

Levels of Service Performance Measures for the Seismic Resilience of Three Waters Network Delivery



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Context

Learning from the Christchurch Earthquake sequence and other disasters has highlighted the need for New Zealand's 3 Waters Services to be seismically resilient. In the context of these guidelines the key aspects of a resilient system are:

- Robust physical assets with key network routes having appropriate alternatives, and response arrangements in place
- Effective co-ordination arrangements (pre- and post-event)
- Realistic end-user expectations and appropriate measures of backup arrangements.

Purpose of the Levels of Service Performance Measures

The Levels of Service Performance Measures for the Seismic Resilience of 3 Waters Network Delivery provides a framework which may be used by engineers and asset managers 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. They are designed to be used in a number of ways:

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

This document provides guidance on definitions of different stages of recovery and how to use the guidelines to develop target Levels of Service related to these stages. *Appendix A: Templates for Target LoS for critical services* provides a tool to assist in collating the target Levels of Service for potable, waste and storm water as the recovery transitions from stage to stage. *Appendix B: LoS impacts on critical services*, identifies a number of critical services that will need to be prioritised when considering seismic resilience.

This document is intended to be the first in a series of guidelines, with future documents providing guidance on assessing system vulnerability, estimating the durations to restore service and the design and implementation of works to improve resilience.

Background

The potable, storm and waste water (3 waters) assets of New Zealand are rarely considered by the public until a natural disaster or major failure affects the service delivery.

Unfortunately, New Zealand is very prone to large natural hazards including earthquake, flood, landslide, and volcanic eruption. Planning for, and mitigating against, the effects of such disasters needs to be ingrained into the business as usual practices of asset management. In respect to 3 waters networks, whilst relatively rare, earthquakes are by far the most damaging event. Fortunately, building seismic resilience into a network and its management processes has been shown to have significant beneficial impacts on the network resilience in many other situations.

Building a resilient 3 waters delivery service begins with a clear understanding of what service is expected to be delivered. The first step in this process is defining Levels of Service (LoS) that are clearly communicated, understood and valued by the community that the system serves. It is upon this understanding that the service expectations, costs, risks and compromises can be agreed with a community. This guidance document defines a framework of Levels of Service performance measures upon which this conversation can be based.

In 2014, the total replacement value of the 3 waters assets in New Zealand was estimated about NZ\$45.2 billion. The wastewater network had the highest replacement value at around NZ\$17.8 billion, followed by drinking water assets at NZ\$16.2 billion and storm water at NZ\$11.2 billion.¹ As these assets are upgraded or replaced, many difficult decisions will need to be made in respect to the trade-offs between Levels of Service, capital costs, operating costs and management of risk. One key lesson from the Canterbury Earthquakes is that insurance cannot be relied upon as a sole risk mitigation strategy.

It is important that the argument for, and the cost of, seismic resilience is adequately understood, so that balanced judgements can be made in the investment and management of the 3 waters assets from a whole-of-life perspective. It is also a requirement of the Local Government Act 2002 Amendment Act 2014 that territorial authorities have an infrastructure strategy that provides for resilience in regards to natural hazards. Again, central to this is a discussion with the community as to the Levels of Service that are expected and how these levels are likely to be affected in the event of a natural disaster. This conversation needs to be framed in respect to the effect on the individual; the wider community; local business and the local and regional economies.

¹ From the Department of Internal Affairs analysis of 2014 Local Authority Annual reports

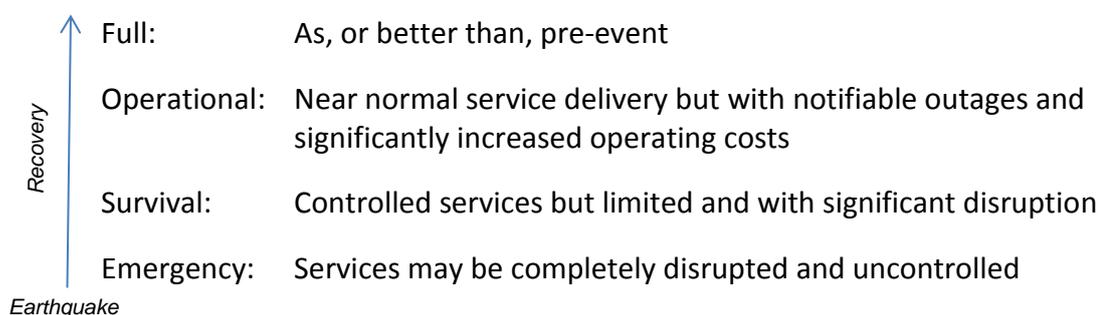
Key elements of the Levels of Service Performance Measures

