Akaroa Wastewater Scheme

Update on Wastewater Flows and Land Based Reuse and Disposal Options

Presentation to the community

Wednesday 4th April 2018

Greg Offer and Mike Thorley (CH2M Beca)

Bridget O'Brien (Christchurch City Council)

Overview

- Update on Akaroa wastewater flows
  - Faulty flow meter replaced
  - New water, wastewater and rainfall data
  - What impact do higher flows have on the wastewater scheme?
- Inflow and infiltration
  - How does stormwater and groundwater get into the wastewater network?
  - What is the Council doing about it?
- Deep bore injection
  - What is deep bore injection?
  - How could it be integrated into the scheme?
  - Where could it be located?
- Summary of high level scheme options
- Next steps

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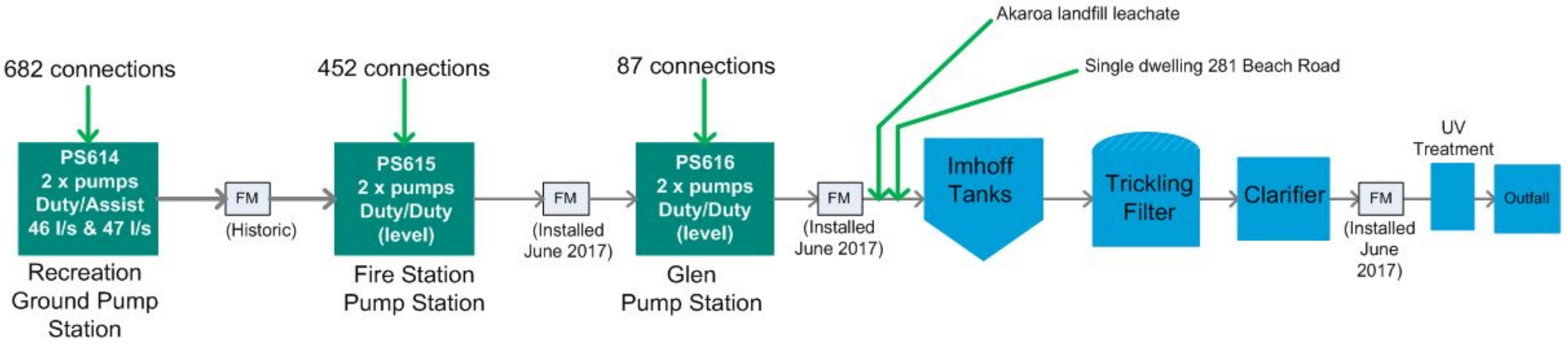
Faulty flow meter

- Analysis of submissions on 100% non-potable reuse drew attention to overall water balance (drinking water in compared to wastewater out)
- Faulty flow meter at wastewater treatment plant identified
- Flow meter had been relied on to derive design flows
- Design flows used to size wastewater treatment plant, irrigation areas, storage pond volumes
- Flows are about double what was previously thought
- Design flows to be confirmed this month once computer model of Akaroa wastewater network has been calibrated using the new flow data

New flow meters installed



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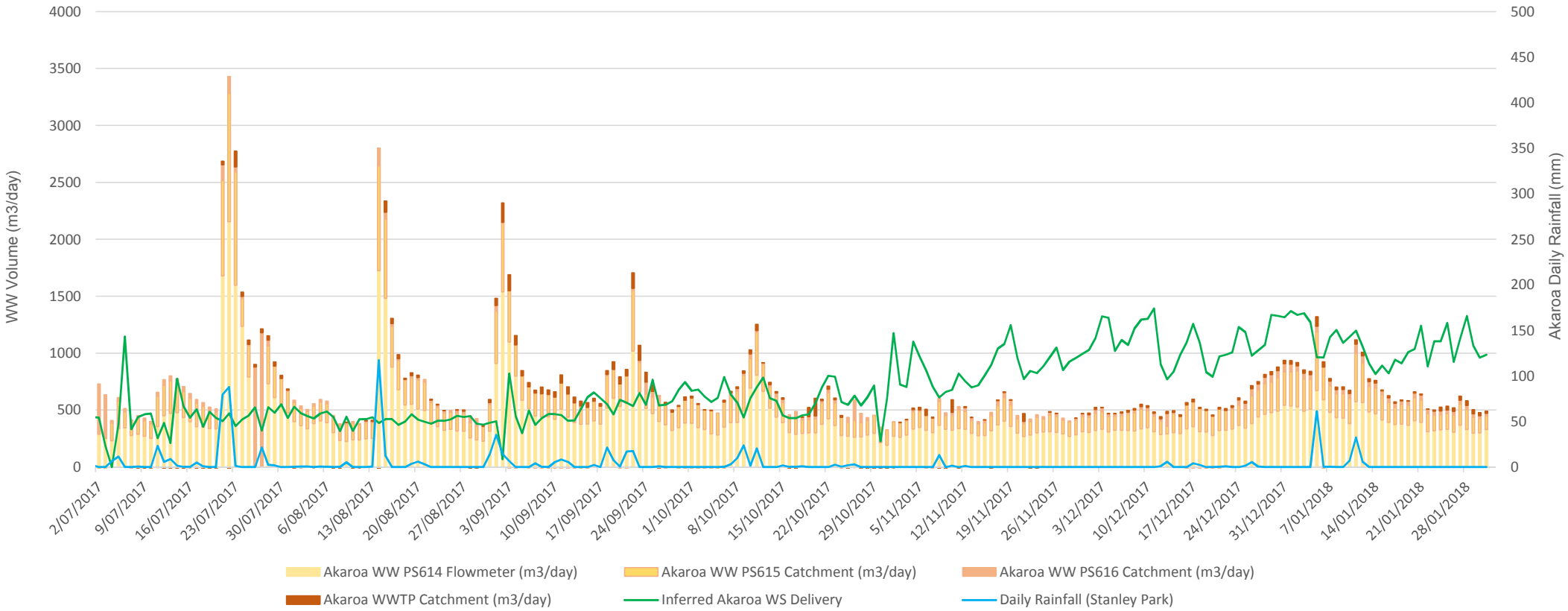
New wastewater, drinking water and rainfall data



