Te Whakaoranga o Te Puhinui: Te Tuuhuratanga

Te Puhinui Regeneration Discovery Document

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Prepared by

RESILIOSTUDIO

in association with Jasmax, Crank, Mau, Done, Morphum, WSP Opus, Native by Nature

For Eke Panuku Development

Te Whakaoranga o Te Puhinui: Te Tuuhuratanga | Te Puhinui Regeneration Discovery Document

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LIMITATIONS

This report has been prepared exclusively for Eke Panuku Development Auckland on the basis of the brief received by Resilio Studio. Resilio Studio accepts no liability or responsibility whatsoever for the use or reliance upon this report by any unauthorised third party.

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This document is a compilation of research relating to Te Puhinui (Puhinui Catchment) derived from a range of primary and secondary sources. This document has been created with assistance and input from multiple collaborators and partners.

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*Note: Best attempts have been made to use te reo Waiohua throughout the document. However, the names used for specific species in this document don't necessarily reflect Te Waiohua dialect. Further work is required to confirm Te Waiohua names for all the species identified in this document.

Contents

1. Introduction

This document captures and presents the key findings and insights gained through the discovery and interpretation phases of the development of Te Whakaoranga o Te Puhinui: Te Rautaki | Te Puhinui Regeneration Strategy.

The purpose of the discovery phase was to learn and document as much relevant knowledge as possible about Te Puhinui in order to help provide a rich picture and shared understanding of the historic and current states of the catchment for those involved in the regeneration. It involved gathering knowledge using a range of techniques and from a range of sources including primary sources such as field research, direct observation, co-design workshops, interviews and focus groups and secondary sources such as existing data sets, technical reports, literature reviews, archives etc.

The key purpose of the interpretation phase has been to make meaning of the information gathered during the discovery phase. Through considered and collaborative interpretation of themes and patterns, the process has started to reveal insights and root causes to help deepen the collective understanding of Te Puhinui and reveal its essential character. Core constraints, challenges and opportunities were framed in a way that focused further design and development toward the place source potential of Te Puhinui.

The discovery and interpretation phases were underpinned by two foundation frameworks - nested wholes and 8 forms of capital. The core instruments (tools and methods) used included site visits and observation, mapping, empathic enquiry, and the identification of patterns and themes to gain insight and frame key constraints, challenges, and opportunities, which define the key parameters for developing effective strategies for regenerating Te Puhinui.

Purpose of this document

The discovery phase has involved gathering knowledge from a range of sources using several different techniques including primary sources such as field research observation, co-design workshops, interviews and focus groups and secondary sources such as existing data sets, technical reports, literature reviews, archives etc. The information gathered has included quantitative data, mapping of spatial information and qualitative research.

The key purpose of the interpretation phase has been to make meaning of the information gathered during the discovery phase. Through considered and collaborative interpretation of themes and patterns it seeks to reveal insights and root causes, in order to identify underlying themes, patterns and insights and to deepen our collective understanding of Te Puhinui and reveal its essential character. Core constraints, challenges and opportunities are framed to enable the ongoing process of development toward its place sourced potential.

Place source potential arises from the relationship between what makes a place unique and the value that this uniqueness can bring into the larger system in which it is nested and upon which it depends for its success.

The purpose of this document is to capture and make meaning of relevant information about Puhinui Catchment

In a way that is accessible to a wide range of audiences (including but not limited to public, private and civic agencies, organisations and individuals)

So that the understanding gained through this phase of the project continues to feed the ongoing regeneration of Te Puhinui and development toward its potential.

Nested wholes

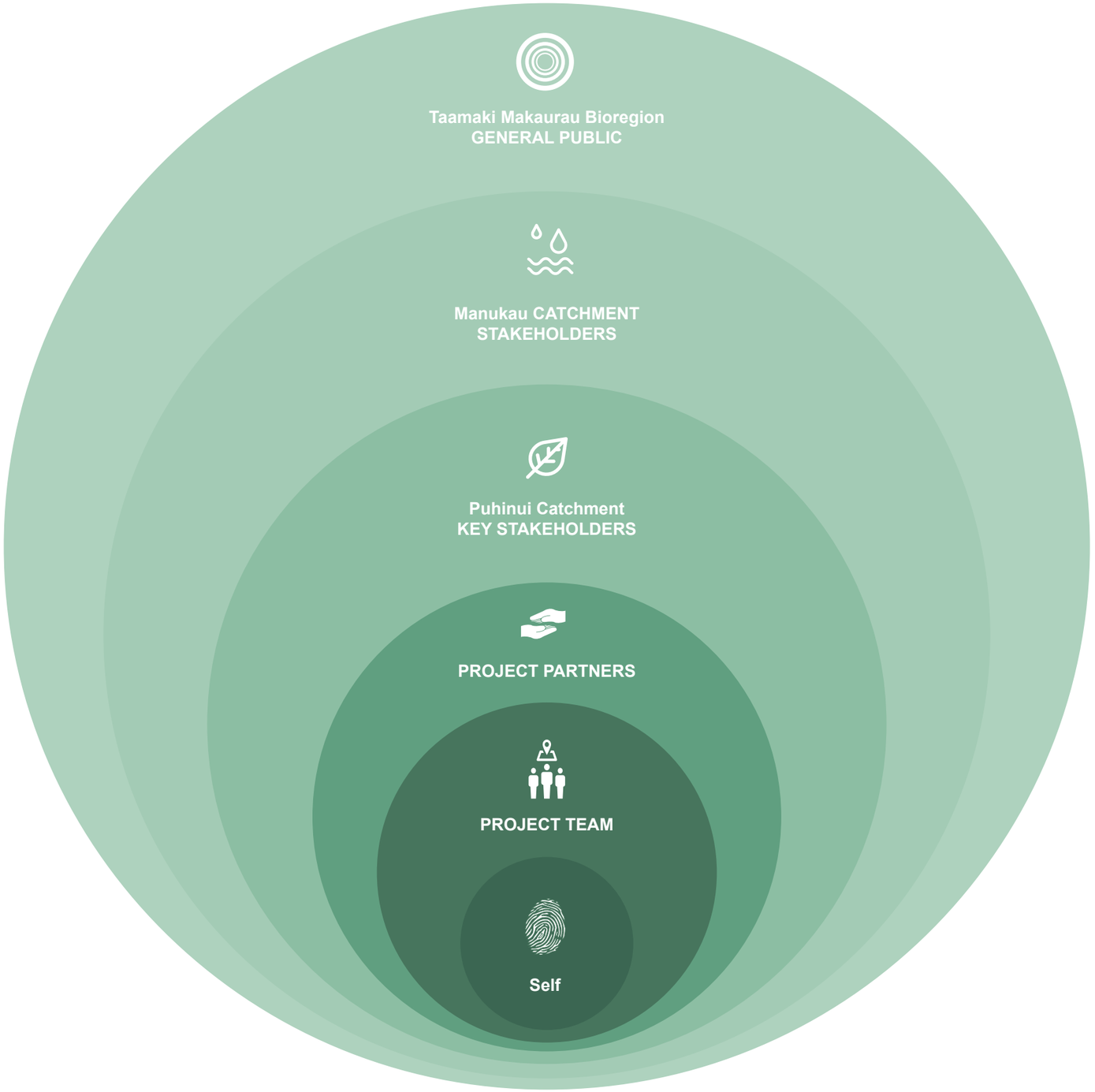
Living systems design recognises nested wholes, or wholes within wholes. These apply equally to the living world and living landscapes as they do to the socio-cultural human landscape of a place.

A living system such as Te Puhinui is a coherent whole. This whole simultaneously integrates with and contributes to larger living systems while being made up of a multiplicity of smaller living systems.

The regeneration of Puhinui Stream needs to be considered and understood within the context of the larger living systems that it is a part of and contributes to. Understanding the larger context within which Puhinui Catchment is located is a key to ensure that design responses always consider the larger systems it serves.

In the opposite direction, Puhinui Catchment is the manifestation of multiple living systems which include the abiotic, biotic and socio-cultural communities of Te Puhinui. Understanding how these smaller living systems contribute to the health and regeneration of Puhinui Catchment is also crucial.

Nested wholes is the foundation framework utilised to better understand the place sourced potential for Te Puhinui.



8 forms of capital

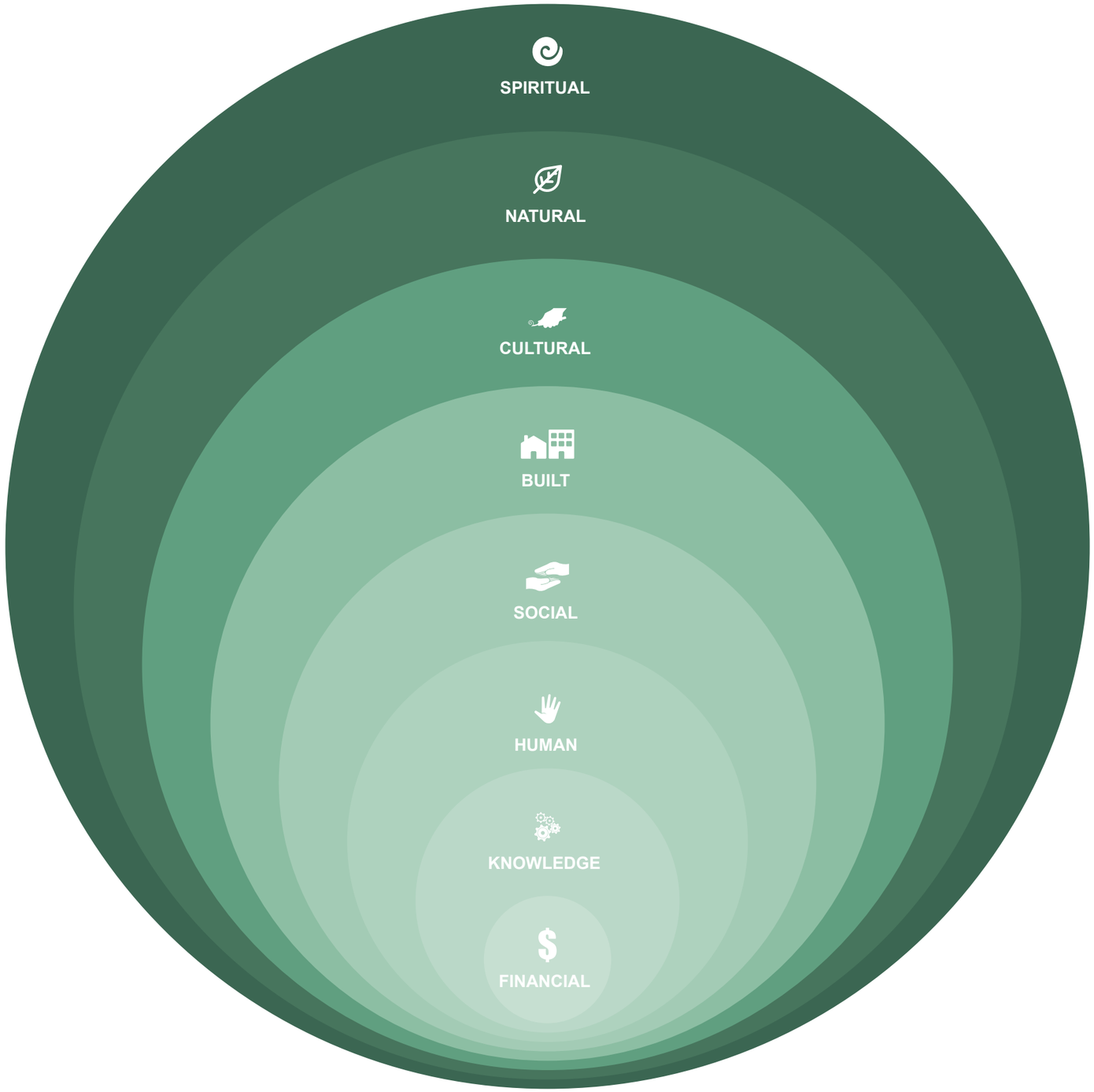
Capital means different things in different contexts - here “capital” is synonymous with “wealth”, capability and/or “stores of value” - it is how systems and communities accrue and store wealth and energy over time.

The eight forms of capital are utilised as a framework to deepen our understanding of the place source potential of Puhinui Catchment. They are:

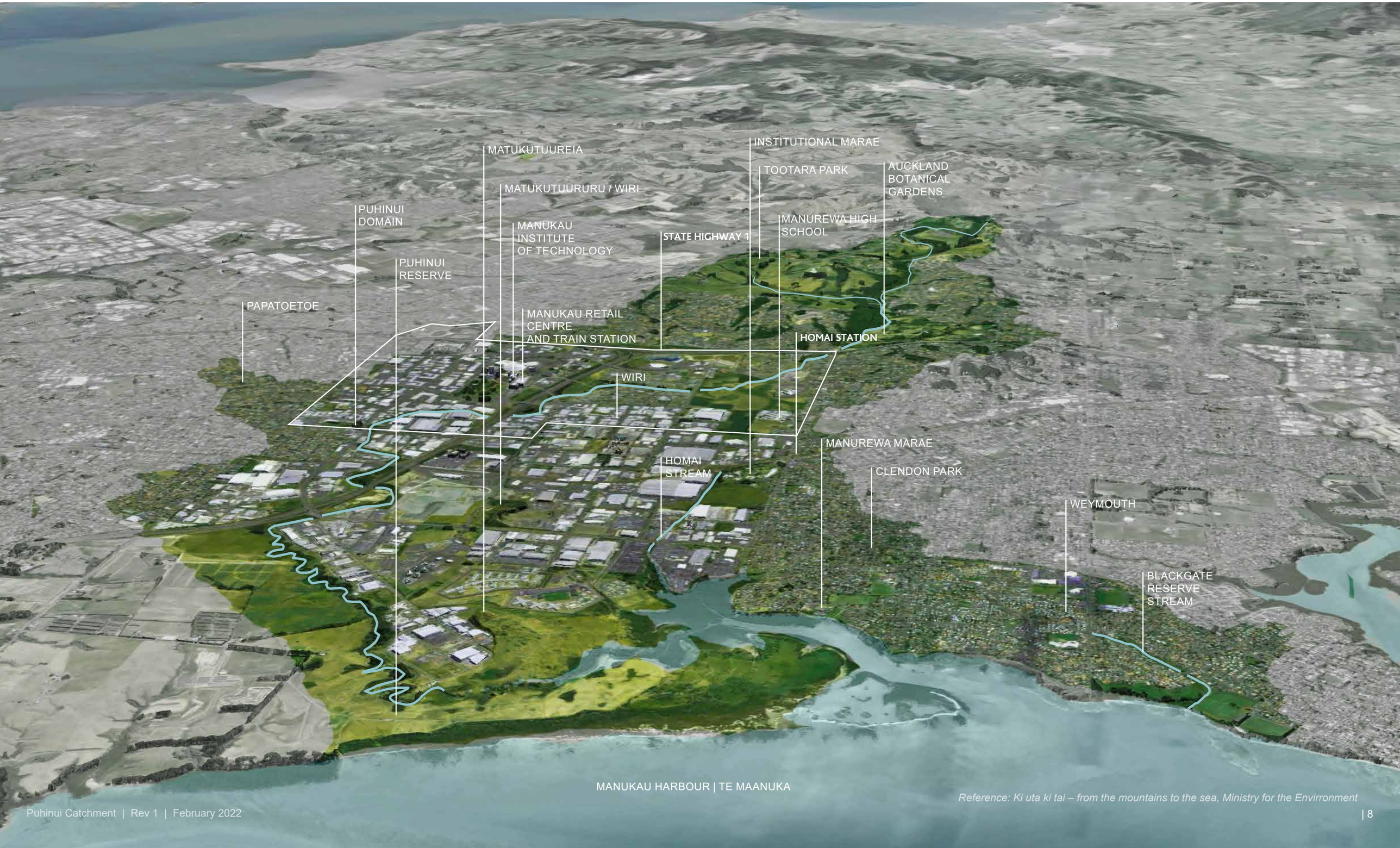
- Spiritual
- Natural
- Cultural
- Built
- Social
- Human
- Knowledge
- Financial

In particular the different forms of capital are used as the organising framework for mapping the multiple aspects / layers that make up Puhinui Catchment.

As well as doing things smarter from here on in, we have a collective responsibility to actively rehabilitate the historic damage already inflicted on the planet, society and a wide range of communities. The eight forms of capital is a useful framework for exploring how we can increase the ecological carrying capacity of the environment and build real wealth through multiple forms of capital.



Mai i Ngaa Maunga ki te Moana
From the Mountains to the Sea



Reference: Ki uta ki tai – from the mountains to the sea, Ministry for the Envirronment

Facts about Te Puhinui

Te Puhinui chatchment lies within the boundaries of two different local boards.

Ootara - Papatoetoe Local Board **85,122** people in 2018

24.2% are 0-14 years old
8,2% are 65+ years old
67.6% are15-65 years old

46.0% identified as Pacific People
35.1% identified as Asian
16.6% identified as European
15.7% identified as Maaori

Manurewa Local Board **95,680** people in 2018

25.8% are 0-14 years old
8,3% are 65+ years old
65.9% are 15-65 years old

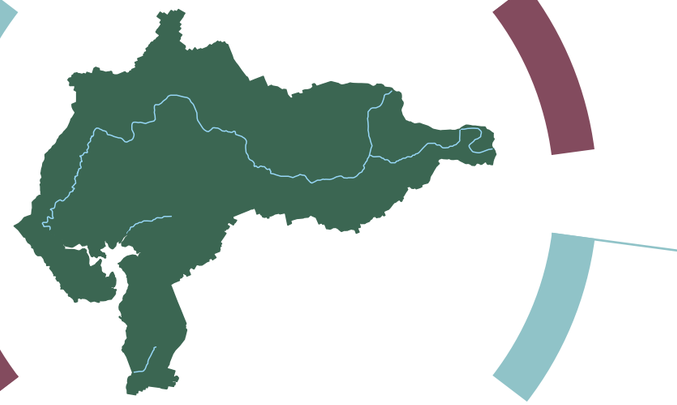
36.3% identified as Pacific People
29.2% identified as European
26.0% identified as Maaori
25.4% identified as Asian

Within Puhinui Catchment, there are:

- 45 schools
- 2 marae (one institutional and one Taura Here marae)
- 7 neighbourhoods
- 4 towns (Manukau, Wiri, Manurewa, Papatoetoe)
- 56 open spaces
- 15 different land use types

Te Waiohua iwi have primary Mana Whenua interest in the Puhinui Catchment area. Te Waiohua are comprised of Ngaati Te Ata, Te Ākitai Waiohua, and Ngaati Tamaoho.

On the 14th June of 2019, Mayor Phil Goff fulfilled his pledge of planting a million trees in this term of council. The millionth tree - a puuriri - was planted during a public planting event at Tootara Park alongside more than 250 volunteers, Mana Whenua representatives and partners including the Department of Corrections and Te Uru Rakau.



Te Puhinui natural capital is rich with:

- 8 unique geological formations, some as old as 23 million years old
- 3 different soil types
- 6 different potential ecosystems.

Te Puhinui has one of New Zealand's oldest archaeological sites that represents human activity: the Matukutuureia Stonefields.

Te Puhinui is home to three maunga and New Zealand's longest and most significant lava cave.

Over 25% of the land use in the catchment is industrial. In 2013, there were 1,209 businesses located in Manukau Central, with an increase of 10.9% from February 2006.

Puhinui Catchment is approximately 2,964 hectares.

Puhinui Stream is approximately 12 km in length, a significant proportion of which is in Council ownership.

In 2010, the stream was considered the dirtiest of all 31 streams that were monitored by the Auckland Regional Council. It was also rated in the bottom 25% of rivers for E. coli, ammoniacal nitrogen and total phosphorus levels.

3.6 tonnes of rubbish were removed in 2016 by 2000 volunteers including 200 supermarket shopping trolleys and 300 car tyres.

In 2016, Puhinui Stream was named New Zealand's most improved river at the NZ River Awards. This was achieved after years of work cleaning up the stream involving community, local schools, business such as Nestle and the Manukau Beautification Charitable Trust.

2. Essence of Place

Regenerative design must start with the whole - in this case Puhinui Catchment.

The regeneration of Te Puhinui needs to be considered and understood within the context of the larger living systems that it is a part of and contributes to. Te Puhinui is one of many catchments that make up the receiving environment for Te Maanuka / the Manukau Harbour - the larger living system that Te Puhinui is a critical part of. The Manukau Harbour and its receiving environment is itself one of at least eight larger catchments that collectively make up the Taamaki Makaurau bioregion - the larger living whole in which Te Puhinui is embedded.

An aspiration for Te Puhinui's regeneration is for the catchment to play a specific and unique role in the ecological, social, cultural and economic regeneration of its larger living systems.

Taamaki Makaurau
The Auckland bio-region

Located between two coastlines and on a volcanic field, the landforms of the Auckland bioregion are unique and diverse. The urban core of the region sprawls between the Manukau and Waitemataa harbours and is anchored on the west by the Waitaakere Ranges and to the south east by the Hunua Ranges. The north west of the region is bounded by a third harbour, Kaipara, the largest in the southern hemisphere. The greater Auckland area is approximately 53,000 ha, the majority of the land beyond the urban boundary is in rural pastoral, forestry or horticulture.

A complex geological history spanning over 200 million years, including extensive periods of volcanic activity, has produced a diverse array of distinctive landforms. Over 50 volcanic maunga, a number of tuff ring lakes, basins, lava flows, scoria cones and maar craters extend across the Auckland region.

The former vegetation of Auckland was dominated by distinct, location-specific forest types. These included coastal forests of pohuutukawa, puuriri, tiitoki and taraire, inland kauri, podocarp, broadleaved forests (found in the Waitaakere and Hunua ranges) and kahikatea forests on flood-prone alluvial river terraces and small pockets of beech forests. The region was also home to a variety of other ecosystem types including fresh and saline wetlands, mangrove forests, sand dunes and unique geothermal, cliff and cave ecosystems.

Maaori settlement was clustered on and around the fertile soils of the volcanoes, the coastal edges of the harbours or the coastal valleys of the west coast of the region. Many sites have been destroyed or have suffered extensive damage through deforestation, cultivation, urbanisation, quarrying and marine erosion. Today there are nineteen iwi authorities recognised as Mana Whenua of Taamaki Makaurau.

Starting with Ngaapuhi in the 1810's and continuing into the 1830's, tribes throughout Aotearoa engaged in trade and warfare in muskets. However, Auckland tribes were particularly impacted by musket raids from the north changing the political landscape of Taamaki Makaurau. Muskets (ngutu paarera) changed the face of intertribal warfare, decimating some tribes and drastically altering the rohe (territorial boundaries) of others. Many were enslaved or became refugees. By the 1830s campaigns had become too costly. With European diseases also taking a heavy toll, warfare gave way to economic rivalry[1].

European colonisation began in the mid 1800's. The urbanisation of the landscape began early in the colonial process and increased on a vast scale post WWII up to the 1980s. Since the 1980s the region has become more densely populated and despite efforts to limit the extent of Auckland's urban footprint, the city has continued to expand into productive landscapes where the land and enabling infrastructure permit.

Auckland's total population is around 1,650,000 making up approximately 33% of the population of Aotearoa. Projected population growth from natural increase and immigration is estimated to reach up to 2,500,000 by 2043. It is home to over 120 different ethnicities, making it the most ethnically diverse region in the country.

Most of the population growth can be attributed to Auckland being the largest commercial centre in Aotearoa, contributing 40% of the country's GDP.

1. *https://nzhistory.govt.nz/war/new-zealands-19th-century-wars/the-musket-wars*

Nga Tohu oo Taamaki Makaurau
Site location

Scale: 1_600 000@A3

0 10 25 50KM

Te Maanuka
Manukau Harbour

Te Maanuka / Manukau Harbour is 340 km² and the second largest harbour in New Zealand. Characterised by extensive mudflats and salt marshes historically it was a highly productive marine environment. The harbour mouth is 2km wide and bounded either side by rugged headlands. Powerful tidal currents surge into the harbour. These are transported through an arterial network of channels that flow throughout the harbour, some of which are deep enough for fishing boats to reach Onehunga wharf.

Highly valued ecological areas of coastal vegetation are distributed throughout the harbour and include seagrass beds, saltmarsh, and mangrove forests. The harbour is especially significant for native and migratory wading birds. It is estimated to support more than 20% of the total New Zealand wader population[1]. It is also significant habitat for New Zealand shorebirds and is currently at a critical point. Declining feeding and roosting habitats of the harbour shorebirds is mainly due to the increasing sedimentation of the harbour, the increasing number of stormwater and treated wastewater discharges and the spread of mangroves.

Te Waiohua iwi have primary Mana Whenua interest in the Manukau Harbour. Te Waiohua are comprised of Ngaati Te Ata, Te Ākitai Waiohua, and Ngaati Tamaoho. The Manukau land area was once fertile and supported abundant kai moana resources from the harbour. The Manukau Harbour was an important transport link for Maaori between the Waikato River and Waitemataa and Kaipara harbours. Prior to European migration and settlement in Taamaki Makaurau, Te Waiohua iwi had paa and kaainga sites that were actively cultivated throughout the harbour and South Auckland including Maangere, Ihumatao, Papakura, Drury, Red Hill, Kirikiri, Ramarama, Karaka, Pokeno and Pukekohe.

The impact of the Musket Wars on the Puhinui Catchment area involved the displacement of Mana Whenua, the abandonment of local settlements including Ngaa Matukurua, and the resettlement of Te Waiohua to Waikato under the protection of the Waikato warrior and leader Pootatau Te Wherowhero. Te Wherowhero later escorted Te Waiohua back to South Auckland and offered his ongoing protection as they re-established their presence in their traditional lands.

Europeans began to settle from the early 1800s, purchasing varying amounts of land from local iwi. While initial exchangers provided mutual benefit, increasing numbers of settlers increased colonial government demand for more land from Maaori. Resistance to sell resulted in dissention and from 1840 - 1870 extensive Land Wars between Maaori and the colonial government forces spread throughout the North Island. In Taamaki Makaurau, government policy treated local Maaori as ‘rebels’, and Te Ākitai, Ngaati Tamaoho, and Ngaati Te Ata lands on the Manukau were confiscated as ‘punishment’[2].

After the Land Wars, small portions of land were awarded back to some individuals from Te Waiohua iwi. An area of land was retained at Puukaki and provided Te Waiohua iwi a place and opportunity to rebuild[3].

Much of the Manukau Harbour area remained rural until the 1950s. By the mid 1950s the southern motorway was built and extended to Redoubt Road opening the doors for industrial and housing development through Ootaahuhu, Maangere, Papatoetoe, Manukau and Manurewa. The remaining rural land is primarily located in Franklin, as well as Papakura Local Board areas along the southern coast of the harbour. While the remaining populations are mainly urban, most live in low to medium density housing and suburban settlements with the harbour catchment. The communities living within the Manukau Harbour catchment area today are incredibly diverse and for most the harbour does not play a significant role in their daily life nor is it a source of identity or pride.

The first Pacific groups started to settle in Auckland around the 1960s and were mainly from Polynesian islands that were historical territories of the New Zealand government, such as Samoa, Tonga, Cook Islands, Tokelau and Niue. Manukau is regarded as the largest polynesian settlement in the world[4]. Maaori from all iwi of Aotearoa today live in the Manukau area.

Today, through the amalgamation of previous local authorities into a single regional Auckland Council, the Manukau Harbour has been divided into eight local board areas: Waitaakere Ranges, Whau, Puketaapapa, Maungakiekie-Taamaki, Maangere-Ootaahuhu, Ootara-Papatoetoe, Manurewa, Papakura and Franklin.

Significant population and commercial growth is expected to continue in the Manukau area over the next 30 years. The residential population is expected to increase from around 6000 households at present to over 10,500 and the number of jobs is expected to increase by over 22,500 to around 56,000. Manukau and the surrounding business area produce about 14% of Auckland’s gross domestic product[5].

Much of early industrial development in the south was located on the edge of the Manukau Harbour. Two prominent industrial features on the eastern shore of the harbour is the Maangere Wastewater Treatment Plant and the Auckland International Airport, both infrastructure built in the 1960s. The airport runway was built on “reclaimed” land, which covers around 66 hectares of the historic coastal marine area.

For many years industrial development surrounding the Manukau Harbour was not monitored. By the 1980s some of the major heavy industries closed and were replaced with new industrial parks, commercial/ business centres and vast swathes of suburban housing. This change in land use resulted in significant degradation of the health of the harbour and associated waterways.

1. *http://www.aucklandcity.govt.nz/council/documents/technicalpublications/TR2009_112%20-%20Environmental%20Condition%20and%20Values%20of%20Manukau%20Harbour.pdf*
2. *http://www.treaty2u.govt.nz/the-treaty-today/the-manukau-claim/index.htm*
3. *http://www.teakitai.com/index.php/about-us*
4. *https://www.aucklandcouncil.govt.nz/plans-projects-policies-reports-bylaws/our-plans-strategies/auckland-plan/about-the-auckland-plan/Pages/pacific-auckland.aspx*
5. *https://www.aucklandcouncil.govt.nz/plans-projects-policies-reports-bylaws/our-plans-strategies/auckland-plan/development-strategy/future-auckland/Pages/what-manukau-look-like-future.aspx*

Te Maanuka
Manukau Harbour

In 2010 the Manukau Harbour Forum was set up in response to the worsening condition of the harbour. The forum consists of representatives from the nine local boards that directly border the Manukau Harbour.

In 2018 the overall health of the main body of the Manukau Harbour, which takes into account the influences of metal contaminants, mud content and macrofaunal community functionality, was classified as “moderate” to “extremely good” in some harbour areas. However, the tidal arms recorded worse overall health scores than the main harbour and were generally classified as “unhealthy” with low resilience[6].

