

# AMPHIBIOUS

## FOR A RESILIENT NEW BRIGHTON



### BACKGROUND

New Brighton is a seaside suburb at the eastern edge of Christchurch City, with significant associations to Maori and European historically and contemporarily. Its location close to the sea, the estuary, and the Avon River and its intertidal ecosystem contribute to a rich assemblage of wildlife habitats historically, fostering a high biodiversity and productivity before European settlement. Environmental degradation resulting from careless drainage and land transformation by early European settlers exacerbated the effects of 2010 and 2011 earthquakes, leaving New Brighton at the risk from the earthquakes and flooding. The great impact of the ongoing natural hazard risks are further fuelled by climate change. However the red zone sits along river corridor and within the regeneration phase of this area offers much potential for resilient living in a dynamic water edge landscape with significant flood hazard, and to connect the site's long evolution history to contemporary urban lifestyles.

### VISION

New Brighton will develop from an earthquake disruption to a safe, lively, beautiful and attractive coastal suburban area to live, work and play for local residents and to draw visitors from the city and beyond. Building upon its unique natural assets, it will be an unconventional suburban fabric that is shaped by natural forces constantly. A new symbiotic relationship will be developed between the restored nature and realigned built environment, which enables its community to enjoy a variety of lifestyles, grow social confidence and resiliency to respond to dynamic natural forces and climate change.

### GOAL

To improve the New Brighton's ability to adapt to current and possible greater effects of riverine and coastal flooding with long-term climate change.

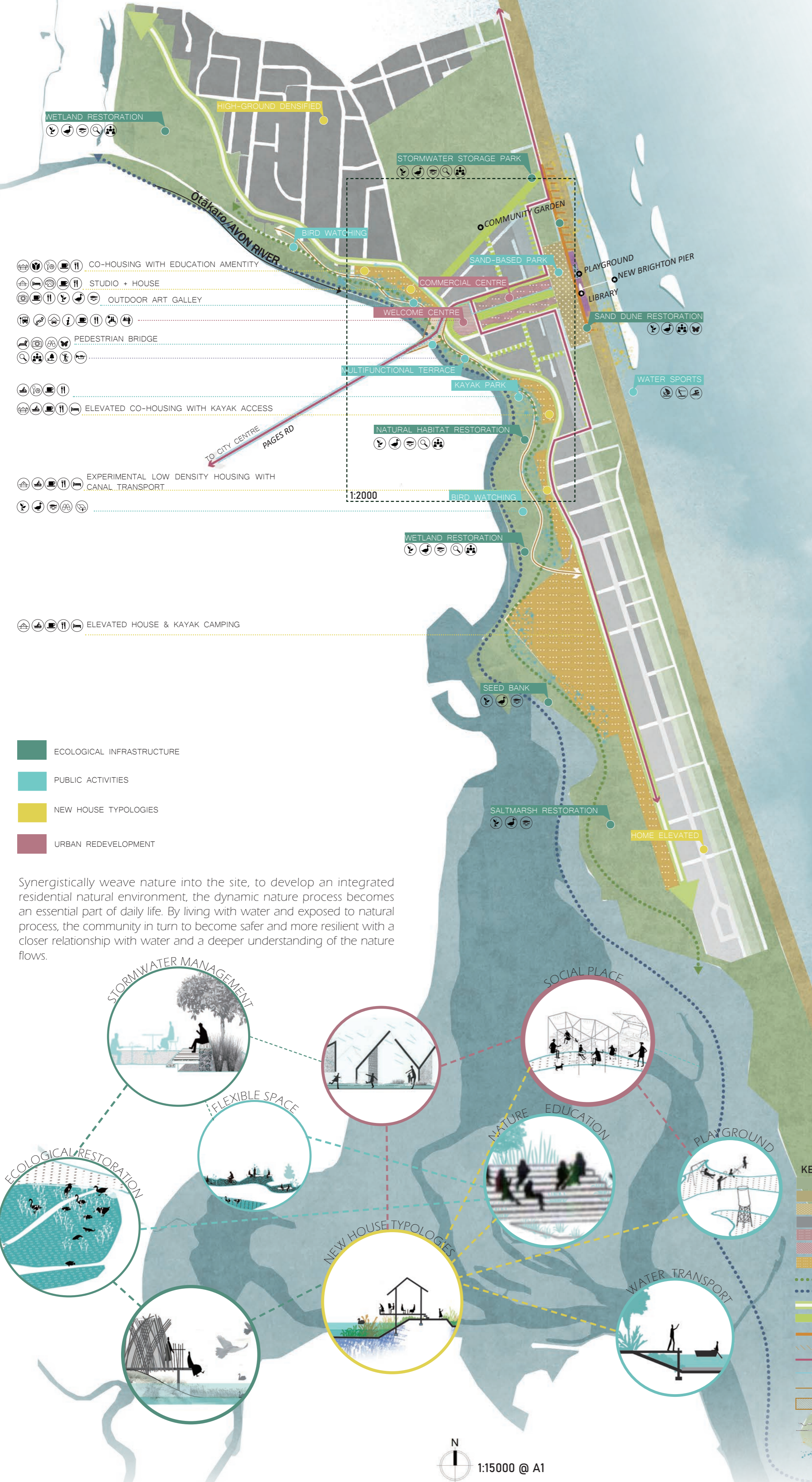
### SUB-GOAL

- To improve the site's ability of absorbing stormwater and storage capacity through natural resources and green infrastructure
- To improve the adaptability and transformative capacity of landscape and built environment facing uncertain hydrological and environmental conditions
- To improve the community's ability to adapt to future climate change through improving their understanding of environment and social connection

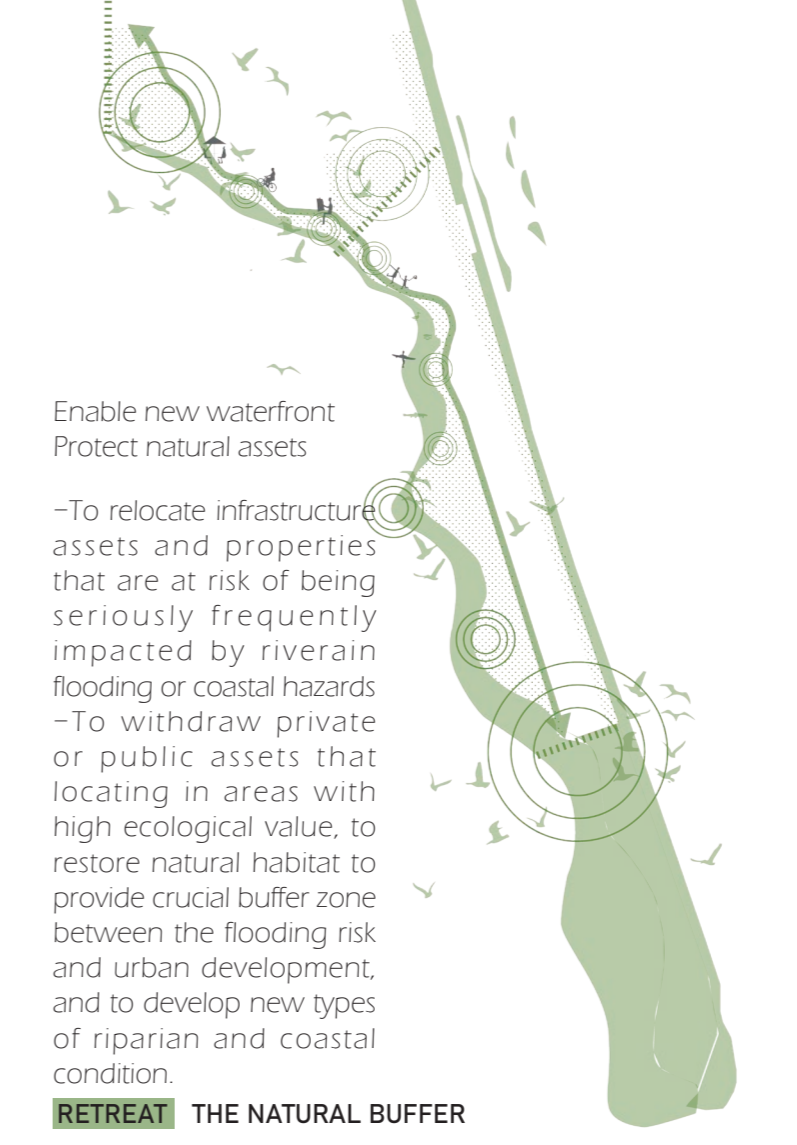
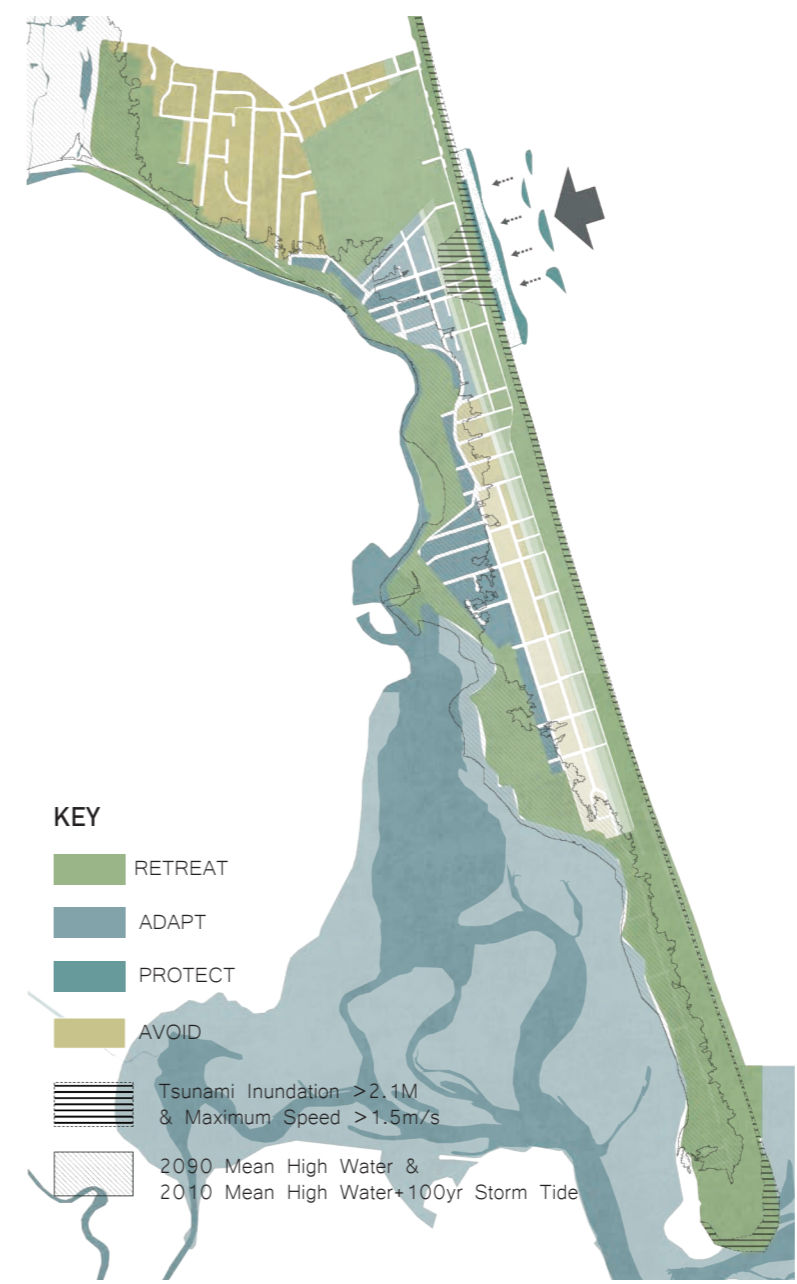
### Restore Otakaro Avon River Corridor Revitalize Otakaro Avon River Corridor

The site belongs to Christchurch City flood management area. The location close to estuary make it a critical role in flooding management for itself and the rest of the city.

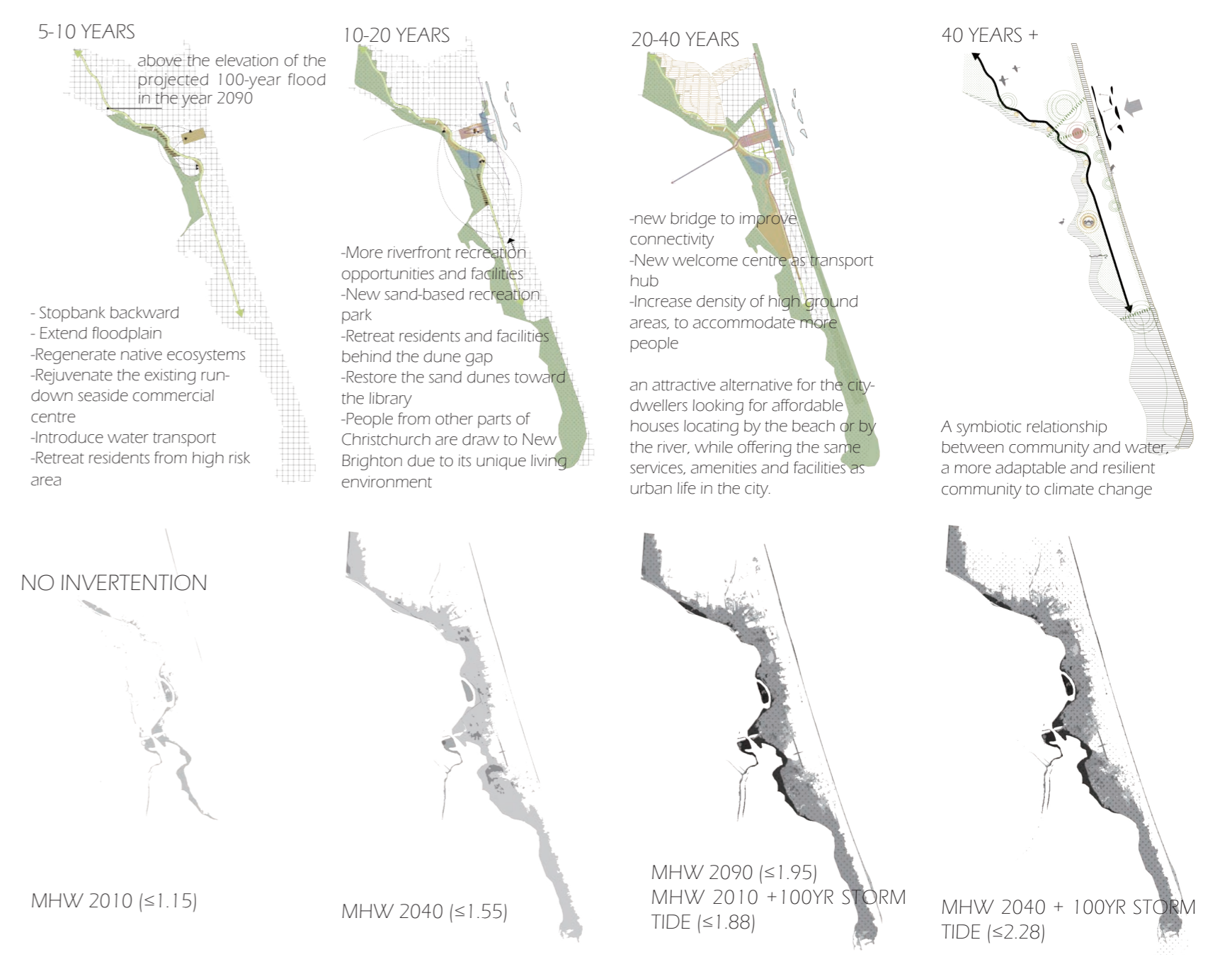
The strategic location of the international bird flyway, and other wildlife, hence establishment and enhancement of the green corridor is significant for livability, ecological system, cultural identity and economic activity of the greater Christchurch.



### STRATEGY



### STAGING



- ### To Improve Connectivity and Mobility
- The city centre and riverside towns and rural communities connected by efficient and sustainable infrastructure.
  - There are a wealth of waterfront and natural habitat-based public spaces integrated a variety of recreational, educational and commercial facilities and amenities will allow New Brighton to be easily and joyfully accessible from near and far
  - New walking and bike paths which separated from vehicle traffic and new boating route provides alternatives for transport modes
  - The waterfront corridor will provide the localized management models with surrounding communities to infuse tailored solutions to the varied needs along the resilient infrastructure.
- ### To Enhance Riparian and Estuary Ecosystem
- Restore the riverside red zones to help enhance riparian and estuary habitat conservation
  - The improved connectivity and size of habitat benefit local ecological community and biodiversity
  - The restored nature habitat will improve the quality and connectivity of the existing bird flyway.
- ### To Improve Resilience Capacity against Flood
- Restored meandering waterway and widened channel with natural riparian edge will improve its flood capacity, prevent streambank erosion, and protect water quality



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### DESIGN INTENT

**Ecological Resiliency:** To naturalize water edge to adapt to dynamic condition. Nature's aesthetic value and other ecological services are delivered through a variety of nature-based recreational, educational opportunities, in turn gained nourishment.

