

Managing Hazardous Waste

Te whakahaere i te para pūmate

A Discussion Paper

November 1998

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Minister's Foreword

Today we realise how many daily activities have the potential to produce hazardous waste. Dangerous substances pour into streams and estuaries from sewers and stormwater drains, into the air from chimneys, and onto land from a host of sources.

Hazardous waste is typically generated as a by-product of commercial and industrial processes. Used medical instruments, incinerator ash and electroplating sludges are obvious examples.

The quantities are significant. As much as eight percent of the solid and liquid waste entering our landfills is potentially hazardous. Total hazardous waste generated in New Zealand is estimated to be at least 8,550,000 tonnes per year. This equates to about 2 tonnes per person per year.

A number of reports published over the past decade have highlighted the lack of consistency in the way different types of hazardous waste are handled in this country. These reports indicate the likelihood of serious adverse environmental effects as a result of inconsistent management, varying definitions of hazardous waste, lack of data about its disposal and generation, lack of regulations for managing it, and lack of knowledge about hazardous waste itself.

In September 1997, the Government announced funding to the Ministry for the Environment for a three-year programme to improve the way hazardous waste is managed in New Zealand. This work builds on our 1992 policy for waste management and furthers our commitment, in the *Environment 2010 Strategy*, to improve waste management in New Zealand.

The Ministry for the Environment is now releasing this discussion paper setting out the problems and risks resulting from poor management of hazardous waste. A range of options for improving the way we manage hazardous waste is proposed.

We are seeking your comments and views on the options outlined in this discussion paper. Your input is vital to assist the Government make decisions on a national framework for improving hazardous waste management.

Simon Upton
Minister for the Environment

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Executive Summary

This paper addresses the management of hazardous waste in New Zealand. It outlines the problems and risks resulting from poor management of hazardous waste and sets out a range of options for an improved management framework.

Environmental Goals

The key environmental goals to be achieved through effective hazardous waste management are:

- to minimise unacceptable risks to people and the environment resulting from generation, storage, transport, treatment and disposal of hazardous waste
- to minimise risks of contaminated sites and associated clean-up costs resulting from poor management of hazardous waste.

Hazardous waste in New Zealand

Hazardous waste is waste that poses a risk to people or the environment. It is the by-product of many industrial and commercial processes.

There are a number of problems with current management of hazardous waste in New Zealand, which may be causing significant environmental problems. If management deficiencies are not addressed, hazardous waste may also result in significant future adverse environmental effects. Many hazardous waste problems can be avoided, however, if waste is properly managed. An effective hazardous waste management framework will minimise risks to people and the environment.

Guiding principles for effective hazardous waste management

The following principles will guide the design of an effective system for environmentally safe management and disposal of hazardous waste in New Zealand:

- Enhanced environmental outcomes
- An agreed national definition
- Clear statutory responsibilities for controlling hazardous waste
- Hazardous waste minimisation
- Costs borne by generators of hazardous waste
- Consistency of risk management
- Appropriateness to the scale of the problem
- Awareness of obligations under the Treaty of Waitangi (Te Tiriti o Waitangi)
- Good information systems/effective monitoring
- Flexibility to incorporate advances in technology

Options for Managing Hazardous Waste

This discussion document presents options for defining, controlling and monitoring hazardous waste. The management options have been developed by the Ministry for the Environment in consultation with local government practitioners, industry, environmental groups and people with expertise in hazardous waste.

A preliminary assessment, against key criteria, indicates that there are three main options for an overall hazardous waste management framework.

These are:

1. *Ambient environmental standards established through regulations and improved Resource Management Act (RMA) consent monitoring.*

This option requires:

- the least amount of change to the present management system
- a tightening of current controls and monitoring
- improved RMA consent monitoring to enforce ambient environmental standards (maximum environmental levels).

2. *Hazardous waste acceptance criteria through guidelines or regulations under the Resource Management Act and improved Resource Management Act consent monitoring, complemented by mandatory record keeping and an industry code of practice.*

This option requires:

- controls on what goes into a hazardous waste facility (acceptance criteria)
- tightening current consent monitoring and some additional monitoring, in association with an industry of Code of Practice.

3. *Hazardous Waste Acceptance Criteria regulations with regulations under the Resource Management Act for ambient environmental standards and improved Resource Management Act consent monitoring, complemented by mandatory record keeping in association with an industry code of practice.*

This option differs from 2 in that it requires:

- controls on what goes into a hazardous waste facility (acceptance criteria); as well as
- controls on the environmental effects created by the facility (ambient environmental standards).

Managing Hazardous Liquid Waste

The control of liquid hazardous waste is important to meeting the goals of this review. However, there are unique problems involved in developing a control mechanism for disposal of hazardous liquid waste (or trade waste) that adequately protects the environment. Two approaches are proposed for managing liquid hazardous waste disposed to sewer:

- controls can be tightened at the point where liquid hazardous waste is discharged to the environment; or,
- controls can be tightened at the point where liquid hazardous waste is discharged into the sewerage system *and* at the point of discharge into the environment.

Feedback

We are seeking your comments and views on the proposals outlined in this paper. Your input will assist the Government to make decisions on a national framework for managing hazardous waste. These decisions will then form the basis of any changes to existing laws, or the formulation of new regulations to implement more effective management of hazardous waste. Contact details and information for providing comment are set out on page 10 of this document.

Part 1: Introduction

1.1 Aim

This paper addresses the management of hazardous waste in New Zealand. It outlines the problems and risks resulting from poor management of hazardous waste, and proposes a range of options for an improved management framework.

Audience

The issues discussed in the paper will be of particular interest to:

- people working in the waste management industry (eg, landfill, waste-water treatment facility and incinerator operators)
- people working in industries producing hazardous waste
- organisations responsible for controlling and monitoring hazardous waste (eg central and local government)
- environmental and conservation groups
- Māori

Feedback

We are seeking your comments and views on the proposals outlined in this paper. Your input will assist the Government to make decisions on a national framework for managing hazardous waste. These decisions will then form the basis of any changes to existing laws, or the formulation of new regulations to implement more effective management of hazardous waste.

Following analysis of your comments, the Ministry for the Environment will prepare a Proposed Hazardous Waste Management Framework. Mechanisms for implementing the strategy will then be developed, and the Ministry will be seeking further comment on the detail of these mechanisms.

To help you prepare your comments on the paper, the Ministry will be holding a series of public meetings in Auckland, Wellington, Christchurch and Dunedin in early February 1999. The Ministry will also hold a series of hui, where people will have the opportunity to make oral submissions on the options presented in the discussion paper. If you are interested in attending one of the public meetings or hui, please contact the Ministry for the Environment for details on the time and place of the meeting nearest to you (see contact details provided below).

The following points may be of assistance in preparing written comments.

- Numbered focus questions are provided to guide your responses. Where possible, please ensure that your comments relate to the numbered questions. However, comments can be made on any issue discussed in the paper.
- It would be helpful if comments of a technical nature are accompanied by supporting information or references.
- Suggestions for improvement are welcome.

Written comments should be sent to:

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Ministry for the Environment
PO Box 10362
WELLINGTON*

Telephone: 04 917-7400

Fax: 04 917-7523

Email comments should be sent to:

hazwaste@mfe.govt.nz

The closing date for comments is: Monday 1st March 1999.

A summary of submissions will be prepared and distributed to all those who contributed comments on this discussion paper.

1.2 Background

In September 1997 the Minister for the Environment announced funding for a three-year programme to improve the management of hazardous waste in New Zealand.

The problem in New Zealand has been highlighted by recent reports and studies such as the *Landfill Census* (1995, Ministry for the Environment:Wellington), *Auckland Region Hazardous Waste Survey* (1996, Auckland Regional Council and the Environmental Business Group:Auckland), *Environmental Performance Review: New Zealand* (1996, Organisation for Economic Co-operation and Development), *Canterbury Regional Council Summary Report: Hazardous Waste Management Options for the Canterbury Region* (1997, CRC:Christchurch), *National Waste Data Report* (1997, Ministry for the Environment:Wellington), and the Parliamentary Commissioner for the Environment's report *Hazardous Waste Management* (1998, PCE:Wellington).

These reports, which are summarised in Appendix 5, found that serious adverse environmental effects may be occurring in New Zealand. The adverse environmental effects are due to:

- inconsistent management of hazardous waste by local authorities
- inconsistent definitions of hazardous waste
- lack of data about hazardous waste disposal or generation
- concern about lack of regulations for hazardous waste management
- lack of knowledge about hazardous waste.

In 1997 the Ministry for the Environment commissioned a study of hazardous waste management in five overseas countries: Australia, Canada, Denmark, Germany and the United States¹. The five review countries provide excellent examples of international best practice which we have used to develop the options for hazardous waste management presented in this paper.

The management options have been developed by the Ministry in consultation with local government practitioners, industry, environmental groups, and people with expertise in hazardous waste. In particular, the Hazardous Waste Advisory Group² has assisted with advice and peer review.

The New Zealand Parliament has already passed legislation setting out the parameters within which it wants hazardous substances to be managed.³ In the passing of the Hazardous Substances and New Organisms Act 1996 (HSNO), the Government has recognised that hazardous substances need special management to avoid unacceptable risks to the public and to the environment. Parliament has also made it clear that it intends hazardous substances to be managed under both the Resource Management Act 1991 (RMA) and the HSNO. The management options presented in this paper are proposals for the implementation and enhancement of existing legislation.

1.3 Scope and structure

This paper develops options for the management of hazardous waste in New Zealand. The types of wastes that may fall within the framework will depend upon the definition that is eventually adopted. (An indicative list of hazardous waste is presented in Appendix 4.) However, for the purpose of discussion we address those hazardous wastes that result from industrial and commercial processes and which pass through one or more of the following phases: generation, transport, storage, treatment and disposal. The document does not address residential and non-point-source hazardous waste. In particular, we focus on hazardous waste that is disposed to landfills, incinerated, or discharged to waste-water treatment facilities.

¹ *A Review of Overseas Approaches to the Management and Landfilling of Hazardous Waste. Environment and Business Group. 1997.*

² *A membership list of the Hazardous Waste Advisory Group is provided in Appendix 8.*

³ *In legislation, the term "hazardous substance" is used in its broadest sense and encompasses hazardous wastes.*

The paper is structured in four parts, followed by appendices:

Part 1: Introduction sets out the purpose and scope of the paper

Part 2: The hazardous waste problem discusses the nature of hazardous waste, its environmental effects and how hazardous waste is currently managed in New Zealand and overseas. Some of the concerns that Māori may have are also presented.

Part 3: Elements of an effective hazardous waste management framework presents and evaluates a range of options for defining, controlling and monitoring hazardous waste.

Part 4: Options for a national hazardous waste management framework discusses the range of policy instruments that are available to government for hazardous waste management. Three framework options drawn from the options presented in Part 3 are set out.

Appendices include a summary of the analysis undertaken in developing options for defining, controlling and monitoring hazardous waste, a list of hazardous waste, a summary of recent reports about hazardous waste in New Zealand, and overview tables showing the adverse effects and risks of each stage of the hazardous waste life-path.

Part 2: The hazardous waste problem

2.1 Hazardous waste in New Zealand

What is a hazardous waste?

Hazardous waste is waste that poses a risk to people or the environment. Hazardous wastes are by-products of many industrial and commercial processes and can occur in solid, liquid or gaseous form. They may be destined for storage, treatment or disposal. Examples of potentially hazardous waste include:

- sludge from oil tanks
- soils contaminated with heavy metals or agrochemicals
- medical and clinical waste (eg used instruments and infectious material)
- pharmaceutical wastes
- used batteries and other discarded electrical products
- electroplating sludge
- wastes from photographic chemicals and processing materials
- some residues from aluminium production
- some timber treatment, tannery and mining wastes
- stormwater cesspit wastes from industrial sites.



A more inclusive list of potentially hazardous waste is provided in Appendix 4.

The development of legislation enabling the implementation of a workable system of hazardous waste management requires a much more precise definition than that provided so far. How we should arrive at such a definition is covered in Part 3. In the meantime we will be working with the fairly general definition of hazardous waste⁴ given above.

⁴ The term "hazardous waste" is used because the material referred to in this discussion document is commonly known as hazardous waste. However, it is possible that an alternative term may be required to avoid any possibility of domestic legislation being automatically subjected to international requirements. This is because New Zealand is a Party to the Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal. This issue will need to be addressed in the event of any legislative amendments.

What hazardous waste is produced in New Zealand?

Using the Australia New Zealand Standard Industry Classification (Economically Significant Enterprises) criteria, the following industries⁵ are generating hazardous waste in New Zealand:

- health and community services: includes pharmaceuticals, drugs and medicines; hospital, dental and pathology waste; veterinary services; incinerator air emissions
- agriculture: includes waste agricultural chemicals
- oil and mining industries: includes oily sludges, flocculants, spent acid, and sulfide-bearing tailings
- manufacturing: a large producer of hazardous waste, particularly from food processing, tanneries and leather finishing, metal coating and finishing, timber treatment, printing; and in the manufacture of paper products, fertiliser and pesticide, chemical and rubber products, iron and steel, photographic and optical equipment, electronic equipment, and furniture
- construction: includes painting and decorating
- transport and storage: includes waste oil, solvents, ballast water, incinerator ash, air emissions
- personal and other services: includes drycleaners, photographic and film processors, hairdressing, and fire brigades.

Non-point-source hazardous waste, such as pesticide residues in agricultural run-off, is not addressed in this paper. It will continue to be managed under the RMA by local authorities, and may subsequently be incorporated into a national hazardous waste framework.

The estimated quantity of hazardous waste generated in New Zealand is at least 8,550,000 tonnes per year. This figure was extrapolated from information in the Tonkin and Taylor⁶ report, which uses disposal figures, survey information and estimated quantities for various regions. The figures provided for each of the nine regions surveyed, were used to calculate estimated figures for all regions in New Zealand. These figures were added together to obtain a total *estimated* quantity of hazardous waste generated in New Zealand.

⁵ Residential wastes are not addressed in this paper.

⁶ Tonkin & Taylor. 1998. *Identification of Hazardous Waste in New Zealand. Report prepared for the Ministry for the Environment, Wellington.*

2.2 The environmental effects of hazardous waste

Hazardous waste can sometimes be treated to reduce its hazardous properties. However, there are times when this is not technically possible or economically practical, and hazardous waste can then be:

- stored until adequate treatment becomes available
- “disposed” to landfills
- discharged to waste water treatment facilities
- incinerated
- exported.

Storing or disposing of hazardous waste does not always result in a reduction of risks to human and environmental health and safety. Tables showing the potential adverse environmental effects and risks during each stage of the hazardous waste life-path are presented in Appendix 6.

In general, the potential effects of hazardous waste on the environment include:

- contamination of groundwater by infiltration (eg from landfill leachate)
- contamination of surface waters (streams, rivers, lakes, etc) by direct disposal or run-off
- short- or long-term contamination of soils and sediments
- emissions of contaminants into the air from inadequate incineration processes, burning at landfills, and industrial processes.

How can hazardous waste enter the environment?

Hazardous waste passes through one or several of the following phases: generation, transport, storage, treatment, and disposal. Hazardous waste can be discharged to the environment during any one of these phases. Any such discharge has the potential to cause an adverse environmental effect within the meaning of the RMA; that is, to adversely effect the environment and ecosystems, including people and communities.

There are three potential exposure routes:

- permitted discharges from generation/treatment/storage/disposal facilities
- accidental discharges during transport, or at any point in the hazardous waste life-path
- illegal discharge.

Example 1

During the 1970s and 1980s wood-processing waste, including sawdust, plywood and particle board pieces, were dumped at a number of poorly controlled sites around the Auckland region. With most sites located on private land, the councils in the region still do not have a complete inventory. All sites found to date lack the environmental controls they would require today⁷.

At the Tallentire site, two gullies were filled for a number of years before the site was closed and poorly capped. The site is estimated to hold 5,000 cubic metres of material, comprising at least 90 percent sawdust and scrap plywood, some of which remains visible just below the surface. The dump site discharges contaminants into two streams, one of which springs from beneath the fill, its watercourse stained with leachate.

Initial investigations focused on heavy metal-based timber treatment chemicals. Contamination of the stream water by arsenic exceeds the Australia and New Zealand Environment and Conservation Council (ANZECC) guidelines and NZ Drinking Water Standards. Sediments in the stream bed are high in zinc, and arsenic levels are 20 times above levels considered acceptable. To date no testing has been carried out for persistent organic chemicals used in the timber industry at the time of dumping, but pentachlorophenol (PCP) and chlordane in the leachate is likely.

(Source: Auckland Regional Council)

These wastes create a significant risk to public health, flora and fauna on and near the site. Inorganic arsenic can cause a range of adverse chronic carcinogenic and non-carcinogenic health effects in humans. Chronic exposure of humans to PCP has been associated with a range of non-carcinogenic health effects, including irritation of the skin, mucous membranes and respiratory tract, signs of chloracne, neurasthenia, depression, headaches, porphyria and changes in kidney and liver function. The environmental effects are likely to be more severe.

(Source: Ministry for the Environment. 1997. Timber Treatment Guidelines)

⁷ While this example originated before the RMA, it shows poor management of hazardous waste can cause environmental problems which persist for a long time.

Solid hazardous waste

In New Zealand, solid hazardous waste is usually disposed to landfills. Most landfills are not designed and operated to modern, internationally accepted standards and do not have good controls over hazardous waste.⁸ As a result there is a significant risk of environmental contamination from hazardous landfill leachate entering soil and groundwater. There are also risks from landfill fires (a common occurrence in New Zealand⁹) discharging hazardous contaminants to air.

Example 2

Thousands of tonnes of rubble that could be contaminated with toxic polychlorinated biphenyls (PCBs) have been dumped throughout the upper North Island, according to a report in the *New Zealand Herald*. The spread of the environmentally persistent material has sparked an alert among authorities from Waikato to Northland. Several thousand tonnes are in Northland and Waikato landfills, while about 4,000 tonnes of rubble contaminated with low levels of PCBs have been stockpiled at the BHP New Zealand Steel mill site at Glenbrook, south of Auckland. Continuing investigations into PCB contamination at the Pacific Steel site on the Mangere inlet of the Manakau Harbour revealed the extent of the spread.