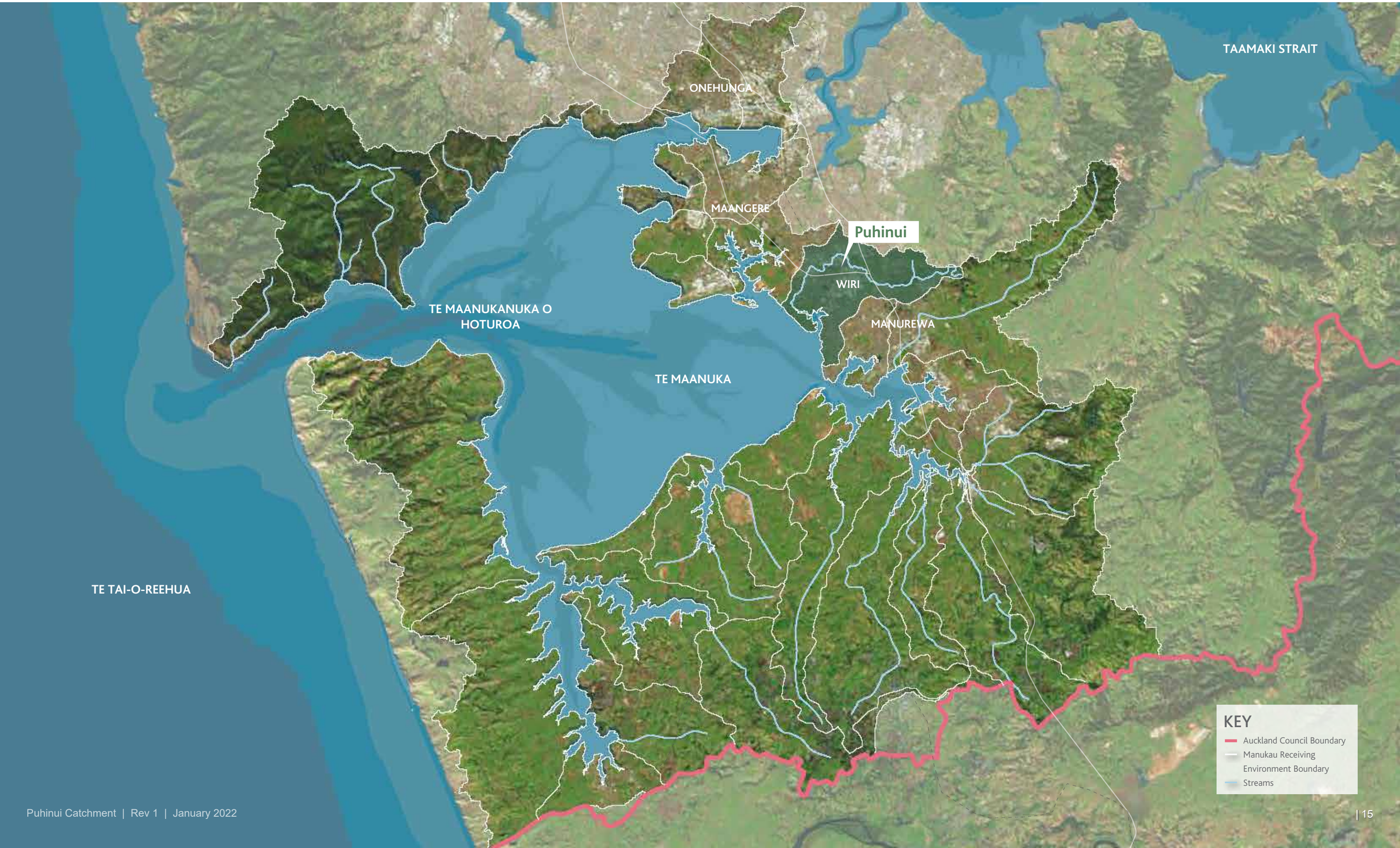
A 13 km pipeline running from Western Springs to the Mangere treatment plant known as the Central Interceptor is currently being developed by Watercare to address Taamaki Makaurau’s aging and fragile water pipe infrastructure. The Central Interceptor is estimated to bring 2 million cubic metres of sewage and stormwater from central Auckland to Maangere each year as a mechanism to mitigate it being discharged into both the Waitemataa and Manukau harbours. It is proposed that the wastewater will be stored, treated and discharged into the Manukau. There is concern that this scheme may discharge excessive amounts of fresh water into the shallow harbour which could impact the habitat of the salt water fish, shellfish and threaten feeding and roosting habitats of the harbour shorebirds.

6. *https://knowledgeauckland.org.nz/media/1346/tr2019-025-manukau-harbour-intertidal-ecology-monitoring-1987-2018.pdf*

Manukau Harbour receiving environment

Scale: 1_200 000@A3

0 2 10 20KM



The essence of Te Puhinui

ENVIRONMENTAL WELL-BEING

Puhinui Catchment covers approximately 2,964 hectares. Topographically, it is characterised by low lying, gently rolling terrain in the lower catchment and stepper incised gullies in the upper catchment where it drops steeply down through Tootara Park and the Auckland Botanic Gardens before flattening out to a broad middle and lower catchment. The top of Puhinui Catchment is located 170m above sea level and 10km east of the coastal edge and mouth of Puhinui Stream.

The topography of Puhinui Catchment and stream, including natural channels and floodplains, has been modified significantly by urbanisation and in particular, through the construction of two state highways and the leveling of land for the urban and industrial areas through the middle of the catchment. Significant areas of the catchment are now paved and piped causing significant loss of ecological, recreational and amenity values[1]. Until recently the stream was renowned for its poor water quality - a neglected space used predominantly as a place to discard waste and contaminants from stormwater runoff[2].

Geology

The oldest areas of the Manukau Harbour catchment are located in the foothills east of Papakura and date back to the origins of the New Zealand land mass over 100 million years ago (m.y.a). Approximately 22 m.y.a, Auckland began to subside into the Waitemataa Basin and sediment eroding for the landmass was deposited on the seafloor. At the same time, volcanism to the west of the subsiding basin began and remnants of the old volcanoes now form the Waitaakere Ranges at the northern headland of the Manukau Harbour.
As the subduction zone migrated south, so too did the volcanism which began on the Coromandel Peninsula approximately 18 m.y.a. Subduction then ceased and by about 16 m.y.a the Waitemataa Basin had been uplifted to form the cliffs along the northern edge of the Manukau Harbour and the land in the upper Puhinui Catchment. From about 2 m.y.a, sediment from the Taupo Volcanic Zone flowed through the ancestral Waipa River to be deposited to the west coast and onto the Manukau lowlands, creating the highly fertile soils over the lower catchment of Te Puhinui. At the coast, currents transported sand northwards to form the Awhitu Peninsula which encloses Manukau Harbour from the sea.
Approximately 35,000 years ago the Auckland Volcanic Field became active and is a defining characteristic of the Auckland Isthmus and surrounding areas. The volcanic field includes over 50 volcanoes, three of which are located in Puhinui Catchment - Matukutuururu, Matukutuureia and Ash Hill. Matukutuururu and Matukutuureia, collectively known as Ngaa Matukurua, erupted approximately 30,000 - 35,000 years ago. Matukutuururu once had a scoria cone 80 metres high before being quarried to its current height of 45m. The lava flows from its formation created Wiri Lava Cave, Auckland's longest known lava cave. Matukutuureia's original peak was 73 metres but has been quarried to a small pyramid-shaped mound. The eastern side of the cone and large area of lava flow to the south remain un-quarried and form the foundations of the culturally significant Matukuturua Stonefields gardens. Ash Hill was first recognised as a volcano in 1961 and has no known Maaori name. Prior to the eruption of the volcanic cones, it is likely that Puhinui Stream would have been more like an estuary than a stream.

Climate

Te Puhinui has a subtropical climate, with warm humid summers and mild winters. The prevailing winds come from the southwest, particularly in winter and spring. The median annual rainfall is approximately 1,200mm. Te Puhinui experiences infrequent flooding and some properties are at risk of flooding during larger events.

As a result of a changing climate, Te Puhinui will get drier overall, but when it does rain it will be heavier. It will be warmer, particularly in built up and paved areas, which will be subject to the urban heat island effect. Depending on the extent of inundation, approximately 90ha of low lying land in Te Puhinui Reserve along the coastal edge and around the mouth of Puhinui Stream and estuary is at risk of coastal inundation over the next 100 years.

Soil

Puhinui Catchment is composed of three different types of soil. Waitemataa residual soils are the oldest, and are located in the upper catchment. Alluvial soils form a highly fertile soil mantle in the middle and lower catchment of Te Puhinui. The Isthmus Volcanic Soils correspond to the lava, scoria and lithic tuff geology of the three volcanic cones of Puhinui Catchment.

Te Puhinui soils are relatively well drained, are highly productive, and are highly modified through deforestation, rural land uses followed by urbanisation. There are some residual areas of highly productive soils in the upper catchment lower catchment with small pockets in the mid catchment.

Hydrology and Water

There are three streams in Puhinui Catchment - Puhinui Stream, Homai Stream and Blackgate Reserve Stream. They are all heavily modified, either channelised and straightened for conveyance and lined with concrete to prevent erosion or constrained significantly by commercial and industrial developments. Several erosion 'hotspots' have been identified near stormwater pipe outlets draining commercial and industrial land uses and in bush fragments with poor bank vegetation in the upper catchment.

Puhinui Stream is typically soft-bottomed, made up of gravel, sand and mud. Prior

1. *https://www.health.govt.nz/system/files/documents/pages/manukau-hia-2009-report-part5.pdf*
2. *Krpo, Ana. GIS model for assessment of land use and urban development effects on stormwater runoff: Puhinui Catchment case study. AUT, 2004*

The essence of Te Puhinui

to deforestation, the stream would have meandered across the land. Once tree coverage was removed the stream became more incised and the alignment became more fixed. This process contributed significantly to sedimentation of Puhinui Estuary and Manukau Harbour.

In a typical catchment, an overall reduction of stream and wetland health - as measured by criteria such as pollutant loads, habitat quality, and aquatic species abundance and diversity - begins when 10% of a water catchment is covered with impervious surfaces. With impervious coverage of more than 30% of a water catchment, impacts become severe and degradation is almost unavoidable[3]. Currently 29% of Puhinui Catchment is impervious and this is expected to increase to approximately 44% once the development outcomes sought in the Auckland Unitary Plan and Manukau Framework Plan are achieved.

Flooding represents a significant health and safety risk to people and property, particularly access issues for residents with reduced mobility, even where buildings are elevated above flood levels. Approximately 20% of Puhinui Catchment is subject to flooding. There are over 2000 buildings in Puhinui Catchment located within the floodplain. While the majority of these have their floor levels above predicted flood levels, approximately 123 residential and commercial buildings in the catchment are predicted to be under water during large storm events (1 in 100 year storm). It is estimated that this number would increase to 203 with continued urbanisation and the ongoing effects of a changing climate.

Water quality is a measure of the pollutant and contaminant loads which include sedimentation, nutrients, heavy metals, hydrocarbons and petrochemicals, and pesticides, as well as temperature and organic contaminants present in water flowing in the stream and the water flowing over and through the land. Aquatic ecosystems are very sensitive to water quality changes. In 2016, LAWA (Land, Air, Water, Aotearoa) assessed Puhinui Stream as ‘poor - making it unsuitable for contact recreation’. The report also indicates the Macroinvertebrate Community Index (MCI) has a ‘likely improving’ trend.

Ecology

Te Puhinui is home to a variety of coastal and forest birds as well as a wide range of insects, spiders and other invertebrates, frogs, skinks and geckos, fish and eels and even bats native to the area. Due to the significant urbanisation of Te Puhinui, it is also home to a wide range of introduced plant and animal species. Exotic plants include easily recognisable species such as pine, macrocarpa, eucalyptus, pampas grass, blue convolvulus, japanese honeysuckle, jasmine, mothplant, onion weed and tradescantia. Exotic animals include dogs, cats, and pest species such as rats, feral and unowned cats, stoats, rabbits, hedgehogs, possum and wasps.

The ecosystems of Te Puhinui have been significantly modified. With an average canopy cover of between 9-15%, Puhinui Catchment has some of the lowest canopy cover in the region. The remaining forest cover remains fragmented and isolated and are mainly composed of exotic species. With the exception of the patches of forest in the Botanic Gardens, Tootara Park, David Nathan Park and along the coastal edge and inner harbour around Puhinui Reserve, Puhinui is an urban ecology. The remaining patches of indegnous ecosystems are under threat due to the pressures of urbanisation and the associated stresses of habitat loss, mammalian pests, competition from noxious plants and kauri dieback. These stresses are likely to be exacerbated by intensification of the catchment and a changing climate.

Puhinui Catchment was once home to six distinct ecosystems. These can be described as three broad ecosystem types: inland forests, coastal ecosystems and stream and aquatic habitats. Mangrove forests are the only ecosystem type in Te Puhinui that are not endangered or critically endangered. As much as we may wish to do so, we can not re-create the ecosystems of the past. As well as being an urban ecology, Te Puhinui is a ‘novel ecosystem’ composed of a unique collection of species that include both exotic and native species that result from human agency and influence but are often not directly or consciously managed by people.

Taamaki Makaurau is a temperate rainforest and the tendency of Puhinui Catchment is to ‘succeed’ from the current state toward a forested landscape - this is nature’s response to disturbance. Whether it is planned or not, as Te Puhinui continues to revert to a forested landscape, new and novel ecosystems will emerge that will create communities of plants and animals that have never coexisted before. These new communities will provide the genetic material for the ecosystems of the future. While the catchment cannot be revegetated to replicate an historic ecosystem; patches of native vegetation and natural stormwater devices in parks and opens spaces, reserves, streets, roads, schools and backyards provide opportunities for ‘novel urban ecologies’ to emerge throughout the catchment and integrate with the built fabric in a way that reflects the older and deeper ecological patterns of Te Puhinui.

Energy

While there is a significant amount of data available for energy demand by sector and type at a national level, there is limited data available for local energy use. While this information can not be extrapolated down to represent the energy use in Te Puhinui specifically, it does provide a high level overview of the energy mix. New Zealand is a net energy importer with approximately 60% of New Zealand’s energy coming from fossil hydrocarbons and 40% from renewable sources. Energy dependency on non renewable sources of energy leaves the economy and its communities vulnerable to changing market conditions and inevitable reduction in availability once stocks of non renewable resources start to dwindle.

3. Arnold and Gibbons, 1996: sighted by Ferguson, 1998.

The essence of Te Puhinui

Sustainability

In 2016, New Zealand's ecological footprint was 4.8 global hectares per person and as a whole there was a biocapacity of 4.6 hectares per person. While New Zealand has the advantage of having large per person biocapacity due to low population density and naturally high ecological production and if everyone alive in 2016 lived the same lifestyle as a typical New Zealander we would need the equivalent of 3 Earths to meet the demands of our ecological footprint. Improving and maintaining the well-being of Te Puihinui's communities while changing lifestyles in a way that reduces their ecological footprint to sustainable levels that fit within the carrying capacity of the Auckland bioregion is one of the most profound challenges of the 21st century.

Food

Food is a prerequisite for all life and a key contributor to well-being, yet it is often taken for granted in our modern industrial society. Today, our food gets to us via a complex system involving all the processes and infrastructure involved in feeding a population: production, processing, distribution, marketing, consumption, and disposal of organic and food related items. While there is a wide range of data available relating to the different actors in New Zealand's food system such as agriculture and primary production, transport, environmental health and community well-being, there is limited information about how the system works as a whole and limited data is available for local food systems.

Te Puhinui was once characterised by highly productive soils and rich kai moana resources. Matukuturua Stonefields gardens are a significant cultural landmark reflecting this historic land use. The current Te Puhinui food system is heavily dependent on imported food including produce. With the exception of the rural land in Tootara Park and Puhinui Reserve, there are limited productive land use activities in the catchment today. One notable exception to this is the emerging Te Maara Kai o Wirihana. Existing production on the most fertile remaining soils in the lower catchment is zoned for industrial development under the Unitary Plan.

Today, a majority of Puhinui Catchment is simultaneously a 'food desert' and a 'food swamp'. A food desert is a place where affordable, healthy food options (especially fresh fruits and vegetables) are limited or non-existent due to the absence of easily accessible grocery stores or other specialist food shops. A food swamp is an area where fast food outlets outnumber healthy food outlets[4]. Whilst the current food system is convenient for most people, and economically efficient by industrial standards, it is environmentally unsustainable, and does not cater for the needs of the culturally diverse communities of Te Puhinui[5].
Organic wastes make up 40% of Aucklanders' domestic waste by weight which typically end up in landfill. There are a number of initiatives across Auckland and within Te Puhinui that are seeking to address challenges relating to food waste.

Te Puhinui's natural capital and land use patterns also mean that opportunities for production in Te Puhinui should be focused on intensive, small-scale productive gardens and orchards for fresh fruit and vegetables and some livestock. Small scale intensive systems require more energy input per area of land than extensive systems and typically have higher yields. Three intensive food production systems suitable for Te Puhinui include intensive gardens, orchards and perennial crops and food forests.

Land Use and Urban Form

Te Puhinui consists of a mix of low density land uses stretching across the landscape. The land use pattern is characterised by large, single use blocks serviced by large-scale vehicular corridors, major intersections, and extensive areas of surface car parking. There are limited pedestrian cycle connections through the catchment and those that do exist are often of poor quality, require maintenance and repair and are unsafe. Most of the catchment is used for industrial, commercial and residential purposes, with small areas of rural production in the upper catchment including Tootara Park and in the lower catchment along the coast as part of Puhinui Reserve.

Prior to the 1970s, the outer areas of Auckland were largely rural with small established villages such as Papatoetoe and Manurewa interspersed across the countryside. Post war growth resulted in mass suburbanisation stretching into the rural landscape, with South Auckland being an especially favoured area for residential development. This was also an era of major road and motorway construction with civic centres such as Manukau Central being designed and built with a strong focus on the automobile. As a consequence, Manukau's urban form is defined by the arterial routes of Great South Road and Wiri Station Road, together with the State Highway 1, Puhinui Road, Kerrs Road, Druces Road and Browns Road.

In more recent years, incremental additions have been made to Manukau's overall urban form. The construction of State Highway 20 and the new rail line extension to Manukau have improved regional connectivity but have also created local severance issues. Manukau Central has experienced intensification with developments of varying scale and quality, particularly office buildings. However small pockets of high density apartments are also now starting to contribute to the urban landscape and built form. Development to the north and south of Manukau Central has continued to consist of low density housing, light industrial and large format retail areas.

Circulation and Transport

Puhinui Catchment is easily accessible from the wider region with three train stations and two main highways within the catchment. On a local level however, this infrastructure

4. Caporuscio, 2020
5. Obesity Action Coalition, 2009

The essence of Te Puhinui

restricts connectivity and accessibility within the catchment. Large swaths of south Auckland, including Te Puhinui were also developed as car oriented settlements during the 1970's with large block size and structure and generally poor quality urban environments throughout the catchment. Compounding the matter is the fact that many people living in Te Puhinui, also live a distance from Manukau Central which makes walking impractical and generally unappealing. Access to and along Puhinui Stream is restricted and several sections of the stream are fenced off or blocked by the motorway or large industrial buildings.

Waste

In 2010, Auckland produced 1.174 million tonnes of waste for landfill. On average, every Aucklander creates around 1 tonne of solid waste, processes 60-110 kgs of recyclable materials and produces 100,000 litres of wastewater per year. This means that less than one tenth of the materials processed in Auckland is recycled into another product. The remaining material is managed as 'waste' in a linear process model from extraction through to production, use and disposal.

The Auckland region currently contains two operating landfill facilities for waste disposal - Redvale Landfill and Energy Park and Whitford Landfill. Both of Auckland's landfills are already partially full and they have a limited lifespan and are consented to collect waste up to 2028 and a replacement facility is expected to be required between 2026 and 2028. A new landfill is currently being planned 70km north of Auckland city.

While the Auckland Council has set the aspirational target of being zero waste by 2040 the Auckland Council's Waste Management and Minimisation Plan also projects that the region's waste will grow through to 2060.

CULTURAL WELL-BEING

Puhinui Catchment reveals a complex but unique cultural ecosystem of inter-related settlements, travel routes, and fishing, gardening and food and resource gathering areas. These activities are all closely associated with a series of prominent natural features and waterways that together form an integral part of the whakapapa, mythology, stories and history of Te Waiohua iwi.

Te Waiohua iwi have primary Mana Whenua interest in Te Maanuka / the Manukau Harbour and Puhinui Catchment. Te Puhinui peninsula is notable for its continued occupation by Te Waiohua since pre-European times due to its proximity and access to the coast for collecting kaimoana, fertile soils for food growing, and maunga for defence purposes. Te Puhinui is inextricably linked to the history, stories, whakapapa and mythology of Te Waiohua, who have a strong spiritual (Taha wairua) association with Te Puhinui which gives its people a sense of meaning and purpose. Cultural values to be protected encompass the geological, the coastal, archaeological, and ecological features within the catchment[6].

Through the impacts of the Musket Wars and colonisation Ngaa Matukuturua became uninhabited and local iwi lost control of their traditional territories and resource base - a situation that continues to impact on the cultural well-being of Te Puhinui today. During and after the Land Wars government policy treated local Maaori as 'rebels', and Te Ākitai, Ngaati Tamaoho, and Ngaati Te Ata lands on the Manukau were confiscated as 'punishment'[6].

Ngaa Matukurua, long term settlements and sites of immense cultural significance to Te Waiohua, have been seriously impacted by colonisation and urbanisation. Matukutuururu has been erased and Matukurtuureia has been significantly debased through extensive quarrying. Other sites of cultural significance in the catchment including the awa and estuary have also been impacted through changes in land use and urban development. Collectively this has impacted on the cultural well-being of local iwi, as well as more recent arrivals who live, work, play and learn in Te Puhinui. Until recently there has been very little visibility or public recognition of Mana Whenua sites of cultural significance.

Matukuturua Stonefields gardens are one of the few pre-European culturally significant sites that are publicly accessible that have been protected. Today this site is managed by Auckland Council as Matukuturua Stonefields Historic Reserve.

Through colonisation, urbanisation and the significant influx of immigrant populations as well as urban Maaori into the catchment, Te Puhinui is now one of the most culturally diverse areas in Aotearoa, New Zealand. It is home to one of the largest Maaori as well as Pacific people populations in the region.

Polyfest is an annual four day youth festival featuring traditional music, dance, costume and cultural speech competitions, and is one of the most recognised events on the Auckland calendar. It happens just outside Puhinui Catchment at the Manukau Sports Bowl and is a major cultural event for youth within Te Puhinui (and across Auckland) and is a showcase of Auckland's diverse cultures and a celebration of youth performance. Students compete on five stages, performing traditional items from Cook Islands, Maaori, Niue, Samoan and Tongan cultures. There is also a Diversity stage featuring performances from a range of cultural groups including Fijian, Tokelau, Chinese, Korean and Indian.

Manurewa Marae is the only urban community marae in the catchment area and it provides a wide range of cultural events, activities and services to the Manurewa community including cultural celebrations, educational programmes and a venue for social clubs. While committed to kaupapa Maaori, the marae provide many ethnicities and communities with support to practice and celebrate their culture. It is located on the edge of Puhinui Stream and has been actively championing increased access to the awa for the local community.

6. *https://unitaryplan.aucklandcouncil.govt.nz/Images/Auckland%20Unitary%20Plan%20Operative/Chapter%20I%20Precincts/4.%20South/I432%20Puhinui%20Precinct.pdf*
7. *http://www.treaty2u.govt.nz/the-treaty-today/the-manukau-claim/index.htm*

The essence of Te Puhinui

‘Language nests’ exist within the catchment area that support many of the cultures of Te Puhinui to celebrate, learn and use their native languages.

Annual Matariki events and celebrations at Tootara Park at the top of the catchment have become commonplace. Maramataka practices are being actively incorporated into activities in and around Te Puhinui by local practitioners, agencies and organisations.

As a result of limited data available on cultural health and well-being in Auckland, as well as the absence of Puhinui Catchment specific information there are many gaps in our knowledge about cultural well-being within the Puhinui Catchment area.

SOCIAL WELL-BEING

Puhinui Catchment lies within the boundaries of Ootara-Papatoetoe and Manurewa local boards.

Ootara-Papatoetoe and Manurewa are two of the three most diverse local board areas in Auckland[8]. Youth and diversity are defining characteristics of the population, with nearly a quarter of all Auckland’s children and young people residing in South Auckland and more than three quarters of the population being of either Maaori, Asian or Pacifika ethnicity. The streets, businesses and learning centres of Puhinui are filled with te reo Maaori, Samoan, Tongan, Cook Island Maaori, Mandarin, Gujarati, Hindi and Punjabi, and English being spoken.

A range of social service providers and community organisations operate in the catchment area providing a range of services for the communities of Te Puhinui.

Manurewa Marae is the only urban community marae in the catchment area and it provides a wide range of social and community services to the Manurewa community.

Schools, kura, high schools and whare kura, early childhood education and language nests (i.e. te reo Maaori & Samoan) exist through the catchment area. The main tertiary institutes in Te Puhinui are Manukau Institute of Technology (MIT), Auckland University of Technology (AUT) and Te Waananga o Aotearoa.

Puhinui Catchment is one of the most deprived areas of Auckland. The majority of Census Area Units (CAUs) in Puhinui Catchment are level 9 + 10 (most deprived) on the NZ deprivation scale.
Social deprivation is widespread within Puhinui Catchment with the middle and lower areas being particularly affected. The middle and lower catchment areas are rated as high and the upper catchment is characterised by a mixture of medium to low social deprivation depending on the area.

The New Zealand Index of Multiple Deprivation (IMD) measures deprivation at neighbourhood-scale called data zones ranging in population from 500 to 1000 (mean 712). It recognises and assesses seven domains of deprivation: employment, income, crime, housing, health, education and access to services.

Deprivation impacts both on people as well as the environment as people experiencing deprivation spend more time and energy meeting basic needs and tend to focus on their immediate circumstance and surroundings over long term, intergenerational outcomes.

Low rates of home ownership (relative to other parts of Auckland) and high rates of social housing result in a high degree of transience and limited sense of ‘home’ and pride of place, particularly in the lower and middle catchment. Household size is variable within the catchment but it is common for households to have over seven or more residents. Generally poor quality housing stock as well as overcrowding impact on health and well-being in the catchment with local populations having high rates of respiratory illnesses.

Metabolic and cardiovascular diseases and obesity are prevalent in the Puhinui Catchment area with the lower and middle catchment being particularly affected by health issues.
Many people in the catchment experience food insecurity regularly and the middle and lower catchment areas are particularly impacted by food deserts and food swamps.

Exposure to crime and gang-related activities are common, impacting on community spirit, trust and perceptions of safety in many neighbourhoods.

The lower and middle catchment are characterised by limited and where present generally low quality public open space. The exception to this is Puhinui Reserve along Puhinui Estuary and harbour edge in the lower catchment. However, access to this significant open space is difficult. This impacts on those communities’ ability to access nature and parks and reserves for active and passive recreation. The upper catchment however has two significant quality open spaces.

The middle catchment has one quality regional facility within the catchment boundary, Vodafone Events Centre, as well as good access to a second regional facility, Manukau Sports Bowl. People living in the middle catchment also have better access to regional transport networks than those in the upper and lower catchment.

According to Auckland’s draft Climate Action Framework 2019, Maaori and Pacific communities are particularly vulnerable to climate change impacts. Given the high population densities of both of these groups this has ongoing implications for health and social well-being in the catchment area.

As a result of limited data available on social health and well-being in Auckland, as well as the absence of Puhinui Catchment specific information there are many gaps in our knowledge about social well-being within the Puhinui Catchment area.

8. Statistics New Zealand, 2013.

The essence of Te Puhinui

ECONOMIC WELL-BEING

In 2018, Ootara-Papatoetoe and Manurewa Local Boards experienced similar levels of growth in terms of population, employment and business of around 2-5%. Economic growth for the Ootara-Papatoetoe area was higher than Manurewa by approximately 6%, however its recorded growth of productivity, based on the GDP of filled jobs, is recorded as being in decline by 0.2 % compared to Manurewa which is recorded as having a 0.5% growth in GDP[9].

There is a significant income gap and a higher rate of unemployment between areas of South Auckland and the rest of Auckland[10]. Compared with the rest of Taamaki Makaurau, more people in the area are unemployed and fewer people earn high wages. More young people leave school in the area without the skills and qualifications needed to find well-paid, sustainable employment and without being enrolled in tertiary study.

According to the 2018 Census the main sectors of employment within the catchment area is technicians, trade, and sales. Approximately 50% of the population is employed and approximately 6% of the population is recorded as unemployed. The average income is between $26-27,000 per annum.

The catchment is an exporter of labour, with a large portion of local residents working in southern employment areas, including Manukau Central, Auckland Airport, Highbrook and East Taamaki. Most workers in the catchment travel by car.

The informal economy comprises all the economic activities that occur outside of the formal market economy which uses national currency as a means of exchange and where transactions are regulated and taxed. Economic activities and ‘transactions’ in the informal economy on the other hand don’t necessarily involve money and are not regulated and therefore not ‘taxable’. Informal economic activities typically include most unpaid domestic ‘chores’, childcare, care of the elderly and sick outside of the formal medical system, and also includes ‘cash’ jobs like home and care repairs, and criminal activities such as theft and the drug trade. The informal economy also includes domestic activities like growing and cooking food and making and repairing clothing and appliances. While data on household and informal economics is limited, it is assumed, with the exception of criminal activity and other antisocial behaviors which negatively impact on community well-being, that the informal economy is both flourishing as well as a core contributor to social, cultural and economic well-being in Puhinui Catchment.

The core land use of Puhinui Catchment is light and heavy industry with the metropolitan centre of Manukau servicing the surrounding residential neighbourhoods. Nearly 40,000 people are recorded to work in Puhinui Catchment. Approximately 20-30% of people live and work in the catchment area[11].

There are three adjacent prisons in the Puhinui Catchment area - a men’s facility, a women’s facility and a youth facility. Social procurement has ensured that the jails provide employment for local residents.

As a result of limited data available on the informal economy in Auckland, as well as the absence of Puhinui Catchment specific information there are gaps in our knowledge about economic well-being within the Puhinui Catchment area.

