CLOSED LANDFILLS POLICY 2003

Introduction

There are thirty-two known closed landfill sites within Wellington City, of which Wellington City Council owns twenty-five. The Council has a number of roles in relation to these closed landfills:

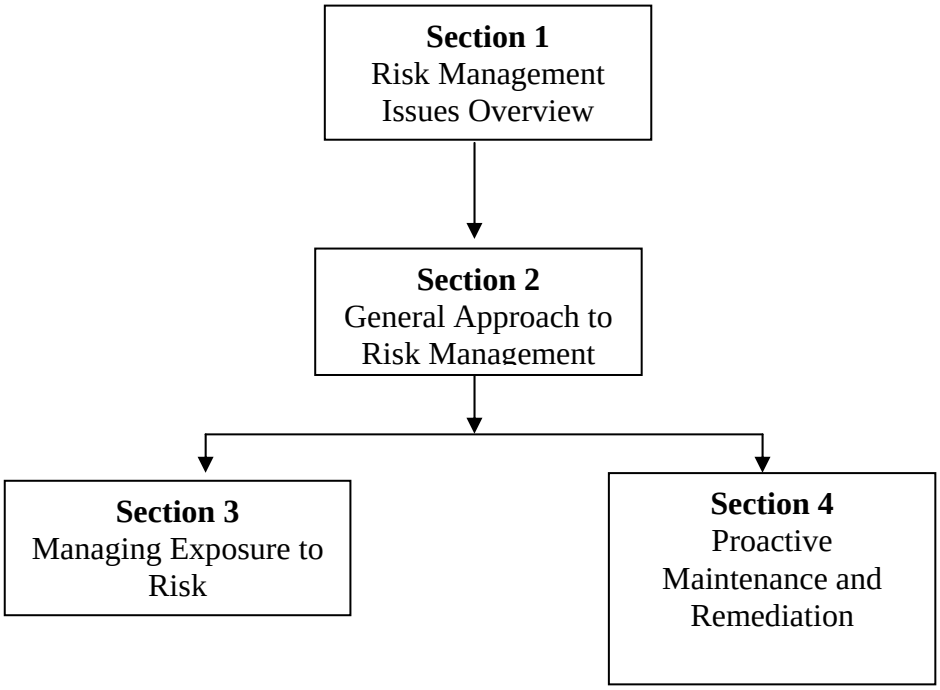
- as a landowner;
- as a regulator under the RMA and other relevant legislation;
- as an information provider under the Local Government Official Information and Meetings Act 1987;
- as a utility operator – water, drainage;
- as an investor in environmental outcomes – e.g. water quality, riparian management.

Wellington City Council needs to manage the risks to the environment, to the community and to individuals of the potential adverse effects of Closed landfills.

The Resource Management Act 1991 (RMA) places on Council a general duty to avoid, remedy or mitigate any adverse effects on the environment, including people and communities arising from an activity carried out by or on behalf of Council. However, the legislative framework, which governs roles and responsibilities of both local government and owners for contaminated sites, is unclear. The Ministry for the Environment has issued a number of discussion documents on those roles and responsibilities but to date no legislation has been proposed and no policy position has been reached.

This document sets out a framework for the management of Wellington City Council's Closed landfills.

It is divided into four parts:



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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.

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Section 2

General Approach to Risk Management

Wellington City Council has an on-going programme to investigate the extent and level of risk associated with the thirty-two closed landfills within Wellington City.

This programme is structured around the following general priorities:

1. Assessment of extent and level of landfill gases;

2. Assessment of exposure to soil contamination;

3. Assessment of health and environmental risks associated with leachate;

4. Assessment of risks associated with subsidence.

Ordering of priorities is based on the view that undetected gas migration from closed landfills theoretically presents the more immediate risk and the greatest immediate potential for harm. Work has been undertaken to identify the level of potential risk associated with former landfill gases and to classify the sites accordingly - this work is still continuing. Classification of the closed landfills according to their potential landfill gas risk will determine the level of gas management mitigation work required and the extent that gas-monitoring programmes (currently underway) will be implemented.

