solid Waste to Land at Existing Landfill

12. No solid waste shall be disposed to the existing landfill, after two years from the commencement of this consent.

13. All new fill should be placed on top of at least 2 metres of existing material in the existing landfill.

14. The Permit Holder shall update the Landfill Management Plan in respect of the operations on the lined landfill to the satisfaction of the Regional Council within six months of the completion of the review of the consents. The Landfill Management Plan shall include, but not be limited to:

    a. The specific conditions contained herein, related to the operation, management and monitoring of the landfill.

    b. A description of the development and maintenance of the landfill.

    c. A description of how the consent will be exercised in a manner to ensure compliance with the consent and the conditions thereof and the Resource Management Act 1991.

    d. A description of how the consent will be exercised to minimise adverse effects on the environment.

    e. A description of the hazardous waste acceptance criteria, including the criteria set out.

    f. The emergency procedures to be followed in the event of natural emergencies and hazardous waste spills.

    g. The methods of controlling dust and odour emissions including the criteria for assessing when, and how regularly, roadways and the landfill are dampened by water or otherwise.

    h. Details of measures to avoid nuisance effects on adjacent properties i.e. birds and vermin, as a result of landfill activities.

i. Operations, intermediate and final capping requirements.

j. Closure and aftercare.

k. Procedure to update the management plan, in light of changing circumstances, to continue compliance with Conditions of this Permit.

l. A screen planting implementation description.

m. The feasibility of carrying out greenwaste composting operations on top of the closed landfill shall be assessed. Where it is deemed to be feasible, the composting operations shall be incorporated into the Closed Landfill Aftercare Management Plan.

The Permit holder shall prepare a Closed Landfill Aftercare Management Plan in respect of the closed landfill (Area "A") to the satisfaction of the Regional Council within six months of the completion of the review of the consent conditions. The Closed Landfill Aftercare Management Plan shall include, but not be limited to those aspects that are detailed in Appendix E of the MfE publication entitled 'A guide for the Management of Closing and Closed Landfills in New Zealand (May 2001)'. The Closed Landfill Aftercare Management Plan shall require at the least:

n. Grading to a final slope on the landfill faces and caps of between 1V:3H (1 in 3) and 1V:40H (1 in 40);

o. Ensuring the final landfill surface is sloped to promote run-off toward the outside of the landfill footprint and prevent surface water ponding on the landfill cap;

p. Ensuring the landfill cap incorporates a layer at least 700 mm thick. All material added to the existing cap to bring the thickness up to 700 mm, or for future cap maintenance purposes, is to have a permeability of not greater than 1 x 10(-7) m/s.

q. Establishing and maintaining a grass or tussock vegetation cover on the capped landfill consistent with an ongoing ability to monitor and maintain the integrity of the landfill cap as per condition 15(d) of Consent 6010.

r. Monitoring the landfill cover on an annual basis to identify areas of differential settlement slope stability issues, erosion and changing vegetation patterns, including a topographic survey to ensure Conditions 14(n) to (q) continue to be met;

The Permit holder shall submit an annual report to the Regional Council by 31 August each year for the duration of this Permit documenting the condition of the unlined landfill and any maintenance carried out during the previous year. The annual report shall address but not be limited to those aspects listed in Conditions 14(n) to 14(r) above. The annual report shall include a plan of the unlined landfill specifically documenting the shape of the closed landfill and any changes during the previous year related to Condition 14(q) [The annual report can be written in conjunction with the annual report required as part of Condition 15(f) for Consent Number 6010].

Specific Conditions – Discharge of Offal and Dead Animals to Land

15. Offal waste shall be immediately buried in depth of 0.6 metres upon delivery.

16. All animals disposed of as diseased animals under the Animal Act 1967 shall be immediately buried to a depth of at least 1 metre.

17. Pits for the burial of offal and animals shall be excavated in mature refuse and shall be away from the public tipping area.

