

Appendix 1

Strategy for Disposal of Sewage during a Disaster

**Prepared for the
Wellington Region CDEM Group**

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1. Introduction

This project was set up in 2005 by the Wellington Region CDEM Group to develop the strategy and specific arrangements around the disposal of sewage during and subsequent to a major disaster. Sanitation is one of the six critical needs identified by the CDEM Group, along with urban search and rescue, treatment and movement of the injured, health, welfare and restoration of lifelines.

Overseas events disasters as the Kobe, Japan earthquake in 1995 and Hurricane Katrina affecting New Orleans in 2005 have highlighted both the vulnerability of wastewater networks and the many practical challenges associated with the disposal of sewage in the days and weeks following. In the case of Kobe, it took up to 85 days to reinstate the key elements of the wastewater network.

The disposal of sewage in the interim period is a complex task given the circumstances, with the very real risk of disease compounding the public health challenges and creating additional demands for medical treatment.

The project has been undertaken in two stages:

- Stage 1 – Identifying the planning issues associated with the disposal of sewage during a disaster, and mapping out the actual disposal process. This includes establishing the specific preparatory measures that territorial authorities (wastewater asset managers and emergency managers) will need to implement prior to an event.
- Stage 2 – Focusing on the key messages (pre-event and post-event) to be communicated to the community via stakeholder organisations.

A Steering Group featuring representatives from all the Group's territorial authorities (wastewater asset managers and emergency managers) and Regional Public Health was established. A Working Group drawn from the wider Steering Group met on a regular basis to work through the issues.

This strategy document presents the output and recommendations from both Stage 1 and Stage 2, and outlines a recommended forward work programme.

2. Context

The strategy is focused on the situation resulting from a major earthquake or a significant loss of power extending for more than a week (i.e. causing failure of water supply as well as wastewater pumping) that would lead to a 'disposal from source' (individual property) problem requiring CDEM Group-level inputs. It is considered that lesser events would be adequately handled by territorial authority asset managers without CDEM Group-level involvement.

Characteristics of the service restoration phase, which may well continue for months after the re-establishment of water supply after a major earthquake, include:

- service restorations being a gradual process across a network (possibly requiring the re-grading of trunk mains in liquefied areas)
- work to reconnect/restore damaged private connections (household & commercial) will not necessarily be able to be co-ordinated with repairs to the Territorial Authority network

Some of the key factors influencing the extent of problems of sewage disposal from these events are the density of the population (CBD apartments vs rural) and the socioeconomic characteristics of the affected population. Along with the time of year and prevailing weather conditions, other influencing factors are location and geology. For example:

- sandy/silty areas – *able to dig*;
- rock/clay hillsides – *unable to easily dig*;
- CBD area – *no space to dig*.

A key focus in the early stages of a major emergency management response is supporting the affected population in place. While much of the emphasis in this strategy is given to arrangements to support people in place rather than evacuate, there are situations when emergency waste disposal immediately becomes a major problem such as in hospitals, residential care and multi-level apartment buildings, and at emergency shelters and for people in transit.

3. Planning Principles

In order to provide a structured approach to guide specific planning, the Working Group has established the following planning principles:

1. Disposal of sewage should be at source where ground conditions and other practicalities permit
2. Disposal of sewage should be land-based (i.e. avoid waterways and beaches) wherever possible
 - Need to take into account established human tendencies in terms of:
 - Disposing of rubbish and waste
 - Trying to use toilet facilities (with or without flushing water)
 - Seeking shower facilities as a personal health and comfort factor (and the associated cultural/security issues)
3. Base planning on the assumption of no evacuation and maximum occupancy of residences as soon as possible
 - The outcomes of this work will address the key question of '*Can we safely support people living in the affected area?*'
4. Integrate disaster sewage planning with advice on and removal of spoiled food from fridges, freezers etc (a big initial issue due to volume and food safety issues)
5. Support the councils' focus of maintaining the confidence of the public that a workable set of arrangements are in place

