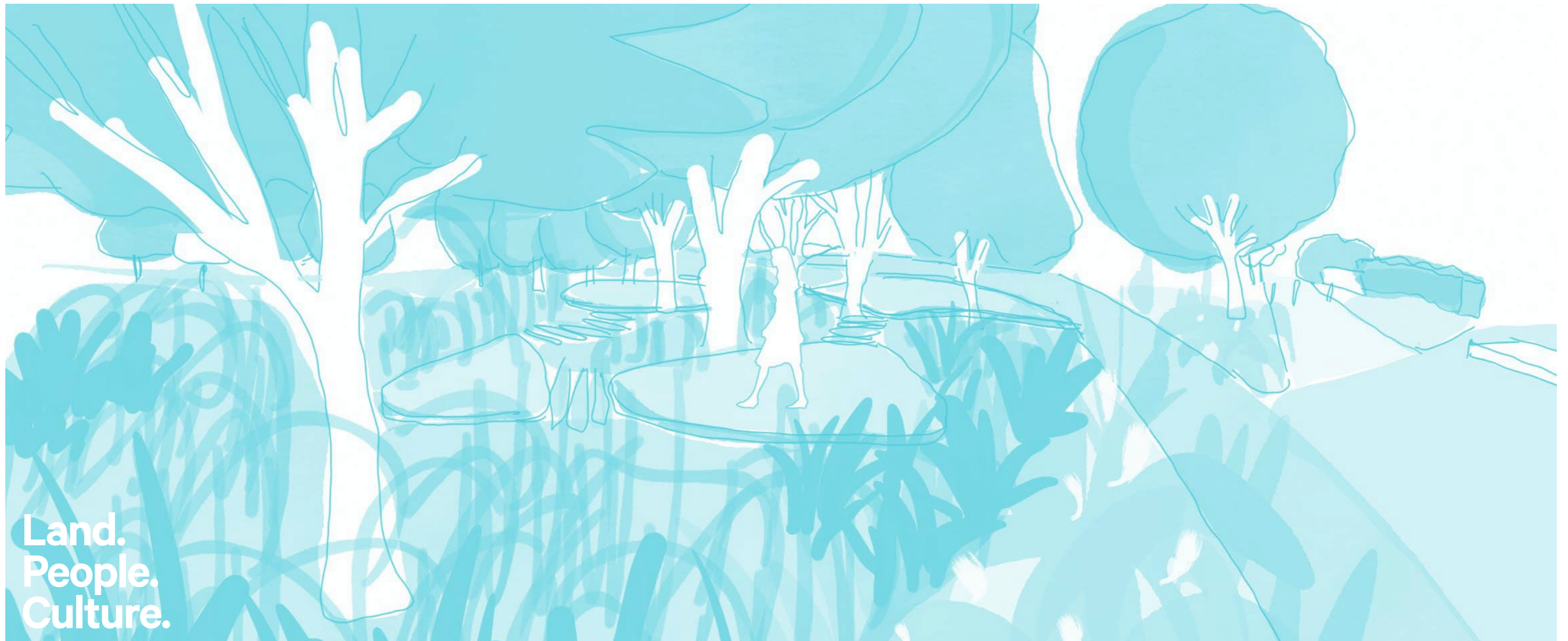


Avon Park. Preliminary Design Ōtākaro Avon River Corridor.

22 December
2022

Isthmus.



Land.
People.
Culture.

Draft for discussion only.

Contents.

1. Site and Context.	3
Cultural Context.	4
Ecological Context.	5
ŌARC Context.	6
ŌARC Project Integration and Connections.	7
Social Context.	10
Social Context.	11
Recent History.	12
Current State.	13
2. Objectives, Principles and Moves.	14, 15
Iwi Management Plan Objectives.	16
Regeneration Plan Objectives.	17
Spatial Principles.	18
Spatial Moves.	19
3. Preliminary Design.	20
Design Statement.	21
General Arrangement Plan.	22
Site Design Intent.	23
Active Zone Plan.	24
Active Zone Character.	25
Community and River Zone Section.	26, 27
River and Calm Zone Section.	28
Community Zone Character.	29
Calm Zone Places of Quiet.	30
Calm Zone Character.	31
River Zone Western Entrance Design.	32
River Zone Edge Condition.	33

4. Landscape Strategies.	34
Movement Diagram.	35
Topography and Water.	36
Tree Strategy.	37
Facilities and Services.	38
5. Engineering Strategies.	39-45
6. Appendix.	46
Tree Summary.	47
Geotechnical Summary.	48
Cracking Observations.	49
Geotechnical summary - Section 1.	50
Geotechnical summary - Section 2.	51
Cultural Framework.	52
How do we measure success together?	53
Design for Kaitiakitanga.	54
Initial Concept Options.	55
Design Feedback.	56
Design Feedback.	57
Design Feedback.	58

Document record.

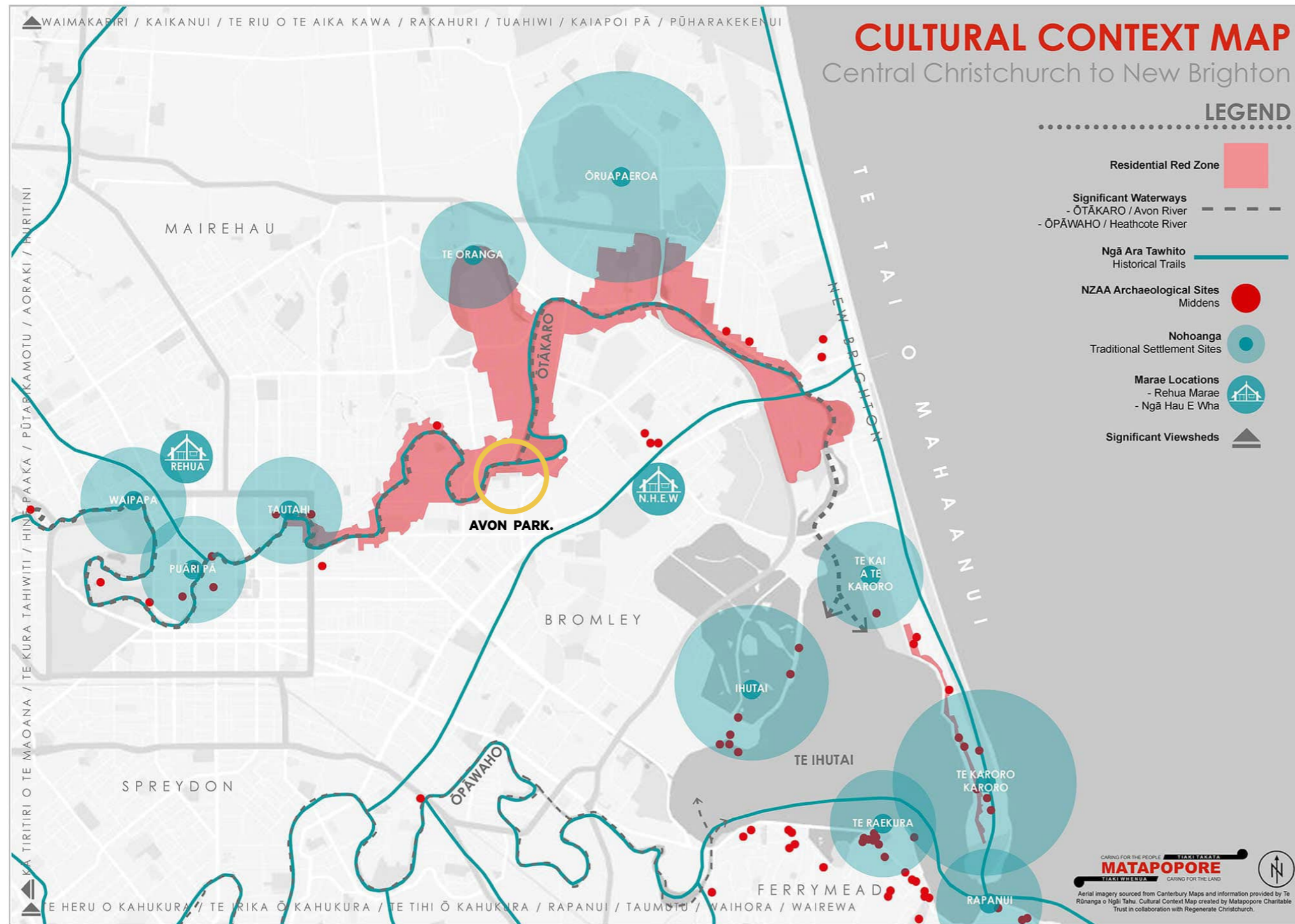
Issue	Revision	Author	QA	Date
50%	-	BP	NK	21.10.22
90%	1	BP	NK	16.12.22
100%	2	BP	AN	21.12.22



1. Site and Context.

Cultural Context.

Cultural Context Map. Matapopore.



While Avon Park sits within a now highly modified landscape, it has a rich cultural context; a once abundant landscape highly prized by tangata whenua as a place of rich resources, of pure water and mahinga kai.

The site, made up of an upper and lower river terrace, forms part of ngā ara tawhito historic trails - which drew people up and down the Ōtākaro. It is likely that this route followed the upper terrace edge, being higher and drier, and that the wider river margin in the lower portion was a place of rich natural resource along that journey.

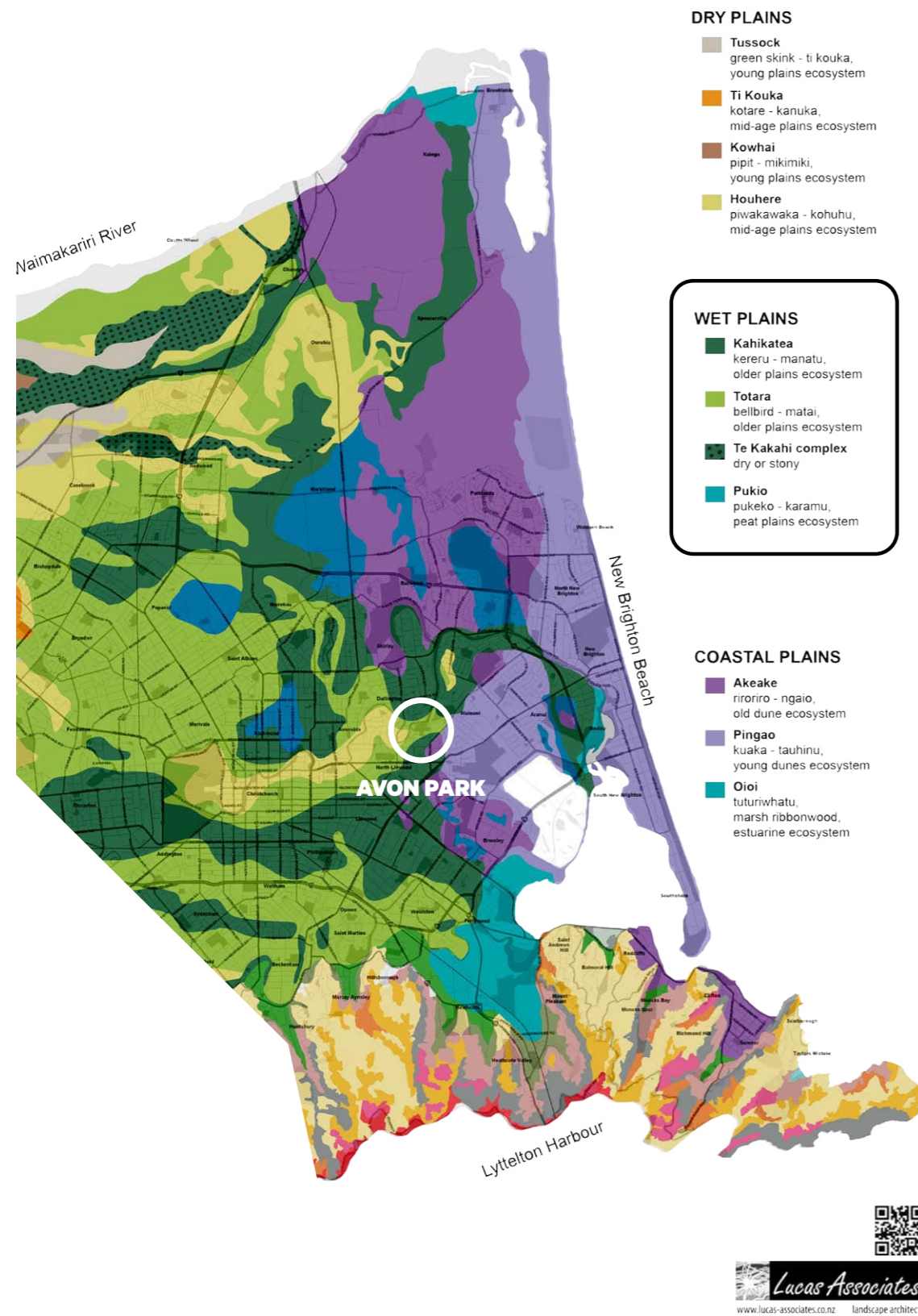
The river in this area is highly modified, with the rowing cut (1951) changing the hydrology and diminishing the mana, mauri and mahinga kai values of the original river channel around Porritt Park. Avon Park sits at the intersection of the original channel and 'the cut'.

Key design considerations:

- 1) Look to acknowledge ngā ara tawhito through site planning and design through all scales.
- 2) Design to enable a rich, self-sustaining river margin ecosystem.
- 3) Improve water quality through management of hard surfaces and use of vegetation as a natural filter.
- 4) Explore with mana whenua whether acknowledgement of surrounding nohoanga and wider viewsheds is desirable.
- 5) Design with mahinga kai as a key driver.
- 6) Explore with mana whenua how this project might appropriately mark the intersection between the natural river channel and 'the cut'

Ecological Context.

Natural Landcover Context Map.
Lucas Associates + CCC.



Ecology and Restoration Opportunities Summary.

Dr Greg Burrell, Instream Consulting Ltd.

Existing ecological values in the Avon Park area are low and restricted to a narrow riparian strip along the river's edge. The ecological value of this riparian strip is limited by the dominance of exotic plant species and its narrow width, due to the close proximity of stop banks to the river edge. The key opportunity the Avon Park project provides is widening and naturalising this riparian area, by pushing back the stop banks and creating a broad wetland. The drier terrace area could also be planted with native species. Both dryland and wetland ecosystems were historically widespread around Christchurch but are now very rare.

Key design considerations to enhance ecological values include:

- 1) pushing back the stop banks to the location of the existing higher terrace, allowing for the creation of a broad riparian wetland;
- 2) the wetland should gradually grade from the river through to the top of the terrace, providing a profile that has a gradient from wetland to more dryland species and that is resilient to sea level rise;
- 3) gentle variations in wetland topography would provide openings for deeper water and variation in the types of plant communities that can establish;
- 4) wetland restoration should aim to provide potential habitat for iconic species such as marsh crane and bittern that were once widespread, but are now rare in urban centres;
- 5) use dense plantings along the water's edge to enhance native habitat and discourage nuisance Canada Geese from camping along the banks;
- 6) formed pathways should skirt around the edge of the wetland, to minimise the 'edge effects' associated with smaller wetland patches and to minimise disturbance to wildlife by humans and dogs;
- 7) provide one or two 'access nodes' around the margins that provide education opportunities and access to mahinga kai, such as harakeke (flax) and tuna (eel).

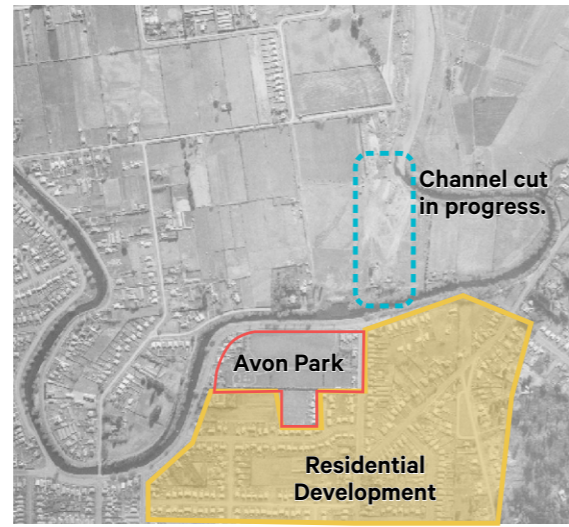
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Recent History.

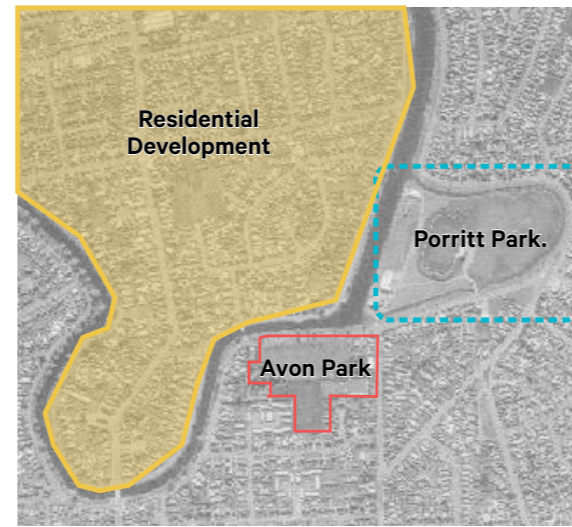
Shifting relationship between river, park and community since European settlement.



1940 - Avon Park established. Suburban development underway.



