Future 4 – Restore

Future 4 – Restore makes space for water by creating a network of open waterways and wetlands, supported by pipes, pumps, overland flow paths, and coastal protection.

This future represents a balance between engineered and nature-based solutions and creates the opportunity for an extended town belt-type landscape, integrating South Dunedin into Dunedin's wider green network.

Some property acquisitions is required to create space for these interventions.

KEY PROJECT FEATURES

- TOTAL REPURPOSED LAND **69 ha**
- **1162** PROPERTIES ACQUIRED
- **2.1 km** SEAWALL
- **16 ha** FOR STORAGE & WETLANDS
- **11** NEW PUMP STATIONS
- **4** NEW OUTFALLS
- **16 km** OF GW PIPE NETWORKS
- **1** NEW GW PUMP STATIONS
- **3.5 km** OF OPEN CHANNELS
- **32.5 km** OF PIPING NETWORKS

What we heard about Future 4 – Restore

In 2025, Council asked for feedback from Aukaha (representing Kāi Tahu mana whenua) and the local community. We've used this feedback to inform development of our futures.

KĀI TAHU RŪNAKA

Engagement with Aukaha indicated that, for Kāi Tahu mana whenua, **Future 4 – Restore** moderately aligns with Te Mana o Te Wai and tikaka (custom) principles because it incorporates more natural systems alongside infrastructure, creating opportunities for ecological connectivity and cultural restoration. This benefits biodiversity, wai (water), and moana (ocean). **Future 4 – Restore** provides scope for mana whenua to re-establish connections, exercise kaitiakitaka (stewardship), and integrate tikaka into environmental restoration.

Additionally, Aukaha noted that lower levels of flooding would result in improved community hauora (health), with wider community benefits related to wellbeing. Therefore, from a te ao Kāi Tahu perspective, **Future 4 – Restore** promotes community safety.

While **Future 4 – Restore** represents strategic and coordinated adaptation, Aukaha stress that its success depends on careful implementation to avoid inequity and to realise cultural aspirations.

COMMUNITY ENGAGEMENT

The South Dunedin community found that **Future 4 – Restore** is a positive and balanced approach. The largest group of respondents (39%) agree this future takes South Dunedin in the right direction, and a further 20% strongly agree, citing the inclusion of waterways and wetlands for their visual appeal and potential to enhance the area's overall character.

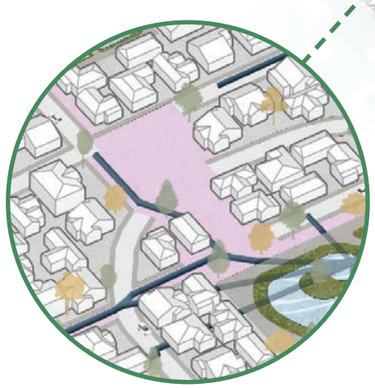
Communities value the creation of multifunctional spaces that support biodiversity, carbon sequestration, and spaces for community, alongside improved access to essential facilities. This future was considered cost-effective and proactive, offering resilience without requiring widespread relocation. However, respondents emphasised the need for clear strategies and transparent communication, particularly around timelines, and safety and maintenance of waterways.

FUTURE 4 – RESTORE

Short-term (next few decades)

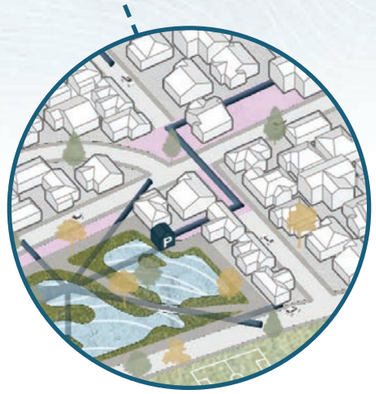
Pipes, pumps and flow paths

Given present day flood risk, Council would make short-term, significant investments in pipes and pumps: new pump stations lifting peak capacity by 137% in large storms and upsizing/adding stormwater pipelines across 25 km, designed to integrate with future waterways. Daily pumping would lower groundwater while draining rainfall; roads may still flood periodically, but property impacts are generally avoided in 2% AEP events, with some risk remaining in rarer 1% events.