9. *https://ecoprofile.infometrics.co.nz/Otara-Papatoetoe and https://ecoprofile.infometrics.co.nz/Manurewa*
10. *https://www.panuku.co.nz/downloads/assets/5306/1/manukau%20framework%20plan%20(part%20two).pdf*
11. *http://archive.stats.govt.nz/Census/2013-census/profile-and-summary-reports/commuting-patterns-auckland/working-auckland.aspx#gsc.tab=0*

Puhinui Catchment and stream alignment

Scale: 1_35 000@A3

0 | 1 | 3KM

4. Spiritual Capital

Spiritual capital refers to the wealth of personal, social or cultural beliefs and meanings that stimulate creativity, encourage moral behaviour and motivate individuals[1]. It is both an expression and a source of well-being (both natural and human capital); providing health, meaning, connection, belonging and purpose. The concept of spiritual capital leads to an examination of values that are desirable in and of themselves, while considering how such values are nurtured and reinforced, how they generate individual and collective capacity, and how they influence social, economic and political relations[2].

While universal, the concept of spirit and spirituality are conceived of and understood differently by different cultures. Two definitions or descriptions that help articulate different cultural relationships to spirituality and spiritual capital are provided below:

> *A. Maaori understanding of the universe is conceived of as a two-world system in which the material proceeds from the spiritual - the spiritual, which is the higher order, interpenetrates the material physical world of Te Ao Marama[3] meaning that all material things have a spiritual essence.*
>
> *B. Spiritual capital is the amount of spiritual knowledge and expertise available to an individual or a culture, where spiritual is taken to mean 'meaning, values, and fundamental purposes. It refers to 'resources of the human spirit', shared meaning, shared purpose and shared vision of what most deeply matters in life - and how these are implemented in our lives and in our behavioral strategies[4].*

From these descriptions we can see that Maaori concepts of spirituality are not necessarily the same as European / Paakehaa understanding. Therefore defining spiritual capital is necessarily subjective and requires consideration to the multiple perspectives of those living, working, playing and learning in Te Puhinui.

More work is required to develop a framing of spiritual capital and a way of evaluating its presence and abundance that is meaningful for Te Puhinui and its people.

1. Spiritual Capital Foundation. https://www.spiritual-capital.org/
2. Palmer, David A., and Wong, Michele Wong. Clarifying the Concept of Spiritual Capital. 2013.
3. Marsden, 2003 cited by Henare 2003: 43
4. Zohar, Danall, and Ian Marshall. Spiritual Capital: Wealth We Can Live By. San Francisco: Berrett-Koehler Publishers, Inc., 2004: 41

3. Cultural Foundations

Cultural foundations refers to the stores of wealth built, stored and incrementally added to by a culture over multiple generations and includes things like language, customs, technologies, laws, decision making processes, art, literature and music.

The cultural foundations for the regeneration of Te Puhinui need to be developed by Mana Whenua in partnership with Eke Panuku Development and other project partners. A process for the development of these foundations is currently underway.

More work is required by project partners to identify and articulate the landscape values and cultural narratives for the catchment. These will be critical to developing a strong sense of place and ensuring the regeneration strategy for Te Puhinui is place-sourced and culture-led.

Landscape values

The development of the landscape values needs to be generated as a separate process led by Mana Whenua. It is assumed that this will include landscape values for the nested wholes of Taamaki Makaurau, Te Maanuka / Manukau Harbour as well as Puhinui Catchment to ensure the wider landscape values are understood and reflected in the regeneration of Te Puhinui.

The Cultural Heritage Inventory (CHI) is a database identifying the locations of sites and other places of known heritage interest in the Auckland region. The database contains records for archaeological sites, historic buildings and historic botanical information.

It is acknowledged that the CHI is not in itself a complete record of the history of Te Puhinui and additional sites and locations of heritage value will continue to be identified through the ongoing regeneration of Te Puhinui. Notwithstanding, the CHI provides key information about a selection of important cultural and historical assets that record history of the site and historic land use patterns and practices.

The Landscape Values map starts to spatially record the heritage of Te Puhinui through the lens of Mana Whenua as well as identifying mataawaka, paakehaa and tau iwi cultural values, aspirations, narratives, practices and places of significance.

Landscape values

Scale: 1_35 000@A3

0 | 1 | 3KM

PAPATOETOE

Kia Aroha College Marae

CLOVER PARK

MANUKAU

Puukaki Marae

Tootara Park

WIRI

Ash Hill

Matukutuururu

Matukutuureia

BLENNZ Homai Marae

MANUREWA

Manurewa Marae

TE MAaNUKANUKA O HOTUROA

KEY

- Catchment Boundary
- Transform Manukau
- Puhinui Stream
- Open Space

CULTURAL HERITAGE

- Ancestral Marae
- Taura Here Marae
- Institutional Marae
- Maunga
- Priority Coastal Areas
- Maritime Sites
- Historic Sites
- Historic Structures
- Historic Botanic Sites
- Maori Heritage Sites
- Archaeological Sites
- Built Heritage

5. A Brief History of the Puhinui

Kia whakatoomuri te haere whakamua
I walk backwards into the future with my eyes fixed on my past

The history of Te Puhinui refers to its development, evolution and transformation over time, from ancient times to the present.

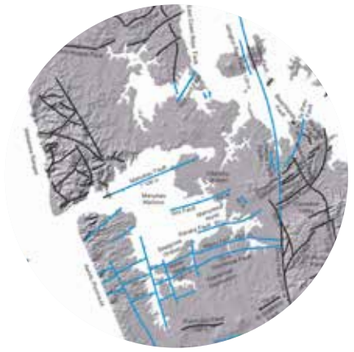
The patterns that have been laid down in the past provide foundational and essential information necessary to understanding a place, how it functions, and often why it is the way it is. Understanding these historic patterns, laid down from ancient times to more contemporary events, also provide insights, inspiration and direction that we can work with and harness to support its evolution towards a vibrant, healthy and flourishing future state.

This section captures and documents the history of Te Puhinui from the Permian-Jurassic period to the present day. The early human history of Te Puhinui is shaped, defined and owned by Mana Whenua and as such needs to be told by kaitiaki of this place. These stories should be sought directly from iwi/hapuu who whakapapa to Te Puhinui and Te Maanuka including the people of Te Waiohua.

Mapping the urbanisation of the catchment helps tell the story of its colonial history and how that has shaped and influenced the catchment.

Timeline of Te Puhinui

Tuatara, last survivors of an order of reptiles that thrived in the age of dinosaurs.

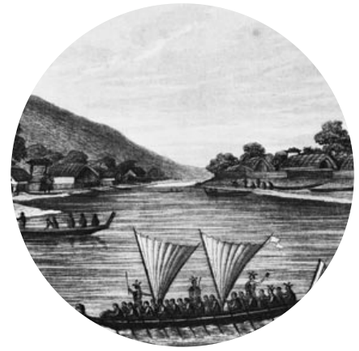


Auckland's fault lines

Isthmus of Auckland with its extinct volcanoes

Matukutuururu / Wiri Mountain meeting Puhinui Stream

Native forrest



Artist impression of the sails used by Kupe

300-150 m.y.a
Permian-Jurassic Period - Geological

New Zealand is formed on the coastal edge of the old southern supercontinent, Gondwanaland. Terrestrial species such as kauri, tuatara, archaic frogs, large land snails, peripatus and weta were present at this time.

130 m.y.a
The first outlines of NZ emerge

Approximately 80 m.y ago, the Tasman sea started to form. By 60 m.y ago, this process had ended and Aotearoa was its own, separated land mass.

120-60 m.y.a
Mesozoic Era
Cretaceous Period

New Zealand is intersected by the Pacific and Indian plates changing the land form significantly. Volcanic activity begins, cliffs rise forming the Northland Coromandel Arc Hauraki Gulf, Waitemataa and northern Manukau harbour.

Uplifted blocks are; Waitaakere Hills, Hunua Hills, Port Waikato and Coromandel. Down-faulted blocks are the Manukau and Kaipara Harbours.

25 m.y.a
Cenozoic Era
Tertiary Period
Miocene Epoch

Manukau lowland was occupied by sea. Manukau strait Te Too Waka connected the Pacific and Tasman sea.

5.3 m.y.a
Pliocene Epoch

Volcanic activity in the central North Island. Ancestral Waipa river discharges sediment forming the Manukau lowlands, Waiuku/Awhitu Peninsula and Kaipara Harbour. Basaltic volcanoes appeared first in South Auckland and the Hunua Ranges.

Auckland is not glaciated. Sea levels drop 135m due to global glaciation. Manukau, Kaipara, Waitemataa harbour and Hauraki Gulf are drained. Streams and rivers are extended.

Pollen evidence points to mangroves (Avicennia) and glasswort (Sarcocornia) surviving in the Auckland area during the last glaciation period.

2-1.5 m.y.a
Cenozoic Era
Quaternary Period

Volcanic activity

Great Ice Age

1 m.y ago. A highly fertile soil mantle is formed over middle and lower catchment of Te Puhinui
Over a third of New Zealand's 2200 vascular plants are found in Auckland.

80% of the country is covered in forest.

Te Puhinui is more like an estuary than a stream.

200,000 BCE
Wiri Mountain erupts - Puhinui Estuary becomes a stream.

30,000 - 35,000 years ago Matukutuururu (Te Manurewa o Tamapahore or Wiri Mountain) erupts.
50+ basalt centred volcanoes form in Taamaki Makaurau Auckland.
Volcanic activity give the two harbours their current form

Volcanoes around Maangere-Ihumaatao district and Puhinui Stream are Maungataketake, Ootuataua (Moerangi), Puketutu, Pukeiti, Manurewa, Waitomokia (crater lake), Matukutuururu, Matukutuureia, and Maangere Mountain. Three volcanic crater lakes that sit at the upper Puhinui Papatoetoe area are: Pukaki, Crater Hill, and Kohuora.

8000 BCE
Holocene Epoch
continues to present day

Post glacial period. Sea levels rise to their current level.

Waitemataa transforms from a valley to a harbour as the water rises.

0000-1000 CE

C.925 Kupe lands

GEOLOGICAL | PRE-HUMAN | POLYNESIAN MIGRATION

Timeline of Te Puhinui

Archeological site of Ootuataua / Ihumaatao food gardens

1840 Te Tiriti o Waitangi

Tamati Ngapora, Ngaati Mahuta chief of Mangere sought peace between Maaori and settlers

Wiri as industrial zone

C. 2010 Manukau Central

2019 Puhinui Stream

C.1150 - C.1350 CE

C.1400 - 1450 CE

1642 -1839 CE

1840
Signing of Te Tiriti o Waitangi / the Treaty of Waitangi

1900 - 1950

1950 - 1999

2000

WWI

WWII

POLYNESIAN MIGRATION AND MAAORI OCCUPATION

First settlement of Toi

First people migrated to New Zealand from eastern Polynesia arriving through several waves of waka voyages: Tainui, Te Arawa, Maata atua, Kurahaupoo, Tokomaru, Aotea, Taakitimu and others. They brought dogs, rats, taro and kuumara.

50% of the country is covered in indigenous forest. Fernland, grassland, shrubland and swamps become a larger part of the terrestrial ecosystems.

C. 1400 Rangitoto erupts

Ootuataua food gardens are developed at Ihumaatao by Mana Whenua living along the Maangere-Puhinui coastline. Intensive settlement along the south west banks of Puhinui Stream.

Abel Tasman anchors in Golden Bay. First Maaori and European contact.

C.1820 Ngaapuhi invade Auckland.

C.1830 European traders and missionaries arrive in Manukau.

1836 William Fairburn purchases over 80,000 acres, including Manukau. This land is boarded by the Ootaahuhu portage, Papakura stream, Wairoa River, and Taamaki River.

COLONISATION

Signing of Te Tiriti o Waitangi. Not all iwi sign.

Pre-purchases of land are investigated by the Crown. Fairburn's purchase was considered legal and subdivided into parts, with much of the subdivided sections going to the Crown. Fairburn legislated to return a third of the land back to Ngaati Paoa, Ngaati Tama-te-Ra, Ngaati Terau, Te Akitai and Ngaati Whanaunga. Crown never returned land. Mana Whenua are displaced.

1840 The government establishes military bases.

1841 Auckland becomes the country's capital. (Capital moves to Wellington in 1865).

1848 Settlers arrived in Ootaahuhu and East Taamaki.
1857 Passenger coach service starts between Auckland and Dury.
1862 Great South Road is rebuilt for military purposes.
1863 Mana Whenua of Maangere, Puukaki, Ihumaatao, and Te Aparangi are given a choice of taking an oath of allegiance to the military or expulsion.
1860 Quarrying of Ihumaatao peninsula destroyed two of its three volcanic cones. A fortified paa is removed.
1864 War enables the Crown to confiscate much of the remaining land in Maangere, Puukaki, Ihumaatao, Wairoa and Kirikiri from local iwi/ hapuu.
1873 Railway opens between Auckland and Onehunga.

URBANISATION

1913 A railway station is opened in Wiri (today known as Manukau central).
1918 WWI Colonial, Maaori and Pacific Islander troops fight together.
1924 Great South Road is concreted and declared a main highway.
1929-39 The Great Depression hits New Zealand.
1942 United States military camps set up in Tootara Park along Puhinui Stream.
1950's Roads and rail are extended. Motor vehicles are in greater use. Ferry services are in decline.

23% of the country is covered in indigenious forest.

1953 Hunua dams provides region-wide water supply.
1960 Manukau sewage treatment plant and oxidation ponds open.

Manukau Harbour becomes a dump for domestic, industrial and chemical waste, animal waste, sewage and stormwater. Rubbish is dumped on land and into volcanic caves. Landfill sites reclaimed. Manukau Harbour and local streams increase in sedimentation. Fish stocks decline. Mangrove colonies increase.

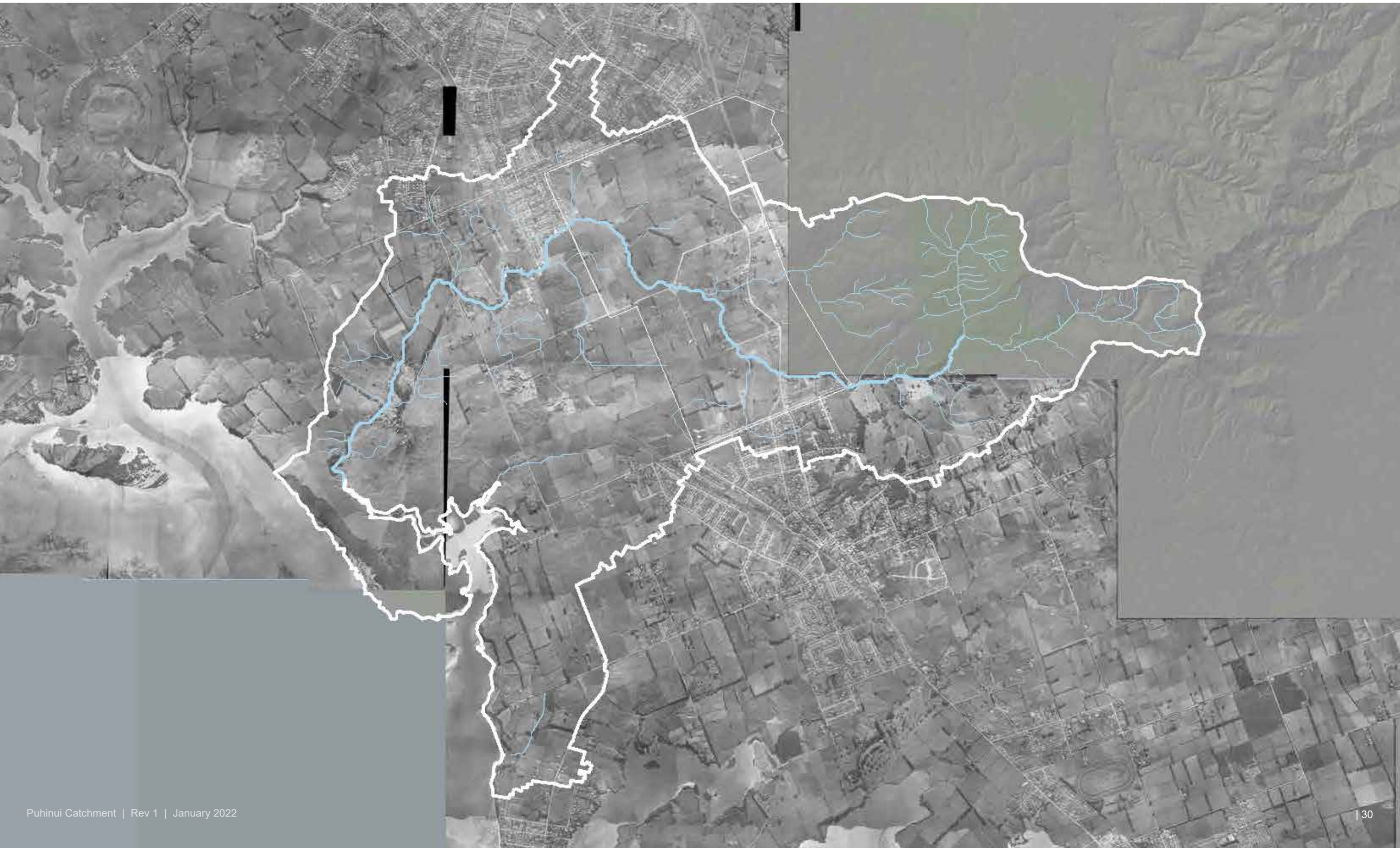
1966 'Manukau City' is formed. Population 73,000.
1966 Manukau City Council purchases 354 acres (143.4 ha) to form 'Tootara Park'.
1960-1970 Wiri is developed as a new industrial zone.
1975 Wiri Park West housing development begins.
1980-1990 Economic downturn causes many factories to close.
1982 Auckland Regional Botanic Gardens opens.
1991 Manukau city purchases 143.4 ha of land and establishes Puhinui Reserve.

2007 An additional 75 ha is added on the top of Tootara Park.
2010 Manukau city council is amalgamated into Auckland Council.
New Manukau railway station opens. Manukau bus and transport hub in progress. Southern and South western motorways are linked.
2016 Puhinui Stream was considered the dirtiest stream out of 31 monitored in the region.
2019 Puhinui Stream regeneration project is identified by Auckland Council's Auckland Climate Action Plan (ACAP) as a potential site to mitigate the effect of climate change.

Historic aerials | 1959

Scale: 1_35 000@A3

0 1 3KM



Historic aerials | 1996

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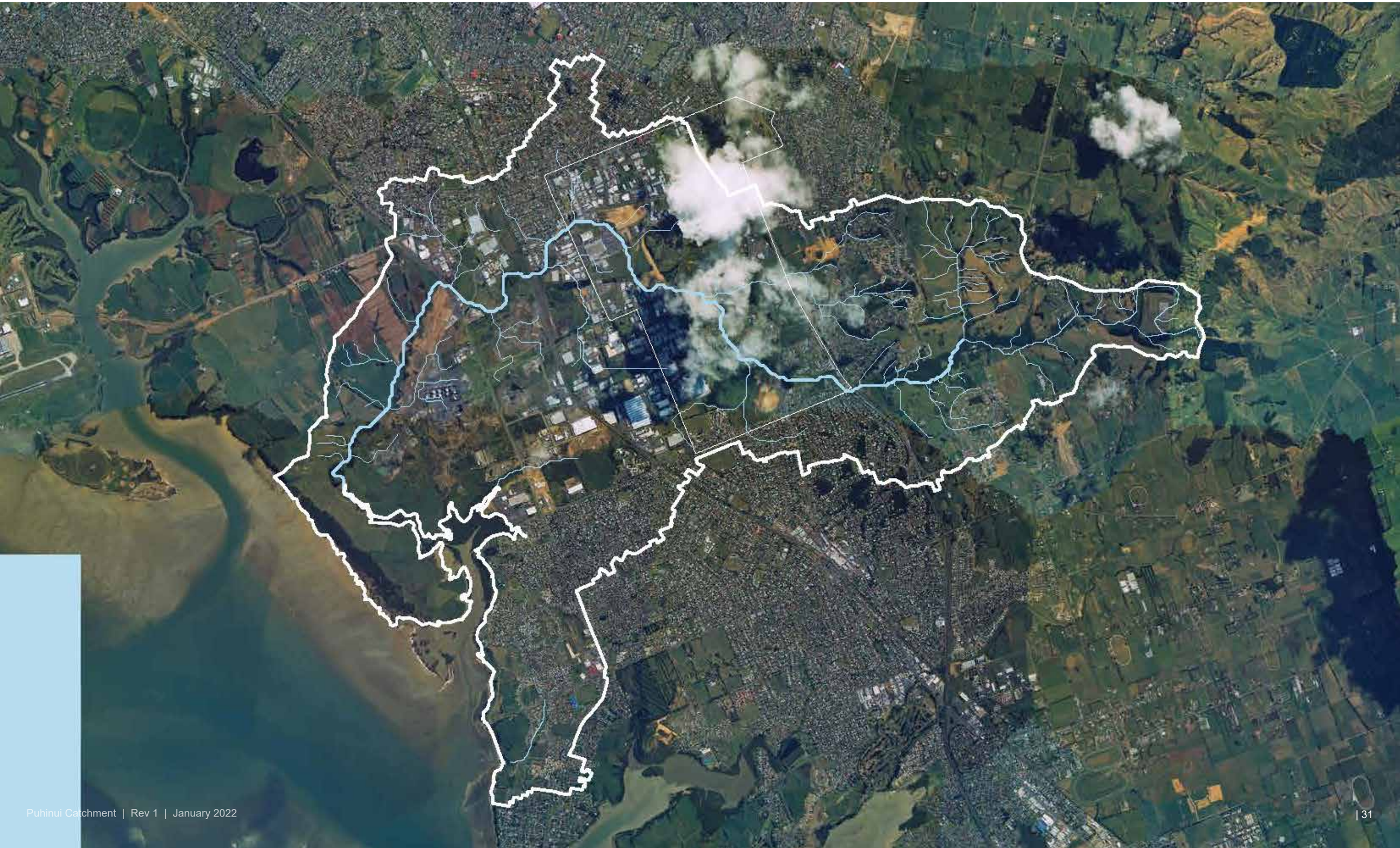


Historic aerials | 2003 + 2004

Scale: 1_35 000@A3

0 1 3KM

Historic aerials | 2017

Scale: 1_35 000@A3

0 1 3KM

Colonial history

The First Settlers

During the 1800s the first European settlers to arrive were missionaries. They set up homes near paa sites and began to purchase land. By 1840 the missionaries had set up farms and made trading contacts.

The Fairburn Purchase

The territory of Taamaki, later known as the 'Fairburn Purchase', was acquired in 1836 by William Fairburn. Initially the territory was to go to Henry Williams, but it seems that during negotiations, "fearing the wrath of his parent body" – the Church Mission Society (CMS) in London, he decided it more appropriate that William Fairburn should take it as the 'putative purchaser'. Note that by the time of the Taamaki / Fairburn Purchase, the CMS had iterated that "it strongly disapproved of the scale of land purchases from Maaori that had recently been made by New Zealand missionaries."

However, the Fairburn Purchase was disallowed by the government because it locked up so much of South Auckland during the Crown Colony years (1854 – 1852).

In September 1841 Fairburn submitted to the Land Commissioners his 'Fairburn Purchase', and eventually was awarded 2,560 acres (1,035ha) – the maximum Crown Grant permissible under the regulations.
In 1847 the Fairburn grant set up a new garrison township which became one of four villages established between 1847 and 1848 in order to form a cordon of defence around Auckland in the event of warfare between Maaori and colonists.

Fairburn never laid claim to the whole block which he purchased. Rather, on 12 July 1837 he 'made over' a third of it to mana whenua who had resided there, promising that once the boundaries had been surveyed, the tribes Ngaati Paaoa, Ngaati Tama-Te-Raa, Ngaati Terau Te Aakitai and Ngaati Whanaunga, "shall have restored to them for their personal use forever, land in proportion to the number of persons of whom their tribes may consist, residing in any part of the north of the Thames and Manukau." The allocated land was disallowed to Fairburn and was not returned to mana whenua. It became 'Surplus Land' for use at the Crown's discretion.

By 1841 settlement of the region had intensified, inflating the value of the Fairburn land. By the late 1840s disingenuous land sales caused conflict between Maaori and settlers in Auckland. This led to the British Government establishing settlements of retired soldiers in strategic locations that bordered the isthmus: Ootaahuuhuu, Oonehunga, Panmure and Howick. With this, trade between Maaori and European farmers gained a ready market for produce of kai moana, meat, grains, vegetables and hay.

During this period the Manukau Harbour and Taamaki Estuary were the principal transportation routes but with escalating conflict causing the Land Wars (1845 to 1872), and the pressing need for easy access to the Waikato, a new transportation route was established.

The Great South Road

A major road bisecting Taamaki-makaurau by running on a north - south axis from Newmarket to Ngaaruawaahia, was a military road created for a strategic purpose.
"With the end of the Waikato War in 1865 and the confiscation of a million acres of Maaori land, the Great South Road's military usefulness was largely exhausted. But the road quickly became important as a link between the farming communities in South Auckland and the adjacent Franklin County." Eventually the road threaded together the settlements of Ootaahuuhuu, Papatoetoe, Manukau Central (formerly Wiri or Woodside), Manurewa, Mahia, Takanini and Papakura, on to Oopaheke, Drury then into the Waikato. Today the Great South Road terminates at Bombay as its southern portion was converted to State Highway 1.

Woodside

Woodside Farm, once owned by Robert Coxhead in the 1850's was located south of Papatoetoe on the Great South Road. The farm was named Woodside in 1867 after his family's English home town. The area around Woodside was then known as Wiri presumably in honour of the local chief Wirihana Takaanini.

Clendon's Grant

On 18 October 1842 a 10,000 acre tract of Wiri land was granted to James Reddy Clendon (JP, merchant, and American Consul 1839-1841). This land was given in recompense for land in the Bay of Islands acquired by the government, when the first capital of New Zealand was established at Okiato near Point Omata.

'Puhinui', the McLaughlin Homestead

In 1845 Thomas McLaughlin arrived from Peru and purchased 2,846 acres (1,151ha) that became known as Puhinui Farm. It was part of the 10,000 acre 'Clendon Grant'. The property extended inland from the Manukau harbour, to Browns Road, The Great South Road, and Puhinui Road in the north. Thomas McLaughlin built a single storey house close to Matukutuureia hence its later name McLaughlin's Mountain. In 1861 Thomas's son William, built 'Puhinui' (also named McLaughlin Homestead) on the farm.

The family had interests in many industries such as kauri milling, wheat cropping and flax milling. A water-driven flax mill was built and powered by Puhinui Stream.

The McLaughlin homestead was shifted to the Howick Historical Society in 1982 where it still stands.

David Nathan Estate

There have been two dwellings at 'The Hill'; the extensive estate on Hill Road in modern Hillpark and the property of wealthy merchant David Lawrence Nathan.

The original timber house was destroyed in an electrical fire in 1923. The second Nathan Homestead was built in 1925, and it is now a heritage listed building. The homestead stood on what was also a 121ha working farm. When the Southern Motorway - State Highway One bisected the estate, the Nathan Family donated the eastern land to be developed as the city's Botanic Gardens, and the western portion was developed as the suburb Hillpark.

1. *Professor Alan Ward. Waitangi Tribunal Rangahaua Whanui Series - National Overview, Volume II. 1997. https://www.justice.govt.nz/assets/Documents/Publications/NatO2.pdf*

Colonial history

In 1961 the Manurewa Borough Council acquired ‘The Hill’, and its surrounding gardens, in Hill Road, Manurewa. The house was renamed the Nathan Homestead, and the surviving grounds were named David Nathan Park. In 1978, the homestead was restored and reopened as a community and cultural centre, and it, along with the gardens, still serve the community in this capacity today.

Local Government

Manukau City Council was formed in 1965 from the amalgamation of Manukau County Council and Manurewa Borough. With the advent of the Auckland (‘Super City’) Council in 2010, the Manukau City Council became obsolete but the terms Manukau, Manukau Central have remained.

Under the new Auckland Council, Local Boards were established. Puhinui Catchment is represented by two local board offices: Ootara-Papatoetoe Local Board and Manurewa Local Board.

Manukau Central (also knowns as Manukau City Centre)

Formerly known as Woodside (in the 19th century) and Wiri (in the early 20th century), Manukau Central was formed in 1965 in the rural Wiri. From the 1970s onwards it has had a dual identity – being referred to as both ‘Wiri’, and Manukau. In 1983 the Manukau City Council officially replaced ‘Wiri’ with ‘Manukau Central’, although Wiri has been maintained for the industrial area that sits west, and residential neighbourhood to the south of Manukau Central. Manukau Central describes the commercial area.

Today much of the Manukau Central area has developed into a modern city centre, with civic, commercial and industrial services. Aside from Matukuturua Stonefields little evidence of Maaori settlements remains.

Wiri

Since 1983, Wiri refers to the industrial area of Manukau. The attractions were the ample supply of flat land and proximity to Auckland Airport, the southern motorway and railway line. Subsequently, new industry has grown steadily with factories, warehouses and railway yards covering the Wiri area.

Weymouth

Weymouth grew at the same rate as the other nearby settlements of Manurewa and Woodside but like Woodside its growth was arrested when the railway was established. The settlement was absorbed by the suburban sprawl that occurred in the post war era becoming another suburb of greater Manurewa.

Manurewa

Converse to Woodside, the new railway line proved beneficial for Manurewa which saw urban growth from the time it was built in 1875. By 1916 Manurewa became a Town District noted as a centre for dairying. The Town District constituted a borough by 1937 then was amalgamated with Manukau City Council in 1965. The last mayor for the borough (Harry Beaumont) was instrumental in the preservation of Hill Road’s indigenous forest, as well as the acquisition of Tootara Park, Nathan Homestead and Orford Park for public use.

Post War Urban Development

Given the geography of the region, coupled with the railway, highways and its proximity to two airports, the area has seen significant growth in all directions including residential housing, commercial establishments, industrial developments, and facilities that benefit the wider community. The area supports Manukau Institute of Technology, Manurewa Shopping Centre (‘Southmall’), a three state corrections facilities: and most notably one of New Zealand’s oldest archaeological sites that represents human activity, being the Matukutuureia Stonefields.