The Mangere contamination was discovered by chance in June. Since then officials have discovered that thousands of tonnes of suspect material, including the waste or flock mud from scrap processing, have gone to the Waipu landfill in Northland, Auckland's Redvale landfill and Hamilton's Horotiu landfill, parts of which are widely believed to leak into the Waikato River.

About 4,000 tonnes of soil contaminated with low levels of PCBs was also taken from Pacific Steel by the Slag Reduction Company to the BHP New Zealand Steel Glenbrook mill, where it is stored under cover. The Slag Reduction Company produces soil conditioner, which was applied to farms where 90 cows died recently, although no link to PCB poisoning has been established. Toxic PCBs used in electrical transformers are known to cause liver damage and respiratory problems in humans. They belong to the family of persistent man-made organochlorines, which include dioxins, a potential cause of cancer and other health problems in humans.

(Source: New Zealand Press Association 11/8/97 and Auckland Regional Council)

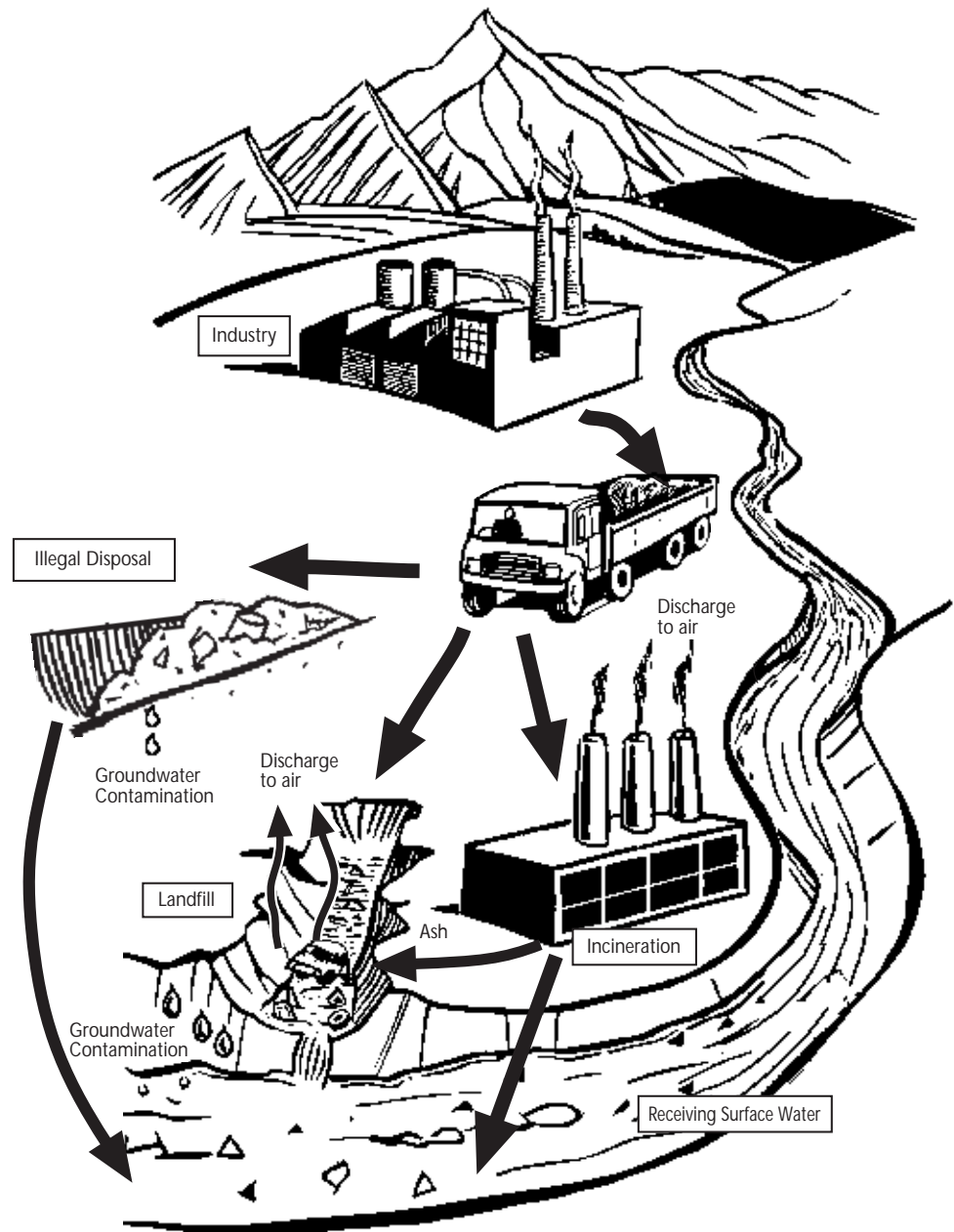
There are also safety issues associated with long-distance transport of highly hazardous waste. While the trend towards rationalisation and regionalisation of landfills will result in improvements to the environment, it will also increase transport distances for hazardous waste. Although accidents or leakages during the transport of hazardous waste present obvious risks to the environment, well designed systems and facilities can mitigate the risks.

⁸ Ministry for the Environment. 1995 Landfill Census. Ministry for the Environment: Wellington.

⁹ 1995 Landfill Census

Figure 1 gives a general idea of what happens to solid hazardous waste generated by New Zealand industry, from generation to disposal. It does not attempt to address all aspects of the hazardous waste life-cycle and does not include imported or exported products and wastes, recycling or recovery.

Fig 1: Solid Hazardous Waste



Liquid hazardous waste

Liquid hazardous waste differs from solid hazardous waste in the nature and scale of adverse effects on the receiving environment. Often liquid wastes are diluted with water to varying degrees, and a much larger amount of liquid hazardous waste (after dilution) is discharged via sewers than solid hazardous waste is discharged to landfill, or burned in incinerators.



Liquid hazardous waste in urban areas is usually discharged from industrial premises to the municipal sewerage system. There they are mixed with trade waste from other sources and domestic waste containing a small amount of hazardous waste. The combined liquid waste stream is discharged into a municipal waste water treatment facility.

Waste water treatment facilities themselves generate waste streams. The liquid waste stream, or “final effluent”, is usually discharged to a receiving water body such as a river, harbour, estuary or the open ocean. Sometimes final effluent is discharged to land. The “solid” waste stream is in the form of coarse screenings and sewage sludge. This is disposed in landfills, or applied to land as “biosolids”, where it is sometimes used as a soil conditioner.

The adverse environmental effects of inadequately treated liquid hazardous waste include the contamination of:

- groundwater, as a result of leachate when contaminated sludges are disposed to land
- air, when contaminated sludges are incinerated and when the storage or disposal of sludges causes odour
- land, due to inappropriate application of contaminated sludges/effluents
- surface water and groundwater, due to contaminated final effluent.

Example 3

Routine dredging of the harbour in Auckland is required to maintain depths for ship movements. This is essential at the dry dock. Historically sediments were simply dredged and dumped in the outer Hauraki Gulf. More recently the sediments have been sampled and analysed to determine the level of risk they present to the environment. Elevated levels of a range of chemicals, including heavy metals and persistent organic chemicals, were detected.

Earlier this century, a marine engineer developed a new anti-foulant to reduce fuel wastage caused by organic growths on ship hulls. Called boot-top because of its colour, it consisted of a combination of bitumen, mercury, DDT and other components. It was applied in a two- to three-metre-wide strip at the waterline of the hull. The material was water-blasted off in dry dock. The resulting debris entered the harbour, becoming incorporated in harbour sediments.

Use of this material stopped some time ago. Dredging has been postponed pending a more detailed analysis of the risks associated with the contaminants and options for their removal.

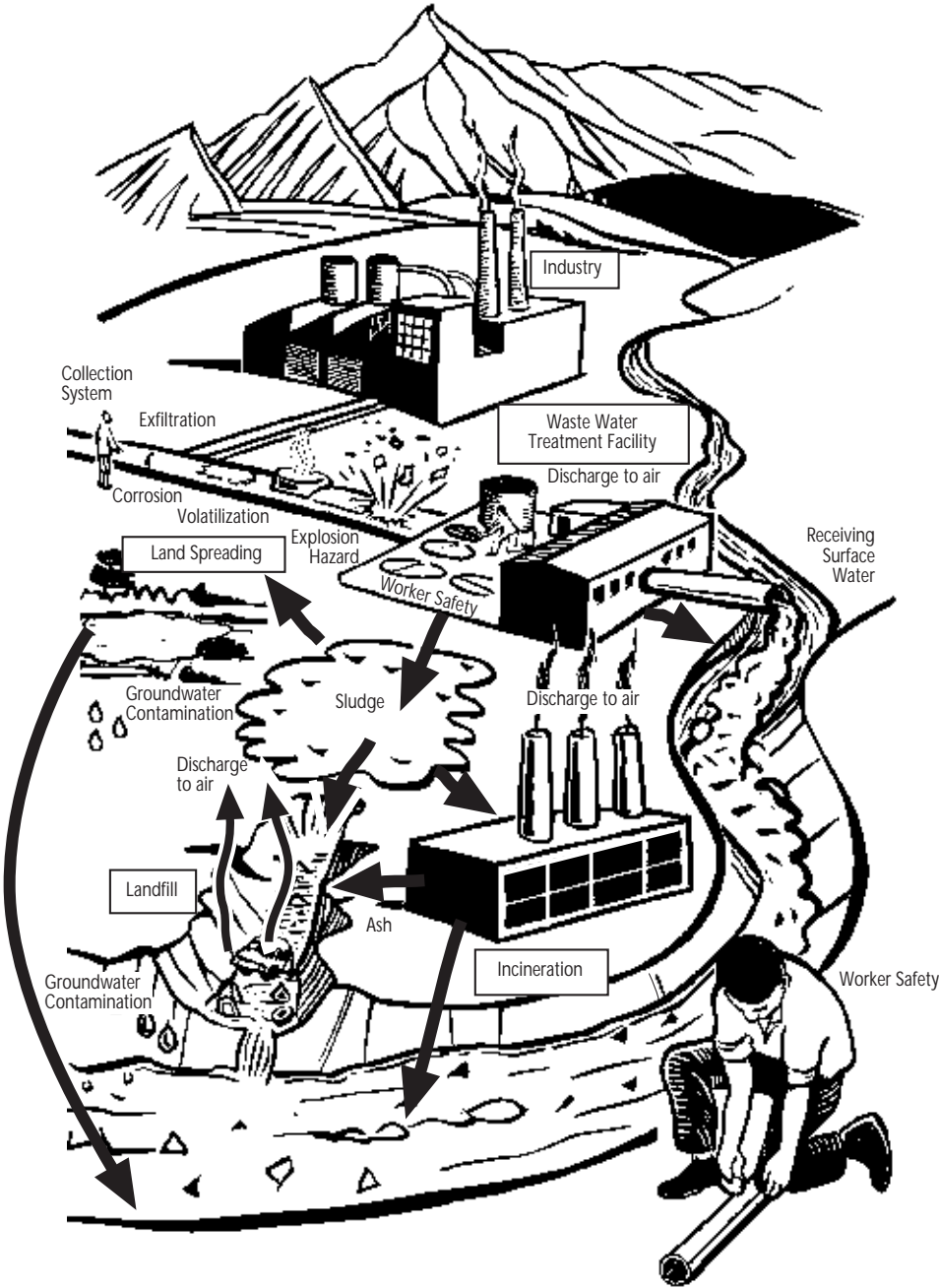
(Source: Auckland Regional Council)

Auckland health officials have yet to be given full details of serious marine pollution discovered by the Defence Force five years ago but made public only last week. The force admitted to the Auckland Regional Council on May 25 that contamination of the sea floor off the Devonport naval base with toxins such as DDT and mercury will cost millions of dollars to clean up.

Health experts say people should not take seafood from a zone 150m from the dry-dock outfall where contamination is greatest. Officials meet tomorrow to plan a clean-up, which could cost \$9.9 million. The Navy denies liability, but accepts that the Crown, as owner of the seabed, could face a bill for dumping up to 110,000 cubic metres of waste.

(Source: New Zealand Herald 17 June 1998)

Fig 2: Liquid Hazardous Waste discharged to Sewer



Gaseous hazardous waste

Gaseous wastes enter the environment from industry stacks, incinerator emissions, burning at landfills, vehicle emissions, landfill gas emissions, etc. Many of these emissions are difficult to monitor and control. The adverse effects of these emissions are varied and often difficult to determine.

Example 4

A loader truck driver had to be treated by ambulance staff after he inhaled a mystery blue haze at the Levin landfill. The driver was working at the landfill when he drove over a pile of empty chemical bags and 20-litre containers, dumped there from a Shannon tannery.

The bags had contained sodium sulphite, hydrated lime and cement powder. The driver noticed a blue smoky haze rising from the pile and leaned out of his loader cab to investigate. He breathed in the substance and started to cough. He became dizzy and nauseous, his lips went numb and he felt 'tingly'. He called emergency services. A 200-metre exclusion zone was established around the area and fire fighters in splash suits were sent in to investigate.

A senior station officer said it appeared that the smoky haze had been caused by a reaction of sodium sulphite powder residue with other chemicals. It was possible that sodium sulphite in the chemical bags had mixed with residue liquid in the containers. He said that the landfill lies to the south of Levin and a strong westerly wind had helped dissipate the chemical haze. There was no threat to the town, or to residents in the area.

(Source: Evening Standard 30/7/98)

The Ministry for the Environment is working, in another programme, to set standards for air emissions. These will form part of the overall hazardous waste management framework. Receiving environment standards and guidelines for the substances more commonly used or discharged in New Zealand are being produced for air under the Ministry's Standards and Guidelines Programme. The effects of toxic and ecotoxic substances on air quality are being addressed through the review of the Ambient Air Quality Guidelines. These standards will be used as a basis for determining the controls necessary on aspects of the life-cycle of a substance (eg labelling, storage). The Organochlorines Programme addresses DDT, PCB and dioxins.

Work on these programmes will be coordinated to ensure integrated and consistent management of gaseous hazardous waste.

2.3 Managing hazardous waste in New Zealand

Government hazardous waste management policy

Current Government hazardous waste management policy is to develop national standards and guidelines for landfills and hazardous substance disposal. In addition, the Government's 1992 Waste Management Policy is aimed at ensuring that, as far as practicable, New Zealand's waste generators meet the costs of the waste they produce, and at encouraging the implementation of the internationally recognised hierarchy of reduction, reuse, recycling, recovery and residual management. The objective is to minimise waste generation, promote economic efficiency and avoid environmental and health risks.

The Government's Environment 2010 Strategy recommends that where there is an absence of comprehensive information, a precautionary approach¹⁰ is required. The strategy states the Government's specific goals for hazardous substances as:

- managing waste to reduce risks to the environment and public health to levels that are widely agreed as being socially acceptable
- managing or preventing the harmful effects of hazardous substances in order to protect the environment and well-being of people and communities so as to enable the maximum net national benefit to be achieved
- ensuring, as far as practicable, that waste generators meet the costs of managing the hazardous waste they produce.

How do we currently manage hazardous waste in New Zealand ?

Hazardous waste in New Zealand is controlled through three key statutes:¹¹

- Resource Management Act 1991 (RMA)
- Local Government Act 1974 (LGA)
- Hazardous Substances and New Organisms Act 1996 (HSNO).

Resource Management Act (RMA)

The Resource Management Act is concerned with management of the environment. Under the RMA, central government may issue National Environmental Standards and/or a National Policy Statement concerning hazardous waste management. A National Environmental Standard is a technical standard and may also prescribe the method for its implementation. The purpose of a National Policy Statement is to state policies on matters of national significance.

¹⁰ Principle 15 of the Rio Declaration on Environment and Development states that, in order to protect the environment, the precautionary approach should be widely applied: "Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."

¹¹ The Health Act 1956, Radiation Protection Act 1965 and the Agricultural Compounds and Veterinary Medicines Act 1997 are also of importance.

Local authorities have primary responsibility for hazardous waste in their regions and districts as this relates to land use and the discharge of contaminants (which includes hazardous substances and wastes). Under s33 of the Act, regional and territorial authorities may delegate functions and powers to one another.

Regional councils

Regional councils are primarily responsible for managing *discharges* of contaminants under s15 of the Act. These discharges may occur at any time during the storage, use, disposal or transport of hazardous substances (including hazardous waste),¹² and may also emanate from contaminated sites created by past land uses. Regional councils retain responsibility for managing hazardous substances (including hazardous waste) within the coastal marine area, and the beds of rivers and lakes. They also have a role advocating and facilitating a consistent regime for the management of hazardous waste throughout the region through regional policy statements and plans.

Territorial authorities

Territorial authorities are made responsible for managing *land use* for the avoidance, remediation or mitigation of any adverse effects arising from the storage, use or transportation of hazardous substances (including hazardous waste). The nature of the controls required in a district plan or through resource consents depends on the local environment, including the characteristics and requirements of existing activities.

The Government is proposing changes to the RMA to clarify the roles of regional and territorial authorities. These changes make clear their respective roles in relation to hazardous substances.

Local Government Act (LGA)

The LGA is concerned with the provision of services. Under the LGA, territorial authorities are service providers and as such have the primary responsibility for hazardous waste disposal. District councils are required to develop waste plans which must provide for collection, reduction, reuse, recycling, recovery, residual management and treatment and disposal of waste. The LGA empowers district councils to own, build and operate facilities for the treatment, storage or disposal of waste, including hazardous waste. Under the LGA, district councils can make bylaws for controlling hazardous waste and regulating the disposal of trade or industrial hazardous waste, and hence they can set controls and charges for the disposal of hazardous waste to landfills, sewers, incinerators, etc.

¹² Hazardous wastes are hazardous substances as defined in section 2 of the RMA.

Hazardous Substances and New Organisms Act (HSNO)

The HSNO Act manages the life-cycle of imported or manufactured hazardous substances, and includes regulations for the control, storage, transport and disposal of these substances, regardless of their location in New Zealand. It is important to note that the term “hazardous substances” under the HSNO is restricted to those substances that are deliberately *manufactured* or *imported* and which meet the thresholds outlined in the regulations to the Act. Hazardous waste not imported or deliberately manufactured is not covered by HSNO.