1951 - Suburban development continues and river channel cut commences construction.



1979 - Intensification of housing and retail adjacent to site. River straightened. Porritt Park and rowing facilities established between old and new river channels. Porritt Park becomes an island.



2016 - Removal of damaged housing stock post earthquake. ŌARC project outlines ecological restoration of red-zone classified land.



Future - A regenerating river environment, a series of ecological islands along the city to sea journey.

Historic imagery - river form, vegetation and activity.



Pre-settlement the river meandered through low-lying, highly vegetated areas rich in flora, fauna and seasonal resources. The Ōtākaro was, and still is, of vital importance to mana whenua who prized the abundant food and natural resources harvested from the springs, waterways, wetlands, grasslands and lowland podocarp forests that flourished here. The area's importance to mana whenua has not diminished, but its health has.



1860 - The City of Christchurch was formed along the Avon River effectively being divided into North and South with the Avon River running East to West from mountain to sea. Given the low lying nature of Christchurch, Avon River acted as a natural drain for the rapid early development that surrounded it. This has subsequently caused disastrous floods since the city's establishment, amplified through land movement as a result of the Canterbury Earthquake sequence.



1881 - With rowing clubs establishing as early as 1881, this section of river has a proud history of competitive watersports, given a boost in the early 1950s with the development of 'the cut' which allowed a straight course. Rowing remains a key activity in this area, including the movement of students around the adjacent area on bike as they make their way to and from training and rowing meets.

AVON CENTENNIAL PARK Gala Opening To-morrow

The spacious area of 12 acres of park land, gardens, playing fields, and sports grounds, comprising Avon Centennial Park, is to be officially opened on Saturday afternoon, and this will add yet another beautiful reserve to those already formed and controlled by the Christchurch City Council.

Avon Centennial Park is designed on the most modern lines, and its area incorporates facilities for the recreation of all types. Facing Avonside Drive, the park extends right back to Kerr's road, and the drive along the high terrace bisecting the playing fields is one of the attractive features. The main arena facing the river is to be used for cricket and football fields, and its wide borders provide accommodation for hundreds of spectators. Across the drive provision has been made for croquet and bowling greens, and basketball and tennis courts.

A high crescent-shaped terrace is the central feature of the park, and this has been lined out in ornamental shrubs and small trees. Thousands of shrubs have been planted in the borders of the park and, when they have shown a few years' growth, it is expected that they will be another attraction. The formation of a heath garden, the second in New Zealand, is another novel feature that is planned.

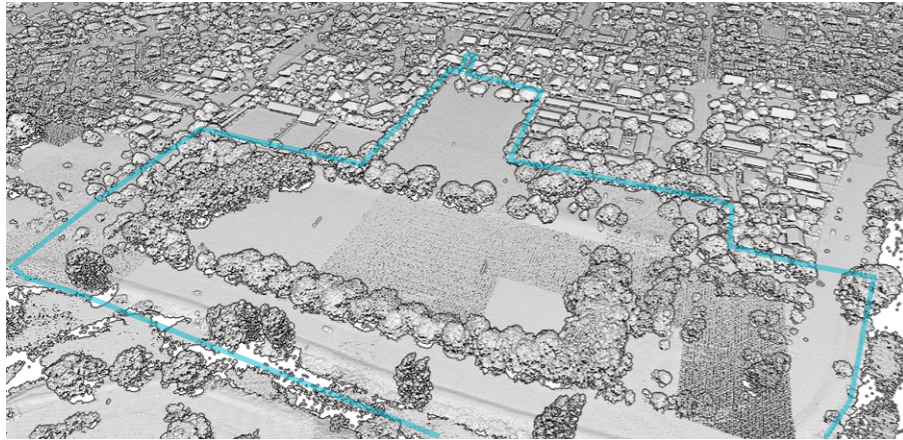
1940 - Avon Park opens
...a spacious area of 12 acres of park land, gardens, playing fields and sports fields...
...Designed on the most modern lines...
...a main arena facing the river...
...a high crescent-shaped terrace is the central feature of the park, and this has been lined out in ornamental shrubs and small trees...
...and when they have shown a few years' growth...
Will be another attraction...

Wainoni Pleasure Garden.



1903 - Established by Professor William Alexander Bickerton, Wainoni Pleasure Garden was opened as a shared residential community and destination for various activities including fireworks displays, shooting galleries, open air concerts, glass blowing, a planetarium and a zoo. The garden was an attraction in Wainoni for 11 years before financial struggles forced the park to close its doors in 1914. The name Wainoni, said to refer to the bend in the river, lives on as the suburb's name. The idea of this area being a place of play and enjoyment is reinvigorated with development of the ŌARC.

Current State.



Significant exotic tree coverage across the site



Existing Avon Park Playground located at the South West corner of the site



Very poor connection between community and park



North-easterly aspect across river toward Ihutai and the Pacific Ocean.










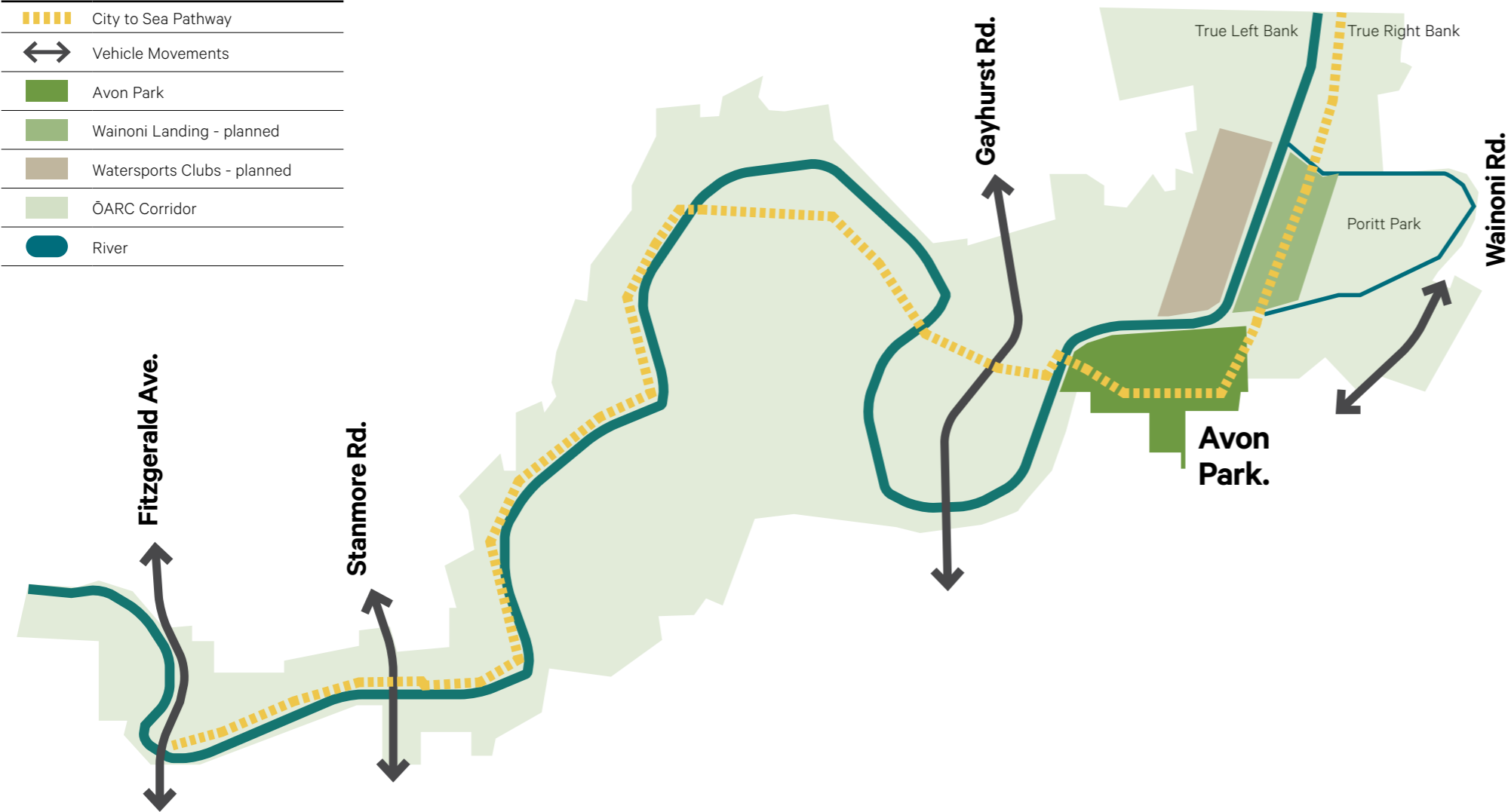
Natural terrace as a place for spectators - traditionally for field sport. Long views to the rowing course.



Prominent exotic trees, lawn and sporadic planting along the river's edge.

ŌARC Context.

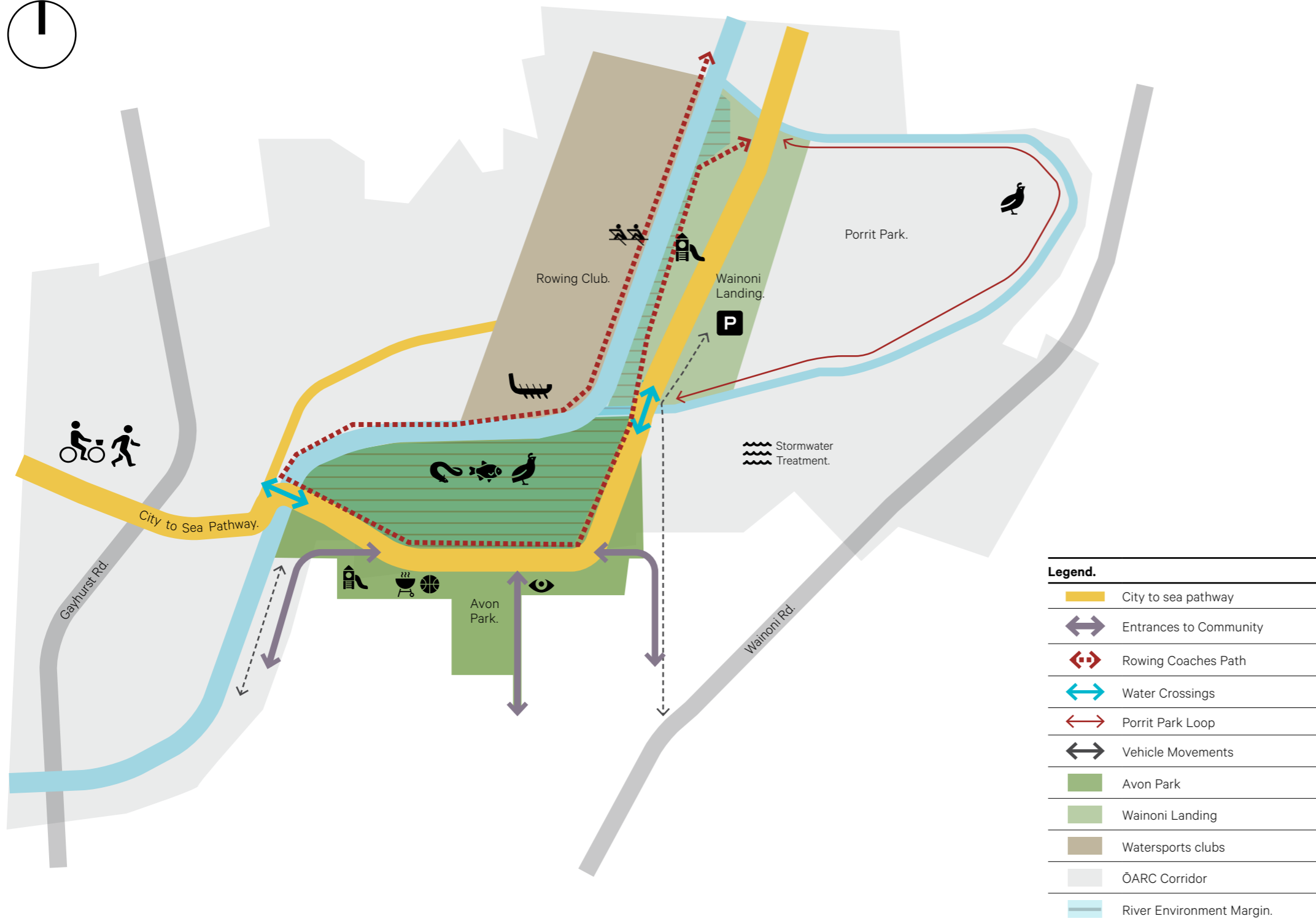
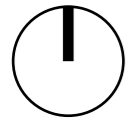
Legend.	
	City to Sea Pathway
	Vehicle Movements
	Avon Park
	Wainoni Landing - planned
	Watersports Clubs - planned
	ŌARC Corridor
	River



Avon Park sits within a very active part of the ŌARC corridor. This area is highly modified, with the 1950s river cut establishing this area as a place for competitive and recreational water sports. This use is likely to ramp up with planned relocation and expansion of club facilities to the true left bank, development of a spectator and events space on the true right (on the edge of Porritt Park) and investigations underway into possible extension of the rowing course.

Avon Park's river edge currently bustles with rowing crews, cycling to and from training and events 7 days a week, morning and afternoon. The edges of the rowing course are used by coaches on bikes, directing their crews via megaphone. Once the club facilities relocate to the true left bank, movement of crews and coaches will likely change, with the number of crews cycling through Avon Park decreasing and the number of coaches increasing as they make their way from club to course.

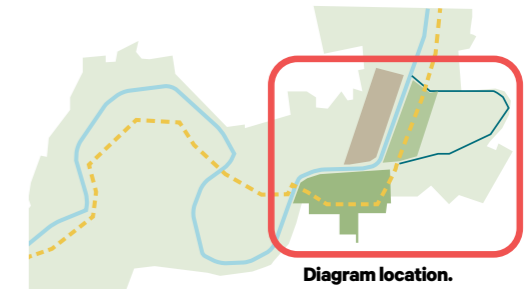
ŌARC Project Integration and Connections.



Legend.

	City to sea pathway
	Entrances to Community
	Rowing Coaches Path
	Water Crossings
	Porrit Park Loop
	Vehicle Movements
	Avon Park
	Wainoni Landing
	Watersports clubs
	ŌARC Corridor
	River Environment Margin.

Location Map.

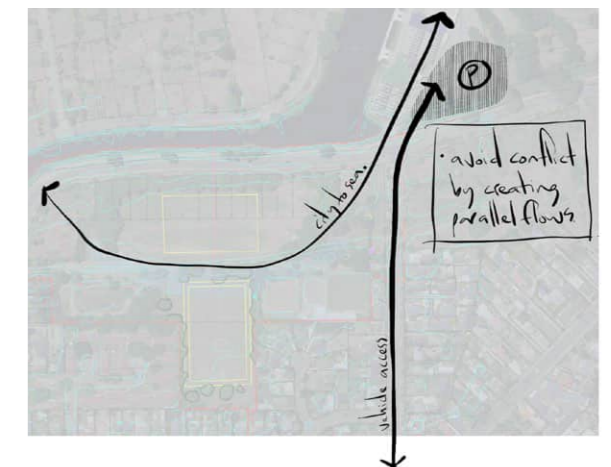


Avon Park, Kerrs Reach and Wainoni Landing form a concentration of activity at the mid-way point between city and sea. Connections are critical:

- For rowing coaches travelling between Kerrs Reach clubs and the true right bank
- For the local community to Avon Park
- For traffic entering Wainoni Landing via Kerrs Road and in the short term from the east via Avonside Drive
- Between Avon Park and Wainoni landing via the City to Sea Pathway

It is expected that Wainoni Landing will be an event venue, for rowing regattas and other community events. In event mode, Avon Park will serve as a place of respite and quiet away from the high energy of the event. Easy connection between is critical, as is the safe and logical organisation of various movement modes, including visitor, service and events vehicles.

Mitigating Conflicts.





Legend.

	Site
	Residential Red Zone
	Park/Reserve
	Bus Routes
	Site Entries
	NZAA Archaeological Sites
	Cycle Lanes
	Proposed City to Sea Pathway

	Existing vehicle bridges
	Existing foot bridges
	Proposed foot bridge
	Walking distance in minutes from site
	Cycle distance in minutes from site
	Church

	Community Space
	Library
	Sporting Centre
	Marae
	Education
	Shopping centre
	Playground

ŌARC Avon Park.

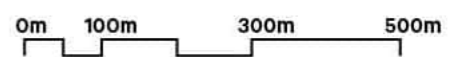
Context Map - Broader Relationships.