Priorities in terms of risk will need to be re-assessed continuously in line with changing conditions and circumstances related to individual landfill sites or development taking place in proximity of a closed landfill site.

To address these issues it is essential that each closed landfill has, a site specific Management Plan. Management Plans for each Former Landfill are being prepared, with the order of work dictated by the initial classification of landfills in terms of potential gas risk. These plans will address the immediate issue of mitigation of potential gas risks (where necessary), they will also outline a programme of future investigative work for the other listed potential risks.

The detailed investigative work on potential gas risk is scheduled for completion in 2003, at that point, an overall assessment of potential risks associated with contaminated soils and leachate will commence, this will then influence any future mitigation programmes, should they be needed.

The following approach to managing potential risks associated with closed landfills has been taken:

- minimising exposure to potential risks; and
- where appropriate mitigation of the existing risks associated with each closed landfill.

The overall risk assessment process will drive the necessity for mitigation programmes.

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Section 3

Managing Exposure to Risks

Objective:	To ensure that Council meets its landowner and regulatory obligations under the Resource Management Act, Building Act and Building Code, Health Act and Health and Safety in Employment Act to control the actual or potential effects of the use of land on or adjacent to landfill sites

This section is concerned with ensuring that the potential hazardous effect on human health and environment from closed landfills is mitigated in strict compliance with health and safety rules. Monitoring and mitigation measures will reduce the level of potential risk while land-use management, education, information and management of landfill assets and controlling the sale of land will reduce the level of human exposure.

Council as landowner, must comply with the requirements of Regional and District plans developed under the RMA, the Health and Safety in Employment Act and the Health Act.

The RMA imposes a general duty on **all** persons to avoid, remedy or mitigate any adverse effects on the environment from activities carried out by or on behalf of those persons (s. 17). It also requires compliance with Regional and District plans and / or requiring persons to obtain resource consents. If anyone is actively in a way that causes or exacerbates the release of contaminants from a closed landfill, that person could, depending on the circumstances be held responsible for the breach of the RMA and or to avoid remedy or mitigate the effects. Enforcement action may, again depending on the circumstances, be taken against that person for not doing so.

As landowner, Council also has a level of responsibility under the Health and Safety in Employment Act and the Health Act.

The Council's potential responsibilities under the RMA arise from both being a landowner and from its statutory powers and duties as a territorial authority. The statutory responsibilities include the functions conferred under section 31 of the RMA to control any actual or potential effects of the use, development or protection of land. Section 35 confers responsibility to gather such information, and undertake or commission such research, as is necessary to effectively carryout its functions under

the Act. The Council also has wide ranging enforcement powers and duties under the RMA.

However, parallel responsibilities are imposed on Regional Councils under sections 30 and 35 of the RMA. Under section 30 (1)(f) of the Act, Regional Councils are responsible for the control of discharges of contaminants into, or onto land, air and water. Regional councils also have similar enforcement powers and duties.

Under the RMA therefore, it is arguable that the responsibilities for controlling the adverse effects of contaminated sites are shared between territorial authorities and Regional Councils.

3.1 Information

Policy:	To ensure that utility operators, the public and landowners are informed, as necessary, of the risks posed by closed landfills.

Under section 44A of the Local Government Official Information and Meetings Act 1987, a territorial local authority must issue a Land Information Memorandum (LIM) in relation to matters affecting any land in the district of the authority.

LIM's must include information that is known to the territorial authority as to any 'special feature or characteristic of the land' including the likely presence of hazardous contaminants that is not apparent from the district plan. In addition, the territorial authority must provide 'information concerning any … notice [or] order… affecting the land… previously issued by the territorial authority". This would include an enforcement order or abatement notice issued under the RMA.

Methods to implement this policy are:

- Develop a general communication strategy to inform people of the LIM's process and the need to use it.

- Develop protocols to ensure that appropriate information on sites adjacent to and at risk from closed landfills is consistently included in LIM's and PIM's.

WCC files contain information on contaminated sites, including closed landfills that is not in an easily accessible from or linked to property boundaries, and may therefore not be included in LIM's and PIM's. The establishment of guidelines and protocols will ensure that LIM's and PIM's issued by the Environmental Control Business Unit under the LGOIMA and the Building Act 1991 respectively include relevant information on possible landfill gas, contaminated soil risks and ground settlement.