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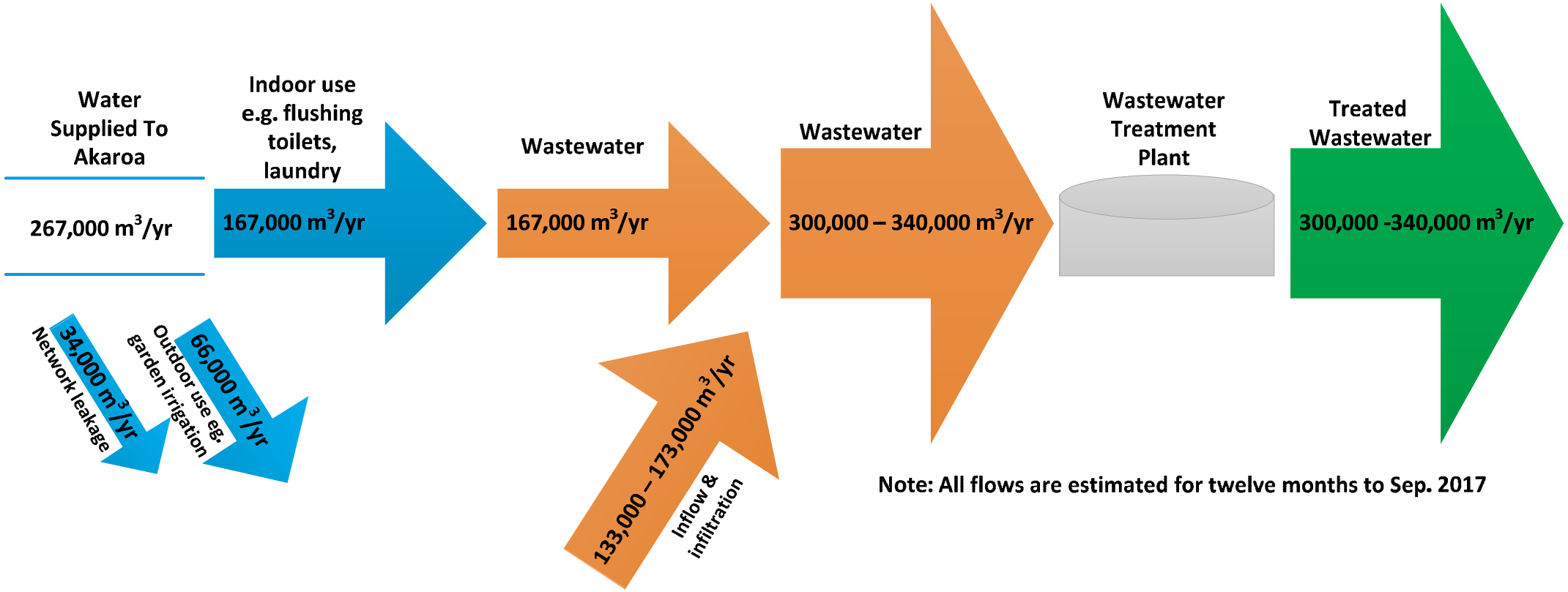
Updated water balance



Note: All flows are estimated for twelve months to Sep. 2017

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Impacts of higher flows on wastewater scheme

- Previous design flow of 138,000 m³/year required 25 ha of irrigation and 17,500 m³ of storage for trees, or 27 ha of irrigation and 35,000 m³ storage for pasture
- Flows have increased to around 300,000+ m³/year, so much more land and storage volume would be required
- Would be difficult to find enough land in Robinsons Bay and/or Takamatua
- Irrigation sites beyond harbour basin offer larger areas and can accept more wastewater (Goughs/Hickory Bay, Pompeys Pillar, Redcliffe Point)
- Reducing stormwater inflow and groundwater infiltration may reduce flows - work underway but flow reduction is uncertain
- Non-potable reuse – would only use around 10% of treated wastewater
- Deep bore injection – could be used for some or all of treated wastewater