18. Pits for the burial of offal and animals shall be at least 10 metres from any landfill batter slope.

19. Pits for the burial of offal and animals shall not exceed a maximum size of two metres by 15 metres.

20. The immediate cover material of all offal and animals shall be a minimum depth of at least 100 millimeters unless these conditions specify otherwise. Pits shall be filled to within one metre of the prior refuse surface level and reinstated with appropriate compaction with previously removed refuse or other suitable material.

21. Pits for the burial of offal and animals shall be demarcated as such and shall be fenced off.

22. Any other malodorous wastes not already covered specifically by these conditions shall be covered immediately upon disposal.

Specific Conditions – Discharge of Biosolids and Sludges to Land

23. Biosolids, sludges and similar materials which do not contain free liquids may be accepted at the landfill as solid waste. This shall include dewatered municipal wastewater treatment plant solids, dewatered processing plant solids and dewatered agricultural wastes.

    The presence of free liquids may be determined by either of the following methods, whichever is most practicable at the time:

    i. The "Paint Filter Test"; or

    ii. Material which may be loaded, transported and deposited at the landfill without the risk of free liquids seeping from the material, and without the risk of having the deposited material flow under gravity down any slope on the landfill shall be deemed to not contain free liquids.

24. If not co-disposed of within the landfill, the biosolids, sludges and similar materials shall be applied to the landfill surface in accordance with the 1992 Ministry of Health Guidelines for the "safe use of sewage effluent and sewage sludge on land".

25. The Permit Holder shall maintain records of:

    a. The type of waste received;

    b. The volume of waste received;

    c. Source of waste; and

    d. The location in which the material was placed.

26. Disposal of site-generated sludge from cess-pits, leachate ponds or other site activities that contain free liquids is acceptable to facilitate site operation, provided this does not adversely affect landfill stability or face operations.

Specific Conditions – Discharge Solid Waste to Land at Lined Landfill

27. Design specifications and a set of construction drawings for the lined landfill shall be forwarded to the Regional Council (Manager Resource Use) for certification, to ensure compliance with the conditions of this consent and all related consents, at least three months prior to the intended construction of the lined landfill begins.

28. The Permit Holder shall construct the liner system for all new cells to include the following elements:

    a. A smooth base constructed from insitu materials the level of which is above the winter groundwater level.

b. A geosynthetic clay liner (GCL) a minimum of 5 mm thick, with a coefficient of permeability not exceeding 3 x 10(-11)m/s. The Permit Holder shall supply documentation from the manufacturer demonstrating quality control procedures ensuring that 95% of the GCL meets the coefficient of permeability standard required.

c. A synthetic flexible membrane (high density polyethylene, HDPE with a minimum thickness of 1.5 mm, or polypropylene, PP with a minimum thickness of 1.0 mm).

d. A protective layer of sand 100 mm thick on the base overlain by a 300 mm thick gravel drainage layer, and on the sides a protective layer of sand 300 mm thick that will be placed progressively as the landfill rises.

e. Provision for the collection of leachate from the liner and reticulating to a treatment system outside the landfill area.

f. An alternative to any of the above as agreed from time to time, in writing, between the Permit Holder and the consent authority.

29. Nine months prior to placement of refuse on the lined landfill, the Permit Holder shall present a Management Plan to the Regional Council including the same items as those described in Condition 14 (a) to (m).

30. If any ancient human remains or artefacts are discovered during any earthworks activity associated with the construction and maintenance of the landfill, then works shall cease, and the Consent Holder shall immediately inform the Manager Resource Use of the Regional Council and relevant iwi. Further work in the vicinity of the find shall be suspended while relevant iwi carry out their procedures for the removal of taonga. The Manager Resource Use of the Regional Council will inform the Consent Holder when work can recommence in the vicinity of the find.

