KOPUPAKA PARK –INTEGRATING ENGINEERING, ECOLOGY, CULTURE & COMMUNITY.

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ABSTRACT

The new Westgate town centre, currently under construction on greenfield land, was masterplanned with the urban design integrated closely with the green infrastructure of a dynamic 22ha open space network, Kopupaka Park. The landscape architects saw the opportunity to add significant value to the proposed stormwater system through a design-led approach that integrates community amenities with engineering and ecological outcomes. The masterplan envisioned a hybrid park typology, a uniquely New Zealand design integrating environmental infrastructure, reinterpreting horticultural practices and respecting Māori cultural values.

The design has challenged stormwater reserve expectations and illustrates how urban growth can be balanced with ecological restoration, the creation of new public reserves and the development of a strong sense of place. The result sets a benchmark for place making through environmental design.

KEY WORDS

Ecological Urbanism, Hybrid Ecology, Environmental Infrastructure.

1. INTRODUCTION

With the population predicted to boom in the next 20 years, Auckland is currently pre-occupied with planning for urban growth and making strides to become 'the world's most liveable city' (Auckland Council, 2013). Westgate town centre is one of Auckland Council's strategic transformational projects to deliver significant commercial and community infrastructure. The new town centre, currently under construction on green-field land to the west of the city, was masterplanned in parallel with the open space network. The urban design of its streets includes permeable paving, rain-gardens and swales that are integrated closely with the green infrastructure of the 22ha stormwater reserve and open space network of Kopupaka Park. The park provides the infrastructure for the attenuation and detention of stormwater run-off from the streets and buildings of the future town centre.

Prior to urban growth the catchment was highly modified for rural production – strawberries were the main crop – and the network of watercourses that flowed through the site was highly degraded. Landscape Architects, Isthmus Group, saw the opportunity to add significant value to the proposed stormwater system through a design-led approach that would fully integrate community amenities with engineering and ecological outcomes. The masterplan envisioned a hybrid park typology, a uniquely New Zealand design integrating environmental infrastructure, reinterpreting horticultural practices and respecting local Māori cultural values.

This paper outlines the design thinking that has underpinned the design, and discusses the way in which the technical engineering requirements, ecological benefits, cultural considerations and community needs were integrated and synthesised into a linear park landscape. It offers a qualitative design narrative and does not attempt to provide a quantitative technical analysis of the performance of the stormwater system (we will leave that to others better equipped than us).

Figure 1. Site Masterplan illustrating Kopupaka Park with the future Westgate town centre to the southeast.

2. LANDSCAPE AS INFRASTRUCTURE

The benefits of integrating ecology into the city are becoming more widely understood and discussed, but still many urban areas are being developed with a lack of eco-infrastructure. The poor design of peri-urban areas often results in the separation of landscape and development, a division into city and nature. The sum total of what might be called 'natural' usually comprises scraps of land, or SLOAP (space left over after planning). But this is where the balance between the urban and the natural may triumph; the contemporary challenge is to combine the planning and construction of infrastructure with recreational and ecological landscapes to create dynamic, multi-functional networks.

In her essay 'Potentials for Landscape as Infrastructure, Part I' Poole (2004) examines landscapes of infrastructure that provide basic and essential components for urban life such as dams, reservoirs, communication networks, transportation routes, power corridors, sewage treatment facilities, power generators, and stormwater structures. Poole is interested in the potential to engage with the technological aspects of utilitarian structures to design contemporary landscapes that do much more than just serve a single functional purpose. In Part II (2004) she argues that since 'infrastructures' are those essential elements and systems necessary to accommodate congregated living in communities and cities, landscape infrastructures are necessarily 'civic' in that they serve the common good.

At Kopupaka Park we seized the opportunity to create a new type of civic infrastructure. We did this by combining a traditional stormwater reserve with a contemporary urban park to create a hybrid typology. As space was at a premium the design challenged traditional boundaries and constraints, and overlapped multiple functions. Places for ecology, culture, and community were overlaid within an urban stormwater reserve, creating a green infrastructure that combines water, vegetation and structures into a seamless parkland. Highly efficient in terms of land use, the project represents excellent value for money when compared with traditional zoned approaches.

