Wellington Water

# Water Supply Resilience Strategic Case

August 2015

Our water, our future.

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| PREPARED BY: | VERSION | DATE PREPARED |
|---|---|---|
| Wellington Water Limited | FINAL | 24 August 2015 |

# 1. Introduction

## 1.1 Purpose and Scope

Wellington Water is a shared service, council-controlled organisation jointly owned by the Hutt, Porirua, Upper Hutt and Wellington city councils, and Greater Wellington Regional Council. We manage the three water networks (drinking water, stormwater and wastewater) on behalf of our client councils and provide advice on how best to deliver the three water services.

Each of Wellington Water's shareholding councils own their respective water infrastructure and decides (after considering advice from Wellington Water) the service levels, policies and investment it will make in consultation with their respective communities. Councils fund the capital and operational expenditure on their networks and Wellington Water's budget.

This document outlines the Strategic Case for investing in improving the resilience of the water supply network in the Wellington metropolitan area of Hutt, Porirua, Upper Hutt and Wellington (serving approximately 400,000 people) in relation to natural or man-made disaster events and operational management risks. The document explains the strategic context for the potential investment, and presents a shared understanding of the scale and significance of problems with the current water supply network, outcomes sought and the benefits desired.

Resilience is one of the nine systemic challenges that the country faces (National Infrastructure Plan 2012). Resilience is the ability to respond or adapt to change. Change can be in the form of one-off adverse event such as hazards or operational failure, or gradual change over time such as climate change or population increase. Some changes can be predicted, some cannot.

There is a need to increase our understanding of the vulnerabilities and resilience of councils' water supply networks – especially the critical assets within those networks. There is also a need to increase the sophistication of how we think about resilience, shifting beyond a narrow focus on shock events and consequent infrastructure failure. We need to think more about dependencies the network has on other infrastructures and the levels of service we provide to the community. We need to know whether the community is prepared for service interruptions in the face of hazards and operational failure.

We have adapted the Better Business Case process to develop this Strategic Case. An overview of the Better Business Case process is described in Appendix One.

## 1.2 Strategic Context

### Overview

Wellington Water's purpose is to create excellence in regional water services for healthy communities. The company's outcomes are: safe drinking water; respect for the environment; and resilient now and in the future. Our customers are those who receive drinking water, stormwater and wastewater services from us and range from residents, businesses and educational institutions to other utilities.

Wellington Water was created in September 2014, when the bulk water group from Greater Wellington Regional Council merged with Capacity. The company employs approximately 180 staff and manages expenditure on behalf of our shareholding councils of approximately $175 million, to maintain and develop water assets worth $2.7 billion. Further information on the

company's financial and funding arrangements, structure and capability can be found in Wellington Water's Statement of Intent 2015-18 or the website wellingtonwater.co.nz.

The company takes a regional approach to three water services and to continuously improve the linkage between outcomes and investment through asset management plans (AMPs) that are jointly owned by councils and Wellington Water. At the heart of this work is the notion that Wellington Water can look across all the individual council AMPs and identify issues which can be progressed more effectively and efficiently as a single issue on behalf of all councils rather than in five discrete parts.

Over the years, the cities have made steady progress in improving the resilience of the water supply, such as: promoting water conservation; improving storage, redundancy and flexibility of supply within the network; and strengthening reservoirs and pipes to minimise loss of water. There is an opportunity now to apply a whole-of-network approach (from source to tap) to ensure communities have access to water supply after a major hazard or operational failure.

## Hazards

The Wellington metropolitan area is surrounded by sea and it sits on the interface of the Australian and Pacific tectonic plates. It has a high risk of earthquakes and is subject to inclement weather, creating many natural hazards such as ground movement and floods. Climate change also brings about changes in weather patterns, frequency and severity of water-related hazards, including drought. One hazard event could also bring on another, for example an earthquake could bring on landslides and tsunamis.

These natural hazards can affect the area's water supply network and its supporting infrastructure such as power, roading and telecommunication. This in turn can affect the liveability of the cities and the businesses within the cities.

The area in particular is threatened by a movement of the Wellington Fault, which is estimated by GNS Science (a New Zealand Crown Research Institute) to have a 10% probability of moving in the next 100 years. This would cause a very high intensity earthquake and up to five metres horizontal and one metre vertical movement.

Such an earthquake would sever the water supply trunk mains in at least five locations where they pass over the fault, resulting in widespread damage to the water supply network and cutting supply of water to Upper Hutt, Wellington and Porirua. It has been estimated that it would take around 70 days to bring back water supply to parts of the Wellington metropolitan area. It could take several years to repair damage to the water supply network resulting from the severe shaking of this earthquake as much of the network may have to be rebuilt.

