

LEVIN LANDFILL - OPERATIONAL AND ENVIRONMENTAL IMPACT REVIEW

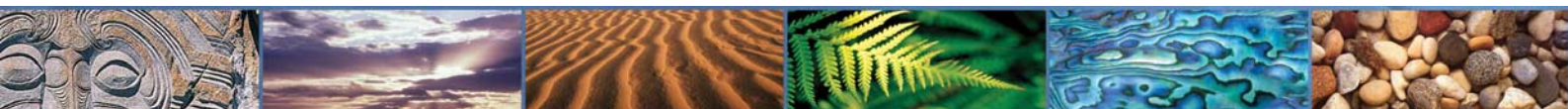
1 Introduction

As requested by the Parliamentary Commissioner for the Environment (PCE), Tonkin & Taylor Ltd (T&T) has reviewed key aspects of the operation and management of the Levin Landfill, located at Hokio Beach Rd, Levin. As set out in the brief dated 30 November 2007, the broad objectives of the review are to:

- assess the adequacy of current structures and processes for managing the landfill;
- assess the adequacy of compliance monitoring and overview;
- assess the extent, or likely extent, of the landfill's effects on the environment; and
- recommend any changes needed to the management, monitoring, or technical aspects of the landfill to ensure the facility is operated, and environmental effects managed in line with expected practice.

The review comprised:

- examination of the PCE's extensive file records and background data on the landfill (this includes information under the following principal headings):
 - correspondence with Horowhenua District Council (HDC), Horizons Regional Council (HRC) and PCE internal file notes
 - issues raised by local residents and iwi groups
 - Landfill Management Plan
 - site operations contract Specification
 - monitoring reports
 - HRC compliance reports and related file records



- documentation, including written evidence, s92 information and the Environment Court decision related to the 1995 resource consent application (confirmed by the Environment Court in June 2002)
- the 6 December 2007 letter from HRC to PCE clarifying the proposed approach to consent matters, as now proposed.
- an inspection of the site on 17 December 2007 accompanied by Ms D. Moran and Mr Kerehi Wiwarena.

2 Background and Context

The Levin Landfill at Hokio Road has operated since the mid 1970s. The total amount of waste accepted at the site to date is unknown, with the historic disposal rate in Area A estimated at approximately 8,000 – 10,000 t/yr, based on available data. The total waste quantity on the site in Area A is therefore likely to be of the order of 250,000 tonnes, occupying a gross compacted and settled volume in Area A (including cover) of some 300,000m³. This equates to an average waste depth over the footprint of 7 to 10m. We understand that public access to the site ceased in around 2003, and the site is now open only to licensed operators using bulk haul vehicles. Area B has been open since 2005 and the total volume of waste and cover in place to date is estimated to be of the order of 35,000m³.

The total waste volume and annual tonnage would place the landfill into the category of a small site by NZ standards. The site is similar to a number of sites established and operated over the 1970s to 1990s, by other small local authorities around the country.

The site is effectively in two parts, all located within a sequence of coastal dune deposits with both shallow (unconfined) and deeper (partially confined) groundwater systems.

The original un-lined landfill cell Area A is located in the northern part of the site, and covers an area of some 4.25 ha. The new “lined” area of landfill is referred to as Area B. Stage 1 of Area B is currently being filled and is located in the central southern part of the site, bordering the adjacent property some 80 m to the south.

The two areas of the site (old and new) will be discussed separately in this report.

The old site appears to have been developed and operated to what were, by and large, the standards of the day – standards prevalent around the country at the time. For smaller, isolated sites, such as Levin (and there are many examples of similar sites around the country), this often meant:

- no principal environmental controls on discharges to surface and ground water (such as a landfill liner);
- poor operational practices (with little attention to applying cover, or controlling birds and vermin) and occasional landfill fires;
- relatively little regulatory control; and
- minimum capital and operating budget spending.