6. Take a similar approach as emergency water in terms of establishing community focal points
7. Toxic trade waste as an initial priority and will need ongoing monitoring (hazsub link)
8. Address via 4Rs (reduction, readiness, response & recovery) approach, giving consideration to both the structural and non-structural elements

4. Response Elements and Preparedness Activity Plan

The Working Group has established that the sewage disposal chain comprises three key stages:

Stage 1 - Household/ key facility containerisation and initial storage

Stage 2 - Collection from households/ facilities

Stage 3 - Disposal by Territorial Authorities/ contractors

In terms of time frames, Stage 1 focuses on the first week (but continuing as long as is necessary), and Stages 2 and 3 come into focus in weeks 2 and 3 onwards (when resourcing and access is available).

The process map in Table 1 on the following page outlines the characteristics and focal points for each of these key stages against the situations of sewage disposal in the CBD, Urban and Rural areas respectively.

The Working Group has developed an outline of specific response elements and messages associated with each of the key stages, and the corresponding preparedness activities by Territorial Authorities (TAs) and contractors. This outline is included on pages 7 and 8 following.

Consideration needs to be given to how much of this can be progressed on a collective (i.e. CDEM Group) rather than individual basis.

It is essential that TA wastewater asset managers and emergency managers implement the specific preparatory measures into their emergency response plans. Further consideration needs to be given to the pre-allocation of key response roles during an event between asset managers and emergency managers.

It is noted that damage assessment and overflow containment is a key initial focus of Asset Managers following a major event such as earthquake.

Table 1: Disaster Disposal of Sewage – Overall Process Map

	CBD Apartments, hotels, key facilities	Urban		Rural	Mass Assembly
		Rock/ clay ground	Soft ground		
Stage 1: Household/ Key facility containerisation and initial storage	Likely to be a combination of solutions adopted for 'Urban – Rock/ Clay' and 'Mass Assembly'	<ul style="list-style-type: none"> Plastic bags best likely option for solids-based Be prepared to store initially on site Communal toilets in parks & sports grounds as short-term option 	<ul style="list-style-type: none"> Focus on on-site disposal Dig long-drops (those physically unable to will require assistance) Where septic tanks in use, put waste directly in through external vent 		<i>Requires further specific consideration</i>
Stage 2: Collection from households/ facilities	<ul style="list-style-type: none"> Unlikely to occur until weeks 2 & 3 To be integrated with disposal of food What are the volumes involved? Logistics to be further investigated Resource (demand & availability) H & S issues (incl. double handling) 	Not required			
Stage 3: Disposal by TAs/ contractors	<ul style="list-style-type: none"> Medium-term storage to be further considered Issues around site selection for permanent disposal to be worked through – landfills may be OK 				

Response Elements and Preparedness Activity Plan

(i) Household/ Key Facility Containerisation and Initial Storage

Response Elements/ Messages	Preparedness Activity
<ul style="list-style-type: none"> Residential storage in urban areas via appropriate plastic bags for use with toilets and in plastic bins is an appropriate practical focus 	<ul style="list-style-type: none"> Appropriate pre-event and post-event messages around alternative interior and exterior toileting arrangements
<ul style="list-style-type: none"> Additional council rubbish bags will be made available at water distribution points 	<ul style="list-style-type: none"> Identify the community distribution points for emergency water TAs to have adequate numbers of bags to cope with initial demand (week 1) (further guidance required to quantify this) Arrangements for backup stocks of standard bags to be helicoptered in (e.g. during the second week)
<ul style="list-style-type: none"> Waste must be kept on-site until confirmed arrangements for collection are in place <ul style="list-style-type: none"> bins used must have some form of lid considerable issues for mass assembly locations 	<ul style="list-style-type: none"> Appropriate pre-event and post-event messages
<ul style="list-style-type: none"> Using wastewater facilities (e.g. wet wells and manhole chambers) is not desirable <ul style="list-style-type: none"> all part of seeking to avoid drawing people to where assessments and repairs will be undertaken by Asset Managers/ Operators 	<ul style="list-style-type: none"> Appropriate pre-event and post-event messages
<ul style="list-style-type: none"> Short-term local communal toilets and washing facilities to be established in sports grounds/ parks <ul style="list-style-type: none"> ie. to be re-excavated once facility no longer required 	<ul style="list-style-type: none"> List of possible locations to be established by each TA Need for an updated version of a basic one or two page summary of the design, construction and management of pit latrines and communal washing facilities in mass context Information on sourcing frames and covers for latrine surrounds from within and outside the region to be prepared – incl. current level of stores; what numbers should TAs be able to provide?
<ul style="list-style-type: none"> Short-term community toilets could be set up over 3.5m³ waste bins using pre-prepared grates and latrine frame 	<ul style="list-style-type: none"> Arrangements including prefabrication where necessary to be put in place

