Absolutely POSITIVELY Wellington
Me Heke ki Pōneke
Wellington City Council

CLOSED LANDFILLS POLICY 2003

Section 1

Potential Risk Management Issues: An Overview

Historically, the Council and other landowners used gullies as landfills to dispose of the city's waste. Many landowners made requests to the Council to use a gully as a landfill so that an area of flat land was created when the gully was filled and capped with soil.

Most closed landfills in Wellington are now open space areas and used as sports fields or passive recreation reserves. In many cases the extent of the fill in the closed landfill is not known with any degree of accuracy. It is likely that some development has occurred either immediately adjacent or on fill surrounding a closed landfill site. The majority of closed landfills are located in the older suburbs in the southern and eastern parts of the city.

1.1 What are the Physical Hazards of a Closed Landfill?

The physical hazards from closed landfills can be summarised as follows:

a) **The presence of landfill gas**. As waste in the landfill decomposes, landfill gases is generated. In most cases, the decomposition process continues for approximately 30 years although there are cases where decomposition has gone on for longer. Gas emissions from landfills contain methane, carbon-dioxide, carbon monoxide, depressed levels of oxygen and other trace gases such as hydrogen sulphide. Some of these gases may be toxic at sufficient concentrations, although to date this has not been a problem in Wellington.

The most significant potential hazard in relation to the gas emissions from a closed landfill is from methane gas accumulated in enclosed spaces such as utility ducts.

b) **The presence of soil contamination**. In some cases, waste in closed landfills may contain contaminants, which are harmful to the environment, or to human health, should they be exposed during excavation work. Of prime concern are landfills, which accepted industrial wastes, particularly wastes from former gasworks sites in the city.

c) **Leachate.** The decomposition process and the presence of contaminants in the waste placed in the landfill can generate leachate, which can affect the surrounding environment by contamination of ground and surface water.

d) **Poor quality capping material**. In some cases capping material has become mixed with waste potentially causing a health and safety hazard.

e) **Uneven ground settlement and poor drainage.** Depending of the amount of waste compaction and waste types placed in the landfill, the site may be subject to uneven land settlement. This can affect roads, paths and structures although it is not necessarily a hazard or safety issue. Re-levelling can be complicated by the need to avoid breaching the landfill capping material.

1.2 What Risks do Closed Landfills Pose?

While a hazard may exist, the risk it poses to the environment or human health is dependent on a chain of events from source to "receptor". Receptors include humans, plants, animals, and the environmental resources. For any site, the risks posed are dependent on the following:

Source: the characteristics of the physical hazards present at a site such as gas or hazardous waste disposed of in the landfill;

Exposure pathways: the route and transport mechanism from a source, such as a contaminant, to a receptor. Exposure pathways need to be clearly identified before the hazard can be effectively mitigated.

Receptors: living beings or resources such as buildings that may be exposed to and affected by a physical hazard

1.2.1 Landfill Gases – Exposure Pathways and Receptors

Landfill gas will migrate from areas of higher pressure to areas of lower pressure. It will also move from areas of high concentration to areas of lower concentration via diffusion. Pressure driven flow is more dominant within the fill of a landfill, and diffusion is more common for migration of gas out of a landfill. Gas flow rates are also dependent on ground permeability, with higher flows through ground of high permeability, and low flows through low permeability ground. However, cracks, pipelines, tunnels and other services provide ideal gas pathways.

The distance that gas may migrate is dependent on subsurface conditions. In the absence of local guidelines, international guidelines have often been adopted for use in New Zealand. UK guidelines recommend that proposed developments within 250m of a closed landfill be assessed for landfill gas migration. In the USA, a 1000 feet zone is used. In the New Zealand Rapid Hazard Assessment System (MfE and Ministry of Health 1993) identifies the primary area of influence of 300 metres. The appropriateness of these guideline distances has not been assessed for Wellington's predominant geology – weathered greywacke.

1.2.2 Leachate - Exposure Pathways and Receptors

Leachate is a concentrated pollutant liquid, which is produced as rain or surface water percolates through solid waste extracting soluble chemicals and product of degradation. The type and concentration would vary with age of landfilled deposits and generally declines over time but the process could continue for longer than 50 years. Leachate can contaminate ground and surface water with consequential adverse effect to human health and environment.

1.2.3 Soil Contamination - Exposure Pathways and Receptors.

After closure, hazardous substances (source) are separated from the ground surface by capping thus closing the major exposure pathway. However, any land-use which involves excavation, such as trenching for the installation of services, digging foundations for buildings, or excavations for a swimming pool, can bring the contaminants to the surface and thus pose a potential risk to the environment and human health.

1.2.4 Uneven Ground Settlement - Exposure Pathways and Receptors

Uneven ground settlement can damage structures built on the surface of the landfill, leading to problems such as cracked walls.

1.2.5 Landslides and Slope Failures

The structural integrity of the landfill form should be addressed and in particular the manner in which landfill faces were formed. For example the difference between structural bunds and hardfill facings on refuse slopes can have significant stability implications. Sites should be checked for static and dynamic stability and internal water levels may need to be determined if an initial screening assessment indicates that this could be critical.