Council will encourage potential purchasers and other interested persons to use the LIM's and PIM's systems. However, if a Purchaser does not request a LIM he or she may not receive the appropriate information on a closed landfill. To deal with this situation, work is under way to investigate other means of making information on closed landfills known to the public.

Issues have arisen in the past where residential development has encroached on a closed landfill site. To prevent further development of sites without suitable mitigation measures in place, it is essential to know the extent of the fill in a closed landfill, and the level of accuracy of that information. Where the extent of the fill is uncertain, Council will take a conservative approach to advise the need for investigations before approving development in the area of uncertainty.

For those landfills, which are classified as lower risk, the information is currently in the LIM's and PIM's systems or the District Plan therefore the level of risk from development on or near a closed landfill site will be less.

3.2 Dissemination of information: managing work practices

Policy:	To ensure that utility operators who carry out works on or around closed landfills (including internal WCC staff and contractors) undertake work according to clear guidelines and standards.

Methods to implement this policy are:

Develop a process with utility operators to ensure long term best practice.

Work via this process to:

- apply appropriate safety provisions guidelines for the sites (e.g. Department of Labour Exposure Limits and Short Term Exposure Limits (for both gases and soil contaminants) for maintenance and service workers;

- develop and apply protocols for preventing gas migration along newly installed service corridors (e.g. sealing service trenches and ducts at critical locations and providing passive vents on the landfill side of the seal);

- develop and apply protocols for minimising the risks of the excavation of contaminants;

- develop and apply guidelines for retrofitting of existing service corridors, where gas migration problems have been previously identified.

Assess whether the development of sealed utility corridors through and around Former Landfill sites is appropriate in high-risk cases.

The sealed utility corridor would prevent gas migration and avoid exposure to contaminated fill material. All underground utilities would then be required to locate within these corridors.

Assess the appropriateness of using signage and utility management plans at high priority sites.

Ensure that Council staff and contractors working on the sites of closed landfills are aware of all hazards to meet the requirements of the Health and Safety in Employment Act.

During the course of repair and maintenance work required for structures and services, which are, located on closed landfill sites, workers may be exposed to either elevated levels of soil contaminants or landfill gas. Persons who control a workplace must take all reasonable steps to ensure that people in the place of work or in the vicinity are not harmed by hazards. This may include hazards arising from a contaminated work site. Council's responsibility under this Act is limited to its status as workplace controller and an employer**.** Since many of Council's open space reserves are on closed landfills, Council has a responsibility to ensure its staff and contractors who work on these sites are protected from the risks.

Increased risks are likely to occur only during excavation operations, although these risks are not expected to be high.

3.3 Managing Land-Uses

Policy:	To ensure that the intensification and extension of land-uses, in particular residential land-uses, is managed in a way to prevent increased population exposure to potential risks from closed landfills.

Methods to implement this policy are:

- Consideration of the location and potential impacts of closed landfills as part of wider urban development planning processes.

- Review where necessary the appropriateness of District Plan provisions to control the actual or potential effects of the use or development of closed landfills and adjacent sites.

The District Plan already has provisions dealing with subdivision and development of contaminated sites. For time to time, there will be a need to revisit those provisions in light of any changes to the District Plan to ensure they remain appropriate.

Before any additional provisions are included in the District Plan section 32 of the RMA requires the Council to, assess whether the provisions are necessary to achieve the purpose of the Act whether inclusion in the District Plan is the most appropriate means for achieving the purpose, and evaluate the costs and benefits for each possible method to achieve the purpose.

A change to the District Plan could then be initiated to the extent that this is appropriate, to deal with the actual or potential effects of the use or development of closed landfills and affected adjacent sites.

Policy:	That any changes in use of any closed landfill site are managed to minimise the risk of exposure to the adverse effects of any contaminant that may be present on that site.

Methods to implement this policy are:

- Continued implementation of District Plan rules as set out in Wellington City Council Operative District Plan 2000 and any changes to or reviews of that District Plan.