A Wellington Fault earthquake has been used as the worst case scenario to assess the impact on the water supply network and its restoration time. In using this worst case scenario, we will ensure all other hazards such as flooding and operational risks are covered off in our analysis. While earthquake shaking may be the driver for bulk water supply operational risks, it will guide investment in the wider network.

## Vulnerabilities in the network

The water supply trunk mains supplying water from the treatment plants stretch from Te Marua to Karori and Wainuiomata / Waterloo to Wellington. The trunk main configuration is inherently vulnerable to supply disruption because the components are typically single pipes with only a limited ability to provide alternative feeds. This configuration also provides limited resilience associated with events that disrupt the pipelines for long periods, such as a major power

disruption. Wellington City is most susceptible to disruption as it is the furthest supply point from the treatment plants.

Forty-three per cent of all the pipes used for reticulating water within the cities are made of cast iron and asbestos cement. These pipes are fragile and prone to sudden bursts and they are also four times more vulnerable to shaking than ductile iron, polyethylene or polyvinyl chloride pipes.

### Legislative requirements

The Civil Defence and Emergency Management Act 2002 (CDEM Act) is founded on the principle that community and infrastructure agencies must have an understanding of the potential hazards and vulnerabilities that they face and take measures to manage those vulnerabilities so as to reduce the impacts of events. The Wellington, Porirua, Hutt and Upper Hutt city councils and the Greater Wellington Regional Council are classified in the CDEM Act as Lifeline Utilities for the supply of drinking water. The CDEM Act requires councils to ensure they are able to continue to function to the fullest possible extent following a hazard event; although that may be at a reduced level.

# 2. Strategic assessment – The need to invest

## 2.1 Overview

A preliminary investment logic mapping process was undertaken to present the investment story to the shareholding councils and programme investment partners and other stakeholders who can shape and influence the success of this business case. This process identified the problem, the benefits of resolving the problem, the strategic response (high level response) to the problem, and the desired outcomes as a result of resolving the problem.

The councils' and other stakeholders' relationship to this business case is detailed in Appendix Two.

## 2.2 Defining the problem

The investment logic mapping process is a series of structured workshops with key stakeholders to agree on problems, benefits and outcomes, prior to investment in solutions. The preliminary investment logic mapping workshop for water supply resilience identified the following four key problems that need to be addressed, with percentages to indicate the relative scale of each the problems.

**Problem statement 1**

The Wellington metropolitan area water supply crosses numerous seismic fault lines from catchments to tap. Should a significant event occur, it could take many days or weeks to repair the network. (40%)

This problem relates to:

- the location and geography of the Wellington metropolitan area and that the cities are located on, adjacent to or between major seismic fault lines
- large sections of the primary trunk mains (bulk mains) are located along (i.e. State Highway 2) or cross the Wellington Fault and are susceptible to rupture as a result of major shifts in land mass

**Problem statement 2**

The network size, age, materials and ground conditions in the Wellington metropolitan area make it susceptible to large scale failures arising from significant seismic events and other natural hazards. This is likely to result in long term outages to water supply (40%)

This problem relates to:

- The water supply network developed over more than 100 years, differs greatly in resilience levels due to material type and age, resulting in likely widespread and difficult-to-predict levels of damage in a natural hazard event
- The geographical and dispersed nature of the Wellington metropolitan area and its population centres mean that significant time, resources and investment will be required to fully repair the entire metropolitan network due to road closures, poor ground condition and other related infrastructure issues

**Problem statement 3**

Wellington metropolitan area water supply network has a linear configuration with limited water storage in high demand areas. A significant outage in these areas would disrupt the water supply to a large number of residents (15%)

This problem relates to:

- The catchment or extraction (aquifer) sites could be disconnected from either the treatment plants, distribution points and major population centres in the occurrence of a natural hazard or man-made event, resulting in the loss of water supply services to the community
- Increasing expectation for investment in the resilience of infrastructure to withstand or minimise damage resulting from natural hazard events

**Problem statement 4**

| The Wellington metropolitan area utilities are likely to be disrupted by a significant event followed by a lengthy period of restoration of the water supply to the community (5%) |
|---|
| This problem relates to:<br>- The limited coordination between councils and other stakeholders (e.g. electricity and roading agencies) in the preparation of investment plans to support water supply resilience<br>- Increasing expectation for working with other stakeholders to develop investment plans for resilience of infrastructure |

## 2.3 The benefits of investment

The potential benefits of successfully investing to address the problems are summarised below. These benefits can apply to more than one problem statement.