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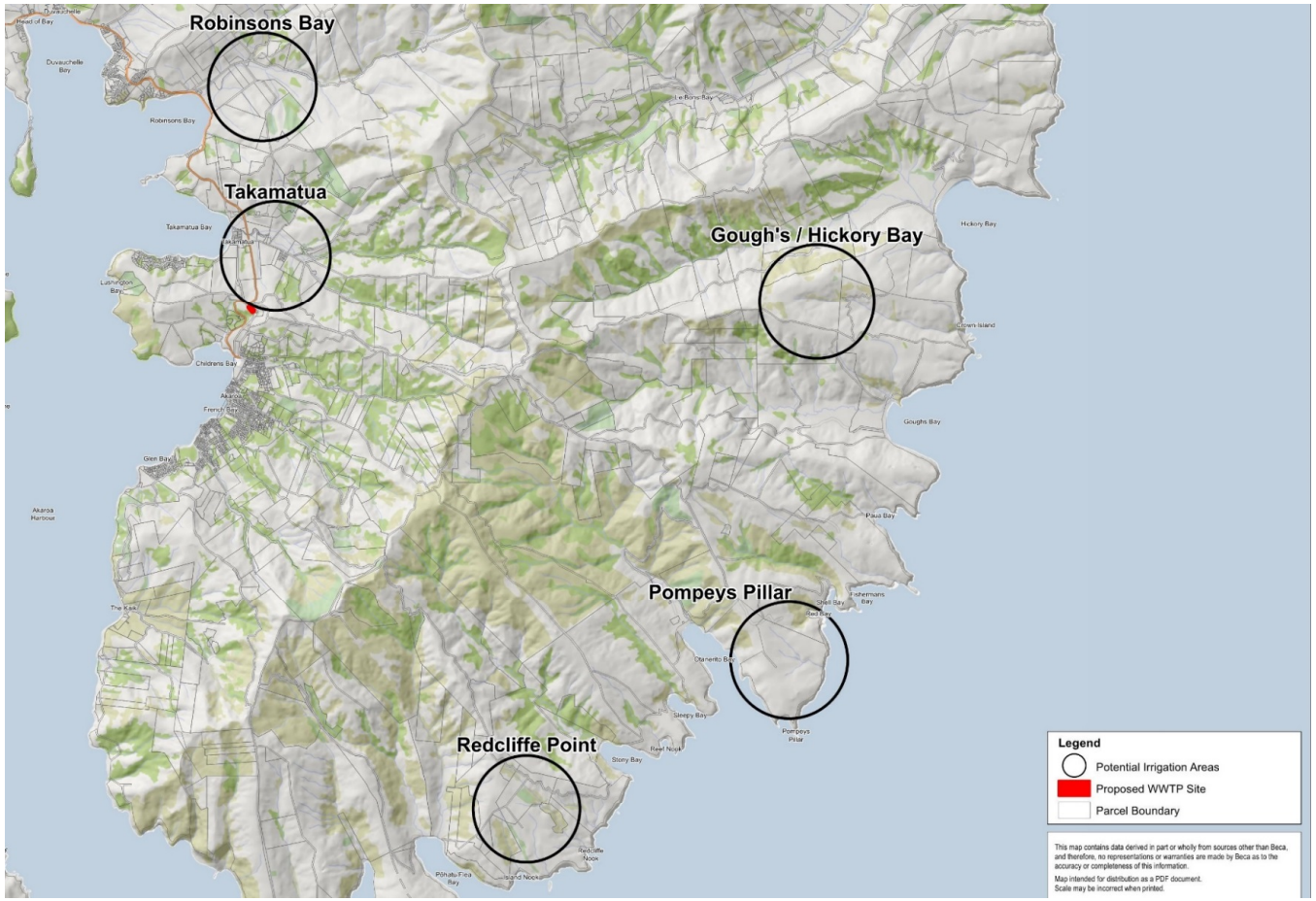
Potential irrigation areas