From the available records and complaints history, most of these general traits appear to have been evident in the operation at Hokio Road in the early years. Neighbours are, in general, reasonably distant from the site (buffer distance available to the north of Area A for example was generally > 400 m). However, the reportedly poor standard of the early

operation did lead to a history of complaints and concerns by neighbours in relation to potential groundwater contamination, surface water impacts, vermin, birds and other impacts such as traffic and litter.

These issues were traversed as part of the resource consent process for the site that began in 1994, following the introduction of the Resource Management Act in 1991. After what appears to have been a very protracted consent process for such a small landfill (at that stage the site should more properly be referred to as a controlled dumpsite), a suite of consents and related consent conditions was confirmed by the Environment Court in May 2002.

It is difficult to make anything other than comparative comment on the historical performance of a small waste disposal site such as this. This is because without Consents being in place the much needed controls that resource consent conditions are designed to provide, were simply not in effect.

Thus, to a large extent, what transpired up until at least 1994 is largely historic and while operations may have been of a low standard that would not have been atypical for a New Zealand landfill (tip) at the time. Historically, the standard of construction and operation of many of the smaller un-lined, uncontrolled tip sites around New Zealand was low, with this situation persisting well into the 1990s. For example, the closure of as many as fifty similar un-lined sites throughout the Canterbury region did not finally occur until around 2002 when the Kate Valley regional landfill was constructed.

This review takes into account that the design, operational and compliance record of the site was likely quite poor in the early days (up until the mid-1990s). The key questions this report addresses are:

1. Are the current structures and processes for managing the landfill adequate?
2. How has the site performed since consents were granted in 2002, and are the compliance record, related processes and compliance management now satisfactory?
3. Has the old area of the site been satisfactorily closed and are there any residual issues related to groundwater, site monitoring, or closure works that need to be addressed?
4. Does the design, operation, monitoring and related compliance reporting of the new site comply with the consent conditions, and does the overall operational standard align with current industry and regulatory expectations?
5. What are the key issues that need to be addressed in the review of Consent Conditions, recently initiated by HRC?

3 Are the current structures and processes for managing the landfill adequate?

This part of the review relates to the period after consents were granted in 2002 and hence, in the main, the current filling in Stage 1 of Area B.

Site development planning is managed by HDC works staff, with design carried out by HDC's consultants. We understand HDC has recently appointed a Solid Waste Manager to give the landfill operation more specific attention within the ambit of the HDC works and services department. This is considered a positive step.

The day-to-day operation and management of the landfill are subcontracted to Fulton Hogan Ltd. Compliance monitoring and reporting is the responsibility of the Consent holder, HDC. Compliance assurance and enforcement is the responsibility of HRC.

Such a structure is usual throughout New Zealand, noting:

- subcontracting landfill operations can sometimes lead to performance issues if the operations contract is not tightly drafted, is poorly administered, or if insufficient financial resources are made available for the contractor to do an adequate job
- monitoring and related reporting requires careful management, which the Consent holder now appears to be managing with assistance from its consultants
- the effectiveness of inspections and compliance usually comes down to the level of experience, availability of and follow-up by Regional Council staff, together with the responsiveness of the consent holder and its staff. Historically, this function has been implemented with considerable variability in relation to landfills around the country.

In summary, the monitoring and reporting requirements that apply to the site are generally in line with requirements at other landfill sites around New Zealand. These will be adequate as long as they are effectively resourced and implemented by both the consent holder and the regulator. There is recent documentation on file suggesting that additional resourcing is to be applied by both parties to overcome a number of historic shortcomings evident from the file record over the period 2002 to 2007.

It is clear from what has transpired to date, that the process would have benefited from the input of an independent peer review panel. Such a procedure is routinely included in consent conditions for landfill sites where the Regional Council may not have staff with either specific landfill experience, or sufficient available resource, and therefore needs independent technical input in relation to design, operations and monitoring. For small landfill sites this is sometimes one independent expert, experienced in landfill design, construction and monitoring, that can assist both consent holder and regulator to achieve the outcomes targeted in the consent conditions.