**Social-Community Resiliency:** New Green-Blue Infrastructure web integrated natural edge and stormwater management cells, with a variety of "social room" and diverse neighborhood amenities, functioned as a variety of experienced route encouraging outdoor stay and social interaction in the public area - enables its now and future residents to a more connected and engaged community.

**Economic Resiliency:** Innovative and experimental housing type make it an attractive alternative for the city-dwellers looking for affordable houses locating by the beach or by the river, while offering the same services, amenities and facilities as urban life in the city.



#### 1. FOOTBRIDGE

New walking and bike paths, swimming entrances, and the integration of transit will allow the park to be easily accessible from near and far. The bridge will be leading visitors to the wetland easily and pleasantly. It also a public space for leisure and education in the nature. This bridge face down toward the river gradually, a row of lounges for people to relax above the river and wetland, while the glass balustrade painted with ecological information also an chance to learn. The hammocks provide a new way to experience the river, lying above the river and feel the water and air flow underneath, while it gives people a closer look of water level change.

#### 2. WELCOMING CENTRE

welcoming centre includes functions of information site, transport transit, restaurant, cafe, interoperative exhibition of local nature and culture, Interpretive exhibits and indoor parking. Its sloping roof garden connecting to the riverbank, allows natural elements flow into urban life.

#### 3. COMMERCIAL CENTRE

The realigned commercial centre has higher density and it is mix-used with a variety of flexible spaces. The orientation of building mitigated the easterly gust, while maximize the views both to the sea and river. The form inspired by "Delta", means where the river meets the sea, as it connects river and beach in urban setting. Functionally, It directs water as well as people across the centre through a serious "social room" and activity. The water gutters which is integrated into paving system is of amphibious use, that serve as separated cycling way in dry periods while turn into water channel with a thin layer of rain water during rain events. The paving strategy use open cell pattern that with blue elements in the gap delivering a sense of river.

#### 4. ARRIVAL PLAZA

An urban plaza at the main access of commercial centre. A sunken plaza invites all people to stay and play. It is also a place to reveal rain water process while provides amenities to celebrate diverse urban life.

#### 5. URBAN BEACH

Its where introduce sand into urban life, a place behind connecting Commercial Centre and New Brighton Library, it contains a variety activity, like sand playground, connecting the Whale Playground, sport fields, skateboard, interpretive sand dune habitat room. It also a place for workshop about recycling run by local community or Library.

#### 6. WETLAND PARK

A linear wetland park with diverse facilities is planned along the Avon river where residents and visitors will have the opportunity to learn about the ecology of the estuary and marsh - a diverse neighborhood amenities that bring water close to riverfront community to help them gain a deeper understanding of the river's ebbs and flows.

#### 7. ART VILLAGE

It is a waterfront neighborhood of studio and house mixed use. Two-story houses build on stilts above the above the elevation of the projected 100-year flood in the year 2090. These houses are accessed directly by stopbank, and bordered by proposed constructed wetland. It facilitated with stormwater management ponds, amphibious shared courtyard. And featured with outdoor gallery and art garden.

#### 8. TERRACES

Connecting welcoming centre and wetland, it extends the exhibition function of welcoming centre to outdoor.

#### 9. PLAYGROUND

Use the difference of elevation to create an exciting amenities for adjacent neighborhoods.

#### 10. HAMMOCK PARK

Together with playground, kayak park and lookout to form an animate corridor, connecting the neighborhoods to waterfront. A place inviting all people to enjoy in nature above river.

#### 11. WATERFRONT CO-HOUSING VILLAGE

One of the key adaptable housing projects, mew houses build on stilts above the above the elevation of the projected 100-year flood in the year 2090. Bordered by marshland and wetland, experiencing dynamic water level at everyday life, shared facilities and stormwater management garden, and with water transport channel. Kayak park nearby, Cafe and restaurant enable it's a welcome place for Airbnb.

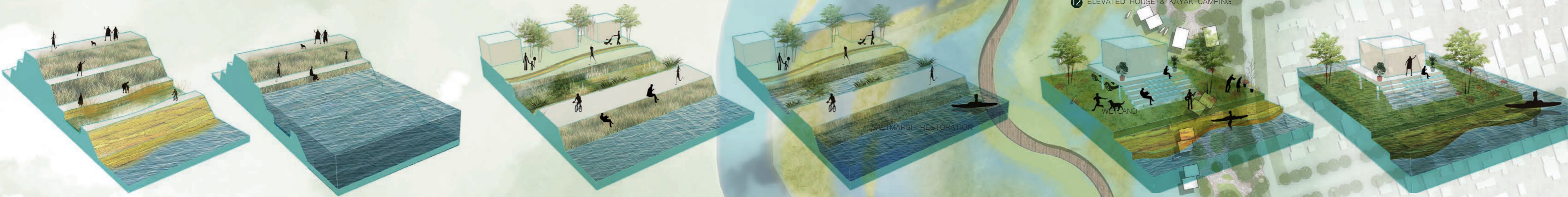
#### 12. ELEVATED HOUSE & KAYAK CAMPING

The neighborhood with closest relationship with the river, with kayak launching deck at first floor, flexible used.

#### 13. NATURE OBSERVATORY

Located at the strategic zone where the river meet the estuary, ecological community affected by sanity and water level change.

#### ADAPTABLE WATER EDGE



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1:2000 @ A1



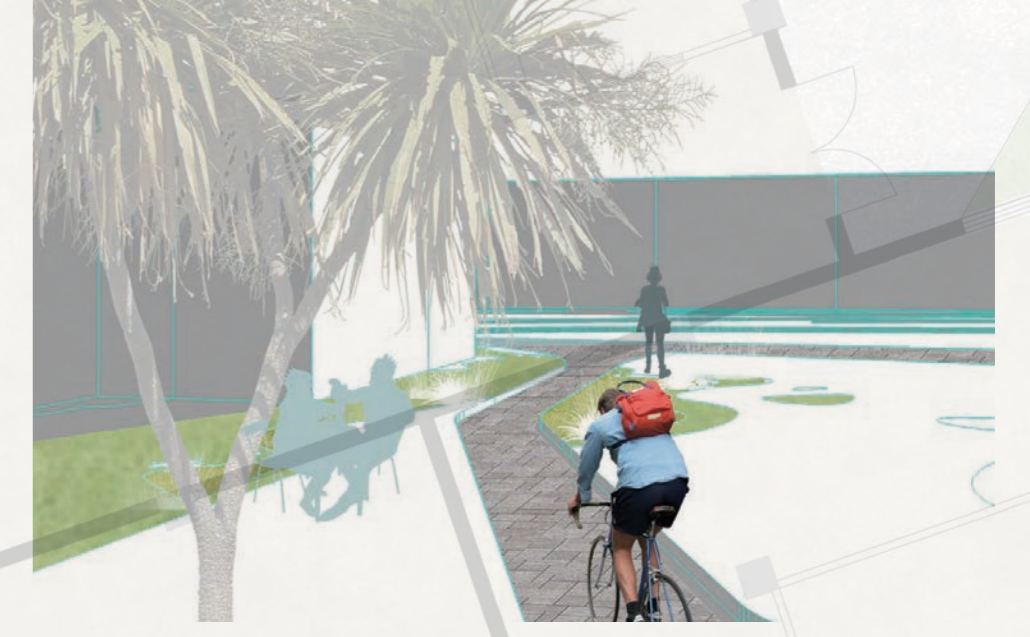
# AMPHIBIOUS

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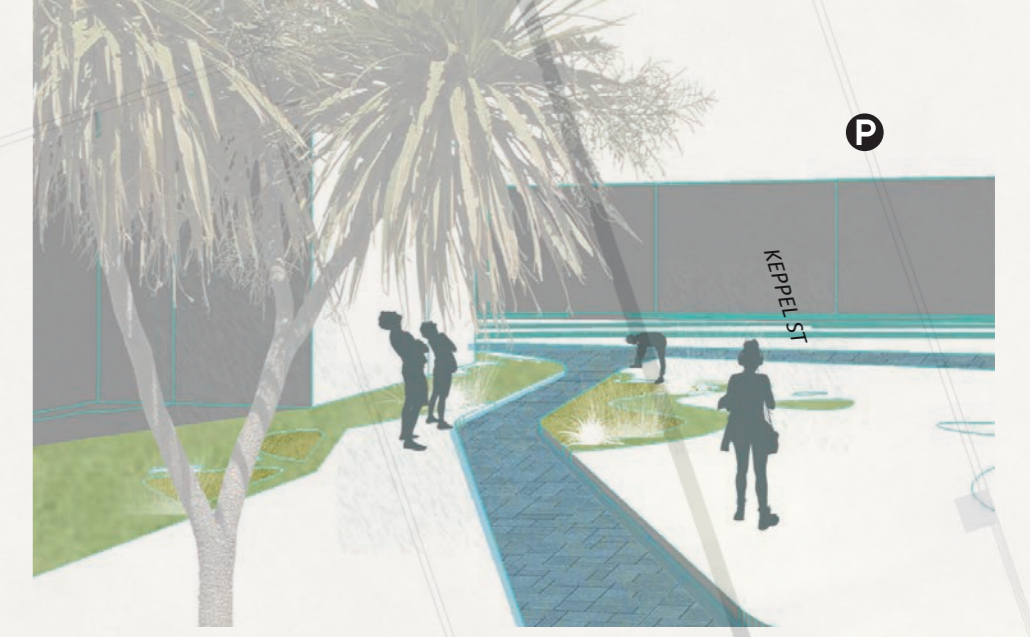
### DESIGN INTENT

Detail plan zooms into the Arrival Plaza of commercial centre to display the permeable and absorptive quality and of the landscape. The paving system, vegetation and landscape features reveals how landscape can bring nature into urban life and enrich people's life. The site reveals the harvesting, filtering, storing and reuse of rainwater, make the rainwater visible to people. Street furniture and water feature provide a pleasant and relax public space to attract people to visit, stay and play.

#### DRY DAYS



#### RAIN EVENTS



THE TWO CONDITIONS OF WATER GUTTER IN COMMERCIAL CENTRE

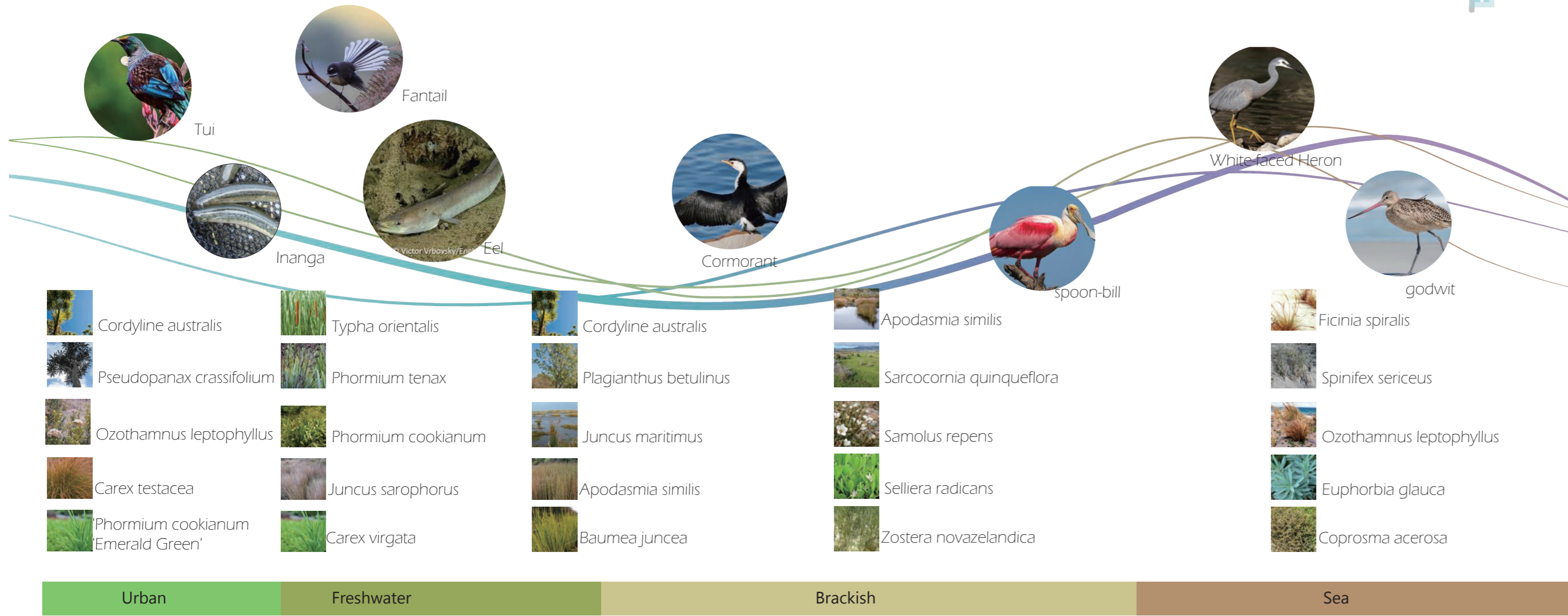


- KEY**
- TF: Top of fence
  - TW: Top of wall
  - TK: Top of kerb
  - TS, BS: Top step, bottom step
  - BW: Bottom of water
  - FFL: Finished floor level

# AMPHIBIOUS

## FOR A RESILIENT NEW BRIGHTON

### ECOLOGICAL ZONE



### INDICATIVE SPECIES

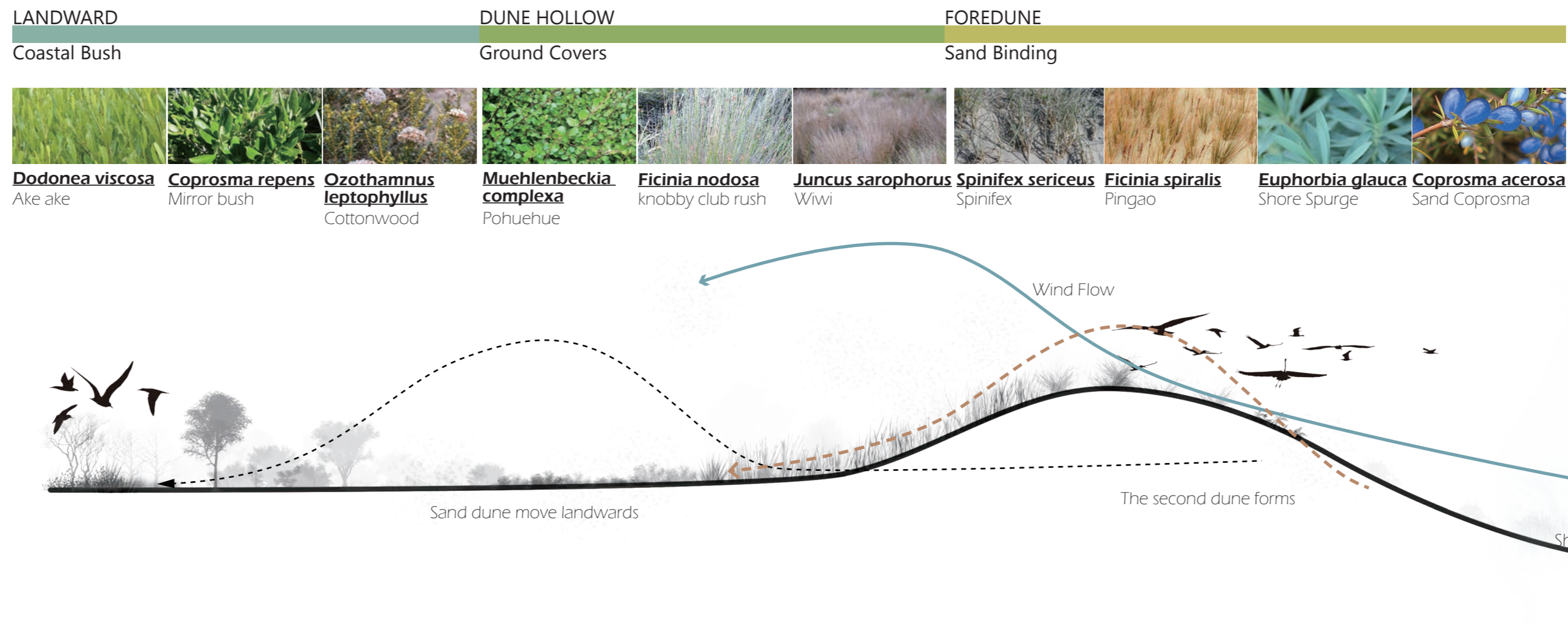
#### GREEN INFRASTRUCTURE

This group refers to the stormwater management vegetation areas, like the infiltration strip lined with road and street and rain gardens. Besides the plants' ecological functions, Ngai Tahu taonga value and aesthetic are important, which aims at create a pleasant and safe place with its own identity.

