Appendix 22: Landfills

1. Introduction

Contamination of waterways and groundwaters from landfill leachate is a potential threat to the health and wellbeing of the Waikato River that needs to be managed to meet Te Ture Whaimana. Concerns raised during consultation for this Study ranged from municipal and industrial landfills through to small farm dumps used to dispose of farm animals (NIWA et al., 2009). This appendix provides an overview of the landfill issue to assist the Waikato River Authority in working with Environment Waikato as the agency responsible for landfill management.

2. Overview of Waikato landfills

The total waste disposed of to landfill and cleanfill from the Waikato region in 2006 was 589,000 tonnes per year, comprising 222,000 tonnes per year to municipal waste, 212,000 tonnes per year to unconsented and consented cleanfills (sum equivalent to 0.55 tonnes per capita year for these two domestic/municipal sources) and 155,000 to dedicated industrial landfills (Sinclair Knight Metz Limited 2007).

In the past there have been environmental issues linked to old landfills, controversy around siting new landfills and inappropriate dumping of highly toxic chemicals (such as organochlorine agricultural chemicals) in the Waikato River catchment. The number of operating municipal landfills in the Waikato region has halved since 1999 and improved operating systems and consents have been established[1]. Over 40 other landfill sites that could not meet modern environmental standards have recently closed. The location of the five open, consented, landfills (Hampton Downs, Horotiu, Tokoroa, Te Kuuiti and Taupoo) within the Waikato and Waipa River catchments are shown in Figure 1, along with the 12 closed consented sites and four closed, unconsented sites. Industrial landfills include: Carter Holt Harvey Kinleith's disposal sites for pulp and paper processing wastes and wood waste bioler ash, Bleakley Landfill (Taupoo) for wood processing waste, Huntly Power Station ash ponds/disposal and Rotowaro Mine Coal ash slurry for mine rehabilitation. Sinclair Knight Metz Limited (2007) also identified at least 13 consented cleanfills[2] within the Waikato region. Landfills are managed by local authorities and industries and consented by Environment Waikato.

[1] http://www.ew.govt.nz/Environmental-information/Solid-waste/What-happens-to-our-waste/Waste-Disposal-Sites/

[2] Cleanfill is defined in the Waikato Regional Plan as material that when discharged to the environment will have no adverse effect on people of the environment. It includes materials such as clay, rock brick and concrete.

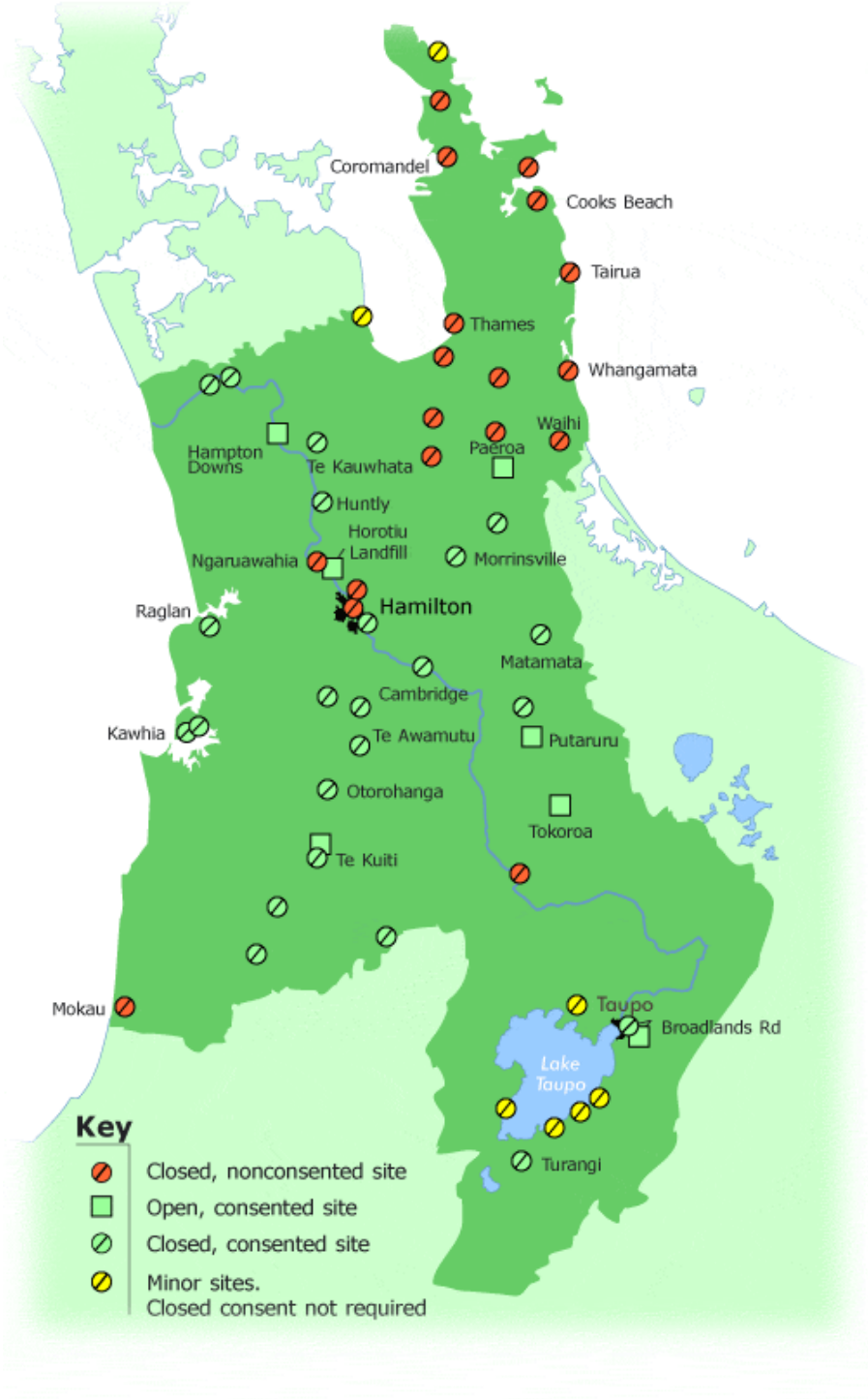

Figure 1: Waste Landfill sites within the Waikato catchment study area. Source: EW website[3].