31. The Regional Council shall initiate a publically notified review of Conditions 2, 8, 14, 28, 29, 32, 33 and 34 of this permit in April 2015, 2020, 2025, 2030 and 2035 unless the Neighbourhood Liaison Group (NLG) agrees that a review is unnecessary. The reviews shall be for the purpose of:

a. Assessing the adequacy of the management plan outlined in Conditions 14 and 29 of this consent; and/or

b. Assessing the effectiveness of Conditions 2, 8 and 28 of this consent.

c. Assessing the effectiveness of the NLG outlined in Conditions 32, 33 and 34.

In avoiding, remedying or mitigating adverse effects on the environment surrounding the Levin Landfill, the review of conditions shall allow for:

d. Modification of the management plan outlined in Conditions 14 and 29 of this consent;

e. Deletion or changes to Conditions 2, 8 and 28 of this consent;

f. Deletion or changes to Conditions 32, 33, and 34; and

g. Addition of new conditions as necessary.

h. An alternative to any of the above as agreed from time to time, in writing, between the Permit Holder and the consent authority.

To avoid, remedy or mitigate adverse effects on the environment surrounding the Levin Landfill.

Specific Conditions – Neighbourhood Liaison Group (hereinafter "NLG")

32. The Permit Holder shall establish a NLG. The following shall be eligible to be members:

    a. Representation from Lake Horowhenua Trustees and Ngati Pareraukawa;

    b. The owners and occupiers of those properties adjoining the Levin Landfill property described as A through to N on Drawing 2181 attached;

    c. Other parties who are invited from time to time, as agreed by the Permit Holder and the NLG, including but not limited to the original submitters; and

    d. A representative from each of the Horowhenua District and the Regional Council, being consent authorities.

33. The Permit Holder shall:

    a. Convene one meeting one month after the commencement of the consents;

    b. Thereafter at intervals of six months for the first 18 months after the date of exercising the consent; and

    c. Thereafter at intervals of no more than 12 months unless 80% of the people attending a meeting agree that changes to the intervals are acceptable.

34. The Permit Holder Shall:

    a. Supply notes of each meeting to the Group Members;

    b. Forward an annual report to members and to the Regional Council and the District Council;

    c. Forward any other information to the Group Members, in accordance with the conditions of the consents; and

    d. The Permit Holder shall ensure the NLG members are:

        i. Able to advise the Permit Holder of potential members of the NLG.

        ii. Given the opportunity to inspect the operations on site on the occasion of NLG meetings, and/or on such other occasions as are agreed by the Permit Holder. The Permit Holder shall not unreasonably withhold such agreement. The Permit Holder shall grant the NLG members access to the landfill property, during working hours, subject to relevant health and safety regulations and the Management Plan.

        iii. Consulted by the Permit Holder as a group prior to any review of the resource consents or any change of conditions pursuant to Section 127 of the Resource Management Act 1991 (and/or any consequential amendments).

        iv. Provided by the Permit Holder with a copy of all monitoring reports and other documentation relating to the non-commercially sensitive, environmental operation of the landfill, at the same time as such reports are provided to the Regional Council in accordance with the resource consents.

        v. Able to raise with the Permit Holder, as necessary, any matter which the NLG member believes the Permit Holder should address in order to meet the conditions of the consent(s).

vi. Formally acknowledged and considered by the Permit Holder with respect to NLG member's written suggestions to the Permit Holder on possible improvements to, or concerns about, the landfilling operations.

vii. Kept informed by the Permit Holder as to whether or not progress is being made towards a regional landfill.

Charges

35. Charges, set in accordance with Section 36(1)c of the Resource Management Act 1991, and Section 690 A of the Local Government Act 1974, shall be paid to the Regional Council for the carrying out of its functions in relation to the administration, monitoring and supervision of this resource consent and for the carrying out of its functions under Section 35 (duty to gather information, monitor, and keep records) of the Act.

[**Note**: Section 36(1)c of the Act provides that Council may from time to time fix charges payable by holders of resource consents. The procedure for setting administrative charges is governed by Section 36(2) of the Act and is currently carried out as part of the formulation of the Council's Annual Plan.]