<b>Pseudopanax crassifolium</b> Lancewood	<b>Cordyline australis</b> Cabbage Tree	<b>Sophora microphylla</b> Kowhai	<b>Dodonea viscosa</b> Ake ake	<b>Ozothamnus leptophyllus</b> Cottonwood	<b>Chionochloa flavicans</b> Dwarf Toe toe	<b>Phormium cookianum</b> Dwarf Mountain Flax	<b>Libertia peregriana</b> Mikoiko	<b>Carex testacea</b> Sedge	<b>Selliera radicans</b> Remuremu
Height: 1.2m / Spacing: 3m Hardy, wind tolerant. Attractive Bark. Used as Street trees and specimen tree in public space. Attracts Birds/Bees. Shade Tolerant.	Height: 10m / Spacing: 2m Attracts Birds and bees, an iconic native tree of Ngai Tahu taonga value, hardy, tolerant coastal condition	Height: 8m / Spacing: 3m Erosion Control. Attracts Birds/Bees. Attractive flowers, wet tolerant, used in filtration garden	Height: 7m / Spacing: 2.5m Tolerates coastal conditions. planted in coastal public space to provide shelter	Height: 2m / Spacing: 2m Green to gold foliage is fine and dense. Hardy, tolerants coastal condition	Height: 1.2m / Spacing: 1.5m Great planted en-masse on a sunny, free draining site. Hardy to cold & exposure.	Height: 1.2m / Spacing: 1.5m site. Attractive colour, Hardy to exposure	Height: 0.8m / Spacing: 0.8m Attractive foliage, Evergreen. Hardy	Height: 0.5m / Spacing: 0.5m Hardy, bright colour, used in rain garden and edges	Native ground cover used in gaps of permeable paving. An alternative of grass.

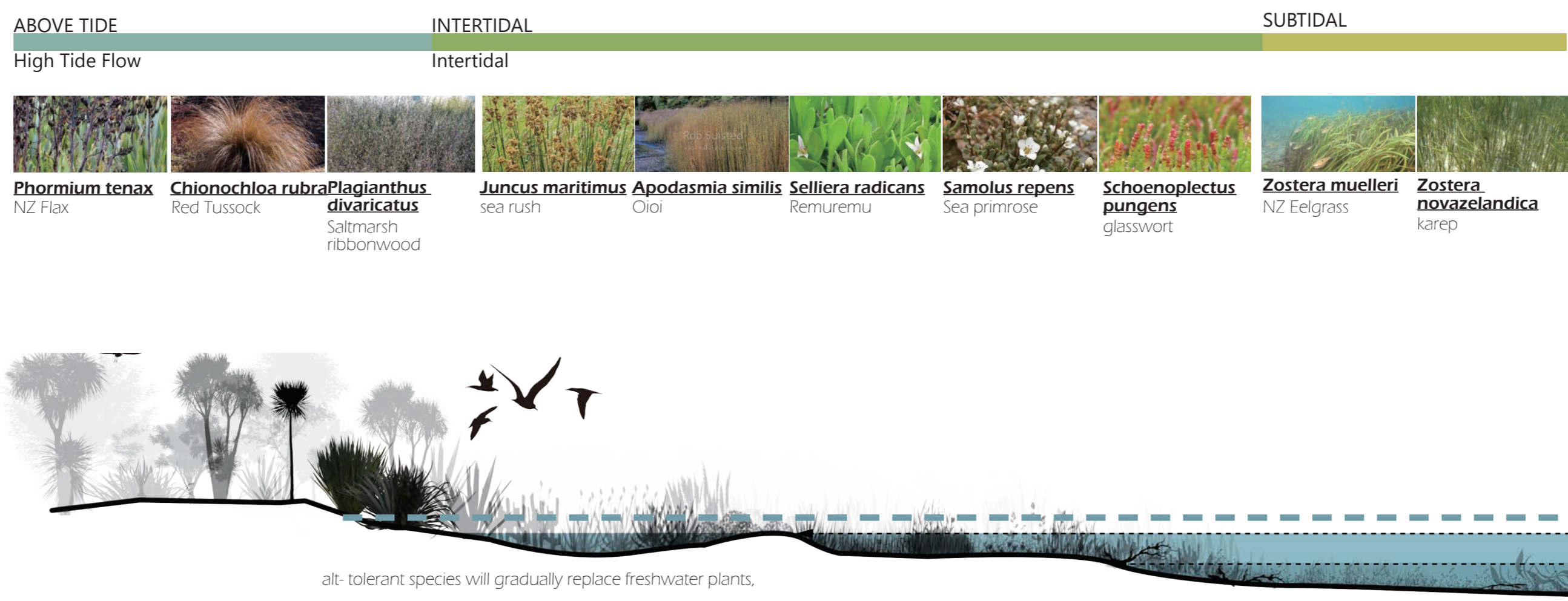
#### SAND DUNE

The sand dune is the seaward natural buffer zone between the coast and urban area. The re-establishment zone in the plan is at the gap around New Brighton Library in short term and the residential strip behind sand dune in future. The form of sand dune is dynamic, so the zoning aims at leave room for dune to grow and move landward with sea level rise and shoreline retreat. The sand park aims at bring back the natural elements into urban life, encourage people to active with sand ecosystem through interoperative micro habitat, help people gain a better understanding of natural process and the environment we rely on.



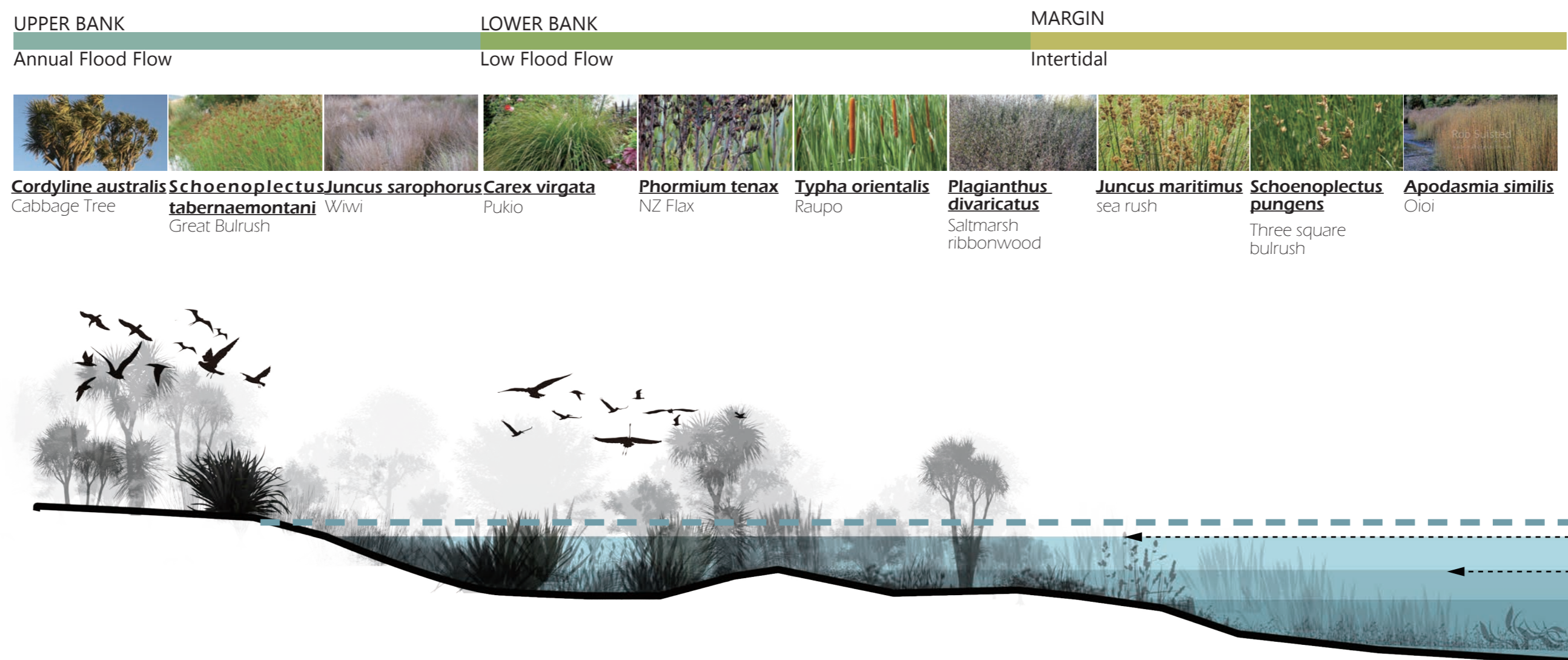
#### ESTURAY

The retreatment of exiting stopbank enable the restoration of saltmarsh and salt meadow. With intermittent tidal flows into salt meadow and saltmarsh. Salt-tolerant species will gradually replace freshwater plants, the wetland park and planting strategy aims at visualize the process of evolution of the ecological community, considering the strategic location between river and estuary, the restored habitat have to consider providing roosting and nesting habitat for wildlife



#### CONSTRUCTED WETLAND WITH INTER TIDAL MARGIN

The retreatment of exiting stopbank enable natural tidal influxes. This zone between riverfront residential zone and river, which is crucial for improve water quality as well as connecting people, so plants are chosen for its ecological, cultural and aesthetical attributes. water purification plants are chosen to slow down and filter polluted runoff, specific species of trees and shrubs on bank are chosen to protect and stabilize soil. Ngai Tahu taonga species value to express the site's past and present natural and cultural heritage, and visualize Mahinga kai, and to recreate the early extensive wetland landscape



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## FOR A RESILIENT NEW BRIGHTON

### CONCEPT: The circle of life

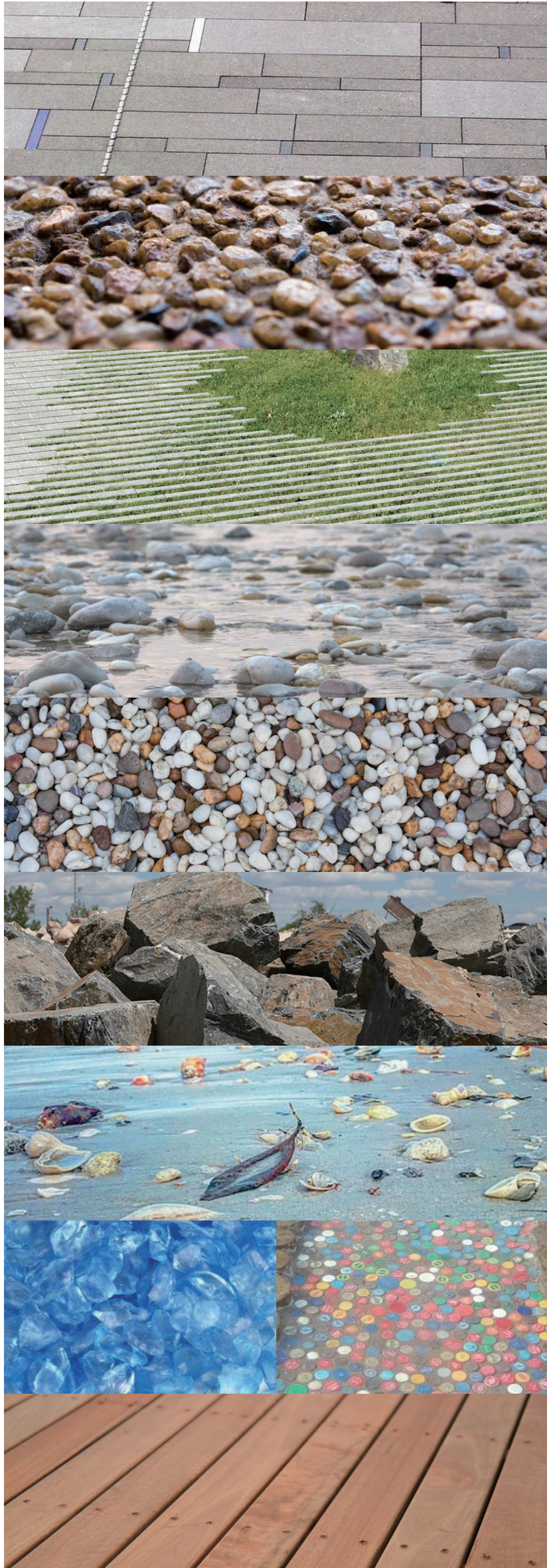
The material strategy aims to reinforce the vision of a more resilient community and the built environment. As the concept that the form of built environment is shaped by natural process, so the hardscape is try to integrated into the dynamic environment and changing states, and help landscape express the flow and metabolism of natural process, while facilitate a new social space made of hard materials for daily recreation, leisure and gathering. Through creating inviting and interesting public space and small intervention help introduce natural element into daily life, and provide opportunity for people to touch, familiarize, understand and get close to the nature.

The resilient material strategy emphasizes to absorb, change and incorporate the material process. Rather than burying waste away from people's sights, the design considers giving them new amenity value and utility value, or bring them into people's sights in a delicate and interesting way, evoking their awareness to the surrounding environment.

### MATERIAL PALLETET

#### PERMEABLE

To maximize the proportion of permeable surface, without sacrificing public space and its comfort. Between soft landscape and hard landscape, between a living area and an inanimate area, A paving system can also serve as an infrastructure while meeting foot traffic and social functions. The paving system lined with bioswale cells to delay, filter, store and reuse for irrigation and water feature, that enable stormwater runoff to circulate on-site.



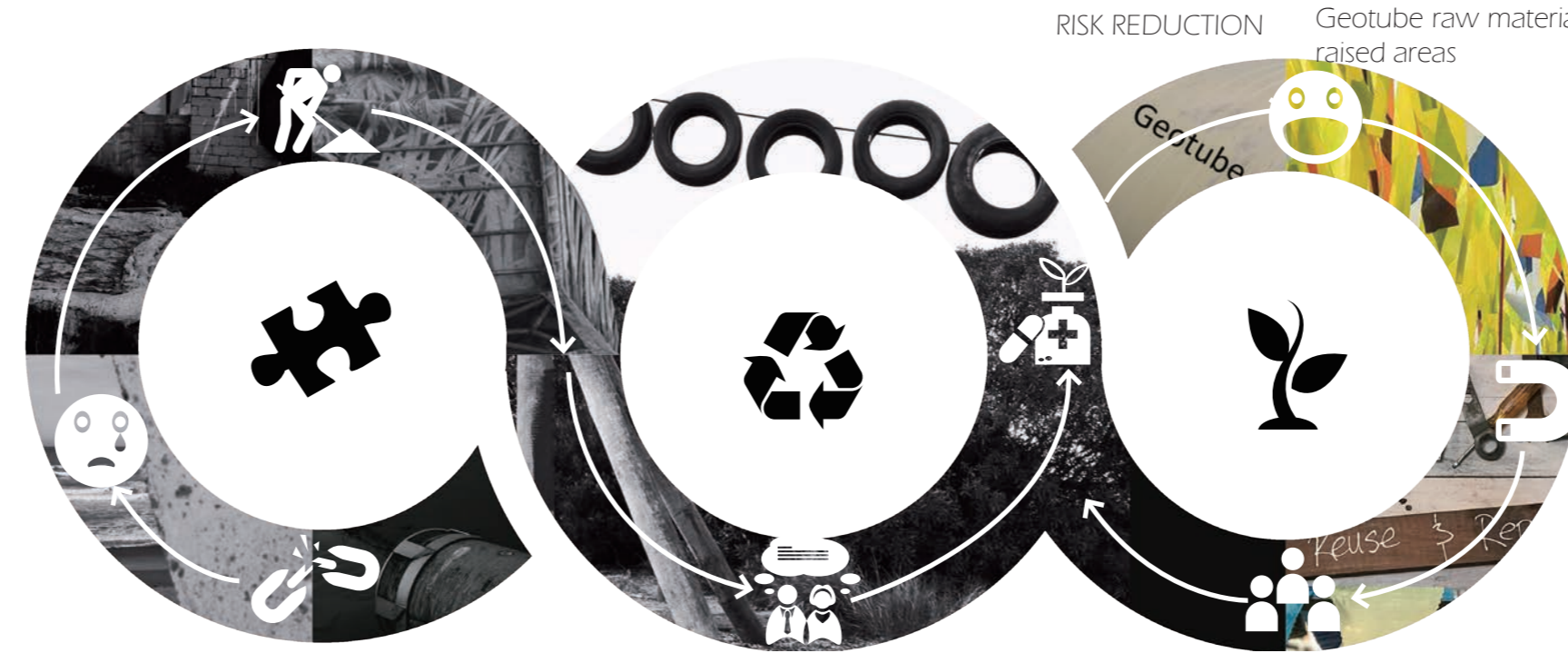
#### HAMMOCK

Seating combined with hammock placed on several sites where natural landscape meets hard landscape are highlights in the design, they provide people of place to relax and play, without interrupting flow of natural energy. An opportunity to enjoy the surrounding natural environment and sky in a sensual experience, that the Carex sway with the wind under the hammock, scorning you softly, or stream flow underneath with gurgling song, an inviting way to draw people to nature.



### CYCLE OF MATERIAL

The resilient material strategy emphasizes to absorb, change and incorporate the material process. Rather than burying waste away from people's sights, the design considers using new ways to give them new amenity value and utility value, or bring them into people's sights in a delicate and interesting way, evoking their awareness to the surrounding environment.



On-site materials from demolished buildings and infrastructure (red zone and flooding zone), Waste Plastic

Recycled centre, work site, Recycle Workshop, Innovative Lab, Art Studio

EDUCATION

COMMUNITY PARTICIPATION

COMMUNITY PARTICIPATION & EDUCATION: Recycle workshop (Library and sand park, studio, organized by community)

#### ADAPTABLE

The hard landscapes can flexibly adapt to change of weather and precipitation, and can change their physical appearance, status and function in relation to external influences. Meanwhile, it introduces water into the town centre to create a watery atmosphere to the neighborhood.