Controls applied by the Environmental Risk Management Authority under the Act are specific to the substance and apply irrespective of location. Under this Act, territorial authorities have an enforcement function; there is no function for regional councils. Many substances regulated by HSNO are not classified as hazardous waste (see Figure 3).

Relationship between the HSNO and the RMA

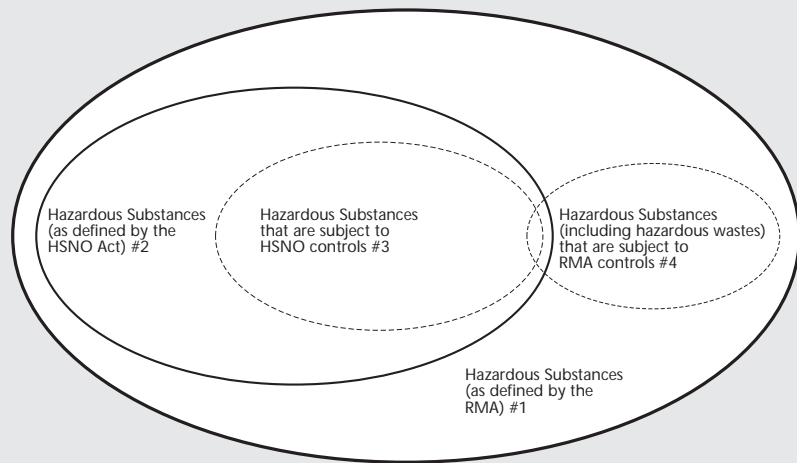
The RMA preceded the HSNO by five years. When reforming the law relating to hazardous substances, Parliament chose not to repeal those parts of the RMA which refer to the management of hazardous substances by local authorities and central government. However, the RMA was amended by the HSNO and now has a definition for a “hazardous substance” which is broader than that used under the HSNO: “*Hazardous substance*” includes, but is not limited to, any substance defined in section 2 of the Hazardous Substances and New Organisms Act 1996 as a hazardous substance.

In this paper, we follow the broader RMA definition for “hazardous substance”. (Note: hazardous waste is also commonly defined as either unwanted substances, or substances destined for storage, treatment or disposal. These definitions have no legal status in New Zealand.)

The RMA focuses on managing the adverse environmental effects of activities, including the discharge of contaminants into the environment and the storage, use and disposal of hazardous substances. Where HSNO controls exist for a substance, these will form the basic requirements. Further controls to deal with site-specific issues and cumulative effects of discharge of these substances to the environment can then be applied under the RMA. The two Acts are therefore complementary. In a situation where a substance falls under the controls developed for both Acts, the more stringent will apply.

HSNO and RMA controls

The large bold circle (#1) represents the total set of hazardous substances and this set is defined by the definition contained with the RM Act. The smaller bold circle (#2) represents the hazardous substances defined by the HSNO definition. These substances are also defined by the RM Act definition. The large dotted circle (#3) represents those substances for which controls have been developed under the HSNO Act. Likewise, the small dotted circle (#4) represents those substances (usually hazardous wastes) for which controls have been developed under the RM Act. The intersection of the circles shows how controls can exist for a particular substance under both Acts, in which case, the more stringent controls are the ones which apply.



What is wrong with the current management system ?

There are a number of problems with current management of hazardous waste, which may be causing significant adverse environmental effects. If management deficiencies are not addressed, hazardous waste may also result in significant future adverse environmental effects. Management problems include:

- failure of current management systems to detect some hazardous waste
- inconsistent application of RMA controls across regions allowing for movement of hazardous waste to regions and facilities with less strict controls
- inadequate and variable controls on the discharge of hazardous waste to landfills and waste water treatment facilities
- poor controls on hazardous waste facilities.

A number of recent reports found significant problems with hazardous waste management in New Zealand. A summary of the key findings is presented in Appendix 5. Significant problems arising from inadequate control and monitoring of hazardous waste include:

- hazardous waste deliberately or inadvertently not being declared, or being “misrepresented” to landfill operators
- hazardous waste “disappearing” and being disposed of inappropriately
- hazardous waste being illegally discharged to sewers and stormwater drains
- few incentives to minimise the generation of hazardous waste.

The absence of minimum performance requirements for the siting, design and operation of hazardous waste facilities has resulted in widely varying management practices for facilities, particularly landfills, across the country. Some of these problems arise because there has been no clear and consistently used definition of “hazardous waste”. As a result, wastes regarded as hazardous in some regions may not be treated as hazardous in others.



Finally, there is insufficient reliable information on the amount and types of hazardous waste generated and disposed of in New Zealand.

Focus Question 1:

Do you think there are other problems with the current management of hazardous waste? If so, please provide details.

2.4 International approaches to managing hazardous waste

In 1997 the Ministry for the Environment commissioned a study of hazardous waste management in five overseas countries which have common features with New Zealand. The resulting report, *A Review of Overseas Approaches to the Management and Landfilling of Hazardous Waste*, (1997, Environment and Business Group) outlines the regulatory frameworks in place for managing hazardous waste in Australia, Canada, Denmark, Germany and the United States.

The five countries reviewed provide excellent examples of international best practice for managing and landfilling hazardous waste, and share common features that are good indicators of the minimum requirements that should be adopted in New Zealand.

Significant common features are:

- clear definitions for hazardous waste
- comprehensive policies at all levels on waste and hazardous waste
- dedicated legislation and regulations for waste and hazardous waste
- implementation of a waste management hierarchy, with preference given to reduction, reuse, recycling and recovery above residual management
- application of the user/polluter pays principle
- requirements for generators, transporters and hazardous waste facilities including:
 - minimum performance requirements for the siting, design and operation of hazardous waste facilities
 - hazardous waste characterisation criteria
 - registration and/or licensing
 - tracking of hazardous waste movements
 - reporting to regulatory authorities
 - exemptions for small quantity generators
- increasing emphasis on self-monitoring by industry and a decreased involvement of regulatory agencies.

In addition, recent international trends reflect an increasingly strong focus on reduction of the use of toxic materials, waste prevention, product life-cycle analysis, and cleaner production. Most countries included in the review have specific waste-disposal reduction targets of between 50 and 60 percent by the year 2000, and are using economic instruments such as taxes or levies on waste disposal to achieve these targets.

A key finding of the study is that all countries covered in the review deal with significant issues related to the economic liabilities arising from the historical mismanagement of hazardous substances and wastes. Importantly, cost/benefit analyses undertaken by the countries reviewed indicate that hazardous waste regulations result in a net overall benefit in terms of avoided potential environmental effects and decreased raw material use and waste-disposal costs.

In addition, countries with well-established regulatory frameworks such as Denmark, Germany and the United States show that dedicated hazardous waste regulations can have a beneficial effect on the economy. This is due to the stimulation of waste industries, treatment technologies, research and consulting services in combination with decreasing raw material use.

2.5 Issues for Māori

The management and disposal of hazardous waste are of particular significance for Māori. Potentially, severe impacts – including contamination and damage – could occur to:

- natural taonga, in particular water (harbours, estuaries, rivers and lakes)
- traditional food supplies and mahinga kai
- wāhi tapu, wāhi taonga and other significant sites.

A number of claims to the Waitangi Tribunal have addressed the impacts of hazardous waste, including the Motunui, Kaituna and Manukau claims. Some iwi and hapū resource management plans include statements of concern regarding the pollution of water, water bodies and other taonga, and policies for their protection from contamination. Hazardous waste issues are fundamental to the kaitiaki responsibility to protect and nurture the physical well-being and mauri of resources and places.

"The mauri is the life force that ensures...that all species it accommodates will have continual life. The mauri can not be intercepted or desecrated...The mauri is defenceless against components that are not part of the natural environment. When the mauri is harmed, so too is the well-being of the people."

Huakina Development Trust v Waikato Water Board (1987) 2 NZLR 188

The Government is committed to consulting with Māori under the Treaty of Waitangi (Te Tiriti o Waitangi) principles of active protection and partnership. These principles are also reflected in the RMA in s6(e), which recognises and provides for, as a matter of national importance, the relationship between Māori, their culture and traditions with their lands, water, wāhi tapu, and other taonga; s7(a) which requires those exercising powers under the Act to have regard to kaitiakitanga; and, s8, requiring the principles of the Treaty of Waitangi (Te Tiriti o Waitangi) to be taken into account.

The Government is required to ensure that hazardous waste management policy addresses Māori concerns, and will consult with iwi and hapū to determine the best way to do this.

The Kaikarae estuary in Otago was once an important site of cultural activity for Kai Tahu, including the gathering of Mahinga kai. The estuary is now heavily polluted due to discharges from industry to the water body. It can no longer be used as it once was and the local hapū have lost mana because of the loss of their kai.

(Kai Tahu ki Otago, Natural Resource Management Plan).

Focus Question 2:

What impact is hazardous waste having on your taonga? What are the key issues that a hazardous waste management framework needs to include to address Māori values?

Part 3: Elements of an effective hazardous waste management framework

Part 3 of this paper presents and evaluates a range of options for defining, controlling and monitoring hazardous waste. These options have been developed by the Ministry in consultation with local government practitioners, industry, environmental groups and people with expertise in hazardous waste. The Hazardous Waste Advisory Group has been of particular assistance in developing these options.

3.1 Guiding principles for effective hazardous waste management

The key outcomes to be achieved through effective hazardous waste management are:

- to minimise unacceptable risks to people and the environment resulting from generation, storage, transport, treatment and disposal of hazardous waste; and
- to minimise risks of contaminated sites and associated clean-up costs resulting from poor management of hazardous waste.

The following principles will guide the design of an effective system for environmentally safe management and disposal of hazardous waste in New Zealand.

Enhanced environmental outcomes

Hazardous waste management should enhance sustainable management of natural and physical resources.

An agreed national definition

“Hazardous waste” should be clearly defined and used consistently in hazardous waste plans and policies.

Clear statutory responsibilities for controlling hazardous waste

People who generate, transport, handle, treat or dispose of hazardous waste need to have a clear understanding of their statutory responsibilities.

Hazardous waste minimisation

There should be effective incentives for waste generators to reduce the amount of hazardous waste generated and to treat hazardous waste before disposal, or disincentives to generate hazardous waste or to dispose of untreated hazardous waste.

Costs borne by generators of hazardous waste

In keeping with the Government's waste management policy, hazardous waste generators should, as far as practicable, meet the costs of treatment and disposal of the wastes that they produce.

Consistency of risk management

If risks are deemed acceptable or unacceptable under the HSNO, they should be treated as acceptable or unacceptable under the RMA.

Appropriateness to the scale of the problem

A national hazardous waste management framework should reflect the scale and nature of the problem in New Zealand.

Awareness of obligations under the Treaty of Waitangi (Te Tiriti o Waitangi)

Hazardous waste management should be responsive to the Treaty principle of active protection. In keeping with the Government's Treaty obligations, Māori will be consulted during the development of the hazardous waste management framework.

Good information systems/effective monitoring

We need to know how much hazardous waste is produced in New Zealand, what sort of hazardous waste is produced, and how it is treated or disposed.

Flexibility to incorporate advances in technology

We need to have access to the best available technology for transporting, treating, storing and disposing of hazardous waste.

Focus Question 3:

Are there other principles you consider important for effective hazardous waste management? Please give details.

The essential components of a management system

An assessment of national and international hazardous waste management systems shows that there are three essential components, which need to be treated separately:

- **defining hazardous waste**
- **controlling hazardous waste**
- **monitoring and enforcing hazardous waste controls.**

Alternative approaches to each of these components of a hazardous waste management framework are discussed in the following sections. The key criteria against which these alternatives will be assessed are listed below and discussed more fully in the relevant sections.

Criteria for assessing management system options

Defining hazardous waste:

International criteria:

- compliance with international conventions and agreements to which New Zealand is a party or is working towards becoming a party
- marketing advantages: promotion of “clean green image” by enabling validation of controls

National criteria:

- compatibility with existing legislation and government waste policy
- practicality and ease of use
- provides certainty for users
- adaptable as circumstances change
- appropriate for New Zealand.

Controlling hazardous waste:

- meets environmental objectives
- fair distribution of costs and responsibilities
- compatibility with existing legislation
- ability to be enforced
- practicality and ease of use
- cost effectiveness
- meets Māori cultural objectives, does not desecrate Māori cultural sites.

Monitoring and enforcing hazardous waste controls

- quality, type and relevance of data
- ability to trace hazardous waste movements
- ease of use
- cost effectiveness
- ease of funding
- compatibility with existing legislation.

Focus Question 4:

Are there other criteria you consider important for comparing the options?

If so, how do you think the options should be assessed?

3.2 Defining hazardous waste

Why we need to define hazardous waste

The basis of any effective management system for hazardous waste is a clear and workable definition of what constitutes a hazardous waste, so as to:

provide a clear description of the wastes subject to a national hazardous waste management framework.

A clear and consistent national definition will enable people to establish the hazardous or non-hazardous nature of a waste in cases of uncertainty, and will also assist industry, regulators and the public in its effective management by providing clear guidance. This will minimise the risks of adverse environmental effects resulting from poor management of hazardous waste.

Five options for defining hazardous waste in New Zealand have been developed following analysis of international and national definitions, with specific reference to the New Zealand context. A wide range of hazardous waste practitioners were consulted in the development of the options.

The analysis undertaken in developing the options is presented in Appendix 2, together with an assessment of the options against key criteria. The options are presented below.

Definition Option 1: No national definition

This option maintains the status quo, that is, an ad hoc collection of varying definitions. Under this option the RMA would effectively define a hazardous waste via its potential discharge into (effect on) the environment.

Advantages:

- no work required
- lower initial resource outlay
- enables regions/districts to adopt their own classifications to suit the activities in their areas.

Disadvantages:

- will result in inconsistent definitions and controls
- no clear guidance for determining what constitutes a hazardous waste
- requires a high level of knowledge about the waste itself and its effects on the environment
- requires expensive case-by-case analysis of the degree of hazard and the risks involved
- there is a greater level of uncertainty about environmental effects resulting from hazardous waste due to lack of sufficient information.

Definition Option 2: Generic description

Under this option hazardous waste would be defined through an inclusive, plain-English textual description without reference to lists or thresholds, eg the draft Joint Australian New Zealand Standard, EV/6 (MS/59).¹³

Advantages:

- relative administrative simplicity
- avoidance of analytical expenses
- flexibility.

Disadvantages:

- imprecise
- no specific guidance for determining hazardous waste
- does not take account of strength and degree of hazardousness
- provides insufficient information
- difficult to interpret
- uncertain costs and benefits of such a definition.

Definition Option 3: Lists

Lists (of industries/processes, hazardous waste, hazardous constituents of waste) can be used to identify hazardous waste that is subject to management; eg, the Australian lists enable generators to know whether or not their wastes are subject to regulation.

Advantages:

- relative simplicity
- eliminates the need to analyse wastes
- practical
- internationally accepted practice.

Disadvantages:

- cross-referencing of most of the international lists is necessary (although a simple list developed for New Zealand would not present this problem)
- potential time delays and costs involved in adding or deleting wastes
- inflexibility: a review process is required to add or remove wastes from the list
- lists alone may not be consistent with the RMA and HSNO
- there is the presumption that wastes that are not on the list are not hazardous.

¹³ This defines hazardous waste as a “component of the waste stream which by its characteristics poses a threat to public health, safety or the environment.”

Definition Option 4: Use of thresholds

Under this option, hazardous waste thresholds would set degrees of hazard below which any waste is not considered hazardous. Hazardous thresholds have been developed internationally and could be adapted to the New Zealand environment.

Advantages:

- introduces certainty
- internationally proven
- clear guidance of the level of risk of a particular waste
- prevents unnecessary management of low-level hazardous waste
- thresholds developed for the HSNO can potentially be adapted for hazardous waste
- would establish good linkages with the HSNO
- expense of threshold testing may be an incentive to minimise hazardous waste.

Disadvantages:

- expensive analytical testing may be required.
- may encourage inappropriate dilution
- there is the presumption that wastes below the hazard threshold are “safe”
- threshold may not take account of cumulative effects or synergistic effects arising from contact with other hazardous substances.

Definition Option 5: Single list plus hazardous characteristic thresholds

Hazardous effect thresholds could be used to provide certainty and complement a New Zealand-specific list.

Advantages:

- a list would
 - enable people to know immediately which wastes are hazardous
 - largely eliminate the need for expensive analytical testing
- hazardous characteristic thresholds would:
 - provide clear guidance of the level of risk of potentially hazardous waste
 - allow thresholds already developed for the HSNO to be adapted for hazardous waste
- the combination of a list and thresholds would:
 - cover all hazardous waste
 - mirror the more common approaches adopted internationally.

Disadvantages:

- difficulty in developing a comprehensive, New Zealand-focused list
- where a list is disputed, expensive analytical testing might be required
- the need to regularly review the appropriateness of the list.

Most Effective Option for Defining Hazardous Waste

Our preliminary assessment of the options for defining hazardous waste against the key criteria (see Appendix 1 Table 1) indicates that Option 5: Single list plus hazardous characteristics thresholds best meets the key criteria for defining hazardous waste.

Focus Question 5:

- (a) *Do you think that a list in combination with hazardous characteristics thresholds is the best option for defining hazardous waste? Please give reasons for your answer.*
- (b) *How can we take account of Māori definitions of hazardous waste?*

3.3 Controlling the disposal of hazardous waste

Controlling the disposal of hazardous waste is essential to avoid adverse environmental effects from poor disposal practices. Current controls under the RMA and LGA are only partially effective in minimising adverse effects. The following control options have been developed by assessing international approaches and their fit within the New Zealand regulatory environment. In particular, the options have been developed to allow good integration with the HSNO approach to controlling the disposal of hazardous



substances. Regulations for the disposal of hazardous substances are being developed under the HSNO, and it is intended that the regulations controlling hazardous waste will be complementary.

Avoiding the adverse effects of hazardous wastes involves not only avoiding poor disposal practice but also minimising the production of hazardous wastes. The impact of any controls on waste minimisation should also be considered: that is, controls must send the right signals to waste generators, as they are responsible for minimising and treating the waste they produce.