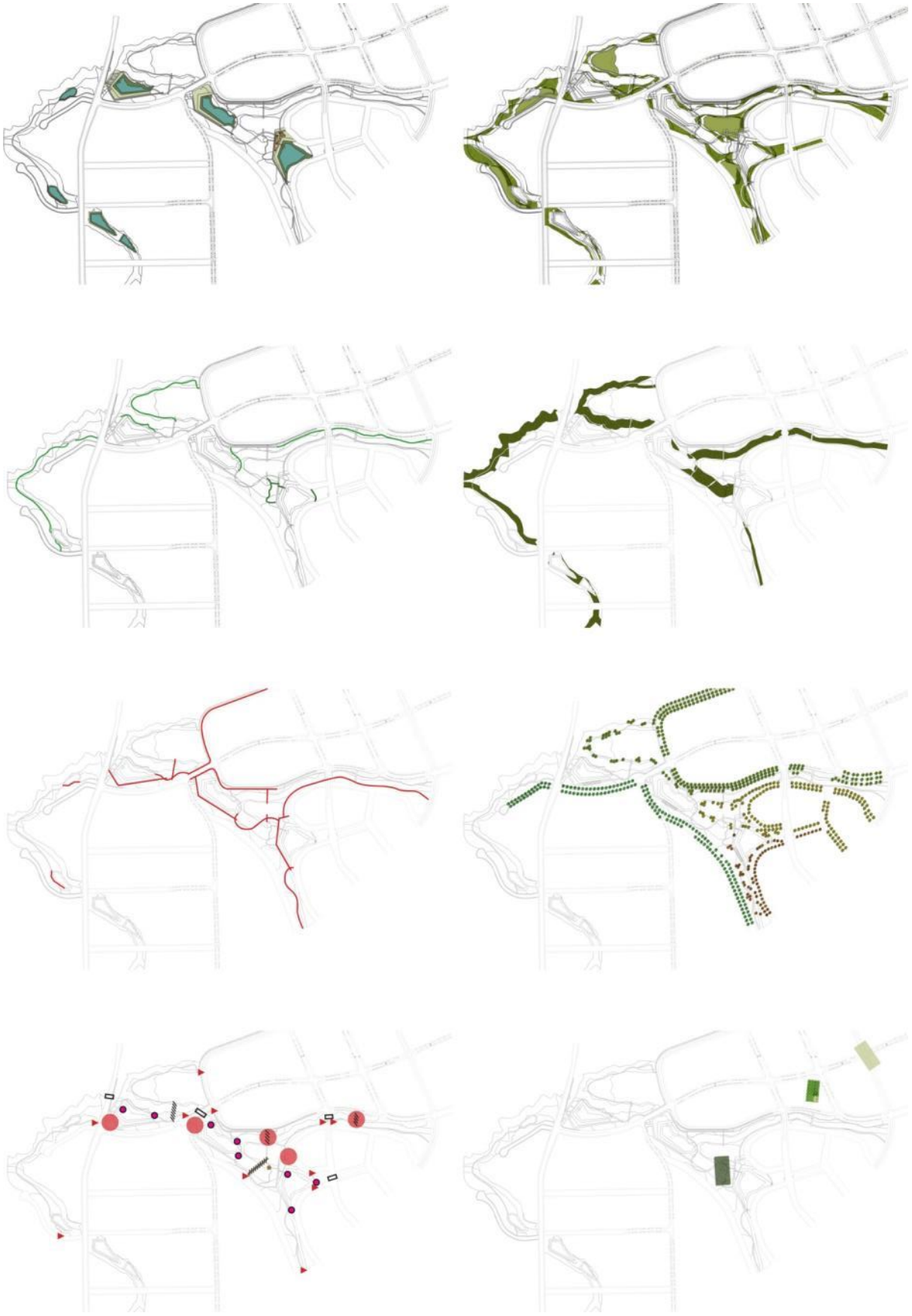

Figure 2. Landscape as Infrastructure – overlapping layers of function and use.