3.4 Disposal of Closed Landfill Assets

Policy:	To only make closed landfills available for passive recreation or active recreation where it is clear that there are no known environmental issues or hazards

Methods to implement this policy are:

- To implement a general "no disposal" policy for closed landfills owned by Council.

Any local authority has the potential to sell a closed landfill. However prior to deciding on disposal, it needs to be assured that there is no potential adverse effects to human heath or environment, that all potential risks and liabilities are known, and that future development will not proceed in an uncontrolled manner.

The principle difficulty is that the Council may become exposed to potential future liabilities after the land is sold a number of times and subsequent purchasers/ vendors are unaware of potential risks. An additional issue may arise where previous owners have not adequately maintained mitigation measures, such as gas collection systems and landfill gas continues migrating away from the fill in the closed landfill.

In the cases where Council does not own the site of a closed landfills which it formerly operated, the landowner may not intend to keep the land in an open space or other passive use. There is therefore a need to recognise the effects of potential development, and to put in place appropriate mechanisms to restrict or control that development.

There are a number of measures that can be utilised including zoning, other development controls, contractual arrangements, or potential acquisition for reserves purposes.

3.5 Maintenance and mitigation measures for closed landfills

Policy:	To promote appropriate measures to mitigate the potential risks of closed landfills.

Mitigation plans are aimed at the preservation of the integrity and effectiveness of the final cover and any amenity plantings, operation and maintenance of any leachate collection systems, monitoring groundwater quality and maintaining and operating any gas collection systems.

Management Plans provide a mechanism for the monitoring of the proposed after-use of the site, physical investigation, and checking of any structures which have been erected on or near the boundary of the closed landfill and provide an emergency management plan in case of adverse environmental effect or natural disaster.

Methods to implement this policy are:

- Monitoring and Investigation - to ensure that Council has in place an appropriate strategy to monitor and investigate the potential risks posed by closed landfills in Wellington.

The Council is required under the RMA to gather information, and undertake or commission such research as is necessary to monitor the state of the environment and to take such action as may be necessary under the RMA. The investigation of closed landfill sites where Council is still the landowner can be readily achieved.

The Council will continue to gather information about other sites. However, the Council has limited ability to actively investigate such sites in other ownership (except with the concurrence of the owner), or to require other parties to investigate and assess them.

- Undertake a staged programme of initial assessment to identify those landfills which pose a potential hazard to human health and safety and the environment from landfill gas, leachate, site contamination and subsidence and determine priorities for mitigation works where appropriate.

The assessment programme would typically include:

- Site engineering assessment (gas , leachate, stormwater systems etc);

- Evaluate construction and other disturbances that occur on the landfill during the post-closure period;

- Water quality monitoring (leachate, streams and or groundwater);

- Assessment and evaluation of potential gas migration routes and receptors (e.g. site offices and buildings, monitoring bores, electrical or pipe conduits, manholes and utility service corridors);

- Assessment of capping integrity and vegetation.

Once an initial hazard assessments are completed, classification of sites and mitigation works have been completed ongoing monitoring programmes will be implemented to ensure the level of risk associated with those sites do not increase over time.

The monitoring frequency will be based on the degree of landfill stabilisation and gradually reduce with time if warranted. Reports on the inspections and monitoring will need to be prepared for appropriate action.

Further information may be required on a site by site basis for each closed landfill. However, obtaining a complete and comprehensive set of information for each closed landfill is an extremely costly exercise therefore sites which present a high risk will be given priority for further investigation.

The programme is staged and contains the following detailed approach:

- Hazard assessment in line with the risk posed by each landfill using the Ministry for the Environment Guide to the Management of Closing and Closed Landfills in New Zealand;

- More detailed site investigation of those sites where the potential level of risk to human health and the environment has been assessed as high;

- Identification of the appropriate preventative or remedial action needed;

- Peer review site investigations on a case by case basis to ensure risk assessment is accurate and recommended actions are appropriate.

Due to the inherent uncertainty in estimating the risks posed by closed landfills and in particular the volume of gas which would be generated in the landfill, it is prudent to obtain peer reviews of all assessments and proposals for mitigation measures.