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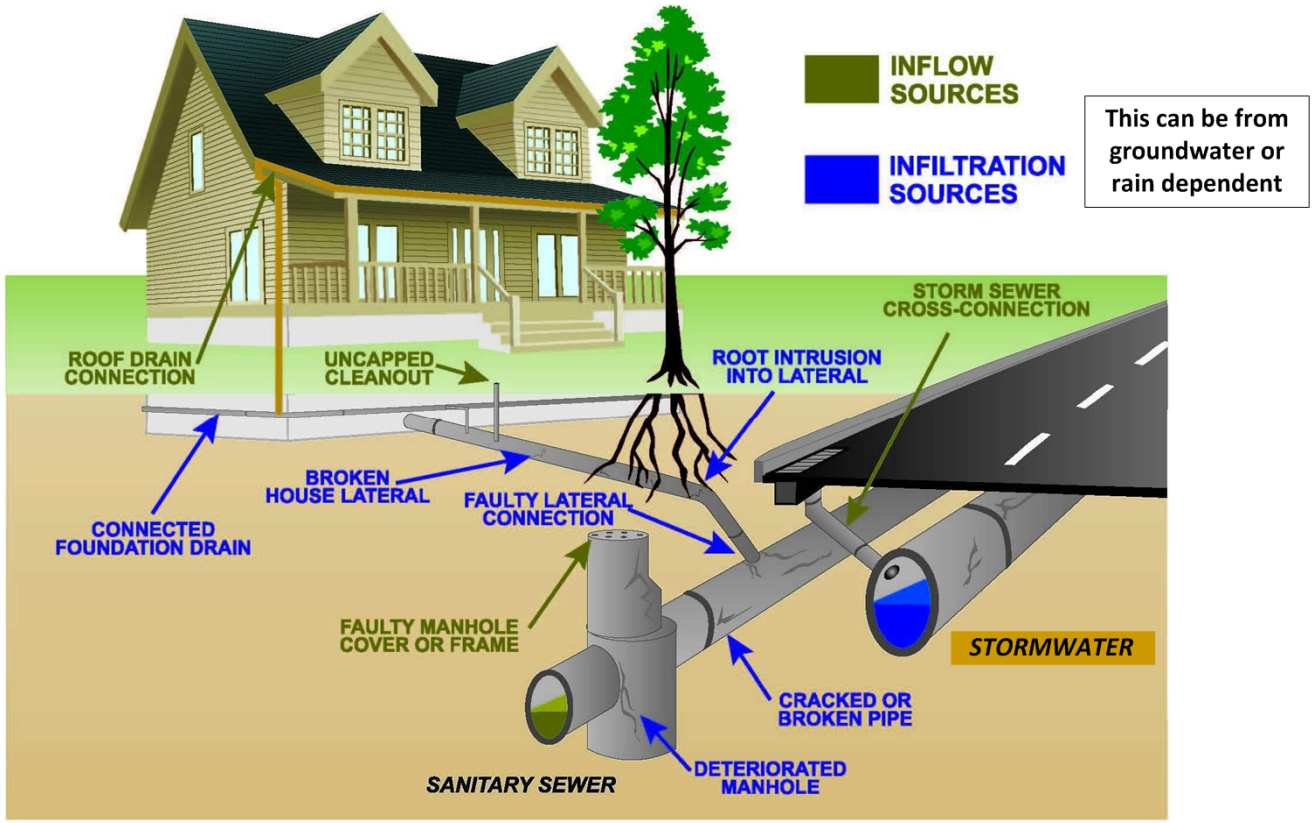
Stormwater inflow and groundwater infiltration



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Stormwater inflow and groundwater infiltration

- Flap valves on overflow points to stop water entering wastewater network
- Checking that stormwater is not flowing into manholes, replacing vents with solid lids if needed and fitting additional seals to solid lids
- Distributed Temperature Sensing (DTS) to pinpoint sources of inflow and infiltration into the wastewater network
  - Property owners being asked to fix problems on private property
  - Council is fixing faults on the public wastewater network

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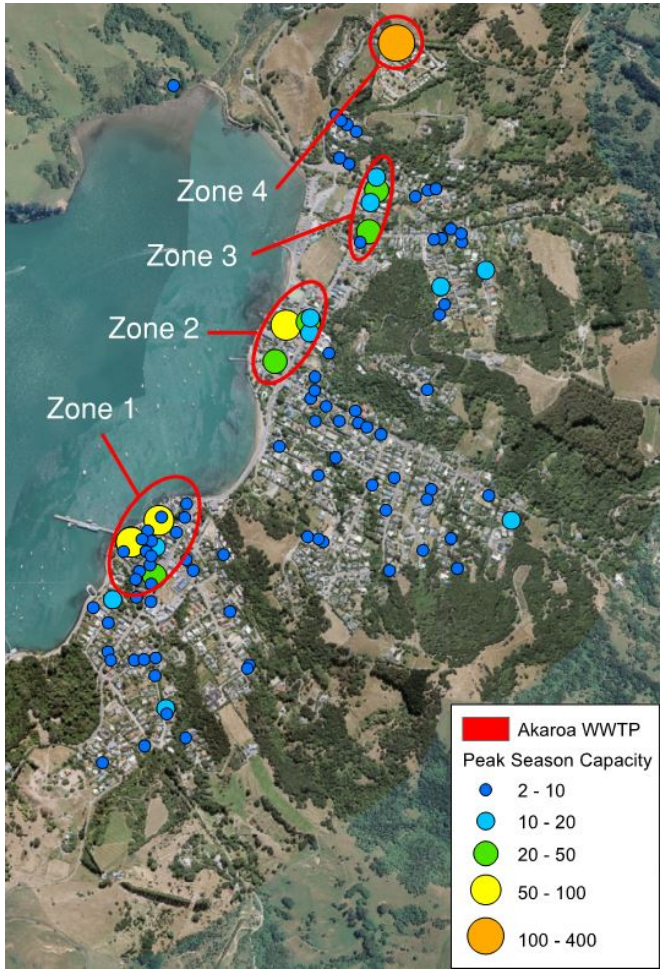
Non-potable reuse option



- Non-potable reuse can reduce flows for reuse or disposal
- Targeted reticulation to areas of high water use offers best value
- Reticulation to entire town would be more expensive with diminishing returns
- Reserves in Akaroa that could be irrigated total 1.6 ha
- Potential reuse about 12,300 m^3/year including targeted users, parks and public toilets

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What is deep bore injection?