3. DISCUSSION

Designed in a truly collaborative manner the spatial lines between riparian corridors, stormwater infrastructure, play spaces, and the urban public realm are blurred within Kopupaka Park. The masterplan is structured around six stormwater wetlands and includes the revegetation of the Totara Creek and Sakaria Stream corridors. The riparian planting was extended to the reserve boundaries with the public amenity spaces cut into it as clearings.

The open space design was developed utilising the pond bulk earthworks to incorporate park amenity spaces. The design of the main wetland ponds includes a playground, a botanical garden and a skate park. Cycleways and connections to the residential, town centre and industrial zones were also incorporated into the design planning of the riparian corridors and road networks.

Over the following pages we discuss the design of the park in terms of the four facets of ecology, culture, community and engineering. A design-led process ensured that these facets were interwoven, from the concept design right through to implementation on site.

Figure 3. Concept design photosimulation overlooking Pond 2.

3.1 ECOLOGY (Water_Life)

Water is a vital, life-supporting element within our landscape, and as such we are instinctively drawn towards it; we like to recreate in and alongside it, float on it, fish in it, paint and photograph it. But for many it also holds spiritual value. Māori believe all things contain mauri, a vital essence. Mauri gives all living things and every place their distinctive characteristics; Williams (2006) explains that the key to understanding traditional Māori environmental management is the importance of not altering mauri to the extent that it will become no longer recognisable. Water is seen as a living thing with mauri of its own, but each different body of water has its own unique mauri. There are three states that water may take. The first, Waiora, translates as "waters of life" and is the purest water. Waiora can often rejuvenate the damaged mauri of other things. The second state, Waikino, is "bad water", a dangerous place such as a stretch of water with rapids or snags, or water which has become polluted, either physically or spiritually. In each case the mauri has changed and is susceptible to being changed again. Finally, Waimate literally translates as "dead water" and has no mauri at all. It cannot support life and can contaminate or absorb the mauri of other waters or of living things.

The water quality of Totara Creek and the Sakaria Stream and their minor tributaries was highly degraded; the high nutrient runoff from the strawberry fields had led to a dominant infestation of the aquatic reed sweetgrass within the streams and wetlands.

Figure 4. An example of the degraded state of the water courses previously onsite, and the sweetgrass infestation.

The new stormwater infrastructure needed not only to accommodate massive urban expansion, but also restore elements of the degraded riparian system, protect water quality and ensure habitat preservation. The design approach for the streams within the park was to retain and enhance their natural state and establish a self-sustaining riparian ecosystem. Earthworks were kept well back from the riparian margins to ensure the natural character of the corridor was retained. Where on-line wetland ponds or road culverts were proposed, a 'designed ecology' aesthetic was developed, that is the artificial nature of the interventions was expressed not disguised.

The ecological restoration and enhancement of the streams and their riparian environs was central to the project. Working with the ecologists a Restoration Management Plan for the streams and wetlands was developed. This included a range of riparian margins from 5m to 30m wide and a total of six wetlands to integrate the riparian restoration into the wider park landscape so the entire corridor of open space was treated as a riparian zone.

The restoration strategy included the following objectives:

1. To protect water quality in the stream by:
- shading the stream
- reducing stream bank erosion.

2. To establish a self-sustaining riparian ecosystem by:
- working with natural successional processes and using existing seed sources
- utilising the existing canopy and ground cover (including exotics, where they can provide nurse crop cover) to assist natural regeneration.

3. To promote native wildlife by:
- establishing an ecological link and wildlife corridor
- providing additional habitat and/or food for native animals.

4. To integrate the riparian restoration into the wider park landscape by:
- using shorter stature native species, where appropriate for safety etc.
- allow for park infrastructure such as pedestrian bridges and pathways.