Designing integrated controls to avoid cross-media effects

An integrated approach needs to be taken to controlling the disposal of hazardous waste to land, air and water, because controlling the disposal of solid hazardous waste separately from liquid hazardous waste, say, could introduce potential for hazardous waste to “disappear” between dissimilar systems. For example, tighter controls on landfills without corresponding controls on other disposal options may result in a transfer of hazardous waste disposal to waste water treatment facilities.

Another issue is sludges, which fall between the categories of liquid hazardous waste and solid hazardous waste. If the sludge is diluted and discharged to sewer, it will be treated quite differently to waste that is treated by settling and thickening and disposed of as a solid waste. Consistency in control is needed to ensure that hazardous wastes on the boundaries of the categories do not slip between controls.

In the following section, we will deal with the disposal of hazardous waste generally. Disposal of trade waste will be looked at in section 3.4.

Options for Controlling Hazardous Waste

The analysis undertaken in developing the options for controlling hazardous waste is presented in Appendix 3, together with an assessment of the options against key criteria. The options are presented below.

Control Option 1: Status quo – RMA controls at regional and local level

Under the RMA, regional councils are able to control the disposal of hazardous waste through the resource consent process (see section 2.3 above). However, in practice, the majority of existing facilities disposing of hazardous waste do not yet have resource consents. This appears to be because the consenting process is more time consuming and difficult than operators or local authorities anticipated. Where facilities are consented, the lack of a clear definition means that disposal of the majority of hazardous waste is largely uncontrolled.

Option 1 would mean no change to the current situation with respect to disposal of hazardous waste. In terms of the key criteria, the resource consent process is not currently meeting environmental objectives, as discussed in Part 2 above.

Control Option 2: Hazardous waste acceptance criteria through guidelines or regulations under the RMA

The disposal of hazardous waste could be controlled by setting acceptance criteria for hazardous waste at point of discharge to a facility (eg landfill, waste water treatment facility, incinerator). “Indirect” discharges via a landfill, sewer or incinerator would be controlled by setting acceptance criteria at the facility.

This option does not change the standards that apply to the discharge from a treatment facility. It assumes that the environmental problems are caused by the controls on what is accepted at those facilities. Developing acceptance criteria would require classifying hazardous waste according to degree of hazard, and then specifying which facilities are capable of accepting specific hazardous waste. The acceptance of hazardous waste to facilities would be dependent on the performance of the landfill, incinerator, or waste water treatment facility.

Hazardous waste acceptance criteria could be implemented through either guidelines or a National Environmental Standard under the RMA. A National Environmental Standard would specify the technical requirements for treatment facilities. These standards would then be implemented by regional councils through regional plans and consents. Regional councils would monitor and enforce the standards. Alternatively, guidelines would then be used by regional councils to develop plans and determine resource consents. They would take time to impact on environmental outcomes. The most effective mechanism is likely to be an National Environmental Standard.

This option would require:

- setting acceptance criteria for a hazardous waste going to a landfill, sewage treatment plant or incinerator, and generalising the facility class
- setting a generic list of specific hazardous constituent concentrations that are not to be exceeded in a TCLP-type test (see below)
- specifying hazardous waste that is not to be discharged
- including provisions that in certain landfills/sewage treatment plants/incinerators, certain types of hazardous waste is only a percentage of total waste.

Technical Implications

Development of acceptance criteria will need to take account of the degree of hazard presented by a particular waste versus the standard of the facility. This is because hazardous wastes differ in the degree of risk they pose, depending on their quantity, concentration, combination, persistence in the environment and other characteristics. Similarly, hazardous waste facilities – including landfills, sewage treatment plants and incinerators – differ with respect to the quality of treatment and environmental protection they can provide. It is the combination of both factors that determines the effect of a hazardous waste on the receiving environment.

Beyond the definition of hazardous waste, there will need to be a standard national classification of particular hazardous wastes according to their potential/type of risk. To a large extent, we will be able to follow international hazardous waste classifications. However, a methodology for classifying hazardous waste will need to be developed. It is likely that the HSNO method for classifying hazardous substances could be adapted.

Criteria will also need to be developed for classifying hazardous waste facilities. Such facilities differ significantly in terms of siting, design and operational management. There will be a considerable number of facilities in New Zealand that are unsuitable for accepting *any kind* of treated or untreated hazardous waste. Many of these facilities already prohibit acceptance of hazardous waste, but some may find that they are no longer able to accept hazardous waste.

To establish whether a hazardous waste meets the designated acceptance criteria for a particular facility, sampling and testing protocols will need to be developed. The two most well-known testing procedures are the USEPA Toxicity Characteristic Leaching Procedure (TCLP) tests, and a European Union-recommended test based on the German Standard Method DIN 38414-S4. The TCLP test is already being used by a number of landfills in New Zealand.

Developing a hazardous waste acceptance matrix

As already mentioned, the suitability of a facility to be used for the disposal of hazardous waste depends on two factors: the degree of hazard presented by the waste, and the kind of disposal facility. Table 2 relates these two factors and thus provides an example of a potential hazardous waste acceptance matrix. It is important to note that the levels of acceptance used in the table are indicative only. As discussed above, developing acceptance criteria for facilities will require further work and consultation with industries and regulators dealing with hazardous waste.

Table 2: Example of a potential hazardous waste acceptance matrix

Wastes	Facilities		
	Class 1 Facility	Class 2 Facility	Class 3 Facility
Waste A Very High level of hazard	Discretionary	Prohibited	Prohibited
Waste B High level of hazard	Discretionary	Prohibited	Prohibited
Waste C Medium level of hazard	Discretionary	Discretionary	Prohibited
Waste D Low level of hazard	Controlled	Limited discretionary	Prohibited

In the above table, a Class 1 facility is assumed to be a “state-of-the-art” facility sited in an appropriate location; Class 2 and Class 3 facilities have comparatively fewer features. Similarly, wastes falling into Group A are those with highly hazardous characteristics, exhibiting environmental persistence and other properties that make them a high environmental risk. Wastes in other groups rank comparatively lower in terms of environmental risk.

This approach is already being used for selected timber treatment wastes and has the potential to be extended to other wastes. International literature and overseas regulations also provide a range of wastes and hazardous constituent thresholds acceptable for landfill, though such lists are by no means exhaustive. It is likely that this approach will need to be supplemented by individual risk assessments for certain hazardous waste that has not been assigned any acceptance criteria.

The same principles as those discussed for discharge to land apply to discharge to waste water treatment facilities and incinerators, namely:

- some types of hazardous waste pose a greater risk than others
- standards of waste water treatment facilities and incinerators differ: the level of treatment offered by some will be substantially higher than that available from others, with a resulting higher level of protection of the receiving environment.

Consequently, the matrix approach outlined for land could also be applied to the disposal of hazardous waste to incinerators and waste water treatment facilities. For example, a Class 1 waste water treatment facility would be defined as a “state-of-the-art” facility able to provide the highest level of treatment, while Class 2 facilities would provide a more basic standard of treatment and Class 3 treatment plants may be those that only serve small residential communities.

This approach would be compatible with the establishment of trade waste bylaws as described by the New Zealand Standard 9201 (Standards New Zealand, 1995. *Model General Bylaws Trade Waste*, ch. 23). This standard provides interim guidance on establishing trade waste bylaws and addresses the setting of acceptance standards, sampling procedures and trade waste charges.

As for disposal to land, a discharge framework for disposal to the sewer system and for disposal to incineration needs to be closely linked to ambient standards for the receiving environments, ie marine or fresh water. The development of such standards is one of the components of the Environmental Standards and Guidelines Programme of the Ministry for the Environment.

It is important to note that while the matrix approach has the potential to control liquid hazardous waste, there are significant legislative issues that need to be resolved before this can happen. Liquid hazardous waste is discussed in section 3.4

Implications of acceptance criteria for hazardous waste generators, facility operators and regulators

Advantages:

- clarity on what wastes can be accepted at landfills, waste water treatment facilities and incinerators
- greater responsibility for generators of hazardous waste
- clarity about where hazardous waste can be disposed, and therefore which wastes should be minimised or recycled
- clear responsibilities for hazardous waste facility operators
- good alignment with current international and New Zealand practices
- greater certainty of environmental protection and that resource consents will not be breached
- reduced risk of delayed adverse effects through controls at point of disposal rather than at point of discharge into the environment
- consistency with the HSNO approach to controlling the disposal of hazardous substances.
- ensures nationally consistent minimum standards
- relatively easy and cheap to implement.

Disadvantages:

- generalisations have to be made about facility processes and design
- exemptions may be necessary for domestic and small volumes
- quantity is not considered, because acceptance criteria are based on inclusion/exclusion by definition of the waste being disposed
- the cost of assessing and grading landfills and waste water treatment facilities (although costs could be reduced by maximising existing information provided through the resource consent process)
- lack of suitable landfills may result in transfer of part of the waste stream to waste water treatment facilities
- suitable disposal sites may be some distance from point of generation, resulting in increased transport costs and increased environmental risks associated with transport
- tighter controls at point of disposal may result in an increase in illegal disposal if there is no system in operation for monitoring movements of hazardous waste.

Focus Question 6:

- (a) What problems do you foresee in developing and implementing a national classification of hazardous waste facilities?*
- (b) Which mechanism, or range of mechanisms (eg regulatory or non-regulatory), do you think would be most effective for implementing hazardous waste acceptance criteria: guidelines or regulations? Please give reasons for your answer.*

Control Option 3: Ambient environmental standards through regulations, with guidelines for acceptance criteria

This approach involves setting ambient environmental standards or environmental “protection” values to enable performance-based management of hazardous waste disposal. It would require setting concentration limits for specific substances in groundwater, surface water, air and land; a landfill, waste water treatment facility or incinerator could therefore be considered as providing treatment rather than discharge.

This option would be implemented through the development of a National Environmental Standard, which would set a national minimum standard for the receiving environment. Guidelines would also need to be developed for acceptance criteria to meet these standards. The standards would be implemented, monitored and enforced by regional councils.

Ambient environmental standards would require that the discharge into:

- land, air or water not exceed a maximum level for any particular substance, or
- water not exceed a maximum value beyond a reasonable mixing zone; or
- a landfill, sewage treatment plant or incinerator not:
 - exceed a set level for the hazardous substance outside the boundary of the facility, or a set level in groundwater
 - result in an unprotected person at the facility being exposed to a set level for that substance.

Technical Implications

The primary purpose of discharge controls is to protect the ambient environment. Defining the parameters for acceptable background levels is an important step in this process.

It is important that levels for hazardous waste be compatible with those set by the Environmental Risk Management Authority under the HSNO. Some guidance already exists, though only for a limited range of contaminants and receiving environments. Existing guides include:

- Australia and New Zealand Environment and Conservation Council, 1998. *Draft Australian Water Quality Guidelines*. ANZECC:Canberra
- the former ANZECC *Guidelines* (ANZECC, 1992a and 1992b)
- Ministry of Health, 1995. *New Zealand Drinking Water Standards*. Ministry of Health:Wellington

Under this environmental performance-based approach, a disposal facility has the responsibility to decide whether the substance they accept will result in non-compliance with an environmental requirement. Such a decision may be beyond the resources and technical expertise of some facility operators, so guidance would be critical if this approach were taken. This could take the form of an approved code of practice, or disposal guidelines produced by industry or regulatory bodies, or default acceptance criteria based on the different classes of facilities.

In practice, a discharge from a facility may be composed of not one but a complex mixture of substances. So while individual substances may not exceed their specified levels, the cumulative effect could be adverse. Therefore, consideration will have to be given to how ambient standards might apply to wastes comprising mixtures of hazardous substances.

Implications of ambient environmental standards for hazardous waste generators, facility operators and regulators

Advantages:

- an effects/risk-based approach in line with the RMA
- environmental goals clearly state the outcomes to be achieved
- provides autonomy, with guidance where required
- not limited by technology
- consistent with the HSNO approach to controlling the disposal of hazardous substances.

Disadvantages:

- the approach is similar to the current management regime, which is not succeeding in controlling the adverse effects of hazardous waste or minimising hazardous waste
- there are issues concerning the validity of attaching numbers, or threshold levels, to environmental protection
- prosecution is effectively only possible after the fact of environmental degradation, which creates the potential for contaminated sites
- controls are aimed at the disposal facility rather than generator
- the approach is complex and therefore provides less clarity for resource users.

Focus Question 7:

What problems do you foresee in developing ambient environmental standards?

Control Option 4: Hazardous waste acceptance criteria regulations in combination with regulations for ambient environmental standards

This option involves setting hazardous waste acceptance criteria at the point of discharge *and* ambient environmental goals to be achieved. This is a combination of Options 2 and 3, so it will have the same features already discussed, but creates a double layer of safety as the discharge controls for hazardous waste are focused at two points:

- the point where the hazardous waste is discharged into the environment
- the quality of the receiving environment.

This option goes beyond the effects-based “end-of-pipe” type of control and would provide more effective control by giving added environmental protection, ie earlier controls through acceptance criteria, as well as effects-based environmental controls to capture any possible residual effects.

This option would be implemented through the development of National Environmental Standards under the RMA for ambient standards and for acceptance criteria. This would set a national minimum standard for the receiving environment and provide certainty as to how this could be achieved. These standards would be implemented, monitored and enforced by regional councils.

Implications of acceptance criteria in combination with environmental goals for hazardous waste generators, facility operators and regulators

Advantages:

- clarity as to what wastes can be accepted at landfills and waste water treatment facilities
- clarity about where hazardous waste can be disposed, and therefore about which wastes should be minimised or recycled
- clear environmental goals
- clear responsibilities for hazardous waste facility operators
- greater certainty of environmental protection
- environmental objectives likely to be met, because this option provides controls both at the point of disposal and the point of discharge into the environment
- at least as stringent as most current international and New Zealand practices, and so will enhance our clean green image
- closely mirrors the preferred HSNO approach to controlling hazardous substances.

Disadvantages:

The disadvantages are the same as those for Options 2 and 3 above.

Most Effective Option for Controlling the Disposal of Hazardous Waste

Our preliminary assessment of options against key criteria (see Appendix 2 Table 3 for a summary) indicates that Option 4: Combination of acceptance criteria and ambient standards is the most effective option for controlling the disposal of hazardous waste.

Focus Question 8:

- (a) *Do you think that Option 4: Combination of acceptance criteria and ambient standards is the best approach for controlling the disposal of hazardous waste? Please give reasons for your answer.*
- (b) *What do you think the implications will be of adopting this approach?*

3.4 Controlling the disposal of liquid hazardous waste to sewer (trade waste)

The control of liquid hazardous waste is important for meeting the goals of this review. On the one hand, there are environmental problems from current management. On the other hand, there are unique problems involved in developing a control mechanism for disposal of trade waste that adequately protects the environment. We propose two options for management of liquid hazardous waste: (1) tightening control at the point of discharge to the environment, and (2) tightening controls both at the point of entering the environment and the point of entry to the sewer.



The key objectives of controlling the disposal of liquid hazardous waste to sewer are:

- to ensure that the polluter pays for appropriate disposal
- to provide effective management of environmental risk
- to prevent cross-media effects
- to provide cost-effective methods of disposal
- to provide incentives for waste minimisation and treatment

Background

Recent reports¹⁴ have shown that most of the hazardous waste disposed of in New Zealand is disposed as liquid hazardous waste to sewer.

Trade waste in the form of liquid hazardous waste is often discharged to sewer and transported to a waste water treatment facility, where the sewage undergoes treatment. There are a range of treatment methods used by waste water treatments in New Zealand:

- primary treatment: removal of solids by screening, filtration or precipitation
- secondary treatment, including oxidation ponds: biological decomposition of organic material and nutrient removal
- tertiary or advanced treatment: chemical treatment, specialist filtration.

Each of the above methods has a different level of efficiency for the removal of conventional pollutants and toxic constituents. For example, primary treatment removes solids only and so is not effective in removing hazardous constituents. Secondary treatment systems are only slightly more effective.

¹⁴ Auckland Regional Hazardous Waste Survey. 1996. Auckland Regional Council and the Environmental Business Group: Auckland

Tertiary systems are designed to provide treatment for specific waste constituents that cannot be removed effectively through primary or secondary treatment processes. They are usually effective in removing hazardous constituents from the liquid phase, but many hazardous constituents are transferred to the resulting sludge component, which still requires disposal.

Traditionally waste water treatment facilities have been owned and operated by territorial local authorities. Over time the way these facilities have been managed has changed. There are now three types of management structures: territorial local authorities, Local Authority Trading Enterprises (LATES), and private companies. Any options for the environmental management of liquid hazardous waste should be robust enough to survive in a changing environment, independent of control issues. The Government has agreed to undertake a comprehensive review of the water, waste water and storm water sector. Close contact will be maintained with this review to ensure that final outcomes are consistent and complimentary.

Environmental problems

There are a number of environmental problems arising from the current management system for liquid hazardous waste going to sewer.

- Many resource consents are set not at environmentally sound levels but at standards that can be met by the waste water treatment facilities' technical capabilities.
- Many waste water treatment facilities may not be consistently meeting their resource consent conditions for final effluent and sludge discharge quality requirements.
- Resource consent conditions are generally checked biannually and many of the facilities that are meeting the requirements at those biannual sampling events, may not necessarily be doing so at other times.
- When certain hazardous wastes are discharged to sewer, the treatment processes are affected. For example, the micro-organisms necessary for treatment at some waste water treatment facilities are entirely knocked out. As a result, sewage containing hazardous constituents may be discharged to the environment, essentially untreated.
- During periods of excess rain, some waste water treatment facilities are unable to treat all the incoming waste due to increased volumes, so that untreated or primary treated sewage containing hazardous constituents is discharged to the environment.
- There is an increased concentration of toxic pollutants in sewage sludge.

The adverse environmental effects resulting from inadequately treated liquid hazardous wastes disposed to sewer include contamination of:

- surface or ground water, as a result of leachate when sludges are disposed to landfills
- surface water, due to contaminated final effluent.
- land, due to inappropriate application of sludge and effluent
- air, when sludges are incinerated.

There are a number of inherent difficulties in managing liquid hazardous wastes:

- industries and sewers are fixed stationary structures
- it is often not practical or cost effective for industry to take their liquid hazardous waste to other disposal facilities
- many industries cannot economically treat the hazardous wastes they produce
- future industrial development will have options of locating according to treatment facilities, but currently, many industries are already inappropriately sited.