Recreation Amenities

The region has several significant parks, many of which incorporate or are adjacent to Puhinui Stream.

At the headwaters in the east of the catchment sits Tootara Park which was opened in stages from 1968 onwards. Today the park is home to a variety of groups such as the Tootara Park Pony Club and Tootara Park Mountain Bike Club. There are public swimming pools and bush and farmland tracks. Puhinui Stream Forest Trail, a walking trail that follows Puhinui Stream west, links Tootara Park with Auckland Botanic Gardens. This park has flourished and boasts exotic and indigenous flora as well as attractions such as sculpture exhibitions, landscape designs and a suitable water trail.

Nearby in the mid-century suburb Hillpark are several council-owned native bush reserves. Some of this bush is in David Nathan Park – the site of David Nathan’s homestead ‘The Hill’. Also, at David Nathan Park is a public tennis court, and early century landscaped gardens.

Wiri Stream Reserve sits at the heart of Wiri and the midsection of Puhinui Stream. In the reserve is a pond surrounded by trees and grassed areas. To its north west and across the motorway sits Hayman Park, named after Manukau City Council’s first city planner. It sits immediately west of the city centre and as these parks originated in the same era, with development from 1973 onwards, they are similar in landscape.

In the west, on the Manukau Harbour coast line lies Puhinui Reserve. It is largely a working farm, and motocross and equestrian events are regularly held here. Other attractions include mountain bike trails and wetlands. East of the park where Puhinui Stream enters the harbour sits the little-known reserve Matukuturua Stonefields. Here sits Matukutureia / McLaughlin’s Mountain and nearby stonefield gardens which can be accessed from McLaughlin’s Road.

Many other recreation facilities have been established since WWII and now Aucklanders can access amenities such as the Vodafone Pacific Events Centre, Wero Park and Rainbow’s End Adventure Park.

Te Araroa

Te Araroa is a continuous 3,000 km walking track from Cape Reinga to Bluff, and Puhinui Stream features in this. The trail follows the stream through southern Manukau, Hillpark, the Auckland Botanic Gardens and Tootara Park before heading south east into Alfriston.

5. Natural Capital

Natural capital refers to the function, integrity and productive capacity of the ecosystems in a given area. From an anthropocentric point of view, it also refers to the quantity and quality of natural resources available for human utility such as energy, minerals, soils, trees etc. as well as the services a functioning ecosystem can provide, including maintaining water quality and sequestering carbon. All of life is dependent on, and a part of natural capital - it is the basis of all other forms of capital.

This section maps and documents the biophysical layers and features of Te Puhinui landscape, including geology, landform, climate, soil, hydrology and ecology.

Geology

Taamaki Makaurau

Aotearoa, New Zealand is the largest landmass above water of Te Riu-a-Maaui - the Zealandia continent. It was formed between 250 - 100 million years ago (m.y.a) along the eastern coast of the southern supercontinent, Gondwanaland. Terrestrial species such as kauri, tuatara, archaic frogs, large land snails, peripatus and weta were all present at this time. Approximately 85 m.y.a, the Tasman Sea started to form. By 55 m.y.a, this process had ended and Aotearoa was its own separated land mass in a similar location to where it is today. The oldest areas of the Manukau Harbour can be traced back to this time and are found in the foothills east of Papakura and form the upper catchments of Otuuwairoa (Slippery Creek) and Papakura Stream.

Approximately 25 m.y.a New Zealand was intersected by the Pacific and Indo-Australian tectonic plates which changed the landform significantly. Volcanic activity began soon after and between 22 – 16 m.y.a. two significant volcanic chains - the Northland-Coromandel Arc, which extends along the eastern side of the North Island to the Coromandel Peninsula and the Waitaakere Arc along the west coast, which formed the foundation of the Waitaakere Ranges and the northern headland of the Manukau Harbour. The subsidence resulted in a large basin where sediment was deposited at bathyal depths, and hardened with burial ino sedimentary rock. By 16 m.y.a, these sedimentary rocks were uplifted and now form the cliffs around the inner Hauraki Gulf and Waitemataa Harbour, the cliffs on the northern edge of the Manukau Harbour and the land in the upper Puhinui Catchment - this geology is known as the East Coast Bays Formation and is made of sandstone and mudstone. It weathers into a soil that is dominated by clay.

Between 5.3 - 2.6 m.y.a the Manukau lowlands were occupied by sea and the Awhitu Peninsula had not yet formed. Between 2.5 - 0.5 m.y.a three major forces began to shape the Manukau Harbour:

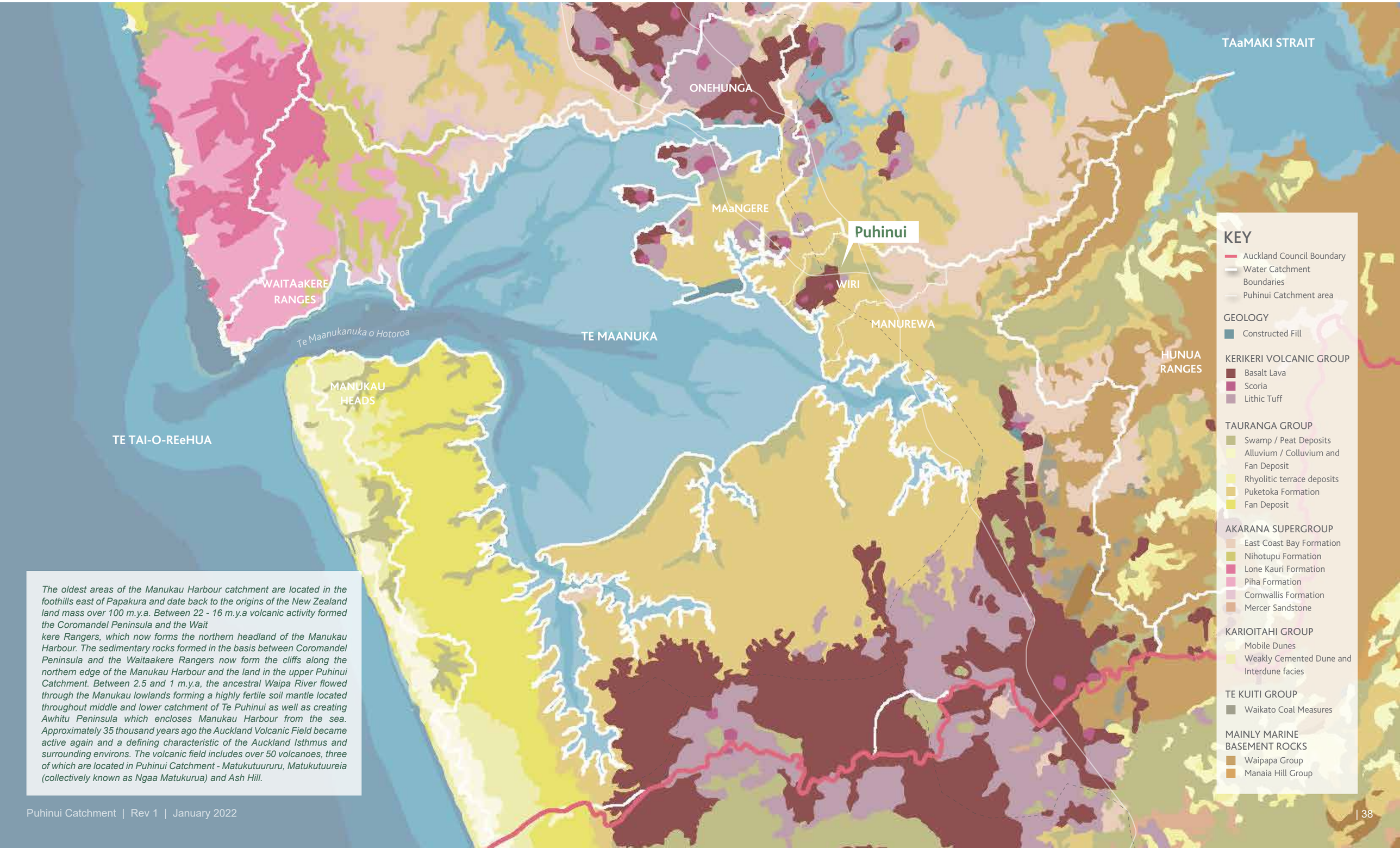
- An ice age began and while Auckland was not glaciated, sea level dropped 135m from current levels due to global glaciation. Manukau, Kaipara and Waitemataa harbours and the Hauraki Gulf were drained; streams and rivers extended to meet the coastline, and the land was forested.
- The ancestral Waipa River flowed through to the west coast and across the Manukau lowlands, depositing sediment derived from the Taupo Volcanic Zone and forming a highly fertile soil mantle. Longshore drift transported the sediment northward to create the Awhitu Peninsula which encloses Manukau Harbour from the sea, as well as forming the northern and southern headlands of the Kaipara Harbour. This geology is located in the middle and lower Puhinui Catchment and is characterised by alluvial sedimentary soils known as the Puketoka Formation. The soils in this area include silts, clay and some layers of sand.
- Volcanic activity in the South Auckland region began approximately 1.6 m.y.a. Basaltic volcanoes appeared first in South Auckland - including the Bombay Hills, extending from Waiuku through Pukekohe to the Hunua Ranges - showering ash over the Auckland region and depositing sediment into the Manukau lowlands.

About 0.5 m.y.a volcanism stopped for a period before beginning again around the Auckland isthmus approximately 35,000 years ago where over 50 basalt centred volcanoes formed. In and around the Manukau Harbour, volcanic cones include Maungataketake, Ootuataua (Moerangi), Te Motu a Hiroa / Puketutu, Pukeiti, Manurewa, Waitomokia (crater Lake) and Te Pane o Mataoho / Maangere Mountain. Puhinui Catchment has three volcanic cones – Matukutuururu, Matukutuureia, collectively known as Ngaa Matukurua, and Ash Hill.

Geology

Scale: 1_200 000@A3

0 2 10 20KM



The oldest areas of the Manukau Harbour catchment are located in the foothills east of Papakura and date back to the origins of the New Zealand land mass over 100 m.y.a. Between 22 - 16 m.y.a volcanic activity formed the Coromandel Peninsula and the Wait
kere Rangers, which now forms the northern headland of the Manukau Harbour. The sedimentary rocks formed in the basis between Coromandel Peninsula and the Waitaakere Rangers now form the cliffs along the northern edge of the Manukau Harbour and the land in the upper Puhinui Catchment. Between 2.5 and 1 m.y.a, the ancestral Waipa River flowed through the Manukau lowlands forming a highly fertile soil mantle located throughout middle and lower catchment of Te Puhinui as well as creating Awhitu Peninsula which encloses Manukau Harbour from the sea. Approximately 35 thousand years ago the Auckland Volcanic Field became active again and a defining characteristic of the Auckland Isthmus and surrounding environs. The volcanic field includes over 50 volcanoes, three of which are located in Puhinui Catchment - Matukutuururu, Matukutuureia (collectively known as Ngaa Matukurua) and Ash Hill.

Geology

Puhinui Catchment

Matukutuururu (also known as Te Manurewa o Tamapahore and Wiri Mountain) erupted approximately 30,000 - 35,000 years ago. It once had a scoria cone reaching 80 metres above sea level[1] before being quarried to its current height of approximately 45m. The lava flows from the formation of Matukutuururu created Wiri Lava Cave. At 290 meters long it is Auckland's longest known lava cave and considered to be New Zealand's best[2]. Because it features rare lava stalactites the cave has garnered international renown. As the only remaining remnant of the Wiri scoria cone, the cave was transferred to the Department of Conservation and declared a scientific reserve in 1998. The cave entrance is locked and entry is by permit only. The cave is between 7.6 x 3.6 m and 1.1 x 0.2 m, and is located about 4m below Wiri Station Road[3,4].

In 2008 the quarried area of Matukutuururu was sold as part of a land swap of the Crown owned Matukutuururu for Matukutuureia[5]. Matukutuureia, also known as McLaughlin's Mountain, is of a similar age as Matukutuururu. Its original peak was 73 metres above sea level, its scoria cone was originally crescent-shaped but extensive quarrying has led to only a small pyramid shaped mound remaining as the summit. The eastern side of the cone was left un-quarried and a large area of lava flow to the south of the cone remains intact. The remaining areas of the volcano have recently been transferred to Department of Conservation Management, primarily because of the high heritage values of the nearby Matukutuurua Stonefields gardens[6].

Ash Hill erupted approximately 32,000 years ago and was a low tuff cone with an explosion crater approximately 150 metres wide and 8 meters above surrounding ground level. First recognised as a volcano in 1961, Ash Hill has no known Maaori name[7]. The site is now covered by industrial development and there is no trace of the volcanic feature today. Ash Hill was named after nearby Ash Road, which was named after ash trees rather than volcanic ash[8]. Prior to the eruption of the volcanic cones, it is likely that Puhinui Stream would have been more like an estuary than a stream. C.W. Firth in 1930, observed that the current alignment of Puhinui stream along northern edges of the volcanic formation and Homai Stream along the southern edge suggests the stream was established before volcanic activity took place[9]. Approximately 11,650 years ago the Pleistocene 'ice age' came to an end and the Holocene geological epoch began and glaciers retreated across the planet. The melt water raised sea levels to its current level[10].

1. https://en.wikipedia.org/wiki/Matukutururu
2. Volcanoes of Auckland - The Essential Guide. By B.W.Hayward, G Murdoch, and G Maitland.
3. https://cityofvolcanoes.wordpress.com/2014/12/01/a-photographic-journey-through-wiri-lava-cave-auckland/
4. https://www.pce.parliament.nz/media/1611/report-on-the-protection-of-the-wiri-lava-cave-march-1990.pdf
5. https://aotearoarocks.blogspot.com/2018/08/guest-post-by-david-fraser-standing-up.html
6. https://en.wikipedia.org/wiki/Matukutureia
7. Volcanoes of Auckland - The Essential Guide. By B.W.Hayward, G Murdoch, and G Maitland.
8. https://www.wikiwand.com/en/Ash_Hill,_New_Zealand
9. http://rsnz.natlib.govt.nz/volume/rsnz_61/rsnz_61_01_000480.html
10. https://en.wikipedia.org/wiki/Holocene

Geology

Scale: 1_35 000@A3

0 1 3KM

Kohuora Park
PAPATOETOE
Puukaki Lagoon
Crater Hill
MANUKAU
WIRI
Lava Cave
Ash Hill
Puhinui
Matukutuururu
Pond Crater
Hōmai
Matukutureia
Eroded Crater
Arena Crater
MANUREWA
Blackgate Reserve

Matukutuururu and Matukutureia, collectively known as Ngaa Matukurua, erupted approximately 30,000 - 35,000 years ago. Matukutuururu once had a scoria cone 80 metres high before being quarried to its current height of 45m. The lava flows from its formation created Wiri Lava Cave, Auckland's longest known lava cave. Matukutureia's original peak was 73 metres but has been quarried to a small pyramid-shaped mound. The eastern side of the cone and large area of lava flow to the south remain un-quarried and form the foundations of the culturally significant Matukuturua Stonefields gardens. Ash Hill was first recognised as a volcano in 1961 and has no known Maaori name. Prior to the eruption of the volcanic cones, it is likely that Puhinui Stream would have been more like an estuary than a stream.

KEY

- Catchment Boundary
- Transform Manukau
- Puhinui Stream
- Contours

GEOLOGY

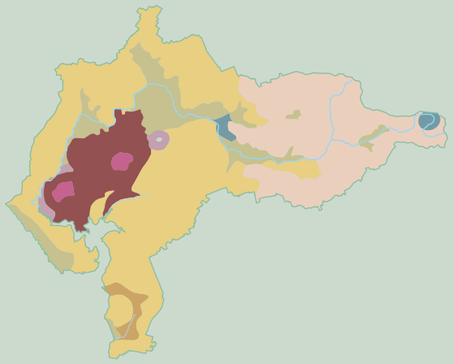
- Argillite - Indurated marine mudstone
- East Coast Bays Formation
- Puketoka Formation
- Undifferentiated Alluvium
- Intertidal Mud
- Lava
- Scoria
- Lithic Tuff
- Constructed Fill

Geology

The geology of Te Puhinui can be traced down the catchment, with the oldest formations in the upper catchment and the younger in the lower catchment.

- East Coast Bays Formation
- Puketoka Formation
- Undifferentiated Alluvium
- Intertidal Mud
- Lava
- Scoria
- Lithic Tuff

Location plan



MIOCENE EPOCH | 23 - 5 million years ago

East Coast Bays Formation
(23.03 - 7.03 million years ago)
Flysch and alternating beds of green-grey muddy sandstone and mudstone, with occasional interbedded grit.

Photo D.L. Homer

PLIOCENE EPOCH | 5- 2 million years ago

Puketoka Formation
(5.333 - 2.58 million years ago)
Pumiceous deposits. Light grey to orange brown, pumiceous mud, sand, and gravel, with muddy peat and lignite.

Photo D.L. Homer

PLEISTOCENE EPOCH | 2.6 - 0.01 million years ago

Undifferentiated Alluvium
(2.58 - 0.012 million years ago)
Mud, sand and gravel occurring in usually graded beds. Includes black organic clay, fibrous peat, rock fragments, shell and volcanic ash.

Photo D.L. Homer

Intertidal Mud
(2.58 - 0.012 million years ago)
Grey to black indistinctly bedded. Occurs within sheltered tidal inlets of Waitemataa and Manukau Harbours. Often vegetated with mangroves.

Photo D.L. Homer

PLEISTOCENE EPOCH | 2.6 - 0.01 million years ago

Lava
(35,000 years ago - present day)
Basalt and basanite. Grey, dense, fine grained lava.

Scoria
(35,000 years ago - present day)
Basalt and basanite scoria. Red, grey and black. Pebble to boulder sized pieces.

Photo D.L. Homer

Lithic tuff
(35,000 years ago - present day)
Thin graded beds of pre-volcanic materials, predominantly sandstone, mudstone, alluvium and micaceous sand bedded with basalt and basanite fragments. Deposit size ranges from mud to sand-sized fragments.

Photo D.L. Homer

HOLOCENE EPOCH | 11,650 cal years before present

Constructed Fill
(11,650 cal years before present)
Recompacted clay to gravel sized material including basalt lava, greywacke and argillite. May include demolition debris.

Photo J. Hearfield

Photos from 'Geology of the Auckland urban area. Scale 1:50 000.' Institute of Geological & Nuclear Sciences.

Landform

Landform refers to a site's topography or the 'lay of the land'. It is the result of countless interactions between geology, water, soils, vegetation, and more recently, urbanisation.

The extensive tidal coastline of the Manukau Harbour and inland waters are defining characteristics of Puhinui Catchment. Puhinui Catchment covers approximately 2.964 hectares. Topographically, it is characterised by low lying, gently rolling terrain in the lower catchment and a steeper upper catchment. The top of Puhinui Catchment is located 170m above sea level and 10km east of the coastal edge and mouth of Puhinui Stream. The upper catchment is the steepest area in the catchment and drops steeply through Tootara Park and the Auckland Botanic Gardens before flattening out to a broad middle and lower catchment.

The mid catchment is a gently rolling urbanised landscape characterised by the state highways, Manukau Central commercial area, single lot suburban housing and large scale medical facilities, public and community facilities including Wiri Central Primary and Manurewa Highschool and residual rural land zoned for further development.

The lower catchment is largely flat, gently sloping up to a small coastal escarpment along the southern edge of the estuary. The area is characterized by commercial and industrial land uses closest to the stream, becoming more open toward the mouth of Puhinui Stream and Puhinui Reserve.

Despite significant quarrying, the two maunga Matukutureia and Matukutuururu (Ngaa Matukurua) are still visible from some areas in the lower catchment. Puhinui Reserve holds the coastal edge for Puhinui Catchment and consists of coastal escarpments, sandspit landforms, intertidal wetlands and mudflats.

Landform

Scale: 1_35 000@A3

0 1 3KM

PAPATOETOE

MANUKAU

Cavendish Drive

CLOVER PARK

121 m

72 m

Tootara Park

126 m

130 m

UPPER CATCHMENT

168 m

117 m

MIDDLE CATCHMENT

WIRI

Puhinui

48 m Matukutuururu

LOWER CATCHMENT

68 m Matukutuureia

Homai

10 m

73 m

MANUREWA

Blackgate Reserve

The extensive tidal coastline of the Manukau Harbour and inland waters are defining characteristics of Puhinui Catchment. Puhinui Catchment covers approximately 2,964 hectares. Topographically, it is characterised by low lying, gently rolling terrain in the lower catchment and a steeper upper catchment. The top of Puhinui Catchment is located 170m above sea level and 10km east of the coastal edge and mouth of Puhinui Stream. The upper catchment is the steepest area in the catchment and drops steeply through Tootara Park and the Auckland Botanic Gardens before flattening out to a broad middle and lower catchment.

KEY

- Catchment Boundary
- Transform Manukau
- Puhinui Stream
- Contours (0-20m)
- Contours (20-40m)
- Contours (40-60m)
- Contours (60-80m)
- Contours (80-100m)
- Contours (100-120m)
- Contours (120-140m)
- Contours (140-160m)
- Contours (160-180m)

Climate[1]

Te Puhinui has a subtropical climate, with warm humid summers and mild winters with few frosts.

Sun

Te Puhinui receives approximately 2000 sunshine hours / annum.

Temperature

The average temperature range is 12-19 °C.

Wind

Prevailing winds come from the southwest, particularly in winter and spring. Southwesterlies during the winter produce cloudy, showery weather whereas southwesterlies in summer are frequently fine.

The average wind speed is 2-3 m/second.

Sea breezes are generated on fine days by the sun warming the land surface more than the sea surface and occur most frequently between November and March. Sea breezes occur one to two times a week during the summer and typically start between 8am and 10am and get stronger through the day.

Strong gusty westerlies which may be accompanied by thunderstorms, and rarely tornadoes are most likely to occur in winter and spring.

Rain

The median annual rainfall is approximately 1,200mm. Rainfall in Auckland ranges from 1,000mm - 2,200mm.

Rain occurs mainly with northerly winds.

Subtropical storms with heavy rain typically come from the east between the months of December and April.

Rainfall is relatively consistent with around 32% of annual rainfall expected in the winter months from June to August and around 20% of rain in the summer months from December to February.

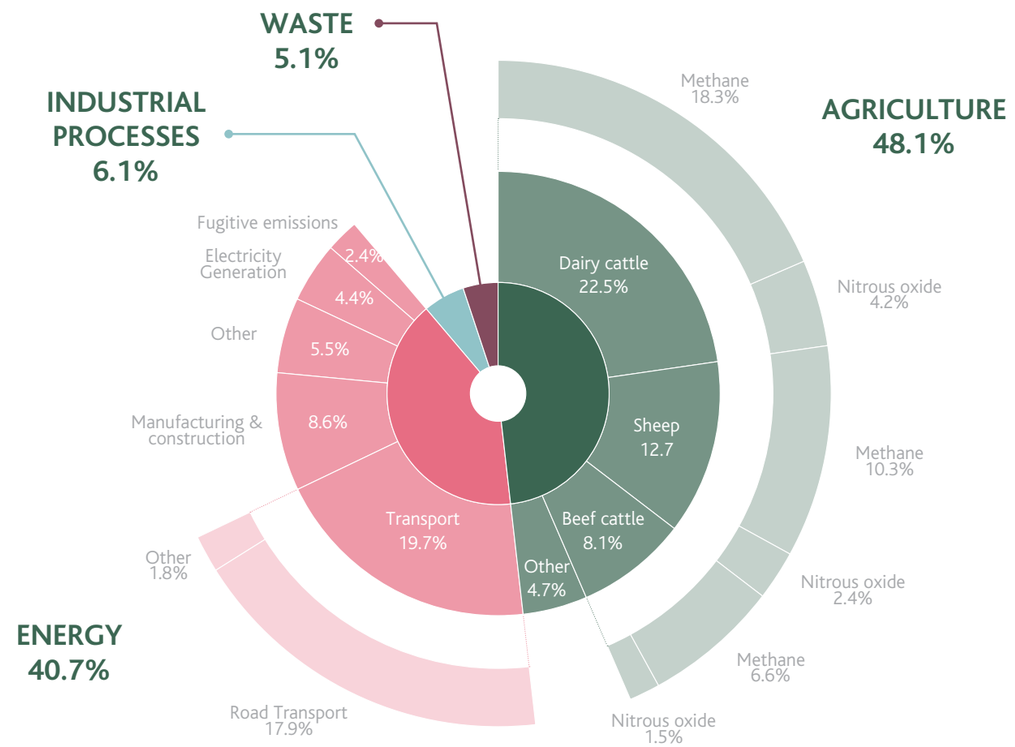
Te Puhinui experiences flooding infrequently and there are some properties at risk of flooding during larger events.

New Zealand Greenhouse Gases

In 2018 New Zealand generated 78.9 million tonnes of greenhouse gases. This was 24% more than 1990 and 1% lower than 2017[2]. During 2018, gross emissions were primarily made up of carbon dioxide (44.5%), methane (43.5%), and nitrous oxide (6.6%)[3].

Emissions from transport were up 2.3% from 2017 and up 89.7% from 1990. Transport emissions were mainly made up by road vehicle emissions (90.7%) with domestic aviation (6.7%) making up for most of the remainer[4]. Transport also produces the majority of carbon dioxide emissions, producing 47% of New Zealand's total carbon dioxide emissions and manufacturing industries and construction made up 17.9% and public electricity and heat production generated 9.4%[5]. The net uptake of carbon dioxide from the atmosphere by land use, land-use change and forestry was 17.6% lower than 1990 due to higher harvesting rates of planted forests[6].

While road transport only accounts for approximately 20% of New Zealand's total greenhouse gas emissions, Te Puhinui is primarily an urban catchment with limited agriculture activity. The proportion of greenhouse gases produced from transport in Te Puhinui is therefore likely to be higher than the national average.



Greenhouse gas emissions in New Zealand by sector[7]

1. The information in this section has been derived from: The Climate and Weather of Auckland, 2nd edition P.R. Chappell # - https://niwa.co.nz/static/web/Auckland_Climate_NIWA.pdfPlan
2. https://www.stats.govt.nz/indicators/new-zealands-greenhouse-gas-emissions.
3. https://www.stats.govt.nz/indicators/new-zealands-greenhouse-gas-emissions
4. https://www.stats.govt.nz/indicators/new-zealands-greenhouse-gas-emissions
5. https://www.stats.govt.nz/indicators/new-zealands-greenhouse-gas-emissions
6. https://www.stats.govt.nz/indicators/new-zealands-greenhouse-gas-emissions
7. https://theconversation.com/nz-introduces-groundbreaking-zero-carbon-bill-including-targets-for-agricultural-methane-116724

Climate[1]

Auckland Council's Draft Te Taaruke-aa-Taawhiri: Auckland's Climate Action Framework

In June 2019, Auckland Council declared a climate emergency and on 21 July 2019 the Council adopted the draft Te Taaruke-aa-Taawhiri: Auckland's Climate Action Framework. The intention of the framework is to reduce the volume of emissions that cause climate change by 50% by 2030, reaching net zero emissions by 2050. The draft plan also seeks to reduce the negative impacts of that change.

In order to achieve these outcomes, the climate action framework identifies eleven 'key moves' with associated actions:

1. Lay the foundation
2. Enhance, restore and connect our natural environments
3. Make development and infrastructure climate compatible
4. Transform existing buildings and places
5. Deliver clean, safe and equitable transport options
6. Move to a zero carbon, climate - resilient economy
7. Help Aucklanders become more resilient and reduce their carbon footprint
8. Te puawaitanga o te tangata
9. Youth and intergenerational equity
10. Shift to decentralised renewable energy
11. Grow a low-carbon, resilient food system

At the time of writing, submissions to the draft plan had closed but the final action plan had not been adopted. Once the final plan is adopted, the Auckland Council will develop a detailed programme of actions for those areas under its direct control and outline how it will play a facilitating role where it does not have direct control. Resourcing will be considered in the council's next 10-year budget.

Effects of Climate Change

Rainfall - Te Puhinui will get drier overall, but when it does rain it will be heavier. This will result in decreased recharge of groundwater with a corresponding increase in runoff, evaporation, dry periods and irrigation demand in productive landscapes.

Temperature - Te Puhinui will be warmer, particularly in built up and paved areas, which will be subject to the urban heat island effect. This will likely result in fewer illnesses during winter but an increase in heat stress during summer. This is also likely to result in decreased demand for electricity in winter for space heating and increased demand for electricity in summer for space cooling.

Coastal Inundation - Depending on the extent of the inundation, approximately 90ha of low lying land in Puhinui Reserve along the coastal edge and around the mouth of Puhinui Stream and estuary is at risk of coastal inundation over the next 100 years. This will likely displace the existing SA2 ecosystem characterised by searush, oioi, glasswort, and sea primrose rushland/ herbfield. If this endangered ecosystem is to remain in Te Puhinui it will more than likely need to migrate upstream to remain in the intertidal area.

Climate

Scale: 1_35 000@A3

0 1 3KM

SUMMER SUN PATH

WINTER SUN PATH

5 m/s

10 m/s

Puhinui

Blackgate Reserve

Te Puhinui has a subtropical climate with warm humid summers and mild winters. The prevailing winds come from the southwest, particularly in winter and spring. The median annual rainfall is approximately 1,200mm. Te Puhinui experiences flooding infrequently and there are some properties at risk of flooding during larger events.

As a result of a changing climate, Te Puhinui will be warmer and drier overall, but when it does rain it will be heavier. Depending on the extent of the inundation, approximately 90ha of low lying land in Puhinui Reserve along the coastal edge and around the mouth of Puhinui Stream and estuary is at risk of coastal inundation over the next 100 years.