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Client: CCC

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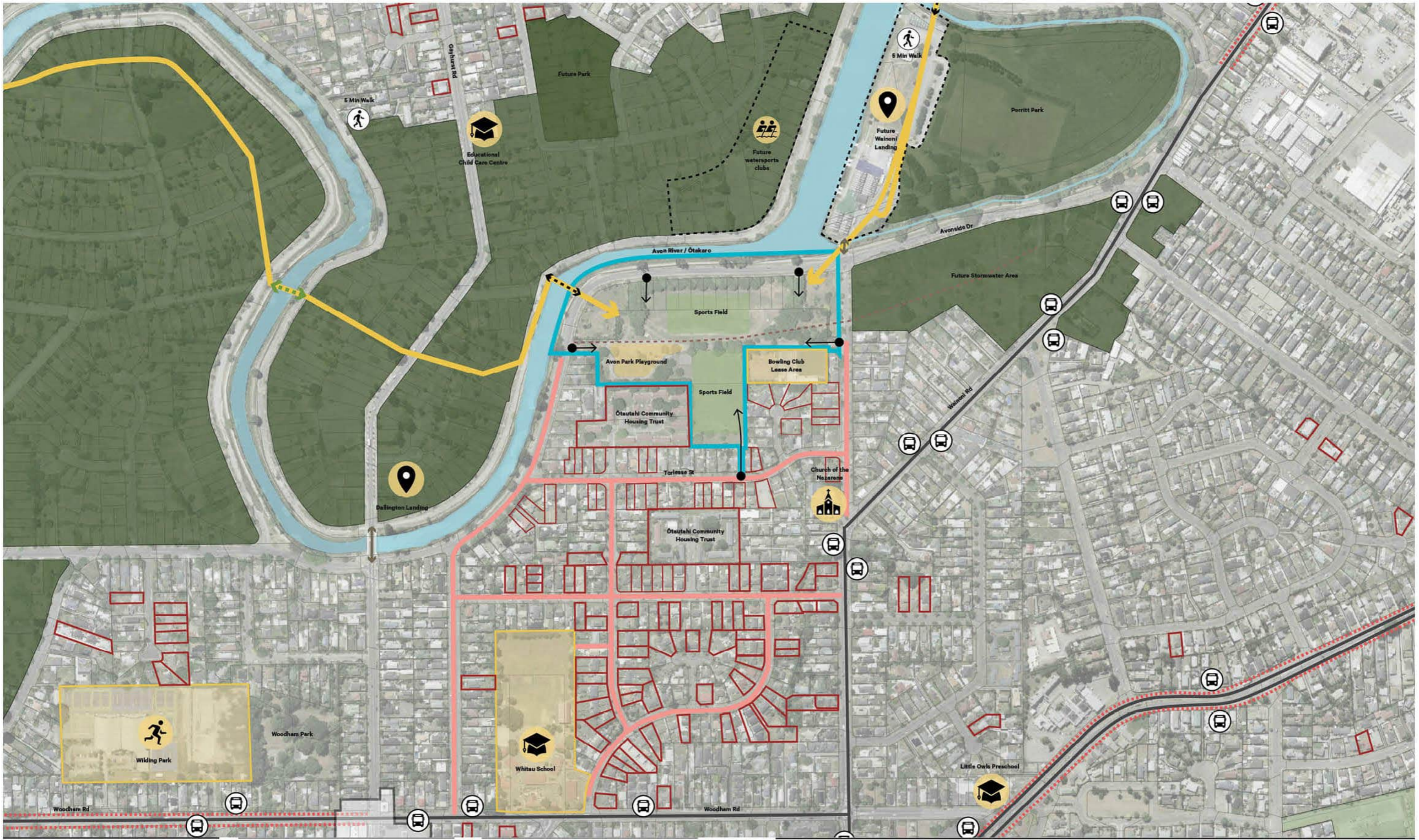


DW Nb: 02

Dw: IGL

Scale: 1:5000

Rv: 02



Legend.

	Site
	Residential Red Zone
	Park/Reserve
	Bus Routes
	Site Entries
	Cycle Lanes
	Walking distance in minutes from site

	Proposed City to Sea Pathway
	Pedestrian desire lines
	Kāinga Ora Properties
	Existing vehicle bridges
	Existing foot bridges
	Proposed foot bridges

	Bus stops
	Sporting Centre
	Future Watersports Area
	Education
	Landings

ŌARC Avon Park.

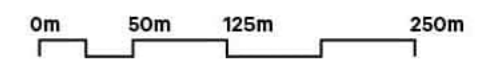
Context Map - Immediate Context.

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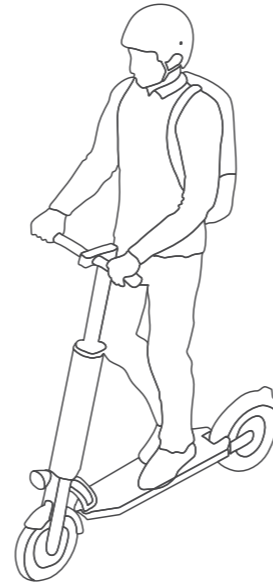
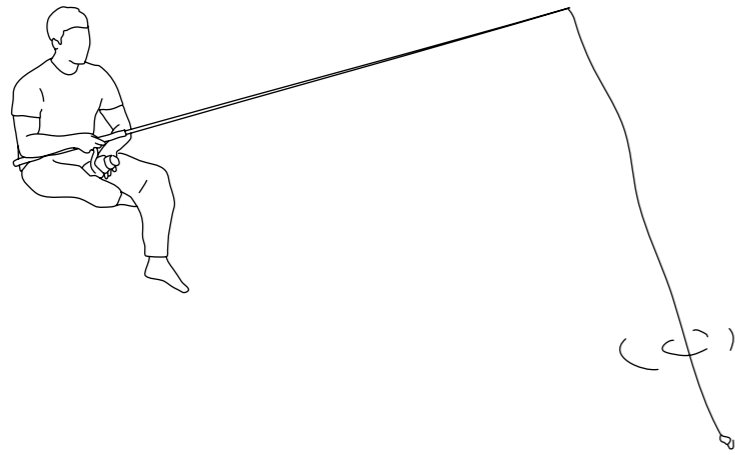
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Social Context.

User Profiles, Stakeholders and Engagement.

User Profiles.

User profiles help us respond to the needs and desires of the diverse user groups that will inhabit and City to Sea Pathway. We can use these profiles to test designs against user experience.



Key Stakeholders and Engagement.

Whitau School.	Avon Park Bowling Club.	ŌCHT	Mana Whenua
Kāinga Ora.	Flatwater Clubs.	Local Community.	Coastal Spirit FC.

Engagement to date:

Whitau School, Community Board, ŌARC Co-Governance, ŌCHT and Kāinga Ora.



Cody. Tweenager.

Cody is 12 years old. He spends his days at Intermediate. In the afternoons he explores the park at the end of his street. The river corridor is a shared backyard for him and his neighbourhood buddies.

He takes his scooter through into the park but soon leaves it behind to explore the park, climb trees and make huts.

Needs and desires:

- Engagement with interactive and play elements.
- Spaces to discover and explore.
- The ability to move freely.
- Opportunities to learn and connect with nature.
- A place that can feel like his own.
- Things to eat, food to harvest and take home.
- A place to park his scooter.

Danny. Young professional.

Danny is 28 years old, working a 9–5 job in the central city. He commutes via the pathway daily—preferring it to the busy on-street cycleways.

Danny rides his e-scooter at pace, occasionally stopping on his way home for a moment of peace.

Needs and desires:

- Safe and quick crossings and access
- Visibility of other users on the main flow
- Open, clear paths with gentle curves to maintain flow.
- Direct shortcut routes as well as longer scenic ones.
- Potential to notice and discover more along the route over time.
- Gentle gradients.
- Navigate via landmarks and recognition.
- Continuous movement.

April and friends. Young adults.

April and her group of friends are finishing off high school or starting tertiary study. At ages 17 / 18 some of them are enjoying independence, flatting in the central city and attending Ara.

They come to the corridor in the evenings and weekends, parking up their cars and finding a spot to hang out, listen to music and share food and drink.

Needs and desires:

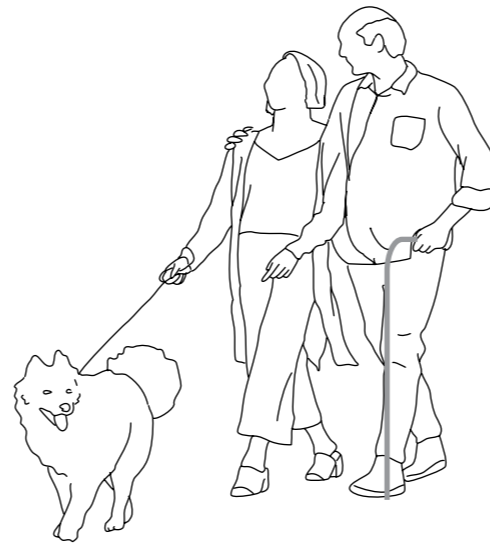
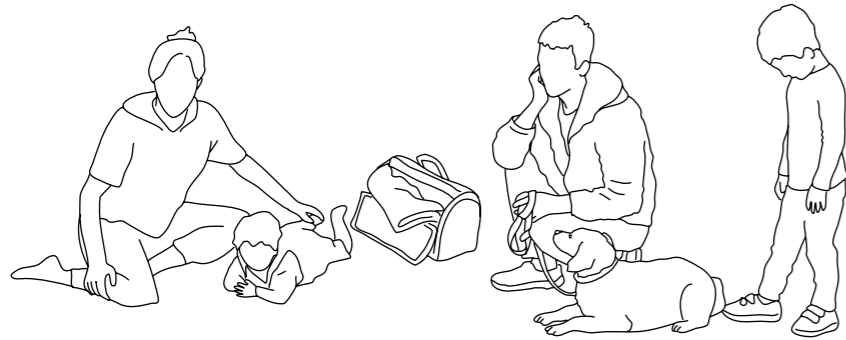
- Quiet places that they can make their own.
- Opportunity to move off the 'beaten path'.
- Feeling of safety, especially at dusk. They leave when it gets dark.
- Places to buy and eat kai.
- Instagrammable moments of beauty and interest.
- Things to eat, food to harvest, flowers to pick and take home.
- Will point out and engage with small moments.

Social Context.

User Profiles, Stakeholders and Engagement.

User Profiles.

User profiles help us respond to the needs and desires of the diverse user groups that will inhabit and City to Sea Pathway. We can use these profiles to test designs against user experience.



Key Stakeholders and Engagement.

Whitau School.	Avon Park Bowling Club.	ŌCHT	Mana Whenua
Kāinga Ora.	Flatwater Clubs.	Local Community.	Coastal Spirit FC.

Engagement to date:

Whitau School, Community Board, ŌARC Co-Governance, ŌCHT and Kāinga Ora.

Marama, Benji, Nikau and Tara. Local whānau.

Marama and Benji are parents in their late thirties. They spend their days balancing part time office jobs to share childcare of their 1 year old Tara and 4 year old Nikau, when he's not at kindy.

Marama and Benji walk the pathway with Tara in the pram, and Nikau trailing along behind on his pushbike.

Needs and desires:

- Space to move off the path in busy areas.
- Slower areas near the younger play area.
- Wide flat paths for small wheels.
- Sheltered place to stop, escape the sun and eat kai.
- Convenient parking.
- Feeling of safety.
- Engagement with interactive and play elements.
- Opportunities for learning.
- Public toilets.

Arch and Michelle. Retirees.

Arch and Michelle are retirees in their 70s, living independently and locally. Arch's mobility has deteriorated in recent years but they still enjoy short circuit walks most mornings.

They use tributary paths to create short walking circuits. Arch uses a walking stick and appreciates places to sit and rest along the way. When Michelle walks by herself, she'll go further, often stopping in to see friends.

Needs and desires:

- Slower movement in close proximity to the community.
- Local route options.
- Fewer other users.
- Convenient parking.
- Areas for their dog to run.
- Space to move off the path in busy areas.
- Accessible seating to sit and rest.
- Points of interest and a continuous desirable experience.
- Shelter shade safety and comfort.
- Even grades.

Martina. Out of towner.

Martina lives in Wellington and enjoys visiting towns and cities across New Zealand—visiting old friends, and enjoying the local attractions.

At 40 years old, she is happy taking trails by foot—and often hires e-bikes to take her a little further. She wants to bike from the city to the sea, but will come back again to spend time in a few interesting areas. There's a festival at Wainoni Landing this weekend which she's bought a ticket to.

Needs and desires:

- Clear directions to destinations.
- Places to eat lunch or buy a coffee.
- Opportunity to move off the 'beaten path'
- Engages with a larger narrative.
- Place to safely leave bike and explore.
- Feeling of safety.
- Points of interest and a continuous desirable experience.
- Engagement with interactive elements.
- Public toilets.
- Sheltered place to stop, escape the sun and eat kai.
- Connection to transport hubs.



2. Objectives, Principles and Moves.

Iwi Management Plan Objectives.

How can these be reflected in Avon Park?

The Mahaanui Iwi Management Plan provides a statement of Ngāi Tahu objectives, issues and policies for natural resource and environmental management in the takiwā. Central to the project is recognition that the river is a significant wāhi taonga, and that success is described as a return to a functioning and healthy environment which allows resumption of traditional mahinga kai practices.

Kaitiakitanga, Wai Māori, Ngā Tūtohu Whenua and Ki Uta Ki Tai are values to be reflected in the redevelopment of Avon Park and these will be placed front and centre in the design response.

We outline opportunities for reflection of each through the project:

Kaitiakitanga

Kaitiakitanga is fundamental to the relationship of Ngāi Tahu and the environment. The responsibility of kaitiakitanga is twofold: first, there is the ultimate aim of protecting mauri and second, there is the duty to pass the environment to future generations in a state which is as good as, or better than, the current state. To Ngāi Tahu, kaitiakitanga is not a passive custodianship, nor is it simply the exercise of traditional property rights, but entails an active exercise of responsibility in a manner beneficial to the resource.

Opportunities:

- The park will embed people in the environment, growing a sense of ownership, identity and care as the evolving river environment becomes a key part of people's daily lives.
- Currently an actively managed sports field and roadway, the lower terrace gives space for the river to breathe, and wide areas for an authentic ecosystem to develop - improving the mauri of the awa.
- The park will let people experience change over time (whether positive or negative) and respond to that change.
- The project is working with the Whitau School community to assist them in becoming greater kaitiaki of the park, building on the great work they already do.
- The project is discussing with Ōtautahi Community Trust and Kāinga Ora to understand how together we can create greater connection between community, park and river.

Wai Māori

Ko te wai te oranga o ngā mea katoa
Water is the life giver of all things

Opportunities:

- When designing in areas where contaminated land is likely to be present, the health of the water is front of mind. Strategies such as removal or encapsulation will be employed to ensure a safe and healthy long term solution.
- Water sensitive design is being employed across the park. Vehicle access to the river's edge is eliminated, and hard surfacing in the park is kept to an absolute minimum, favouring permeable surfaces which allow water to return to ground.
- Planting is of this place, evolved to thrive in the conditions present on site. As groundwater and the river margin change with sea level rise, planting is designed to adapt, with species finding their place in the changing environment. An authentic ecosystem approach rather than a garden approach.
- River edges will be designed to encourage native bird species and discourage exotics, particularly polluting species such as Canada Geese and Swans. Potential exists for introduction of water-purifying species such as freshwater mussels.

Ngā Tūtohu Whenua

Ngāi Tahu cultural heritage: sites, places, resources, traditions, knowledge, and landscapes of importance to Ngāi Tahu. This includes wāhi tapu, wāhi taonga, mahinga kai and other sites of significance, and the traditional and contemporary landscapes within which they occur. For Ngāi Tahu cultural heritage isn't something that happened in the past; but rather a reflection of an ongoing and enduring relationship with the land.

Opportunities:

- While there are no listed cultural heritage sites within the scope of this project, we acknowledge the whole area as a wāhi taonga, and that the river formed an important route inland by land and water, abundant with resources along the river's length and breadth.
- We see potential for this project to tell these stories, and would welcome the opportunity to discuss this with Ngāi Tahu.
- While not visible from within Avon Park, there are a number of key cultural heritage sites within the immediate and wider environment.
- Areas such as community gardens can layer in traditional mahinga kai and rongoa species and practices.
- Play will have a strong nature focus, and be of this place. Opportunity exists to tell stories or re-energise traditional activities or practices.
- We would welcome discussion around how the park design might best deliver on each of these.

Ki Uta Ki Tai

The principle of Ki Uta Ki Tai reflects the holistic nature of traditional resource management, particularly the interdependent nature and function of the various elements of the environment within a catchment.

Opportunities:

- Routing of the City to Sea Pathway through Avon Park will have users passing over the river, across low-lying river edge ecologies and up onto the dry upper terrace.
- Integration of quiet spaces within the lower terrace area connects people to the natural systems that surround them
- Nature play is sited and designed to integrate with the river environment, educating while entertaining and connecting back to Ōtākaro - place of play.
- Opportunity exists to create elevated views from within the park, locating the site between views to Te Tiritiri-o-te-moana and Te Moana-nui-a-Kiwa
- Making changes in the environment, both short term and longer term visible and in some circumstances interactive.
- Using wayfinding, cultural trail and play to communicate Ki Uta Ki Tai.

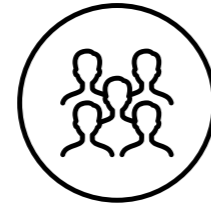
Regeneration Plan Objectives.

How can these be reflected in Avon Park?



Regenerating Nature

- Give space back to the river, for the good of all.
- Focus on actions which will accelerate toward creation of self-sustaining ecosystems.
- The park as a place of physical, spiritual and social nourishment within a regenerating natural environment.
- See the value in existing qualities and features, and the benefit these can provide during the transition from manicured park to an authentic ecology.



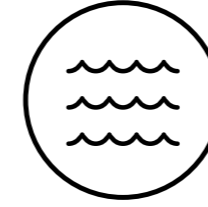
Connect and involve community

- Safe, desirable and fun connections to the park.
- Park as a place of community connection, with uses which develop over time as demand increases.
- A place of resources, food, medicine and education, where cultural practices are encouraged.
- Integrated play as a connector of people and place.
- Draw on community knowledge and aspiration in the park's development.
- Intergenerational kaitiaki spaces and activities.
- Work with adjacent property owners to create great relationships between homes, park and river.
- Acknowledge the history of the area and the park. Use these to step both the community and environment forward.
- Build on Whitau School's current connection through kaitiaki programme.