The assessment of risk closed landfills pose to human health or the environment from the contaminants on site is essential to ensure that the contaminated sites provisions in the District Plan are complied with, as are any applicable provisions in the various regional plans. However, it is noted that the majority of closed landfills are zoned Open Space, and that there are currently no contaminated site provisions for these sections of the District Plan.

- Determine the maximum distance landfill gas is likely to migrate away from identified former landfill sites in Wellington

To assess the risks that closed landfills pose, their impact on the surrounding environment must be identified. Commonly used international standards for landfill gas migration distances may be extremely conservative in the Wellington geology and an appropriate standard will be developed for the local environment.

- Determine the level of certainty of the currently identified extent of the fill material in closed landfills. For those closed landfills, which have been identified as requiring further work, ascertain extent of the fill.

As noted in Section 3, the closed landfill area may have been encroached upon by other land-uses. Investigating the extent of the fill area for those closed landfills that have been identified as requiring further work is a key part of the investigation programme.

- Make information available as necessary to the owner/occupier of sites of closed landfills and work with owner/occupiers to identify the most appropriate way of dealing with either contamination, subsidence and/or landfill gas issues;

- Provide information on possible mitigation options for the adverse effects of closed landfills for new developments on or adjacent to closed landfill sites.

The Council has experience in assessing mitigation options and will work with owners and occupiers to find the best practicable solution to reduce the risk to such persons and users of the site.

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Section 4

Mitigation Actions

Objective:	To reduce or mitigate the potential hazards or risks for sites which have been assessed as posing a high risk to the environment or the community.

- Require appropriate mitigation measures (such as landfill gas control systems or alarm systems) as appropriate, for any new development, which may be at risk from landfill gas.

- Assess Wellington's closed landfill sites to determine which sites (if any) may require a Regional Council resource consent for discharges to land, air or water, and apply for the appropriate consents, where necessary.

Wellington Regional Council is responsible for regulating any off-site discharges from closed landfills to air, water and land.

The provisions of the Regional Air Quality Plan for the Wellington region apply to the management of landfill gas discharges. Small-scale production, storage, transfer and flaring of hydro-carbons and bio-gas from industrial and trade premises is permitted provided that flaring of hydrocarbons and bio-gas is less than a combined rate of 2 MW. This provision may allow for flaring of landfill gas as a way of managing the effects of closed landfills and recognises the likely low environmental impacts of such an activity.

In addition, the passive venting of landfill gas from closed landfills is permitted provided that "no dust, gases (including carbon dioxide and methane gases), or odour from the process which is offensive, objectionable, noxious or dangerous at or beyond the boundary of the premises or property".

It is probable that several of the closed landfills do not meet this condition, and thus may possibly require resource consent for passive venting of gas. This requires further assessment of each individual situation, as well as a detailed consideration of the statutory position.

Develop Landfill Management Plans according to the following order of priority:

Each plan will have the following indicative structure:

- Plan Objectives
- WCC (Management) Responsibility
- General site characteristics: natural and built environment
- Landfill engineering information
- Resource Consents Issues
- Potential Hazards (Risks and Risk Mitigation)
- Institutional controls
- Engineering closure requirements
- Permitted and Restricted Activities
- Monitoring
- Emergency response plan

Contaminated soils, leachate and subsidence management investigation and action planning will occur subsequent to the establishment of the gas management components of each plan.

It must be recognised that the Management Plan will have to be reviewed periodically to meet any new performance procedures and standard or regulatory and statutory changes throughout the post-closure period for the landfill.

Landfills	Information	Assessment	Action Plan

Where the risk from landfill gas to residential or high occupancy buildings is high, then landfill gas control measures will be considered. Their installation will be staged so that the effect of each increment of engineered gas control can be assessed and once an adequate level of protection is achieved, further measures other than monitoring become unnecessary.

Gas management plans need to be site specific, and can be based on a generic model. They should include plans for ongoing maintenance and monitoring. The development and implementation of these gas management plans will be easier whilst Council is the owner of the site. Other elements of the plan would require Council communications/liaison with other organisations such as utilities operators.