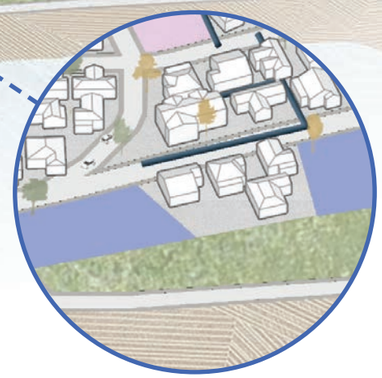
Property acquisition

Property acquisition (shown in pink areas) would take place in high groundwater zones to prepare for green infrastructure. Rezoning begins in the Flat for changes in development rules to avoid increasing risk.



Storage

Parts of Forbury, Bathgate and Tonga park are used for stormwater storage balancing space for sports, recreational natural spaces, and water. This storage is connected to a stormwater pumped system, which drains the ponds and adds further capacity to the overall system. More blue-green spaces would be needed in the future requiring some land acquisition (shown in pink).



New development

Areas shown in purple along Victoria Road would be zoned for high-density development to provide lower-risk spaces for people to shift to in the future.

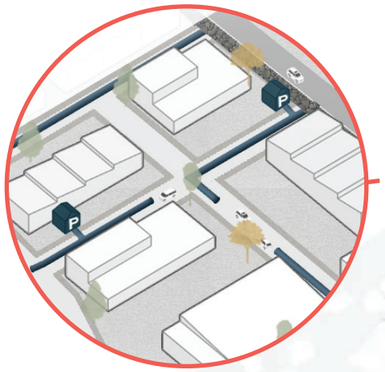
Coastal protection

In the coming decades, there are no changes to coastal protection along the harbourside.

Working together with the St Clair / St Kilda Coastal Plan: There are a few ways to protect the coast, from hard structures like seawalls and offshore barriers (offshore breakwater) to softer options like adding more sand. Any plan would also deal with the contaminated landfill at Kettle Park. Right now, the quickest and most effective thing to do is protect the area where the St Clair geobags end and the Kettle Park landfill begins. This would mean building an offshore breakwater there, removing some of the landfill, and reshaping the dunes at Middles Beach to help reduce erosion. This intervention is under development and appraisal at this stage.

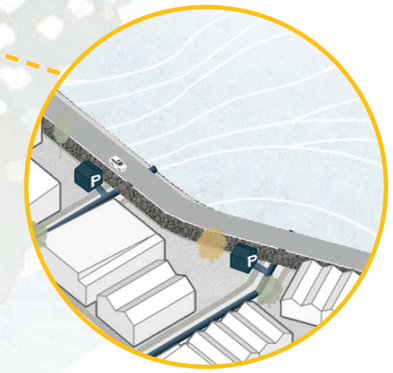
FUTURE 4 – RESTORE

Medium-term (mid-century)



Pipes, pumps and flow paths

Once flood depths greater than 150mm occur on residential lots or local roads, Council invests in a further 5.7km of pipes and increases pump capacity by an additional 21%. Roads still periodically flood, but impacts to properties are generally avoided during rainfall events with a 2% chance of occurring each year. During extreme events with a 1% chance of occurring each year, there remains some risk of property damage.



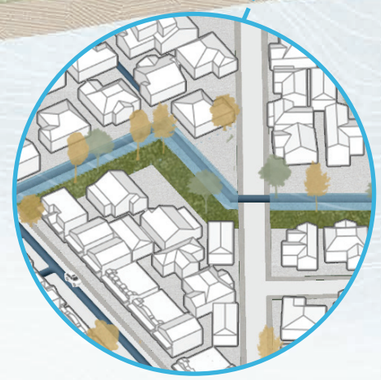
Coastal protection

Once sea level reaches 0.55m above 2005 levels, improved coastal protection along the harbourside would be required, with Council investing in extending the seawall to Bayfield Park to reduce risk to the school and raising road levels to maintain emergency and community access.

Working Together with the St Clair / St Kilda Coastal Plan: Rising sea levels and more storms would weaken and undermine the south coast seawall over time. To stop it from failing and to help keep sand on the beach, the seawall would need to be upgraded, shifted, and possibly supported with extra sand. The contaminated landfill at Kettle Park may also need ongoing remediation to prevent pollution. In future, buffer zones might be needed along the coast to allow room to move things back if erosion or flooding gets worse.

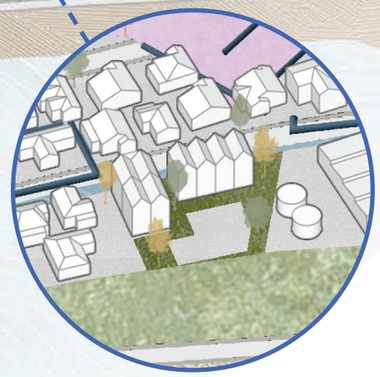
Property acquisition

Property acquisition would be complete by this point and would provide more space to manage stormwater and groundwater flooding.