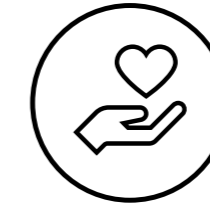
Destination for all

- Turn the park from a back to a front. Draw community to the river's edge as a part of everyday life.
- Develop a suite of fixed and flexible attractors. These may be seasonal, event based or developed over time in response to demand.
- Acknowledge that Avon Park is near the City to Sea Pathway mid point, and with its northerly aspect and play overlay, is a logical stopping point for visitors. Use spatial design to create interactions between locals and visitors.
- Develop this as a place known for its abundance of resources, drawing people back again and again.
- Acknowledge adjacent planned developments (Kerrs and Wainoni Landing) and consider the role of each in creating a wider destination experience.



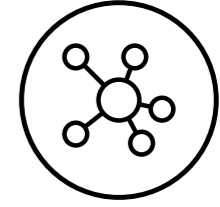
Living with water

- River as a means of movement once again.
- Observable change. Make change apparent in short (tidal) and long (sea level rise) term.
- Increase the diversity of water and margin habitats.
- Connect the river environment back to the historic river terrace, making the increasingly wet environment part of the Avon Park experience.
- Locate stopbanks away from the river to allow it to breathe while providing protection to our communities near the ŌARC.
- Embracing of the flat nature of the site adjacent the river and planning for inundation of the lower terrace as a result of sea level rise. Design for the resultant river margin ecology.



Creating Prosperity

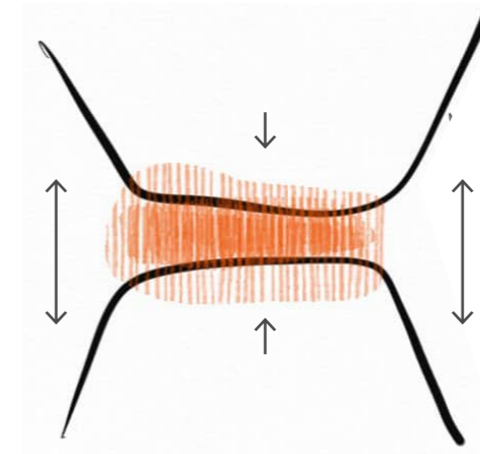
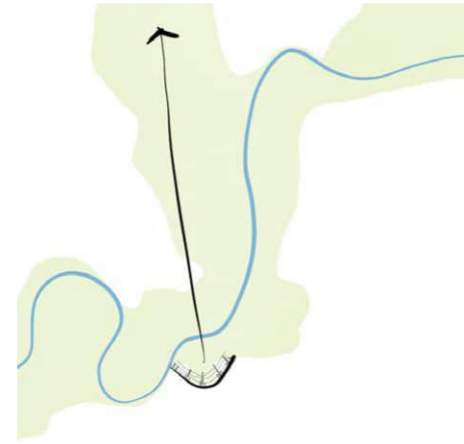
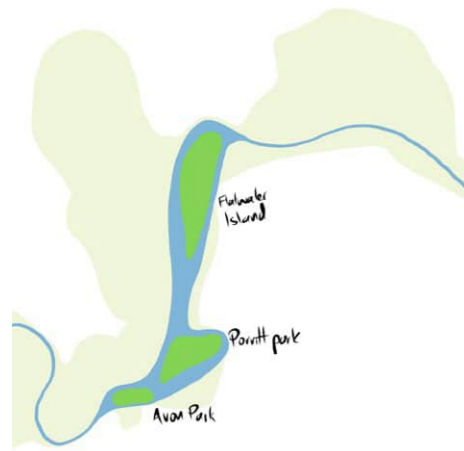
- Future potential for the park as a place of community resource - for example community gardens, where free kai assists in creating a more prosperous community.
- Direct connection to a key active travel route, the City to Sea Pathway, provides a means of no-cost travel beyond the community while adding health and wellbeing benefits.



Living Laboratory

- Potential for the site and context to be used in monitoring of change over time
- Educational value is elevated through a mahinga kai approach, and through play which integrates with the natural environment.

Spatial Principles.



Evolve toward an authentic ecosystem.

- Give space to the river, for the benefit of all.
- Look ahead to creation of a series of islands or refuges along this reach of the river.
- Lower terrace as a 'habitat island'. Humans and domestic animals discouraged here.
- Self-sustaining environment as a long term goal.
- Focus on moves which will accelerate the area in this direction.
- Integrate stopbanks into authentic ecosystem.

An aspect to nature. A place for spectators.

- The park has a long view toward Te Oranga, Waikākāriki.
- Embrace the park's north facing aspect and its history as a river plain below a natural terrace
- Nod to the park's history as a centennial park.
- Look to draw attention to the wider landscape - explore options for both elevation above, and immersion within the landscape.
- Evolution from spectators of sport, to spectators of a self-sustaining ecosystem.

Bind community, environment and visitors

- Avon Park is the interface between community and the river corridor.
- Park needs to turn from a back to a front.
- City to Sea Pathway will bring visitors, and is an attractive and accessible transport option for the community.
- Work with adjacent land owners to achieve great community connection, ownership and safety.

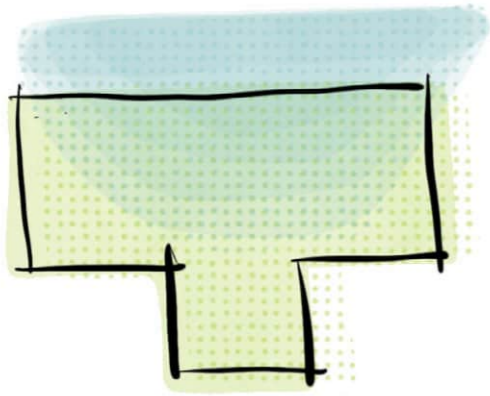
Compress and decompress

- Decompress for a better ecological outcomes.
- Compress for a better human outcome.
- In creating space for nature, compress human activities and movement for a higher energy park environment.

Nothing leaves the site

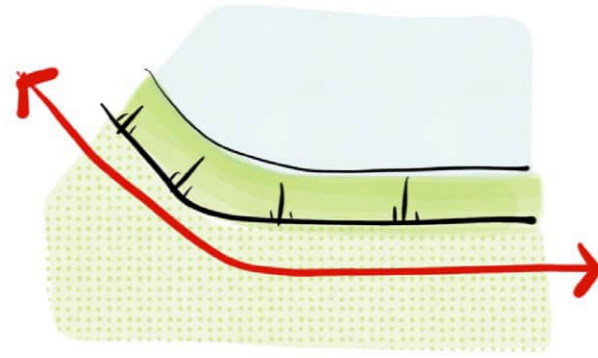
- Look to reuse all material currently on site.
- Re-purpose creatively to retain energy in this place, reduce transportation costs and carbon impact.

Spatial Moves.



River first.

- Allow the river environment into the park
- The terrace as a natural transition from wet to dry landscape
- Give space to, and design for indicator species (long fin tuna, adult inanga, freshwater mussels, bittern, marsh crake)
- Design in natural separation between people and their pets, and wildlife habitat.



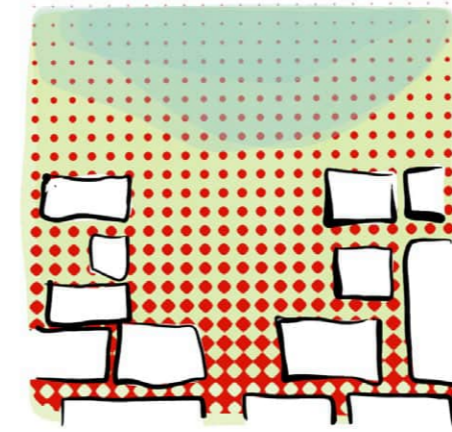
Build on better ground.

- The redzone overall has poor ground conditions, however the upper terrace of Avon Park is of better quality
- Focus built elements here, where land is more stable, construction is more straightforward and a greater level of resilience can be achieved
- Draw the City to Sea Pathway along the terrace.



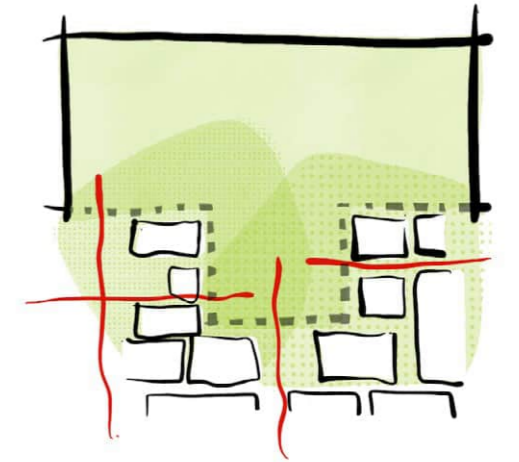
Crescent terrace as a high energy place.

- Natural terrace identified in the original park design as being an active place, with 'space for hundreds of spectators'
- Concentrate local function, play, movement and visitor attractions here
- Compress more into a smaller space, encouraging mixing of locals and visitors



Changing context: Succession and adaptation.

- Adapt to the changing context: succession and adaptation
- Design with the short, med and long term in mind
- Succession in planting and in park design
- Acknowledge that water is rising. Design to work with this
- As community densifies, change park uses to best address community need in order to tie the two together.



Open the edges.

- Connect neighbours to the park
- Increase local ownership
- Improve safety through passive surveillance
- Work with neighbouring landowners looking to re-develop
- Increase reasons to visit
- Intergenerational attractors
- Communal uses - an extension of peoples' homes
- Explore additional connection points into the park
- Park changes from a back to a front

3. Preliminary Design.



- acknowledge original river + current topo.
- play binds Wairori + Avon.
- river passes through play.
- separate C2S + vehicles. no crossover.
- parking on high ground. water on low.

Design Statement.

Avon Park is one of the few places along the Ōtākaro Avon River Corridor where river, pathway and community come together. A place where energy is concentrated.

The design looks to give low-lying space back to the river - a river first approach - while amplifying energy on the upper terrace through concentration of people and activities. The natural river terrace between, described in 1940 as 'a place for hundreds of spectators' retains that use, with the spectators transitioning from viewing the action on a sports field to observing the action of a rich, self-sustaining ecosystem and its change over time.

The City to Sea Pathway connects the community to its surroundings through an active, green route. A few minutes to Dallington and Wainoni Landings, and a 15min bike ride to the city, making the pathway a viable, low cost and attractive transport route.

The park and community are currently disconnected through boundary fencing and dense vegetation. Private properties and the park turn their backs on each other, and the only physical connection is of low amenity and feels unsafe both day and night. With busy roads on the community's other edges, and a demographic which would benefit from connection to nature and active travel options, connecting the park and the community will be key. Active edges, park oversight and pedestrian links will lead to increased usage and a growing demand for community uses within the park - an evolution the park design needs to plan for.

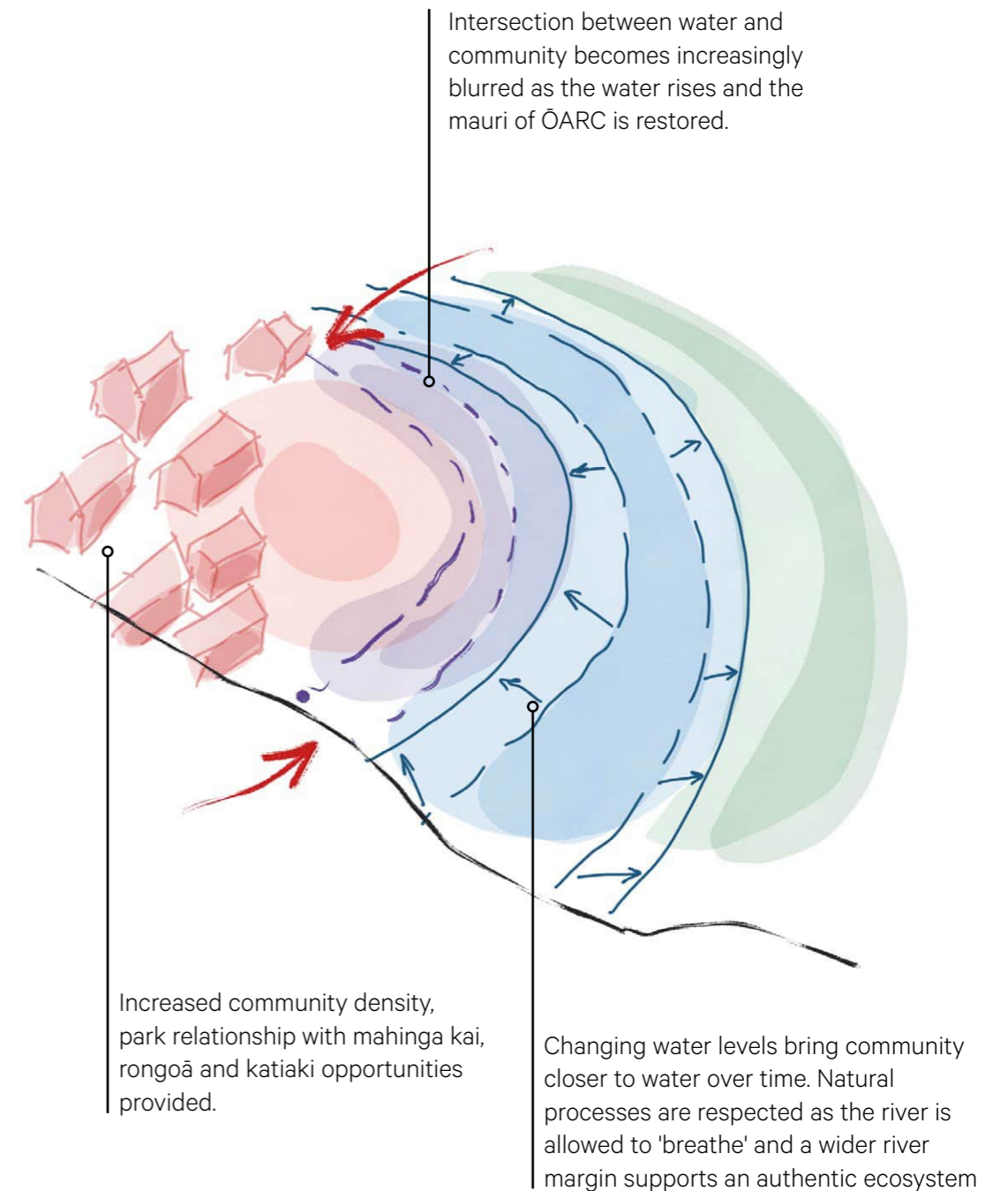
Design of the park is to allow for evolution over time - evolution of the environment and of the people.

What is needed now to begin establishment of an authentic ecosystem?

- Separation of wildlife habitat from humans and domestic animals (particularly dogs)
- Identification of target species, and creation of conditions which will attract and sustain them
- successional planting and pest management to accelerate creation of a self-sustaining system

The design intends to:

- Decompress the river - relocate the stop-bank and remove the road, allowing the river to move in and out of the site with tidal flows, and to inundate in the longer term with sea level rise
- Compress space for people to the upper terrace, concentrating energy and making this a dynamic, energetic place for community and those travelling from city to sea
- Celebrate the natural river terrace, its reason for being and its function as a place for people.
- Create space for community use, allowing for evolution as community needs change.
- Step toward a self-sustaining ecosystem, focussing effort on initiatives which will accelerate this
- Use play as a means to link community, visitors and environment
- Ensure a natural flow between footbridges and the park.
- Use excavated material on site, likely to build up eastern and western ends of park

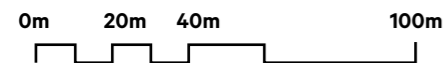


General Arrangement Plan.







Legend.