The performance of a network after an event is multi-faceted. There are a number of elements that make up the performance measures. These comprise:

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

Operating Stages

Four operating stages have been defined in regards to the road to recovery. These are:



Different geographical zones will be affected differently in an event. A more resilient network will have zones that spend less time in the lower operating stages and these zones will be smaller. Some zones may never reach an emergency stage.

Service aspect

The 3 Waters have been broken down into a number of different service aspects. These are:

- Potable Water Quality
- Potable Water Quantity
- Fire Protection (from fire mains or alternative sources)
- Wastewater collection (within the property)
- Wastewater conveyance (public, in the street, pipes, manholes, etc.)
- Wastewater treatment and disposal (public at treatment plant and beyond)
- Storm water collection (off property)
- Storm water containment (flood protection)
- Storm water treatment
- Storm water disposal (flood alteration)

Community measures

These are the primary measures which are aimed at elected representative and members of residential and business communities. They define service levels and targets pertaining to different stages, from normal service down to the minimum, emergency, levels of service that may be expected. Displaying the areas operating at the different service level by means of GIS can make the recovery plans and activities understandable to the general public and its leaders.



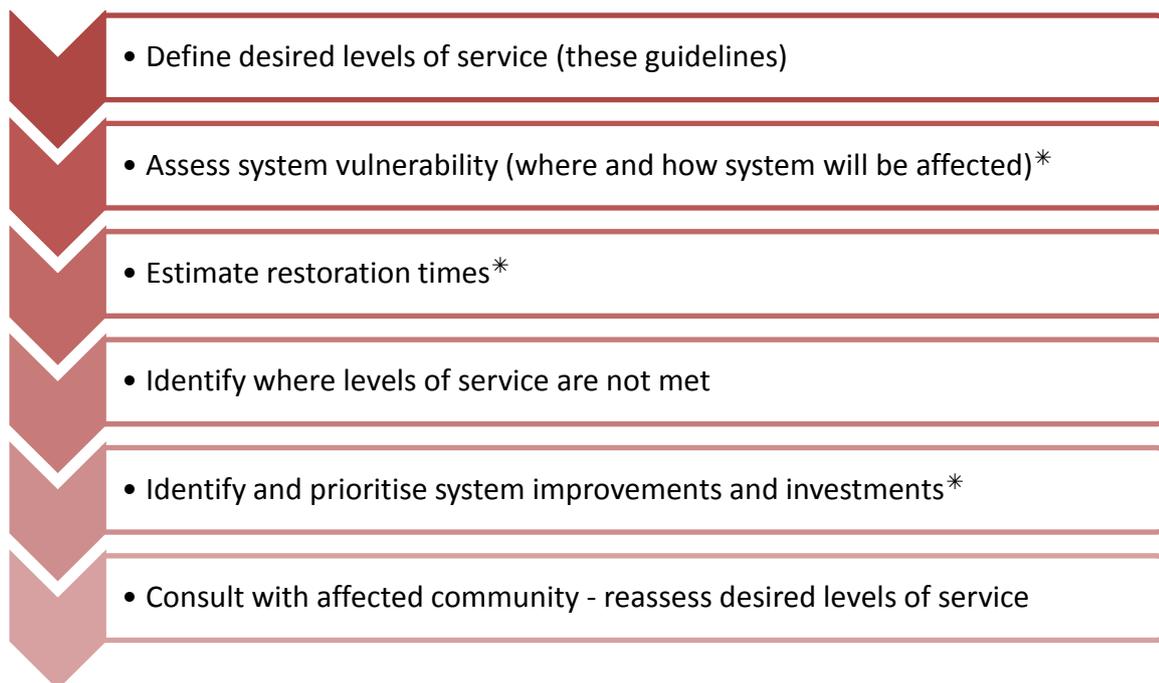
Figure 1: Map identifying zones by status of wastewater network

Critical community services

Critical services such as hospitals and emergency services are identified based on a hierarchy of needs. This hierarchy itself may vary depending on the ability of the service to be self-sufficient in respect to its water needs or whether the service is able to be relocated to a place with acceptable levels of service. The criticality is based upon potable water, public health and fire service needs.