Waterways and storage

The construction of a network of MacAndrew, Kaituna, Victoria, Coughrey, and West waterways occurs in the medium-term. Some of these align with historic natural systems, and multi-use green spaces for stormwater storage and recreation. Victoria waterway in particular helps to manage groundwater, capturing tidally influenced groundwater before it moves inland and helping to manage saltwater intrusion. In some places it is still difficult to manage groundwater though so Council would construct green spaces in areas of persistent groundwater emergence, like in Musselburgh.



New development

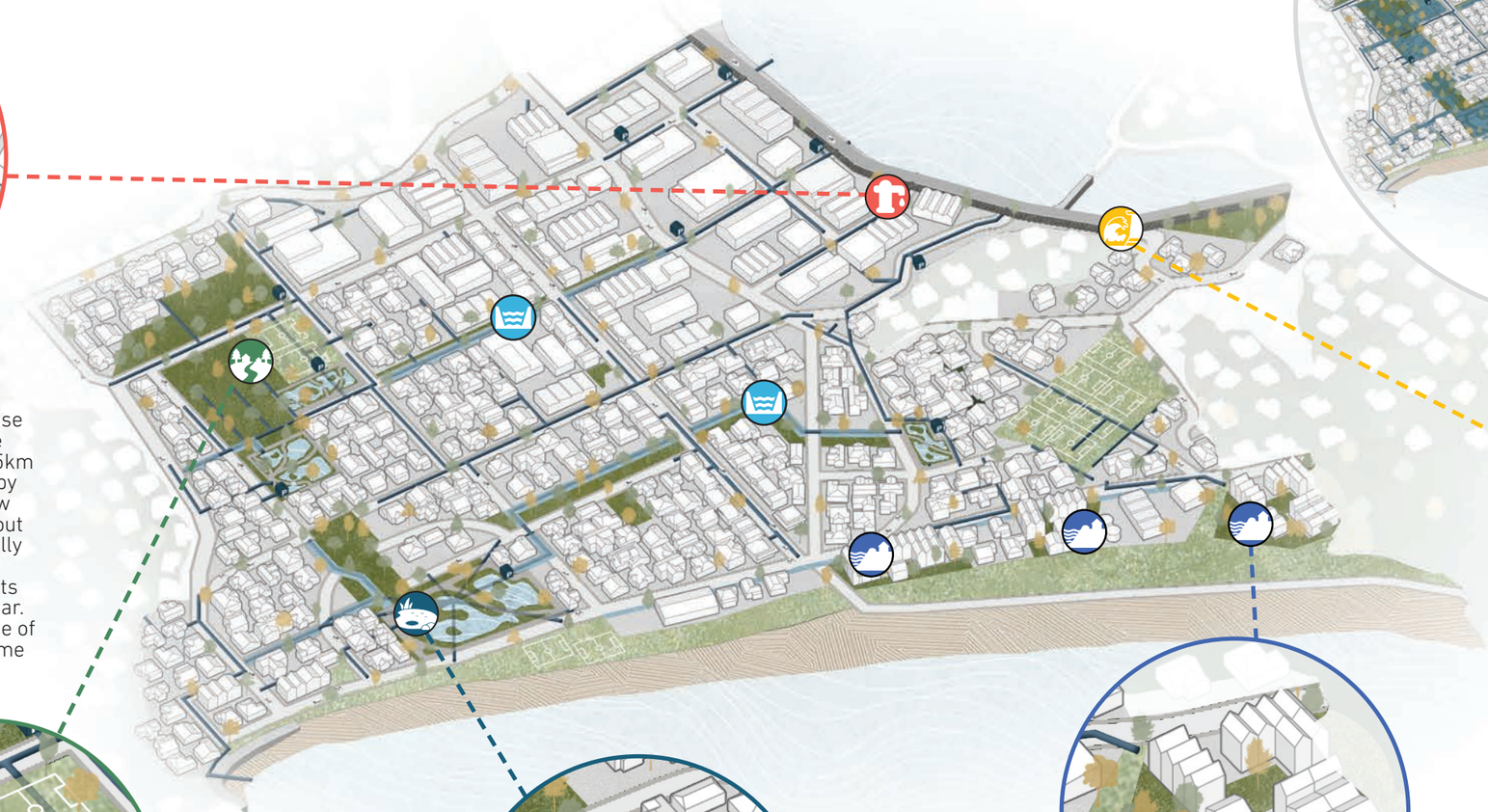
High density residential areas would be developed along Victoria Road with on-site stormwater management, in an area buffered from our current understanding of where future shorelines would be. This provides safer areas for people to relocate to. Any loss of existing park space would be balanced by creation of more parks and green spaces in higher risk areas, such as on the Flat, to enable the best use of land in South Dunedin.