We worked closely with local iwi to ensure that cultural sensitivities were identified. Historic occupation often occurred along stream margins; understanding this context was an important aspect of our approach as it revealed that local iwi used a wetland at the streams confluence as a food gathering site (eels). Interpretation panels have been designed into the project that highlight aspects of the freshwater ecology.

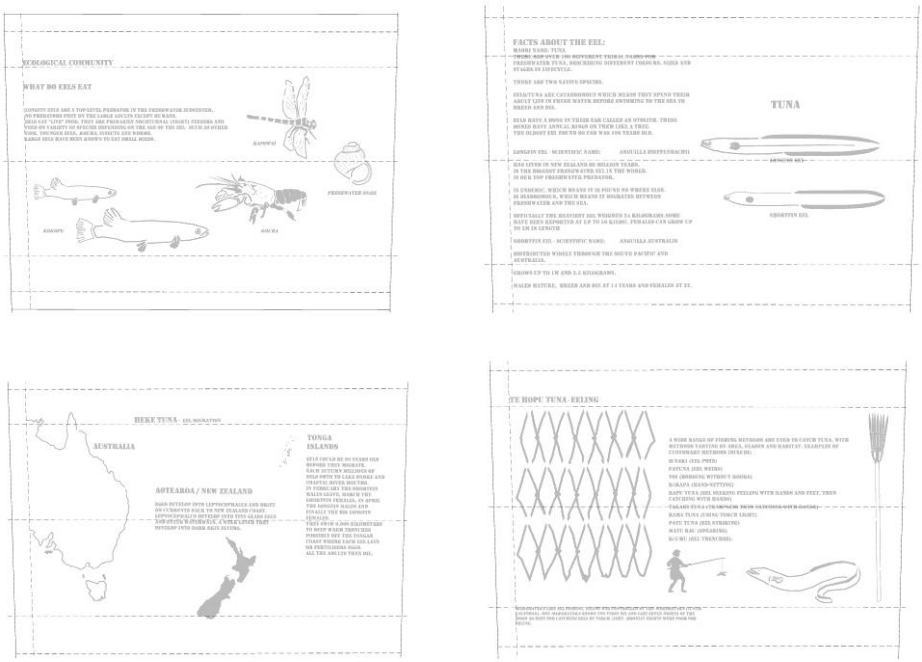

Figure 5. The designers developed a series of interpretation panels that explain the lifecycle, habitat and cultural significance of the native eel.

3.2 CULTURE (Water_Art)

Auckland Council, together with Ngā Aho, a network of Māori design professionals, recently published the Te Aranga Principles (2014). This brought together a series of guiding principles that design professionals and developers are encouraged to consider to ensure that the status of iwi and hapū as mana whenua is recognised and respected. At Kopupaka Park the concept of Taiao - protecting and restoring the natural environment – has been followed closely, with local biodiversity established in ecological corridors of native plants selected to attract birds and provide a cultural resource.

Layered into this native restoration framework, the horticultural history of the land has also been referenced. The notion of weaving histories and overlapping functions together became dominant design narrative for the park. The 'thread, weave and gather' concept has been articulated in the merging tributary and constructed wetlands of the park, with flax as the signature species and an aesthetic evolving from the strawberry furrow patterns and horticultural features.

Recognising the scale of the urban development about to unfold (land zoning for Westgate includes a mixed use of commercial, residential, large format retail and industrial uses) the need for a strong simple design was required. This called for bold placemaking on a significant scale to hold its own in a new urban centre.

Sculptural woven 'fibres' of timber crib weave together to form the spaces and places within the overall earthwork design. The graphic patterns of the walls represent a flax rope and basket, but also references the stacked orchard boxes found on site. The development of the crib wall concept conceived by the designers included collaboration with council and the artistic director Robin Rawstorne. The town centre and entry nodes have been defined with the structures. From outside the site they identify the park, while internally they enclose and define spaces that are programed with a range of community and cultural uses. The 'woven fibre' creates the northern arrival to the town centre creating a gateway either side of Tahi Road; their sculptural form pays homage to the original stream corridor alignment.