Using the measures to evaluate post-event levels of service

The levels of service described in this document have been derived by an expert panel of practitioners in light of the experience in the Canterbury Earthquakes. The aim is for them to be a national guideline. However, local circumstances may make these LoS unobtainable or unaffordable. Therefore these measures provide the starting point for an iterative process of evaluation of acceptable levels of service in a catchment.



*Future guideline documents will address assessment of system vulnerability, estimation of restoration times and the design and implementation of works to improve resilience.

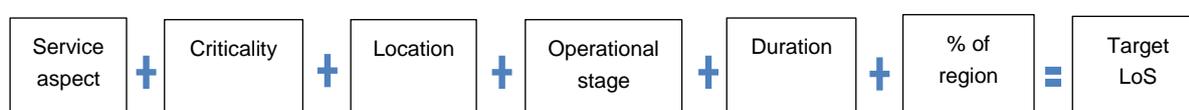
Components of a LoS target

The requirements for potable, waste and storm water services needed by people, groups and organisations are different between users. For example individuals and families need to have access to at least a few litres per-person per day of water that is safe to drink, fire-fighters need a large amount of water that could be saltwater to put out fires, while the hospital will need a large amount of good quality water to provide patients and staff. The wastewater service requirements will need to mirror the supply of potable water. Storm water services may have significant impacts on some lifelines for example.

The acceptable LoS target will comprise a number of elements:

- Service aspect
- Operational stage
- Location of service
- Criticality of service
- Duration of operational stage

In addition, the proportion of a region affected may also be an input when considering impacts of diminished levels of service in regards to relocation of services or the scale of assistance required.



The location and users supplied by the water supply is where water services are needed and by whom. If water isn't flowing through the taps in a house the people living there may be able to find water nearby (e.g. at a school or community centre) and still remain in their home. Alternatively a hospital cannot function unless enough water is delivered to its location each day. Fire-fighters need water at many points across the city to deal with unpredictable emergencies.

Duration is the amount of time the community might expect to live with water services that are not as good as pre-event. This will vary geographically across a region; a hazard event will affect some areas more than others. The map of the different levels of service will likely be a patchwork across a region.

The proportion of a region relates to the number of people, organisations and facilities affected by damage to the region's water supply infrastructure.

Criticality is chosen by the importance of the service or asset that the 3 Waters system serves. The criticality of a service may vary as the recovery progresses.

The 'percentage affected' measure reflects the ability of communities to adapt to lower levels of service. If only a small portion of the city is affected then additional resources can be mobilized to that area to assist the people affected and there is scope for residents to be relocated to other sections of the city. This is not the case if a large portion of the city is affected.

The following section defines the performance measures and targets.

Community Service performance definitions and targets matrix

Operating Stage (Wellington Lifelines Group, 2012)				
← Recovery →				
Service Aspect	Full <i>As, or better than, pre-event</i>	Operational <i>Near normal service delivery but with notifiable outages and significantly increased operating costs</i>	Survival <i>Controlled services but limited and with significant disruption</i>	Emergency <i>Services may be completely disrupted and uncontrolled</i>
Potable Water Quality	Microbiologically safe Quality assurance systems fully operational	Microbiologically safe Quality assurance systems may not be fully operable.	May be microbiologically unsafe Disinfection required Risk of contamination between treatment plant and property.	Reticulated water may be microbiologically unsafe DIY disinfection Own supply of bottled water