Determination – Water Permit 6012

Consent is granted to the Horowhenua District Council to divert stormwater from around the Levin landfill, Hokio Road, Levin, legally described as Lot 3 DP 40743 Blk ll Waitohu Survey District, for a term expiring 35 years from the commencement of the consent subject to the following conditions:

1. Charges, set in accordance with Section 36(1)c of the Resource Management Act 1991, and Section 690 A of the Local Government Act 1974, shall be paid to the Regional Council for the carrying out of its functions in relation to the administration, monitoring and supervision of this resource consent and for the carrying out of its functions under Section 35 (duty to gather information, monitor, and keep records) of the Act.

   [**Note**: Section 36(1)c of the Act provides that Council may from time to time fix charges payable by holders of resource consents. The procedure for setting administrative charges is governed by Section 36(2) of the Act and is currently carried out as part of the formulation of the Council's Annual Plan.]

2. Stormwater run-off contaminated by leachate to an extent that it may cause adverse environmental effects shall be regarded as leachate.

3. Stormwater falling on the operational cells of any lined landfill area shall be regarded as leachate.

4. The Permit Holder shall carry out such stormwater or sediment control measures as are necessary to ensure that sediment is not carried and deposited beyond the boundaries of the site.

5. The Permit Holder shall ensure that:

   a. Stormwater drains within the site are maintained to ensure that the flow of stormwater around the landfill is unrestricted and the potential for stormwater contamination is reduced;

   b. Stormwater diversion systems, including all drains and ponds, are kept clear of refuse; and

   c. Any sediment ponds are regularly cleaned to ensure effective settling out of suspended solids.

Determination – Discharge Permit 6011

Consent is granted to the Horowhenua District Council to discharge landfill gas, odour and dust to air at the Levin landfill, Hokio Road, Levin, legally described as Lot 3 DP 40743 Blk II Waitohu Survey District, for a term expiring 35 years from the commencement of the consent subject to the following conditions:

1. Charges, set in accordance with Section 36(1)c of the Resource Management Act 1991, and Section 690 A of the Local Government Act 1974, shall be paid to the Regional Council for the carrying out of its functions in relation to the administration, monitoring and supervision of this resource consent and for the carrying out of its functions under Section 35 (duty to gather information, monitor, and keep records) of the Act.

   [**Note**: Section 36(1)c of the Act provides that Council may from time to time fix charges payable by holders of resource consents. The procedures for setting administrative charges are governed by Section 36(2) of the Act and is currently carried out as part of the formulation of the Council's Annual Plan.]

Environmental Effects

2. The Permit Holder will ensure dust is controlled on access roads and on the landfill, if necessary, by watering or other methods.

3. There shall be no discharge of odour or dust from the landfill that in the opinion of a Regional Council Enforcement Officers is noxious, dangerous, offensive, or objectionable beyond the property boundary. The permit holder will also ensure that:

   a. On-site and off-site Health and Safety Effects of landfill gas being emitted by the old landfill should be quantified by sampling groundwater monitoring wells for evidence of landfill gas when groundwater samples are taken from the wells. As a minimum, the gases tested for are to include methane, carbon dioxide and oxygen; and

   b. Any building on the landfill site is adequately ventilated.

4. There shall be no deliberate burning of waste or other material at the landfill. If fires occur at the landfill they shall be extinguished as quickly as possible.

5. The Permit Holder shall take all practicable steps to avoid, remedy or mitigate significant adverse effects of the discharge of landfill gases to air.

Monitoring and Reporting

6a. The Permit Holder shall keep a record of any complaints received. The complaints record shall include the following, where possible:

   a. Names and addresses of complainant;

   b. Nature of complaint;

   c. Date and time of the complaint and alleged event;

   d. Weather conditions at the time of the event; and

   e. Any action taken in response to the complaint.

The record shall be made available to the Regional Council on request.