Consultation with iwi was carried out following the formation of these conceptual ideas. The form of the 'woven basket' has been drawn from traditional eel pots and is a reference to the historical tuna gathering site below the confluence of the two streams - an environmental education boardwalk is inspired by inaki (fish traps). Overall, water and art have combined to generate a strong sense of place that is grounded in the culture of the site.

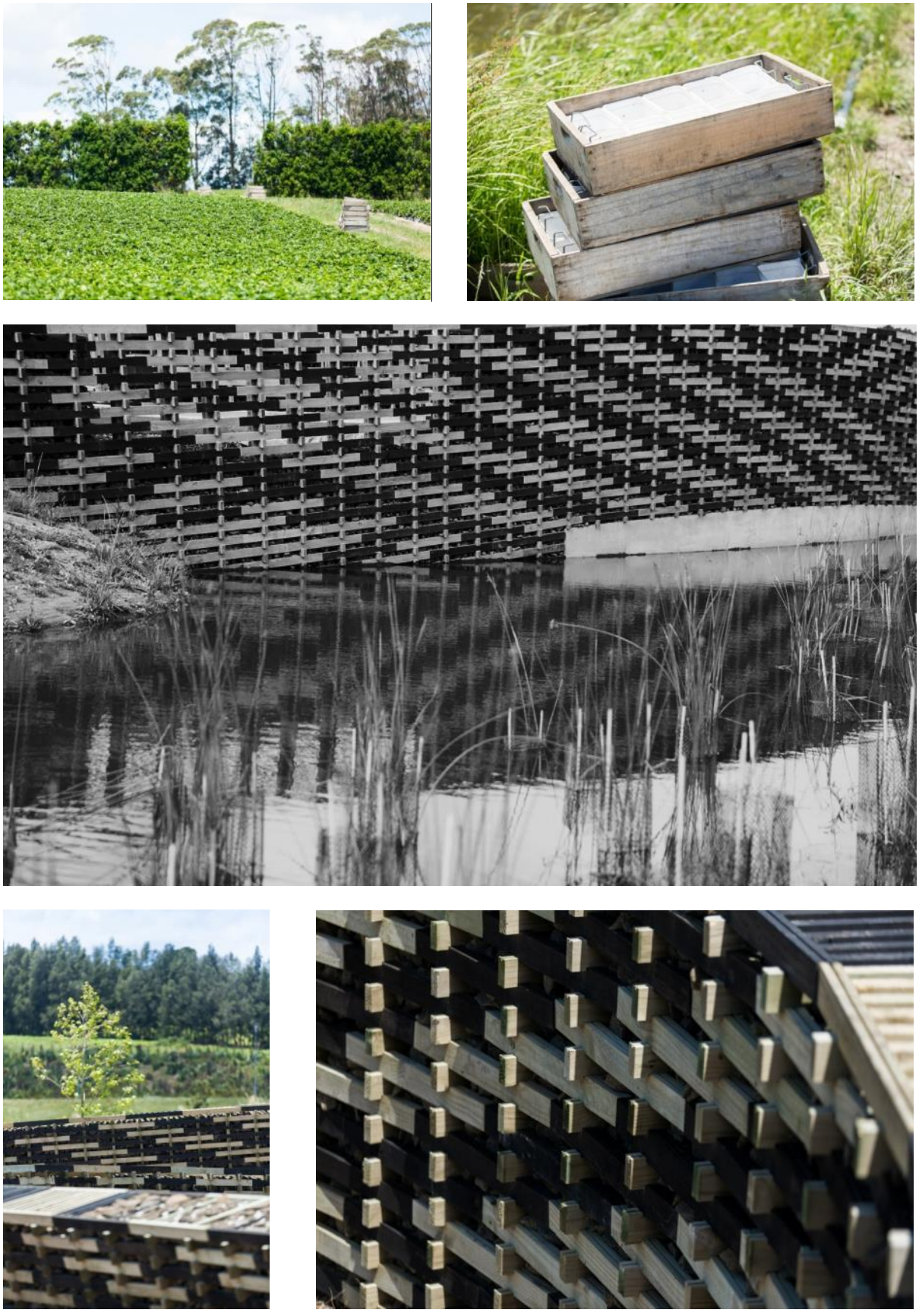

Figure 6. Retaining walls become a sinuous artwork that winds through the park.