In this case the record of ongoing back and forth correspondence between the parties suggests the process of administering the consents has been problematic at times, and the input of an independent peer reviewer would likely have seen matters dealt with more effectively (noting that appointment of an independent Peer Review panel was not a consent requirement in this case). Requiring the input of a peer reviewer in the future would, we consider, be a positive step in relation to the HDC site.

Ultimately, it is the consent holder's responsibility to ensure compliance with consent conditions and the recent appointment of a council officer with full responsibility for the site's management will assist in this regard. The consent holder must ensure that any subcontracted processes are effective and are well resourced, and must have sufficient technical review and management controls in place to ensure consent conditions are met without instances of non-compliance.

HRC in turn needs to implement effective processes that ensure these outcomes are routinely achieved and that the requirements of the conditions are fairly assessed and problem areas are dealt with appropriately. In addition to any peer review processes undertaken by the Consent Holder, this could include HRC implementing an internal peer review or overview process of its own to ensure compliance is being routinely achieved.

4 How has the site performed since consents were granted in 2002, and are the compliance record, related processes and compliance management now satisfactory?

The consent conditions contain a number of specific monitoring, reporting and information deadlines. As part of the review process recently initiated by HRC, we expect that HRC staff will be preparing a detailed report on the site's compliance history. HRC's records would need to be reviewed in detail to confirm the extent to which the requirements of the General and Special Conditions of consent have been met since being granted in June 2002.

However, it is clear from the file that there have been a number of non-compliances of varying sorts over the period since May 2002. These relate to instances such as late delivery of reports, failure to manage leachate on site, slow implementation of requirements for site closure and capping and failure to monitor for VOCs. The file features a history of correspondence between the parties related to delays in implementation or failure to meet reporting deadlines, and failure by the Consent Holder to meet other aspects of the consent conditions.

The file information suggests that to date, the management processes adopted by HRC staff have taken some time to gain effect in enforcing the requirements of the conditions. An infringement notice was issued in September 2005 for failure to submit VOC samples for the second year in a row, and an abatement notice was issued in 2006 for failure to hold a required Neighbourhood liaison Group meeting.

We reiterate that it is the Consent Holder's responsibility to ensure consent conditions are met, irrespective of whether or not the outcome of non-compliance might be considered by the Consent Holder to be of minor significance. The consent conditions were set by the Environment Court to give all parties, including neighbours and the general public, confidence that standards and processes at the site are routinely of a good standard and that the risk of adverse effects is minimised.

5 Has the old area of the site been satisfactorily closed and are there any residual issues related to groundwater, site monitoring, or closure works that need to be addressed?

The old landfill area (Area A) was required under the consents to be finally closed and capping completed by 24 November 2004. The compliance record shows that capping was not completed until some time after February 2005. Inspection shows the capped area to be relatively tidy, with the cap surface in most places appearing relatively tight with a surfacing of competent material. It is understood that the cap thickness is typically of the order of 1m, as required by the consent conditions. Apart from some bare areas the cap is now covered in a mix of grass and weed species, and pines have been established in some areas.

The side slopes show evidence of bare areas where runoff is concentrated and also areas of settlement-induced cracking. There was no surface evidence of landfill gas emissions of significance on the day of the site visit.

The consent conditions in relation to the cap are loose and in part ambiguous (e.g., the slope requirement). The surface of the closed landfill is slightly sloped, but is essentially a "flat deck" landfill surface. This has resulted in low settled areas that appear to pond water during rain, with much of this ponded water likely to enter the landfill as seepage and form leachate. This and other issues relating to the capping of Area A were commented on in a review undertaken for HRC by Golder Associates in November 2007. As noted by Golder,

the consent holder is monitoring and reporting on the ongoing effects of discharge from the closed landfill area. If trigger levels are exceeded in the early warning monitoring bores it is likely that remedial action will ensue. So far this has not been necessary.