The Permit Holder shall also keep a record of landfill gas monitoring results including:

a. Date and time of sampling;

b. The concentrations of gasses detected.

c. Weather conditions at the time of sampling.

The monitoring results shall be made available to the Regional Council on a quarterly basis.

7. The Regional Council shall initiate a publically notified review of Conditions 3 and 6 of this permit in April 2015, 2020, 2025, 2030 and 2035, unless the Neighbourhood Liaison Group (NLG) agrees that a review is unnecessary. The reviews shall be for the purpose of:

a. Assessing the effectiveness of Conditions 3 and 6 of this consent,

in avoiding, remedying or mitigating adverse effects on the environment surrounding the Levin Landfill.

The review of conditions shall allow for the:

b. changes to Conditions 3 and 6 of this consent; and

c. addition of new conditions as necessary;

to avoid, remedy or mitigate adverse effects on the environment surrounding the Levin Landfill.

Determination – Discharge Permit 7289

Consent is granted to the Horowhenua District Council to discharge liquid waste onto and into land at the Levin landfill, Hokio Road, Levin, legally described as Lot 3 DP 40743 Blk ll Waitohu Survey District, for a term expiring 35 years from the commencement of the consent subject to the following conditions:

1. Charges, set in accordance with Section 36(1)c of the Resource Management Act 1991, and Section 690 A of the Local Government Act 1974, shall be paid to the Regional Council for the carrying out of its functions in relation to the administration, monitoring and supervision of this resource consent and for the carrying out of its functions under Section 35 (duty to gather information, monitor, and keep records) of the Act.

   [**Note**: Section 36(1)c of the Act provides that Council may from time to time fix charges payable by holders of resource consents. The procedure for setting administrative charges is governed by Section 36(2) of the Act and is currently carried out as part of the formulation of the Council's Annual Plan.]

2. Liquid wastes shall only be placed at the Levin Landfill as a contingency to normal disposal.

3. For the purposes of this Permit, contingency conditions are circumstances where liquid waste is unable to be treated and disposed of at its regular location, for reasons of either, unforeseen events, breakdown or temporary closure for maintenance purposes.

4. Liquid wastes are defined as the following:

   a. Septic tank waste ("septage");

   b. Grease trap waste;

   c. Sewage; and

   d. Any material that contains free liquids.

   The presence of free liquids may be determined by either of the following methods, whichever is most practicable at the time:

   i. The "Paint Filter Test"; or

   ii. Material which may be located, transported and deposited at the landfill without the risk of free liquid seeping from the material, and without the risk of having the deposited material flow under gravity down any slope on the landfill shall be deemed to not contain free liquids.

5. The Permit Holder shall notify the Regional Council's Manager Resource Use and the Neighbourhood Liaison Group as soon as practicably possible after receiving notification of the intention to dispose of waste at the landfill under the terms of this consent, or as soon as practicable following urgent disposal in accordance with Condition 3.

   The Permit Holder shall detail the reason for the discharge, volume of discharge and timing of the discharge.

   Each nominated member of the Neighbourhood Liaison Group shall be notified in writing by post.

6. The maximum annual volume of liquid waste discharged shall not exceed 150 cubic metres ($150m^3$) in any calendar year. (Calendar year is defined as being over any 12 month or 365 day period.)

7. Subject to Condition 6, the volume of liquid waste discharge shall not exceed 75 cubic metres ($75m^3$) during any seven day period.

8. Subject to Condition 6 and 7 the maximum daily volume of waste discharged shall not exceed 20 cubic metres ($20m^3$).

9. The liquid material shall be placed in trenches which are no more than 2m wide, 1.5m deep and 5m long which are excavated in compacted refuse which is at least six months old and located within a lined landfill area.

10. .Only one trench shall be open at any one time.