This raises a number of transitional issues regarding tightening of controls of liquid hazardous waste disposal. These will be carefully considered in the development of management options.

Problems applying proposed control options to trade waste

The proposals advocated in this paper for managing the disposal of solid hazardous waste cannot satisfactorily be applied to liquid hazardous waste going to sewer because the current legislation does not allow input controls to be imposed. Liquid hazardous waste is controlled through two pieces of legislation: the discharge from the waste water treatment facility is controlled by the RMA, while the discharge from the generator is managed under the LGA.

There are two possibilities for addressing the trade waste problem. Controls can either (1) be tightened at the point where wastes are discharged to the environment, or (2) controls can be tightened at the point where hazardous wastes are discharged into the sewerage system *and* at the point of discharge into the environment.

Option 1: Tighten controls at the point of discharge to the environment

This essentially means enhancing the present legislative system. Under this option the LGA will continue to be used to regulate trade waste entering the sewerage system and the RMA to regulate waste water treatment facility effluent. Under the LGA, territorial authorities are empowered to undertake trade waste disposal and may make trade waste bylaws.¹⁵ The power to make bylaws applies to the discharge of trade waste into any sewerage drain controlled by the local authority. A model bylaw for trade wastes is available, and many authorities have adopted this (with modification) to suit their circumstances.¹⁶ The use of bylaws appears to be limited to protection of the sewerage infrastructure and recovering the cost of treating the hazardous constituent in sewage, so the Act cannot be used to control trade waste to avoid adverse environmental effects.



Under this option, ambient National Environmental Standards would be developed under the RMA and the model bylaws would be revised. Waste water treatment facilities would be required to meet the new ambient standards.

This assumes that the LGA is an adequate mechanism for managing discharge of trade wastes to sewers, and that inadequate enforcement is simply due to a lack of resources or political will by councils to address the issue. Resource consent holders are in a good position to control what goes into the waste water treatment

facility and thereby the environment, and environmental controls are only required where wastes are discharged to the environment. Increased pressure to beneficially use sewage sludges is putting pressure on waste water treatment facility operators to ensure that trade waste inputs comply with contaminant limits for land application. This, coupled with enforcement of tighter ambient discharge standards, will encourage territorial authorities to better enforce bylaws. The costs of non-compliance are very high and provide a major incentive for the consent holder to “go back up the pipe” and regulate industries that cause resource consents to be exceeded. The LGA provides adequate means to do this.

¹⁵ Part XXXVIII of the LGA (ss 488–501).

¹⁶ NZ9201, ch. 23(Int), 1995.

However, it has been argued that trade waste bylaws are not adequately controlling the hazardous discharges to waste water treatment facilities for the following reasons:

- there is no requirement to account for environmental effects
- the application of bylaws is discretionary to individual councils
- bylaws are not properly set and do not adequately address treatment limitations
- bylaws are not subject to national or regional standards
- there are a number of Crown entities which are exempt from control by bylaw
- there is inadequate enforcement and monitoring of bylaws because:
 - there is difficulty finding who is putting what into the system
 - there is no right to enter the property to undertake spot checks
 - penalties are too low and do not match the RMA penalties
- the Government's generator-pays policy is difficult to implement because:
 - the charging regime used by territorial local authorities varies around the country, and the charging mechanisms are often unclear, unnecessarily complicated, do not address current "polluter pays" concepts, and in many cases do not allow for full recovery of territorial authority costs
 - in some areas charges are low or non-existent and price signals cannot be set in order to create an incentive not to pollute
- it is difficult to charge trade waste generators the cost of environmental damage or treatment
- territorial authorities are liable for the waste discharged to trade waste sewers
- territorial authorities have little incentive to encourage waste generators to minimise the waste they produce or to find better alternatives to discharging the waste to the trade waste sewer.

In addition, continuing with the current system where controls are set at the point of discharge into the environment is uncertain and could take considerable time to take effect. Timeliness is an issue, because if tighter controls for disposal to land become regulations, “cross-media” effects will occur: waste normally destined for a landfill may be disposed to the sewer unless parallel controls are introduced.

Finally, the effect of revised model bylaws is likely to be limited because their uptake and enforcement is voluntary under the LGA.

Option 2: Tighten controls at the point where hazardous wastes are discharged into the sewerage system and at the point of discharge to the environment.

If the LGA as it stands is not adequate for controlling discharge to sewers then changes will need to be made to ensure that it can be adequately controlled. There are two legislative options for this, involving either the LGA or the RMA.

Amending the LGA

The LGA could be amended to make it more responsive to environmental effects. However, amending the LGA to protect against adverse environmental effects and transfer the costs of environmental protection to hazardous waste generators would require substantial changes, effectively changing the purpose of the Act. The changes may have implications for other parts of the Act that have not been considered by this review. For instance it is unlikely that Crown exemptions would be lifted.

Amending the RMA

The RMA cannot be used to control discharges to a waste water treatment facility because the Act does not apply to the discharge of trade waste to sewers, as the definition of water excludes water in a pipe. However, s15 of the RMA controls the discharge of contaminants into the environment and this section could be amended to cover the discharge of hazardous waste to sewers.

Amending the RMA to set controls at the point where trade wastes are discharged into the sewerage system would provide environmental protection, an appropriate charging regime, and an appropriate penalty system. However, it would also have implications for the administration of trade waste discharges. The controlling authorities would be regional councils, in line with their function to control discharge of contaminants under s15. This would take control of inputs into waste water treatment facilities away from the operator of the system and could therefore reduce the ability of the operator to effectively run a sewerage system.

The Ministry for the Environment recognises that no-one wants duplication of control and that changes to the current system may have implications on compliance cost. We will ensure that any proposed options addresses these issues.

Focus Question 9:

- a) *Should liquid hazardous wastes going to sewer be controlled at the point where wastes are discharged into the sewerage system, or at the point where treated effluent is discharged to the environment, or both?*
- b) *Is there a problem with using bylaws to control discharges to sewers?*
- c) *Could we make changes to the LGA which would overcome these problems?*
- d) *Should we use consents and plans to control discharges to sewers?*
- e) *Who should have control of inputs to a sewer system?*
- f) *Can you see any problems in implementing the proposals for control of liquid hazardous waste going to sewer?*

3.5 Monitoring and enforcing hazardous waste controls

The tightening of hazardous waste controls will not in itself solve all the problems identified in this paper. A monitoring system will also be required and enforcement of controls will be necessary to ensure compliance.

Administrative authorities will need to determine if environmental objectives are being met.

It is proposed that monitoring and enforcement be improved in two ways: firstly, to provide regulation or guidance on tighter monitoring under the RMA to ensure that environmental standards are met; secondly, to monitor to gather information on the generation, transport, storage, treatment and disposal of hazardous waste. Reliable information will facilitate regional and national reporting requirements, eg OECD environmental reporting requirements.

The key objectives of a hazardous waste monitoring system

An effective monitoring system should:

- monitor the environmental effects of hazardous waste management
- provide data on the types, quantities and origins of hazardous waste generated
- track the movement of hazardous waste from generation to final disposal, including all hazardous waste management facilities (generation, treatment, storage, and disposal).

The recording and reporting of hazardous waste through all stages of its life-path has many benefits.

- The recording of individual waste loads from their point of generation to the point of disposal helps to ensure that hazardous waste is not “lost” en route.
- The ability to monitor individual hazardous waste streams back to their source will clarify and increase the accountability of the waste generator, and therefore enable better control of illegal dumping.
- Reporting of hazardous waste generation and disposal will facilitate the monitoring of resource consents for hazardous waste facilities.
- Reporting waste loads transported and accepted at disposal facilities will assist with the identification of new hazardous waste generators.

- Regular and standardised reports of hazardous waste generation will facilitate “state-of-the-environment” reporting, and consequently serve as a useful tool to fulfil waste data reporting obligations associated with international agreements.
- Information about the sources and quantities of hazardous waste generated, transported and disposed is useful for transport planning, because it can be used to minimise transport risks and in planning road works.
- Knowledge of the location and movements of hazardous waste loads will be helpful in planning emergency responses for incidents involving hazardous waste.

The analysis undertaken in developing the options for monitoring and enforcing hazardous waste controls is presented in Appendix 4, together with an assessment of the options against key criteria. The options are presented below.

Option 1:

RMA resource consent monitoring

Under the RMA, regional councils are able to control hazardous waste through the resource consent process. However, in practice the majority of facilities and operators dealing with hazardous waste either do not yet have resource consents or do not require resource consents. Where facilities are consented, controlled discharge of contaminants into the environment is permitted and regional councils assess the consents and monitor the discharges regularly. It is not possible to track the movement of hazardous waste or monitor hazardous waste generators as part of resource consent conditions.

This option would mean no change to the current situation with respect to monitoring and enforcement. In terms of the key objectives, RMA resource consent monitoring would be most effective if consistent standards for disposal and treatment facilities could be implemented to ensure that all operators were subject to the same requirements. However, this option does not provide for controlling transport of hazardous waste (consent not required under the RMA) or storage of hazardous waste (consent not usually required under the RMA).

Advantages:

- no additional cost
- no additional bureaucracy
- local authorities can tailor systems to available resources.

Disadvantages:

- environmental objectives are not currently being met
- a reliance on other initiatives to minimise adverse effects of hazardous waste
- an inability to keep track of hazardous waste
- inconsistent standards between regions
- inappropriate trans-regional movement of hazardous waste
- it does not allow for control of transport or storage of hazardous waste, because resource consents are not normally required for those activities.¹⁷

Focus Question 10:

- (a) *How can resource consent monitoring of hazardous waste be improved?*
- (b) *Do we need to move beyond the current resource monitoring of hazardous waste?*

¹⁷ The transportation of dangerous goods, including hazardous waste, is addressed in Draft Rule 45001: Land Transport Safety (Dangerous Goods).

Option 2:

Mandatory record keeping in association with an industry code of practice

Following international trends, this option combines two approaches to deliver a cost-effective system that provides data, tracks hazardous waste and facilitates monitoring of environmental effects. Under this option, all generators, transporters, storage and treatment facilities and disposal site operators would be required to keep accurate records of all movements of wastes that are hazardous (including waste hazardous substances). Records would be required to be made available to regulators at any time. Record keeping requirements would be set by a National Environmental Standard under the RMA. This option would facilitate basic monitoring and policing of hazardous waste generators, transporters, treatment and disposal facilities and disposal site operators.

In addition, all industries generating, transporting, storing, treating or disposing of hazardous waste could opt to be part of a voluntary system to control hazardous waste. This system would be based on compliance with an agreed code of practice. Those operating under a code of practice would only deal with others who are also following the code of practice.

A code of practice for good environmental management of hazardous waste could, for example, address training and expertise, waste minimisation and emergency procedures. To ensure consistency of information, a code of practice should also specify reporting requirements. Those operating under a code of practice would report regularly to regional councils. This would allow regional councils to better enforce hazardous waste controls and to identify “missing” hazardous waste.

There are a number of reasons why organisations would want to be part of the voluntary system. Those who manage hazardous wastes in a sound manner would be given recognition and therefore a market advantage. This would drive the development of the system. It would be to disposers’ advantage to accept waste only from others who comply with the code of practice, and so on up the chain.

Advantages:

- mandatory record keeping will enable tracking of illegal discharges and subsequent enforcement
- mandatory record keeping will stop hazardous materials falling between the HSNO and Hazardous Waste Regulations
- industry can make their own decisions regarding the merits of joining the system
- a code of practice promotes consistent data recording in a useable format
- key hazardous wastes can be targeted and traced
- recognises environmentally responsible resource users
- achieves the goals of ensuring hazardous wastes are disposed of appropriately, tracking hazardous waste movements, providing data and facilitating monitoring of environmental effects
- although voluntary, it is similar to the HSNO approach.

Disadvantages:

- there are implementation issues: it may take some time to get the system up and running.
- will require education and training programmes
- there will be some costs in recording and reporting procedures (USEPA estimate 20 hours/annum)
- will take some time to develop a comprehensive code of practice
- requires a critical number of operators to join the scheme for success

Focus Question 11:

- (a) *What are the implications of Option 2: Mandatory record keeping in association with an industry code of practice for recording of hazardous waste movements?*
- (b) *Who should develop a hazardous waste code of practice?*

Option 3:

Mandatory record keeping and reporting

This proposal is similar to Option 2 in that it would require records of hazardous waste to be kept and regular reports to regional councils. This will allow regional councils to better enforce hazardous waste controls and to identify “missing” hazardous waste. In RMA terms, this option would make holding and transporting of hazardous waste a permitted activity so long as standard recording and reporting requirements were met.

The main difference between the two options is that the reporting requirement of all those dealing with hazardous waste would be mandatory. This would require amendment to the RMA.

Advantages:

- administrative costs picked up by generators
- other advantages as for Option 2.

Disadvantages:

- will require amendment to the RMA
- there are implementation issues: it may take some time to get the system up and running.
- other disadvantages as for Option 2.

Focus Question 12:

What are the implications of mandatory record keeping and reporting?

Option 4:

Licensing of transporters under the LGA

Under the LGA, a territorial authority is empowered to make bylaws for the control of hazardous waste, including hazardous liquid trade wastes. It can also make bylaws for regulating the collection and transportation of waste (s542). The Act indicates that bylaws for waste management shall have regard to the environment and economic costs and benefits for the district, and shall ensure that the management of waste does not cause a nuisance or be injurious to health.

Such bylaws may provide for the licensing of persons who carry out the collection and transportation of waste, including the provision of reports setting out the quantities and types of waste collected and transported, and the source and destination of such waste. The LGA could therefore be used to implement a monitoring system for the collection and transportation of hazardous waste.

Advantages:

- compatible with current legislation
- administration costs can be pushed back to generators.

Disadvantages:

- licensed transporters can only carry solid or containerised waste, so this system cannot address discharge of gaseous and liquid hazardous waste
- because generators and facilities storing/treating/disposing of hazardous waste are not licensed, it is difficult to check transporter reporting
- will not ensure that generators are using licensed transporters or disposing hazardous waste appropriately
- unlikely to be nationally consistent, because implementation of model bylaws by territorial local authorities, under the LGA, is voluntary
- will require education and training programme
- potentially high implementation and administration costs and bureaucracy for organisations crossing district boundaries.

Focus Question 13:

What are the implications of licensing transporters under the LGA?

Option 5:

Manifest tracking

This option would require full manifest tracking of all hazardous waste copied to and compiled by the system administrator. This system is likely to require some form of licensing.

For example, a hazardous waste generator might obtain sign-off and documentation from a hazardous waste transporter, which could then be linked with documentation from a disposal facility by the administrator to ensure that the hazardous waste actually reached its final destination. The cost of administration could be reduced by a system of spot checking and auditing of random manifests, thus avoiding the need for matching all forms.



Advantages:

- provides detailed tracking of information, allowing discrepancies to be rapidly identified
- could be applicable for very high-hazard wastes
- provides for control of hazardous waste at all stages from generation to disposal.

Disadvantages:

- high administration costs to match manifests of all hazardous waste movements to ensure that the final destination is reached.
- will require legislative changes
- will require training and education programmes.

Example: The ANZECC Tracking System

One example of manifest tracking is the Australia New Zealand Environment and Conservation Council (ANZECC) system. The manifest has five parts, each with carbon copies. Parts A and D are filled in by the generator, and include information such as the generator's name, address, licence number, waste classification/code numbers, waste quantity, intended waste treatment and disposal method and location. The generator retains a carbon copy of both parts A and D. Part D is sent off to the responsible administrator as a record that the waste has left the site. The original of part A is forwarded on intact with the remainder of the form to the transporter.

All parts (A, B, C and D) have the same unique notice number, which uniquely identifies the particular load of waste. The transporter completes part B of the form, including details such as name, address, licence number, and vehicle registration number. The transporter retains a carbon copy of Parts A and B for their own records. When the information is entered into a database, the regulator can routinely check that the transporter is only carting waste types for which the vehicle is appropriately equipped (via the licence number and associated conditions).

If the waste is as described on the form, the treatment plant completes part C of the form with their licence number and type of treatment. The treatment plant retains a carbon copy of parts A, B and C for records and sends the original of C on to the administrator. Data from the forms is fed into a database and a report is generated on all waste movements. Forms are tallied to ensure that waste went where it was said to go and was disposed of appropriately.

Focus Question 14:

What are the implications of using manifest tracking?

Most Effective Option for Monitoring and Enforcing Hazardous Waste Controls

Our preliminary assessment of options against key criteria (see Appendix 3 Table 4) indicates that Option 2: Mandatory record keeping in association with a code of practice, is the most effective option for monitoring and enforcing hazardous waste controls.

Focus Question 15:

- (a) Is Option 2: Mandatory record keeping in association with an industry code of practice, likely to be the most effective framework for monitoring and enforcing hazardous waste controls? Please give reasons for your answer.*
- (b) Are there any other options that we should consider that have not been suggested here? Please provide details.*

Part 4: Options for a national waste management framework

4.1 Approaches to improving hazardous waste management

Hazardous waste policy will be developed within a Resource Management Act (RMA) framework. However, parts of the proposed framework may require legislative amendment, which will take some time. If amendment is required, interim policy will be developed and some interim options may fall within the powers of the Local Government Act (LGA).

The Government could improve hazardous waste management by adopting a combination of:

- education and encouragement
- making regulations under the RMA (ie National Environmental Standards)
- National Policy Statements under the RMA
- amending existing legislation.

The implications of each approach are discussed below.

Education and encouragement by way of guidelines, model bylaws and workshops

The Ministry for the Environment is empowered by the Environment Act to issue advice about environmental management. Any change in environmental outcomes requires a voluntary response from households, industry and local authorities. Education has the potential to change the behaviour of individuals and assist individuals and organisations, including councils and industry, to use new systems and processes.

Sometimes guidelines are the only policy instrument available when legislation does not enable central government controls. For example, the LGA is administered entirely by local authorities and central government's role is limited to issuing guidelines, model bylaws, conducting workshops and seminars, producing information kits, etc.

However, because of the voluntary nature of guidelines, certain key criteria for a hazardous waste framework may be compromised. For example, the likelihood of national consistency is low, and the implementation of guidelines is subject to interpretation, which may result in a compromise of their objectives. Nevertheless, there will still be aspects of the framework where guidelines and model bylaws may be suitable or the only mechanisms available. For example, guidelines for education purposes, or model bylaws for charging regimes for waste-water treatment.