- Treated wastewater is injected into deep bores
- Injection depth around sea level to avoid injected water contributing to springs
- Bores discharge well away from or much deeper than water supply wells
- Bores would be far enough from the harbour to achieve a residence time in the ground of months to years
- Wastewater would be treated to a very high standard as for other options
- Used in Russell for treated wastewater disposal
- Used in many parts of the country (such as Auckland, Tauranga, Waikato) for stormwater and heating or cooling water disposal (such as Christchurch)

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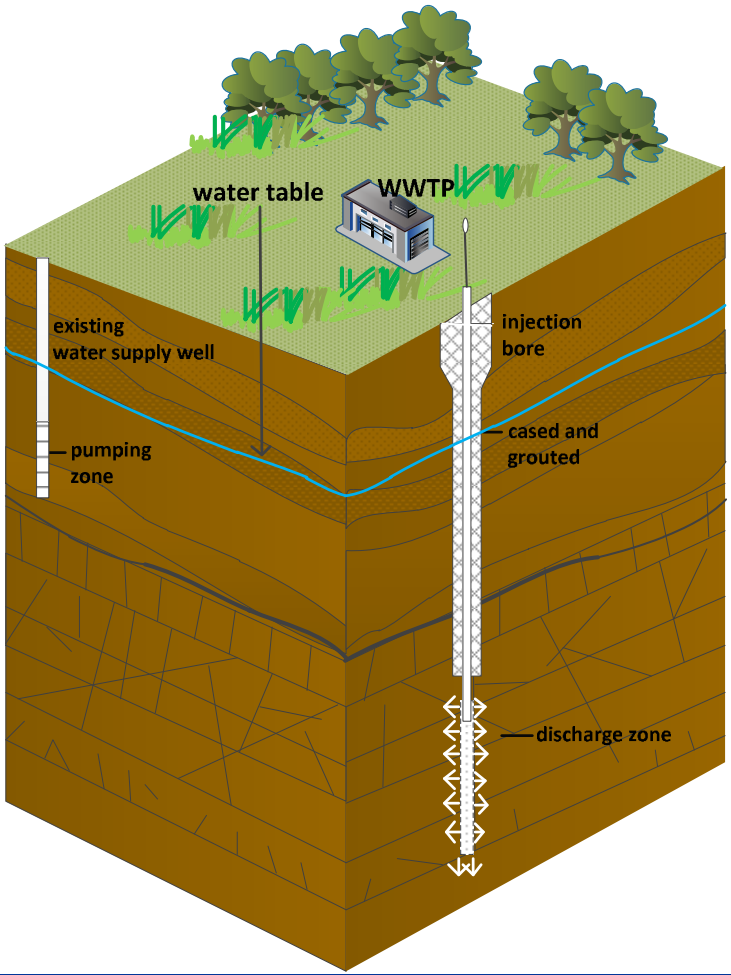
Deep bore injection



- Treated wastewater would be injected into deep bores that extend below groundwater level and below sea level
- The upper portion of the borehole would have a solid casing keeping the water in the bore. The lower portion has a screen casing that extends as deep as necessary to discharge the volume of treated wastewater required
- It is intended that the screen would start in saturated ground
- Treated wastewater is discharged from a length of well, disperses through fractures in the rock, and is further diluted by mixing with groundwater as it slowly moves downgradient