#### FLAGSTONE

use: paving surface, fountain

Different shades of flagstone to provide an attractive and welcoming surface for movement. Flamed and honed finish is antiskid, safety in wetting period. paving patterns convey an abstraction of surrounding environment.

#### EXPOSED AGGREGATE CONCRETE

use: paving surface

Permeable, durable and low maintenance Locally sourced. Rough surface reduce slipping. Rich and natural texture combined with different elements offers a variety of looks and colours echoing with maritime and riverine environment.

#### POROUS CONCRETE

use: paving surface, parking

Open cell concrete block filled with grass reduces abandoned hardscape associated with vehicles and parking, help mitigate heat islands. While providing new look of place.

#### RIVER STONES

use: Edge and gaps of paving, rain garden, bioswale

Permeable texture enable stormwater runoff to flow through, while filtering preliminary. The natural look provide the site a pleasant aesthetic and atmosphere.

#### GRAVEL

use: pathway

Permeable, locally sourced and natural looking, Natural or coloured gravels provide a variety of appearance, a metaphor of river and beach

#### BOULDER

use: decoration of water feature, seating

Natural and organic looking reflect the character of the river, give a sense of nature to artificial water feature. Its size is also suitable for people to sit on it for a short break in relatively busy space.

#### SHELLS

use: decoration of water feature, Edge and gaps of paving, surface finish of exposed aggregate concrete.

echo the cultural and natural legacy, a reflection of the beach and coastal environment.

#### RECYCLED GLASS and PLASTIC

use: decoration of water feature, Edge and gaps of paving, surface finish of exposed aggregate concrete.

The crushed glass collected and recycled from the demolished building, reused in the new landscape. The shinning glass reminds river in the sun and variety in colour bring the site a vibrant and artistic sense.

#### HARDWOOD DECING TIMBER

use: decking

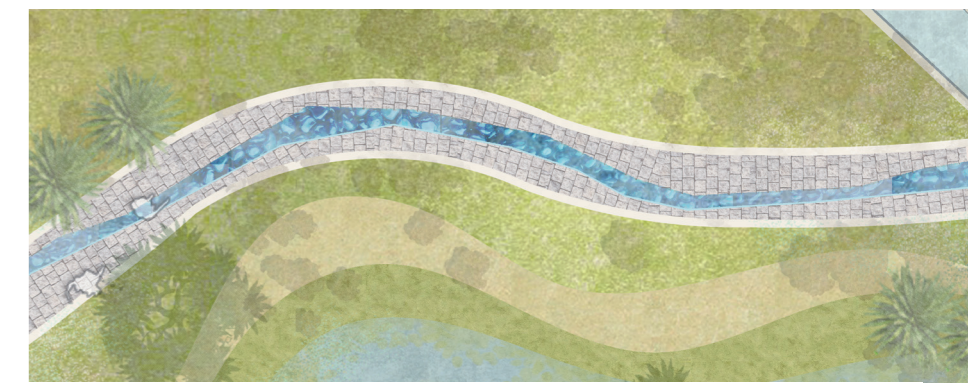
Recycled, resistant to periodic wetting, griptread surface reduce risk of slipping. Natural and wooden look give the site a calm and relax atmosphere. Comfort and pleasant for seating and rest.

#### AESTHETIC

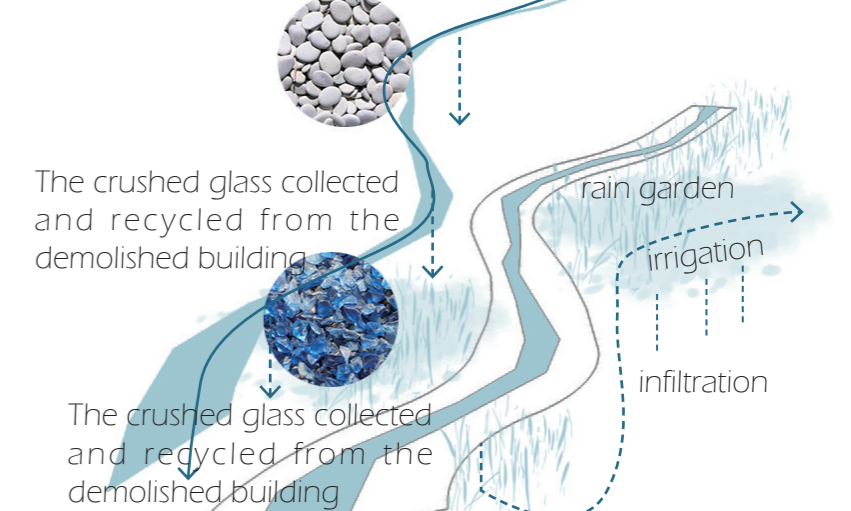
The design of the place emphasizes the participation of people through attractive visual expressions and forms of experience. Material palette echo the cultural and natural legacy. Hardscape materials in the landscape will be a reflection of the remolded building and infrastructure, surrounding environment and hidden natural process. Paving patterns convey an abstraction of earthquake and liquefaction, but water sprays bring vitality, which signify the cycle of life and the resiliency. The bottom of the fountain in the sunken square uses basalt, a metaphor of the riverbed of Avon river.



Paving pattern conveys an abstraction of earthquake and liquefaction.



#### GRAVEL



Permeable surface with recycled materials from the community, provides both ecological and aesthetic value



#### INDICATIVE SPECIES



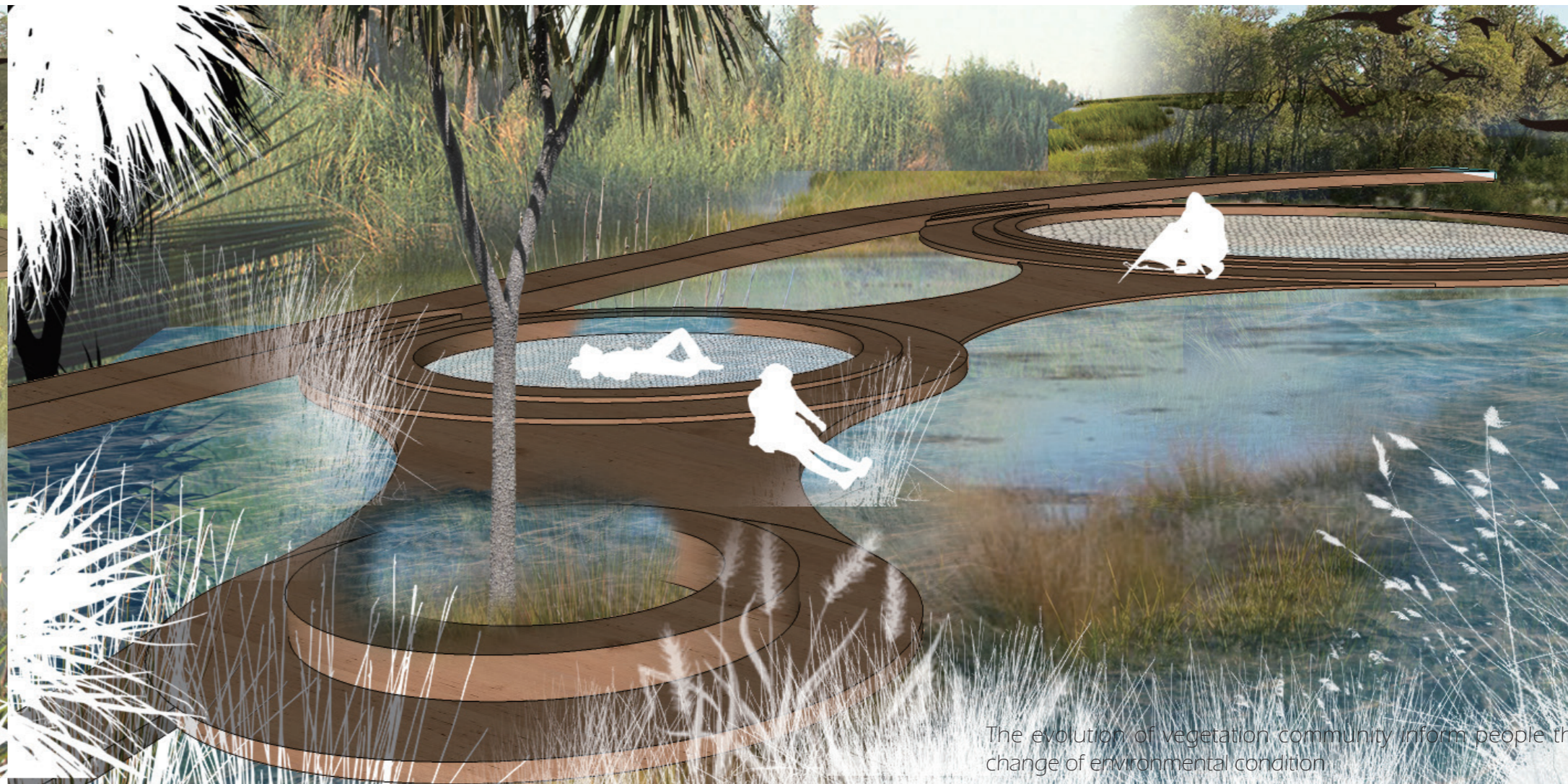
*Selliera radicans*



*Carex testacea*

Open cell concrete block leave space for rain water infiltrated through native ground cover and Carex

### A MORE WATERY ATMOSPHERE WITH SEA LEVEL



The evolution of vegetation community / For people the change of environmental condition

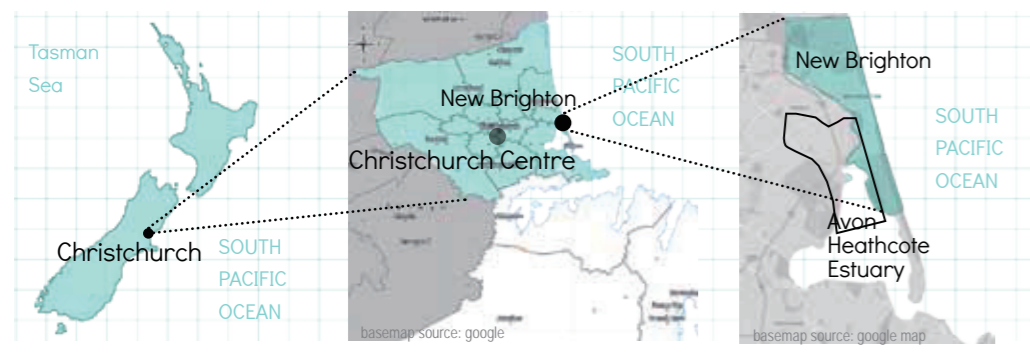
# TOWARD A RESILIENT CITY

## Study of New Brighton

### BACKGROUND

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### SITE



The site is located at the eastern edge of Christchurch, and 8 kilometres east of the city centre. It is adjacent to South Pacific Ocean, the Avon River and the Estuary.

### ISSUES

- Significant riverine flooding hazard from the Avon River
- Increased risks of storm flooding and coastal flooding due to the greater tidal prism with rising sea level in future
- Damaged land and infrastructures, major loss of housing stock and major community facilities lead to major loss of population and livability
- Shrinkage and disintegration of educational infrastructure, recreation facilities, community facilities and commercial environment due to loss of population
- Community safety around empty land and damaged land area
- Decreased value of land and rental properties
- Decreased social capital and community sense

### PRECEDENTS

**Resilience** The ability of absorbing the predictable or uncertain effects of changes and integrate the effects into the context of natural and built environment (Lyster, 2015).

#### Maeslantkering, Holland

appropriate for a stable, certain future



Hard, static, giant engineering which aim to resist or defend change fail to meet the challenges of unpredictable disturbance and change in the long term, which is usually and top down, mono-functional, capital intensive. (Coff, 2016)

#### New York's winning project Big U for future climate impacts

Hard, static, giant engineering which aim to resist or defend change fail to meet the challenges of unpredictable disturbance and change in the long term, which is usually and top down, mono-functional, capital intensive. (Coff, 2016)



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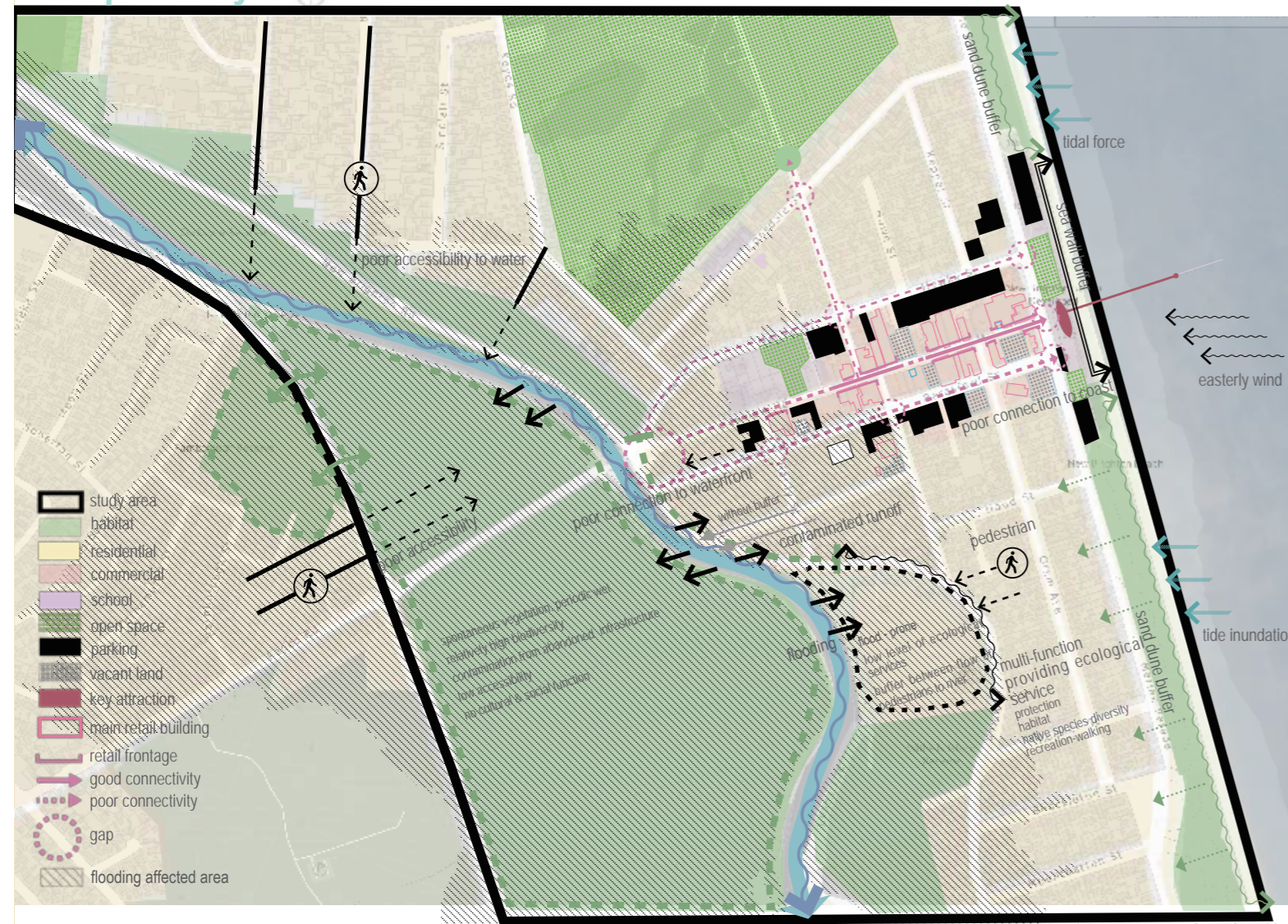
**REFERENCE**  
 National Centre (2003a). Technical Publication (TP) 124 ULD Design (Chapter 4). <http://www.aucklandcity.gov.nz/council/documents/technicalpublications/TP124LowImpactDesignManualfortheAucklandRegionChapter4-2000.pdf>  
 Lyster, N.M. (2015). Resilience: designing the new sustainability. Topos, 90, 14-21.  
 Coff, E. (2016). Toward an urban ecology. New York, NY: The Monacelli Press.