01	Avonside Drive entrance and vehicle turnaround.
02	Traditional swing-play area.
03	Elevated walkway to existing bridge
04	Young children play.
05	Family exploration area.
06	Intermediate play
07	Quiet resting platforms.
08	Rest and BBQ area under established oak trees
09	Flexible sports court and viewing mound
10	Community kaitiaki area building on Whitau School programme.
11	Lower terrace with marshland planting and channel cut to allow temporary inundation in high water-level events.
12	Casual sports space
13	Viewing tower aligned to Kerr's Reach cut.
14	Existing Carpark
15	Refurbished shared entrance from Kerrs Rd. Vehicle entrance to bowling club + park maintenance.
16	Viewing area in planting
17	Existing Avon Park Bowling club
18	Exploratory trails through native bush
19	Potential temporary carparking
	City to Sea Pathway
	Relocated Exeloo unit



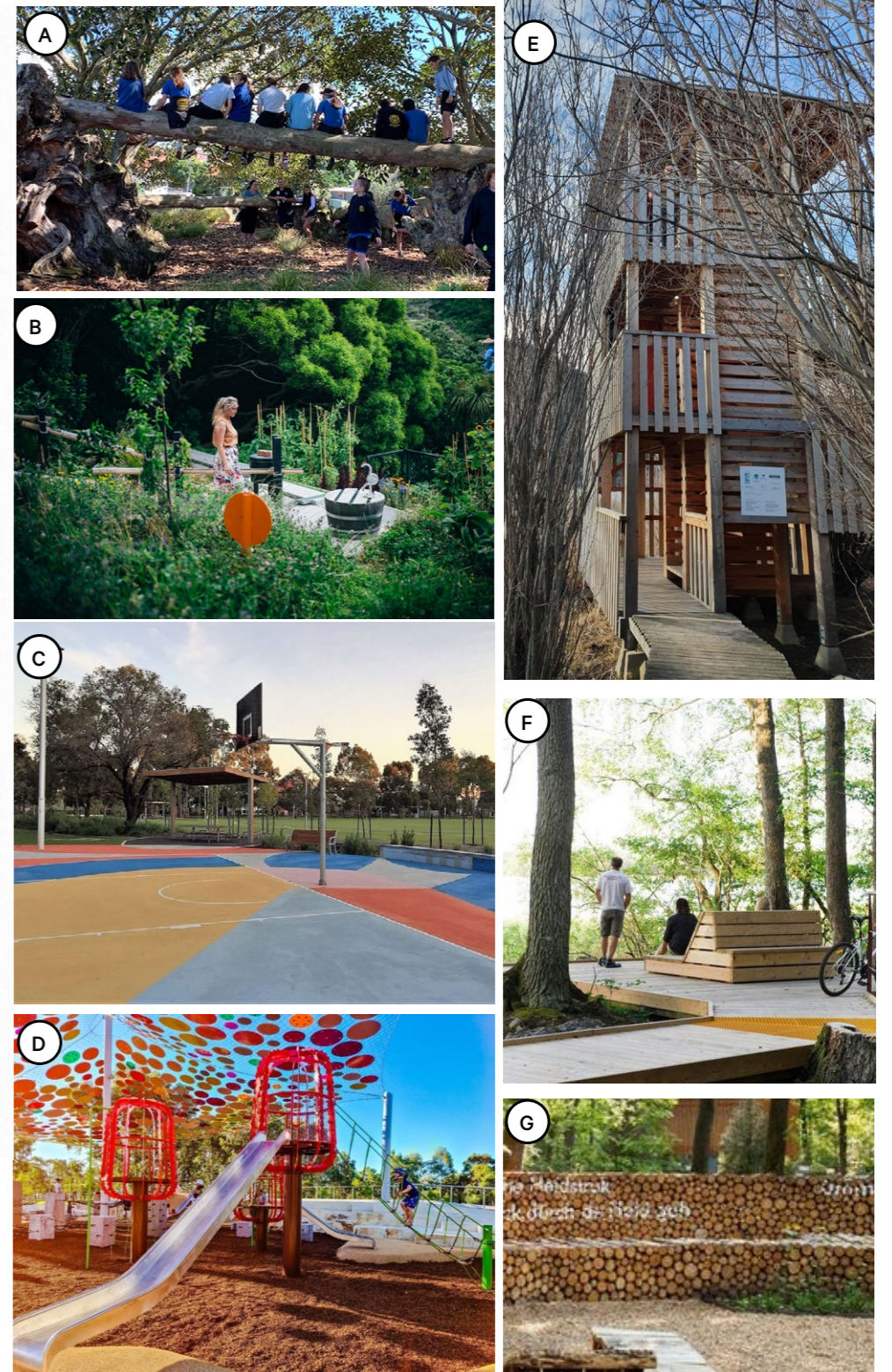
Site Design Intent. Character Zones.

Legend.

	Active zone.
	Community zone.
	Calm zone.
	River zone.



Precedents.

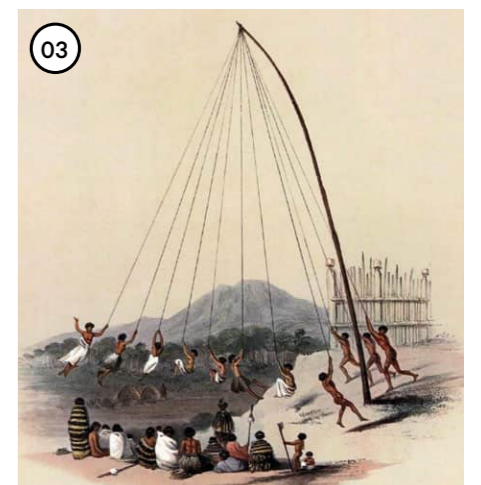


Active Zone Plan.



Legend.

- 01 Path over wet landscape
- 02 River edge seating/play
- 03 Traditional swing play element
- 04 Slow path zone controlled by narrowing path
- 05 Meeting area
- 06 Turning and entry
- 07 Entry path and vehicle control bollards retained
- 08 Secondary flow retained
- 09 Mounded play
- 10 Swing
- 11 Easy scooter trail
- 12 Visually permeable boundary with new fence allowing passive surveillance while maintaining privacy.
- 13 Rope net climbing play
- 14 Flying fox or other challenging linear element
- 15 Kai preparation area, BBQ and rest under trees
- 16 Basketball court
- 17 Mounded viewing
- 18 Quiet rest and viewing platforms
- 19 Family exploration zone



Active Zone Planted Character.

Open canopy of Marbleleaf and Lancewood

Drifts of larger shrubs to help define space without impeding views to active areas

City to Sea Pathway



Confluence area marked by vertical elements

Clambering and exploratory meandering movement

Open visible character

Strong playful textures of the wet plains typology

Precedents.



Community and River Zone Section.

Location Plan.



Natural engagement space.



Nature play and discovery



Pockets of kai, foraging and rongoā planting

Active Lawn.

Active Lawn space Located away from water habitat. Raised to provide better aspect and generate a cut/fill balance allowing site material to be kept on site.



Raised active lawn precedent.



Native lawn species.

Potential Viewing Tower

City to Sea Pathway

Existing Tree's retained with City to sea Pathway running between. Busy path located away from sensitive habitat and water logged soils.

Wet/Dry areas.

Existing levels retained across majority of lower terrace, with full area planted to establish native vegetation cover.



Carex Secta

Short term.



Staged removal of exotic trees to maintain shade while indigenous trees are planted. Exotic trees to be drilled and filled with herbicide, with dead trees left standing. Hay bales placed provide spawning habitats

Medium Term.



Revegetation understory species grow up under existing exotics providing shade for the waterways. Exotic species start to die out in this time. Underplanting catches leaf fall, and shelters legacy trees.

Long Term.



Native tree and understory planting are fully established. The wide planting profile provides optimal shading for waterways



Wet areas.

Water level rise over time encouraged as a natural process. Gradual grading to allow water into the site.



Harakeke



Raupō

Target Marsh Species.

Trees retained to provide roosting habitat



Bittern



Marsh Crake

Target Aquatic Species.

Stop bank and road removed. Gradual grading creates a larger variety of habitat for flora and fauna.



Freshwater Mussel



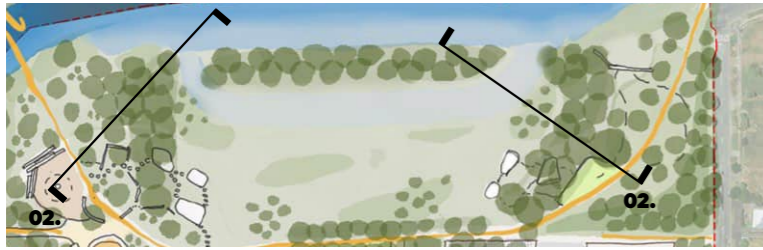
Tuna



Inanga

River and Calm Zone Section.

Location Plan.



City to Sea Pathway

Wet areas.

Entrance bringing water into the site. Graded to sit above water level creating wetter areas without flowing water.



Harakeke



Raupō

Quiet Space.



Simple raised platforms encourage quiet observation.



Stepped access slows movement, connects people with their environment and discourages domestic animals.

Stopbank.



Subtle grading combined with regenerating vegetation.

Community Zone Planted Character.



Precedents.



● Calm Zone.

Existing Condition.

High maintenance, low energy, low ecological value.

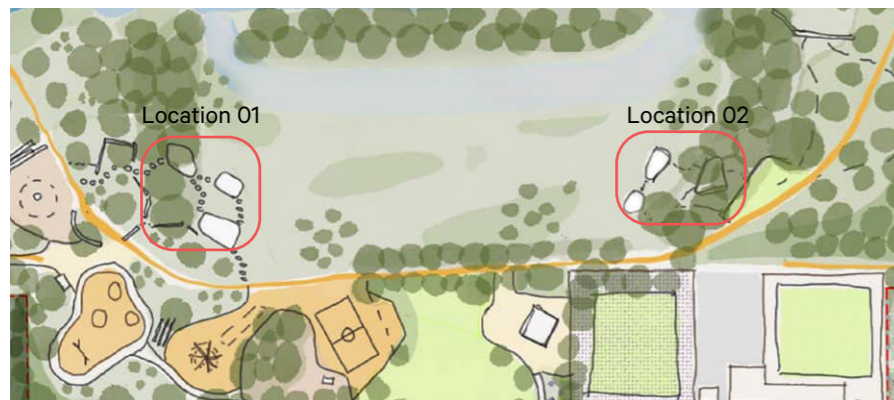


Proposed Condition.

High energy pathway, quiet people spaces amongst ecology.



Key Plan.



Calm zone strategy.

It is proposed that the double avenue of Plane Trees each end of the lower terrace be retained, with their ground condition and spaces underneath re-visited with spaces to layer ecology and places for people under the trees' canopy.

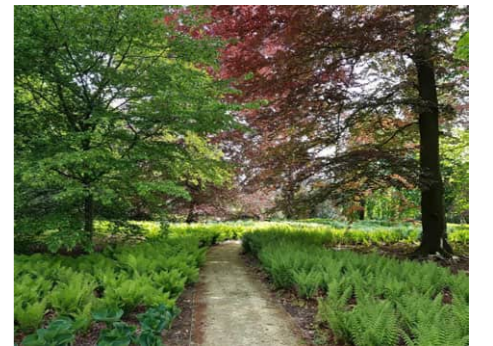
Lower terrace planting will extend under the trees, across the current gravel path route and up to the City to Sea Pathway edge. Stepping off the City to Sea Pathway, people will move slowly and carefully across a range of platforms and stepping stones within the landscape and under the dappled shade of the Plane Trees. A range of spaces could be created, from areas to gather and share kai, to places for one where views out over the planted lower terrace and river margin allow for peaceful contemplation - connected with nature.

Play ideas should be explored in these areas, including what play may be possible across the lower terrace from one end to the other - such as speaking tubes, signalling other low volume communication.

● Calm Zone Planted Character.

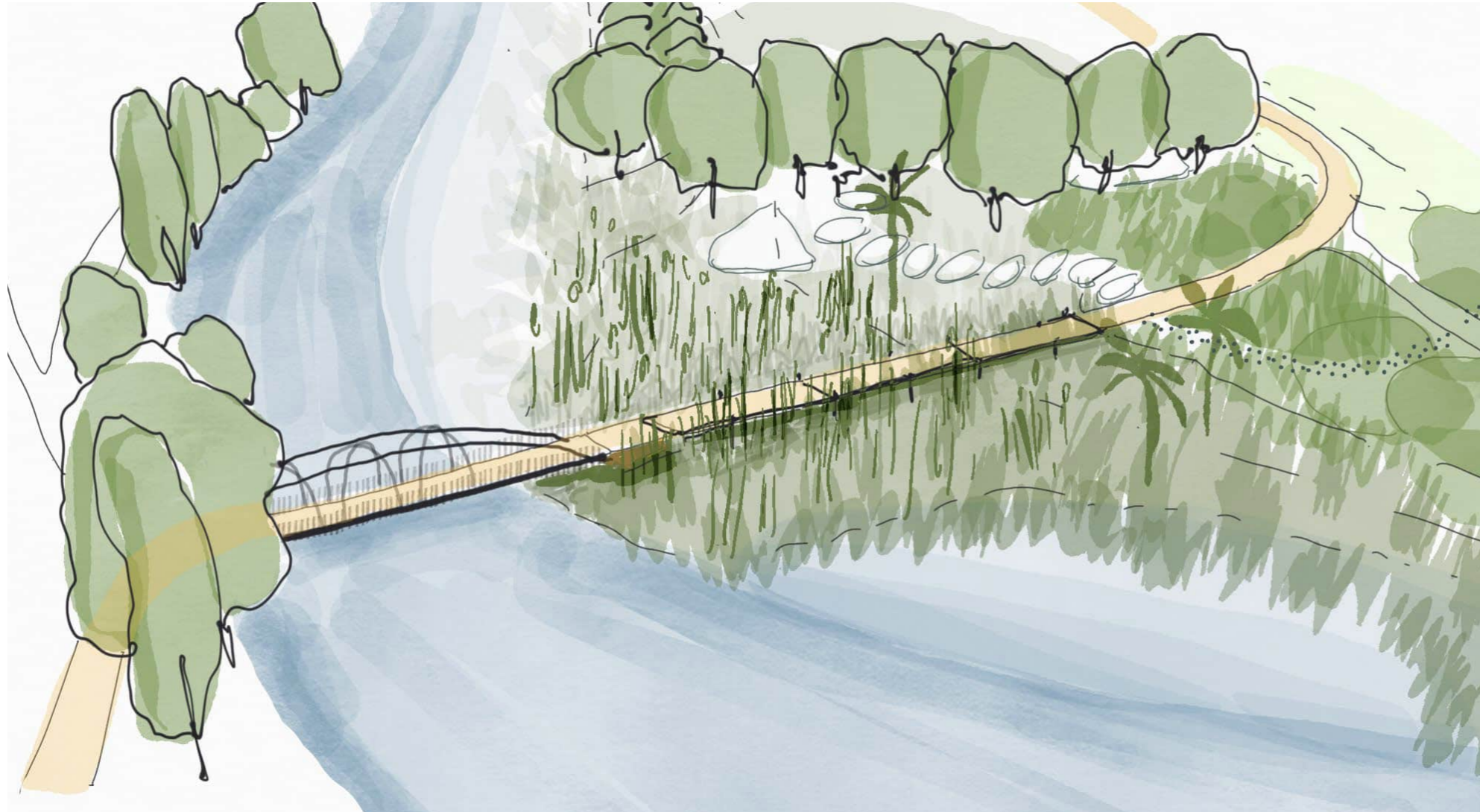


Precedents.



River Zone Western Entrance Design.

Floating path over low-lying river margin.



Entrance strategy.

The current Snells Bridge tie-in design is based on Avonside Drive remaining open and active. This project includes the closing and removal of the roadway, and it is recommended that a more appropriate approach be designed, more naturally flowing users across the river and improving accessibility outcomes. The proposed options look to connect users with the river landscape and better embed the bridge within this.

This design looks to ground users within the landscape, creating a sense of floating over the low river margin landscape. This will be most successful if the pathway sits lightly above the landscape, with planting flowing up to and under a slightly elevated pathway.

Key Plan.



River Zone Edge Condition.

Existing Condition.

River compressed by steep banks, stop bank and road.



Proposed Condition.

River allowed to breathe.



Key Plan.



River first strategy.

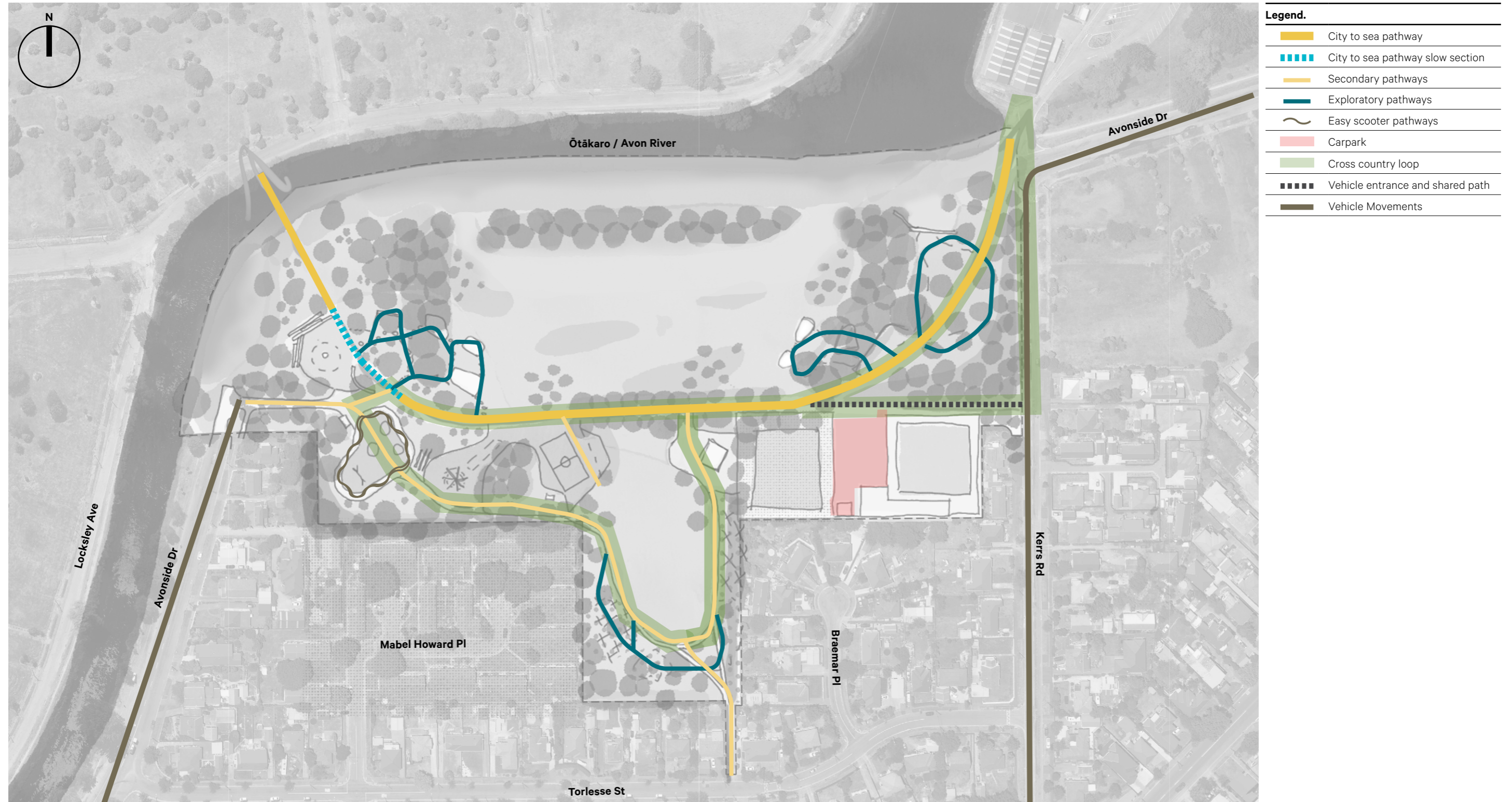
While the park's lower terrace was once a part of the river environment, it has long been disconnected through river channelisation. More recently the two have been further disconnected by temporary stopbanks. Water collect on Avonside Drive during rainfall events - the park and river want to be reconnected.