Potable Water Quantity	<p>Normal pressure</p> <p>Normal volumes</p> <p>Disruptions:</p> <ul style="list-style-type: none"> ▪ Planned ▪ Notified ▪ Short duration <p>Limited to local impact.</p>	<p>Water restrictions</p> <p>Planned and notified disruptions for repairs</p> <p>Reticulated water supplied to property may be at reduced pressure with frequent fluctuations</p>	<p>Water delivered via the reticulated system or by tanker to a suburb</p> <p>Reduced pressure</p> <p>Frequent disruptions</p> <p>Water restrictions</p> <p>Tankers or standpipes available within 500- 1000m of home or minimum reticulated supply of 20l/person/day</p>	<p>The expectation is that the household is self-sufficient for the first three days. Households may need to use water that stored in hot water cylinders or other sources.</p>
Fire Protection	<p>Fire code compliant</p>	<p>Normal Fire Code standard but not at expense of domestic/industrial supply</p>	<p>Alternative sources</p>	<p>Alternative supply such as: river, lake, sea, etc.</p>
Wastewater collection (Within the property)	<p>Unimpeded use of toilet and other wastewater disposal sources (e.g. bathroom, kitchen)</p>	<p>Normal toilet function at most times. May be limited in wet weather</p> <p>Possibly some leakage into ground</p>	<p>Provision of temporary systems, i.e., portaloos, chemical toilets or pump-out provided by council</p>	<p>No or very limited service on property</p> <p>Possibly toilet dug in garden by home owner</p> <p>Blowbacks on properties</p> <p>Objectionable odours</p>

<p>Wastewater conveyance</p> <p>(Public, in the street, pipes, manholes, etc.)</p>	<p>No leakage or odours during dry weather.</p> <p>Number of wet weather overflows is below the agreed containment standard.</p>	<p>No overflows to waterways during dry weather but more wet weather overflow than the agreed containment standard.</p> <p>Higher than normal flows in the sewers</p> <p>No objectionable odours</p> <p>Higher operating costs</p>	<p>Controlled overflows to waterways during dry weather; uncontrolled discharges during wet weather</p> <p>Objectionable odours</p>	<p>Uncontrolled overflow from pipes, manholes or pump stations; to waterways or onto private property.</p> <p>Sewage in street at times</p> <p>Discharges into waterways during dry and wet weather</p> <p>Objectionable odours.</p>
<p>Wastewater treatment and disposal</p> <p>(Public at treatment plant and beyond)</p>	<p>Full primary, secondary and tertiary treatment to consented water quality standard</p> <p>Return to pre-event flows</p>	<p>Treatment to consented water quality standard</p> <p>Increased flows</p> <p>No objectionable odours</p> <p>Higher operating costs</p> <p>No untreated disposal into waterways in dry weather</p>	<p>No recreational contact or food gathering in receiving waters</p> <p>Objectionable odours</p> <p>Discharge through emergency points</p> <p>Screening and primary treatment only within treatment plant</p> <p>No solids in discharge</p>	<p>No treatment</p> <p>Impossible to meet environmental protection and community's health standards</p> <p>No recreational contact or food gathering in receiving waters</p> <p>Discharge through emergency points, i.e., river, estuary, etc.</p> <p>Solids in discharge.</p> <p>Objectionable odours</p>

Storm water collection (off property)	Fully controlled systems No surface run-off or ponding up to the agreed design level Uninterrupted access to properties.	Collection system generally working but more surface runoff and localised ponding than pre-event. Controlled access to properties	Temporary relief systems required (pumping, emergency channels, etc.) Limited access to properties	Piped collection system significantly damaged or overwhelmed Systemic failure No access to properties
Storm water containment (flood protection)	Fully within design channels, No properties flooded for less than 1 in 100 year events	Basement / street/ neighbourhood flooding – properties flooded in localised areas under extreme rainfall	No flooding of lifeline routes Overflow/inflow from wastewater systems Widespread flooding under extreme rainfall events	Stop bank over-topped or failed Community wide flooding
Storm water treatment	Treatment systems to consented levels – no environmental impacts	Treatment systems to consented levels – no environmental impacts	None, uncontrolled environmental impacts	None, uncontrolled environmental impacts
Storm water disposal (flood alteration)	Controlled as designed Minimal overflows	Fully utilised control systems (stop banks, ponds, channels, etc.), i.e. at full capacity	Disposal points blocked, changed, damaged	Uncontrolled System overloaded

Appendix A: Templates for Target LoS for critical services

The template below can be used to inform the process of setting post-earthquake LoS targets for the 3 water system. The LoS set out priorities for restoring service during the survival stage of the recovery.

The inputs (on the left side of the table) are drawn from the performance measures and from the hierarchy of needs outlined in Appendix C. The outputs (the duration of a particular stage of LoS and the extent of the acceptable area of limited service) are the basis of consultation with the community. A bullet point (■) denotes a negotiable LoS component around which to engage the community. As each community will have different circumstances and priorities quantities, quality and other factors different from those in this template may also need to be consulted upon.