11. Trenches shall be at least 10 metres from any landfill batter slope.

12. The open trench shall be open for no longer than two weeks.

13. Trenches shall be filled with liquid wastes to a depth of not less than 1m below the prior refuse surface level and reinstated with appropriate compaction with previously removed refuse and cover.

14. The location of placement and cumulative volume will be identified on a site plan which shall be made available to the Regional Council upon request.

15. The location and placement shall be appropriately signed and fenced.

16. The Permit Holder will ensure odours, vermin and flies are not generated from or do not accumulate in open trenches.

17. The Permit Holder shall maintain records of:

    a. The type of liquid waste received;

    b. The volume of liquid waste received;

    c. The source of liquid waste; and

    d. The location in the landfill in which the material was placed.

18. In addition to the material that is accepted on the basis set out above, the consent holder may dispose of site-generated sludges that contain free liquids from cess-pits, leachate ponds or other site activities to facilitate site operation, provided this does not adversely effect landfill stability or face operations. The disposal of such materials is not to be included within the quantity restrictions as set out in Conditions 6, 7 and 8 of this permit.

19. The Regional Council shall initiate a publically notified review of Conditions 5, 9, 12 and 17 of this permit in April 2015, 2020, 2025, 2030 and 2035, unless the Neighbourhood Liaison Group (NLG) agrees that a review is unnecessary The reviews shall be for the purpose of:

    a. Assessing the adequacy of the monitoring conditions outlined in Conditions 5 and 17; and

    b. Assessing the effectiveness of Conditions 9 and 12 of this consent,

    in avoiding, remedying or mitigating adverse effects on the environment surrounding the Levin Landfill.

    The review of conditions shall allow for the:

    c. Modification of monitoring outlined in Conditions 5 and 17;

d. Changes to Conditions 9 and 12 of this consent; and

e. Addition of new conditions if necessary,

to avoid, remedy or mitigate adverse effects on the environment surrounding the Levin Landfill.

Decision – Discharge Permit 102259

The Team Leader Consents of the Manawatu-Wanganui Regional Council (trading a horizons.mw) has considered this non-notified application. On 15 May 2002 the Team Leader pursuant to delegated authority under Section 34 of the Resource Management Act, grants Discharge Permit 102259 pursuant to Section 105 of the Act, to Horowhenua District Council to discharge stormwater to land and potentially to groundwater via ground soakage from the Levin landfill, Hokio Beach Road, Levin, subject to the following conditions.

1. This Permit shall be for a term of 35 years from the date of commencement of Levin Landfill Consents 6009 – 6011 and 7289.

2. Pursuant to Section 125(1) of the Resource Management Act 1991, this Permit shall not lapse within its duration of 35 years.

3. The activities authorised by this Permit shall be restricted to the discharge of stormwater to land via ground soakage originating from the existing fill site or any part of the new lined landfill that has had, or is intended to have, refuse placed beneath or upon it, as shown on Plan C102259 attached to and forming part of this Discharge Permit.

4. All works and structures relating to this Discharge Permit shall be designed and constructed to conform to best engineering practices and shall at all times be maintained to a safe and serviceable standard.

5. The Permit Holder shall ensure that the stormwater system, including all drains and ponds, is kept clear of refuse at all times.

6. The Permit Holder shall ensure the stormwater soakage ponds are inspected regularly and maintained to optimise their performance at all times. This shall include de-sludging or remediating the ponds as required.

7. There shall be no ponding in the stormwater soakage areas 12 hours after the last rain event.

8. There shall be no runoff or existing discharge of stormwater beyond the property boundary that has originated on any landfill area or new lined landfill area that has had, or is intended to have, refuse placed on it.

Management – Existing Landfill

9. As far as practically possible, the Permit Holder shall ensure that all stormwater from the existing landfill area is directed to a centralised soakage area to the south of the existing fill, as shown on Plan C 102259.

Management – New Landfill

10. Where it is practical and economical to do so, the Permit Holder shall ensure that within the operational landfill cell the minimum amount of stormwater shall be allowed to come into contact with refuse. This shall be effected by constructing impermeable barriers, diversion drains or bunds on the side slopes and within the base of the landfill.