Relocation of the stop-bank inland and removal Avonside Drive, along with reprofiling of the river's margin reconnects river and lower terrace, and enables creation of gently graded margins which will enable creation of a self-sustaining ecosystem. Design for kaitiaki species away from people and domestic animals will have benefits far wider than the park itself.

Retention of a number of established exotic trees along the park edge retains memory of the park, while providing valuable roosting, shade and shelter to the river margin. Over time these trees will succumb to rising water levels and changes in salinity, at which point they could be removed and re-purposed for habitat creation on site, or retained to continue providing roosting while naturally returning to the ground. Being in an area away from people, safety risks should be considered low if the latter strategy was to be chosen.

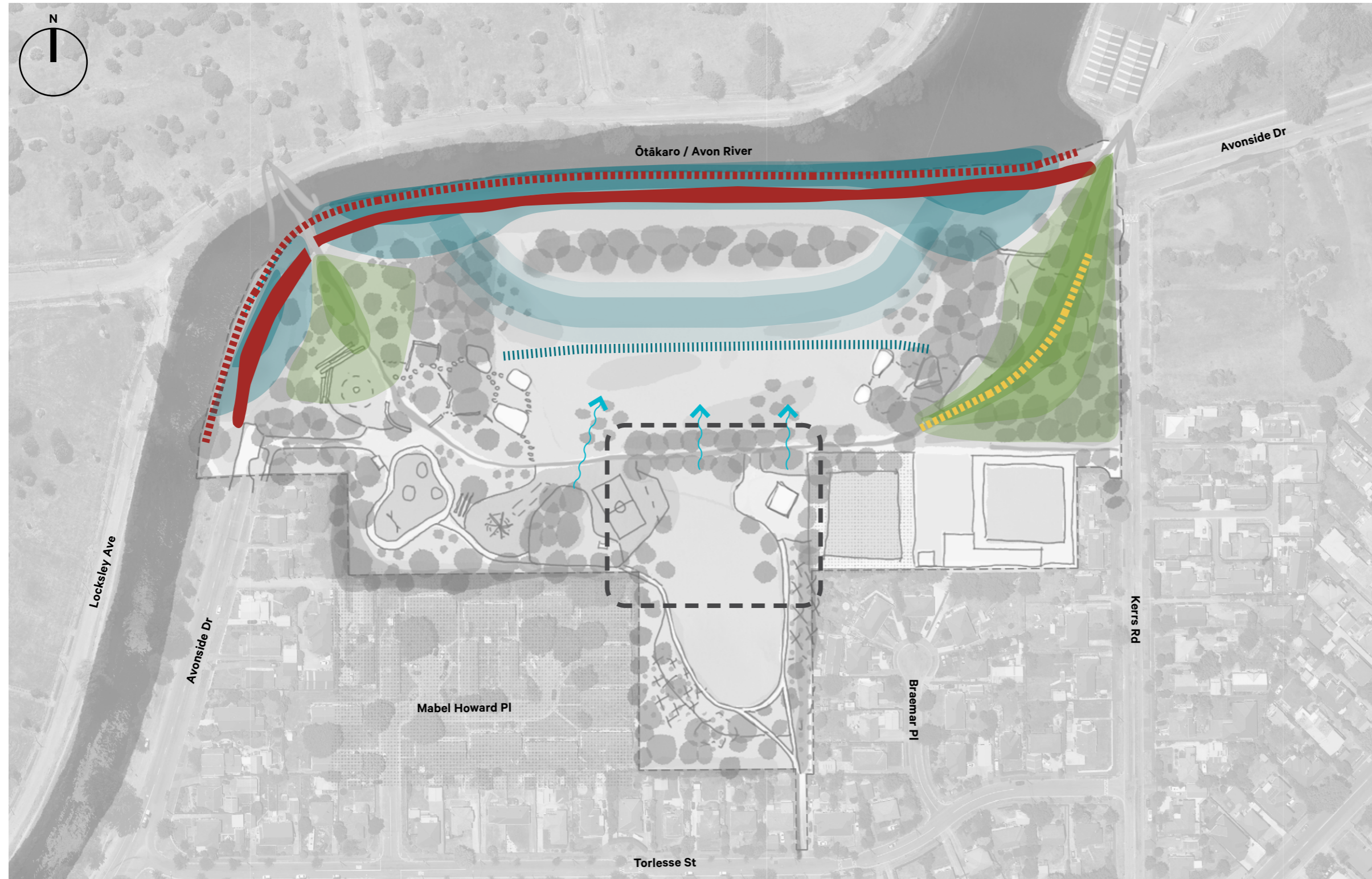
4. Landscape Strategies.

Movement Diagram.

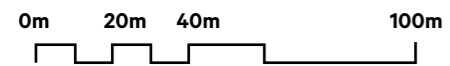


Legend.	
	City to sea pathway
	City to sea pathway slow section
	Secondary pathways
	Exploratory pathways
	Easy scooter pathways
	Carpark
	Cross country loop
	Vehicle entrance and shared path
	Vehicle Movements

Topography and Water.



Legend.	
	Fill Area
	Cut Area
	Road Removal
	Potential Fill Area
	Stopbank Removal
	Proposed stopbank to tie into future works.
	Low natural mound to slow runoff toward river encouraging wet landscape on lower terrace. Large branches salvaged from removed trees may be used to form the mounding.
	New one-way runoff path for water trapped behind terrace.



Tree Strategy.



Legend.

●	Retained (117)
●	Staged removal (20)
●	Removed (74)
⋯	Native species in row retained
■	Structural park tree stand
■	Exotics to be removed/natives to be kept where practicable
■	Area cleared to create native character
■	Permeable screen planting required. Assess existing vegetation to create desired effect.
Ⓣ	Transplantable
Ⓛ	Lift canopy in general area.

Criteria for Removal.

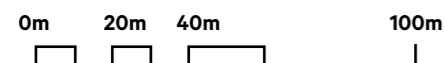
All tree removals have been carefully considered in collaboration with tree experts, SimplyArb.

The overall strategy is to retain all tree stands that are significant in terms of stature or site structure. The overall larger site moves including; stopbank location, earthworks, river widening and location of wet areas have been developed in such a way that significant stands are retained.

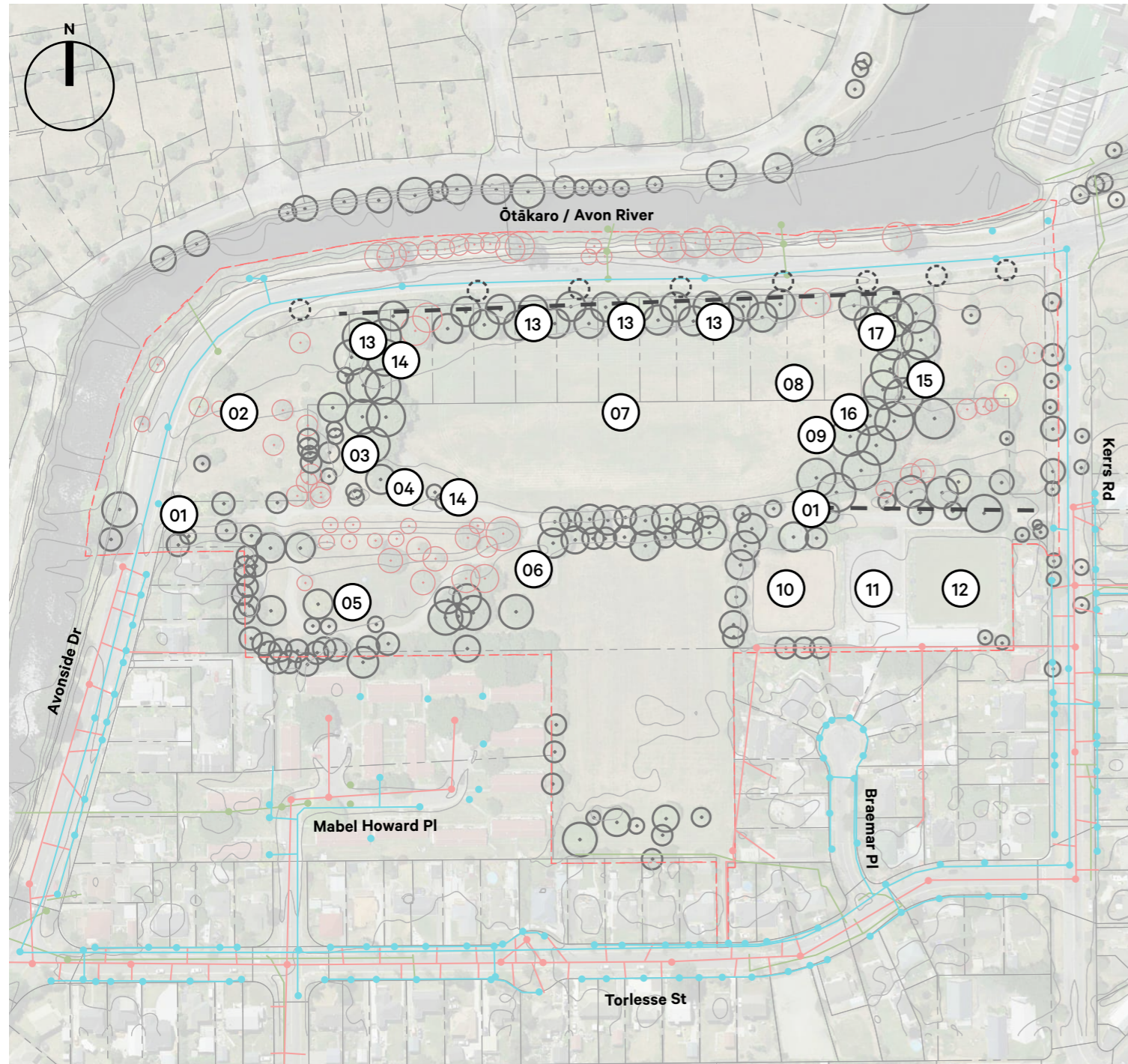
Removed large trees will be assessed for repurposing potential. This might include use of timber for cladding, artificial habitats natural elements etc. or to be used as mulch to help establish planting on site.

All tree removals fall into one or more of the following criteria:

- The tree creates CPTED issues. These are usually coniferous evergreens.
- The tree is insignificant and prohibits key moves on the site.
- The tree is in poor condition.
- The tree is exotic in areas of native revegetation and therefore hampers ecological outcomes.
- The tree sits on the City to Sea Pathway route.



Existing Facilities and Services.



Legend.	
	Wastewater
	Water Supply
	Stormwater
	Bollards
	Powerlines
	Existing trees to keep
	Existing trees to remove
	Avon Park Site Boundary
	Vehicle Control Bollards
	Whitau School Kaitiaki Zone
	Whitau School Insect Hotels.
	Toilet Stalls x2
	Playground (Slide, See-saw, Swing-set, Merry-go-round)
	Half Court (Hoop and linemarking)
	Football pitch
	Cricket pitch
	Cricket net, softball cage
	Unused bowls green
	Carpark (45 Carparks)
	Bowls club building, greens and shelters
	Field lights
	Bins
	Shipping container
	Cricket pitch



Half court surface sits within the bounds of the new court and may be refurbished. The existing hoop and back board are in poor condition. These may be re-purposed for another use.



Existing play equipment appears to be original of the 1940's park design. Relocation and refurbishment will help to reduce cost and remain in keeping with the parks character.



Potential site for future recreational or other active use.

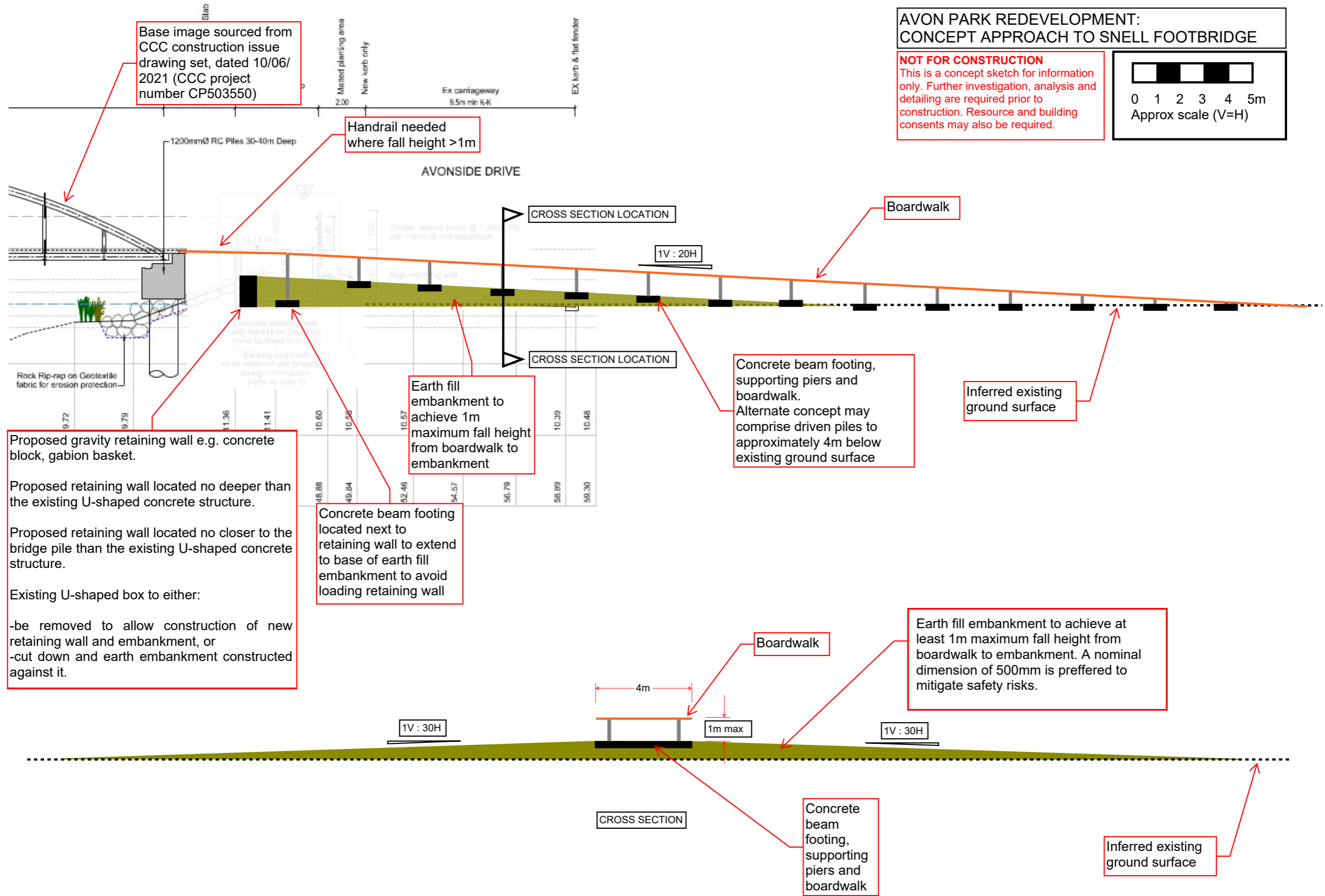


Existing sports infrastructure including: football fields, cricket nets, throwing facilities, cross country loop and long jump pit to be facilitated in future park development on another site or on the active lawn area.



Existing ablutions to be relocated to solid ground on top terrace facing active and open space to promote safety, add resilience, and serve busy areas.

5. Engineering Strategies.



13 December 2022
Job No: 1019517.1000

Isthmus Group Limited
PO Box 24116
56 Victoria Street
Wellington

Attention: Nik Kneale

Dear Nik

Avon Park
Stopbank Concept Design - Engineering Considerations

Introduction

As requested, we have considered your proposed conceptual alignment for the stopbank through the proposed Avon Park. This letter briefly outlines some engineering considerations associated with the proposed alignment. This advice is provided under our service agreement with Isthmus Group Limited, dated 28 September 2022.