(ii) Collection from Households/Key Facilities

Response Elements/ Messages	Preparedness Activity
<ul style="list-style-type: none"> Collection unlikely to occur until week 2 or 3 	<ul style="list-style-type: none"> Appropriate pre-event and post-event messages
<ul style="list-style-type: none"> Needs to be integrated with removal of at-risk food from fridges, freezers etc (potentially bigger issue due to volume incl. hotels & restaurants) 	<ul style="list-style-type: none"> TAs modify contract or establish MoU with their waste management contractors regarding the specific functions required, expectations, etc Waste management drivers to receive specific briefing on expectations, default arrangements in the event of limited communications etc
<ul style="list-style-type: none"> The organisation of contractors and their bulk containers need prior planning 	<ul style="list-style-type: none"> Means of identifying waste management contractors and vehicles as essential services is to be developed by CDEM Group and TAs Should include MoUs/ extensions to contracts for post-disaster work Sourcing of large numbers of liners for bins required
<ul style="list-style-type: none"> The communications and logistics issues around collection operations are vast 	<ul style="list-style-type: none"> Further understanding of the process practicalities is required
<ul style="list-style-type: none"> Supporting resources to be identified by TAs 	<ul style="list-style-type: none"> Pool of tradespeople to support TA wastewater/ waste management contractors

(iii) Disposal by TAs/Contractors

Response Elements/Messages	Preparedness Activity
<ul style="list-style-type: none"> Need to identify locations for intermediate bulk storage of solid human waste <ul style="list-style-type: none"> - Disused tanks, former landfills 	<ul style="list-style-type: none"> Identify possible locations Adequate protection from rain, stormwater flows is required
<ul style="list-style-type: none"> There are understood to be not too many long-term environment issues associated with mass human waste disposal sites, due to reality of decay 	<ul style="list-style-type: none"> Further consideration of planning obstacles for disposal in landfills is required

5. Linkages with Other Territorial Authority Activities

Reference has been made in the previous section to linking the planning for emergency sewage disposal with the distribution of emergency water supplies.

Another example of TA post-event operational activities that need to be linked in with sewage response planning involves council GIS systems. The integration of information on damaged buildings gathered by TA Building Control via the plotting on GIS of posted building safety placards (red, yellow, green) can be used to highlight where the greatest sewer main damage is likely. This system has been used effectively during overseas events such as the 1994 Northridge, Los Angeles earthquake. While this relates to the recovery phase activities, it ideally should be set up pre-event.

Other TA operational linkages should be explored, with emphasis on asset management related activities.

6. Information Strategy & Framework

The range of process elements identified in the previous section highlights the need for a carefully structured and comprehensive set of information and messages.

The complexity of the task of disposing of sewage while the damage to the wastewater network is being assessed and repaired is re-iterated, along with the very real risk of disease compounding the public health challenges.

The information strategy therefore needs to involve the development of specific information messages covering pre- and post-event timeframes aimed at two target audiences:

- *Those responsible for addressing the problem* – Territorial Authorities and the Public Health Service
- *Those left to deal with the consequences* – General public/community

It is important that specific key messages to both audiences are developed in parallel to ensure consistency of messages and awareness, with the emphasis on pre-event planning to improve the level of preparedness within the communities.

This section summarises the key elements of an information strategy and framework.