KEY

- Catchment Boundary
- Transform Manukau
- Puhinui Stream
- Building Footprints

FREQUENCY OF WIND BLOW

- 1-2 hours during the year
- 3-5 hours
- 6 hours or more

FLOOD

- Flood Plains

COASTAL INUNDATION - ANNUAL EXCEEDENCE PROBABILITY (AEP)

- 1% AEP
- 1% AEP plus 1m sea level rise
- 1% AEP plus 2m sea level rise

Soil

Soil refers to the upper layer of earth, composed of organic and inorganic materials that develops over time through the weathering of the underlying geology and interactions with living organisms. Soils have a significant effect on water flow, drainage patterns, vegetation and ecological communities that exist in a place. The mineral content of soils accounts for approximately 45% of the volume of the soil[1]. Soil is made up of a combination of sand, silt and clay which come from the underlying geology and/or through deposition of material from the movement of tectonic plates, glaciations, erosion, changing courses of rivers etc. The remaining volume is made up of air (25%), water (25%) and organic matter (5%). It is this last 5% that also accounts for the carbon content of the soil, which is why soils with more organic matter sequester and hold more carbon. Soils are home to a large proportion of the world's biodiversity and among the most complex substances on earth. It is estimated that a single teaspoon of soil (1 gram) can contain up to one billion bacteria, several metres of fungal filaments, several thousand protozoa, and dozens of nematodes. Puhinui Catchment is composed of three different soil types:

Waitemataa residual soils

The Waitemataa residual soils are Te Puhinui's oldest and correspond to the East Coast Bays Formation. They are located in the upper catchment of Te Puhinui. The sedimentary rocks were formed in a subsided oceanic basin that has now uplifted to form the Auckland isthmus. These soils have developed through the weathering of the sandstone and mudstone, which also contains variable volcanic content and interbedded volcaniclastic grits. The rock typically weathers to form a soil mantle comprising firm to very stiff clays, with silt and sand, and variable plasticity. These soils are prone to shrinkage in summer months and swelling in winter months due to seasonal fluctuations in groundwater levels.

Alluvial soils

The alluvial soils are a highly fertile soil mantle located in the middle and lower catchment of Te Puhinui. They are made up of fine-grained fertile soil deposited by the ancestral Waipa River when it flowed through the Manuku lowlands toward the Kaipara Harbour. The alluvial soils correspond to the underlying undifferentiated alluvium and intertidal mud geology layers and make up approximately 60% of Puhinui Catchment.

Isthmus Volcanic Soils

The isthmus volcanic soils correspond to the lava, scoria and lithic tuff geology of the three volcanic cones of Puhinui Catchment - Matukutuururu, Matukutuureia, and Ash Hill. This soil is often rich in nutrients and holds water well because of the volcanic ash content. This is a relatively young soil, building on the 30,000 - 35,000 years old volcanic activity and is likely to be acidic as a result.

Productive Potential

Puhinui Catchment has some of the country's most productive soils. In New Zealand, the productive potential of soils is typically measured using the land use capability (LUC) classification system – a means of classifying land according to its capacity to support long-term sustained commercial production after taking into account the physical limitations of the land. The LUC classification system ranks soils from 1-8, 1 being the most productive, 8 being the least productive. Soils 1 - 5 are suitable for a larger range of land uses such as cropping and horticulture, as well as pastoral systems or forestry. Class 8 land is generally unsuitable for production, while classes 6 and 7 are generally suitable for pastoral or forestry uses. Te Puhinui is made up of a combination of class 1, 2 and 3 soils.

Land Use Capability (LUC) Classification:

1_Highly suitable for cultivated cropping, vineyards and berry fields, pasture, tree crops or production forestry with minimal physical limitations for arable use.

2_Suitable for many cultivated cropping, vineyards and berry fields, pasture, tree crops or production forestry with slight physical limitations for arable use.

3_Suitable for cultivated cropping, vineyards and berry fields, pasture, tree crops or production forestry with moderate physical limitations to arable use.

4_Suitable for pasture, tree crops, production forestry or for occasional cropping with severe physical limitations to arable use.

5_Unsuitable for arable cropping but only negligible to slight limitations to pasture, vineyards, tree crop or production forestry use.

6_Suitable for pasture, tree crops or forestry and in some cases vineyards, but unsuitable for arable use.

7_Suitable for pastoral grazing, tree crop or production forestry use and in some cases vineyards and berry fields.

8_Land unsuitable for grazing or production forestry, and is best managed for catchment protection and/or biodiversity conservation.

Soil and water

The permeability of soil plays a significant role in the way water moves underground and over the landscape as surface water flows and is a critical consideration for land use. Susceptibility to erosion, degradation through compaction and contaminants (if any) are also critical considerations. Soils with high levels of permeability allow the water to soak into the landscape, recharging aquifers and reducing runoff. Soils with low permeability result in lower volumes of infiltration and higher rates and volumes of runoff.

1. By weight the mineral content accounts for approximately 85% of the total, with water accounting for 12% and the remainder organic matter living organisms and air.

Soil

The majority of soils in Puhinui Catchment, Waitemataa residual and alluvial soils, have limited drainage capacity and are not suitable for stormwater soakage. Some infiltration for hydrologic mitigation is likely to be possible in the Puketoka formation in the lower and middle catchment, however high groundwater levels and saturated soils may limit this. Upper catchment clays in the East Coast Bays formation are likely to have very limited infiltration capacity, particularly where groundwater levels are high. Stormwater management practices suitable for these soils include rain gardens, sand filters, extended detention, wet ponds and wetlands, swales, filter strips, and areas of vegetation. Development on Te Puhinui's well drained volcanic field soils should manage stormwater via soakage, unless site specific testing demonstrates this isn't practicable. Stormwater management practices suitable for these soils include rain gardens, sand filters, extended detention, swales/filter strips, infiltration basins, infiltration trenches, porous pavement and areas of vegetation.

Soil Modification

While the underlying soil of Te Puhinui was once highly fertile, the reality is that a majority of the soils in the catchment are now highly modified soils. The Waitemataa residual soils in the upper catchment, which are characterized by fine clays are also highly vulnerable to degradation through compaction, are challenging to rehabilitate, and take many years to recover naturally. The fine clays are susceptible to erosion and contribute to the sedimentation of wetland and estuarine environments[2].

2. Water Sensitive Design for Stormwater - Guideline Document 2015/004, March 2015 (GD04)

Soil

Scale: 1_35 000@A3

0 1 3KM

PAPATOETOE
MANUKAU
CLOVER PARK
Tootara Park
WIRI
Puhinui
Homai
MANUREWA
Blackgate Reserve

KEY

- Catchment Boundary
- Transform Manukau
- Puhinui Stream
- Contours

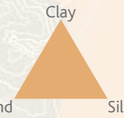
Soils

Isthmus Volcanic soils

Often rich in nutrients and holds water well due to the volcanic ash content. They are often young and acidic depending on which type of volcano they come from.

Alluvial soils

Fine-grained fertile soil deposited by water flowing over flood plains or in river beds.



Waitemataa residual soils

Sandstone and mudstone with variable volcanic content and interbedded volcaniclastic grits. Typically weather to form a mantle of residual soils generally comprising firm to very stiff clays, silts and sands of variable plasticity. Prone to shrinkage in summer months and swelling in winter months due to seasonal fluctuations in groundwater levels.

Urban Area

There is no precise data that covers the urban area.

Puhinui Catchment is composed of three different types of soil. Waitemataa residual soils are the oldest in the catchment and are located in the upper catchment. Alluvial soils form a highly fertile soil mantle in the middle and lower catchment. The isthmus volcanic soils correspond to the lava, scoria and lithic tuff geology of the three volcanic cones of Puhinui Catchment - Matukutuururu, Matukutuureia (collectively known as Ngaa Matukurua) and Ash Hill.

Te Puhinui soils are relatively well drained, are highly productive, and are highly modified through deforestation, rural land uses followed by urbanisation. There are some residual areas of highly productive soils in the upper catchment and lower catchment with small pockets in the mid catchment.

Hydrology[1]

Hydrology refers to the water cycle in Puhinui Catchment. It includes the interrelationship between landform, soil and vegetation and the hydrological function of the upper, middle and lower catchments. It also refers to the quantity of water flowing through the catchment, including flooding; the quality of the water with regard to sediments and contaminants; and the condition and health of the stream and the related aquatic habitat and receiving environments[1].

Puhinui Catchment

There are three streams with associated tributaries in Puhinui Catchment: Puhinui Stream, Homai Stream and Blackgate Reserve Stream. The watercourses within Puhinui Catchment have been heavily modified, lack riparian vegetation, and suffer from bank stability issues, loss of habitat and poor water quality.

A water catchment has three different areas that perform different hydrological functions and host different ecological compositions and wildlife communities. The areas of the catchment are the upper, middle and lower catchments. In an unmodified environment, the upper catchment, also referred to as the headwaters, are home to steep and intermittent streams that require vegetation to protect them against erosion and to slow water, allow it to recharge aquifers and disperse stormwater runoff to prevent it from concentrating into overland flow paths. The mid catchment includes gently rolling landforms where stormwater runoff merges together to form larger stream and wetland systems. The lower catchment is where water disperses widely across the landscape to provide a rich environment for freshwater and saline wetlands, estuaries and coastal forests.

Allowing water to soak into the ground to recharge aquifers is critical to maintaining the base flow level of streams. Urbanisation increases the amount of impervious surfaces in a catchment, which prevents rainfall from soaking into the ground and increases the volume and velocity of rainfall runoff. This leads to a loss of stream base flows, changes to natural flow patterns of the catchment, increases stream bed and bank erosion and pollution from contaminated stormwater and higher water temperatures. In a typical catchment, an overall reduction of stream and wetland health, as measured by criteria such as pollutant loads, habitat quality, and aquatic species abundance and diversity, begins when 10% of a water catchment is covered with impervious surfaces. With impervious surface coverage of more than 30% of a water catchment, impacts become severe and degradation is almost unavoidable[2]. Currently 29% of the catchment is impervious and this is expected to increase to approximately 44% once the development outcomes sought in the Auckland Unitary Plan and Manukau Framework Plan are achieved.

Puhinui Stream

Puhinui Stream is approximately 12,000 meters long, a significant proportion of which is in Council ownership. Puhinui Stream is typically soft-bottomed, made up of gravel, sand and mud. Prior to deforestation, farming and later urbanisation, the stream would have meandered more across the land through the middle and lower catchment. Once tree coverage was removed the stream became more incised and the alignment became more fixed. This process contributed significantly to sedimentation of the Puhinui Estuary and Manukau Harbour.

A stream in an unmodified catchment distributes nutrients and food for wildlife across the catchment and aids species dispersal[3]. Over 60% of Puhinui Stream is now channelised and straightened for conveyance and lined with concrete to prevent erosion. This is most prevalent through parks and reserves such as Raataa Vine and Wiri reserves. Puhinui Stream gets progressively deeper and wider as it moves through the landscape, averaging 0.4m deep and 1.9 m wide through the middle of the catchment and reaching a maximum width of 10 m and 2 m deep in the lower catchment. The stream also meanders more and is less modified in the lower catchment.

Erosion ‘hotspots’ have been identified near stormwater pipe outlets draining commercial and industrial land uses and in bush fragments with poor bank vegetation in the upper catchment. Dogs have also been identified as causing damage to vegetation, and increasing erosion in areas within Auckland Botanic Gardens where they have access to the stream. Riparian planting has resulted in stabilisation of the banks in some locations. Puhinui Stream has generally low levels of erosion and ‘good’ bank stability in the lower catchment.

Homai and Blackgate Reserve Streams

Homai Stream is 1,500 meters long. It is tightly constrained by industrial land uses and continues to be accessed by stock over 350 meters of its length.

Blackgate Reserve Stream is 950 meters long and is also primarily in council ownership. It is also lined with concrete for conveyance, however sedimentation is an issue in the unlined sections due to the flat grade of the stream bed.

Overland Flow Paths and The Pipe Network

15% of the streams in the catchment are intermittent, or seasonal streams, and 1.3% of the streams are ephemeral, which are streams that flow during and after rainfall. These are primarily located in and around Tootara Park[4]. In an undeveloped catchment this would typically be much greater than 50% of the total stream length. The existing stormwater network is not always able to convey the capacity required in the Stormwater Code of Practice and the stormwater volumes are likely to increase

1. Unless stated otherwise, the information in this section has been derived from The Stormwater Management Plan.
2. Arnold and Gibbons, 1996: sighted by Ferguson, 1998.
3. Auckland Council, 2013, TR35.
4. Morphum, 2017.

Hydrology

with the increasing impacts of climate change. Once capacity is reached, water will follow the topography and shortest route and will result in flooding of public and private land . The stormwater network inspection model accesses the higher risk pipes in the catchment more frequently. Of the approximately 1350 of the 9300 (15%) of the pipes that have been assessed, the majority are in a moderate or better condition and only 7 pipes were identified as being in poor or failing condition.

Water Quantity

Water quantity refers to the volume of water flowing over and through the catchment and includes flooding and coastal inundation. Flooding occurs when the volume of rainfall exceeds that capacity of the stormwater network, when blockages in the network occur and in depressions that fill up when it rains. Flooding represents a significant health and safety risk to people and property, particularly access for vulnerable residents, even where buildings are elevated above flood levels. Approximately 20% of Puhinui Catchment is subject to flooding.

There are over 2000 buildings in Puhinui Catchment located within the floodplain. While the majority of these have their floor levels above predicted flood levels, approximately 123 residential and commercial buildings in the catchment are predicted to be under water during large storm events (1 in 100 year storm). It estimated that this number would increase to 203 residential and commercial buildings with continued urbanisation and the ongoing effects of a changing climate.

Water Quality

Water quality is a measure of the pollutant and contaminant loads present in water flowing in the stream as well as the water flowing over and through the land and includes sedimentation, elevated levels of nutrients, heavy metals, hydrocarbons and petrochemicals, pesticides and organic contaminants. Temperature is also a mesure of water quality. Aquatic ecosystems are very sensitive to water quality changes resulting from stormwater runoff. Water quality and stream ecology has been monitored and assessed by LAWA (Land, Air, Water, Aotearoa) in 2016 and is recorded as ‘poor making it unsuitable for contact recreation’, however the report also indicates the Macroinvertebrate Community Index (MCI) has a ‘likely improving’ trend.

A significant portion of the catchment, approximately 46% or 1,370ha, currently drains via a network of publicly and privately owned constructed ponds and wetlands, providing treatment and/or detention to runoff entering the stream. The actual performance of these devices is not currently known.

Existing Council maintained ponds provide treatment to runoff from a large area of the upper residential catchment suburbs of Goodwood Heights, Auckland Botanic Gardens and Tootara Park. The Wiri Pond in particular is strategically important as 30% of the catchment drains through it. The high contaminant generating state highways appear to have relatively good coverage however there are some sections not currently treated. Te Puhinui Domain pond has a large capacity, however it is unlikely to be performing as well as it could in its current configuration. There is uncertainty about how much of the commercial/industrial area is treated.

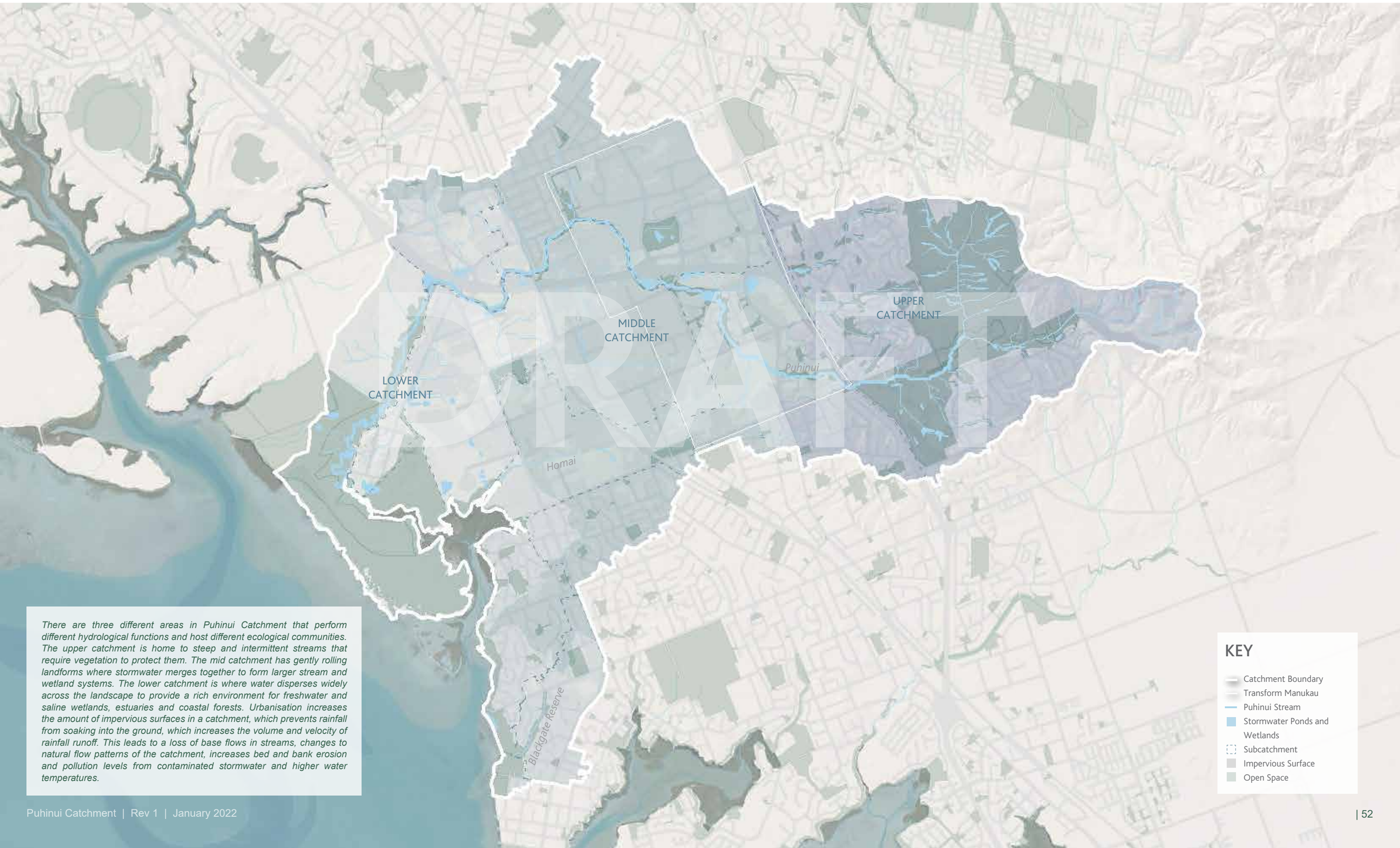
There are no known engineered overflow points where wastewater can enter the receiving environment in Puhinui Catchment. However, Te Puhinui Watercourse Assessment[5] identified sewage fungus at three locations along the stream.

4. Morphum, 2017.

Hydrology | Puhinui Catchment

Scale: 1_35 000@A3

0 1 3KM



There are three different areas in Puhinui Catchment that perform different hydrological functions and host different ecological communities. The upper catchment is home to steep and intermittent streams that require vegetation to protect them. The mid catchment has gently rolling landforms where stormwater merges together to form larger stream and wetland systems. The lower catchment is where water disperses widely across the landscape to provide a rich environment for freshwater and saline wetlands, estuaries and coastal forests. Urbanisation increases the amount of impervious surfaces in a catchment, which prevents rainfall from soaking into the ground, which increases the volume and velocity of rainfall runoff. This leads to a loss of base flows in streams, changes to natural flow patterns of the catchment, increases bed and bank erosion and pollution levels from contaminated stormwater and higher water temperatures.

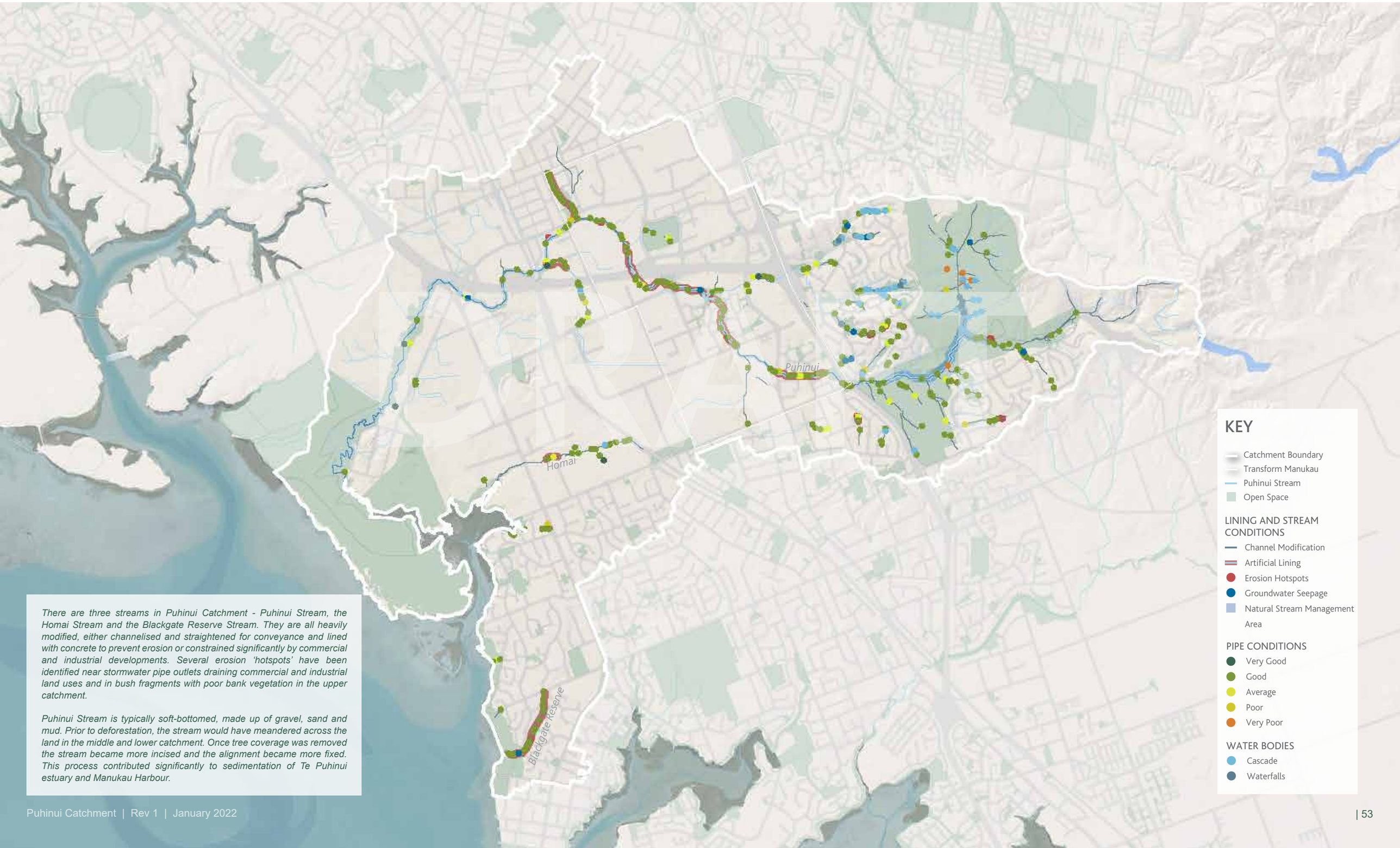
KEY

- Catchment Boundary
- Transform Manukau
- Puhinui Stream
- Stormwater Ponds and Wetlands
- Subcatchment
- Impervious Surface
- Open Space

Hydrology | Puhinui, Homai + Blackgate Streams

Scale: 1_35 000@A3

0 1 3KM



There are three streams in Puhinui Catchment - Puhinui Stream, the Homai Stream and the Blackgate Reserve Stream. They are all heavily modified, either channelised and straightened for conveyance and lined with concrete to prevent erosion or constrained significantly by commercial and industrial developments. Several erosion 'hotspots' have been identified near stormwater pipe outlets draining commercial and industrial land uses and in bush fragments with poor bank vegetation in the upper catchment.

Puhinui Stream is typically soft-bottomed, made up of gravel, sand and mud. Prior to deforestation, the stream would have meandered across the land in the middle and lower catchment. Once tree coverage was removed the stream became more incised and the alignment became more fixed. This process contributed significantly to sedimentation of Te Puhinui estuary and Manukau Harbour.

KEY

- Catchment Boundary
- Transform Manukau
- Puhinui Stream
- Open Space

LINING AND STREAM CONDITIONS

- Channel Modification
- Artificial Lining
- Erosion Hotspots
- Groundwater Seepage
- Natural Stream Management Area

PIPE CONDITIONS

- Very Good
- Good
- Average
- Poor
- Very Poor

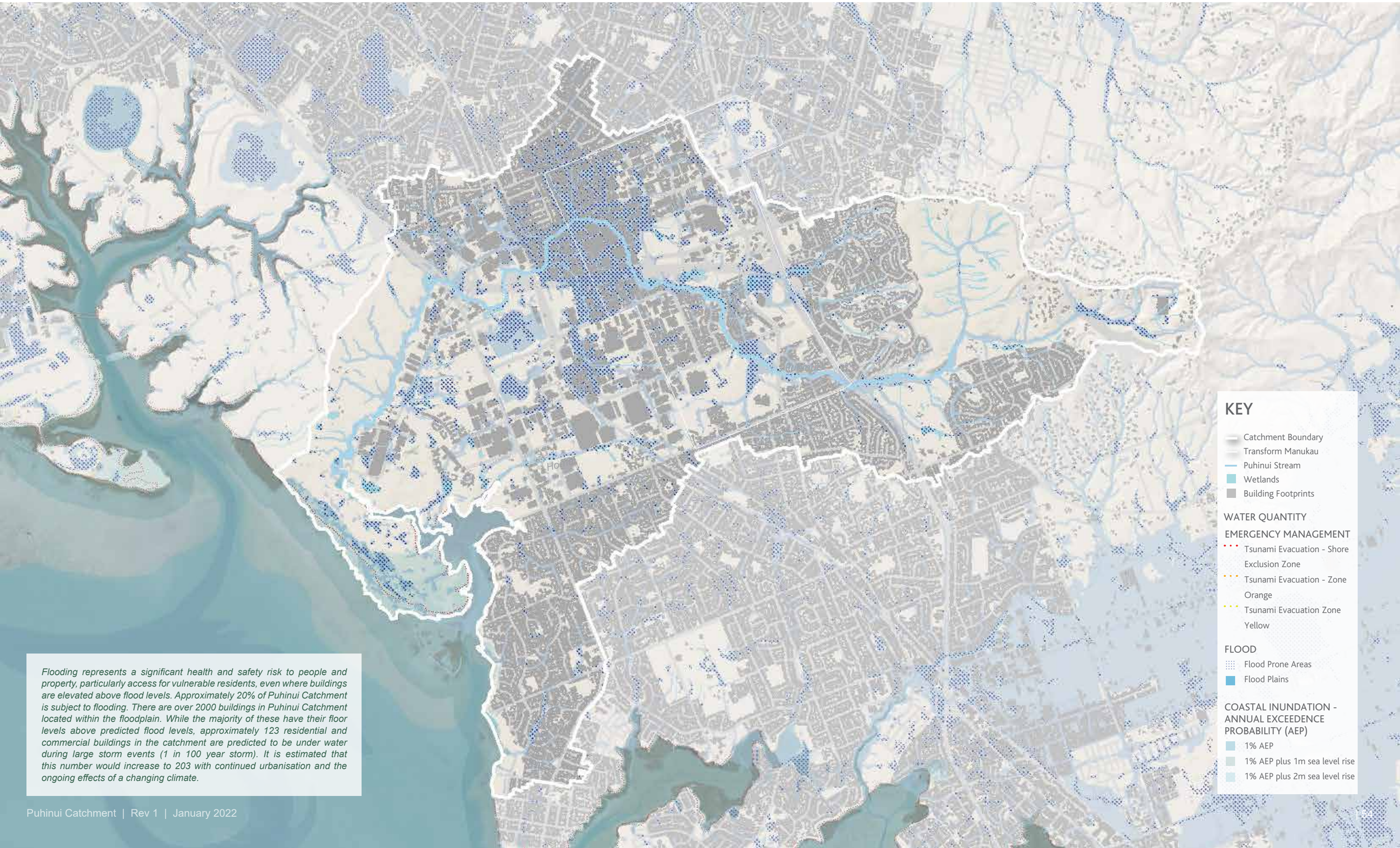
WATER BODIES

- Cascade
- Waterfalls

Hydrology | Water quantity

Scale: 1_35 000@A3

0 1 3KM



Flooding represents a significant health and safety risk to people and property, particularly access for vulnerable residents, even where buildings are elevated above flood levels. Approximately 20% of Puhinui Catchment is subject to flooding. There are over 2000 buildings in Puhinui Catchment located within the floodplain. While the majority of these have their floor levels above predicted flood levels, approximately 123 residential and commercial buildings in the catchment are predicted to be under water during large storm events (1 in 100 year storm). It is estimated that this number would increase to 203 with continued urbanisation and the ongoing effects of a changing climate.

Hydrology | Water quality

Scale: 1_35 000@A3

0 1 3KM

Te Kete Waiora *(outlet)*
NO_3^- = 5.7 ppm

Te Kete Waiora *(pond)*
NO_3^- = 8.1 ppm

Te Kete Waiora
NO_3^- = 4 ppm

Te Kete Waiora
NO_3^- = 6.5 ppm

UPPER CATCHMENT

MIDDLE CATCHMENT

LOWER CATCHMENT

Homai

Water quality is a measure of the pollutant and contaminant loads in water flowing in the stream as well as the water flowing over and through the land including sedimentation, nutrients, heavy metals, hydrocarbons and petrochemicals, pesticides, temperature and organic contaminants. Aquatic ecosystems are very sensitive to water quality changes. In 2016, LAWA (Land, Air, Water, Aotearoa) assessed Puhinui Stream as 'poor - making it unsuitable for contact recreation'. The report also indicates the Macroinvertebrate Community Index (MCI) has a 'likely improving' trend.

A significant portion of the catchment, approximately 46% or 1,370ha, currently drains via a network of publicly and privately owned constructed ponds and wetlands, providing treatment and/or detention to runoff entering the stream. The actual performance of these devices is not currently known.