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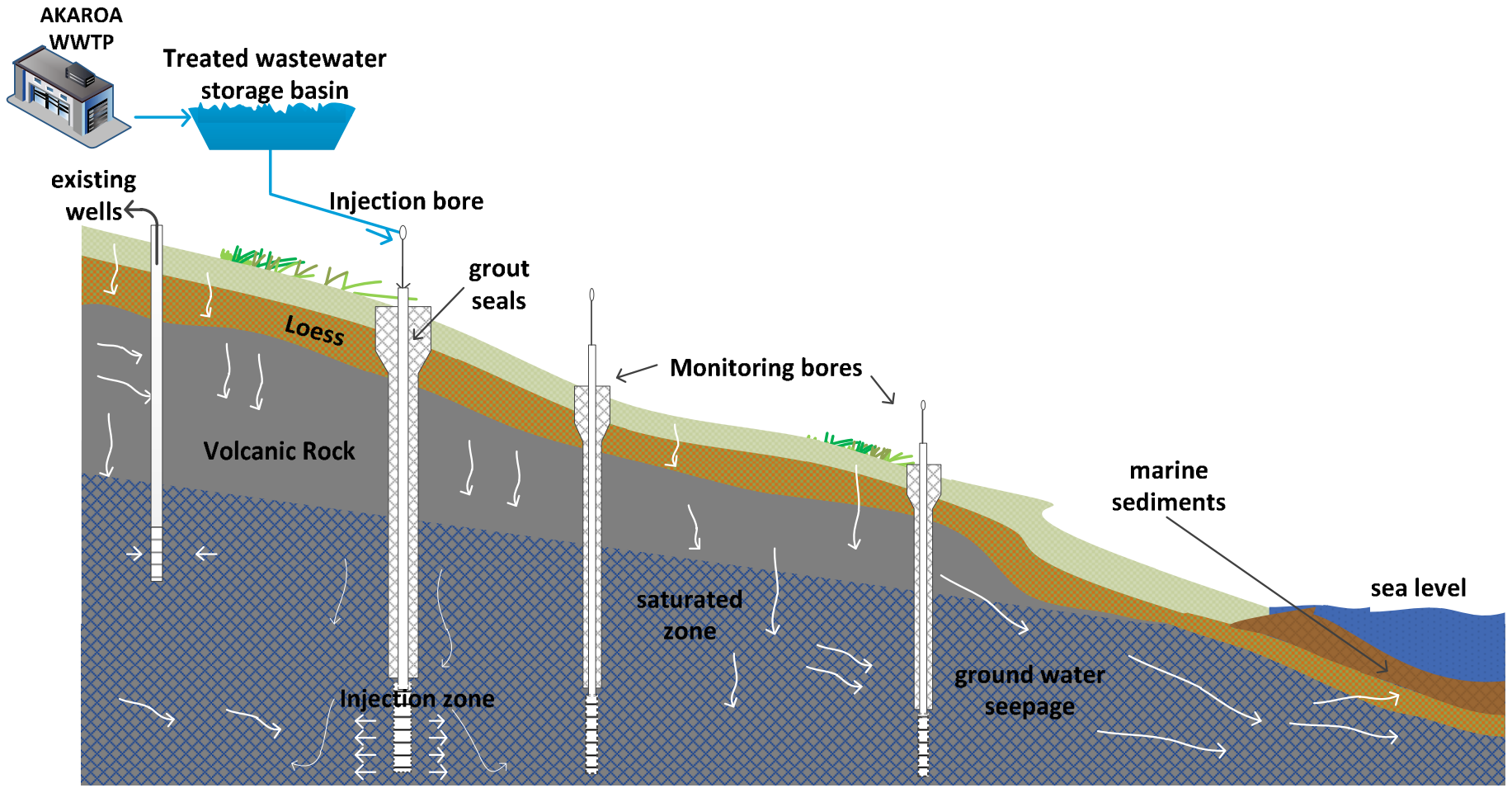
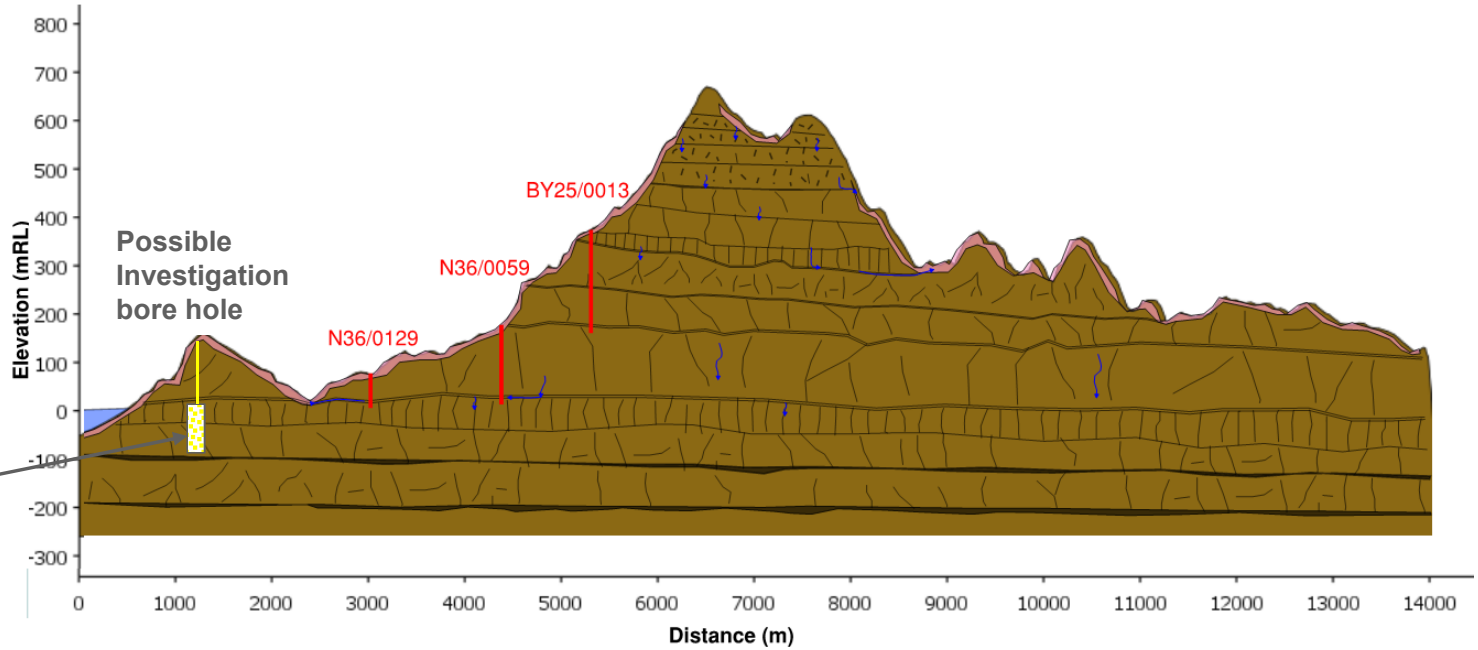
Deep bore injection