### GOAL

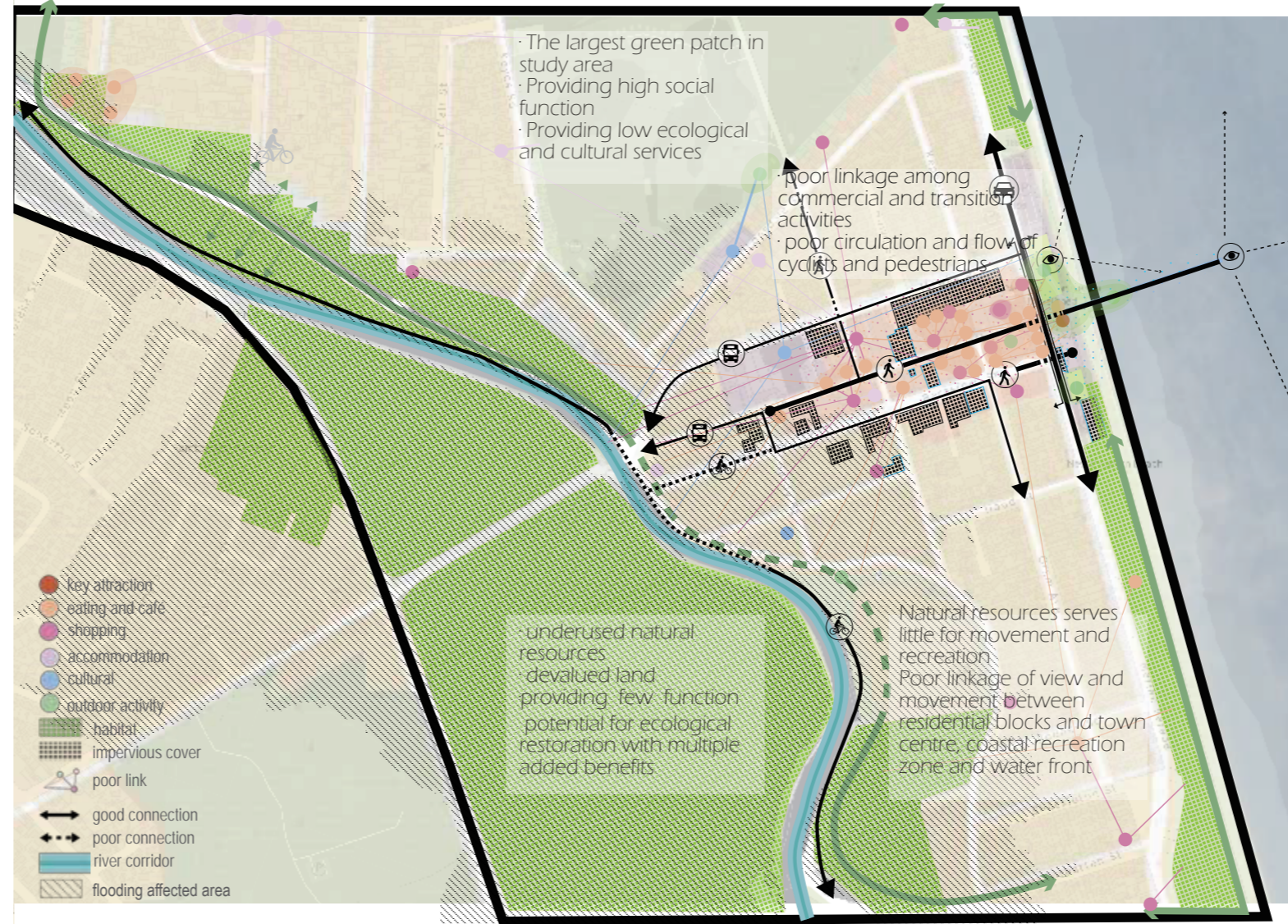
To improve the New Brighton's ability to adapt to current and possible greater effects of riverine and coastal flooding with long-term climate change.

SUB-GOAL	OBJECTIVE	INVENTORY	SCALE			
			regional	masterplan	community	detail
1. To improve the site's ability of absorbing stormwater and storage capacity through natural resources and green infrastructure	i. To preserve and enhance the region's natural landforms and natural ecological systems, like sand dune, marsh	size and type of existing natural ecological systems	●			
	ii. To expand green infrastructure throughout residential and commercial area and to enhance their connectivity	size and type of existing green infrastructure connectivity of existing natural ecological habitat patch and corridor	●			
	iii. To reduce imperviousness cover throughout the region, especially along river corridor	land zoning land surface type (Imperviousness) road hierarchy road width	●	●	●	●
	iv. To change the zoning of affected residential area to open green space for recreation and education use	land zoning flooding affected area	●	●		
2. To improve the adaptability and transformative capacity of landscape and built environment facing uncertain hydrological and environmental conditions	v. To provide alternative road alignments or transport modes to accommodate changing hydrological conditions	existing circulation type and condition	●	●		
	vi. To build open space that allow water in and adjust to different weather condition	type and use condition of existing open space	●	●	●	●
	vii. To reveal the natural process in landscape and made infrastructure systems functional legible	existing drainage system	●	●	●	●
3. To improve the community's ability to adapt to future climate change through improving understanding and greater shared resourcefulness	viii. To improve access to green and blue infrastructure for both residents and visitors	activity spot access to green infrastructure circulation	●	●	●	●
	ix. To increase education and recreation facilities and amenities in natural settings	density view corridor sun path wind	●	●	●	●