Regulation through National Environmental Standards under the RMA

National Environmental Standards (NESs) are regulations under s43 of the RMA. They prescribe technical standards for the use, development and protection of natural and physical resources, including standards relating to contaminants, water quality, air quality, or soil quality in relation to the discharge of contaminants.

An NES has the advantage of being able to provide a degree of certainty about environmental effects by standardising minimum standards for hazardous waste. A disadvantage is that an NES may result in an overly restrictive regime for some regions, or in costly reporting requirements, which is why the public consultation elements of NES development are so important. As NESs are likely to be minimum standards, it may sometimes be the case that they are not restrictive enough, in which case local authorities will need to supplement controls through their plans and resource consent processes if the desired level of environmental protection at the local level is to be achieved.

Amendments to existing legislation

A National Environmental Standard would not be able to override existing resource consent conditions unless the RMA is amended. The Government is considering an amendment to the RMA to enable review of resource consents on promulgation of National Environmental Standards. The RMA is also unable to control the discharge of hazardous trade waste to a sewer. (Potential amendments are discussed in Part 3.4, which deals with trade wastes.)

Other mechanisms

The RMA provides for the possibility of a National Policy Statement for hazardous waste. This has been discounted because it is unable to provide mechanisms specific enough for hazardous waste management.

The various approaches presented above are able to incorporate or provide options for a variety of hazardous waste management mechanisms. These could include specifications or guidance for monitoring and reporting systems, formulas for trade waste charging, methods for auditing hazardous waste recording, and the use of market mechanisms for managing hazardous waste. Market mechanisms could include taxing polluters, tradeable permits for hazardous waste, and/or incentive methods for pollution reduction.

4.2 Framework options

This paper has presented options for defining, controlling and monitoring hazardous waste. Each of the individual options has been assessed against key criteria and preliminary best options have been identified. The next task is to combine the most effective of these options into an overall system for managing hazardous waste.

The way that hazardous waste is defined and controlled will determine the management framework and have an impact on the monitoring method. Therefore, the following options have been based around the proposed control mechanisms and associated monitoring methods.

Framework Option 1: Ambient environmental standards through regulations (with guidelines for interpretation) and improved RMA consent monitoring

This option is effectively a tightening of current RMA controls and monitoring. It involves the least amount of change to the present system. Improved RMA consent monitoring would be used to enforce ambient environmental standards.

Implementation, monitoring and enforcement of the ambient standards would be the responsibility of regional councils, given their responsibility for management of contaminants under s15 of the RMA.

Framework Option 2: Hazardous waste acceptance criteria through guidelines or regulations and mandatory record keeping in association with a code of practice

This option requires controls on what goes into a hazardous waste facility (acceptance criteria). The use of acceptance criteria would require tightening current RMA consent monitoring, and mandatory record keeping in association with an industry code of practice.

Implementation, monitoring and enforcement of the guidelines or the standards would be the responsibility of regional councils, given their responsibility for management of contaminants under s15 of the RMA.

Framework Option 3: Hazardous waste acceptance criteria regulations with regulations for ambient environmental standards and mandatory record keeping in association with a code of practice

This option involves setting environmental outcomes through a combination of hazardous waste acceptance criteria *and* ambient standards. It would require additional monitoring through mandatory record keeping in association with a code of practice. This would need to be complemented by improved RMA consent monitoring.

Implementation, monitoring and enforcement of the standards would be the responsibility of regional councils, given their responsibility for management of contaminants under s15 of the RMA.

4.3 Criteria for evaluating framework options

To make an informed choice between different options for a hazardous waste management framework, we need to establish criteria against which we can evaluate the alternatives. s32 of the RMA sets out a process for evaluating benefits and costs of alternative methods and compares these on the basis of criteria set out in set out in s32 (1)(c) of the Act.

After obtaining feedback on the options presented in this paper, we will undertake a more detailed evaluation of methods and policies, based on the process set out in the RMA.

The Ministry proposes that, in addition to the criteria set out in s32 of the RMA, the following criteria be used as the basis for making comparisons among policy options for hazardous waste:

Environmental benefits

Methods will be assessed on the basis of the environmental benefits they create, including their effects (including cumulative effects) on:

- natural and physical resources
- ecosystems
- human health
- social and cultural factors
- Māori
- other matters listed in s2 of the Fourth Schedule of the RMA.

Cost effectiveness

The costs of each alternative are assessed against the extent to which objectives are likely to be achieved.

Practicality and ease of use

To be effective, management systems must be practical and straightforward to administer.

Compatibility with international conventions and agreements

Domestic waste policy must be compatible with international conventions and agreements, eg the Basel Convention on the Transboundary Movement of Hazardous Waste.

Compatibility with existing legislation and government waste policy

Although legislation can be changed, our first priority is to explore methods that can work within the existing legislation. Amending legislation takes time, which will cause delays implementing the framework.

Provide certainty for users

The method must clearly set out the responsibilities of all parties.

Focus Question 16:

- (a) Which of these framework options will most effectively reduce risks posed by the disposal or treatment of hazardous waste? Please give your reasons.
- (b) What, if any, alternative options do you think might be more effective?
- (c) What implications do you see for implementing hazardous waste controls through regulations under the RMA?
- (d) What implications do you see for implementing hazardous waste controls through guidelines?
- (e) What are the alternatives?

Appendices

Appendix 1:

Developing options for defining hazardous waste

This appendix presents an overview of the analysis undertaken in developing the options for defining hazardous waste and an assessment of the options against key criteria.

Current definitions of hazardous waste in New Zealand

Currently there is no consistent national definition of hazardous waste.

Different local authorities use different definitions, often utilising or amending overseas definitions, while some choose not to define it at all. Māori may also define hazardous waste differently. This has resulted in an ad hoc collection of definitions, including:

- OECD classification system for hazardous waste, which is largely qualitative and does not take into account the actual strength or degree of hazard of waste
- Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal, which is based on the OECD classification system
- New Zealand Waste Identification Code (NZWIC), a slightly modified and truncated version of the system used in the Basel Convention, which has been adopted in the Government's Waste Analysis Protocol
- Hazardous Substances and New Organisms Act 1996, which defines "hazardous substance" (potentially including hazardous waste) as any substance:
 - (a) With one or more of the following intrinsic properties:
 - (i) Explosiveness
 - (ii) Flammability
 - (iii) A capacity to oxidise
 - (iv) Toxicity (including chronic toxicity)
 - (v) Corrosiveness
 - (vi) Ecotoxicity with or without bio-accumulation

(b) Which on contact with air or water (other than air or water where the temperature or pressure has been artificially decreased) generates a substance with any one or more of the properties specified in paragraph (a) of this definition.

A lower limit for each of these properties is provided for in regulations under s74(b) of the Act. Below this limit, the substance would not be captured by the Act.

- Resource Management Act 1991, which expands the HSNO definition of hazardous substances to state: “*Hazardous substance*” includes, but is not limited to, any substance defined in section 2 of the *Hazardous Substances and New Organisms Act 1996* as a hazardous substance.
- Māori perspective, whereby generally any waste that affects the mauri (the life force or the very essence of the well-being of all living things) is a hazardous waste.

The consequences of this lack of a clear and consistent definition are:

- no clear guidance for those who are unsure whether or not they have a hazardous waste
- an inconsistent application of RMA controls across the country, which may lead to transfer of wastes to facilities with lower costs and lesser (and possibly inadequate) controls
- a greater risk of adverse environmental effects resulting from poor understanding about what constitutes hazardous waste.

International approaches to defining hazardous waste

Given the complexity of hazardous waste management, it is not surprising that there are significant differences in the approach taken by various countries, regions and organisations to defining hazardous waste. The problem has been recognised for some time at the international level because of the need to reach an agreed definition for the purposes of international agreements.

The *Review of Overseas Approaches to the Management and Landfilling of Hazardous Waste* (1997, Environment and Business Group) found that all the countries investigated shared a tiered approach to defining hazardous waste, with the following common elements:

- *a list of hazardous substances*
- *a list of hazardous characteristics* such as toxicity, ecotoxicity and flammability
- *thresholds* to determine whether a waste is hazardous or not.

Essential characteristics of a hazardous waste definition

A definition of hazardous waste should have the following characteristics, based on those criteria established for assessing all of the management options.

- **Compatible with international conventions and agreements**
A New Zealand definition must be compatible with international agreements and conventions. New Zealand is a signatory to a series of international agreements and instruments dealing with the management of, or trade in, hazardous substances and waste, including: the Basel Convention on the Transboundary Movements of Hazardous Wastes and their Disposal (concluded in Basel in 1989), International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) (concluded in London in 1973), the Waigani Convention¹⁸, and OECD Council Acts.
- **Compatible with existing legislation and government policies on waste**
A definition should be in accordance with government policies on waste and with the RMA, HSNO and LGA. Ideally, a definition of hazardous waste should build on the HSNO approach to defining hazardous substances and so ensure good integration in the management of hazardous substances and hazardous waste.
- **Flexible and specific**
A good definition should be specific enough to provide certainty and guidance for users and allow for measuring and monitoring of hazardous waste, while being flexible enough to allow for innovation and change. In a world of rapidly changing technology, the number of hazardous substances in use and the hazardous waste generated is thought to be increasing. A definition of hazardous waste must allow for such changes.
- **Practical, cost effective and easy to use**
Establishing whether one is dealing with a hazardous waste should not be time-consuming, difficult or costly. Many generators of hazardous waste may lack the knowledge or training to identify hazardous waste, or may not have sufficient resources to commission expensive analyses. A good, workable definition should allow for efficient and simple identification of the majority of commonly generated hazardous waste, as well as providing good information on how to deal with the “grey areas”.

¹⁸ “Convention to Ban the Importation into Forum Island Countries of Hazardous & Radioactive Wastes and to Control the Transboundary Movement & Management of Hazardous Wastes within the South Pacific Region”, concluded in Port Moresby in 1995.

Adaptation to the New Zealand context

New Zealand is unique in its decision to manage hazardous substances separately from hazardous waste, under HSNO legislation. A New Zealand definition of hazardous waste must be compatible with the HSNO.

It is likely that New Zealand can adopt a more simple and effective definition of hazardous waste than those used in larger, more highly industrialised countries. The complex, multiple lists used in international situations are not appropriate to New Zealand because:

- there are a limited number of industries producing hazardous waste in New Zealand
- quantities of hazardous waste in New Zealand are relatively small compared to other industrialised nations
- the range of categories of waste is narrow because New Zealand does not produce the same variety of wastes as countries with a broader industrial base.

In addition, there are fewer technical, financial and human resources to manage hazardous waste. Therefore simplicity, practicality and effectiveness are required.

Additional issues that will need to be considered in the development of a hazardous waste definition include the following:

Hazardous waste quantities

The options for a definition of hazardous waste focus on the intrinsic hazardous characteristics of the waste rather than the quantity or cumulative effects of waste to be assessed. Quantities do not determine the degree of hazard posed by the waste, but they can influence the potential for adverse environmental effects.

Dilution and mixing

Many countries prohibit dilution or mixing of hazardous waste. For example, a waste generator may attempt to reduce disposal costs by diluting a high-strength waste so that concentrations of hazardous constituents are lower and thereby meet thresholds. The quantity of the wastes needing disposal will increase as a result. Similarly hazardous waste may be disposed of to surface waters at points of mixing for dispersion of the waste. Cumulative effects must also be considered.

Ambiguities

Regardless of how comprehensive a definition may be, there will be instances of uncertainty where a decision needs to be made as to whether it is hazardous or not. There is a need for a final arbitrator to determine the status of the waste.

Monitoring and review

As is the case for many classification and identification systems overseas, regular reviews of the definition should be undertaken to ensure that new developments and information can be accommodated. A review process will need to be developed.

Table 1 (over) shows the current situation (no national definition) and the four other options ranked against key criteria for developing a New Zealand definition for hazardous waste.

Table 1: Definition options assessed* against key criteria

Key Criteria	Options				
	1: No national definition	2: Generic description	3: Lists	4: Thresholds	5: List and thresholds
International					
Basel Convention	Partial: current practices adequate, but it is possible that hazardous waste is not being reported due to a lack of definition	Partial: it is likely that hazardous waste might not be captured because of the generic nature of the description	Yes, if the list reflects the Basel list	Partial, unless supported by lists similar to the Basel list	Yes, if list reflects Basel
OECD performance reporting requirement	No	Partial, but no clear guidance	Yes	Improved	Yes
Marketing advantages: credible clean green image	No	Partial	Yes, but depends on quality of list	Improved	Yes
National					
RMA compatible:					
• minimise adverse effects	No	Partial	Improved	Yes	Yes
• consistent with philosophy	No	Yes	Partial	Yes	Yes
HSNO compatible	No	Potentially, but not necessarily	Potentially, but not necessarily	Yes	Yes
State of the environment reporting: ability to measure and monitor hazardous waste	No	No	Improved	Improved	Yes
Practicality and ease of use: works at local level and provides certainty for users	No	No	Yes	Improved, but more expensive than other options	Yes
Adaptable: able to respond to the dvpt of new industries, processes and waste concerns	N/A	Yes	Improved, but depends on quality of list	Yes	Yes, but depends on quality of list
NZ appropriate, especially in the level of detail	No	Partial	Yes, depending on quality of list	Yes, but more expensive	Yes, but depends on how list is generated

* No: does not meet the criteria Partial: partially meets the criteria Improved: largely meets the criteria
 Yes: meets criteria

Appendix 2:

Developing options for controlling hazardous waste

This appendix presents an overview of the analysis undertaken in developing the options for controlling hazardous waste and an assessment of the options against key criteria.

International approaches to controlling the disposal of hazardous waste

Most industrialised countries control the disposal of hazardous waste in some manner (*A Review of Overseas Approaches to the Management and Landfilling of Hazardous Waste*, 1997, Environment and Business Group). The majority of waste management programmes control discharges of single substances directly to air and water through specifying end-of-pipe environmental quality standards, ie the level that is to be achieved at the point of discharge.

However, discharges to landfill are typically based on acceptance criteria, such that landfills with tighter engineering controls can accept hazardous waste with higher levels of hazard and in greater volumes.

For example, the landfilling of hazardous waste is generally controlled through a combination of landfill standards and waste restrictions. Landfill standards address the manner in which landfills are sited, designed and managed, so that a landfill receiving hazardous waste needs to comply with certain guidelines or conform with minimum performance standards. Waste restrictions determine the types of wastes that are prohibited in landfills, or require treatment, or are otherwise subject to special requirements before they can be landfilled.

There are two basic approaches with respect to landfills.

- Hazardous waste is only accepted at certain dedicated and specified landfills (eg the United States and Canada).
- Landfills are classified according to their siting, design, management procedures, monitoring requirements and aftercare provisions, and only certain classes of landfills are permitted to accept certain types of hazardous waste (eg Australia and the European Union).

The restrictions applied by many countries to the types and quantities of hazardous waste capable of being landfilled also exhibit similarities.

- Some wastes are generally prohibited from landfill disposal.
- Many countries limit or prohibit the disposal of hazardous waste with non-hazardous waste, commonly referred to as “co-disposal”.
- Most hazardous waste needs to be treated to such a degree that it is no longer considered to be hazardous.
- Wastes need to be tested in accordance with specified requirements to determine whether they are hazardous or not, and require further testing after treatment to demonstrate that they are no longer hazardous.
- To be accepted into a landfill, treated hazardous waste needs to be accompanied by information specifying their type, quantity and source, contaminant concentration and leachability, and landfill operators need to state the site of placement in the landfill.

The disposal of liquid hazardous waste to the sewerage system is also strictly regulated. Some countries control such discharges by separate legislation, eg Germany and the United States. In other countries, eg British Columbia (Canada), discharges of liquid hazardous waste are controlled under the same regulations as discharges to air and land.

The situation is similar when it comes to controlling hazardous discharges to air. As with disposal of liquid hazardous waste, discharge to air is often controlled through separate legislation. Certain hazardous substances are tested for in discharges and upper limits placed on what can be discharged.

How is hazardous waste currently disposed of in New Zealand?

Disposal of hazardous waste in New Zealand generally occurs through the following methods:

- landfilling
- discharge to waste water treatment facilities
- incineration
- specialised disposal methods, such as surface impoundments or underground injection¹⁹
- export overseas.

Strictly speaking, the first three methods above represent treatment rather than disposal, as each process gives rise to further potentially hazardous waste, eg:

- leachate and landfill gas from landfilling
- sewage sludge and effluent from sewage treatment
- ash and air emissions from incineration.

¹⁹ Such methods are rarely used in New Zealand and are therefore not considered in further detail.

However, for the purpose of this paper, landfilling, discharges to sewer and incineration are labelled as “disposal”, while any other activities aimed at changing the nature or concentration of a waste prior to disposal are termed ‘treatment’.

Under the RMA, which is effects-based, the predominant aim of developing specific controls for hazardous waste is to avoid, remedy or mitigate any adverse effects on the receiving environments of air, land and water. Ideally, hazardous waste controls will specify the minimum level to be achieved when disposing of a hazardous waste, but not prescribe how that level is to be achieved. This provides environmental protection while enabling flexibility in the disposal methods that can allow for the incorporation of technological advances.

Discharge controls could therefore incorporate two levels of control:

- criteria defining safe background levels in the receiving environments (ie ambient standards for water, air and soil)
- criteria relating to the effects produced by a hazardous waste in combination with a specific disposal method.

For example, Table 3.4.1 in the *Draft Australian water quality guidelines for fresh and marine waters* (ANZECC, 1998) gives proposed water quality guideline trigger or threshold values for toxicants above which there are adverse effects and corresponding management requirements. The initial level for mercury in fresh water is 0.013 mg/L, and in marine waters is 0.029 mg/L. Any discharge of mercury or mercury-containing compounds above those levels is likely to cause an “adverse effect”. The disposal of a mercury-containing waste that has been pre-treated and deposited in a secure landfill is likely to meet these guidelines, whereas the deposit of untreated mercury waste in a sub-standard landfill is unlikely to meet these guidelines.