KEY

- Catchment Boundary
- Transform Manukau
- Puhinui Stream

WATER TREATMENT

- Stormwater Treatment Areas
- Treatment Ponds
- Wetlands

WATER QUALITY

- Pollution
- Debris Jam
- Impervious Surface

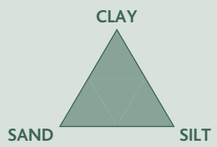
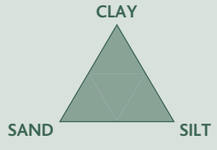
Water sensitive design opportunities

Water Sensitive Design (WSD) is an approach to stormwater management that integrates the ecology of a site, best practice in urban design, and community values.

"WSD aspires to ensure multiple public benefits from stormwater management, and to develop a unique 'sense of place' for our communities. A WSD approach takes into account the multiple objectives influencing project outcomes, including urban design, landscape amenity, and community issues and aspirations. In this way, stormwater management is targeted to where the greatest benefit can be achieved for both community and ecological outcomes"
Water Sensitive Design for Stormwater, 2015

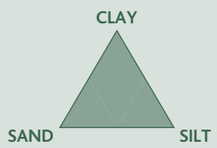
A WSD approach avoids potential sources of contaminants (impervious surfaces and exposed hazardous materials) and additionally promotes the treatment of stormwater runoff close to source. Protecting and enhancing permanent and intermittent streams forms a key feature of a water sensitive design approach in Puhinui Catchment.

Water sensitive design opportunities

WATER SENSITIVE DESIGN DEVICE			LAND USE APPLICATION	SOIL TYPE	CATCHMENT REQUIRED	WATER QUALITY ACHIEVED	WATER QUANTITY CONTROL	ADDITIONAL BENEFITS
VEGETATED SWALE/ FILTER STRIPS		An earth drainage course with gently sloped sides and planted with grass, or native vegetation. Riprap & check dams can be used on steeper slopes.	- Residential Zone - Country Living Zone - Business Zone - Light Industrial Zone - Streets / Road Corridors - Car Parks - Open Spaces		Maximum 20,000 m2	- Suspended solids - Metals - Synthetic organics - Petroleum - Reduce temperatures	- Peak discharge control - Volume Control - Ground water recharge	- Improve amenity and ecology - Minor habitat benefits for micro and macro invertebrates, reptiles and birds
URBAN SWALE		A constructed drainage course suitable for constrained environments with vegetation and riprap incorporated.	- Residential Zone - Country Living Zone - Business Zone - Light Industrial Zone - Streets / Road Corridors - Car Parks - Open Spaces		Maximum 20,000 m^2	- Suspended solids - Metals - Synthetic organics - Reduce temperatures	- Peak discharge control - Volume Control - Ground water recharge	- Improve amenity and ecology - Minor habitat benefits for micro and macro invertebrates, reptiles and birds
RAINGARDEN		A planted depression or garden that provides stormwater runoff the opportunity to infiltrate the soil.	- Residential Zone - Country Living Zone - Business Zone - Light Industrial Zone - Streets / Road Corridors - Car Parks - Open Spaces		Maximum 10,000 m2	- Suspended solids - Metals - Litter - Synthetic organics - Reduce temperatures	- Peak discharge control - Volume Control - Ground water recharge	- Improve amenity and ecology - Minor habitat benefits for micro and macro invertebrates, reptiles and birds

Reference: Omaru Creek, Stormwater Management Plan, Auckland Council

Water sensitive design opportunities

WATER SENSITIVE DESIGN DEVICE			LAND USE APPLICATION	SOIL TYPE	Catchment Required	WATER QUALITY ACHIEVED	WATER QUANTITY CONTROL	ADDITIONAL BENEFITS
WETLAND		Constructed wetlands are large shallow planted ponds that allows for sediment to settle and a degree of bio filtration.	- Residential Zone - Country Living Zone - Business Zone - Light Industrial Zone - Streets / Road Corridors - Car Parks - Open Spaces		Minimum 20,000 m²	- Suspended solids - Metals - Synthetic organics - Reduce temperature	- Peak discharge control - Volume Control - Ground water recharge - Stream bank erosion control	- Improved amenity - Significant habitat benefits for micro and macro invertebrates, reptiles and birds
DETENTION BASIN		Designed to temporarily detains stormwater runoff and allows sediment particles and associated pollutants to settle out.	- Residential Zone - Country Living Zone - Business Zone - Light Industrial Zone - Streets / Road Corridors - Car Parks - Open Spaces		10,000 - 80,000 m²	- Suspended solids - Metals	- Peak discharge control - Stream bank erosion control	- Can be dual purpose (i.e. public amenity) - Underground tanks can be integrated with facilities
ABOVE GROUND STORAGE		Detain and retain runoff from roofs in an above ground storage device such as a tank or oversize down pipes. Requires first flush diverter.	- Residential Zone (except apartments) - Country Living Zone		1 - 10 m²	- Litter	- Volume Control	- Potential for re-use of water for irrigation and some domestic uses such as flushing toilets - With additional treatment, water can be drunk.

Reference: Omaru Creek, Stormwater Management Plan, Auckland Council

Water sensitive design opportunities

WATER SENSITIVE DESIGN DEVICE			LAND USE APPLICATION	SOIL TYPE	CATCHMENT REQUIRED	WATER QUALITY ACHIEVED	WATER QUANTITY CONTROL	ADDITIONAL BENEFITS
BELOW GROUND STORAGE		Detain and retain runoff in an underground storage device such as a tank or structural cell. Requires first flush diverter.	- Residential Zone - Country Living Zone - Business Zone - Light Industrial Zone - Streets / Road Corridors - Car Parks		1 m²	- Litter	- Volume Control	- Low maintenance and no visual impact
STABILISED PERMEABLE SURFACES		Provides for downward percolation of stormwater runoff. Materials include porous concrete, porous asphalt, permeable pavers, reinforced turf and stabilised loose material.	- Residential Zone - Open spaces - Low volume streets - Country Living Zone		Maximum 30,000 m²	- Suspended solids - Litter	- Peak discharge control - Volume Control - Ground water recharge	- Low maintenance and no visual impact - Potential to improve amenity
PROPRIETARY TREATMENT DEVICES		Examples include gross pollutant traps, sand filters, grease traps, vortex drains, carbon filters and litter traps. Storm filters can be integrated with bio retention features, such as rain gardens.	- Residential Zone - Country Living Zone - Business Zone - Light Industrial Zone - Streets / Road Corridor - Car Park - Open Space		1 m²	- Suspended solids - Metals - Synthetic organics - Petroleum - Litter	N/A	- Small spatial requirement - Can be retrofitted to existing stormwater infrastructure.

Reference: Omaru Creek, Stormwater Management Plan, Auckland Council

Water sensitive design opportunities

WATER SENSITIVE DESIGN DEVICE			LAND USE APPLICATION	SOIL TYPE	CATCHMENT REQUIRED	WATER QUALITY ACHIEVED	WATER QUANTITY CONTROL	ADDITIONAL BENEFITS
LIVING ROOFS		Partially or completely planted roof to filter water and air. Reduces impervious surfaces through the inclusion of a vegetation layer.	- Residential Zone	N/A	N/A	- Reduce temperature	- Peak discharge control - Volume Control	- Provide insulation and enhance air quality - Improve amenity and ecology - Reduce urban heat island effect
TREE PITS		Directs rainfall via streamflow and filters stormwater runoff through soil layers and root pores. Note: trees will be replaced every 10-15 years.	- Residential Zone - Country Living Zone - Business Zone - Light Industrial Zone - Streets / Road Corridor - Car Park - Open Space	CLAY SAND SILT	Maximum 10,000 m²		- Some peak discharge control	- Improve amenity and ecology - Reduce urban heat island effect
RAINWATER HARVESTING		Collecting rainwater to use in the home, business or within the community. Requires first flush diverter plumbed in.	- Residential Zone (except apartments)	N/A	1 m²	- Litter	- Peak discharge control - Volume Control	- Potential for re-use of water for irrigation and some domestic uses such as flushing toilets - With additional treatment, water can be made drinkable.

Reference: Omaru Creek, Stormwater Management Plan, Auckland Council

Stream enhancement opportunities

WATER SENSITIVE DESIGN DEVICE			WATER QUALITY ACHIEVED	WATER QUALITY CONTROL	ADDITIONAL BENEFITS
STREAM IMPROVEMENT		Stream improvement can be activated using tools such as vegetating margins, weirs, stream bank stabilisation and stream re-contouring/ channelling.	- Suspended solids - Metals - Synthetic organics - Reduce temperature	- Peak discharge control - Volume control - Ground water recharge - Stream bank erosion control	- Improve amenity and ecology - Place-making - Potential to remove need for detention in the catchment
REVEGETATION		Revegetation can improve the complexity of the stream, which inturn encourages a greater diversity of potential species.	- Suspended solids - Metals - Synthetic organics - Reduce temperature	- Peak discharge control - Volume control - Ground water recharge - Stream bank erosion control	- Strengthen the stream bank - Provide varying levels of shade - Creates habitat and breeding sites for steam and streamside occupants - Filter contaminants and control groundwater flow - Supply leaf litter which can begin an aquatic food web - Contribute complexity to the structure of the overall stream formation
STREAM DAYLIGHTING		Bringing piped stormwater flows or buried streams to the surface and into restored stream environments.	- Suspended solids - Metals - Synthetic organics	- Peak discharge control - Volume control - Ground water recharge - Stream bank erosion control	- Improve amenity and ecology - Placemaking
YAZOO STREAM		A constructed tributary stream that runs parallel to, and within the floodplain of the main creek. Can be planted to encourage bio filtration.	- Suspended solids - Metals - Synthetic organics - Reduce temperature	- Peak discharge control - Volume control - Ground water recharge - Stream bank erosion control	- Improve amenity and ecology - Placemaking

Reference: Omaru Creek, Stormwater Management Plan, Auckland Council

Existing biodiversity

Puhinui Catchment was once home to six distinct ecosystems. These can be described as three broad ecosystem types: inland forests, coastal ecosystems and stream and aquatic habitats.

Inland Forests

Three primary forest types make up the inland forests of Puhinui Catchment - Puuriri forest; Taraire, tawa, podocarp forest; and Kauri, podocarp, broadleaved, beech forest. See Indigenous terrestrial and wetland ecosystems of Auckland for more information on these ecosystems.

Puuriri forest was the most dominant forest type in Puhinui Catchment and is characterised by puuriri, karaka, kohekohe and taraire and would have supported stands of kahikatea swamp forest with swamp maire, titoki and pukatea along boggy streams and in wetlands. Puuriri forests are found from northern Waikato north and were once widespread through the Auckland isthmus where fertile soils are free-draining alluvial terraces or volcanic soils.

Taraire, tawa, podocarp forests occur in moderately fertile soils that consist of andesitic and basaltic heritage and also include rimu and northern raataa with kahikatea, hiinau, rewarewa, pukatea, miro, puuriri, karaka, niikau and tree ferns. There was once a small patch of this forest type adjacent to the estuary next to Homai Stream.

Kauri, podocarp, broadleaved, beech forest are found largely in the eastern areas south of Auckland, the Coromandel and the islands in the Waitemataa Harbour and occupy ridge and gully landform with variable soil fertility and moisture availability. They also include taanekaha, tootara, rimu, miro, tawa, hIinau, northern raataa, rewarewa, toowai, kohekohe, narrow-leaved maire and taawari. This forest type is found in the upper Puhinui Catchment.

These forests once supported a diverse range of invertebrates; amphibians including Hochstetter's frogs and geckos; reptiles and long-tailed bats as well as a wide range of inland birds. These would have included kereruu, tuuii, morepork, kingfisher, long-tailed and shining cuckoo, fantail, tomtit, grey warbler, silvereye, New Zealand falcon, kaakaa, bellbird, kookako, kaakaariki, rifleman, whitehead, robin, hihi and saddleback.

These forests once supported a diverse range of invertebrates; amphibians, and geckos; reptiles and long-tailed bats as well as a wide range of inland birds. These would have included kereruu, tuuii, morepork, kingfisher, long-tailed and shining cuckoo, fantail, tomtit, grey warbler, silvereye, New Zealand falcon, kaakaa, bellbird, kookako, kaakaariki, rifleman, whitehead, robin, hihi and saddleback.

There are twenty three significant ecological areas in Puhinui Catchment, including five in the lower catchment along the coast and stream and seventeen in the upper catchment - five in Tootara Park/ Botanic Gardens, one along the stream, east of Tootara Park, eight in Goodwood Heights, and three in Hill Park.

Today these ecosystems are classified as Regionally Endangered or Critically Endangered[2] and many of the species listed above only exist on predator free islands and in heavily managed areas of the Hunua Ranges.

Coastal Ecosystems

The extensive tidal coastline of the Manukau Harbour and inland waters are defining characteristics of Puhinui Catchment. Te Puhinui coastal area is made up of gently-graded sand flats, intertidal banks, shell banks, and coastal embankments which combine to create three broad ecosystem types: coastal broadleaved forest, mangrove forest and saline rushland and herb field. Significant areas of Te Puhinui's coastal environment have been identified as an Area of Significant Conservation Value by the Department of Conservation[3].

Coastal broadleaved forest of poohutukawa, puuriri, karaka, and taraire as well as koowhai, niikau and kohekohe grow on clay banks and low cliffs. Mangrove forests occupy frost-free, soft muddy shorelines in brackish tidal estuaries, inlets, rivers and streams. The mangroves growing in the shelter of Te Puhinui Creek are the oldest mangroves in the Manukau Harbour.

Depending on variant of mangrove forest other plant species may include; oioi, swamp twig rush, salt marsh ribbonwood, glasswort, sea primrose, half star, shore celery, arrow grass, sea blite, sea rush, coastal needle grass, knobby club rush, bachelor's button and tauhinu. Mangrove forests are the only ecosystem type in Te Puhinui that are not endangered. Intertidal wetlands including salt marsh and salt meadows grow on soft, muddy shoreline and include plants such as oioi, glasswort, sea primrose, saltmarsh ribbonwood and other plants tolerant of high concentrations of salt.

Today, the coastal broadleaved forest and saline rushland and herb field are both endangered due to land use changes in the catchment. These include the ongoing effects of runoff with sediment, pesticides and pollutants, sewage and industrial effluent discharges, land reclamations, the spread of Pacific oysters and Spartina, expansion of mangrove forests, fishing and recreational activities.

Te Puhinui coastal environment supports dense populations of intertidal sand flat organisms, terrestrial invertebrates, fin fish, shags, herons, spoonbill, waterfowl, banded rail, marsh crake, puukeko, kingfisher, fernbird, fantail, grey warbler, silvereye, blackbird and finches. Mangrove forests also act as a nursery for various species of fish.

The Manukau Harbour provides habitat and feeding ground for a wide range of international and national migratory birds,

1. At the time of writing, a specific ecological survey for Te Puhinui had not been completed - this section has been compiled using a range of sources, particularly Auckland Council's Indigenous Terrestrial and Wetland Ecosystems of Auckland, 2017.
2. Conservation status of all of the region's terrestrial and wetland ecosystem types and their regional variants are rated using the International Union for the Conservation of Nature Red List of Ecosystems criteria which evaluates the severity and impact of multiple symptoms of risk produced by different processes of ecosystem degradation, including changes in the distribution and extent of an ecosystem, degradation of the physical environment and changes to its characteristic species, all of which contribute to risk of decline - Auckland Council. Indigenous Terrestrial and Wetland Ecosystems of Auckland. 2017.
3. http://www.aucklandcity.govt.nz/council/documents/technicalpublications/TR2009_112%20-%20Environmental%20Condition%20and%20Values%20of%20Manukau%20Harbour.pdf

Existing biodiversity

including a number of threatened species. It is estimated to support more than 20% of the total New Zealand wader population - 60,000 of the 250,000 New Zealand waders[4]. Approximately half of Manukau Harbour's shore birds are resident species (eg. NZ and banded dotterel, pied oystercatcher, pied stilt and wrybill). The national migrants are pied oystercatcher, banded dotterel and wrybill. They are generally in the Manukau Harbour from January through to August and in South Island riverbed breeding sites during the rest of the year. Arctic migrants, which are present from September through to March include bar-tailed godwit, lesser knot, turnstone and curlew sandpiper[5].

Increasing sedimentation of the harbour, the increasing number of stormwater and treated wastewater discharges, and the spread of mangroves are impacting on feeding and roosting habitats of these harbour shorebirds which threaten their survival.

Stream and Aquatic Habitats

The stream and aquatic habitats in Puhinui Stream vary along its length as it passes through the different ecosystems that make up Puhinui Catchment. Notwithstanding, the stream can be considered a distinct and continuous ecosystem in its own right.

Puhinui Stream follows a relatively natural, meandering course through the lower catchment and includes ecologically significant places suitable for spawning iinanga, and shortfin eels and banded kookopu. However, overall Puhinui Stream is in poor condition, rating amongst the worst ten in the Auckland Region.

The health of a stream and its aquatic habitats is significantly influenced by the size and extent of the riparian corridor which strengthens the stream bank, creates habitat, filters contaminants, supplies leaf litter to feed into the aquatic food web and shades the stream to help regulate temperature. The stream coverage can be measured as a percentage - the higher the percentage of cover the healthier the stream is likely to be.

The riparian corridor along Puhinui Stream varies significantly along its length, from none in significant segments of the mid catchment through to dense mature native forest over 100m wide (50m both sides of the stream) through part of Tootora Park and the Botanic gardens. The upper catchment has the most extensive riparian coverage which ranges between 50-90%. The mid catchment has significantly less coverage with an average of around 30% through Raataa Vine, the current DHB land holding and Wiri Reserve. This reduces to 10 - 30% through the industrial areas. The lower catchment averages between 30-50% riparian cover. Homai Stream has an average riparian coverage between 10-30% and the Blackgate Reserve Stream averages around 10%.

The upper Puhinui Stream and its many tributaries support a wide range of insect and fish species, including mayflies, stoneflies and caddisflies, kakahi (freshwater mussel), koura (freshwater crayfish), several species of bully, long and shortfin eels, and banded kookopu. Barriers to fish passage in the lower catchment mean that iinanga, which is a poor climbing species, are seldom seen in the upper catchment.

The low-lying flats and alluvial soils of the mid catchment were likely to have supported stands of kahikatea swamp forest with swamp maire, titoki and pukatea along boggy streams and in wetlands. However, agricultural drainage, logging and urbanization have all contributed toward the displacement of these plant communities and lowered the water table resulting in further loss of wetlands and swamp forest.

Poor water quality and an increase of volume and frequency of flood events have significantly altered the stream environment for wildlife. Notwithstanding, Puhinui Stream is home to several species of native fish and invertebrates. Ecosystem diversity in the mid catchment is poor compared to the upper and lower catchment. The most prominent animals are those species tolerant of pollution and varying levels of oxygen. These include short and long finned eels, Cran's bully, redfin bully, banded kookopu and glow worms. Bridges, culverts and other stream infrastructure can create a barrier for fish needing to migrate along the stream and restrict water flow during flood events.

Urban Ecology

The ecosystems of Puhinui have been significantly modified. With an average canopy cover between 9-15%, Puhinui Catchment has some of the lowest canopy cover in the region. The remaining forest cover remains fragmented and isolated and is mainly composed of exotic species[6]. With the exception of the patches of forest in Auckland Botanic Gardens, Tootara Park, David Nathan Park and along the coastal edge and inner harbour around Puhinui Reserve, Puhinui is an *urban ecology*.

As outlined above, Puhinui Catchment is home to a variety of coastal and forest birds as well as a wide range of insects, spiders and other invertebrates, frogs, skinks and geckos, fish and eels and even bats native to the area. Due to the significant urbanisation of Te Puhinui, it is also home to a wide range of introduced plant and animal species. Plants include easily recognisable species such as pine, macrocarpa, eucalyptus, pampas grass, blue convolvulus, japanese honeysuckle, jasmine, mothplant, onion weed and tradescantia. Exotic animals include dogs, cats, and mammal pests such as rats, feral and unowned cats, stoats, rabbits, hedgehogs and possum as well as other pests such as wasps.

The existing patches of indigenous ecosystems remain under threat from the pressures of urbanisation and the associated stresses of habitat loss, mammalian pests, competition from invasive plants and

4. http://www.aucklandcity.govt.nz/council/documents/technicalpublications/TR2009_112%20-%20Environmental%20Condition%20and%20Values%20of%20Manukau%20Harbour.pdf
5. Talk 10 Birds of the Manukau Tim Lovegrove.pdf
6. Te Rautaki Ngahere ā-Tāone o Tāmaki Makaurau: Auckland's Urban Ngahere (Forest) Strategy. Ōtara-Papatoetoe local board area is calissifed as being bare at 9% coverage. The Manurewa Local Board Area is classified as having low coverage with between 10% - 15%.

Existing biodiversity

kauri dieback. These stresses are likely to be exacerbated by intensification of the catchment and a changing climate - warmer and drier weather overall with increased risk of flooding resulting in erosion and coastal inundation.

As much as we may wish to do so, we can not recreate the ecosystems of the past. As well as being an urban ecology, Te Puhinui is a ‘novel ecosystem’. A novel ecosystem is composed of a unique collection of species that include both exotic and native species that result from human agency and influence but are often not directly or consciously managed by people.

Taamaki Makaurau is a temperate rainforest and the tendency of Puhinui Catchment is to ‘succeed’ from the current state toward a forested landscape - this is nature’s response to disturbance. Whether it is planned or not, as Te Puhinui continues to revert towards a forested landscape, new and novel ecosystems will emerge that will create communities of plants and animals that have never coexisted before. These new communities will provide the genetic material for the ecosystems of the future. While the catchment cannot be revegetated to replicate an historic ecosystem; patches of native vegetation and natural stormwater devices in parks and opens spaces, reserves, streets, roads, schools and backyards provide opportunities for ‘novel urban ecologies’ to emerge throughout the catchment and integrate with the built fabric in a way that reflects the older and deeper patterns of Te Puhinui.

The following pages present six potential ecosystems that reflect historic ecosystem patterns and distribution. While the landscape has been significantly modified, many of the underlying influences such as aspect, prevailing weather condition, underlying soils and rainfall remain the same and present useful guides for understanding broad regenerative patterns of the landscape.

Potential Ecosystems

The following pages present six potential ecosystems that reflect the historic extent of ecosystem types and current environmental influences. The historic extent of each ecosystem type was mapped by examining historic vegetation spatial data sets. Where this information was not available; climate, geography, geology and soil characteristics were used as determinants.

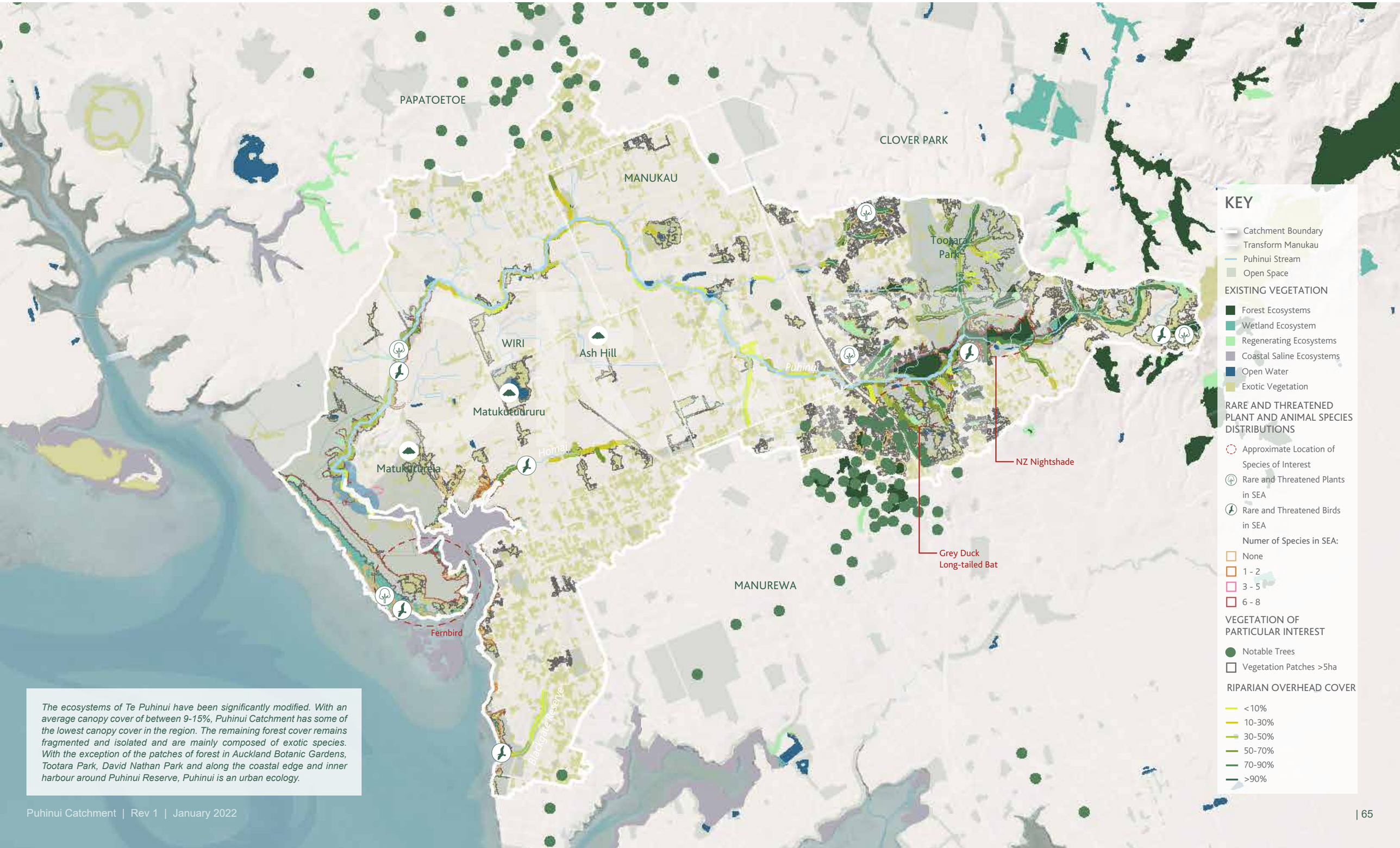
Where the potential ecosystems reflect historic patterns extrapolated from historic vegetation data sets, mapping of current existing ecosystems involved collating data and information from a variety of sources including data from former councils prior to amalgamation into Auckland Council; the Department of Conservation’s Protected Natural Area programme survey reports; research papers for sites throughout the region; and further ecological surveys of approximately 200 sites where existing data was missing.

While the landscape has been significantly modified, many of the underlying influences such as aspect, prevailing weather conditions, underlying soils and rainfall remain the same and present useful guides for understanding broad regenerative patterns of the landscape.

Existing biodiversity | Inland and coastal habitat

Scale: 1_35 000@A3

0 1 3KM



The ecosystems of Te Puhinui have been significantly modified. With an average canopy cover of between 9-15%, Puhinui Catchment has some of the lowest canopy cover in the region. The remaining forest cover remains fragmented and isolated and are mainly composed of exotic species. With the exception of the patches of forest in Auckland Botanic Gardens, Tootara Park, David Nathan Park and along the coastal edge and inner harbour around Puhinui Reserve, Puhinui is an urban ecology.

Existing biodiversity
Inland and coastal habitat

As much as we may wish to do so, we can not recreate the ecosystems of the past - Te Puhinui is a 'novel ecosystem' that is composed of a unique collection of species that include both exotic and native species that result from human agency and activity but are often not directly or consciously managed by people.

Through the design and/or management of emergent ecosystems, new and novel ecosystems will emerge that will provide the genetic material for the ecosystems of the future.

The photos to the right show a range of common plants and animals found within Te Puhinui. Most of these species are considered pests, in particular animals such as rats, cats, stoats and possums.


Common Myna / *Acridotheres tristis*


Paarera / Grey Duck / *Anas superciliosa*


Weasel / *Mustela nivalis vulgaris*


Common brushtail possum / *Trichosurus vulpecula*


Tuui / Parson Bird / *Prosthemadera novaeseelandiae*


Kereruu / New Zealand Pigeon / *Hemiphaga novaeseelandiae*


Ship Rat / *Rattus rattus*


Feral Cat / *Felis catus*


Piiwakawaka / Fantail / *Rhipidura fuliginosa*


Rainbow Skink / *Lampropholis delicata*


Cattle Tick / *Haemaphysalis longicornis*


Pampas grass / *Cortaderia selloana*


Crack Willow / *Salix xfragilis*


Tree Fern / *Cyathea*


Kaikomako / *Pennantia corymbosa*


Tii kouka / Cabbage Tree / *Cordyline australis*

Existing biodiversity | Aquatic habitat

Scale: 1_35 000@A3

0 1 3KM

The stream and aquatic habitats in Puhinui Stream vary along its length as it passes through the different ecosystems that make up the Puhinui catchment. However, overall Puhinui Stream is in poor condition, rating amongst the worst ten in the Auckland Region.

Puhinui Stream follows a relatively natural, meandering course through the lower catchment and includes ecologically significant places suitable for spawning iinanga, shortfin eels and banded kookopu. The upper Puhinui Stream and its many tributaries support a wide range of insect and fish species. Barriers to fish passage in the lower catchment mean that iinanga, which is a poor climbing species, are seldom seen in the upper catchment. Ecosystem diversity in the mid catchment is poor compared to the upper and lower catchment. The most prominent animals are those species tolerant of pollution and varying levels of oxygen.

KEY

- Catchment Boundary
- Transform Manukau
- Puhinui Stream

HABITAT

- Terrestrial Significant Ecological Area
- Open Space
- Inanga Spawning
- Fish Barrier

FISH SPECIES SURVEYED[1]

- Banded Kookopu
- Grass Carp
- Iinanga
- Mosquito fish
- Shortfin Eel
- Unidentified Eel
- Unidentified Galaxias
- Unknown
- Other

1. 2017 watercourse assessment, Morphum

Existing biodiversity
Stream habitat

The streams of Puhinui are typically soft-bottomed, made up of gravel, sand and mud. Prior to deforestation, farming and later urbanisation, the streams would have meandered more across the land.