Conceptual schematic geological diagram



Schematic diagram showing conceptual understanding of geology (Adapted from: Sanders, 1986)

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Deep bore injection

- Very preliminary groundwater modelling indicates travel time of injection water from months to a few years before reaching the harbour (below sea-level), for an injection site 400 metres from the coast
- Injected wastewater dispersion, direction and destination will depend on the local ground and groundwater conditions
- Injection would be sufficiently deep to avoid land stability issues
- Injection would be sufficiently deep to avoid mixing with water taken from other wells
- Disposal rate assumed to be about 4 - 5 L/s per bore, to be confirmed by test bores
- Not beneficial reuse of treated wastewater
- Potential risks include:
  - Could limit alternative groundwater use in zone of influence
  - Regular maintenance required to maintain bore performance

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How can deep bore injection be integrated into scheme ?

- Deep bore injection could be used to dispose of some or all Akaroa wastewater
- Deep bore injection could complement land irrigation as a means to reduce storage requirements by injecting into the ground during wet weather when wastewater cannot be applied to land
- Deep bore injection could be co-located with land irrigation site(s) or be spatially separate

Protecting private water supplies

- Potential impact on other groundwater users to be assessed
- Drilling investigation is required to understand ground layers and to design a suitable injection arrangement
- Injection will be spatially separated from existing bores in the area, both vertically and horizontally
- Monitoring bores will also be constructed to allow ongoing tracking and monitoring of dispersion plume

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Criteria for deep bore injection sites

Selection Criteria	Criteria	Basis for Criteria Selection
Minimum set back to coastline	400 m	Set back to provide 1 – 3 months residence time (typical) before any wastewater reaches harbour waters. To allow any remaining contaminants in the injected treated wastewater to be dispersed, diluted and attenuated
Maximum height above sea level	200 m	Greater depths are more difficult, higher risk and more costly to drill
Public water supply exclusion zone	1500 m	Separation of 1500 m from public water supply wells is recommended to avoid any potential interaction with injected wastewater