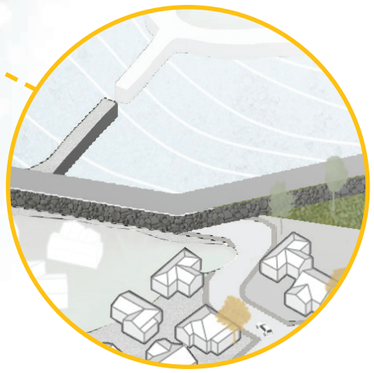
FUTURE 4 – RESTORE

Long-term (towards the end of the century and beyond)

Pipes, pumps and flow paths

To avoid annual flood damage/ response costs compromising delivery of core services, Council invests in a further 1.5km of pipe and increases pump capacity by an additional 10% to continue to allow stormwater and groundwater to flow out during high tides. Roads still periodically flood, but impacts to properties are generally avoided during rainfall events with a 2% chance of occurring each year. During extreme events with a 1% chance of occurring each year, there remains some risk of property damage.

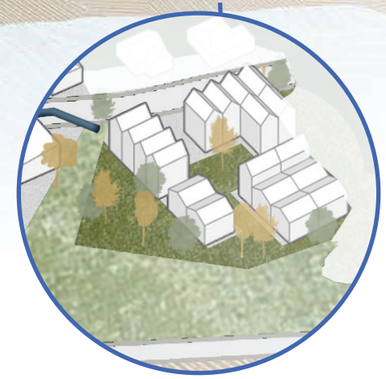




Coastal protection

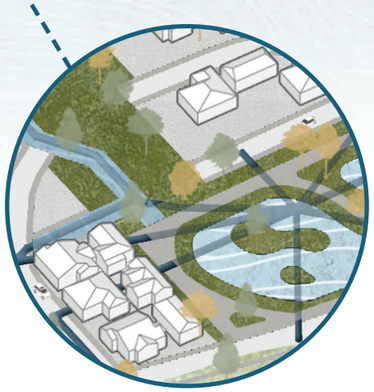
In the long-term an extended seawall would provide coastal protection along the harbourside, along with a raised road levels to maintain emergency and community access.

Working Together with the St Clair / St Kilda Coastal Plan: Rising sea levels and more storms would weaken and undermine the south coast seawall over time. To stop it from failing and to help keep sand on the beach, the seawall would need to be upgraded, shifted, and possibly supported with extra sand. In future, buffer zones might be needed along the coast to allow room to move things back if erosion or flooding gets worse.



New development

High density residential space along Victoria Road would be complete by this stage providing space for people in low-lying areas to shift to safer areas.



Waterways and storage

The waterways and storage systems continue to help manage stormwater and groundwater up to 1.1m of sea level rise.

Green space creation

When persistent flooding or groundwater interference begins to limit normal land use, all acquired land at Forbury Corner and Musselburgh would be transitioned to green space for stormwater and groundwater management, recognising the area's high long-term risk. These spaces would include a mix of natural reserves, sports fields, and parks, with sports fields managed via pumped drainage. Council will remain flexible to adapt to other futures, and if risks become unmanageable, a gradual move away from the Flat remains a very long-term option.

FUTURE 4 – RESTORE

Objectives assessment

SUSTAINABLE URBAN DEVELOPMENT

Short-term

Short-term strategic planning supports long-term housing and connectivity as stormwater upgrades and changes to planning rules shape a compact urban form, though embodied emissions remain a challenge and reliance on pumping heightens vulnerability. Early land acquisition enables future green infrastructure.

Medium-term

Open waterways, wetlands, and greenways enhance amenity and embed water-sensitive design. Multi-use green spaces provide flood storage and recreation to support a compact urban form, and coastal protection maintains shoreline connectivity.

Long-term

A more resilient urban form emerges through integrated waterways, wetlands and green corridors, with adaptive management and green infrastructure reducing pump reliance. Modular, circular design cuts waste and embodied carbon. Flexible transition planning preserves options for large-scale retreat if future risks escalate.