11. There shall be no contamination of stormwater with leachate. Leachate includes any stormwater within an operational cell that is not separated from refuse by a barrier as defined in Condition 10.

12. The Permit Holder shall ensure that a suitable stormwater soakage area is available for a given design storm and the area of the operational cell from which the stormwater is collected.

13. Areas designated for stormwater discharge to land and their catchment and reticulation system shall be identified and located on site plans and their dimensions submitted for approval by horizons.mw's Team Leader Compliance prior to their use.

Monitoring

14. The Permit Holder shall monitor groundwater quality in at least one upgradient and one downgradient bore of the existing landfill stormwater soakage area, and at least one upgradient and two downgradient bores of the new landfill area. The location and number of bores is to be determined in consultation with horizons.mw's Team Leader Compliance. Groundwater samples shall be taken quarterly in January, April, July and October for the term of this Discharge Permit, beginning in October 2002, and analysed for the following parameters:

    - PH
    - Conductivity
    - Ammonia-N
    - Nitrate-N
    - Sodium
    - Boron
    - Chloride
    - Iron

15. Monitoring bores required in condition 14 of this Discharge Permit can be incorporated into the monitoring programme of other Levin Landfill Consents (6009-6011 and 7289), providing the information sought is obtained at the frequency specified and reported as required for this Permit.

16. The results of monitoring under Condition 14 of this permit shall be reported to Horizon Manawatu's Team Leader Compliance by 31 August each year for the duration of this Permit beginning 31 August 2003. The annual report shall be supplemented by the raw water quality analysis data being forwarded to the Regional Council as soon as practically possible following the receipt of laboratory analysis certificates.

17. If a laboratory is used for water quality analyses which does not have independent accreditation for the parameters measured, then on each sampling occasion duplicate samples from at least one sampling location shall be analysed by a laboratory with independent accreditation for the parameters measured. Continued analysis by the unaccredited laboratory shall be at the discretion of horizons.mw.

18. Should any groundwater and surface water parameters tested for under Condition 14 of this consent exceed the Australian and New Zealand Environment and Conservation Council Water Quality Guidelines (2000) for Livestock Watering, the Permit Holder shall report to horizons.mw's Team Leader Compliance as soon as practicable on the significance of the result, and where the change can be attributed to the landfill operation, consult with horizons.mw's Team Leader Compliance to determine if further investigation or remedial measures are required.

19. The Regional Council shall initiate a publically notified review of all conditions of this Permit in April 2015, 2020, 2025, 2030 and 2035, unless the Neighbourhood LiaisonGroup (NLG) agrees that a review is unnecessary.

    The reviews shall be for the purpose of:

    i. reviewing the effectiveness of these conditions in avoiding or mitigating any adverse effects on the environment; and/or
    ii. reviewing the adequacy of the monitoring programme required by this discharge permit.

The review of conditions shall allow for:

i. the deletion or amendment to any conditions of this permit; and
ii. the amendment or addition of new conditions as necessary to avoid, remedy or mitigate any adverse effects on the environment

If necessary and appropriate, the review provided for under this condition shall require the Permit Holder to adopt the best practicable options to avoid, remedy or mitigate any significant adverse effects on the environment.

20. Charges, set in accordance with Section 36(1)c of the Resource Management Act 1991, and Section 690 A of the Local Government Act 1974, shall be paid to horizons.mw for the carrying out of its functions in relation to the administration, monitoring and supervision of this resource consent and for the carrying out of its functions under Section 35 (duty to gather information, monitor, and keep records) of the Act.

[Note: Section 36(1)c of the Act provides that horizons.mw may from time to time fix charges payable by holders of resource consents. The procedure for setting administrative charges is governed by Section 36(2) of the Act and is currently carried out as part of the formulation of horizons.mw's Annual Plan.]

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