Many old style disposal sites such as Area A at Hokio Rd were filled relatively slowly, under what were often semi-aerobic conditions (little cover placed) and with much of the waste being readily degradable organic material. As a result the common impacts on shallow groundwater at such sites are elevated levels of organic nitrogen (typically present in shallow groundwater as ammonia and nitrate/nitrite); together with increased levels of compounds such as chloride, sulphate, boron, and metal species such as iron and manganese. Depending on groundwater, soil and redox conditions below a site, often effects are relatively localised. When coupled with what is often poor quality shallow groundwater, the impacts of such historic sites, while evident, are often not significant enough to warrant major remedial actions following site closure.

Effects on surface water have not been recorded to date at the surface water monitoring sites. However, monitoring results show clear evidence of increasing impacts on groundwater quality at down gradient wells. Key leachate indicators show steady increases, in some cases to relatively high levels, in some down gradient wells (ammonia in B2, COD in B2 and B3, sodium and chloride in all wells except C1 and E2s). However, the information reviewed as presented in the monitoring reports and as able to be assessed from available file records, is insufficient to evaluate the significance of these impacts in terms of effects on the surrounding environment, including the potential for effects on surface water as a result of the high ammonia levels in particular, but also other contaminants recorded in the shallow groundwater monitoring wells. The locations of wells, surface water features and surface water monitoring sites, together with groundwater levels and flow direction could not be confirmed from the data provided for this review, and in some cases do not appear to have been measured. While levels of most toxicants appear to be relatively low, the high levels of ammonia in particular are of concern and could indicate some potential for future 'breakthrough' of other toxicants.

Overall we conclude that a thorough review of the significance of these monitoring results, and of the adequacy of the monitoring programme, would be appropriate. This comment was also made by Golder in its August 2005 report. The review would need to have available to it, more detailed information regarding the locations of wells, surface water features and surface sampling locations, and factual (rather than inferred) groundwater information. This exercise should clearly be a key consideration in the current review of consent conditions.

Following closure it is difficult to fully mitigate the effects on shallow groundwater of an unlined tip site located over a shallow unconfined groundwater system. There are many such historic sites around New Zealand and following the introduction of the RMA, the accepted practice has tended to be to grant discharge permits for these "attenuate and disperse" sites (as they were termed) to consent the ongoing discharges to groundwater and to allow the sites time to slowly stabilise. Consent conditions typically require regular monitoring of groundwater impacts, and significant remedial action usually only takes place if there is evidence that groundwater aquifers, local users of groundwater, or surface water systems are being detrimentally impacted, or there is evidence of a significant risk of latent or potential effects.

In this particular case there is no current evidence that direct intervention or mitigation is necessary in relation to Area A, or the local shallow groundwater system. However, we agree with the Golder review comments that a precautionary approach should be taken to monitoring and aftercare at this site. One reason for this is that the historic controls on waste acceptance at the site, even as set out in the consents confirmed in 2002, are very loose by today's standards. It is known that the site accepted sewage sludges and it is quite likely that some hazardous wastes may have been co-disposed within the waste mass. No records of such disposals are likely to exist for Area A. Hence a prudent approach to site management would be based on:

- continuing with a comprehensive groundwater and surface water monitoring programme that will alert the need for more extensive environmental control measures or other discharge control steps, should evidence of more serious contamination occur in the future, with this monitoring programme to be improved as necessary
- ensuring the landfill cap is effective in preventing water ingress. We believe that some of the current practices are inappropriate and some relatively simple cap and drainage improvements would be of significant benefit in mitigating the potential for effects. These improvements include:
 - removing the pine trees (which are likely to be detrimental over the long term)
 - adding additional cover soil to mound the central cap area, eliminate surface depressions, ponding and infiltration, and promote runoff
 - implementing a programme of regular cap compaction to control cracking of the cap on the side slopes
 - improving the surface drainage system and constructing cap drains to avoid concentrated areas of runoff, with associated surface erosion and ingress of surface water into the waste mass.