It is important to recognise that a hazardous waste will give rise to different environmental effects depending on the method chosen for its treatment and disposal. For example, the mercury-containing waste discussed above may not give rise to environmental effects exceeding the ambient groundwater criteria when deposited in a secure landfill, but if incinerated it may result in a significant degradation of ambient air quality. In order to avoid cross-media contamination, it is therefore essential that discharge controls are provided for *all* receiving media.

Table 3: Assessment of options for controlling the disposal of hazardous waste against key criteria

Options				
Key Criteria	1: Status quo – RMA controls at regional and local level	2: Hazardous waste acceptance criteria through guidelines or regulations under the RMA	3: Ambient environmental standards through regulations, with guidelines for interpretation	4: Hazardous waste acceptance criteria regulations plus regulations for ambient environmental standards
Meets environmental standards	Not yet, as shown by the various recent reports summarised in this paper	Potentially, but base levels may need adjusting for local environment and generalises facility processes and design	Potentially, but effects may not be detected until after contaminant enters environment, and majority of standards still to be developed	Yes, because controls are provided at point of disposal and at point of discharge to the environment.
Cost Effective: • implementation • operation	In place Costs vary across the country	Initial costs in grading facilities; however, can use existing resource consent information Yes, because provides clarity and certainty at facility gate, but generators will have to provide more information	Expensive and time-consuming to develop full range of standards Costs associated with determining environmental from outcomes; will require more information generators	Establishment costs as per Options 2 and 3 Acceptance criteria will reduce costs, as per Option 3
Compatible with existing legislation	Yes	Yes, if guidelines, but regulatory approaches will require RMA amendment for trade wastes	Yes, RMA effects based	Yes, for solid and gaseous wastes, but RMA amendment required for trade wastes
Meets Māori cultural objectives - does not desecrate Māori cultural sites	Currently not consistently meeting this criteria, though there is currently a forum for addressing this issue	Possibly, but not guaranteed	Depends on setting of ambient environmental standards	Most likely, but depends on setting of ambient environmental standards
Practical and easy to use	Unclear	Yes, because provides clarity for generators, operators and regulators	Some difficulties and therefore uncertainties with interpretation of standards; however, guidelines will assist	Yes, because acceptance criteria will provide clarity for generators, operators and regulators and complement standards
Able to be enforced	Yes, although not currently enforced consistently	Yes	Some difficulties due to delays in detecting effects	Yes, acceptance criteria complement standards
Fair distribution of costs and responsibilities	No, costs and responsibility lie with disposal site operators, often not transferred to generators	Increased transparency and clarity of controls at point of disposal will encourage more equitable distribution of costs	Delays in detecting effects put more responsibility on disposal site operators	Controls at point of disposal mean a more equitable distribution of costs

Appendix 3:

Developing options for monitoring and enforcing hazardous waste controls

This appendix presents an overview of the analysis undertaken in developing the options for monitoring and enforcing hazardous waste controls and an assessment of the options against key criteria.

Current systems for monitoring in New Zealand

At present, hazardous waste is monitored through discharge consents under the RMA. The LGA also allows for monitoring of bylaw provisions.

Current monitoring does not meet the above key objectives because:

- not all discharges require consents, and even when consents are required monitoring is not always required, so unmonitored hazardous waste may enter the environment
- many illegal discharges are difficult to detect
- hazardous waste may not be declared, or is falsely declared, to landfill operators
- hazardous waste is discharged to sewers with no consideration given to environmental effects, and trade waste permits are sometimes breached
- generators are not required to report their hazardous waste generation, so there is limited opportunity to collect reliable data.

International approaches to monitoring and enforcing hazardous waste controls

As noted in section 2.4 above, the *Review of Overseas Approaches to the Management and Landfilling of Hazardous Waste* (1997, Environment and Business Group) found that all countries reviewed had provisions for the reporting and monitoring of hazardous waste. Common requirements included:

- industry registration and/or licensing
- tracking of hazardous waste movements
- reporting to regulatory authorities
- exemptions for small-quantity generators.

Overseas experience also shows that there is an increasing tendency towards self-monitoring, with hazardous waste generators, facilities and transport operators being required to keep records. This is backed up by annual or biannual reporting to responsible authorities. Regulatory authorities are able to inspect industry records on request.

The general approach adopted by some of these countries is briefly outlined below.

United States

The US employ a particularly stringent system for the reporting and tracking of hazardous waste. This involves the requirement for all so-called “Large Quantity Generators” (LQGs)²⁰ and transport, treatment, storage and disposal operators (TSDs) to obtain an Environmental Protection Agency (EPA) identification number and to complete a Uniform Hazardous Waste Manifest each time a hazardous waste leaves a site and is transported and disposed of. Each “participant” of this system is required to keep copies of all manifests for three years. In addition, each LQGs and TSD operator needs to file a report every two years, which provides information on waste minimisation, waste generation and management, waste received from off-site, waste treatment, disposal and recycling processes.

Canada

Canada’s system for hazardous waste tracking is enshrined in the Transportation and Dangerous Goods Act 1980, which establishes standards for the safe shipping of all regulated dangerous goods, including hazardous waste. This Act includes provisions for the classification of hazardous substances and wastes and sets the framework for a manifest system. Each Canadian province is required to maintain such a manifest system to track the movements of hazardous waste between provinces and territories from origin to destination, thus ensuring delivery of the entire waste consignment.

Australia

In 1994 Australia established a nationwide system for the inter-state tracking of hazardous waste, which involves a mechanism for the notification and classification of hazardous waste, and transport papers. In addition, individual states also legislate for reporting and tracking. For example, New South Wales has recently enacted the Waste Minimisation and Management Act 1995, under which the old tracking system²¹ has been superseded by a new approach, whereby facilities and activities involving hazardous waste²² require a licence, a prerequisite of which is that records are kept that enable the waste to be tracked from point of generation to point of disposal. A well-defined auditing system is expected to ensure compliance with the new record-keeping arrangements. Obligations to document the transport of hazardous waste under the National Manifest System and international treaties will be maintained.

²⁰ A Large Quantity Generator is one that produces at least 2,200 lb (998 kg) of hazardous waste, or 2.2 lb (0.998 kg) of acutely hazardous waste, in any month.

²¹ This system worked on a similar basis to the US tracking system, requiring five-docket manifests to be completed for each hazardous waste load.

²² As is the case in the US, a quantity threshold applies: generation of less than 10 tonnes of hazardous waste per year, or storage of less than 2 tonnes of hazardous waste per year, does not require a licence. The threshold is much lower for biomedical and quarantine wastes (2 tonnes and 50 kg respectively).

Germany

Rather than employing a strictly regulatory approach to reporting and tracking, Germany has recently changed to a system based on incentives and voluntary compliance. All waste generators that produce more than a specified amount of hazardous waste are required to prepare waste management plans addressing the avoidance, recycling and disposal of these wastes. These plans must be submitted, upon request, to the relevant regulatory authority. In addition, both waste generators and waste operators who produce or handle wastes above the indicated thresholds have to develop a yearly waste balance, which can also be requested by the regulatory authority. Waste operators (transporters, recyclers, treatment and disposal facilities) may obtain certification, which is entirely voluntary, but which carries with it certain privileges in terms of reduced inspections and much simplified procedures with respect to these activities. The general concept behind this approach is to provide an environment where responsible waste generators and operators have a competitive advantage over non-complying ones, with a minimum of bureaucracy.

Table 4 Assessment of options for monitoring and enforcement against key criteria

Options	
Key criteria	
Ability to trace hazardous waste	
1: RMA resource consent monitoring	No routine collection of data. No ability to trace hazardous waste. Other measures required to meet objective of eliminating inappropriate discharge/disposal
2: Mandatory record keeping & code of practice	Yes, mandatory record keeping will enable tracking of illegal discharges and subsequent enforcement.
3: Mandatory record keeping & reporting	Same as Option 2
4: Licensing of transporters under LGA	Data is collected. Trans-regional movements (which have the greatest potential to "disappear") are tracked, but require inter-district co-ordination and co-operation. Highly hazardous waste can be targeted and traced from annual reports and records.
5: Manifest tracking	Meets objectives for : <ul style="list-style-type: none"> • data collection • cradle to grave tracking • potential to cover all hazardous waste facilities
Ease of use	
	System currently in place. Consent procedure expensive, time consuming and doesn't necessarily meet environmental objectives. Inconsistency between districts and regions because no guidelines
	May require some education and training programmes. Code of practice will set guidelines for record keeping.
	Same as Option 2
	Guidelines and/or model bylaws could be used to increase ease of use and potential for consistent recording and reporting, and potential for consistent national "tracking" system. Will require education and training programme. Will initially incur some additional time constraints for collection and transport businesses and territorial local authorities.
	Nationally consistent reporting procedure and full tracking system. Will require education and training programme. High level of bureaucracy. Will initially incur additional time constraints for most businesses.

Table 4 Continued

	Options				
Cost effectiveness	No significant direct costs. However, there is a deferred cost in the potential for significant environmental costs in the absence of other initiatives	Some costs in recording and reporting (eg USEPA estimate 20 hours) for each facility/activity/transporter. Many businesses already carry out similar procedures.	Same as Option 2. It may be possible to recover more system costs through fees if the system is compulsory.	Minimal cost to waste generators and facilities. Costs for transporter in recording and reporting and for territorial local authorities in administering the system. Territorial authorities may recover costs through licensing fees. The transporters could then push costs back to generators.	Data collection and administration costs significant. High costs for manifest matching of all shipments to ensure final destination is reached. Data entry costs at administrator level if hazardous waste tracking data is to be maintained at a central level (as opposed to relying on licensee reporting statistics).
Type / usefulness of data Collected	Inconsistent, incomplete data collection	Data collected from reports. Need to ensure report requirements are structured to obtain useful data.	Same as Option 2	Data collected on licence basis. Tracking information collected.	High level of data collection
Ease of funding	Present inconsistent disposal levy/consent charges	Could be self funded	Same as Option 2. May be possible to recover more system costs through fees if the system is compulsory.	Licence fee and/or disposal levy	Licence fee and/or disposal levy. Possible funding under LGA No 4.
Compatibility with NZ legislation framework	Only workable if new regulations and standards provide consistency for hazardous waste management facilities	Flexible because voluntary. Can be tailored to meet individual industry requirements. Does not need legislation, but is compatible.	Adaptable to suit individual industry requirements. An amendment to the RMA may be required.	Yes	Best suited to regional co-ordination. Comprehensive hazardous waste regulation would be needed.

Appendix 4:

List of wastes that are likely to be considered hazardous

Animal wastes

(Refer to Glossary for definition. Thresholds to be established.)

Biocide

- waste from the production, formulation and use of pesticides and herbicides
- waste from the manufacture, formulation and use of wood-preserving chemicals.

Clinical /medical waste

- waste from medical care in hospitals, medical centres, clinics and veterinary surgeries (eg used needles, bloodied swabs, infectious wastes).

Contaminated soil/sediment

- from stormwater cesspits and industrial sites and other contaminated areas
- residues and debris from a spill of hazardous substances.

Explosive

- chemical waste of explosive nature.

Inorganic elements/metals

- waste from production, formulation and use of photographic chemicals and processing materials
- waste from surface treatment of metals and plastics
- waste electroplating sludge
- waste galvanising liquids and sludges
- waste metallic dusts and powders
- spent catalyst material
- sewage sludges
- sludges from water purification and waste-water treatment
- other waste liquids or sludges containing metals
- ashes or cinders
- residue from pollution control
- scrubber sludges
- ion exchange residue
- waste batteries and other electrical cells

- waste arsenate of lead
- waste chromic acid sludge
- residues and drosses from alumina production
- foundry dross and fly ash (Cu, Fe, Al)
- incinerator ash (medical, chemical, quarantine)
- tannery waste
- timber treatment sludge, including copper-chrome-arsenic (CCA)
- mine tailings.

Inorganic wastes without metals as principal hazard

- waste from heat treatment and tempering operations containing cyanide.

Non-halogenated organic sludges/waste solids

- tarry residues from refining, distillation and any pyrolytic treatment
- grease trap wastes
- decarbonisation residues
- gas works waste
- still bottoms
- residues from oil re-refining
- waste oils and sludges.

Non-halogenated organic compounds

- waste from the production, formulation and use of organic solvents
- waste oil/water, hydrocarbon/water mixes, emulsions
- waste from production, formulation and use of inks, dyes, pigments, paints, lacquers, varnish, resins, latex, plasticisers, glues/adhesives.

Organohalogenes

- waste substances and articles containing or contaminated with polychlorinated biphenyls (PCBs) and/or polybrominated biphenyls (PBBs)
- waste perchloroethylene
- waste trichloroethylene
- waste methylene chloride.

Pharmaceutical

- some wastes from the production and preparation of pharmaceutical products.

Uncharacterised

- residues arising from industrial waste disposal operations
- residues arising from incineration of household waste
- other industrial waste liquids
- residue from cleaning tanks and equipment
- contaminated equipment
- contaminated containers
- quarantine wastes
- paint sumps
- pulp mill sludges (possibly containing dioxins, tannins and lignins)
- unknown military wastes
- waste cyanides
- unspecified waste chemicals, fungicides and pesticides.

²³ *Environment and Business Group Ltd and Auckland Regional Council, 1996, pp. 61–2.*

²⁴ *The extent to which adverse toxic effects or harm occurs to any living organism or ecosystem.*

²⁵ *The extent to which reaction by chemical action and breakdown of the biological or physical structure of materials (eg metal, skin) occurs.*

²⁶ *Environmental Performance Review: New Zealand. Organisation for Economic Co-operation and Development, 1996, p. 84.*

²⁷ *CRC Summary Report: Hazardous Waste Management Options for the Canterbury Region. 1997. Canterbury Regional Council:Christchurch*

²⁸ *Hazardous Waste Management. 1998. Parliamentary Commissioner for the Environment:Wellington*

Appendix 5:

Recent surveys on hazardous waste

A number of recent reports have found significant problems with hazardous waste management in New Zealand. The key findings from these reports are summarised in the table below.

Table A.1: Summary of key findings

SURVEY	Key Findings
1995 Landfill Census (Ministry for the Environment)	Nationally: <ul style="list-style-type: none"> poor management of hazardous waste inconsistent definitions of hazardous waste lack of acceptance criteria for hazardous waste at landfills poor site management practice inadequate hazardous waste training for landfill operators.
1996 Auckland Region Hazardous Waste Survey ²³	In the Auckland region: <ul style="list-style-type: none"> 33% of the 1,862 surveyed Auckland businesses (8% of the manufacturing, transport and community/personal services sectors) generated hazardous waste the manufacturing sector accounted for 99.7% of hazardous waste generated between them, these businesses generated 4,617,733 tonnes of waste, 98% of which was in the form of liquid trade waste. the most common types of waste generated were acidic/alkaline solutions or solids, scrubber sludges, animal wastes and industrial liquids containing metals. the most prevalent hazardous characteristics were ecotoxicity²⁴ and corrosivity²⁵ of the total amount of solid wastes disposed of in the Auckland region, approximately 15% was hazardous trade waste of the total amount of sewage treated at the regional waste water treatment facilities, approximately 10% was hazardous trade waste very few companies kept detailed and accurate records on the hazardous waste they generated many hazardous waste generators did not know where to obtain advice, information or services related to hazardous waste there is a definite need for education and training, many hazardous waste operators were concerned about the lack of regulation and the need for education and training in the industry.
1996 OECD Environmental Performance Review ²⁶	Nationally: <ul style="list-style-type: none"> national legislation is urgently needed so that an effective cradle to grave management system can be put in place no adequate treatment facilities lack of a clear definition of hazardous waste waste generators and regional authorities may not know how to dispose of hazardous waste safely.
Canterbury Regional Council 1997 ²⁷	In Canterbury: <ul style="list-style-type: none"> appropriate commercial treatment and disposal options exist for industrial waste streams and for waste oil for domestic hazardous waste and agrochemical waste, management options are problematic there is a lack of data on quantities of stockpiled wastes there is a lack of data on the nature or extent of the environmental risks from stockpiled wastes.
1997 National Waste Data Report (Ministry for the Environment)	Nationally: <ul style="list-style-type: none"> increasingly New Zealand landfills are refusing to accept types of hazardous waste, and therefore other treatment or disposal methods have to be sought 92% of New Zealand landfills do not accept hazardous waste over 8,000 sites were identified as potentially contaminated in 1992 national waste data are scarce, especially for hazardous waste waste definitions are inconsistently used in the absence of a set of legal or nationally agreed definitions.
1998 PCE Report ²⁸	Nationally: <ul style="list-style-type: none"> findings of previous reports were acknowledged a process for monitoring the Government's progress in developing a hazardous waste policy was proposed.

Appendix 6:

Adverse effects and risks at each stage of the hazardous waste life-path

In 1998 the Ministry for the Environment commissioned a report on the distribution of hazardous waste in New Zealand from generation through to disposal, and the risks posed by hazardous waste to people and the environment (Tonkin & Taylor. 1998. *Identification of Hazardous Waste in New Zealand*. Report prepared for the Ministry for the Environment, Wellington.). The report found that the lack of a standard definition of hazardous waste meant that potentially large quantities of waste are being excluded from consideration as hazardous. The documented quantities of hazardous waste generated in any region were found to be influenced by the types of waste included in surveys or estimates. For example, local authorities differ in their classification of trade waste discharges, animal wastes and sewage sludges. As a consequence, the report found that many of these potentially hazardous wastes may be being mismanaged.

In general the report found that there is a correlation between population size and the generation of hazardous waste. Hazardous waste generation is also influenced by the nature of the industry base in a region. For example, in regions where manufacturing industry exists, hazardous waste generation will be dominated by those industries (mostly trade wastes), rather than by rural activities (eg agrochemical wastes).

Table A.2(a): Disposal of hazardous waste

Storage	Issues	Adverse Effects
<ul style="list-style-type: none"> Storage is either at a dedicated facility or on site where generated. Non-halogenated organic compounds are the main compounds stored in Auckland and Taranaki. 390 tonnes of PCBs were stored in Auckland.²⁹ The largest proportion of hazardous waste in long-term or temporary storage is waste oil. Storage of intractable agrochemicals, PCBs and radioactive wastes makes up a small percentage of total hazardous waste in storage. 	<ul style="list-style-type: none"> Storage on site where generated may pose some risks as storage may be at a low standard. Stormwater contamination. 	<ul style="list-style-type: none"> Effects from discharge to: <ul style="list-style-type: none"> – land – stormwater – groundwater – air risks to hazardous waste "handlers".