Status: Endangered

Characteristics of flora and fauna: mayflies, stoneflies and caddisflies, kakahi (freshwater mussel), koura (freshwater crayfish), several species of bully, long and shortfin eels, banded kookopu, iinanga and glow worms.

Nature of Potential Threat: Ongoing deterioration of water quality and aquatic habitats as well as increased flooding and bank instability resulting from ongoing urbanisation and intensification which increases runoff, sedimentation, nutrients, heavy metals, hydrocarbons and petrochemicals, pesticides, temperature and organic contaminants and reduction in canopy cover and increased temperatures.

Location plan


Amphipods / *Paracalliope fluviatilis*


Titiwai/ Glow worms / *Arachnocampa luminosa*


New Zealand mudsnail / *Potamopyrgus antipodarum*


Koura / Freshwater crayfish / *Paranephrops planifrons*


Banded kookopu / *Galaxias fasciatus*


Tiitarakura / Crans bully / *Gobiomorphus basalis*


Tiitarakura / Red-finned bully / *Gobiomorphus huttoni*


Tuna / *Long-finned eel / Anguilla dieffenbachii*


Tuna / Short-finned eel / *Anguilla australis*

Note: The images above are representative of some of the species present in a healthy ecosystem. Not all species represented are currently present in Te Puhinui.

Potential ecosystems

Scale: 1_35 000@A3

0 1 3KM

Puhinui

Homai

Blackgate Reserve

KEY

- Catchment Boundary
- Transform Manukau
- Puhinui Stream

ECOLOGY

- WF4 - Poohutukawa, puuri, broadleaved forest
- WF7 - Puuriri forest
- WF8 - Kahikatea, pukatea forest *(not in the catchment)*
- WF9 - Taraire, tawa, podocarp forest
- WF12 - Kauri, podocarp, broadleaves, beech forest
- SA1 - Mangrove forest and scrub
- Bog / Fen mosaic
- Swamp mosaic
- Open Water
- Potential Vegetation Extent - Areas currently not paved or covered with buildings

The potential ecosystems represent broad historic ecosystems as they would be today without human's presence. Puhinui Catchment would host six different ecosystems according to this classification. While the landscape has been significantly modified, many of the underlying influences such as aspect, prevailing weather condition, underlying soils and rainfall remain the same and present useful guides for understanding broader regenerative patterns of the landscape.

While the catchment cannot be revegetated to replicate an historic landscape pattern, patches of native vegetation and natural stormwater devices in parks and open spaces, reserves, streets, roads, schools and backyards provide opportunities for 'novel urban ecologies' to emerge throughout the catchment and be integrated through the built fabric in a way that reflects the older and deeper patterns of Te Puhinui.

Reference: Indigenous terrestrial and wetland ecosystems of Auckland, Auckland Council

Potential ecosystem Poohutukawa, Puuriri, Broadleaved forest [WF4][1]

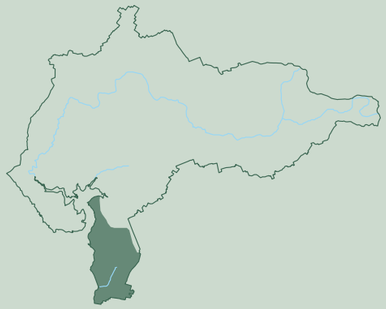
Coastal broadleaf forest is predominantly located within 600-800 m of the shoreline, and further inland in exposed and frost free areas and volcanic sites. This forest type has been considerably reduced from its original extent and is now reduced to several remnants still found along the coastline. Dominant species are poohutukawa, puuriri and taraire with frequent appearances from koowhai, niikau and kohekohe.

Status: Endangered

Characteristics of flora and fauna: The forest supports a diverse range of invertebrates, amphibians, reptiles and bats, as well as both sea birds and inland birds. Puuriri, karaka, tawa, taraire, tawaapou provide nectar and fruit, including a necessary food source for kereruu. Other species of bird who share in this habitat include morepork, kingfisher, shining cuckoo, fantail, grey warbler, tuuii and silvereye. Additional native fauna species that thrive in this ecosystem when pest-free are; karaka, tawa, tiitoki, mangeao, rewarewa, puka, tawaapou, and ngaio.

Nature of Potential Threat: Sea level rise and increased storm events could result in erosion and possible inundation. Increased urbanisation and removal of vegetation under an altered climate may add further pressure.

Location plan




Kaakaa / Bush parrot / *Nestor meridionalis*


Kootare / Kingfisher /*Todiramphus sanctus*


Tuuii / Parson bird / *Prosthemadera novaeseelandiae*


Moko kaakaariki / Auckland green gecko / *Naultinus elegans*


Pekapeka / Short-tailed bat / *Mystacina tuberculata*


Pepetuna / Puuriri moth / *Aenetus virescens*


Poohutuwaka / *Metrosideros excelsa*


Kohekohe / New Zealand Mahogany / *Dysoxylum spectabile*


Puuriri / *Vitex lucens*

Note: The images above are representative of some of the species present in a healthy ecosystem. Not all species represented are currently present in Te Puhinui.
Reference: Warm Forest - Indigenous terrestrial and wetland ecosystems of Auckland, Auckland Council

Potential ecosystem Puuriri forest [WF7] [1]

Puuriri forest is found from the Waikato north, where the climate is warm and frost-free. This forest ecosystem was once widespread along the Auckland isthmus along the free-draining and fertile alluvial terraces and in the volcanic soils. One of these predominant Puuriri forest areas is in the Manukau Harbour.

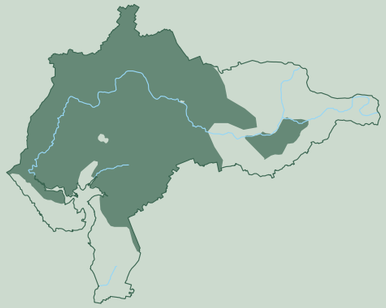
Due to land clearing activities by humans only remnants remain. An area of note in the puuriri forest ecosystem are the 'rock forests' which occupy the exposed lava beds. Though they have less puuriri they have more houpara, mangeao and tiitoki. Dominant forest cover is made up of puuriri, karaka, kohekohe and taraire.

Status: Critically Endangered

Characteristics of flora and fauna: Past puuriri forests would have supported a diverse range of invertebrates, amphibians, reptiles, birds and bats. Current puuriri forests provide almost year round fruit or nectar for morekpork, kingfisher, shining cuckoo, fantail, grey warbler and silvereye. Additional flora species found in puuriri forest include; tootara, mataii, pukatea, rewarewa, tawa, tiitoki and northern raataa, and with abundant stands of niikau.

Nature of Potential Threat: Urbanisation, mammalian pests and weed invasion, which may increase as a result of climate change, are significant threats.

Location plan




Ruru / Morepork / *Ninox novaeseelandiae*


Pihipihi / Silvereye / *Zosterops lateralis*


Piiwakawaka / Fantail / *Rhipidura fuliginosa*


Riroriro/ Grey warbler / *Gerygone igata*


Karaka / *Corynocarpus laevigatus*


Niikau / *Rhopalostylis sapida*


Rewarewa/ *Knightia excelsa*


Puuriri / *Vitex lucens*


Pukatea / *Laurelia novae-zelandiae*

Note: The images above are representative of some of the species present in a healthy ecosystem. Not all species represented are currently present in Te Puhinui.
Reference: Warm Forest - Indigenous terrestrial and wetland ecosystems of Auckland, Auckland Council

Potential ecosystem
Taraire, Tawa, Podocarp forest
[WF9] [1]

Taraire, tawa, podocarp forest occur in moderately fertile soils that largely consist of andesitic and basaltic heritage. This forest type sits amongst topography ranging from shallow to steep hill slopes, gullies, and ridges where they have moisture availability. This ecosystem prefers a frost-free climate, absent of kauri. Dominant species are rimu and northern raataa, with kahikatea, hiinau, rewarewa, pukatea, miro, puuriri, karaka, niikau and tree ferns.

Status: Endangered

Characteristics of flora and fauna: Mammalian pests and clearing of this forest type has reduced the diversity of fauna. The taraire, tawa, podocarp forest in the Hunua Ranges is home to kookako, New Zealand falcon, kaakaa, bellbird, tomtit and long-tailed bats. Other native species include morepork, kingfisher, shining cuckoo, fantail, grey warbler, tuuii, silvereye and Hochstetter's frogs. Native birds, especially kereruu and tuuii, are important for pollination and seed dispersal. Additional flora species present include kohekohe, tawa, rimu, miro and mangeao.

Nature of Potential Threat: Mammalian pests, which may increase as a result of climate change, are significant threats, causing the decline of flora and vulnerable fauna. Increased urbanisation and removal of vegetation under an altered climate may add further pressure.

Location plan


Kereruu / New Zealand Pigeon / *Hemiphaga novaeseelandiae*


Kookako / Blue-Wattled Crow / *Callaeas wilsoni*

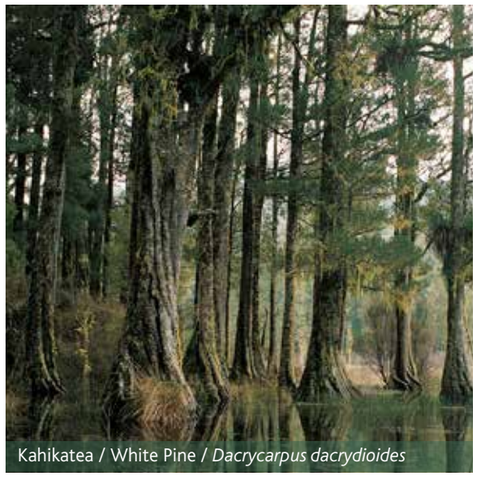

Tuuii / Parson bird / *Prosthemadera novaeseelandiae*


Ngaarara paapaa / Pacific gecko / *Dactylconemis pacificus*


Piipiiwharauroa / Shining cuckoo / *Chrysococcyx lucidus*


Piiwakawaka / Fantail / *Rhipidura fuliginosa*


Tawa / *Beilschmiedia tawa*


Kahikatea / White Pine / *Dacrycarpus dacrydioides*


Taraire / *Beilschmiedia tarairi*

Note: The images above are representative of some of the species present in a healthy ecosystem. Not all species represented are currently present in Te Puhinui.
Reference: Warm Forest - Indigenous terrestrial and wetland ecosystems of Auckland, Auckland Council

Potential ecosystem Kauri, Podocarp, Broadleaved, Beech forest [WF12] [1]

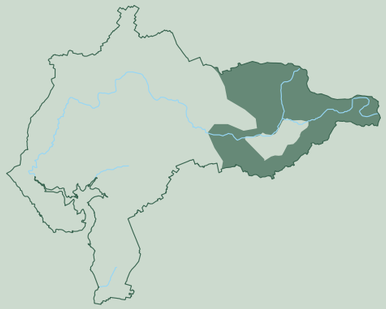
Kauri, podocarp, broadleaved, beech forest are generally located below 600m in a warm and sub-humid climate. They are found largely in the eastern areas south of Auckland, the coromandel and the islands in the Waitemataa Harbour. They occupy ridge and gully landform with variable soil fertility and moisture availability. Dominant species in this forest type are; kaauri, hard beech, taanekaha, thin-barked tootara, tootara, rimu, miro, tawa, hlinau, northern raataa, rewarewa, toowai, kohekohe, narrow-leaved maire and taawari.

Status: Endangered

Characteristics of flora and fauna: This ecosystem type support morepork, kingfisher, shining cuckoo, fantail, grey warbler, tuuii and silvereye. On pest-free islands kaakaariki species, long-tailed cuckoo, rifleman, whitehead, robin, tomtit, hihi, bellbird, saddleback and kookako are present. Seeds from the kauri tree would be an important seasonal food for kaakaa and the cavities in beach trees would provide roosting and nesting sites for geckos, kaakaa, kaakaariki, rifleman, hihi, saddleback and bats.

Nature of Potential Threat: The more immediate threat to kauri forests is from kauri dieback, although any increase in mammalian pests as a result of climate change will also impact upon this ecosystem.This forest type is also vulnerable to increase in wildfires and urbanisation.

Location plan




Ruru / Morepork / *Ninox novaeseelandiae*


Tiitipounamu / Rifleman / *Acanthisitta chloris*


Piiwakawaka/ Fantail / *Rhipidura fuliginosa*

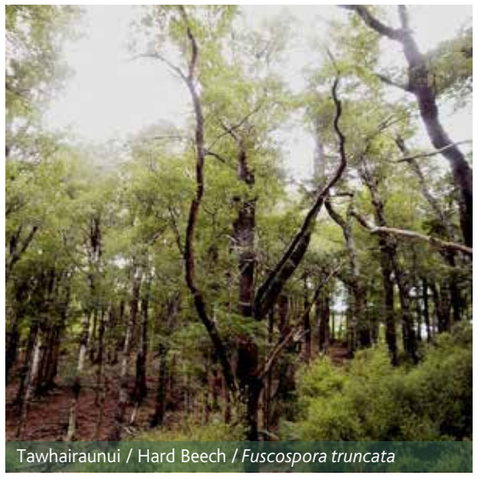

Gecko / *Hoplodactylus- Sp.; Naultinus - Sp.*


Hihi / Stitchbird / *Notiomystis cincta*


Kootare / Kingfisher / *Todiramphus sanctus*


Rewarewa / NZ Honeysuckle / *Knightia excelsa*


Kauri / *Agathis australis*


Tawhairaunui / Hard Beech / *Fuscospora truncata*

Note: The images above are representative of some of the species present in a healthy ecosystem. Not all species represented are currently present in Te Puhinui.

Reference: Warm Forest - Indigenous terrestrial and wetland ecosystems of Auckland, Auckland Council

Potential ecosystem Mangrove forest and scrub

[SA1] [1]

Mangrove forest and scrub is found in frost-free ecosystems within brackish tidal estuaries, inlets, rivers and streams. There are several variants of mangrove forest, many of which are found throughout the harbours in the Auckland region. Depending on variant of mangrove forest other species of flora present may include oioi, swamp twig rush, salt marsh ribbonwood, glasswort, sea primrose, half star, shore celery, arrow grass, sea blite, sea rush, coastal needle grass, knobby club rush, sea primrose, bachelor's button, sea blite and tauhinu.

Status: Least concern*

Characteristics of flora and fauna: This ecosystem type provides vital ecosystem services. They strengthen shorelines against coastal erosion and aid in contaminant, sediment and carbon retention. This ecosystem supports terrestrial invertebrates, fin fish, shags, herons, spoonbill, waterfowl, banded rail, marsh crake, puukeko, kingfisher, fernbird, fantail, grey warbler, silvereye, blackbird and finches. The mangroves act as a nursery for various species of fish.

Nature of Potential Threat: Sediment supply combined with the rate of sea-level rise will determine the future distributions of mangrove habitats in the Auckland Region.

Location plan

Moho pereruu / Banded rail / *Gallirallus philippensis*

Parekareka / Shag / *Stictocarbo punctatu*

Kootuku Ngutupapa / Royal Spoonbill / *Platalea regia*

Tuna / Short-fin Eel / *Anguilla australis*

Mauhauaitu / Grey mullet / *Mugil cephalus*

Matuku moana / White- faced heron / *Egretta novaehollandiae*

Manawa / Mangrove / *Avicennia marina subsp. australasica*

Sea grass

Oioi / *Apodasmia similis*

**As mangrove and scrub forest range remarkably, variants of mangrove forest have not been assessed.*
Note: The images above are representative of some of the species present in a healthy ecosystem. Not all species represented are currently present in Te Puhinui.
Reference: Saline - Indigenous terrestrial and wetland ecosystems of Auckland, Auckland Council

Indicators of a healthy natural environment

A range of native species, habitats, and ecosystems can provide an indicative measure of the state of and changes to native biodiversity. There are two national environmental indicators for biodiversity - The first is concerned with land coverage by native vegetation, the second, the distribution of selected native species.

Land area with native vegetation shows the proportion of land environment covered by native vegetation. It also illustrates the proportion of various native ecosystem types under legal protection. The distribution of selected native plants and animals shows whether selected native species are present or absent in areas where they might be expected to be found. Monitoring the quality and extent of suitable native habitats for a selection of 'indicator species' is a practical way of assessing changes in Te Puhinui's native biodiversity.

Location plan


Tiitarakura / Red-finned bully / *Gobiomorphus huttoni*


Whekii grow in a protected substory


Pekapeka / Short-tailed bat / *Mystacina tuberculata*


Ruru / Morepork / *Ninox novaeseelandiae*


North Island brown kiwi / Apteryx mantelli


Paarera / Grey duck / *Anas superciliosa*


Kookako / Blue-wattled crow / *Callaeas wilsoni*


Kaakaa / Bush parrot / *Nestor meridionalis*


Kootare / Kingfisher / *Todiramphus sanctus*

The above species are suited to the six ecosystem types of Te Puhinui.

Indicators of a healthy natural environment

Seven indicator species have been selected from the national biodiversity indicator programme currently under development by the Department of Conservation[1]. These species are all managed by the department under recovery plans, and they were selected for their usefulness as indicators, their habitat requirements, the availability of data for them, and their level of threat. The seven species are:

1. Lesser short tailed bat / *Mystacina tuberculata*
2. Kiwi / *Apteryx spp.*
3. Kaakaa / *Nestor meridionalis*
4. Kookako / *Callaeas cinerea*
5. Moohua / *Mohoua ochrocephala*
6. Wrybill / *Anarhynchus frontalis*

The species relevant to Te Puhinui are:

- Lesser short-tailed bat / pekapeka (Mystacina tuberculata) are the only native terrestrial mammals and are good indicators of the general health and structure of a forest ecosystem.
- Five species of kiwi (Apteryx spp.) are good indicators of the abundance of key mammalian predators in a range of forest types in many parts of the country.
- Kaakaa (Nestor meridionalis) is a good indicator of possum and stoat abundance.
- Kookako (Callaeas cinerea) is a good indicator of rat and possum densities. The kookako, because of its sensitivity, only exists in managed sites.
- Dactylanthus / Woodrose / pua o te reeinga (Dactylanthus taylorii) is a parasitic flowering plant and is a good indicator of forest health including densities of introduced browsers, presence of native pollinators, seed dispersers, and host trees.

In addition to the above species, photographs of several additional species have been included that are anecdotally known to represent a healthy environment - for example kingfisher / kootare as an indicator of water quality and morepork / ruuruu as an indicator of forest health.

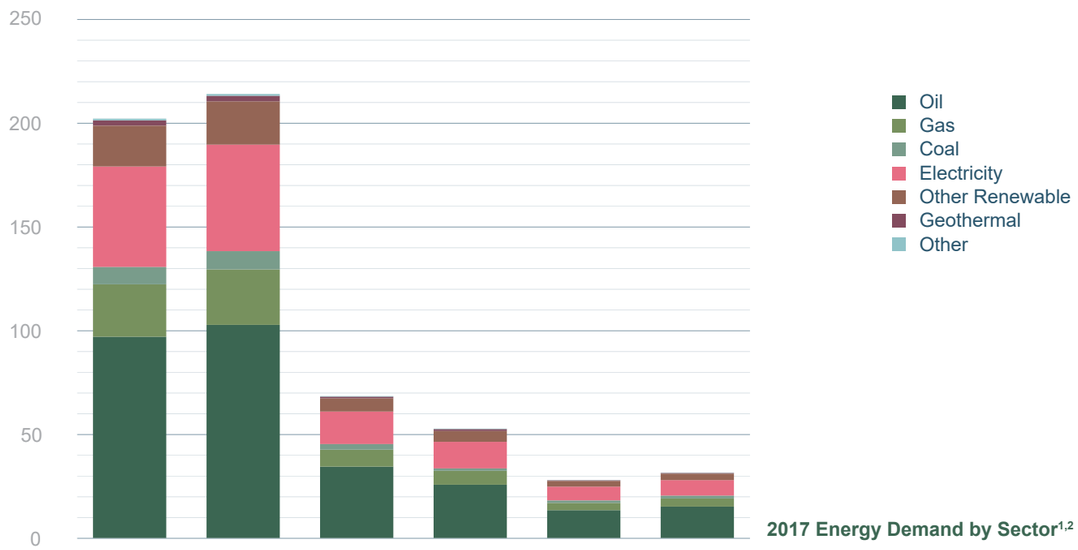
Note that the indicators used to report on biodiversity assess only native land-based and freshwater ecosystems and do not include marine ecosystems. In addition, indicators do not provide information on ecosystems at a community or habitat level – that is, they do not describe the distribution and number of various species in an ecosystem or habitat, neither do the indicators provide information about the quality of the habitats or ecosystems.

1. https://www.mfe.govt.nz/publications/environmental-reporting/environment-new-zealand-2007-chapter-12-biodiversity/national

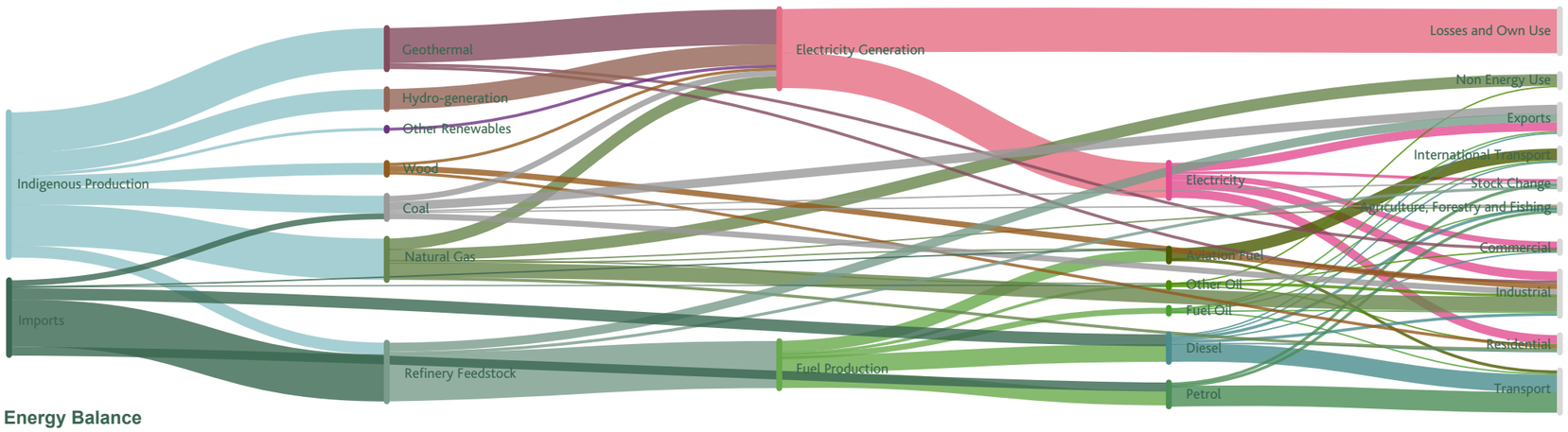
Energy

While there is a significant amount of data available for energy demand by sector and type at a national level, there is limited data available for local energy use. While this information can not be extrapolated down to represent the energy use in Te Puhinui specifically, it does provide a high level overview of the energy mix.

Abundant and affordable energy is critical to a functioning industrial society. While New Zealand has one of the best renewable electricity networks in the world it remains a net energy importer with approximately 60% of New Zealand's total energy supply coming from fossil hydrocarbons and 40% is from renewable sources[3]. Energy dependency on non-renewable sources of energy leaves the economy and its communities vulnerable to changing market conditions and inevitable reduction in availability once stocks of non-renewable resources start to dwindle[4].



2017 Energy Demand by Sector[1,2]

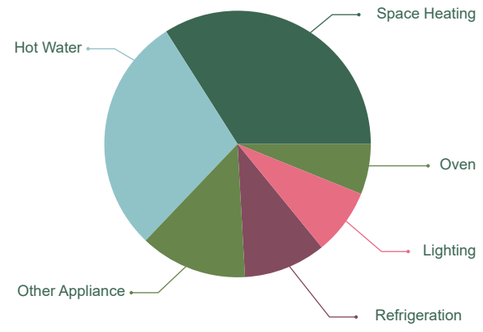


Energy Balance

Household Energy Use

Residential buildings account for approximately one third of all of New Zealand's electricity use. Cold, damp homes also contribute significantly toward respiratory issues and other preventable health conditions including rheumatic fever and skin infections. Improving the energy efficiency of residential buildings presents a significant opportunity for reducing New Zealand's overall energy demand and there is strong evidence, nationally and internationally, of improved health outcomes resulting from warmer and drier homes.

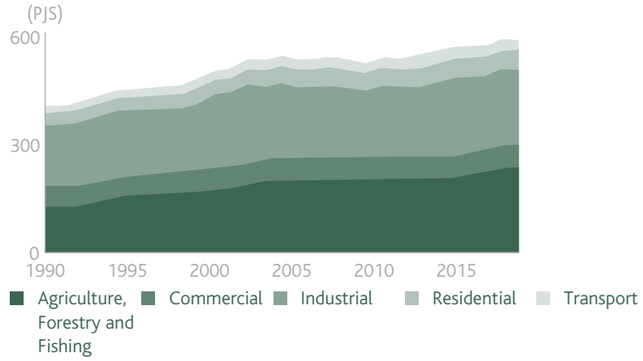
Average New Zealand Household Energy Use



1. *https://www.mbie.govt.nz/dmsdocument/11679-energy-in-new-zealand-2018*
2. *http://www.energymix.co.nz/our-consumption/new-zealands-consumption/*
3. *https://www.mbie.govt.nz/dmsdocument/11679-energy-in-new-zealand-2020*
4. *In 2017, New Zealand mined 11.3 million barrels of oil while the Marsden Point refinery refined 41.7 million barrels of imported oil. 60% of this oil came from the Middle East, 36% from South East Asia, 3% from Russia and 1% from Australia. A majority of this oil, approximately 80%, is used in the transport sector which accounts for about 40% of national energy demand. Of the oil used for transport 50.8% is for heavy tracks; 26.6% is for light tracks, vans and utilities; 15.8% is for cars and passenger vehicles; 3.5% is for buses and 3.2% is for rail.*

Energy[1]

Consumer energy demand by sector has been regularly increasing over the past years and now remains relatively static. The most demanding sector is transport, followed closely by residential.



60% of New Zealand's total energy supply comes from fossil hydrocarbons and 40% is from renewable sources[2].

Transport accounts for 40% of national energy demand. Nearly all imported oil and petroleum products are used for transport, with the majority for road transport.

82.4% of electricity generation in New Zealand came from renewable sources in 2019.

New Zealand's share of renewable electricity generation was the third highest in the OECD.

The Wiri fuel terminal is operated by Wiri Oil Services Limited (WOSL), which is a major fuel supplier in Auckland and throughout New Zealand. They also operate Marsden Point Terminal[3].

New Zealand's total energy consumption is 589PJs, which is 0.15% of the world's total annual consumption[5].

The Refinery to Auckland Pipeline (RAP) is a critical part of the fuel supply chain nationally. The RAP is a 250mm wide pipe carrying diesel, petrol and jet fuel in controlled batches under farmland, towns and part of the Manukau Harbour to the Wiri fuel terminal in Wiri. A small pipeline from Wiri supplies Jet fuel to Auckland International Airport[4].

The government has passed the Climate Change Response (Zero Carbon) Amendment Act and set a target of net-zero carbon emissions by 2050 (except biogenic methane). Future demand for electricity will depend heavily on the path of decarbonisation and the extent of changes in electricity using technologies and supply technologies over the next 30 years.

1. *Unless stated otherwise, the information in this section has been derived from The information in section is derived from: https://www.mbie.govt.nz/dmsdocument/11679-energy-in-new-zealand-2018*
2. *https://www.mbie.govt.nz/dmsdocument/11679-energy-in-new-zealand-2020*
3. *https://www.wosl.co.nz/*
4. *https://www.refiningnz.com/refinery-to-auckland-pipeline/*
5. *United Nations statistics, www.unstats.un.org, 2013*

Ecological footprint

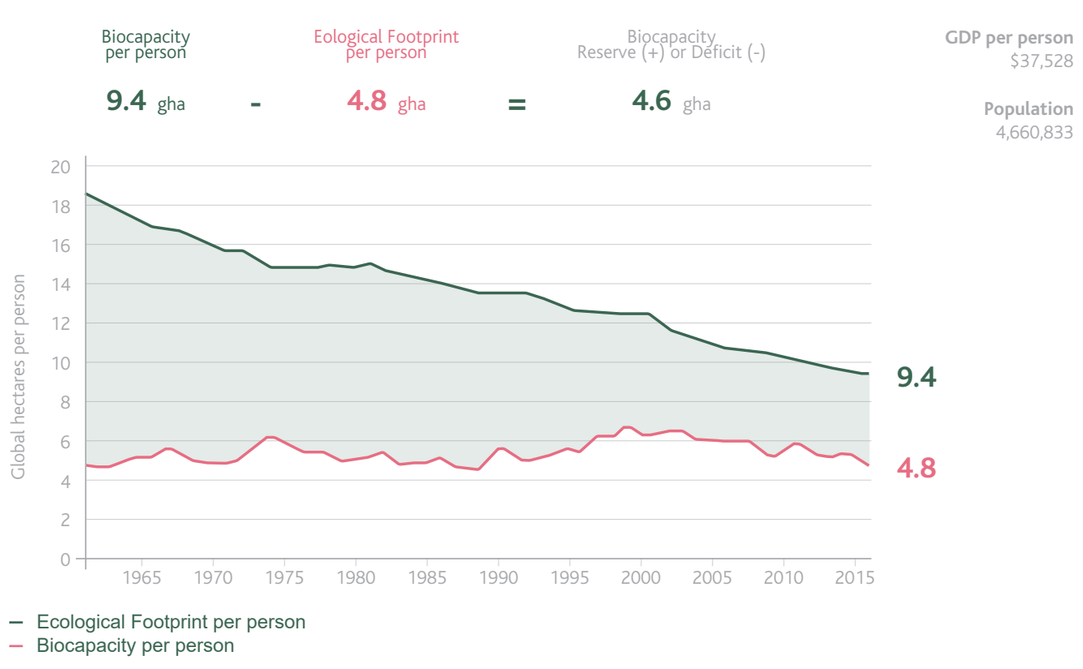
Developed in the early 1990's by Mathis Wackernagel and William Rees, the Ecological Footprint is a way of measuring humans' behavior and their impact on the environment[1]. The Ecological Footprint measures both the demand side and supply side of the equation.