It is our understanding that cap improvement options such as described above, together with the adequacy of the current monitoring regime will be discussed as part of the upcoming consent review. This will likely include review of "phytocap" cover discussions. While a phytocap approach is a technical possibility, it does not appear to us to be appropriate for this site. Further discussion on issues around phytocap covers is, however, beyond the terms of this current brief.

It remains to be seen whether monitoring ultimately indicates that remedial action is necessary in relation to groundwater. At this stage remedial action is not warranted in terms of the consent conditions. While impacts on local groundwater are very much evident, the resource is not utilised and is of poor quality. However, as noted above, the unknowns around what wastes have actually been disposed of at the site, mean that at the very least a comprehensive, technically robust programme of ongoing tiered monitoring, together with some limited improvements to the landfill cap, are warranted.

6 Does the design, operation, monitoring and related compliance reporting of the new site (Area B) comply with the consent conditions, and does the overall operational standard align with current industry and regulatory expectations?

A modern landfill operation has been the targeted objective for Area B, as described in the consent application and related Environment Court appeal documentation. Given the lack of locally available clay, a geocomposite liner has been adopted, using a GCL as the clay barrier component as required by Condition 27.

Other design and operational consent conditions for the Area B lined landfill development appear to be generally being met.

The design for Area B represents a major improvement over Area A. However, several aspects of the consents related to waste acceptance criteria, design and related reviews are somewhat more “open” than conditions now generally being applied by the Environment Court or recommended in the MfE publication “Guide to Landfill Consent Conditions, May 2001”. We suggest that HRC or the Consent Holder give consideration to the following design and consent issues during the upcoming review of consent conditions:

- the appropriateness of the waste acceptance criteria: hazardous waste is now generally not permitted to be disposed (or co-disposed) at municipal solid waste sites in New Zealand, even the most secure sites
- the adequacy of a GCL alone without a further clayey bedding/attenuation layer beneath it
- the performance of the GCL within the exposed, un-ballasted liner areas (for example Stage 2 as recently constructed) : this relates to the potential for both hydration and shrinkage/necking of the GCL panels given that the deployed liner is likely to remain exposed and the GCL un-ballasted for some time; and related issues of GCL performance on subsequent loading
- the lack of a consent condition limiting leachate head on the liner: 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
- design review processes.

In relation to the operations in Area B, we made the following points and observations on the day of inspection:

- the amount of exposed refuse was excessive overall, not helped by the need to use sandy cover soil which tends to be lost into the voids in the waste. Options for improved cover to the waste do, however, exist and should be looked at. These include use of tarpaulins or sprayed synthetic daily cover materials, as well as topping up of sandy cover materials where used in intermediate cover areas
- bird numbers were excessive given the size of the site and the waste tonnage being received
- the amount of wind-blown litter was excessive: both operational practices and related consent conditions need to be improved in this regard

- the leachate pond and related piping should be regularly monitored for their adequacy as a containment system. This is because all leachate is now pumped to a storage lagoon for either removal offsite, or possible recirculation.

Based on the file information we consider that the leachate management approach now being proposed is appropriate. This approach no longer involves direct spray irrigation of leachate, and partial leachate recirculation is to be implemented, with offsite disposal to an approved wastewater treatment facility of the nett excess leachate generated by the facility.

The progressive nature of landfill development and the review processes built into the conditions mean that this and other aspects of the facility's development and operation can be reassessed periodically and amended as necessary. The operation of Area B represents a marked improvement over historic practices at the site, but there is still room for operational improvements to bring the design and operational standards fully into line with accepted practice at other New Zealand landfill sites.

7 What are the key issues that need to be addressed in the review of Consent Conditions, recently initiated by HRC?

There has been a significant improvement in design and operational standards at the site since the granting of consents in 2002. However, a number of aspects of non-compliance with consent conditions are evident from the file, as are failings in the process aspects of site management by both the consent holder and HRC. Ultimately it is the Consent Holder's obligation to meet the conditions of consent and we understand improved management processes are now being implemented by HDC to achieve this.

When HRC considers the review of consent conditions, it will no doubt take the performance of the site to date into account, together with the rather uncertain, but significant trends for ongoing effects shown by the results of monitoring of the impacts of the facility on surface and ground water over the intervening period.