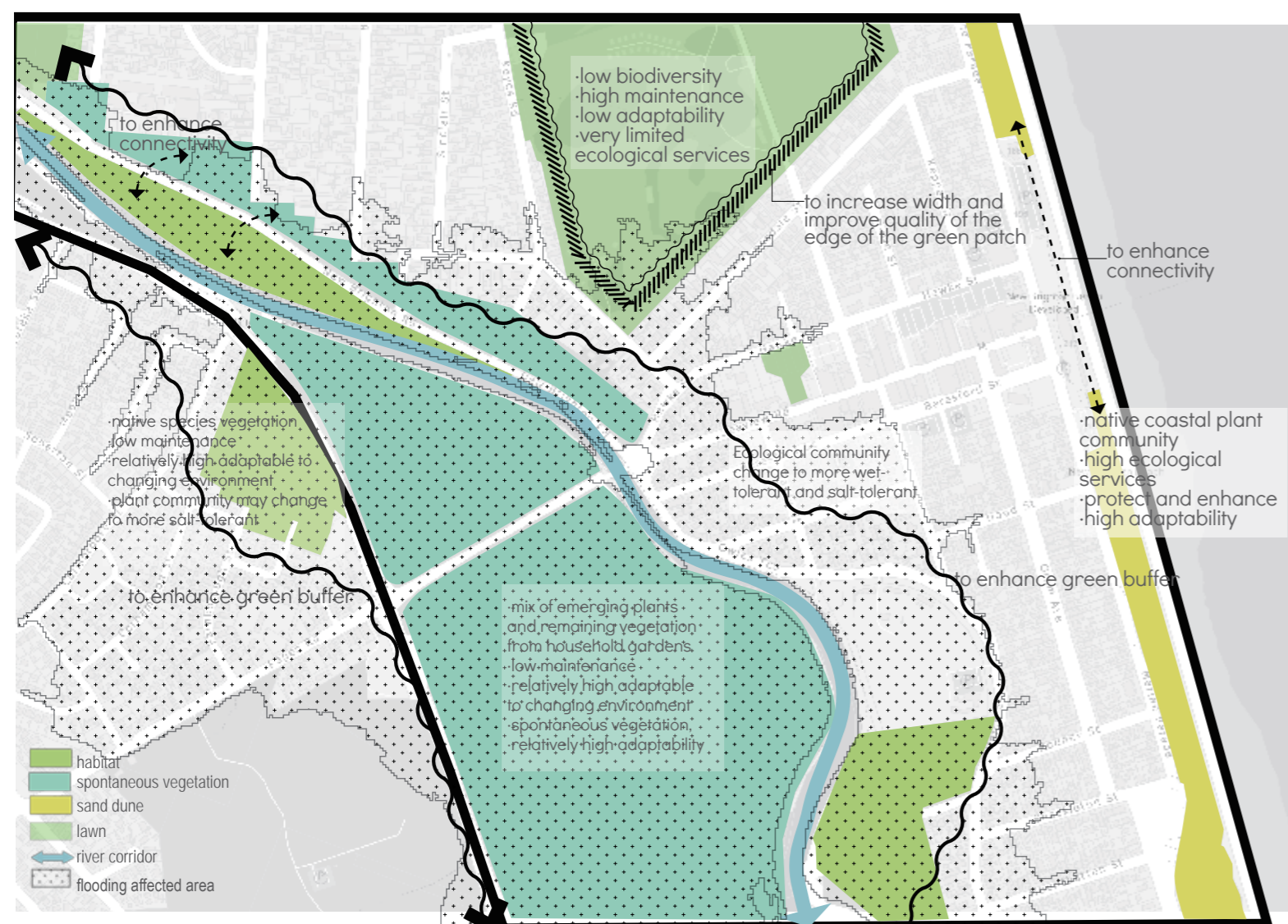
### Masterplan Analysis



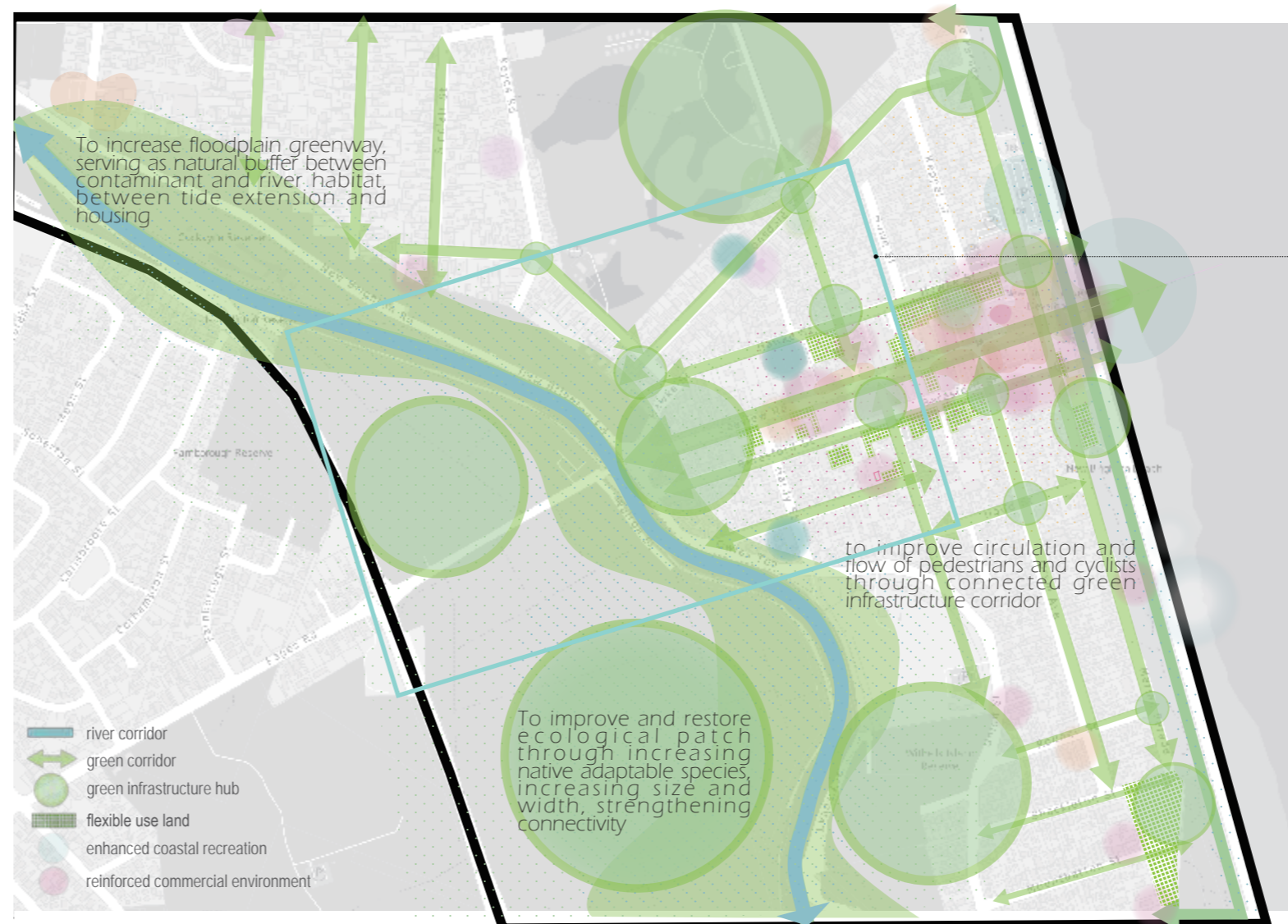
Circulation Analysis 1:12000



Activity and Connection Analysis 1:12000

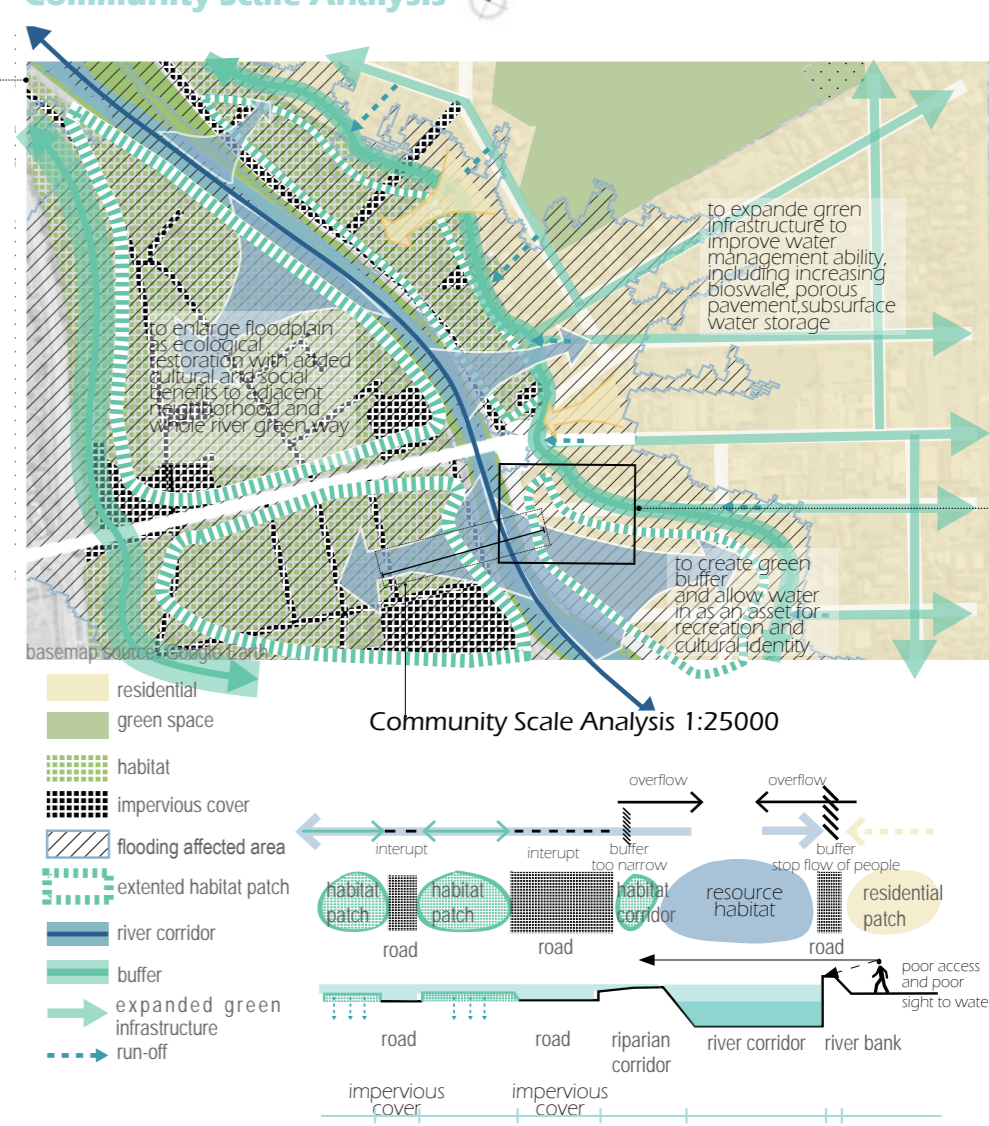


Green Infrastructure Analysis 1:12000

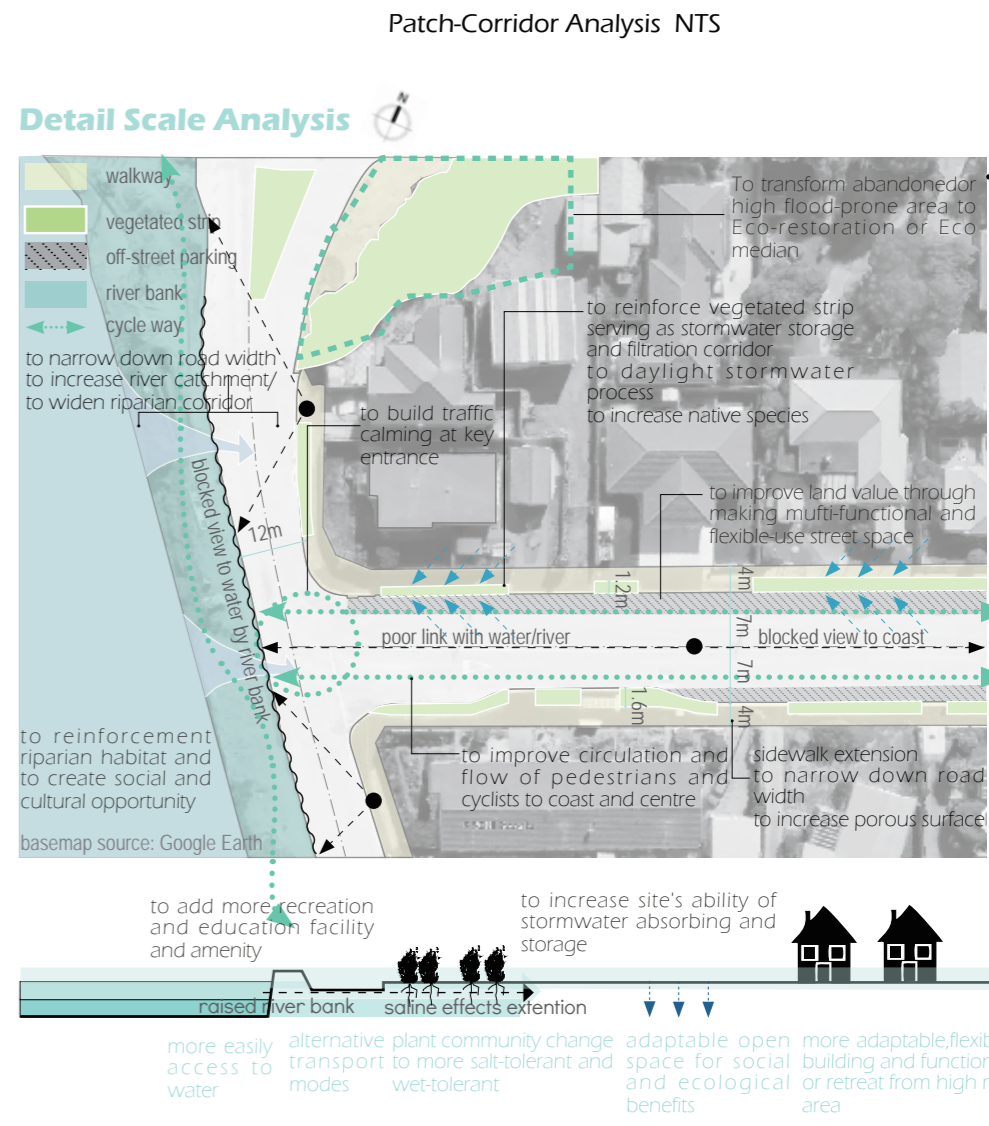


Green Infrastructure Network Analysis 1:12000

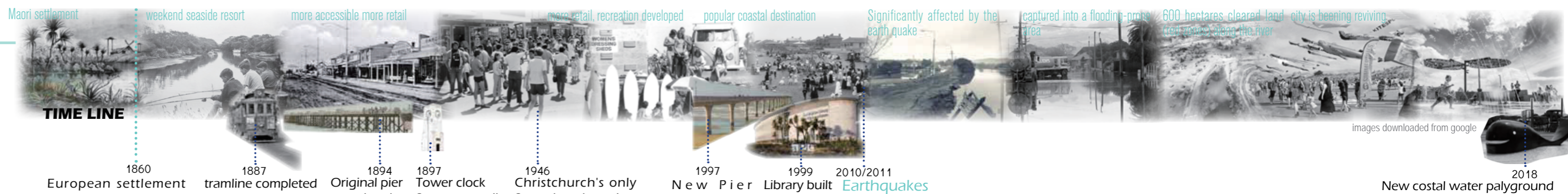
### Community Scale Analysis



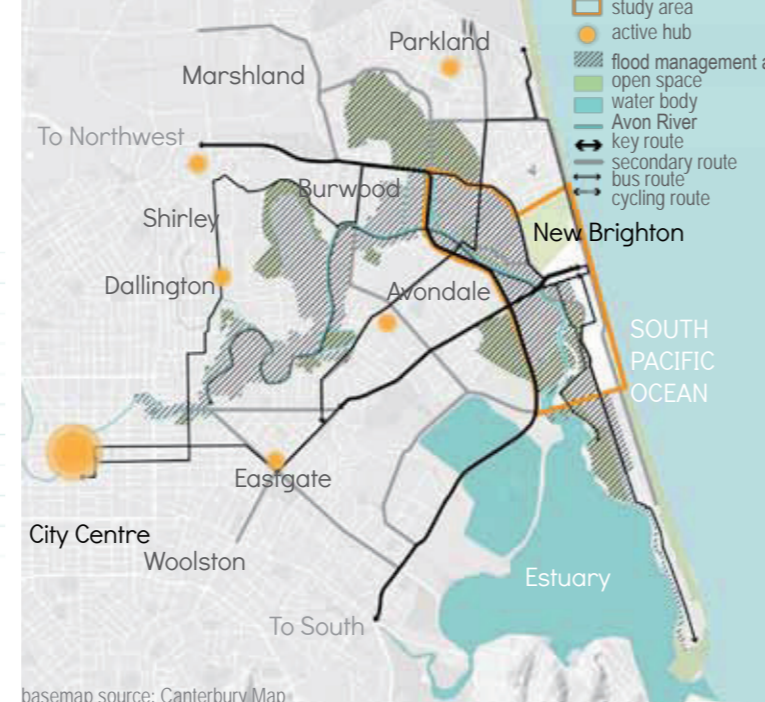
Community Scale Analysis 1:25000



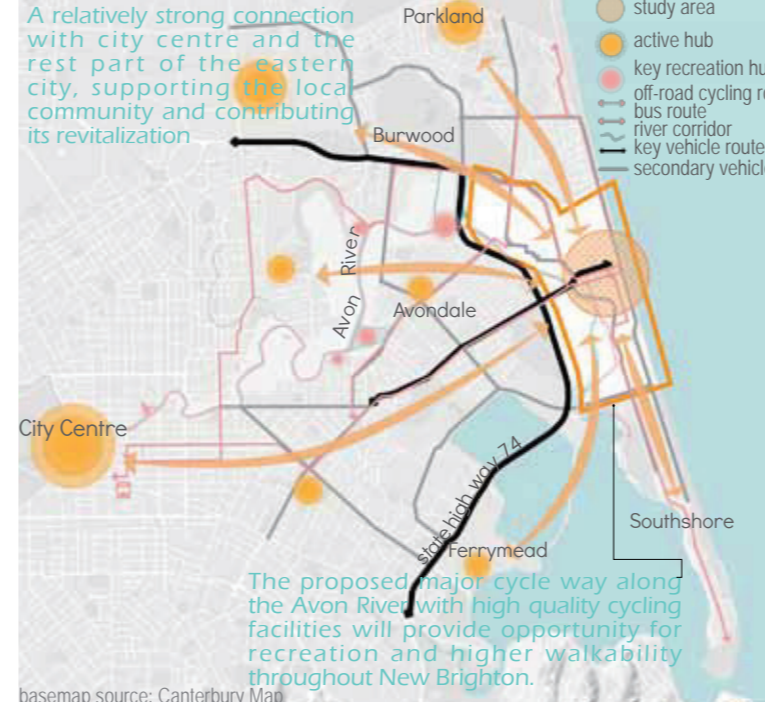
Detail Scale Analysis 1:12000



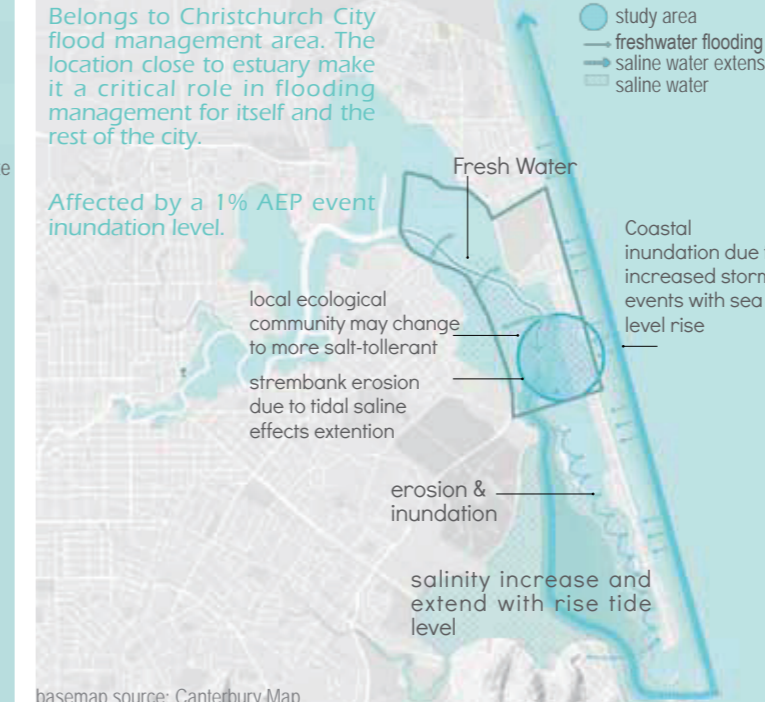
### Context Analysis



Context Map NTS



Circulation Analysis NTS

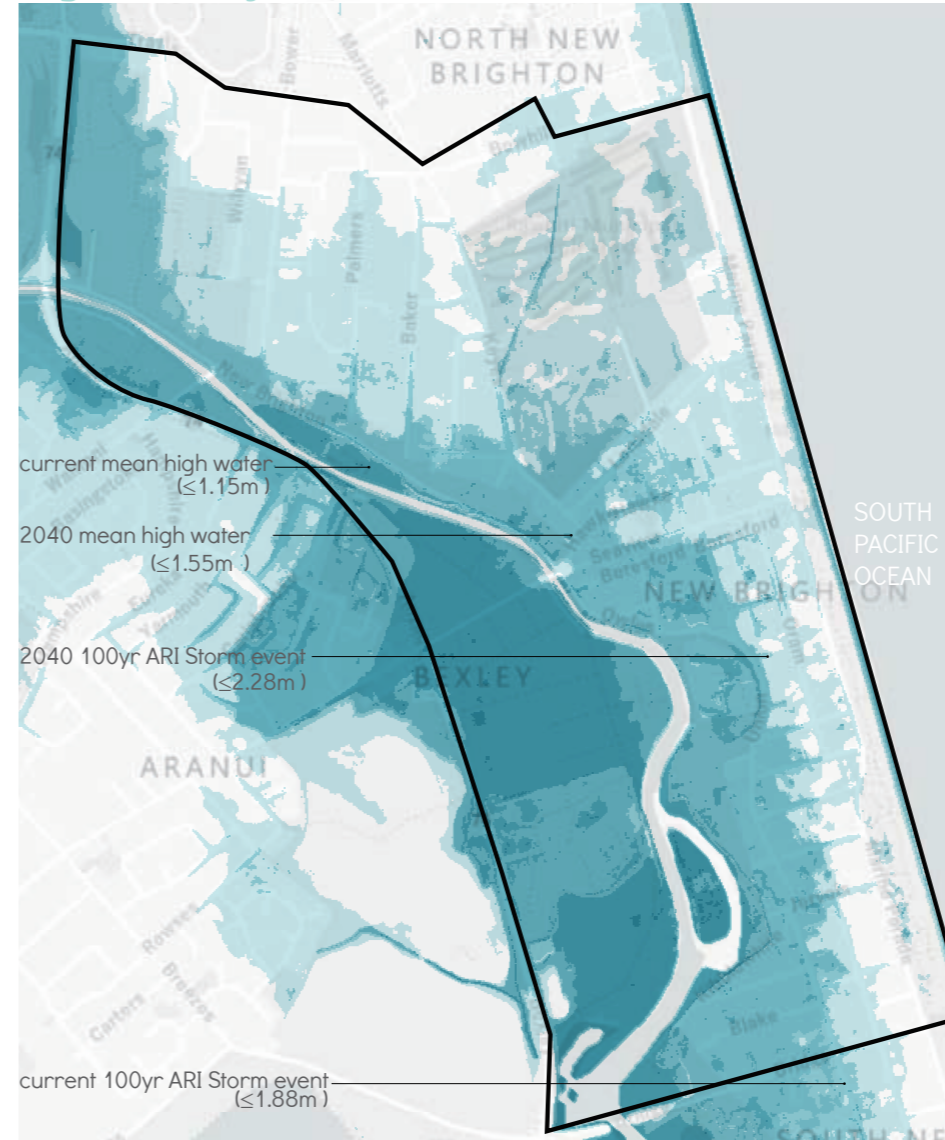


Flood Management Area NTS

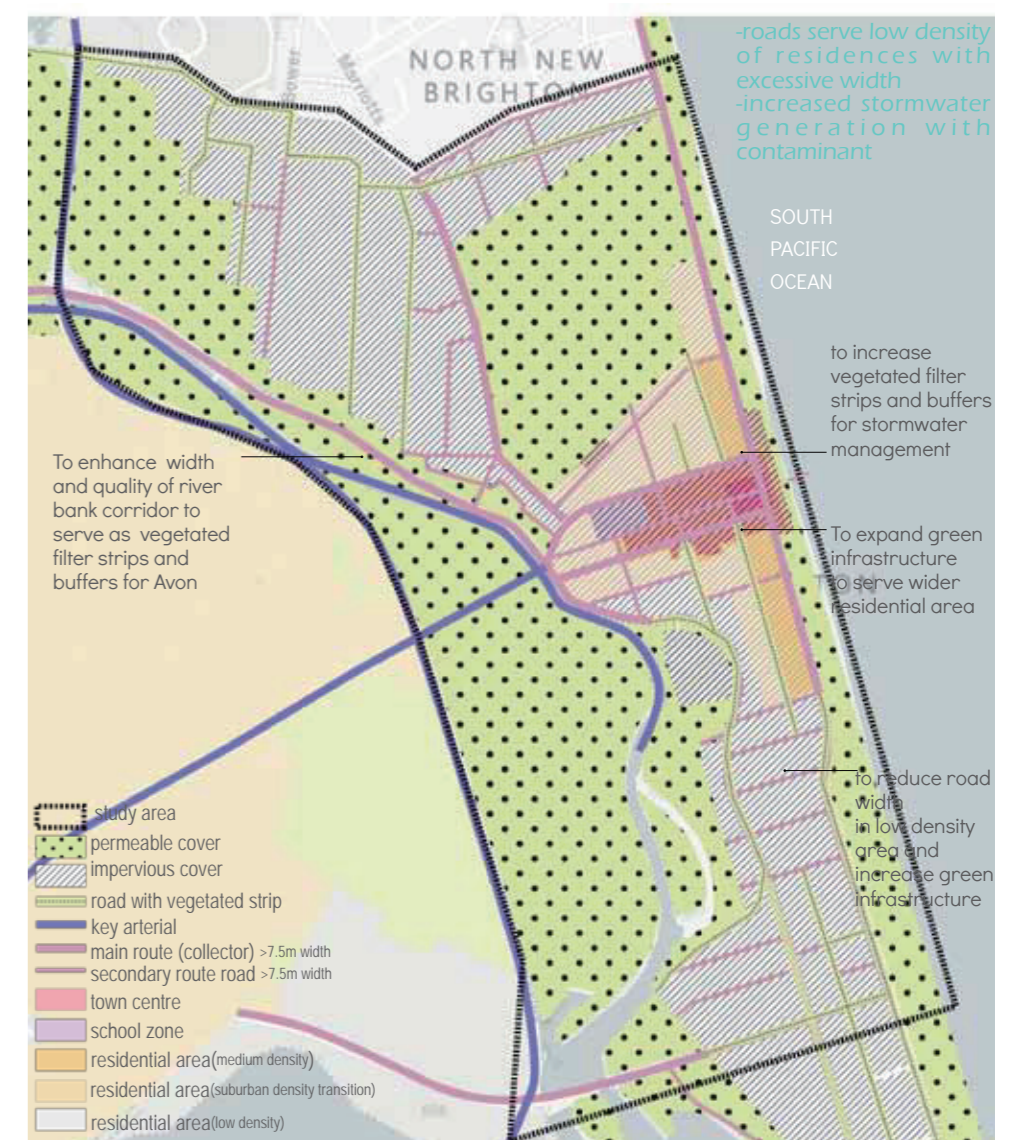


Green Corridor Connection NTS

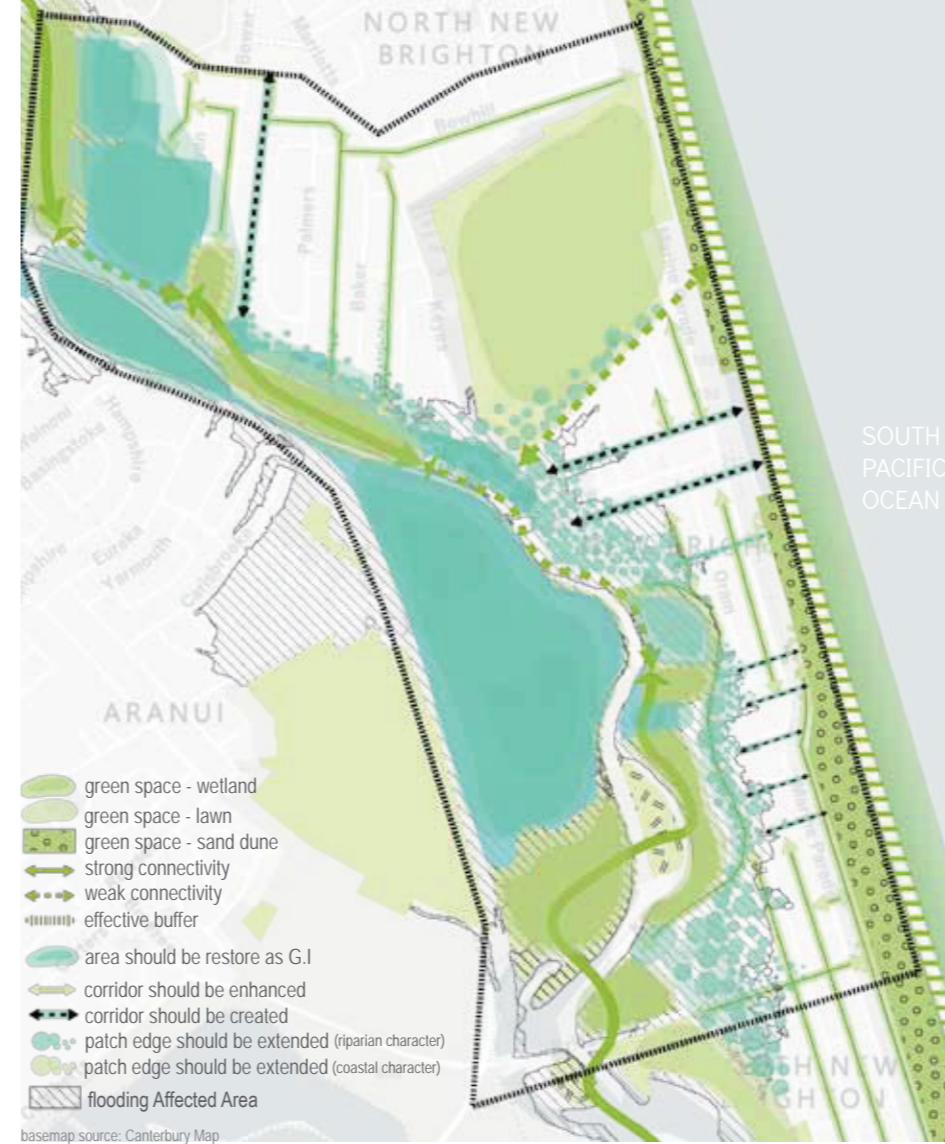
### Regional Analysis



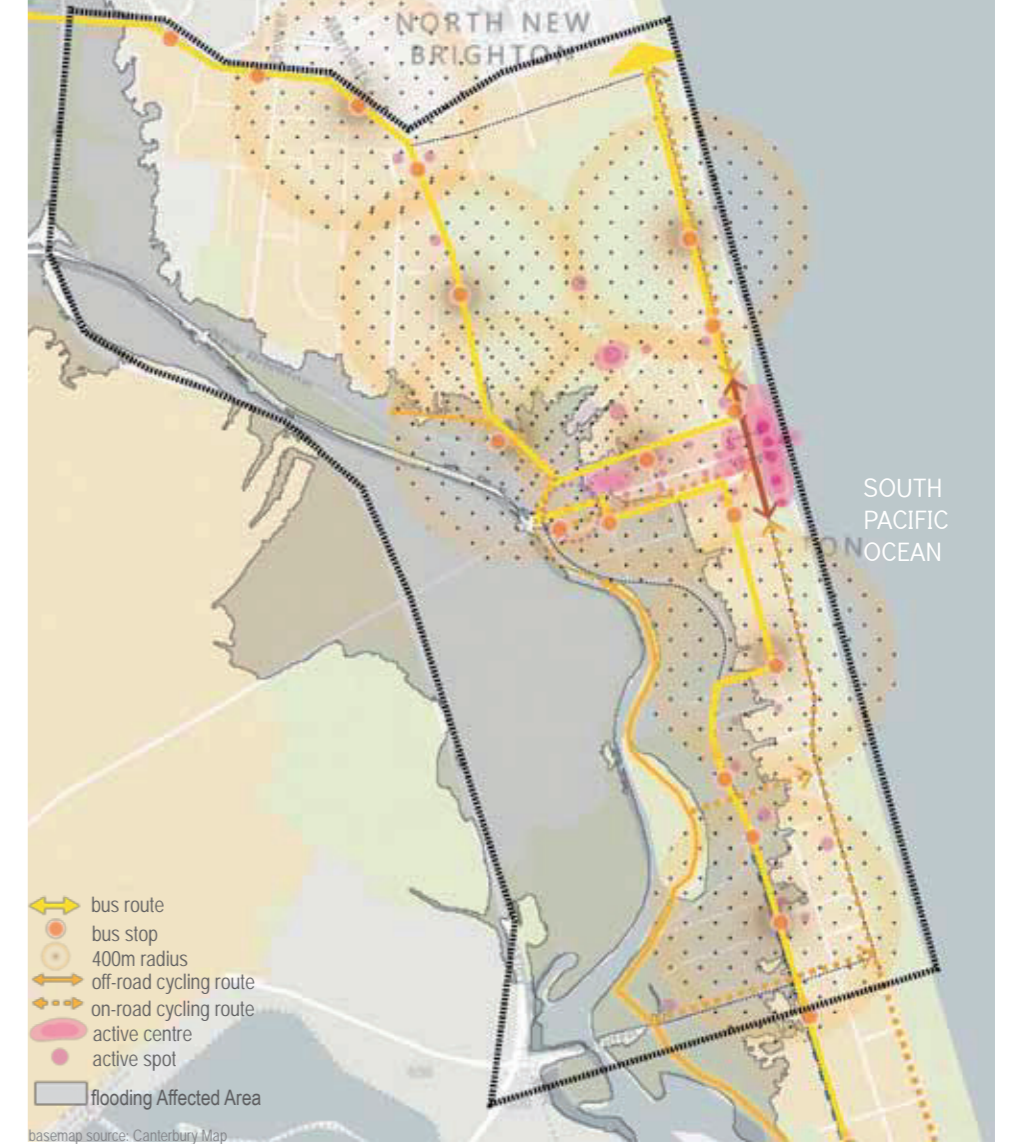
Flood Level Map 1:25000



Imperviousness Analysis 1:25000



Green Infrastructure Analysis 1:25000



Circulation Analysis 1:25000

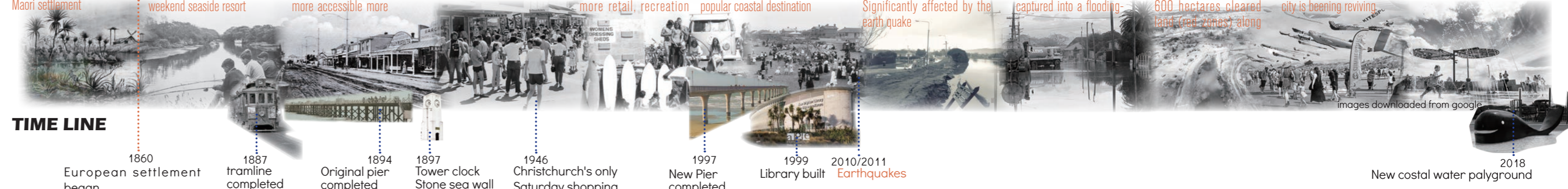
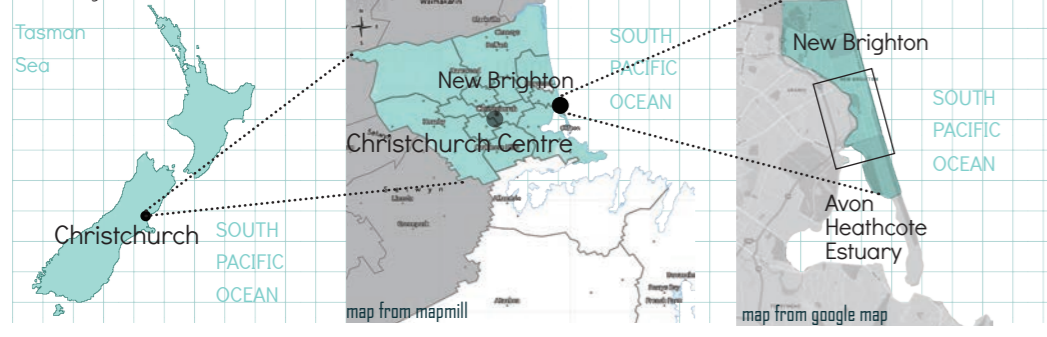
# TOWARD A MORE RESILIENT COASTAL DESTINATION - Study of New Brighton

## BACKGROUND

New Brighton is a seaside suburb at the eastern edge of Christchurch City, with significant associations to Maori and European historically and contemporarily. Its location close to the sea, the Estuary, and the Avon River and its intertidal ecosystem contribute to a rich assemblage of wildlife habitats historically, fostering a high biodiversity and productivity before European settlement. Environmental degradation resulting from careless drainage and land transformation by early European settlers exacerbated the effects of 2010 and 2011 earthquakes, leaving New Brighton at the risk from the earthquakes and flooding. The great impact of the ongoing natural hazard risks are further fuelled by climate change. However, the red zone sits along river corridor and within the regeneration phase of this area offers much potential for resilient living in a dynamic water edge landscape with significant flood hazard, and to connect the site's long evolution history to contemporary urban lifestyles.

## SITE

The site is located at the eastern edge of Christchurch, and 8 kilometres east of the city centre. It is adjacent to South Pacific Ocean the Avon River and the Estuary.



## VISION

New Brighton is evolving itself from earthquake disruption to a safe, lively, fun and attractive place to live, work and play for local residents and the greater Christchurch region, with a rich range of waterfront and natural habitat based recreation opportunities, a strong connection to cultural and natural heritage, and growing social confidence and community resiliency to climate change.

**Resilience** is defined as "the capacity of a system to absorb disturbance and respond to change without reducing its basic function and structure" (Walker 2006)

References  
Walker, B. (2006) Resilience Thinking - Sustaining Ecosystems and People in a Changing World. Washington, DC USA: Washington, DC USA Island Press.