ENVIRONMENTAL AND CULTURAL RESTORATION

Short-term

Early planning for waterways and wetlands with mana whenua support mauri restoration and kaitiakitaka though short-term ecological gains are limited. Temporary loss of coastal open space poses cultural risks requiring strong engagement.

Medium-term

Wetlands and green corridors improve ecological connectivity, biodiversity, and water quality, while also strengthening rakatirataka (right to exercise authority) and kaitiakitaka through renewed links to historic waterways. Coastal protection supports access to Ōtakou marae, though risks include potential heritage disturbance and loss of some recreational spaces.

Long-term

Restoration enhances green infrastructure, ecosystems and cultural landscapes and while ki uta ki tai connections are limited, a holistic wellbeing focus strengthens Te Ao Māori values and relationships between place and people.

PROMOTE COMMUNITY SAFETY

Short-term

Changes to planning rules and early acquisition lower long-term hazard exposure while stormwater upgrades reduce flooding during frequent events and improve safety and access. Residual groundwater risk and reliance on pumps create vulnerability during extreme events or system failure.

Medium-term

Stormwater, coastal and groundwater interventions would remove flooding from frequent events and reduce impacts from rarer ones, improving access and safeguarding lifeline services. Coastal erosion risk at the St Clair / St Kilda dunes remains and requires ongoing resilience measures.

Long-term

Integrated greenways, modular systems and adaptive land use improve access and reduce hazard exposure. Very high residual coastal-erosion risk at the St Clair / St Kilda Dunedin persists and requires ongoing resilience strategies, with long-term resilience dependent on continual monitoring and adaptive responses.

JUST TRANSITION

Short-term

Reduced flood risk and maintained access improve certainty for vulnerable communities, while changes to planning rules signal long-term affordability gains. Narrowed short-term housing options, property acquisition, and construction disruption may create stress, particularly for low-income and culturally and linguistically diverse households.

Medium-term

Safer development zones and improved housing supply promote fairness, though higher development costs may affect affordability for low-income households. Construction and relocation can disrupt social and cultural ties, requiring inclusive support. Expanded green space enhances equitable access to recreation and amenity in South Dunedin.

Long-term

Gradual relocation helps maintain social cohesion and allows communities to adapt over time, while intensification and adaptative reuse support affordable housing supply; however, escalating risks could prompt further retreat, potentially displacing vulnerable populations and reducing long-term certainty for families.

SOCIAL AND ECONOMIC RESILIENCE

Short-term

Access to social and economic hubs is maintained, supporting business stability and future high-density growth, though construction disruption, acquisition uncertainty, and affordability pressures may strain community cohesion and require proactive support for vulnerable households.

Medium-term

Shared blue-green spaces strengthen community cohesion and enhance amenity and investment, while green infrastructure and coastal protection reduce economic risk, though relocation and affordability pressures still require careful mitigation.