Table A.2(b)

Transport ³⁰	Risks	Adverse effects
<ul style="list-style-type: none"> Generators transported about 110,188 tonnes (Auckland 1995). Operators transported about 204,109 tonnes (Auckland 1995). Materials included sludges containing hazardous metals (eg chromium, zinc), followed by animal wastes. 	<ul style="list-style-type: none"> Low risk when New Zealand Standard NZS 5433 applies. Risk only expected in exceptional circumstances following a transport incident Risk as hazardous waste is often not well characterised or not covered by the Standard. 	<p>These include:</p> <ul style="list-style-type: none"> localised ground contamination contamination of surface water localised release to the air of volatile hazardous constituents.

²⁹ *Review of Overseas Approaches to the Management and Landfilling of Hazardous Waste*. Environment and Business Group. 1997. Very little data regarding storage of hazardous wastes are available for developing a national picture, and what data there is cannot be compared between regions.

³⁰ 1,379 tonnes of waste per year were identified as being transported within Christchurch city but this does not account for the large rural area of the Canterbury region. Information on transport of hazardous wastes was not readily available for other regions.

Table A.2(c)

Treatment	Issues	Adverse effects
<ul style="list-style-type: none"> • A variety of physical, chemical and biological treatment processes exist for the treatment of hazardous waste.³¹ • Treatment facilities eliminate the hazard or reduce it to a level where it can be recycled, reused or disposed. • 67% of all hazardous waste is treated on-site by generators (liquids 99.6%).³² Most common waste types were acid and base solutions or solids, animal wastes and industrial waste liquids containing metals.³³ • Much lower amounts are treated by hazardous waste operators: mainly liquids, sludges, waste oil and organic solvents.³⁴ 	<p>Environmental problems may arise if:</p> <ul style="list-style-type: none"> • contaminated stormwater is discharged from the site • a breach in the containment leads to groundwater contamination • treated waste water or solid wastes/sludges are mixed into top soil, and contamination may result if improperly managed. 	<p>Direct application to soil may cause:</p> <ul style="list-style-type: none"> • increased contaminant levels (and the creation of contaminated sites) • contamination of stormwater or groundwater.

Table A.2(d)

Recycling	Issues	Adverse Effects
<ul style="list-style-type: none"> • Wastes that are recycled would normally be stored and then transported to the recycling site. • Non-halogenated organic compounds, non-halogenated organic sludges/waste solids and animal wastes may be the most common types recycled (animal wastes, waste oil and grease-trap wastes).³⁵ 	<ul style="list-style-type: none"> • Most facilities are designed and operated so that hazardous waste is contained on site. However some sites are of a lower standard. 	<ul style="list-style-type: none"> • There is potential for contamination of surface water and groundwater.

Table A.2(e)

Disposal to Landfills	Risks	Adverse effects
<p>Landfill design reflects an increasing level of engineering design and management practice. The largest groups of hazardous wastes disposed are:</p> <ul style="list-style-type: none"> • contaminated soil • animal wastes • non-halogenated organic compounds (mainly waste oils) • metallic sludges. 	<p>Risks from hazardous waste are a function of :</p> <ul style="list-style-type: none"> • design • management • the types and quantities of wastes • the location of the landfill in relation to present and future human habitation, drinking water supplies and valued ecosystems. 	<p>These include:</p> <ul style="list-style-type: none"> • groundwater contamination • discharges to air of volatile hazardous constituents • landfill fires • contamination of stormwater • contamination of surface water as a result of contaminated groundwater flow • contamination of stock, irrigation or drinking water supply • adverse effects on aquatic biota or ecosystems, including assimilation of toxins into food chains • effects on future generations (eg site contamination)

³¹ Centre for Advanced Engineering, 1992. *Our Waste: Our Responsibility*.

³² Auckland Regional Hazardous Waste Survey. 1996. Auckland Regional Council and the Environmental Business Group: Auckland

³³ *ibid.*

³⁴ *ibid.*

³⁵ See Tonkin & Taylor. 1998. *Identification of Hazardous Waste in New Zealand. Report prepared for the Ministry for the Environment, Wellington.* p.27.

Table A.2(f)

Incineration	Issues	Adverse effects
<ul style="list-style-type: none"> • Takes place in purpose-built incinerators and the level of hazardous emissions varies with technology. • All combustion systems fitted with emission control equipment. 	<ul style="list-style-type: none"> • Hazardous non-combustible residues remain after burning. • Particulate matter retained by the pollution control system may contain metals and products of incomplete combustion. • The pollution control system itself may discharge hazardous liquid waste (eg from wet scrubbing of the gas stream). • Hazardous compounds may be created during incineration (eg dioxins). 	<ul style="list-style-type: none"> • Discharge to air (deposition is usually close to emission point). • Hazardous concentrations may build up in the ground, waterways or sediment. • Human health may be affected by inhalation or contaminated water supplies. • Stock may be affected.

Table A.2(g)

Illegal disposal	Issues	Adverse effects
<ul style="list-style-type: none"> • There is disposal to unlicensed sites, waterways, land, sewers, or stormwater. • There is very little information about the extent of the problem.³⁶ 	<p>These include:</p> <ul style="list-style-type: none"> • unavailability of a suitable disposal facility • excessive transport distances to a suitable facility • excessive disposal charges • lack of appreciation of the nature of the substance and the likely consequence of improper disposal • inadequate policing • municipal refuse tips in small localities often being unattended • inadequate penalties • inadequate hazardous waste tracking system. 	<p>Uncontrolled contamination of:</p> <ul style="list-style-type: none"> • land • groundwater • surface water • air.

³⁶ Tonkin & Taylor p.59.

Appendix 7:

Environmental effects of liquid hazardous waste

The Tonkin and Taylor report (Tonkin & Taylor. 1998. *Identification of Hazardous Waste in New Zealand*. Report prepared for the Ministry for the Environment, Wellington.) found that:

- environmental risks from trade wastes are higher where there are:
 - major trade waste contributors
 - inadequate treatment
 - low rates of dilution
 - sensitive receiving environments
- waste water treatment facility technologies have different levels of efficiency for the removal of both conventional pollutants and toxic constituents
- no surveyed waste water treatment facility operators use a standard definition for hazardous waste
- very little information is available about the quality of final effluents or receiving waters.

Table A.3 An overview of the major issues associated with trade wastes.

Sewage sludge	Issues	Adverse Effects ³⁷
<ul style="list-style-type: none"> • Higher levels of treatment cause greater quantities of sludge generation. • It is estimated that 400,000 tonnes of liquid sludge are generated per year from 23 surveyed Waste water treatment facilities. • Hazardous contaminants in sludges include pathogens,³⁸ and trace metals and organics³⁹. 	<ul style="list-style-type: none"> • Trade waste sources may render sludges hazardous due to elevated contaminant concentrations. • Sludge quantities are related to the level of treatment employed by the various waste water treatment facilities, not to the population. • Disposal methods for screenings and sludges vary between Waste water treatment facilities, with the majority disposed to land and landfills, and held in storage. • Elevated residual contaminant concentrations in sludges and biosolids can prevent beneficial re-use, such as disposal to land. • Rising landfill costs means there is a growing demand for beneficial re-use of sludge. • Most sludge generated in New Zealand does not meet relevant ⁴⁰guidelines for beneficial re-use. 	Contamination of: <ul style="list-style-type: none"> • groundwater, as a result of leachate when sludges are disposed to landfills • air, when sludges are incinerated • land, due to inappropriate application of sludges/ biosolids.

³⁷ The Ministry for the Environment is currently funding research into assessing hazardous constituents in New Zealand sewage sludges, which will provide a greater understanding of the scale of environmental effects and risks.

³⁸ *Salmonella*, faecal coliform, enteric virus and helminth egg concentrations.

³⁹ Eg organochlorines and poly-nuclear aromatic hydrocarbons.

⁴⁰ Department of Health, 1992. Public health guidelines for the safe use of sewage effluent and sewage sludge on land. Department of Health:Wellington

Table A.4:
Evaluation of environmental effects and risks: solid waste stream, hazardous trade wastes⁴¹

Assessment Criterion	Disposal to Landfill	Storage	Disposal to Land
Trade waste inflow quantities	33 million m ³ /year	14 million m ³ /year	14 million m ³ /year
Screening/sludge quantities (dry weight)	25,000 tonnes	11,000 tonnes	36,000 tonnes
Screening/sludge quantities (wet weight)	97,000 tonnes	46,000 tonnes	240,000 tonnes
Concentration of hazardous constituents	Known only for some waste water treatment facilities; potentially high concentrations of hazardous constituents possible	Known only for some waste water treatment facilities; potentially high concentrations of hazardous constituents possible.	Better known; moderate to high concentrations of inorganic hazardous constituents in raw sewage; less knowledge on organic hazardous constituents.
Efficiency of management/treatment	Not known	Not known	Variable between waste water treatment facilities; most sludges/biosolids meet Dept. of Health requirements, but not NSW criteria.
Primary environmental pathways	Via landfill leachate into ground and surface waters	Via leachate into ground and surface waters	Controlled application to specific land areas or wide spread via distribution of compost; potential long-term accumulation of hazardous waste constituents in soils.
Sensitivity of receiving environment	Variable and site-specific; sensitive environments generally better protected where landfill is designed to modern standards	Variable and site-specific	Variable and site-specific; generally more sensitive if applied to land used for the harvest of primary produce or for grazing.
Nature of potential environmental effects	Potential toxic effects on aquatic biota and humans; effects rating: medium to high.	Potential toxic effects on aquatic biota and humans; effects rating: low to medium	Potential effects on soil microbiological communities, and animal and human health; effects rating: medium to high.
Possible failures/accidents leading to significant adverse environmental effects	Landfill liner failure, leachate leaks/escapes; chance of occurrence: medium	Not applicable	Pipe failures, uncontrolled application of sludge/biosolids, contamination of sludges/biosolids above acceptable levels; chance of occurrence: high.
Likelihood of potentially significant adverse effects associated with normal operating conditions	Low	Low locally	Medium to high and widespread
Likelihood of potentially significant adverse effects associated with accidents	Medium locally	Not applicable	Medium to high and widespread
Geographical differences	High	Insignificant	High

Appendix 8:

Members of the Hazardous Waste Advisory Group

Bill Birch	NZ Chemical Industry Council
Patricia Blutner	Auckland Regional Council
Robert Brodnax	Environment Waikato
Jenny Easton	Tasman District Council
Gloria Herbert	Resource Management Committee of Te Kotahitanga o Te Tai Tokerau
Chris Humphrey	New Plymouth District Council
Jennifer Leadley	B.J. Dakin & Co Ltd
Robyn Manuel	University of Auckland
Paul Prendergast	Ministry of Health
Michael Szabo	ECO representative
Norm Thom	University of Auckland

⁴¹ See *Tonkin & Taylor* for information about assumptions and inputs to this risk assessment.

Glossary

Ambient Environmental Standards

Standards that specify concentrations of contaminants in the receiving environment that are not to be exceeded

Animal wastes

Wastes from slaughtering and meat processing, including any off-cuts or parts of animals

Bioaccumulation

Accumulation within the tissues of living organisms

Biocide

A chemical capable of killing living organisms

By-product

An incidental or secondary product made in the manufacture of another product

Consent Authority

The Minister of Conservation, a regional council, a territorial authority or a local authority that is both a regional council and a territorial authority, whose permission is required to carry out an activity for which a resource consent is required under the RMA

Contaminant

Any substance (including gases, liquids, solids and micro-organisms) or energy (excluding noise) or heat that either by itself or in combination with the same, similar or other substances, energy or heat:

- a) when discharged into water, changes or is likely to change the physical, chemical or biological condition of the water; or
- b) when discharged onto or into land or into air, changes or is likely to change the physical, chemical, or biological condition of the land or air onto or into which it is discharged
(see RMA)

Controlled activity

An activity which:

- a) is provided for, as a controlled activity, by a rule in a plan or proposed plan; and
- b) complies with standards and terms specified in a plan or proposed plan for such activities; and
- c) is assessed according to matters the consent authority has reserved control over in the plan or proposed plan; and is allowed only if a resource consent is obtained in respect of that activity
(see RMA)

Decomposition

The breakdown of organic waste materials by micro-organisms

Discharge

Emit, deposit and allow to escape
(see RMA)

Discharge Permit

Has the meaning set out in s87(e) of the RMA

Discretionary activity

An activity:

- a) which is provided for, as a discretionary activity, by a rule in a plan or proposed plan; and
- b) which is allowed only if a resource consent is obtained in respect of that activity; and
- c) which may have standards and terms specified in a plan or proposed plan; and
- d) in respect of which the consent authority may restrict the exercise of its discretion to those matters specified in a plan or proposed plan for that activity
(see RMA)

Disposal

Covers:

- a) treating the substance in such a way that it is no longer a hazardous waste; or
- b) discharging the waste into the environment as waste; or
- c) exporting the substance as waste from New Zealand

Ecotoxic

Capable of causing ill health, injury or death to any living organism
(see HSNO)

Environment

Covers:

- a) ecosystems and their constituent parts, including people and communities
- b) all natural and physical resources
- c) amenity values
- d) the social, economic, aesthetic, and cultural conditions which affect the matters stated in paragraphs (a) to (c) of this definition, or which are affected by those matters

Explosive

Capable of sudden explosion owing to a release of internal energy; and includes the capability to generate :

- a) deflagration; or
- b) pyrotechnic effects

Groundwater

Water saturating the voids in soil and rock; water in the zone of saturation in the Earth's crust

Hapū

Subtribe or district group, community

Hazard

A property or situation that in particular circumstances could lead to harm

Hazardous substance

Any substance

- (a) with one or more of the following intrinsic properties:
 - (i) explosiveness
 - (ii) flammability
 - (iii) a capacity to oxidise
 - (iv) corrosiveness
 - (v) toxicity (including chronic toxicity)
 - (vi) ecotoxicity, with or without bioaccumulation; or
- (b) which on contact with air or water (other than air or water where the temperature or pressure has been artificially increased or decreased) generates a substance with any one or more of the properties specified in paragraph (a) of this definition

Hazardous waste

Any waste that is classified or assessed as hazardous in accordance with the definition; commonly considered to be unwanted materials that exhibit hazardous characteristics such as toxicity, corrosivity, explosiveness, reactivity, flammability or radioactivity or otherwise have the potential to damage human, animal and other species

Infectious waste

Any waste from sources known to have, or suspected of having, a communicable disease, unless treated to a standard acceptable to the Health Department; the extent and duration for which this waste is regarded as infectious will depend on the particular infection, the state or type of the disease, and in some cases the effect of specific treatment, and should be based on consideration of the known modes of transmission of the organisms involved.

Iwi

Tribal group

Kaitiaki

Guardianship; the duty of tangata whenua to take care of the resources and taonga in their area for present and future generations

Landfill

Any premises used for the lawful deposit or disposal of waste materials into or onto land

Leachate

Liquid released by, or water that has percolated through, waste, and that contains dissolved and/or suspended liquids and/or solids and/or gases

Liquid

Any substance that does not meet all the criteria of being physically solid and that is not a gas

Mauri

Essential life force; the spiritual power and distinctiveness which enables each thing to exist as itself

Non-halogenated

A chemical compound not containing one or more of the elements fluorine, chlorine, bromine, iodine or astatine

Non-point source discharge

Indirect discharge, mobile, not from a fixed source, or discharge that cannot be monitored and controlled, eg agricultural run-off into a water course.

Organohalogen

A chemical based on carbon and also containing one or more of the elements fluorine, chlorine, bromine, iodine or astatine (usually chlorine or bromine)

Orphan waste

Any waste that has been dumped by a person or persons unknown and the generator/owner of which is not identifiable

Permitted activity

An activity that is allowed by a plan without a resource consent if it complies in all respects with any conditions specified in the plan

Phytopharmaceutical

A “drug” for the protection of plant health

Point source discharge

Direct or fixed discharge/emission, or discharge that can be monitored and controlled, eg storm-water drain discharge into water course, industry stack emission into air

Precautionary principle

Principle 15 of the Rio Declaration on Environment and Development states that in order to protect the environment, the precautionary approach should be widely applied: "Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."

Prohibited activity

An activity which a plan expressly prohibits and for which no resource consent shall be granted
(see RMA)

Quarantine waste

Examples include: waste generated during an aircraft or ship journey outside New Zealand; materials that originate in New Zealand and are brought back into the country on the return journey; unwanted material that is attached to imported goods, eg soil; contaminated articles of clothing or other materials produced during the removal of the unwanted materials

Recycling

The processing of a waste into a similar non-waste product

Re-use

Waste re-used with or without cleaning and/or repairing

Risk

A combination of the probability or frequency of occurrence of a defined hazard and the consequences of the occurrence

Run-off

The portion of precipitation that drains from an area as surface flow

Sludge

Semi-liquid waste produced as a by-product of an industrial process; the solid constituent of sewage or other residues with a high water content and the consistency of soft mud

Solid waste

All waste that is generated in solid form or converted to a solid form for disposal

Spadeable

A physical state of a material where the material behaves sufficiently like a solid to be moved by a spade at normal outdoor temperatures

Taonga

Valued resource, asset, prized possession

Toxic

Capable of causing ill-health in, or injury to, human beings

Toxicity

The capability of causing harm or even death

Treatment

Physical, chemical or biological processing of a waste for disposal

Tangata whenua

The iwi or hapū that holds customary authority in an identified area

Wāhi taonga

Places of traditional and historical significance to iwi and hapū

Wāhi tapu

Places of spiritual and sacred importance to iwi and hapū

Waste

- a) materials and energy which have no further use and are released into the environment as a means of disposal (AS/NZS 381:1998 Waste Management)
- b) unavoidable materials for which there is currently or no near future economic demand and for which treatment and/or disposal may be required (OECD)
- c) objects which the owner does not want, need or use any longer, which require treatment or disposal (UNEP)

Waste facility

Any premises used for storage, treatment, reprocessing, sorting or disposal of waste