HRC also has the ability under the conditions to, inter alia:

"add....new conditions as necessary"

to deal with issues that may have become evident only since consents were granted.

The extent to which changes to conditions, or the addition of new conditions are required, will depend on the full review of the landfill's compliance performance that HRC will be undertaking, its assessment of the significance of non-compliances to date, and its views on the processes to be undertaken in future should further non-compliances occur.

By and large the existing monitoring conditions appear to be appropriate but are, we consider, able to be refined. We consider that the waste acceptance criteria, particularly the ability to accept hazardous waste for co-disposal (Conditions 7, 8, 11) warrant review, as do aspects of the design and review provisions in the conditions necessary to ensure the design and performance monitoring of key aspects of the facility (e.g., leachate containment and pumping system, liner, cap etc) are adequate, and to bring the conditions into line with MfE recommendations and accepted practice elsewhere in New Zealand.

8 Summary

The HDC waste disposal site at Hokio Rd near Levin has operated for some 30 years, with a total waste input to date estimated at some 250,000 to 300,000 tonnes. Initial filling was in an un-lined sand dune area, with relatively few environmental controls and resulted in a

history of concerns and complaints by neighbours. However, despite episodes of poor performance, the isolated location and natural setting of the site with its limited local shallow aquifer system, has resulted in direct environmental effects appearing to be relatively localised.

The unlined area of the site (Area A) was eventually closed and capped in 2005 and groundwater and surface water are being routinely monitored under the conditions of consent set in May 2002. Overall, Area A is shown to be impacting on shallow groundwater quality in the area, and while the effects are locally quite marked, information to date indicates effects are likely to be localized and on a low quality groundwater resource that is not used for potable supply in the vicinity of the site. No effects on surface water are evident from the monitoring data presented to date.

The design and management of the new landfill area (Area B) as consented in 2002 are of a much higher standard, although there is still room for improvement in aspects of the operation, and possibly some aspects of the design detailing.

The legacy of Area A is typical of many older style “attenuate and disperse” dumpsites around New Zealand most of which are now closed, and some of which are in environmental settings significantly more sensitive than the Hokio Rd site. While not an ideal environmental outcome, the ongoing approach being taken to managing Area A, following its closure is what is envisaged by the consents and is an approach commonly adopted at similar sites. This approach involves capping and ongoing monitoring, with a view to implementing further remedial measures for groundwater or surface water if necessary at some future time. Such an approach is reliant on a robust monitoring network and monitoring programme, and on a good understanding of the local groundwater and surface water systems. Beyond this, there is potential for the Consent Holder to further reduce the risk associated with the site through some relatively minor cap improvement and related drainage works.

The upcoming review of consent conditions by HRC provides an opportunity to review some aspects of the conditions to bring them into line with accepted landfill practice in New Zealand. It also provides HRC and other interested parties with the opportunity to reflect on the compliance performance of the site, adjust aspects of the consent conditions as may be necessary, and clarify the future approach to be taken to compliance overview and response.

9 Recommended actions

As a result of this review we recommend the following actions for PCE to put forward for consideration, either as part of the current review of consent conditions being undertaken by HRC, or by HDC itself as the Consent Holder:

1. Confirmation of required structure, actions and timetable for compliance reporting and management including, if deemed appropriate by HRC, the incorporation of a peer review process for ongoing design, operations and monitoring
2. A review by HDC of the site operations contract for adequacy in relation to meeting the performance criteria set out in the conditions of consent
3. A review by HDC of recommendations made in this report relating to aspects of the detailed design of Area B

4. A comprehensive, independent review of the results of monitoring to date and of the implications of this review for the monitoring conditions for groundwater and surface water systems
5. A review of other general conditions of consent where these depart from accepted norms, particularly those related to waste acceptance and hazardous waste disposal.

10 Applicability

This report has been prepared for the benefit of the Parliamentary Commissioner for the Environment with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

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