## Change & Disturbance

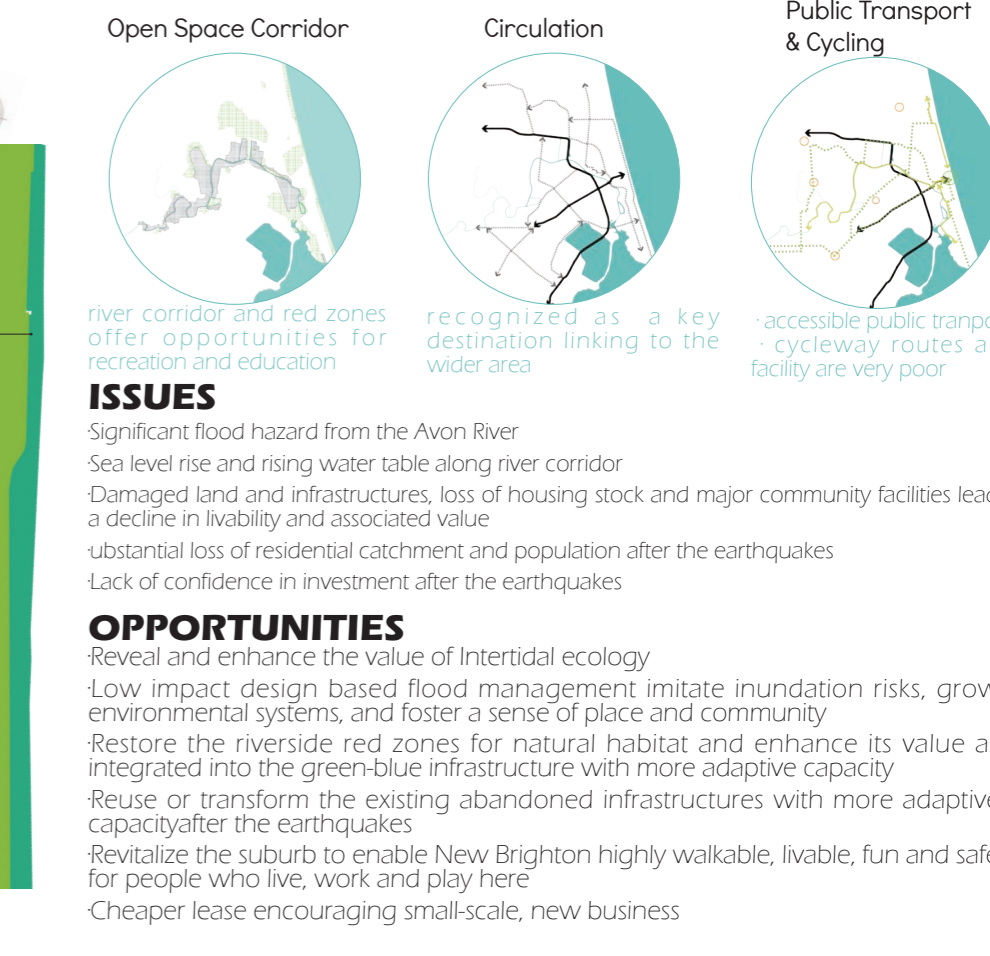
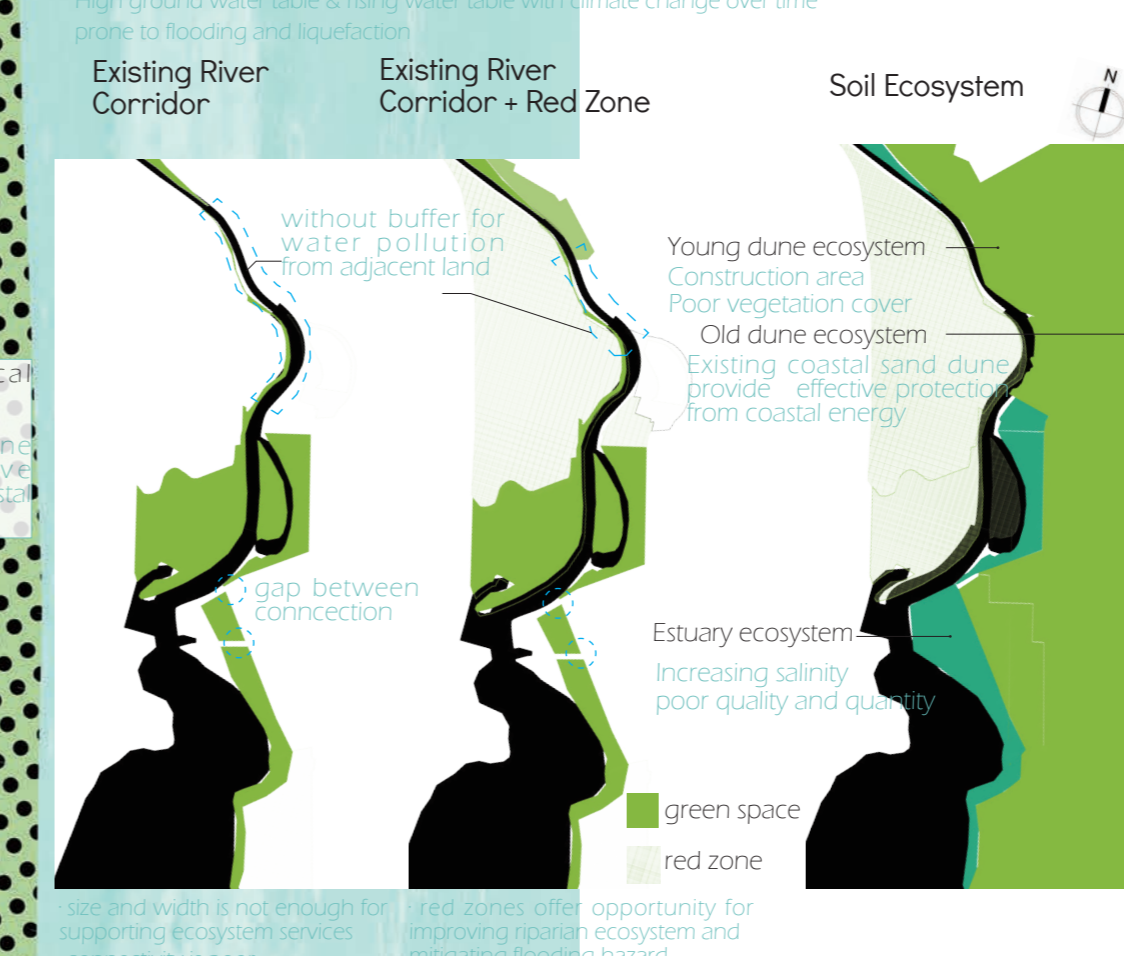
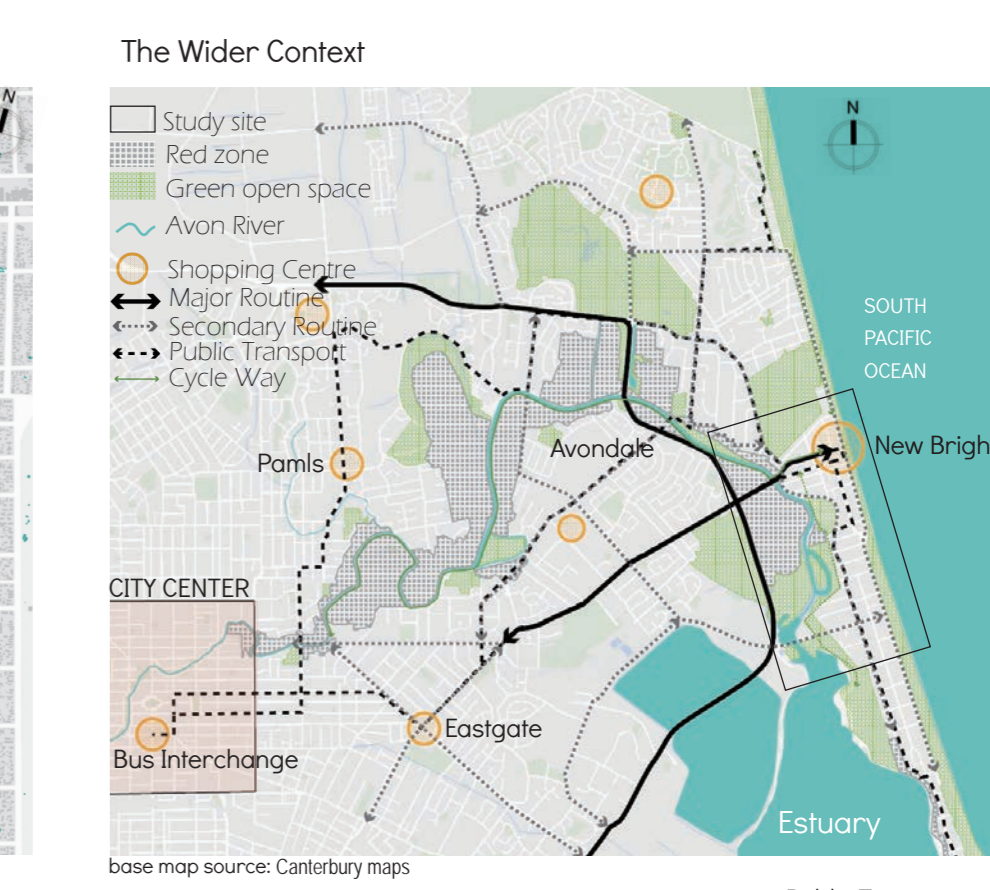
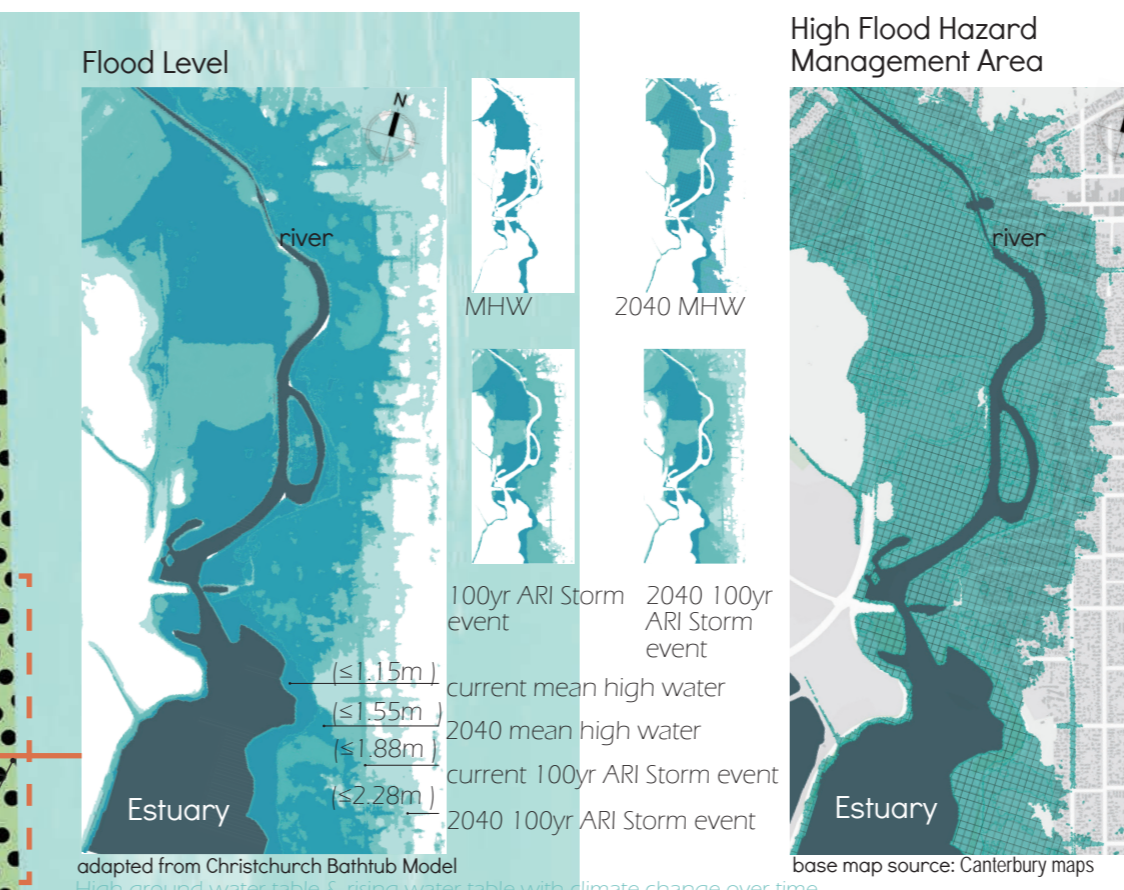
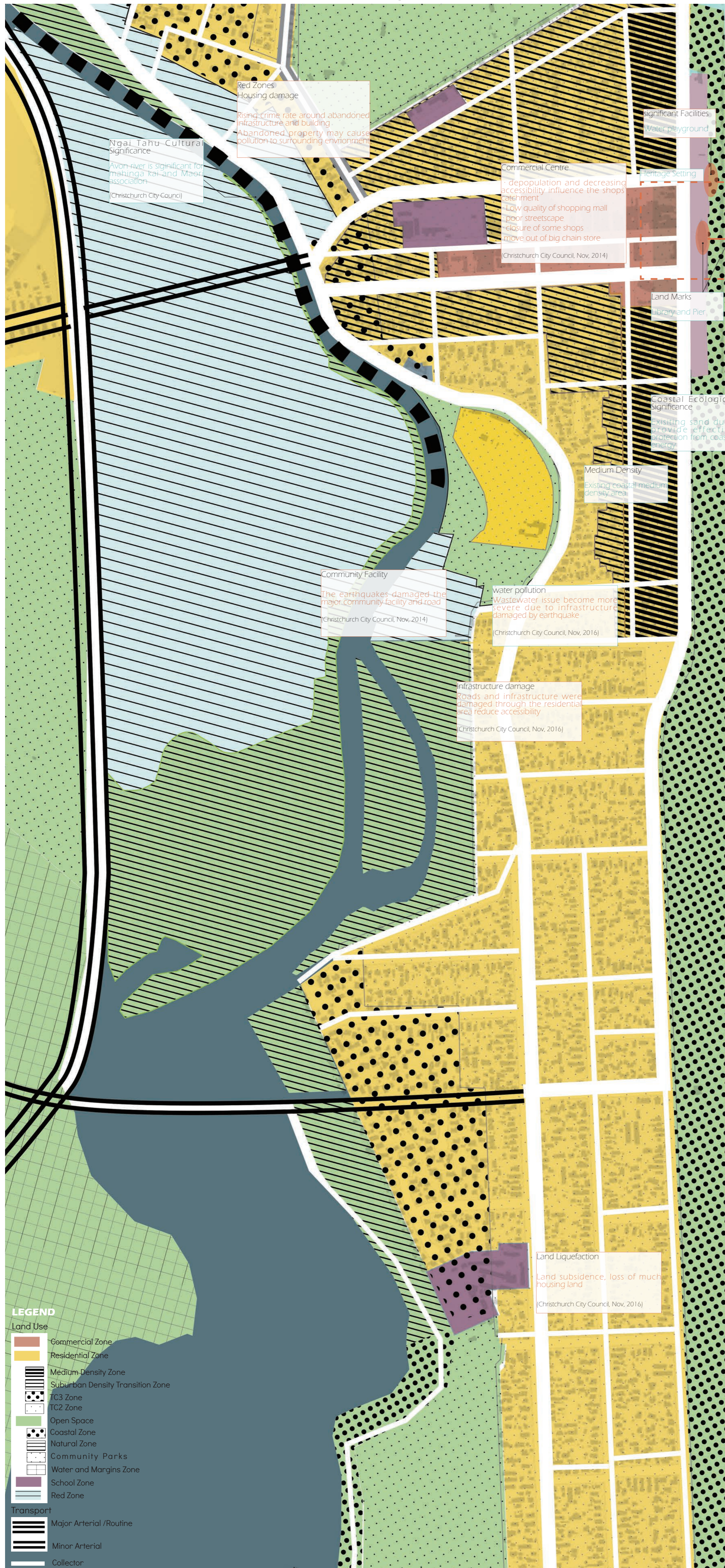
- Dynamic water level
- Rising water table
- Flooding Risk
- Uncertainty future of red zone

## Basic function

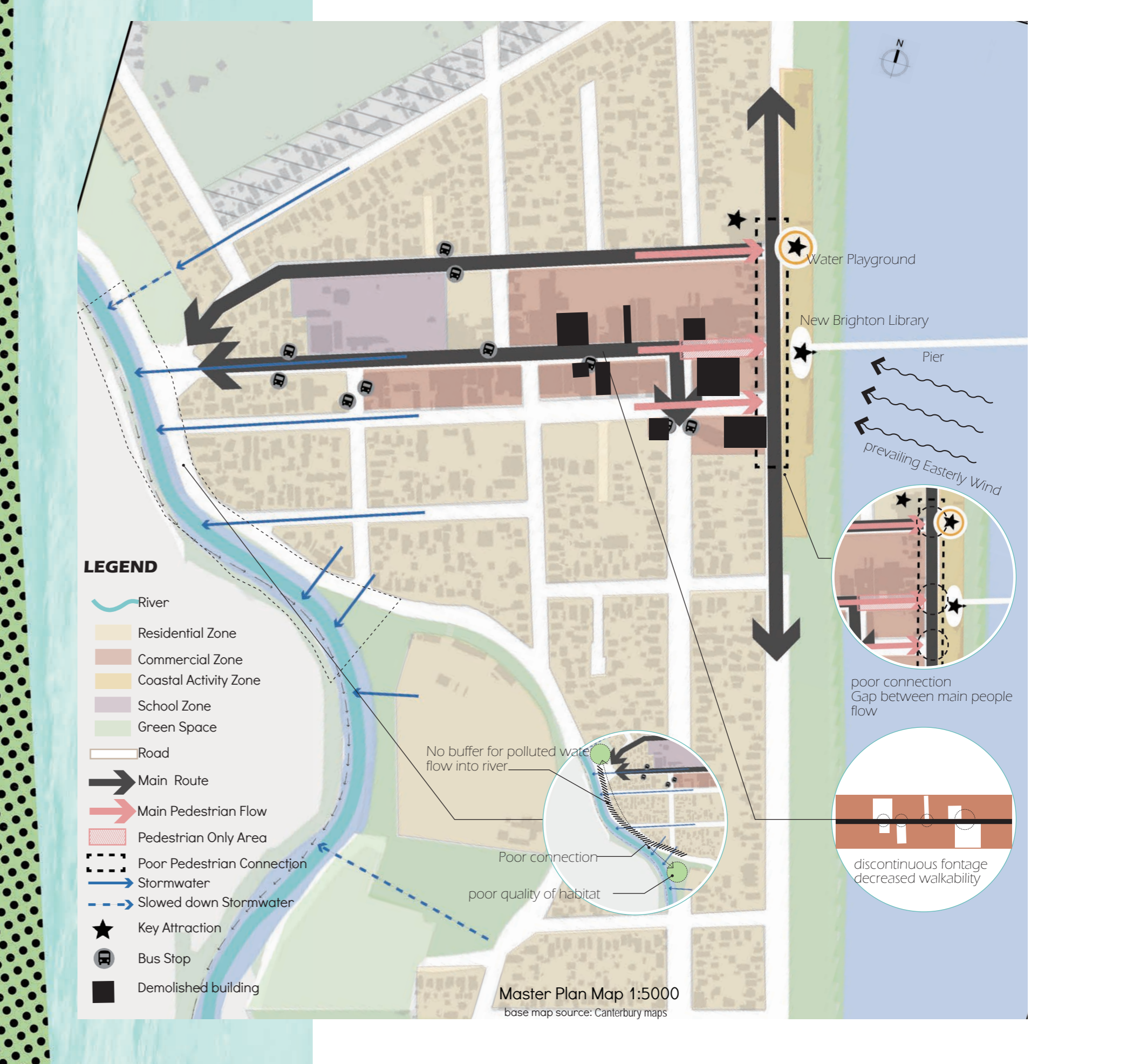
- Residential: safe housing, effective movement network
- Commercial: accessible transport, place for transaction activity, community facilities, public open space
- Recreational: sufficient people volume, recreational facilities, increasing soil salinity

## Existing and Potential Impact

- Shrinking land for housing, recreation
- Housing damage and unoccupied land
- Threats to life and safety
- Rising crime rate around abandoned infrastructure and building
- Depopulation and decreasing customers
- Damage to traffic infrastructure system
- Damage to sewerage and energy system
- Loss of natural habitat
- Water pollution
- Decreased livability
- Decreasing social capital
- Decreasing accessibility
- Declining value and confidence in business
- Environment degradation and decreased biodiversity



- ### GOALS
- To improve land utilization and land adaptability
  - To mitigate flooding risks
  - To improve resilience of community for the changing environment
- ### OBJECTIVES
- To increase housing density in higher land for longer-time durability before inevitable change occurs
  - To improve land flexibility in commercial and residential area through more fine grain, mixed-use human-scale development
  - To design flexible public spaces adaptable to changing conditions and different uses
  - To protect and enhance existing coastal and river ecosystem
  - To construct green infrastructure network along the Avon river and across the neighborhood
  - To increase native wastewater treatment plants and canopy
  - To improve walkability and support alternative transport
  - To daylight natural and energy flows in infrastructure and landscape
  - To incorporate different use and function in infrastructure
  - To enhance coastal recreation facilities and provide more recreation alternatives
- ### INVENTORIES
- land use
  - residential density
  - public space
  - water level
  - connectivity of habitat patch
  - width and size of habitat patch
  - soil type
  - drainage
  - community facilities
  - recreation facilities
  - circulation



- ### LEGEND
- #### Land Use
- Commercial Zone
  - Residential Zone
  - Medium-Density Zone
  - Suburban Density Transition Zone
  - TC3 Zone
  - TC2 Zone
  - Open Space
  - Coastal Zone
  - Natural Zone
  - Community Parks
  - Water and Margins Zone
  - School Zone
  - Red Zone
- #### Transport
- Major Arterial/Routine
  - Minor Arterial
  - Collector

## REFERENCE

McHarg, I. L., & Mumford, L. (1969). *Design with nature*. New York: American Museum of Natural History.

Orff, K. (2016). Toward an urban ecology.

Wiser, S. K., Buxton, R. P., Clarkson, B. R., Hoare, R. J., Holdaway, R. J., Richardson, S. J., ... & Williams, P. A. (2013). New Zealand's naturally uncommon ecosystems. *Ecosystem services in New Zealand: conditions and trends*. Manaaki Whenua Press, Lincoln, 49-61.

## IMAGE RESOURCES:

PAGE 1: photos in context map

Bexley Wetlands:

<http://www.livingheritage.org.nz/schools/primary/st-james/bexley/index.html>

Travis wetland

<https://inaturalist.nz/projects/travis-wetland-nature-heritage-park>

Horseshoe Lake reserve

<https://www.google.com/search?q=horseshoe%20lake%20reserve%20christchurch&tbm=isch>

Avon river

<https://www.onthegotours.com/ca/New-Zealand/Best-Places-To-Visit/Christchurch/Punting-on-the-Avon-River-with-Optional-Gondola-and-Botanic-Gardens-Tour>

Avon river park terrace

<https://bestawards.co.nz/spatial/built-environment/landlab-1/avon-river-park-terraces-city-promenade/>

New Brighton beach

<https://discoverywall.nz/media/4275>

PAGE 5:

Images of plants in PLANT STRATIES all from Kauri park and Southern woods

<https://www.kauriparknurseries.co.nz/>

<https://www.southernwoods.co.nz/>

PAGE 6:

Shells : photo taken by Shellekelle, retrieved from pinterest

Geotube:

[https://serc.carleton.edu/integrate/teaching\\_materials/coastlines/student\\_materials/1071](https://serc.carleton.edu/integrate/teaching_materials/coastlines/student_materials/1071)

Aggregate:

<https://capitalmasonry.net/blog/enhance-surfaces-with-exposed-aggregate/>

River stone:

[http://www.fabiovisentin.com/photos/world/28\\_1358/Calm-river-stones.ashx](http://www.fabiovisentin.com/photos/world/28_1358/Calm-river-stones.ashx)

River Rock:

<https://colliermaterials.com/river-rock>

boulder:

<https://climbz.org.nz/nz/ni/wellington/turakirae-head/the-point/low-tide-boulder>

Hardwood:

<http://www.ramienstimmer.com.au/decking-and-screening/hardwood-decking-spotted-gum>

Green Paving:

<https://www.hardscape.co.uk/products/materials/greenbrick/>

PLANTS from <https://www.southernwoods.co.nz/>