Potable Water and Firefighting

Purpose of LOS	Amount, Quality	Location, user supplied	Duration until LoS is provided	% City	Notes
Firefighting	SNZ PAS 4509:2008	Priority locations <ul style="list-style-type: none"> ■ ■ ■ ■ 	■	All	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.

Emergency Response	20l/p/d SNZ PAS 4509:2008	Civil defence centres Emergency operation centres Ports, airports & other lifelines	2 days	All	<p>It is expected that these users will have facilities to boil water when they are provided water that is not of potable quality.</p> <p>It is expected that these users will have onsite storage to last until water is provided.</p> <p>20l/p/d provides adequate water for drinking, food, basic hygiene and cooking needs (Howard, Guy; Bartram, Jamie, 2003) and (WHO, Technical Notes on Drinking-Water, Sanitation and Hygiene in Emergencies, 2013). USAID and the Sphere project indicate that 15l/p/d may be adequate.</p>
Loss of life, emergency response – fire fighting	SNZ PAS 4509:2008	Relocation areas Hospitals Age care centres Prisons Ports, airports & other lifelines Civil defence centres Emergency operation centres	3 days	All	<p>It is expected that these users will have onsite storage to last until water is provided.</p>

Care of injured, elderly and others that cannot be moved	60l/p/d, potable SNZ PAS 4509:2008	Hospitals	3 days	All	It is expected that these users will have onsite storage to last until water is provided. The Sphere Project and USAID recommend that hospitals have a supply of 40-60l/p/d.
	20l/p/d, potable SNZ PAS 4509:2008	Age care centres, Prisons	3 days	All	It is expected that these users will have onsite storage to last until water is provided. 20l/p/d provides adequate water for drinking, food, basic hygiene and cooking needs (Howard, Guy; Bartram, Jamie, 2003) and (WHO, Technical Notes on Drinking-Water, Sanitation and Hygiene in Emergencies, 2013). USAID and the Sphere project indicate that 15l/p/d may be adequate.
Drinking, cooking, basic hygiene	20l/p/d, potable SNZ PAS 4509:2008	Relocation centres	3 days	All	It is expected that these users will have onsite storage to last until water is provided. 20l/p/d provides adequate water for drinking, food, basic hygiene and cooking needs (Howard, Guy; Bartram, Jamie, 2003) and (WHO, Technical Notes on Drinking-Water, Sanitation and Hygiene in Emergencies, 2013). USAID and the Sphere project indicate that 15l/p/d may be adequate.

	20l/p/d	Within 500 - 1000m of households ¹	3 days	■	<p>It is expected that these users will have facilities to boil water when they are provided water that is not of potable quality.</p> <p>It is expected that these users will have onsite storage to last until water is provided</p> <p>20l/p/d provides adequate water for drinking, food, basic hygiene and cooking needs (Howard, Guy; Bartram, Jamie, 2003) and (WHO, Technical Notes on Drinking-Water, Sanitation and Hygiene in Emergencies, 2013). USAID and the Sphere project indicate that 15l/p/d may be adequate.</p>
	20l/p/d, potable	At household	■	■	<p>120l/p/d provides adequate water for drinking, food, basic hygiene and cooking needs (Howard, Guy; Bartram, Jamie, 2003) and (WHO, Technical Notes on Drinking-Water, Sanitation and Hygiene in Emergencies, 2013). USAID and the Sphere project indicate that 15l/p/d may be adequate.</p>
Community development, Education	20l/p/d, potable Firefighting at SNZ PAS 4509:2008	Schools	■	■	<p>The Sphere Project recommends 3l/p/d for schools. Auckland Regional Council TP58 (2004) indicates 15-20l/p/d is typical usage.</p>
Community development – meeting places	Potable water at pre-earthquake quantity, Firefighting at SNZ PAS 4509:2008	Community meeting places, e.g. cafes, sports centres	■	■	

Governance	Potable water at pre-earthquake quantity, firefighting at SNZ PAS 4509:2008	Central & government facilities	■	All	
Employment	Potable water at pre-earthquake quantity, firefighting at SNZ PAS 4509:2008	Shopping, business and industrial areas	■	■	
Housekeeping	70l/p/d, potable	Households	■	■	Adequate water for drinking, cooking, personal washing, washing clothes, sanitation and cleaning home (WHO, Technical Notes on Drinking-Water, Sanitation and Hygiene in Emergencies, 2013).