**Benefit statement 1**

| Benefit 1: We continue to provide drinking water to the people in the Wellington metropolitan area post event (30%) |
|---|
| This benefit relates to:<br>- The need for increasing levels of service (i.e. reliable, sufficient volume, drinkable and accessible) for water supply to the community and business in the periods following a major event<br>- The preparation of government authorities (i.e. councils and their agents, emergency services) for the restoration of water supply within acceptable timeframes after an event<br>- Better planning to ensure the water supply network is located in areas least likely to be impacted by an event |

**Benefit statement 2**

| Benefit 2: We maintain continuity of supply to priority users (30%) |
|---|
| This benefit relates to:<br>- The expectation of the community, businesses and government that Wellington Water and other responsible entities will be able to continue to supply water after an event<br>- The need for continuous water supply services to essential services following an event (eg. hospitals, emergency centres and Parliamentary Services Department)<br>- The need for continuous water supply to other interdependent agencies which are essential for response (eg. councils, Wellington Electricity and NZTA) |

**Benefit statement 3**

| Benefit 3: We minimise the time for economic recovery (25%) |
|---|
| This benefit relates to:<br>- The ability of businesses to minimise the recovery time and enable them to return to operational, 'business as usual'<br>- The ability for the community to return to productive work as quickly as possible<br>- The actual response to the natural hazard event and responses by the government, community and businesses to staying and reinvesting in Wellington in the long term after the event |

**Benefit statement 4**

| Benefit 4: We comply with legislation (15%) |
|---|
| This benefit relates to:<br>- Meeting the legislative requirements of the CDEM Act<br>- Better coordination with other utilities and stakeholders<br>- Promoting public health as well as health and safety in the community |



## 2.4 Strategic responses to realise benefits

The high level strategic responses that may be undertaken to achieve the benefits and resolve the problems are:

**Strategic responses**

| Strategic responses to realise benefits | |
|---|---|
| 1 | Improve public preparedness through education and policy - education on self-reliance to respond to an event |
| 2 | Assess and improve the water supply network infrastructure and operations to enable it to provide the agreed level of services function post event |
| 3 | Improve Wellington Water's readiness capability and response plans for a major event |
| 4 | Improve coordination with other stakeholders, working together to create parallel investment plans to support water supply resilience |

## 2.5 Desired outcomes

The desired outcomes sought from resolving the problems and achieving the benefits are:

**Desired outcomes**

| Desired outcomes | |
|---|---|
| 1 | The communities in the Wellington metropolitan area have sufficient water supply in the earliest practicable time (reflective of event size and impact) |
| 2 | Optimal economic and social recovery of the Wellington metropolitan area and the country |
| 3 | There is coordinated planning and response by all councils, lifeline utilities pre and post event. |
| 4 | Cost effective changes to the water supply network build resilience to an acceptable level |

# 3. Conclusion

The CDEM Act requires councils to reduce the impact of hazards and vulnerabilities on their water supply networks and to ensure the networks continue to function after an event, although that may be at a reduced level. Our analysis has shown that we need to do more to enable us to comply with the Act as a lifelines utility and that there is a case for change.

# Appendix One

## Overview of the Better Business Case Process

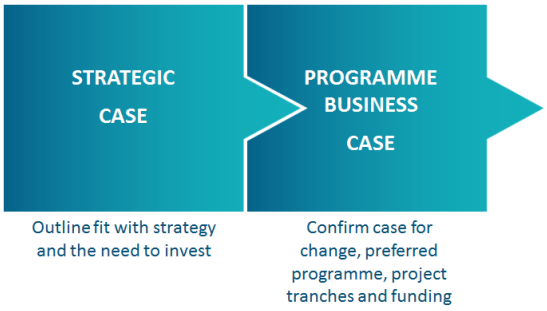
The Better Business Case process is a tool adapted for New Zealand from international good practice (UK and Australia). It is a structured way of thinking, and enables the stakeholders to work together using a step-by-step approach to develop a solution that is fit for purpose and owned by all the stakeholders.

We start by preparing a Strategic Case, which outlines the case for investing in improving the resilience of the water supply network in the Wellington metropolitan area. In doing so, it explains the strategic context for the investment, and presents a shared understanding of the scale and significance of problems with the current water supply network, the outcomes sought and the benefits desired.

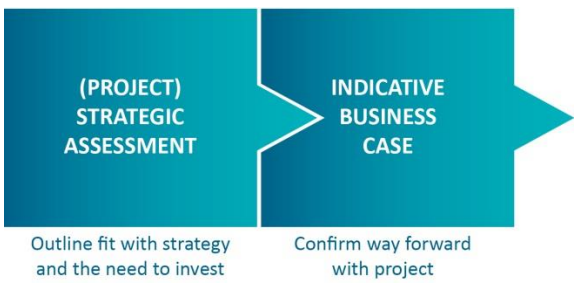
The objective of this Strategic Case and the subsequent planning and implementation of the investment programme will be to greatly enhance the ability of the people and economy of the Wellington metropolitan area to survive and recover from the impact of hazards or operational failure on the water supply network. This will be achieved through investing in the ability of the water supply network to better withstand hazards or operational failure events and achieve agreed levels of service.