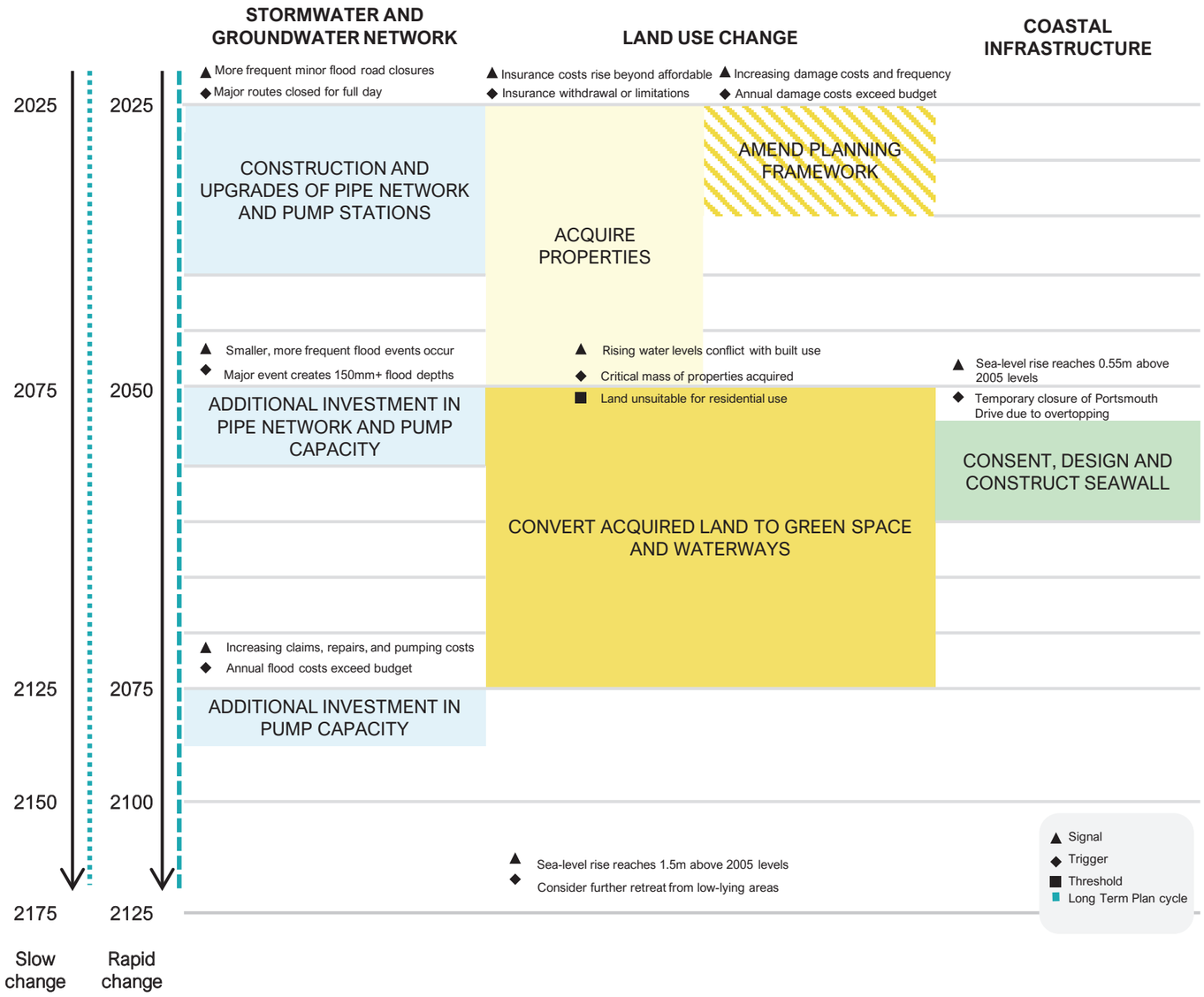
Long-term

Medium-density housing, active transport and mixed-use green spaces strengthen resilience and wellbeing, while reduced climate risk boosts economic stability. Balancing housing supply with green infrastructure needs will require continued innovation and policy support.

FUTURE 4 – RESTORE

Implementation approach

Adapting South Dunedin to a changing climate requires a sequence of interdependent actions, as shown below, which illustrates the indicative timeline for implementation. Actions during Future 4 - Restore are presented with sample signals (◆) and triggers (▲) representing early warning signs and resulting key decisions or enabling actions. Signals, triggers, and adaptation thresholds may be social, economic, ecological, physical, or cultural. The timing shown for signals, triggers, and actions is indicative only.



Early in the short-term, the planning framework must be amended to regulate development. These changes would restrict development in some low-lying areas to avoid exacerbating existing risks and allow for future land acquisition, while enabling development in other areas.

In the medium-term, land acquisition would continue to support later development of green space for stormwater management. Properties acquired during this stage could be rented, leased or similar until enough land is consolidated to enable large-scale transformation.

Where funding and development partners are confirmed, this would trigger major projects, including housing development at Tahuna.

The enlargement of the Portsmouth Drive seawall would be complete to manage the projected increasing coastal risks. In the long- term, all land acquired is expected to be developed into greenspace for stormwater management across low-lying areas, while Tahuna would be intensified into high-density residential developments to house the community. Each step depends on the successful completion of earlier actions, creating a chain of dependencies so that South Dunedin can adapt effectively to climate change.

WHAT ELSE DO WE NEED TO ACTION IT?

Changes in land use regulations: Council would need to make changes for development in the Flat and enable works related to upgrading infrastructu re and developing the area near Tahuna.

Property acquisition (buyouts): Land would need to be acquired to make space for pipes, pump stations and green infrastructure (e.g. stormwater management wetlands) which are "public works" because of their flood mitigation and public safety functions. Areas identified for acquisition are where risk may be too challenging to manage in the long-term or where locations are required to manage risk for the wider area.