Additional notes

- 1 In New Zealand, distances of 400m and 800m have previously been used to model access to neighbourhood resources at an estimated 5min and 10min walking time respectively (Pearce et al. 2008). These distances do not consider load bearing trips and so an optimal distance of 500m may be appropriate in the context of a centralised water supply. 100m to 1000m is recommended by (Howard, Guy; Bartram, Jamie, 2003). Consideration also needs to be given to the number of people being supplied from each point. The ability of the system post event to provide adequate water to that point and to be able to dispense it in an orderly manner to the people being served needs to be considered. USAID recommend a maximum of 250 people per standpipe.

Waste Water disposal

Purpose of LOS	Amount, Quality	Location, user supplied	Duration until LOS is provided	% City	Notes
Emergency Response	Toilet & shower facilities	Civil defence centres Emergency operation centres	2 days	All	Service may initially be provided through the provision of portaloos.
Care of injured, elderly and others that cannot be moved	60l/p/d black and grey collected from property	Hospitals	3 days	All	It is expected that users will have facilities on site to store wastewater until measures are in place to collect wastewater and remove it from the property. Service may initially be provided by sucker trucks removing wastewater from onsite storage tanks or other similar measures. Private pipes may need repair to allow service
	20l/p/d black and grey collected from property	Age care centres	3 days	All	
Drinking, cooking, basic hygiene	Toilet and shower facilities and facilities of black water	Within 500 - 1000m of households	3 days	■	Grey water may be disposed onto property. Blackwater may need to be collected on the property and transported in buckets to the disposal site.
	Toilet and shower facilities	Relocation centres	■	All	

	Toilet facilities	At property boundary of household	■	■	Grey water may be disposed onto property. Blackwater may need to be collected on the property and transported in buckets to the disposal site. Service may initially be provided through the provision of portaloos.
	Wastewater collected from property at pre-event levels	Households	■	■	Private pipes may need repair to allow service
Public Health	Wastewater discharges	Wastewater overflows are restricted to isolated or controlled locations	■	■	
Community development, Education	20l/p/d grey and black water	Schools	■	■	
Community development – meeting places	Wastewater conveyance at pre-event levels	Community meeting places, e.g. cafes, sports centres	■	■	
Governance	Wastewater conveyance at pre-event levels	Central & government facilities	■	All	

Employment	Wastewater conveyance at pre-event levels	Shopping, business and industrial areas	■	■	Private pipes may need repair to allow service
Environmental impacts – conveyance	Wastewater is no longer discharged directly to watercourses or other temporary areas. Dry and wet weather overflows are within consented levels.	Wastewater Discharges	■	■	
Environmental impacts – treatment	Discharges from the treatment plant are in accordance with consented levels	Wastewater Treatment Plant	■	■	

Storm Water

Purpose of LOS	Amount, Quality	Location, user supplied	Duration until LOS is provided	% City	Notes
Emergency Response – Lifelines	1/50 year flood	Lifelines locations and transport routes: <ul style="list-style-type: none"> ■ ■ ■ ■ ■ 	■	All	
Life safety	Habitable locations where risk of inundation of greater than 1m in 1/50 year event	<ul style="list-style-type: none"> ■ ■ ■ 	■	■	

Appendix B: LoS impacts on critical services

Adapted from (Opus International Consultants, 2015)

The following identifies the likely critical services that rely upon the 3 waters system and how those services' needs are likely to change as recovery occurs. Each region's critical services and needs will be different. The importance of the interdependencies of different services and lifeline utilities specific to a region must also be taken into account. These interdependencies may have significant impact on the Levels of Service that can be delivered after an event.