A Programme Business Case will follow the Strategic Case. The Programme Business Case will set out the levels of service options and the investment programme (covering operations, renewals and upgrades) to bring the water supply network up to the regional agreed level of resilience. The Programme Business Case will consider the commercial viability, rough order costs and potential funding sources, the tranches of projects and how the programme is intended to be delivered.






For large scale construction projects, such as projects currently in the councils' Long Term Plans, we propose to prepare a 2 stage Project Business Case as follows:



# Appendix Two

## Shareholding councils and programme investment partners

| Programme investment partners | Relationship to the proposal |
|---|---|
| Greater Wellington Regional Council | Greater Wellington Regional Council is responsible for environment management, flood protection and land management and co-ordinates Civil Defence Emergency Management Group for the region.<br><br>It assumed responsibility for the water supply catchments and the extraction, treatment and supply of drinking water to the metropolitan area's four cities when it was established in 1980, by incorporating the responsibilities of the Wellington Regional Water Board and the Wellington Regional Planning Authority.<br><br>The council operates under both the Local Government Act 2002 and the Wellington Regional Water Board Act 1972, and is also responsible for granting resource consents for water abstraction and three waters discharges. |
| Hutt City Council | Hutt City Council is the local authority for Lower Hutt city from Petone, Wainuiomata and Eastbourne, and north to Stokes Valley.<br><br>The city operates under the Local Government Act 2002, which gives responsibility for water supply to serviced connections, and stormwater and wastewater disposal within its city boundary. |
| Porirua City Council | The Porirua City Council is the local authority for Porirua city, covering the area from Pukerua Bay in the north to Kenepuru in the south and Haywards in the east.<br><br>The city operates under the Local Government Act 2002, which gives responsibility for water supply to serviced connections, and stormwater and wastewater disposal within its city boundary. |
| Upper Hutt City Council | The Upper Hutt City Council is the local authority for Upper Hutt city, covering the area from Silverstream in the south to Kaitoke and parts of the Rimutakas in the north.<br><br>The city operates under the Local Government Act 2002, which gives responsibility for water supply to serviced connections, and stormwater and wastewater disposal within its city boundary. |
| Wellington City Council | Wellington City Council is the local authority for Wellington city, covering Wellington and its northern suburbs to Linden.<br><br>The city operates under the Local Government Act 2002, which gives responsibility for water supply to serviced connections, and stormwater and wastewater disposal within its city boundary. |

# Other stakeholders (Draft and incomplete)

| Stakeholders | Relationship to the proposal |
|---|---|
| Wellington Regional Emergency Management Office (WREMO) | Agency responsible for emergency response planning and coordination in the Wellington metropolitan area. WREMO emergency operations centres are critical users of the water supply.<br>Education and support to improve public preparedness for an event (for example sufficient bottled water in homes and businesses). |
| Emergency Services | Covers Fire Services, Police and Ambulance Services as critical users requiring water for emergency response.<br>Fire Service - Pressurised water required in network for firefighting purposes. |
| Hospitals and medical centres | Require water supplies urgently after an emergency to allow hospital services to continue.<br>Continued operation of hospitals and medical facilities requires sufficient volumes of water to be made available. It is critical to be able to treat patients post event. |
| Government departments | Require water supplies to allow government departments to continue to function. |
| Parliamentary Services Department | Water supply required soon after an emergency to the National Crisis Management Centre (Beehive) and parts of the parliament complex. |
| NZTA | Interdependency with Wellington Water for water supply to traffic operations centre as a critical lifeline utility, and Wellington Water requires early road access for trunk mains repairs.<br>Access required to repair critical assets within the water supply network. Road closures will occur. |
| Wellington Electricity | Interdependency with Wellington Water for water supply as a critical lifeline utility, and Wellington Water requires priority power supply to treatment plants and pumping stations.<br>Restoration of electrical supply required at water pumping stations post event. |
| Seaview Fuel Depots | Fuel depots need water for fire-fighting when dispensing fuel after an emergency. Wellington Water needs priority supply of diesel for treatment plants and key pumping stations. |
| Other Lifeline Utilities (eg. port, airport, telecommunications, gas) | To establish their requirement for water supply following an emergency.<br>For example: Operation of Centre Port requires water to be shipped in along with materials, fittings and machinery to repair the water supply network. This is considered critical given the likely isolation of Wellington CBD due to state highways susceptibility to failure as a result of major shifts in land mass. |
| Iwi | Interested in impact on water resources (for example increased abstraction of water from rivers to meet water demands) |
| Other facilities | Eg. rest homes, dialysis patients, education facilities |