Funding mechanisms: Funding mechanisms are crucial for both the development of infrastructure and property acquisition. Further work is needed on possible funding mechanisms but public-private partnerships or development contributions are used for infrastructure upgrades and Central Government may provide support through the Regional Infrastructure Fund (or similar) or protection of Crown assets (like schools).

FUTURE 4 – RESTORE

Economic measures

The Cost Benefit Assessment work seeks to compare the implications of proposed futures for South Dunedin.
Costs and benefits are indicative and intended for comparison at this step of the South Dunedin Future (SDF) Programme.

Time period	Benefits ($m)	Costs ($m)	BCR
Short-term (0 - 25 years)	$457	$1,284	0.36
Medium-term (26 - 50 years)	$381	$287	1.33
Long-term (51 - 100 years)	$514	$58	8.86
Overall	**$1,351**	**$1,629**	**0.83 (0.71 - 0.98)**

KEY PROJECT FEATURES

- TOTAL REPURPOSED LAND **69 ha**
- **11** NEW PUMP STATIONS
- **16 ha** FOR STORAGE & WETLANDS
- **1** NEW GW PUMP STATIONS
- **16 km** OF GW PIPE NETWORKS
- **32.5 km** OF PIPING NETWORKS
- **3.5 km** OF OPEN CHANNELS
- **2.1 km** SEAWALL
- **1162** PROPERTIES ACQUIRED
- **4** NEW OUTFALLS

Cost estimation approach

Based on spatial mapping of potential scenarios and typical unit rates from similar New Zealand projects. Calculated at 2025 present values, assuming staged implementation across the three time periods identified with Construction spread over the first 10 years of each period. Includes:

* Construction (capital, preliminaries, demolition, utilities)

* O&M costs

* Professional fees

* Contingency and optimism bias (+66% per Treasury guidance)

* Property acquisition – 1162 properties (residential, commercial, social)

Whole-of-life costs: 25-year maintenance cycles + annual O&M. Pump stations include an allowance for annual electricity charges.

Exclusions: GST, escalation, downtime.

Costs do not account for potential offsets (e.g., land resale) or private owner contributions.

Range: $1.63b ($1.4b – $1.8b), influenced by scale and uncertainty.

Monistised benefits include:

* Avoided fatalities & injuries

* Avoided residential, industrial & commercial property damages

* Avoided infrastructure damage

* Avoided trauma and social cohesion costs

* Avoided water quality impairment

* Avoided income loss and emergency services costs.

Benefits excluded due to data unavailability at this stage:

* Redevelopment potential / Gains in property value

* Avoided loss of open spaces and ecosystem services

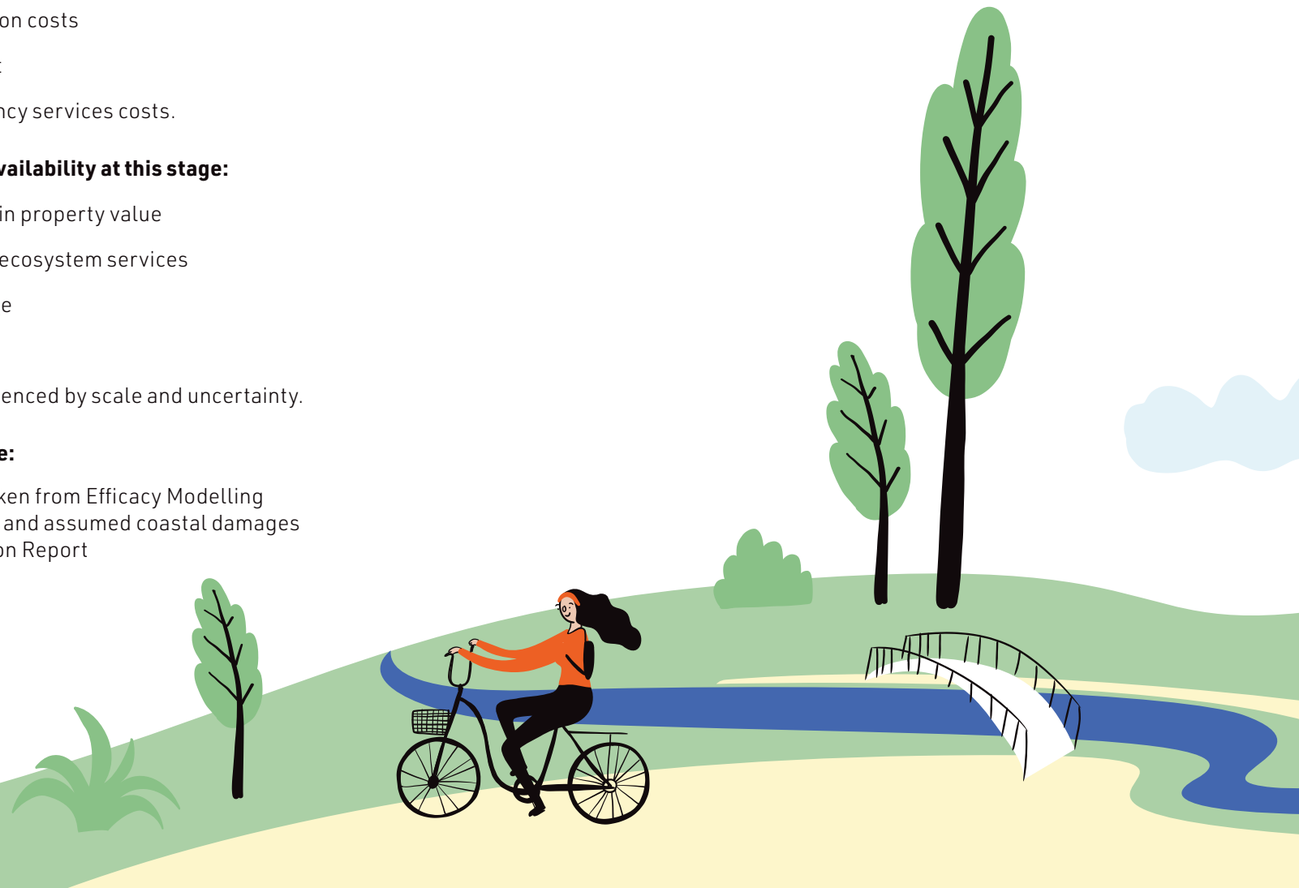
* Avoided heritage building damage

* Value of insurability.

Range: $1.35b ($1.2b – $1.5b), influenced by scale and uncertainty.

Key assumptions used at this stage:

- Annualised Average Damages taken from Efficacy Modelling work across three return periods and assumed coastal damages as outlined in Economic Evaluation Report
- Project horizon: 100 years.



FUTURE 4 – RESTORE

Risk assessment

Future 4 – Restore provides significant reduction in pluvial flooding and groundwater risk in the short-term relative to the Status Quo (present day, unmitigated) risk.

This risk profile would further reduce over the medium-term despite increasing natural hazards. In the long-term, risk associated with most hazards is managed; however, high uncertainty remains regarding the long-term management of coastal hazards at St Clair / St Kilda, and further investigations are underway. In all timeframes, residual risk remains, which is associated with the consequences of hazard events that exceed as-built design limits, and structural failures (e.g. seawall, groundwater pumping systems). It can also be associated with operational risks (e.g. power failures, lack of maintenance).

Overall, the **Future 4 – Restore** risk profile is largely similar to the other futures, but has a slightly higher long-term risk than **Future 3 – Protect** and **Future 5 – Reshape** as the other Futures benefit from additional risk reduction associated with raising land. This also means that **Future 4 – Restore** is more prone to residual risk and uncertainty regarding coastal hazards.

HOW IT WOULD REDUCE RISK

In the short-term, stormwater infrastructure upgrades are predicted to remove the flood risk associated with frequent events (10% chance of occurring each year) and drive significant reduction of flooding associated with infrequent events (1% chance of occurring each year) across all buildings, lifelines, and critical infrastructure. Up to 33% of buildings may be exposed to infrequent flooding, with 11% of those likely to experience flooding above floor level. Otherwise, flooding would be generally contained within roads posing a low risk. Improved drainage and pumping also lowers groundwater levels so that buildings, parks and roads are unlikely to be at risk.

In the medium-term, strategic acquisition of land for conversion to green space, and continued stormwater infrastructure improvements, coastal protection, and management of groundwater means pluvial flood risk, coastal flooding risk, and groundwater risk is generally low across all buildings, lifelines, critical infrastructure and roads. The percentage of buildings exposed to infrequent flooding above floor level drops to 8%. In the long-term, this drops further to 7% however, residual risk due to pluvial flooding and groundwater remains, as well as increased uncertainty regarding effective management of coastal hazards increases.

HOTSPOT SUMMARY OF RISKS TO SOUTH DUNEDIN FUTURE 4 - RESTORE: EXPOSURE OF BUILDINGS AND ROADS TO FLOODING AND GROUNDWATER