User group	Ability to adapt to a lower level of service
Emergency services	<p>Limited ability to adapt to a lower level of service, particularly for firefighting where water is vital to reduce more widespread damage and injury from the disaster. In general, water for firefighting is needed immediately after the event, however, this may be available from alternative sources which are negotiated and understood by the fire service.</p> <p>This group may be in the position to reduce their need for water over time as the disaster recovery progresses, though at all times fire, police, and ambulance services must be equipped to respond to an event such as a major aftershock.</p>
Hospitals	<p>Limited ability to adapt to a lower level of service given the expected increase in demand for hospital care and emergency department treatment.</p> <p>A reduction in demand will still place hospitals as a significant consumer of water that requires high volumes of piped water for continued operation. A minimum of 60 litres per-person per day is the survival level for a hospital care.</p>
Age care facilities	<p>Age-care facilities, like hospitals have limited capacity to adapt to a lower level of service. The residents of these facilities generally have a high need for ongoing supply of water for medical care, consumption, and hygiene. Staff operating these sites will be in a position to reduce demand of water to meet daily health needs. A minimum of 60 litres per-person per day is the survival level for aged care facilities.</p>
Other lifeline utilities	<p>The interconnectedness of water with external lifeline utilities means that in many cases one cannot function adequately without the other. The potable water supply is reliant on power for treatment and pumping; and road access via the transport network.</p> <p>Similarly, the regional fuel supply; telecommunications; and sea and air transport all rely on a high level of water service to provide their own</p>

	services.
Civil defence	Community Civil Defence locations also have the ability to adapt to a lower level of service, though this directly affects the support they can provide to the community.
Industry and business	<p>Limited ability to adapt to a lower level or service though this varies between sectors/business types. Businesses that are important for community functions and social activity such as grocery and hospitality locations may be able to reduce their demand for water and perform a scaled back service over the short-term.</p> <p>For a return to full service most businesses and industries require re-establishment of a high level of water service both to sell products and for safety such as building sprinkler systems etc.</p>
Prisons	Limited ability to adapt to a lower level of service beyond reducing consumption per person. This must be achieved in a manner that does not cause further unrest, nor reduce the capacity of the prison environment to function effectively.
Central and local government	<p>In the short-term both central and local government are able to adapt to a lower level of service through scaling back of services to focus on core roles, and the use of on-site stored water.</p> <p>Beyond the short-term a higher level of service will be necessary to provide effective governance and community support during the recovery. Local government is less able to move outside of the city/region but can likely move to a new location if the existing premises face long-term low levels of service for water infrastructure.</p>
Community services and facilities	<p>These groups and locations are adaptable to lower levels of service though it is likely to have a direct effect on their ability to provide support to the wider community.</p> <p>Ongoing temporary disruptions are able to be dealt with through planning ahead of time. This may lead to services temporarily located elsewhere.</p>
Education	<p>Education facilities have a limited level to adapt to a lower level of service for water access.</p> <p>Reopening will be based on a range of community and city/regional recovery factors, of which access to water will be one. Therefore a high level of service is required for reopening of education facilities.</p>
Households and communities	Generally these users are able to adapt to a lower level of service in the short-term if there is an accessible supply of water to meet basic consumption and hygiene needs.

	<p>Ongoing low levels of service are likely to force individuals/families/households to relocate if they are able. Vulnerable individuals who are unable to move become a significant concern at this point.</p> <p>Households and communities are likely to be able to adapt to ongoing temporary disruptions as water infrastructure is taken off-line for repairs. These periods should be communicated in advance and alternative supply options be made available.</p>
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Priority user group by recovery stage

Stage	Priority	User group	Function
Emergency Services may be completely disrupted or occurring in an uncontrolled manner	Preserve human life	Firefighting	Fight fires where risk to human life
	Emergency response	Civil Defence	Coordination of emergency response, centralised locations for off-site access to water supplies
		Emergency Services	Emergency response, medical needs, consumption and hygiene for staff in emergency response roles
Survival Controlled services but limited and with significant disruption	Preserve human life	Firefighting <ul style="list-style-type: none"> • Relocation areas • Hospitals • Age care centres • Prisons • Ports, airports & other lifelines • Civil defence centres • Emergency service centres 	Prevent fires establishing in locations with high population densities, people who cannot be easily moved and other lifeline facilities
	Care of injured & elderly	Hospitals Age care facilities	Meeting essential consumption, hygiene, and medical needs of these vulnerable populations
	Drinking,	Households and	Meeting consumption

	cooking, basic hygiene	communities Relocation centres Prisons	and hygiene needs of local residents
	Coordinate responses & community development	Community Support Centres	Centres where people can access support services and where recovery activities can be coordinated

Feedback

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