3.3 COMMUNITY (Water_Place).

The ponds, wetlands and control structures of the stormwater reserve were designed to allow for maximum public access and to provide multiple amenity functions for the community. The three main wetlands provide the locations of the park's primary gathering spaces, while the central pond offers a civic frontage to the town centre. The southern pond adjacent to future residential development and the Sakaria Stream has a community focus and will include a large playground and areas that support environmental education. The northern pond located within the large format retail zone is home to a proposed regional skate park drawing activity to this end of the park.

The large scale earthworks that were required to provide the stormwater infrastructure presented an opportunity to structure the public spaces. The crib walls were used at a range of scales to define the spatial experience of the park. The structures provide vantage points for the wetlands, they also provide significant amenity ensuring environmental spaces are not just valued but fundamentally desired.

Deliberately designed with a formal side and an informal or natural stream side, the anglar form of the pond embankments mimic the site's former irrigation dam. Formal terraces around the dam embankments ensure that safety benches and grades are met but provide significant flat usable space for passive recreation. Extensive benches and islands for aquatic planting and habitat have been included to balance recreation with ecology. Paths, seating, tables and BBQ areas are located above the 100 year flood levels and generously scaled paths create a series of promenades around the ponds.

Cycleways and shared paths follow and weave between the streams, these routes lead to the confluence of the streams and the location of the wetlands and the community gathering places. An off-road cycleway along the Sakaria Stream has been extended through the central area of the park. All the cycleways have been set at 3m wide to meet network standards.

Overall the town centre earthworks included roading culverts over streams and a motorway bridge embankment as well as the required stormwater ponds. Looking to maximise the land-use possibilities and remove redundant earthworks the central and northern ponds were brought closer to the road embankment to combine dams and road batters. This allowed the creation of increased areas of open space for the community.

At the northern pond a skate park will provide a unique experience, including 'a bowl in a basket' that will provide a regional destination for skateboarding, located close to public transport and motorway access. The skate park has been located between the pond and road embankment to capitalise on the embankment earthworks and spectator opportunities.

The central pond area is an important connection to the town centre; it is the main civic open space of the park. Crib walls house a botanical garden of weaving that showcases plants used for making kete (baskets) and will allow for cultural harvesting. A flexible, passive garden space the crib structure can be adapted as contemporary 'band rotunda' for medium sized events. To the rear of the pond a land bridge structure offers a powerful environmental experience and provides an important cycleway connection to the western side of the park.

The playground at the southern pond provides family gathering spaces on the site of the old irrigation pond. The yellow irrigation tower of the old wind pump has been retained to support the theme of horticultural history and sustainable environmental education. The crib wall structure for this pond takes the form of an inaki (fish trap), the rock-filled reed bed structure functions as an environmental filter and provides boardwalk access out into the pond and allows for close engagement with the water. Environmental education and interpretation will create an immersive and interactive learning experience. Each structure has interpretation signage inserting cultural and environmental education. Water and recreation combine to provide meaningful and varied experiences for the community.

Figure 7. Simulation of the basket and terraces that will contain the skatepark.

3.4 ENGINEERING (Water_Flood)

The most significant component of Kopupaka Park - the stormwater infrastructure - is largely hidden from view. The headwalls, outfalls and concrete retaining structures form the underlying 'bones' of the park, but their presence is concealed by the multiple landscape layers around and above them.