To inform these considerations, we have approximated your proposed alignment and modelled it using 12d software. Base survey data and aerial photography was obtained from Land Information New Zealand (LINZ) in NZTM 2000 projection. Concept drawings showing a plan of the proposed stopbank, a long section, and cross sections at 20 m intervals are attached to this letter.

The stopbank crest height and geometry is based on advice from Christchurch City Council (CCC). The key details are:

- Crest level RL 12.2 m (Christchurch Drainage Datum).
- Crest width 7 m.
- Batter slopes 4H:1V.

Table 1.1 was also provided by CCC and provides key design parameters:

Table 1.1 Design parameter information

AEP	2%	2%	1%	1%
SLR allowance in base WL	0	0.45	0	0.45
Water level	11.25	11.511	11.25	11.6
Freeboard	0.5	0.5	0.3	0.3
Future Allowance	0.34	-0.1	0.47	0.02
Design Core height	12.09	11.911	12.02	11.92
Construction Tolerance	0.13	0.13	0.13	0.13
Core Build Level	12.22	12.041	12.15	12.05

The above design levels were converted to NZVD (2016) using the conversion factor as calculated using the methodology recommended by LINZ. A design level of RL 2.81 m was adopted (equivalent to RL 12.2 m CDD).

The majority of the stopbank comprises existing ground which meets the design crest level of RL 2.81 m along an existing terrace feature. At the eastern end of the stopbank, the alignment extends beyond the terrace so a small embankment will be required (approx. CH350-500). The maximum height is approximately 1.7 m above the existing ground level. The estimated volume of stopbank fill above the existing ground level is 1,600 m³. This volume does not include fill to replace topsoil strip or nominal foundation excavation or topsoil on embankment fill.

Engineering considerations

Terrace section (CH0 – 350)

The main engineering consideration for this section is permeability of the natural materials in the terrace and the potential for seepage through the terrace during spring tides and/or flood events. The low ground behind the terrace is approx. RL 11.7 m. CCC have provided information based on their modelling that the water level in the Avon during a 1% AEP flood event is approximately RL 11.6 m.

The current proposal of removing the existing temporary stopbank along Ōtākaro /Avon River to flood Avon Park brings the river approximately 120 m closer to the houses on the backside of the terrace. This makes it more likely that the groundwater on the landside of the terrace will be influenced by high river levels. There is still approximately 65 m setback from the riverside edge of the terrace to the majority of the residential properties. At the western extent there are two properties situated on the edge of the terrace within this nominal 65 m setback; however the ground level for each of these properties is generally at or above the design crest level of RL 2.81 m. Groundwater is likely to be reasonably high through there under normal circumstances (around 1 m below ground level), and short term groundwater elevation during a large flood event is unlikely to have a material incremental effect on the nearby properties.

Stopbank sections (CH350-500)

The below summarises the main engineering considerations for the stopbank sections:

- Analysis of CPTs from the approx. area of the two sections of stopbank predict significant liquefaction from shallow depth (1 m) in both the 4% Annual Exceedance Probability (AEP) (equivalent to residential Serviceability Limit State (SLS) event) and 0.2% AEP (equivalent to a residential Ultimate Limit State (ULS) event), with free field settlements in the order of 50 mm to >200 mm respectively, and lateral spreading in the order of 200 mm to >500 mm respectively.

- Ground crack mapping following the Feb 2011 earthquake event at the site show multiple ground cracks between 50 mm and 200 mm. These cracks are likely still present and will have implications for any foundation design and preparation.
- Lateral spreading occurs either in the direction of a free-face, or downslope, i.e. toward the river. As each of these sections of stopbank are approximately perpendicular to the river, it lateral spreading was to occur, lateral spreading will tend to create transverse cracking through the stopbank. This will significantly weaken the stopbank.
- If the stopbank were to be designed to withstand even a moderate earthquake event, significant foundation treatment would be required, attracting significant design and construction costs.

Based on conversations with CCC, we understand that their desired earthquake performance is essentially “as good as is possible for modest expenditure”. Based on this, and the above considerations, CCC may not wish to proceed with quantitative assessment of potential stopbank settlement and lateral spreading during a future earthquake. We highlight the desired earthquake performance of the stopbanks as a key decision to be made prior to advancing more detailed design.

Western stopbank tie-in

The stopbank has been terminated at the western extent of the terrace. This is a decision point for CCC to consider where future tie-in is desired. The existing temporary stopbank appears to terminate to the north of the large riverside tree, and has a crest level of approximately RL 2.8 m. It would be feasible to tie into this, but if the longer-term aim is to tie-in to a permanent stopbank to the south, extending this stopbank to the north as part of this project may not be necessary.

Applicability

This letter has been prepared for the exclusive use of our client, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

Yours sincerely



John Harris
Dam Engineer



Grant Lovell
Project Director

Attached: Stopbank alignment plan, long section and cross sections

13-Dec-22
\\ttgroup.local\corporate\christchurch\tt projects\1019517\1019517.1000\issueddocuments\20221213_avon park - stopbank concept deisgn engineering considerations.docx



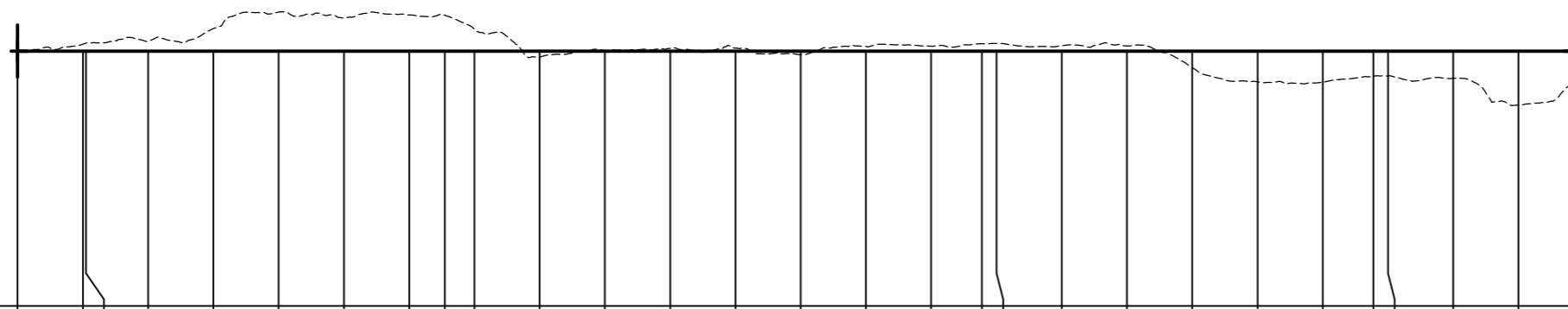
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PROJECT No. 1019517		CLIENT PROJECT	Christchurch City Council
DESIGNED	DRAWN	CHECKED	TITLE
	jha		
12D DRAFT		SCALE (A3)	SKETCH. No. Sheet 1 - CH 0.00 to 477.14
		1:2000(H) 1:200(V)	





Datum RL(m) -5

FINISHED LEVEL (m)	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81
EXISTING GROUND RL (m)	2.81	3.02	3.05	3.11	3.5	4	3.83	3.92	3.91	3.47	2.63	2.82	2.89	2.9	2.69	2.95	2.96	2.96	3.03	3.05	2.97	2.97	2.3	1.86	1.84	2.04	2.05	1.97	1.15	1.86														
CHAINAGE (m)	0.00	20.00	20.98	40.00	60.00	80.00	100.00	120.00	130.98	140.00	160.00	180.00	200.00	220.00	240.00	260.00	280.00	295.54	300.00	320.00	340.00	360.00	380.00	400.00	415.54	420.00	440.00	460.00	477.14															
VERTICAL GEOMETRY	0%																																											
HORIZONTAL GEOMETRY	Tangent Length=21m		Rad=-886.515 Arc Length=110m							Tangent Length=164.6m											Rad=-96.686 Arc Length=120m					Tangent Length=61.6m																		
SUPERELEVATION	-----																																											

LONGITUDINAL SECTION: ALIGNMENT STOPBANK CL->ALIGNMENT STOPBANK CL

Horizontal Scale 1:2000

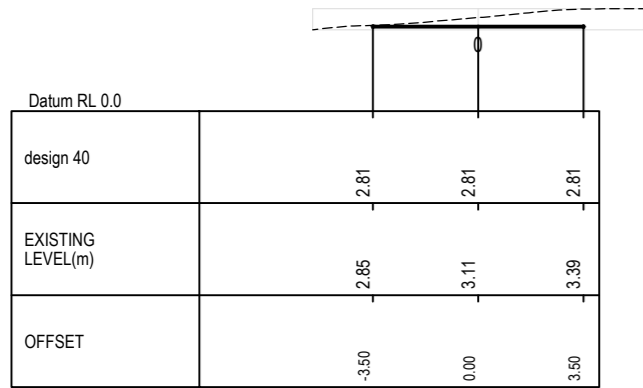
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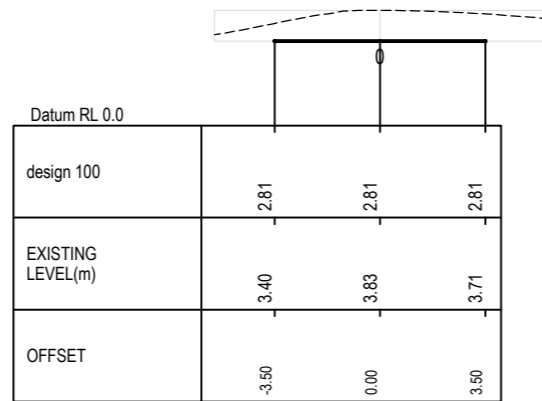
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PROJECT No. 1019517		CLIENT PROJECT	Christchurch City Council
DESIGNED DRAWN CHECKED	jha	TITLE	LONG SECTION
12D DRAFT		SCALE (A3)	1:2000(H) 1:200(V)
		SKETCH. No.	Sheet 1 - CH 0.00 to 477.14

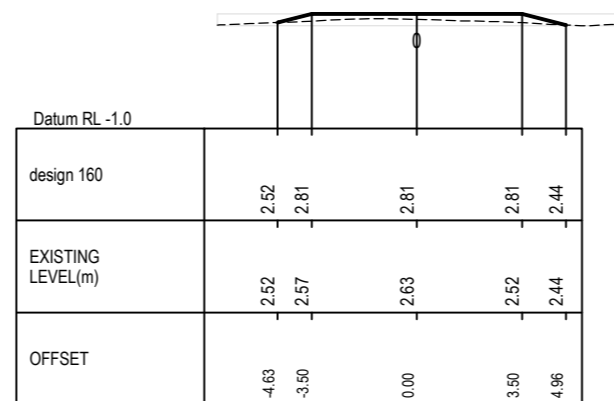




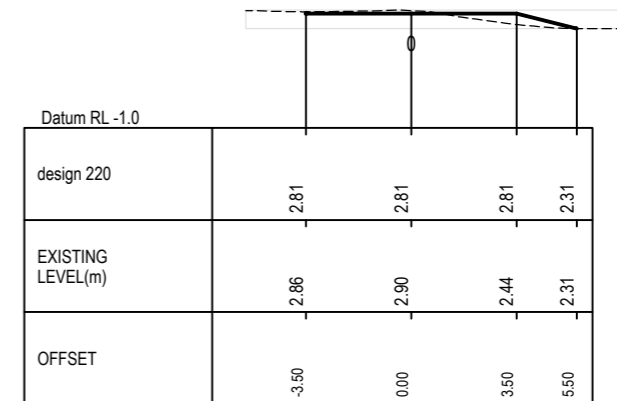
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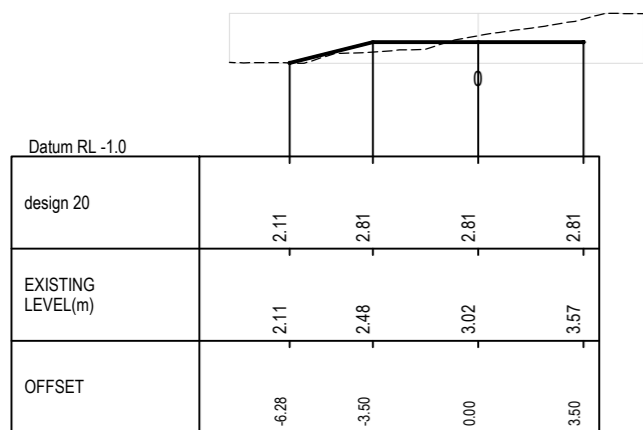
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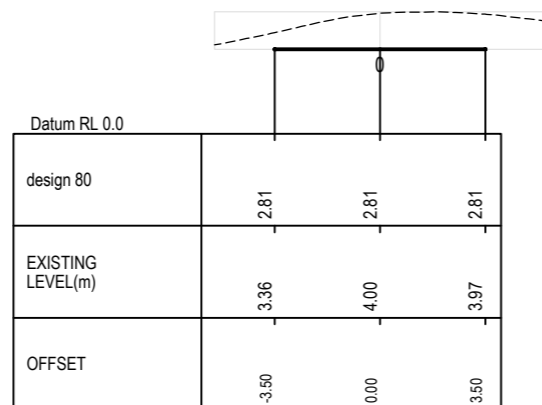
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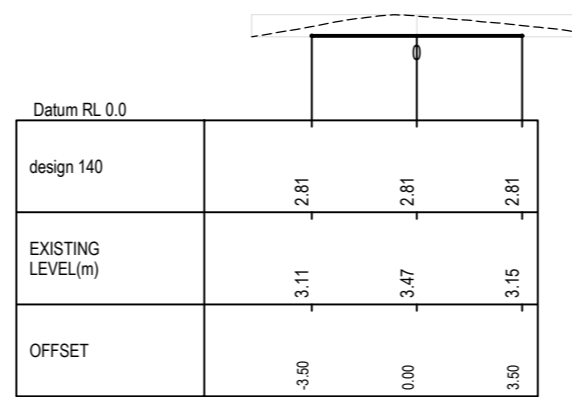
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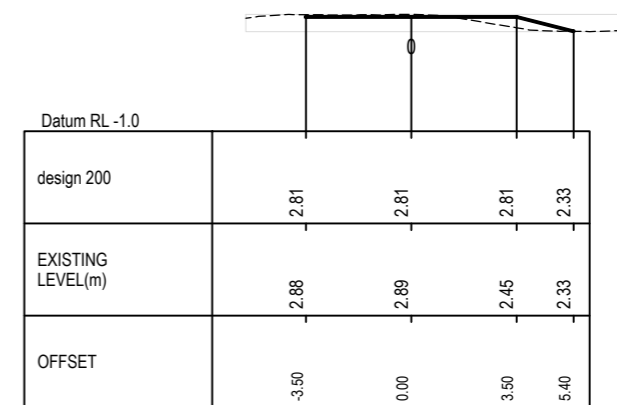
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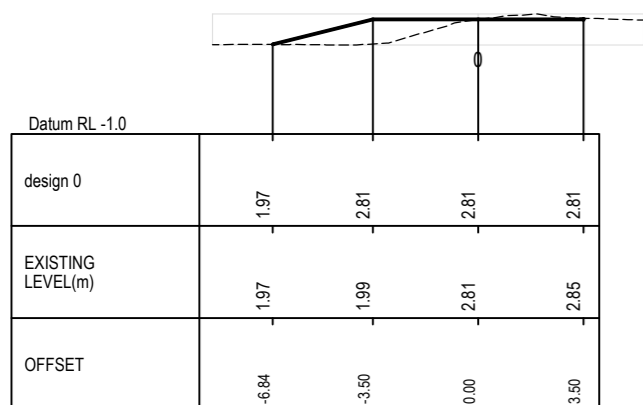
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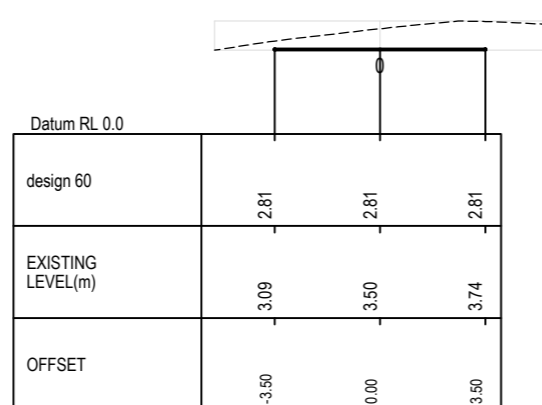
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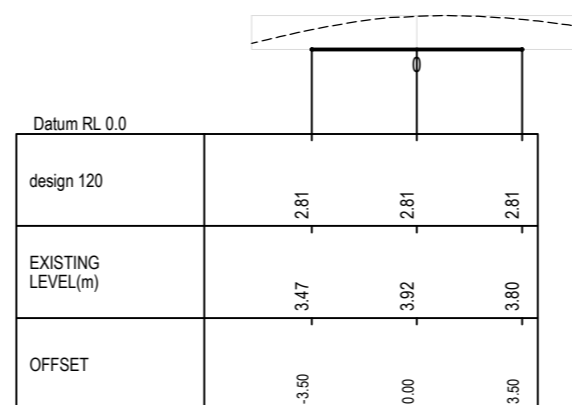
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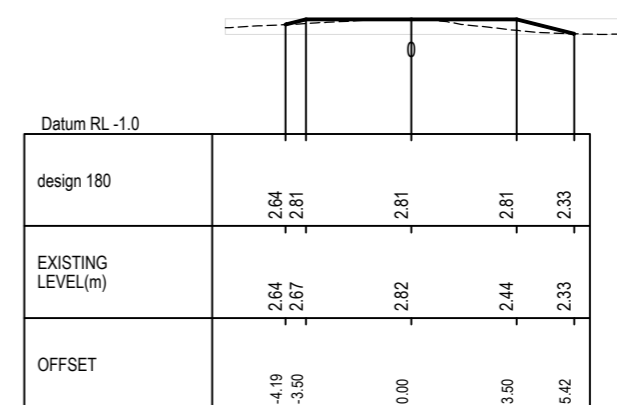
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SECTION 60



SECTION 120



SECTION 180



PRELIMINARY DRAFT

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PROJECT No. 1019517

DESIGNED
 DRAWN jhha
 CHECKED

12D DRAFT

CLIENT
 PROJECT Christchurch City Council

TITLE CROSS SECTIONS

SCALE (A3) 1:250(H)
 1:250(V)

SKETCH. No. Sheet 1 - CH 0 to 220REV

6. Appendix.

Tree Summary.