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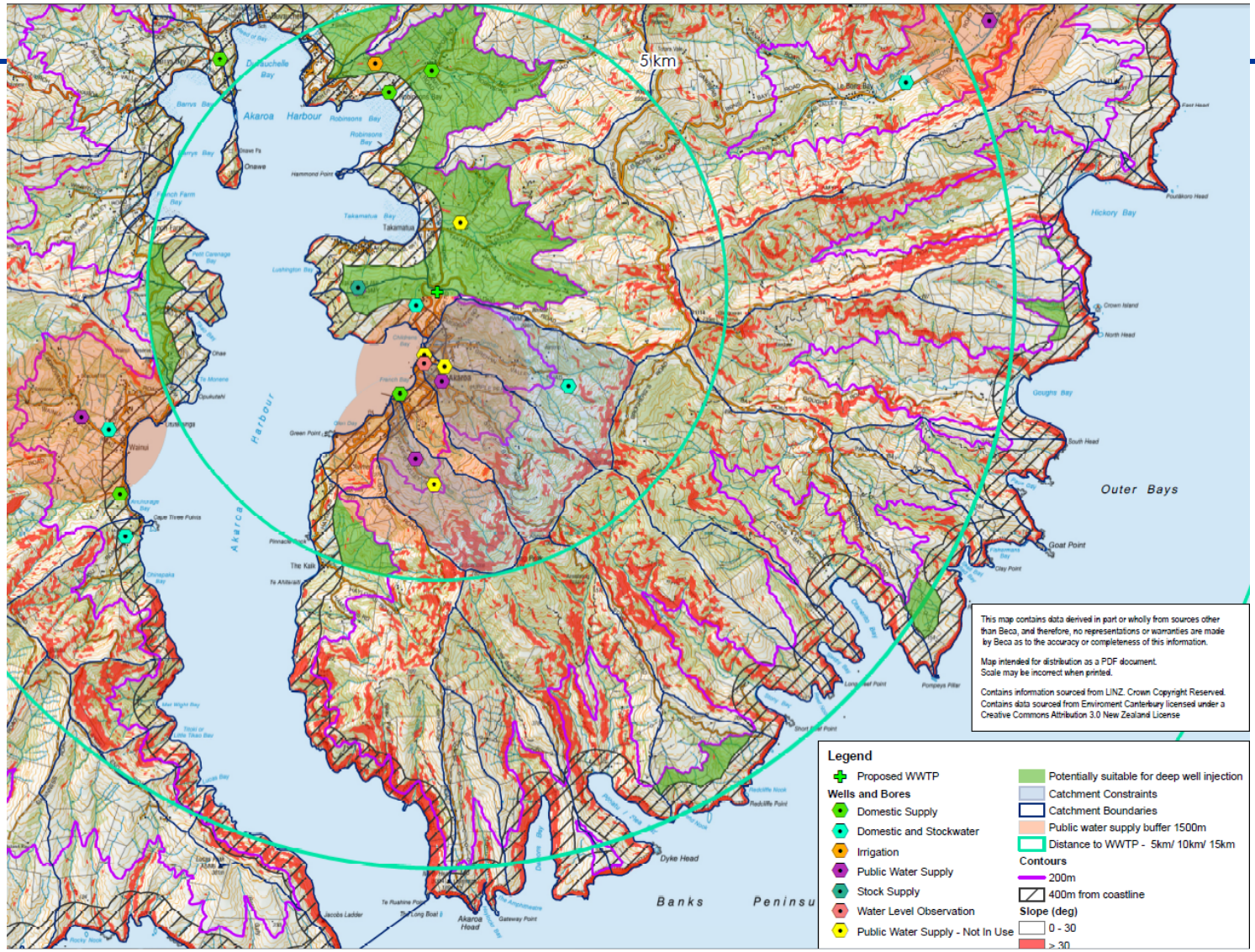
Map of criteria to identify possible sites for deep bore injection



Injection site screening assessment

	Site	Proximity to possible irrigation area	Facilitates non-potable reuse	Starting site elevation (m above sea level)	Good access	Acceptability to Ngāi Tahu Parties	Acceptability to local community	Pipeline, pump and bore (100m below MSL) capital cost	Suitable Geology
1	Upper and western harbour areas	Some	Possible	60	Yes	TBC	TBC	TBC	TBC
2	Pompeys Pillar	Yes	Possible	PP – 160	Yes	TBC	TBC	PP - $7.8M	TBC
	Goughs Bay			Goughs - 230				TBC	
	Redcliffe Point			Red - 160				TBC	
3	Robinsons Bay	Yes	Possible	90	Yes	TBC	TBC	$4.6M	TBC
4	Takamātua Valley	Some	Possible	60	Yes	TBC	TBC	$3.3M	TBC
5	Takamātua Peninsula	No	Possible	160	Yes	TBC	TBC	$5.1M	TBC
6	The Kaik	No	Yes	120	No	TBC	TBC	$5.5M	TBC
7	Hamilton's Land	No	Yes	200	No	TBC	TBC	TBC	TBC
8	WWTP Site/Pond Site 10	No	Possible	120	Yes	TBC	TBC	$3.9M	TBC

Deep bore injection – field investigation

- Field investigation needed to confirm if deep bore injection is feasible
- Drilling investigation will provide information about ground layers, inform further groundwater modelling and to design a bore injection arrangement
- First stage of investigation is one test borehole and one or two monitoring bores:
  - Pumping tests in the bores will determine the hydraulic capacity of the rocks and provide information about the groundwater movement
  - Groundwater levels will be monitored across the bores and at different depths
  - Groundwater quality will be measured

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Preferred sites for investigation bore

- Screening criteria indicates that Robinsons Bay Valley, Takāmatua Valley or the proposed treatment plant site at Old Coach Road (or adjacent Pond Site 10) are the preferred sites for establishing an investigation bore
- Geological information still to be received and likely to be a key consideration

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Summary of high level options

- Irrigation to trees or pasture in Robinsons Bay and/or Takamātua Valley in combination with deep bore injection
- Irrigation to trees or pasture in Eastern Bays (Pompeys Pillar, Goughs Bay or Redcliffe Point) with either a storage pond in Eastern Bays or deep bore injection in Robinsons Bay, Takamātua Valley or Takamātua Peninsula
- Deep bore injection in Robinsons Bay, Takamātua Valley, Takamātua Peninsula, the proposed treatment plant site or Pond Site 10
- Non-potable reuse in combination with any of the above options

Next steps

- Calibrate computer model of wastewater network and confirm design flows
- Drill and test investigation bore(s), establish feasibility, effects and cost of deep bore injection
- In consultation with the Ngāi Tahu parties and the working party decide what frequency of overflows from the network we should design for
- In consultation with the Ngāi Tahu parties and the working party decide on the short-list of options (including combination options)
- Finalise cost estimates and any further technical work required
- Undertake public consultation

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