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Level of Service Performance Measures for the Seismic Resilience of 3 Waters Network Delivery

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Engineering a **Resilient Future**

Conservative estimates of the damage to Canterbury's 3 Waters Network

Creating Resilient Communities

- Potable water – **NZ$ 100 million**
- Storm water – **NZ$ 800 million**
- Waste water – **NZ$ 1 Billion**

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NZ's estimated 3 waters renewal value

- As of 2014, estimated renewal value:
  NZ$45.2 billion.

Aim of today's presentation

- To introduce the *Level of Service Performance Measures for the Seismic Resilience of 3 Waters Network Delivery Guidelines*
- To discuss how they might be used
- Propose a series of workshops around NZ

Purpose of the guidelines

To provide a framework to define the current or potential operating stage of any part, or parts, of a 3 waters network in the event of, or planning for, a significant earthquake.

Why are the guidelines important?

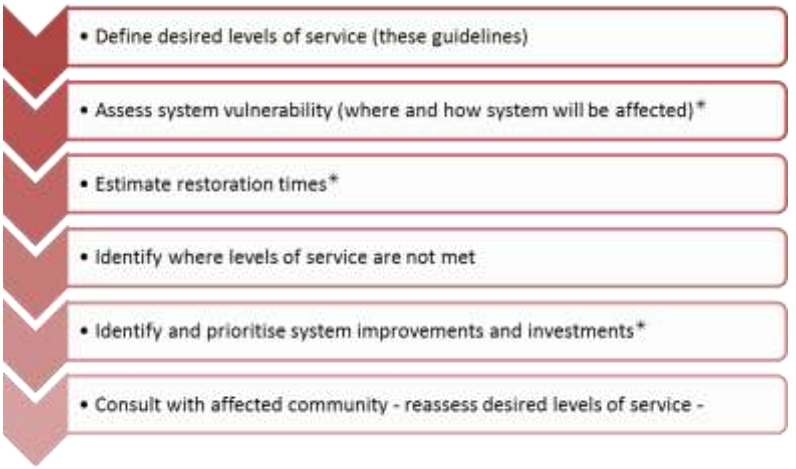
The guidelines help you and your community build resilience into 3 Waters Infrastructure by allowing a realistic discussion on:

- The risks the community carries
- What LoS can and cannot be expected if a seismic event occurs
- Capital investment choices
- Maintenance decisions
- Insurance
- Other mitigation strategies

Three specific uses

1. A communication tool to explain the network status to communities and their leaders.
2. An aid to tracking recovery to normal Levels of Service after damage caused by a seismic event.
3. A management tool to assist engineers and asset managers explain the investment needs to improve the resilience of networks.

Consulting with the community – an iterative process



Key elements

Key elements of the LoS Measures are:

- The operational stage
- Service aspect
- Community measures
- Critical community services

Operating stages

Four operating stages are defined

Recovery ↑	Full:	As, or better than, pre-event
	Operational:	Near normal service delivery but with notifiable outages and significantly increased operating costs
	Survival:	Controlled services but limited and with significant disruption
	Emergency:	Services may be completely disrupted and uncontrolled
Earthquake		

Operating stages

It is important to begin by defining what is meant by **FULL** Level of Service.
It is only when the full level of service is understood that the lesser levels can be defined.

- Does your community understand what is currently delivered?
- Is this an acceptable Level of Service?

Service aspects – Potable and Fire

Potable Water

- quality
- quantity

Fire Protection

Service Aspects - Wastewater

- Wastewater collection
  - Within property
- Wastewater conveyance
  - Public, in the streets
  - Pipes, manholes. Etc.
- Wastewater treatment and disposal
  - Public, at treatment plant and beyond


Service aspects - Storm water

- Storm water collection
  - off property
- Storm water containment
  - flood protection
- Storm water treatment
- Storm water disposal


Community measures – Waste water

	Full
Wastewater collection	• Unimpeded use of toilet and other wastewater disposal sources (e.g. bathroom, kitchen)
Wastewater conveyance	• No leakage or odours during dry weather. • Number of wet weather overflows is below the agreed containment standard.

Community Measures – Waste Water

	Operational
Wastewater collection	• Normal toilet function at most times. May be limited in wet weather • Possibly some leakage into ground
Wastewater conveyance	• No overflows to waterways during dry weather but more wet weather overflow than the agreed containment standard. • Higher than normal flows in the sewers • No objectionable odours • Higher operating costs

Community Measures – Waste Water

	Survival
Wastewater collection	• Provision of temporary systems, i.e., portaloo, chemical toilets or pump-out provided by council
Wastewater conveyance	• Controlled overflows to waterways during dry weather; uncontrolled discharges during wet weather • Objectionable odours

Community Measures – Waste Water

	Emergency
Wastewater collection	• No or very limited service on property • Possibly toilet dug in garden by home owner • Blowbacks on properties • Objectionable odours
Wastewater conveyance	• Uncontrolled overflow from pipes, manholes or pump stations; to waterways or onto private property. • Sewage in street at times • Discharges into waterways during dry and wet weather • Objectionable odours.

Critical services

These are community services that the 3 Waters systems serve, e.g.:

- Emergency services
- Hospitals
- Aged care facilities
- Etc.

There is a hierarchy of critical services. The hierarchy may change as the recovery progresses

Components of a LoS target

Target LoS =

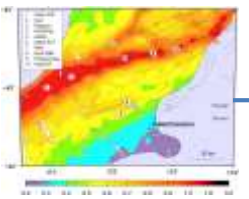
+ Service aspect
+ Operational stage
+ Location
+ Criticality
+ Duration
+ % of region

Output Levels of Service

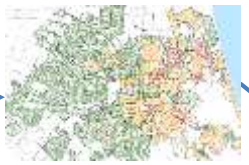
LoS Purpose	Amount Quantity	Location or User Supplied	Duration until LoS provided	% City
Firefighting	SNZ PAS 4509:2008	Priority locations • • • •	• • •	All
Notes: Priority locations for providing post event firefighting supplies need to be agreed with the Fire Service, Civil Defence Emergency Management Group and water service providers				

What else is needed?

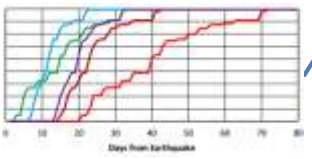
Expected damage



Hazard model



Expected LoS



Restoration curves

Next steps

1. A pipe network renewals workshop:
   a) Understanding current work programmes
   b) Coordinating future needs and workstreams
2. LoS Workshop series:
   a) Two-three hour exercise to identify key extent of likely damage
   b) Application of Operating Stages and LoS templates
   c) Local collation of required information required
   d) Coordinated by lifelines groups?

Conclusion

- Using Levels of Service to drive resilience improvements
- Using the LoS guidelines as planning tools for:
  – Functional responses to improved resilience
  – Investment planning to improve resilience
  – Engaging the community in the resilience discussion

Guidelines can be found on the home tab of the Quake Centre's website or the Water NZ website.

Questions?

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