Principles

The following principles were identified by the Working Group in the development of an information strategy:

1. A CDEM Group-wide approach, maximising the amount of common material
2. The processes for preparing and disseminating Public Information (pre- and post-event) are to be in accordance with the CDEM Group Public Information Management Plan and Public Education Plan
3. Addressing key groups within communities (houses, apartments, schools, institutions, businesses, govt agencies)

4. Recognising the range of impacts within each of these community groups
 - Areas severely affected – physical damage, manifest problems
 - Areas nominally affected – little physical damage, don't see/understand the problem
5. Preparation of standing information to promote the ongoing education and awareness of the public and ready-to-go information to hand out at all council locations and community support points
6. TA's and Public Health Service to prepare for both proactive and reactive response elements

Framework

The framework in Table 2 on the following page has been proposed to structure and organise the development of information on the key principles based on three key questions:

1. **Who needs to know?**
2. **What do they need to know?**
3. **What do they need to do now to prepare for this?**

Table 2: Information Framework

<p>Who Needs to Know? <i>Analysing the targets</i></p>	<p>What do they need to know? <i>Painting the picture post-earthquake</i></p>	<p>What do they need to do <i>now</i> to prepare for this? <i>Pre-event preparedness</i></p>
<p>Those responsible for addressing the problem</p> <p>Territorial Authority Asset Managers</p> <ul style="list-style-type: none"> • operators of the system that 'causes' the problem <p>Public Health Service</p> <ul style="list-style-type: none"> • custodians of public health; authorities of advice on makeshift arrangements 	<p>Expected reality following a major earthquake</p> <ul style="list-style-type: none"> • Both the event context and sewage specific • Direct/physical • Wider consequences/collateral effects 	<p>Messages developed for each of the target sectors (including TA Asset Managers)</p> <p>What to do; how to do it; what not to do</p> <ul style="list-style-type: none"> • FAQs • Generic prepared pre-event issue/delivery
<p>Those left to deal with the consequences</p> <p>General public/community sectors</p> <ul style="list-style-type: none"> • Householders <ul style="list-style-type: none"> – dwellings (owned and rented) – apartments (owned and rented) • Schools • Businesses • Institutions • Government agencies • Others? 	<p>What the authorities (owners of the problem) are going to be doing about it</p> <p>What the community sectors will need to do</p> <p>What individuals and organisation leaders will need to do</p> <p>All linked with other generic key CDEM messages</p>	<p>Plus additional specific prepared post-event in response to actual event circumstances</p> <p>Stocking up of CD Centres, welfare venues etc with key messages, along with associated information covering the safe handling of food and emergency water</p>

7. Summary and Action Plan

Work undertaken on this project during 2005/ 06 has identified the various physical process elements involved with disposing of sewage during and subsequent to a disaster event, along with the many associated information needs. The approach adopted has been to work out how disposal would be undertaken and to work back to establish the preparatory (or Readiness) measures that must be implemented prior to the event.

The use of a Working Group which comprises wastewater managers, emergency managers, public health advisers and environmental representatives has proven successful in gathering and understanding the different perspectives and drivers.

It is apparent that specific work needs to be undertaken in order to operationalise the ideas and principles contained in this document. This work will take time, and there needs to be a stronger level of involvement from wastewater asset managers.

It is therefore recommended that the Working Group continue in an ongoing role to address a specific programme of work. Appropriate resourcing in terms of project management will be required.

The key elements of the proposed work programme for 2006/ 07 for which approval is sought from CEG are:

1. Clarify post-earthquake roles and responsibilities between Asset Managers, Emergency Managers and contractors (as applicable)
Output: a generic response plan indicating the types of key activities to be undertaken by the main players
2. Develop the *containerisation, collection and disposal* strategy and logistics for mass assembly/ critical facilities (possibly using one specific facility as a pilot)
Output: Logistics plan covering each of the containerisation, collection and disposal elements
3. Develop the information strategy and framework
Output: Information Strategy and content developed to the level of detail where printing of some elements can be undertaken (including a Fact Sheet); material for public display at the Te Papa *Earth Rocks* display over Labour Weekend