The Massey North Catchment Management Plan set the overall stormwater hydraulic design. The design process started with the stormwater engineer's preliminary pond sizing data, from which we, the landscape architects, developed the contour design and provided preliminary volume checks. Once the landscape design of the earthwork shape and form of the ponds was resolved, the engineers confirmed the volume and hydrological requirements. Any future design changes were brought back to the landscape architects to resolve the implications on contour or structures.

Inlet and outlet designs were developed to levels and dimensions set by the engineers to meet functional and maintenance requirements such as flow dissipation and debris management. On this engineering base we added design elements that tied the structures into the whole park, with a consistent look and feel. The crib wall elements create a strong design language for the park and replace traditional wing walls and associated structures. A standard timber crib retaining system was used to create the basket forms.

Figure 8. A stormwater outfall structure under construction – upon completion it is hidden behind the crib wall.

The outlet structure design conceals the pipes behind the crib wall and incorporates a submerged outlet and debris control element below the water level. A series of culverts below the wall under the permanent water level ensure that 100 year outfall flows are met. These culverts are permanently filled with water and provide a cool, shaded aquatic environment, a favourite of eels. Fish passage for climbing species has been provided within the chamber.

The rock-filled crib structures act as water filters and conceal the pond's stormwater outlets. It is anticipated that the rock fill will adapt an urban ecology and generate its own micro aquatic habitat. Standing up to 5m high, the walls deal with the large stormwater infrastructure and insert scale and structure to the park.

Access to the ponds for maintenance has been built into the promenade pathways around the ponds. Maintenance to the chambers behind the crib walls is built into manholes and ladders within the structures.

Flood management is a large part of the infrastructure requirements. The pond's capacity was increased to allow for additional impervious surfaces of the skate park and entrance pathways. Permeable surfaces have been used within the pathways and promenades to ensure the balance of stormwater runoff across the wider development area was met.

The most important phase of the project was the bulk earthworks and pond shaping and sizing, this led to a number of iterations and re-checks as the design process unfolded. As the concepts for the crib walls developed the engineering allowed for an iterative process to provide some flexibility in accommodating the design team's aspirations. This is a critical collaborative step in the design process which is often missed in infrastructure projects; ownership of this phase is shared between designer and engineer, however strong design leadership was required.

Figure 9. Flood mitigation and stormwater cleansing are celebrated with green infrastructure.

4. CONCLUSION

The design of Kopupaka Park has deliberately challenged stormwater reserve expectations in an attempt to illustrate how urban growth can be balanced with ecological restoration and the creation of new civic spaces. The emerging results offer a new precedent for place making; a locally responsive environmental design that integrates engineering, ecological, cultural and community outcomes.

Reed (2010) argues for the potential of ecology to be a more complex and more provocative formative idea for how cities are made and reshaped. Among the four design practices set out he describes 'hybrid ecologies' as design systems that tap into environmental, engineering and social dynamics simultaneously. Such systems are open ended, engaged in large scale environmental dynamics and put human and non-human systems and elements into dialogue.

We must constantly evolve public spaces and civic expression in response to place and culture. Kopupaka Park offers an alternative model, a hybrid infrastructure that performs an engineering function, restores ecologies and also invigorates civic life.

Figure 10. Kopupaka Park under construction.

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Richard Challis – Stormwater Planning team

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Iwi:

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Ngāti Whātua Nga Rima o Kaipara

Te Kawerau a Maki

Core Consultant Team:

Isthmus – Project Direction, Urban Design and Landscape Architecture

Blue Barn Consulting – Civil Engineering

Coffey – Structural & Geotechnical Engineering

Thomas Civil - Ecology

Rawstorne Studio – Art Direction

WT Partnership – Quantity Surveying

Wider Consultant Team:

RCP – Project Management

Cato Engineering – Construction Management

Contracting Team:

A&R earthworks – bulk earthworks construction

ICB Construction –crib wall construction works

Cameron Civil – civil construction works

Natural Habitats – riparian planting

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