[3]http://www.ew.govt.nz/environmental-information/Solid-waste/What-happens-to-our-waste/Waste-landfills-map/

3. Landfill management to protect surface and groundwaters

Control of water movement through landfills is a key aspect of environmental management to protect natural waters. If rain or groundwater infiltrates landfills, then leachate, which can contain very high concentrations of contaminants, can leach into and contaminate groundwater or surface waters. The main components of leachate are:

- Major ions – calcium, magnesium, potassium, iron, sodium, ammonium, bicarbonate, sulphate and chloride.
- Trace metals, such as manganese, zinc, copper, chromium, nickel, lead and cadmium.
- A wide variety of organic compounds which are usually measured as total organic carbon (TOC), chemical oxygen demand (COD) or biochemical oxygen demand (BOD).
- Individual organic compounds which are hazardous at very low concentrations, such as pesticides, benzene, phenol.
- Microbial contaminants.

The key components of a landfill leachate management scheme are:

- Minimisation of leachate generation by control of surface and groundwater inputs.
- Minimisation of the amount of precipitation coming into contact with waste by use of small cell.
- Phased disposal and progressive restoration.
- Use of a low permeability cap.
- Shaping of the final landform to encourage surface water run-off away from 'active' phases.
- Control of liquid inputs and use of solidification or encapsulation processes as an alternative to direct landfill of waste.
- Containment of leachate within the landfill.

In the past leachate management has relied somewhat upon the ‘attenuate and disperse’ principle, whereby the geological formations beneath a site were considered able to provide a degree of attenuation of contaminants in leachate. In some cases this appears to have worked. For example, despite highly contaminated leachate, and operating conditions that would not meet modern standards, it was

not possible to discern an impact of the Horotiu landfill on the adjacent Waikato River (Macaskill 2006). However, there is an increasing requirement for the use of composite liners (a natural compacted clay mineral liner in direct contact with a synthetic liner above it). This system may be improved upon by comprehensive leachate collection facilities situated above the liner. Collected leachate should be abstracted and treated on-site using aerated lagoons. The base of the landfill should be above the water table.

A degree of local contamination will inevitably occur in the long-term by diffusion of leachate through composite liners and through defects or holes. There is therefore the need to monitor leachate within the landfill and to monitor groundwater boreholes. Contingency plans should be provided in the event of contamination being detected. Leachate management must continue until leachate is of adequate quality to allow discharge to surface water or groundwater.

In the past, there have been problems in the Waikato River catchment with old, poorly managed landfills contaminating waterways and producing dangerous landfill gases. According to Environment Waikato's website unsatisfactory disposal sites in the region have now been closed or upgraded.[4] The website states that new landfills must use modern technology and management techniques to protect the environment. All open and most closed landfills must have resource consents from Environment Waikato. These consents set management standards including discharge controls, requirements for sealing and rehabilitation of closed sites and monitoring of ground and surface water, leachate and types of waste.

The Study team acknowledges that unconsented landfills can be a potential hazard to waters, but there is a mechanism for dealing with any that are identified. Landfills are acknowledged as potential contaminated sites by Environment Waikato. They are one of 52 land uses identified in the Ministry for the Environment's Hazardous Activities and Industries List (HAIL), which defines industries and activities that typically use or store hazardous substances. Contaminated sites within the Waikato region are in the process of being registered and tested for contamination.[5] Any suspected landfill sites can be brought to Enviornment Waikato's attention for registration and assessment.

The Study team assumes that all currently used municipal landfills are adequately managed and monitored to ensure no environmental damage. The Study team was unable to identify any other specific issues around landfills and their impacts in the Waikato River catchment that were not under management by Environment

[4] http://www.ew.govt.nz/environmental-information/Solid-waste/What-happens-to-our-waste/
[5] http://www.ew.govt.nz/environmental-information/Hazardous-substances-and-contaminated-sites/Contaminated-sites/Managing-contaminated-sites/

Waikato. Consequently there are no recommended remediation actions around landfills apart from maintaining a watching brief on Environment Waikato management.

4. Recommended action

The Study team recommends that the Waikato River Authority keep a watching brief on Environment Waikato reporting and monitoring around landfills to ensure there is sufficient groundwater monitoring boreholes, competent analysis of groundwater samples and that monitoring results confirm that operators are complying and meeting their consent conditions.

5. Reference

Macaskill, B. (2006). Horotiu landfill: audit of past and present-day environmental impact on ground and surface water quality. *NIWA Client Report HAM2006-032.*

NIWA; Tipa & Associates; Diffuse Sources Ltd; Nimmo-Bell & Co. Ltd; AgResearch; Beca Group (2009). Waikato River Independent Scoping Study – Baseline Report – Framework for Restoration based on Maatauranga Maaori. *NIWA Client Report HAM2009-117.*

Sinclair Knight Metz Limited (2007). Waikato regional waste infrastructure stocktake and strategic assessment. Sinclair Knight Metz Ltd. *Environment Waikato Technical Report 07-44.* 49 p.