Tree Survey Plan.
Simplyarb Ltd.



Avon Park Tree Survey.
Craig Taylor, Simplyarb.

Trees and shrubs were assessed for health and structure against the Christchurch City Council (CCC) Health and Structure Assessment Methodology.

The following is a breakdown of the various categories identified within the survey area in Avon Park (including Avon Park Bowling Club).

- 1) Individual specimen trees were assessed as individual trees.
 - 2) Groupings of trees and shrubs were assessed as a group (not as individual specimens).
 - 3) Tree and shrub groupings which had both native and exotic specimens were identified as a mixed shrub boarder.
 - 4) Tree and shrub groupings which had both exotic specimens were identified as a native shrub boarder.
- Where a specimen tree note worthy of being identified as a specimen tree was identified within a shrub boarder (2, 3 and 4 above). These were identified as individual specimen trees.

The majority of the trees were included within the CCC asset management system and were identified using the CCC asset number. Where trees and shrubs were not included in the CCC asset management system they were attributed a tree ID for ease of future identification. Trees within Avon Park were identified within the survey as public realm trees, as outlined under the Christchurch District Plan 9.4 Significant and other trees if the trees were greater than 10m high in a park or public open space.

Overall tree condition

Public Realm	Non-protected
103	90

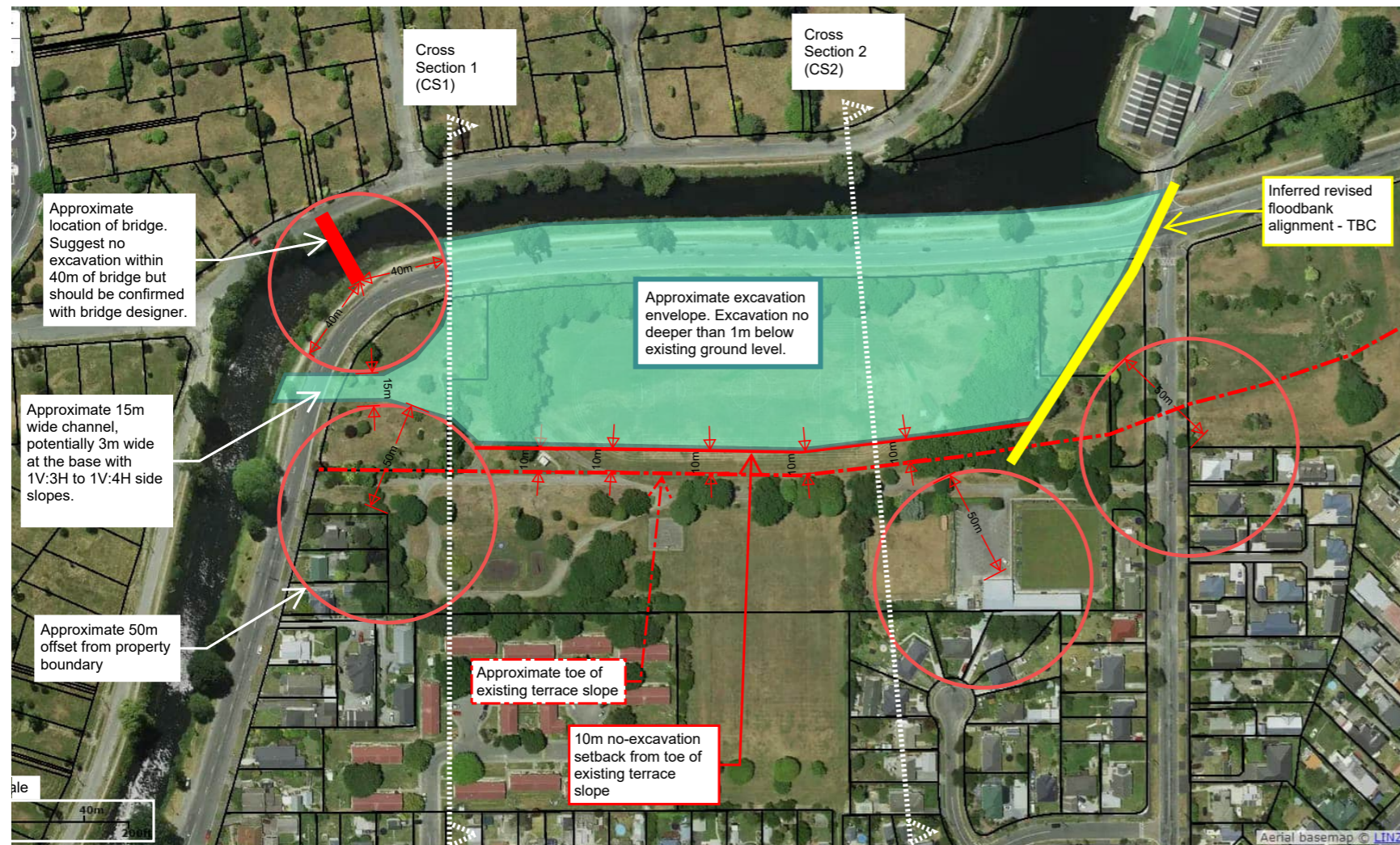
193 specimen or groupings of trees were identified within Avon Park with the following a breakdown of the various assets identified and their overall condition against the CCC Health and Structure Assessment.

Overall tree condition

Good	Fair	Poor	Very Poor
32	132	17	9
Total			193

Geotechnical Summary.

Geotechnical Analysis Plan.
Tonkin and Taylor Ltd.



Site: Avon Park
T+T ref: 1019517
Sketch: Working sketch for discussion showing geotechnical constraints
SAFF 31/08/2022

Geotechnical summary.
Scott Forster, Tonkin and Taylor Ltd.

A major geotechnical hazard in the Avon Park area is liquefaction and the associated lateral spread and resulting ground cracking, as observed during the 2010/2011 Canterbury Earthquakes.

A ground model was created using geotechnical investigation data currently available on the New Zealand Geotechnical Database (NZGD), and groundwater levels adopted from the mean recorded values from across the available investigation locations. As part of developing the ground model, a liquefaction assessment was also undertaken including checking liquefaction triggering during the modelled 22 February 2011 earthquake ground motion at the Avon Park area (Magnitude 6.2, peak horizontal ground acceleration 0.5g). The ground model indicates “better” ground conditions upslope of the natural terrace when compared to the ground conditions downslope of the natural terrace and closer to the Avon River, which reflects the difference in observed performance during the Canterbury Earthquakes. This is mainly due to thicker layers of liquefaction susceptible soils closer to the Avon River and thicker deposits of dense non-liquefiable soils upslope of the natural terrace at the level of shaking experienced during the 22 February 2011 earthquake.

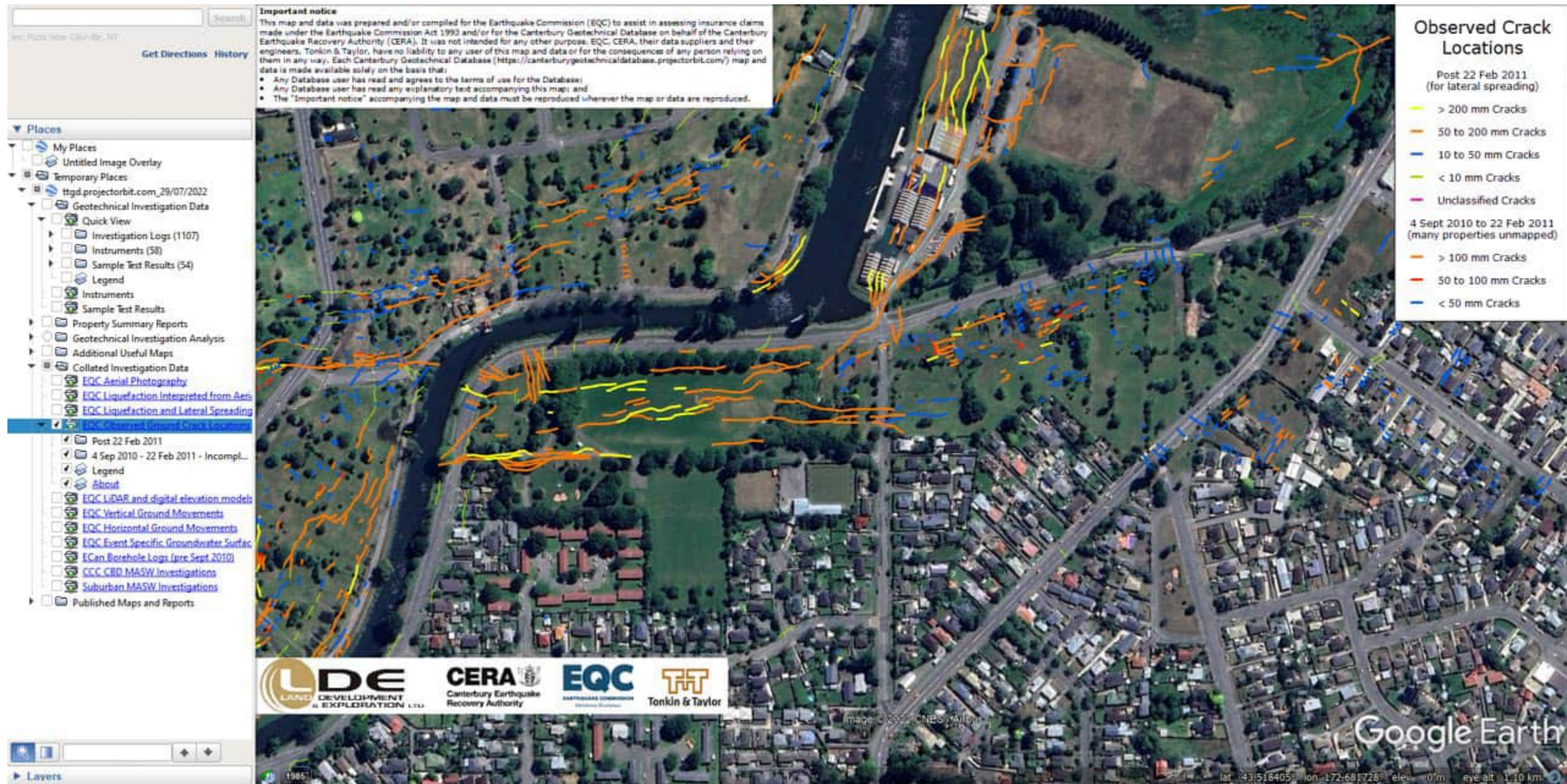
Once the ground model was developed, a “back analysis” slope stability model was completed to assist with estimating soil parameters and to check the model outputs were similar to the observed ground behaviour during the Canterbury Earthquakes.

After the “back analysis” was complete and suitable soil parameters were adopted, a “forward analysis” was undertaken to estimate an envelope of a potential excavation area within the site. With the existing slope stability model we raised the groundwater by 1m to account for potential climate change effects, then “excavated” the upper 1m of the existing ground profile. We also adopted a 10m no-excavation bench from the toe of the existing terrace so not to adversely affect the static stability of the existing natural terrace slope. The results of this arrangement indicated that excavation within the defined envelope was unlikely to materially affect the existing lateral spreading hazard for the existing properties located approximately 50 to 75m upslope of the defined envelope.

At the west end of the site there is potential to create a channel to connect the existing Avon River to the Avon Park area, provided an offset of at least 50m is adopted from the nearest property boundary and the effect of such a channel on the nearby bridge is checked with the bridge designer. We have estimated a 40m offset between the bridge and channel may be appropriate, however this would need to be confirmed as suitable with the bridge designer. There has also been some discussion regarding constructing an earth-fill abutment to the existing footbridge to act as a ramp off the bridge into the Avon Park area. The effects of the loads imposed from an earth-fill approach onto the existing bridge foundations would also need to be checked by the bridge designer.

It is noted that Civil design will be progressed during Preliminary Design, once CCC’s flood modelling and stop-bank requirements are confirmed.

Cracking Observations.



Geotechnical summary - Section 1.

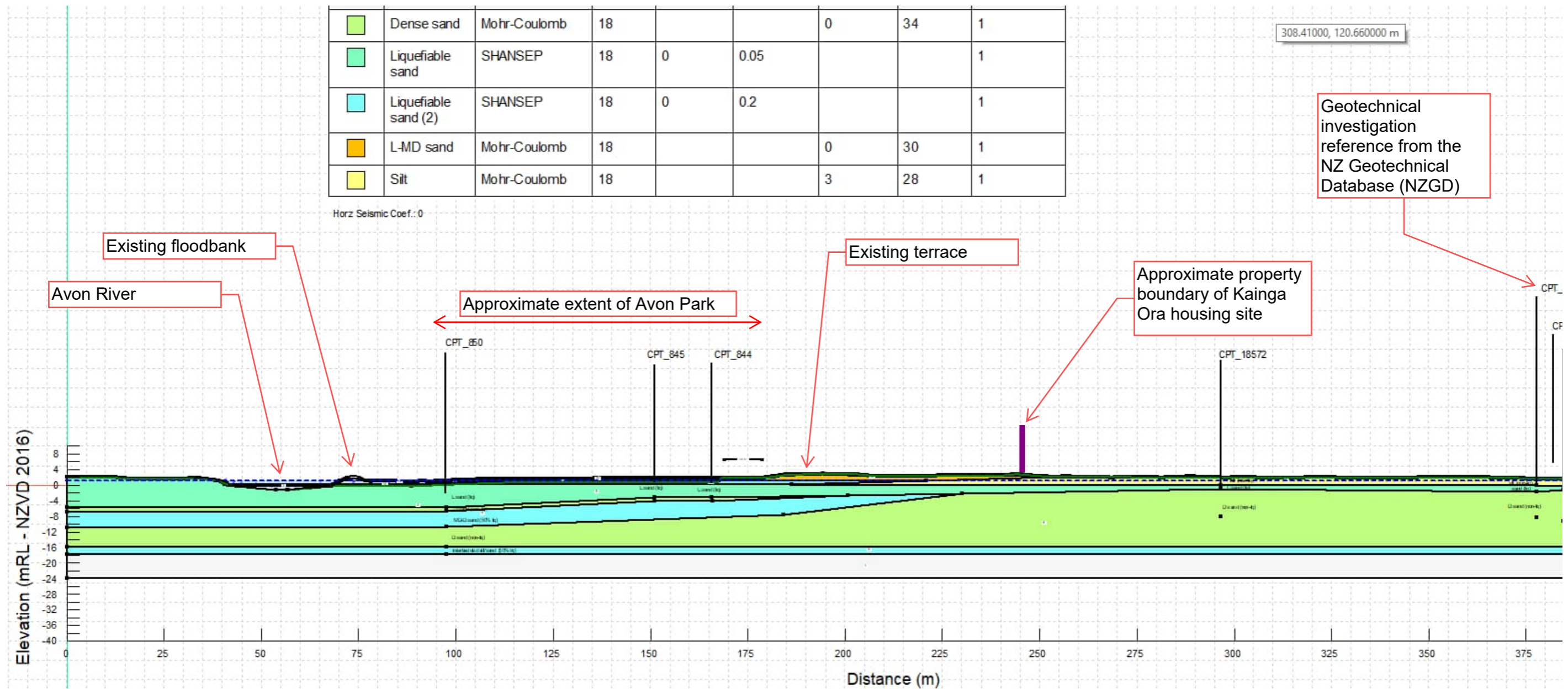
Color	Name	Slope Stability Material Model	Unit Weight (kN/m ³)	Minimum Strength (kPa)	Tau/Sigma Ratio	Effective Cohesion (kPa)	Effective Friction Angle (°)	Piezometric Line
Light Green	Dense sand	Mohr-Coulomb	18			0	34	1
Light Blue	Liquefiable sand	SHANSEP	18	0	0.05			1
Orange	L-MD sand	Mohr-Coulomb	18			0	30	1
Yellow	Silt	Mohr-Coulomb	18			3	28	1

Horz Seismic Coef. 0.01



Site: Avon Park
 T+T ref: 1019517
 Sketch: Geological Cross Section 1 (CS1) - looking downstream of the Avon River
 SAFF 31/08/2022

Geotechnical summary - Section 2.



Site: Avon Park
 T+T ref: 1019517
 Sketch: Geological Cross Section 2 (CS2) - looking downstream of the Avon River
 SAFF 31/08/2022