On the demand side, the Ecological Footprint tracks six different productive uses - cropland, grazing land, fishing grounds, built-up land, forest area and carbon demand on land - to measure the amount of natural capital required to maintain existing lifestyles of human populations as well as the area needed to absorb our waste products, including carbon.

On the supply side, the biocapacity represents the productive potential of a given area of land, for example the Auckland (bio) region. In this way, a place's Ecological Footprint can be measured against its biocapacity - If a bioregion's biocapacity exceeds its Ecological Footprint it has an ecological reserve and is living within its carrying capacity[2]. Conversely, if a population's Ecological Footprint exceeds the bioregion's biocapacity then demand for natural capital exceeds supply and the population is in ecological overshoot. So long as additional biocapacity is available elsewhere, a bioregion in overshoot can meet its ecological deficit by importing goods and services and exploiting its own natural capital. For example, overfishing in a way that slowly diminishes the overall fish stocks and/or by disposing of its waste somewhere else, and/or emitting carbon dioxide into the atmosphere.

In 2016, New Zealand's ecological footprint was 4.8 global hectares[3] per person and had a biocapacity of 4.6 global hectares per person. While New Zealand has the advantage of having large per person biocapacity due to low population density, if every person alive globally in 2016 lived the same lifestyle as a typical New Zealander we would need the equivalent of three Earths to meet the demands of our ecological footprint.

Ecological Footprint and Biocapacity of New Zealand (2016)[5]



In 2013 the Royal Society of New Zealand released a paper exploring the carrying capacity of New Zealand. The paper highlights the inherent link between economic activity and resource consumption, stating "most economic activity depends directly or indirectly on environmental resources and services, which are subject to natural limitations of supply, renewability, quality and ability to deal with wastes"[4]. It also notes that the prevailing assumption and policy direction is that economic growth, with an emphasis on New Zealand's primary production, will continue to put pressure on resource use which will increase New Zealand's Ecological Footprint. This is accentuated by New Zealand's economic dependence on food exports and importing most of the technological goods and cultural services that we use.

The environmental impact of most households in New Zealand depends strongly upon income, with few effects due to lifestyle differences. Using household income as a strongly corresponding variable to environmental impact, the paper generates a finer grain estimate of the Ecological Footprint of the typical New Zealand lifestyle compared to a 'Fair Earth Share' of 1.7 hectares per person - A measure of equal distribution of the world's productive land between the world's population.

The paper highlights two significant findings:

1. New Zelanders with a higher than average income have an Ecological Footprint almost double those with a lower than average income; and
2. New Zealanders with a lower than average income still have an ecological footprint almost twice a 'Fair Earth Share'.

Of particular relevance to the demographis of those living in Puhinui Catchment is the report's Ecological Footprints of those who live in Ootara and Papatoetoe with an estimated ecological footprint of 1.7 and 2.1 respectively.

1. *https://www.footprintnetwork.org/our-work/ecological-footprint/*
2. *The Human Carrying Capacity (HCC) is the measure of a specified area's ability to sustainably support human activity given aggregate lifestyle and development choices and the means used to achieve these, and is expressed in terms of number of people.*
3. *Both the Ecological Footprint and biocapacity are expressed in global hectares—globally comparable, standardized hectares with world average productivity.*
4. *Sustainable-Carrying-Capacity-v3.0-Final.pdf*
5. *National Footprint Accounts 2019 edition (Data Year 2016): building on World Development Indicators, The World Bank (2019); U.N. Food and Agriculture Organiization.*

Ecological footprint

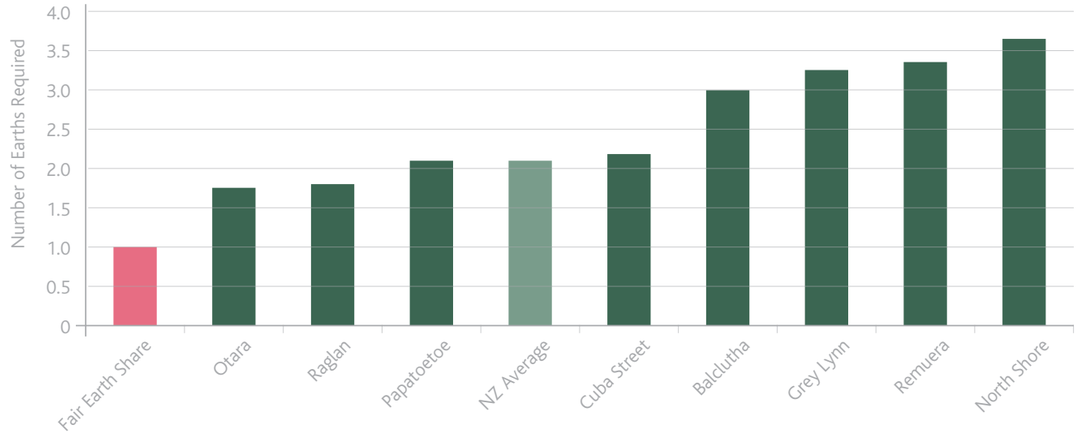
The paper also explores the correlation between Ecological Footprint and well-being, in particular the acknowledgement that up to a certain level, the health and happiness of people increases with increase in income. However, beyond a certain level additional income does not necessarily lead to increase in well-being. The paper concludes:

"Carrying capacity depends upon resource use and, despite the poor connection between resource use and well-being, lifestyles are changing to become more resource-demanding at both national and global levels… The complicated nature of human well-being, the rate of change of technologies used to deliver well-being, and the difficulty in determining sustainability all mean that defining an upper human population density for New Zealand's sustainable carrying capacity with any precision is not possible, although it must be considered in analyses of the ecological future of New Zealand… New Zealand's discussion around these constraints would benefit from more comprehensive measures of well-being and, in particular, a stronger understanding of the connections between well-being, consumption, and environmental impact along with better data about the state of, trends of, and limits on our natural capital."

Improving and maintaining the well-being of Te Puhinui's communities while changing lifestyles in a way that reduces their ecological footprint to sustainable levels that fit within the carrying capacity of the Auckland bioregion is one of the most profound challenges of the 21st century.

Resource overuse and the number of Earths required to sustain New Zealand lifestyles. The North Shore lifestyle is characterised by preferences for high-levels of consumption, travel and large houses. Conversely, people with a Raglan lifestyle prefer self-sufficiency, simpler consumption, working fom home and have a lower income on average[6].

Number of Earths Required according to lifestyle in regions of New Zealand[7]



6. *Sustainable Carrying Capacity of New Zealand. The Royal Society of New Zealand, 2013*
7. *Ibid*

Food

Food is a prerequisite for all life and yet it is often taken for granted as a key contributor to well-being in our modern globalised food system. A food system includes all processes and infrastructure involved in feeding a population: production, processing, distribution, marketing, consumption, and disposal of organic and food related items. It also includes all inputs needed to support the system such as land and ecosystem services and all outputs generated throughout the system. The food system is influenced by and operates within the environmental, societal and economic context in which it is situated. Complex system dynamics and drivers including energy, environment, economics, equity, governance, health and nutrition, ethics and technology have a huge influence over food systems. Today food systems exist at a range of scales from global to hyper-local with significant interdependencies between them making these systems increasingly complex, intertwined and vulnerable to external system dynamics and drivers.

While there is a wide range of data available relating to the different actors in New Zealand's food system such as agriculture and primary production, transport and environmental health and community health and well-being, there is limited information about how the system works as a whole and limited data is available for local food systems. Unlike other critical infrastructure such as transport or water, food is a global commodity and there is no national or regional body responsible for core system functions. For example Waka Kotahi / NZTA provides national oversight of our roading network and Watercare manages Auckland's drinking water, however no agency or authority is responsible for ensuring food security, or sustainable and resilient food systems at regional, national or global scales.

Some key concepts and considerations:

- New Zealand's food system was estimated to use 30% of the nation's primary energy demand[1].
- Agriculture accounts for 48% of New Zealand's Greenhouse gas emissions[2].
- New Zealand's national food system is industrial relying on significant non-renewable energy inputs. Industrial food systems in the United States of America consume 12 calories of energy to produce 1 calorie of food[3].
- Increasing pressure on farmers to increase production through intensification of land use, increasing scale of operations to achieve economies of scale, and improved technological efficiency has resulted in negative impacts including loss of soil fertility, loss of biodiversity, dependence on fossil fuels, reduced viability of family farms, and reduced human health and quality of life in rural communities[4]. As Parliamentary Commissioner for the Environment Jan Wright wrote, New Zealand faces a "classic economy versus environment dilemma"[5].
- 60% of New Zealand's income comes from farms and 87% of New Zealanders live in towns and cities. In addition the connection between producers and consumers of food is broken in both directions[6]. This dynamic has created misunderstandings between rural and urban New Zealanders that inhibit meaningful dialogue around significant challenges to New Zealand's food system such as water quality and climate change.
- Food insecurity is a daily reality for many New Zealanders including those living in Te Puhinui. Food insecurity is a situation of limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways. Food security exists when a community, family, individual have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life at all times.
  - 20.1% of New Zealand households experience food insecurity.
  - Houses with 7 or more people are more likely to experience food insecurity than households with less people. Te Puhinui is known to have one of the youngest populations in the region as well as particularly large households in parts of the catchment.
- Nationally, New Zealand throws away $872 million worth of uneaten food per year.
- The average New Zealand family wastes $563 worth of food each year.
- As a nation we throw 122,547 tonnes of food away every year.
- Unhealthy diet is the leading preventable risk for poor health in New Zealand.
- Over a third of all health loss in New Zealand results from preventable causes, such as poor diet, tobacco and alcohol consumption and not enough exercise.
- Maaori and Pacifika living in areas with high social deprivation such as Te Puhinui suffer from higher rates of food related ill-health and are less likely to meet the daily recommended intakes of the fruit and vegetables. The same group of people also have increased risk of obesity - 17% of Maaori and 20% Pacifika children are considered obese.
- The Auckland region has approximately 2,500 square kilometers of rural land for production. While Te Puhinui was once home to some of New Zealand's most productive soils, they have been highly modified through deforestation, rural land use and urbanisation, significantly impacting the productive potential of Puhinui Catchment.
- Food sovereignty is a situation where the people who produce, distribute, and consume food control the mechanisms and policies of food production and distribution, rather than the private

1. *1983, Energy use in the New Zealand food system by M.G.Patterson*
2. *Mfe, 2018.*
3. *In Possible Energy Constraints to Further Urbanization by Richard Heinburg from Canning et al.*
4. *Growing for Good from the Parliamentary Commissioner for the Environment, 2004.*
5. *Quoted in https://www.nzgeo.com/stories/the-future-of-food/*
6. *https://www.nzgeo.com/stories/the-future-of-food/*

Food

companies and market institutions that characterise industrial food systems.

- A regional food system is a description of a geographically localised method of food production, distribution, sales, consumption and nutrient cycling of food waste, rather than nationally and/or internationally based systems.

REGIONAL AND LOCAL TE PUHINUI FOOD SYSTEMS

Production

As noted above, Te Puhinui was once characterised by highly productive soils and rich kai moana resources. Matukuturua Stonefields gardens is a significant cultural landmark reflecting this historic land use. Despite its history, the current Te Puhinui food system is heavily dependent on imported food including produce. With the exception of the rural land uses in Tootara Park and Puhinui Reserve, there is limited productive land use activities in the catchment today. One notable exception to this is the emerging Te Maara Kai o Wirihana. Existing production on the most fertile remaining soils in the lower catchment is zoned for light industrial development under the Unitary Plan.

Processing and Distribution

Currently staple fresh produce is imported into the catchment from production hubs throughout New Zealand, specifically Pukekohe in the Auckland region[7]. Some of these imports are processed through industrial processing hubs in Wiri, before being distributed to supermarkets, restaurants, and community organisations. The area does support large scale processing factories and distribution centres, such as Griffins Foods, Irvine Pies, Foodstuffs frozen, and Bluebird Foods.

Today, a majority of Te Puhinui is simultaneously a ‘food desert’ and a ‘food swamp’. A food desert is characterised by a lack of access to affordable and nutritious food and convenience stores are more prevalent, which typically have more expensive food with less nutritional value than supermarkets and other specialist food shops. A food swamp is an area with an abundance of convenient, fast food outlets which outnumber healthy food outlets[8].

Marketing and Consumption

Whilst current food systems processes are convenient and economically efficient by western standards, they have created an environmentally unsustainable, and culturally insufficient food system for many within the catchment[9]. Through urbanisation, convenience and consumer culture as well as social deprivation, fast food and its ubiquitous presence and promotion has led to significant nutrition and diet related health pandemics regionally and more specifically in South Auckland, impacting the health and well-being of many of Te Puhinui’s communities. This further compounds social deprivation, especially in the middle and lower catchment. Maaori and Pacifika living in areas with high social deprivation suffer from higher rates of food related ill-health and are less likely to meet the daily recommended intakes of the fruit and vegetables. The same group of people also have increased risk of obesity - 17% of Maaori and 20% Pacifika children are considered obese.

Disposal / cycling of organic and food related items

Organic wastes make up 40% of Aucklanders’ domestic waste by weight which typically end up in landfill. There are a number of initiatives across Auckland and within Te Puhinui that are seeking to address challenges relating to food waste.

- WormsRUs is a longstanding company providing residential and commercial scale composting services located right in the middle of the catchment.
- Auckland Botanic Gardens and Auckland Council’s Wastewise programme provide food composting support and education programmes for schools.
- The Compost Collective, a regional collaborative project aimed at increasing the number of Auckland households engaged in composting and organic waste reduction, operates in the catchment.
- The app Share Waste provides a platform for peer to peer neighbourhood and residential scale food composting but is not currently being used in the catchment area.
- Local boards, council staff, decision makers and social change agencies in South Auckland are currently working to establish a southern Community Resource Recovery Centre which will likely include large scale organic nutrient cycling.

PRODUCTIVE POTENTIAL

There are three broad types of food production: intensive small scale production including fresh fruit and vegetables and some live stock; extensive cropping and pastoral systems include grains, legumes, dairy and meat; and wild harvest, which includes hunting and harvesting of plants and animals from both land and water. Urbanisation has significantly limited options for extensive production and wild harvest of terrestrial, freshwater and marine food sources.

Te Puhinui natural capital and land use patterns mean that opportunities for production in Te Puhinui should be focused on intensive, small-scale productive gardens and orchards for fresh fruit and vegetables and some livestock. Small scale intensive systems have larger energy input per square metre than extensive systems and typically have higher yields. Soil fertility is maintained through inputs such as compost, manure, worm castings, fish meal etc. Produce typically doesn’t store or transport well. With

7. *Horticulture New Zealand, 2017*
8. *Caporuscio, 2020*
9. *Obesity Action Coalition, 2009*

Food

decreasing access to fossil fuel for transport access to locally grown produce will become increasingly important to the well-being and resilience of local communities. Three intensive food production systems suitable for Te Puhinui include intensive gardens, orchards and perennial crops and food forests.

Gardens

Intensively managed garden for annual vegetables, salad mixes, and herbs; flowers for cutting and beneficial insects; small fruit-bearing plants and shrubs, dwarf and espalier fruit trees; some small livestock and animal systems such as worms, bees, poultry and rabbits.

Orchards and Perennial Cropping

Annual and perennial vegetables and staple crops with long growing seasons; flowers for cutting and beneficial insects; larger shrubs and fruit-bearing bushes; orchards; some market crops; larger composting areas; mushroom cultivation; animals such as bees, poultry, pigs, goats; and fire retardant and shelter planting.

Food forests

A productive ecosystem based on a forest of diverse species incorporating fruit and nut trees, shrubs, herbs, vines and perennial vegetables which have yields directly useful to humans - opposed to an orchard which is typically limited in the diversity of species, vertical layers and yields. Auckland's unique and highly productive environment is one of very few places in the world where it is possible to grow three different types of orchards – deciduous, mediterranean and subtropical - in the same location. Because a food forest has the form and function of a forest, they have significant biodiversity outcomes in addition to producing useful crops of food, fibre and medicine.

Urban metabolism

The metabolic requirements of a place can be defined as all the materials and commodities needed to sustain that place's inhabitants at home, at work and at play. Understanding a place's metabolism requires consideration to how natural capital is extracted and used to 'fuel' an area's metabolic requirements. This includes its day-to-day needs for energy and materials to maintain, repair and sustain itself as well as to expand if conditions allow, in addition to its day-to-day needs to process wastes, either by 'elimination' or reabsorption back into its environment.

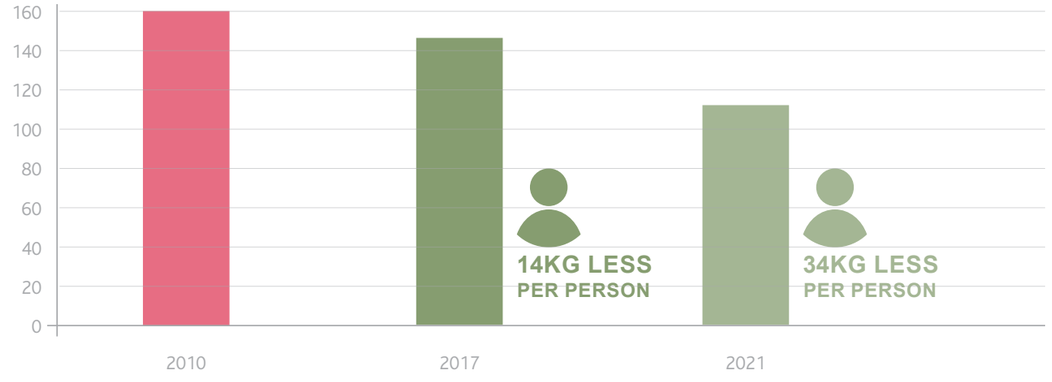
Urban metabolism refers to the sum total of the technical and socio-economic processes that occur in cities, resulting in growth, production of energy, and elimination of waste[1]. It involves describing and quantifying the main flows (e.g. materials and energy) that enter in a place, which are used or stored, and then that leave that place, thus offering an integrated and holistic viewpoint of all that place's activities, of its levels of resource productivity (gross domestic production/domestic material consumption) and urban systems' efficiency and sustainability[2].

Urban metabolism provides a unique model for understanding how Puhinui Catchment and the Auckland region function and a more systemic and holistic perspective on their relationships and dependencies to other places as well as their overall level of sustainability and resilience.

One of the key goals of a sustainable region, city or urban environment is to minimise waste as much as possible. Zero Waste is a goal that is ethical, economical, efficient and visionary, to guide people in changing their lifestyles and practices to emulate sustainable natural cycles, where all discarded materials are designed to become resources for others to use. It means designing and managing products and processes to systematically avoid and eliminate the volume and toxicity of waste and materials, conserve and recover all resources, and not burn or bury them. Implementing Zero Waste will eliminate all discharges to land, water or air that are a threat to planetary, human, animal or plant health[3].

Average Auckland rubbish bin (by weight)[4]

Domestic kerbside refuse per capita[5]



Auckland produced 1.174 million tonnes of waste in 2010. On average, every Aucklander creates around 1 tonne of solid waste, processes 60-110 kgs of recyclable materials and produces 100,000 litres of wastewater per year. This means that less than one tenth of the materials processed in Auckland is recycled into another product. The remaining material is managed as 'waste' in a linear process model from extraction through to production, use and disposal.

The Auckland Council has set the aspirational target of being zero waste by 2040 with the following key milestones along the way:

- 2015 onward: The provision of consistent domestic waste and recycling services and receptacles across the region, where practicable.
- 2020: reducing domestic kerbside refuse by 30%.
- 2027: reduce council and private sector influenced waste to landfill by 30% working with the commercial sector and the private waste industry to achieve these targets.
- 2031: To achieve a 40% reduction in human generated greenhouse gas emissions.
- 2040: "Zero Waste, turning waste into resources".

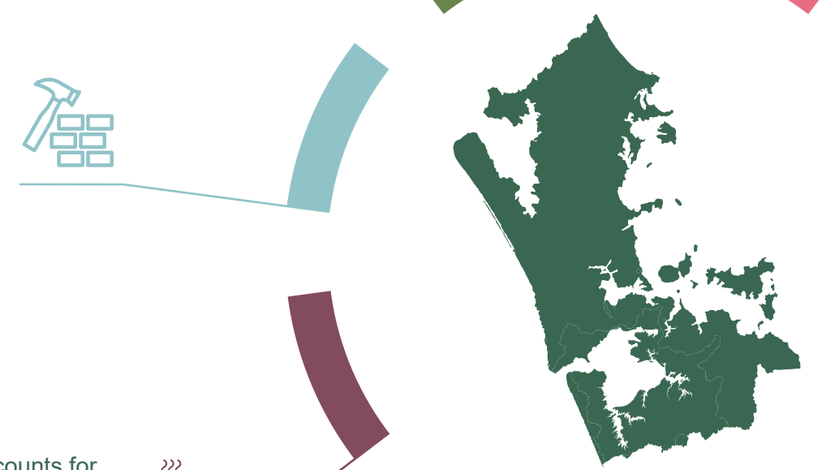
1. *Kennedy C, Cuddihy J, Engel-Yan J (2007) The changing metabolism of cities. J Ind Ecol.*
2. *Sanches T.L., Bento N.V.S. (2020) Urban Metabolism: A Tool to Accelerate the Transition to a Circular Economy. In: Leal Filho W., Marisa Azul A., Brandli L., Gökçin Özuyar P., Wall T. (eds) Sustainable Cities and Communities. Encyclopedia of the UN Sustainable Development Goals. Springer, Cham. https://doi.org/10.1007/978-3-319-95717-3_117*
3. *Zero Waste Alliance International*
4. *Auckland Council WMMP 2018*
5. *Auckland Council WMMP 2018*

Urban metabolism[1]

In 2017, 1,300 tonnes of rubbish were illegally dumped in the Auckland region, 800 tonnes of which were in South Auckland[3].

The methane from Redvale Landfill and Energy Park is captured and generates enough electricity to power 12,000 homes in Auckland. By the end of 2020, this will increase to 14,000 homes.

The amount of waste going to landfill over Christmas and New Year increases by 10% and the amount of recycling increases by 20%[4].



Construction and demolition waste accounts for 30% of all waste[2].

Currently, around 40% of our refuse is trucked out of Auckland for landfilling in neighbouring regions[5].

Waste collection, treatment, and disposal accounts for 6% of Auckland's overall greenhouse gas emissions.

The Auckland region currently contains two operating landfill facilities for waste disposal - Redvale Landfill and Energy Park and Whitford Landfill.
Both of Auckland's landfills are already partially full and they have a limited lifespan and are consented to collect waste upto 2028 and a replacement facility is expected to be required between 2026 and 2028.
A new landfill is currently being planned 70km north of Auckland city.

Auckland Council's Waste Management and Minimisation Plan projects that the region's waste will grow through to 2060.

Local boards, council staff, decision makers and social change agencies in South Auckland are currently working to establish a southern Community Resource Recovery Centre.

1. Unless stated otherwise, the information in this section has been derived from https://www.wastemanagement.co.nz/my-region/auckland/auckland-regional-landfill/frequently-asked-questions
2. Sperber, R. Resources & Redefining Waste, Auckland Permaculture Workshop. 2020.
3. Ibid
4. Ibid
5. Ibid

7. Built Capital

Built capital refers to physical stocks and built infrastructure including buildings, energy, transport, water and communication networks, tools, machines and all technological systems, products and environments. In essence it refers to any uniquely human made environment or artefact. Built capital is developed through the application of the other six forms of capital. Durability, resource and energy availability, and sustainability are important considerations for the development and long term maintenance of built capital.

This section maps and documents the urban morphology of Te Puhinui, the character of the built environment; planning and land use; transport and movement including a summary of the Manukau Central Walking and Cycling area plan, the open space network and significant underground infrastructure and services.

Urban morphology

Urban morphology refers to the study of the built environment and urban landscape with a focus on the formation and transformation of spatial patterns, urban form and physical character over time. Urban block size and structure and the size and grain of buildings and land uses are defining characteristics of an urban area. Smaller blocks with a mix of uses support interconnected street patterns appropriate for pedestrian permeability, walkability and access to public space. Public spaces in these areas are often defined and framed by the buildings surrounding them and the uses within these buildings contribute significantly to the functionality, vibrancy and safety of these spaces.

Larger blocks are generally car-oriented and often consist of large isolated buildings set in parking lots accessed by main arterial roads. Public spaces in these environments are often poorly defined, large, amorphis and lack a distinctive character or identity. Although necessary in some urban areas, they generally contribute to fragmented and disconnected neighbourhoods and don't generate the same wealth over time as pedestrian scale mixed use environments[1].

Te Puhinui consists of a mix of low density urban form stretching across the landscape. The land use pattern is characterised by large, single use blocks serviced by large-scale vehicular corridors, major intersections, and extensive areas of surface car parking. There are limited pedestrian cycle connections through the catchment and those that are provided are often of poor quality, require maintenance and repair, and are unsafe. Most of the catchment is used for industrial, commercial and residential purposes, with small areas of rural production in the upper catchment including Tootara Park and along the coast as part of Puhinui Reserve. However, most rural land uses outside of Puhinui Reserve are zoned to become light industrial development under the Unitary Plan.

Prior to the 1970s the outer areas of Auckland were largely rural with small established villages such as Papatoetoe and Manurewa interspersed across the countryside. Post war growth resulted in mass suburbanisation stretching into the rural landscape, with South Auckland being an especially favoured area. This was also an era of major road and motorway construction with civic centres such as Manukau Central being designed and built with a strong focus on the automobile. As a consequence, Manukau's urban form was defined by the arterial routes of Great South Road and Wiri Station Road, together with State Highway 1, Puhinui Road, Kerrs Road, Druces Road and Browns Road.

In more recent years, incremental additions have been made to Manukau's overall urban form. The construction of State Highway 20 and the new rail line extension to Manukau Central have improved regional connectivity but have also created local severance issues. Manukau Central has experienced intensification with developments of varying scale and quality, in particular office buildings. Small pockets of high density apartments are also now starting to become a part of the urban landscape and built form. Development to the north and south of Manukau Central has continued to consist of low density housing, light industrial and large format retail areas.

While land use within the catchment area of Te Puhinui is diverse, there are three distinctive urban forms - single lot residential, large industrial land uses, and the civic centre.

Residential

The residential land use of Te Puhinui is relatively consistent across the catchment in terms of density and building typologies however there is localised variation.

The upper catchment is suburban while still retaining a semi rural character with low to medium density single dwellings on medium to large countryside living lots. Population density is low with high quality recreational open spaces in this area.

The residential landscape to the east of State Highway 1 is characterised by low density single dwellings on smaller land parcels set within a neighbourhood street pattern consisting largely of cul de sacs extending from two main connector roads. Small neighbourhood parks provide the area with some public open space.

The mid catchment is characterised by medium to low density single lot dwellings with a low population density. Neighbourhoods are surrounded by state highways and are interspersed with community facilities such as schools. There are limited open spaces for recreation and these are generally of poor quality.

The medium to low density residential character extends into the lower catchment, where a low population is also prevalent. Street patterns consist of smaller block sizes and less cul-de-sacs. There are areas of high quality open spaces, however access to these is difficult from many neighbourhoods.

Industry

The industrial area of Te Puhinui is located almost entirely in the mid catchment and is characterised by large scale single use buildings and a very low residential population. The industrial land use makes up 25% of land area of Puhinui Catchment. There are almost no open spaces for recreation and they are generally of poor quality. Large vehicle dominated streets delineate the area and provide poor and limited pedestrian and cycle connections to the wider catchment. The industrial land uses in the area significantly restrict public access to the stream.

Manukau Central

Manukau Central was developed as an administrative and commercial centre for

1. *Footnote needed - Strong Towns.*

Urban morphology

South Auckland. It was a greenfield, car-oriented development. Historically, the town centre has been characterised by a mix of small and large scale commercial activities, single use buildings, light industry and a single large open space - Hayman Park. Large areas south of the centre are occupied by large scale recreation and events facilities - Rainbow's End, Vector Wero Whitewater Park and Vodafone Events Centre. More recent developments include a tertiary institution, large train and bus station and small blocks of high density apartments fringing the commercial centre. Despite recent developments, the area still consists of large swathes of car parks and large car dominated streets. The state highways restrict pedestrian movement and limit connections to amenities and open spaces for recreation.

Transform Manukau Framework Plan

The Transform Manukau project covers six square kilometres and is centred around Manukau Central and Wiri neighbourhood. It is situated within the Ootara-Papatoetoe and Manurewa Local Board areas. The intention of the project is to regenerate Manukau by building high-quality, people oriented urban environments that empower communities and lift local well-being. Changes focus on creating a new human scale built form within the undeveloped blocks that are more accessible through improved street and block design.

Key building blocks on undeveloped sites within easy walking distance to Manukau Central include plans to develop higher density residential housing in the form of high rise apartment buildings and terrace housing with quality communal open spaces for residents.

Opportunities to progressively intensify established residential neighbourhoods also exist and will provide greater housing provision and choice. A high concentration of Kaainga Ora ownership in these neighbourhoods presents an opportunity to comprehensively redevelop the area over time to provide a denser and more diverse mix of housing types. Recognising and utilising the full potential of the open space and recreational amenity of Puhinui Stream, as well as supporting and strengthening existing local amenities, schools and community facilities are identified as critical and central aspects to consider when intensifying these neighbourhoods.

New open space networks and residential neighbourhoods are planned for DHB greenfield land to the south of Manukau Central which will be closely integrated with an expanded healthcare hub which is proposed at the existing Manukau SuperClinic. This development will create a major activity hub along Great South Road.

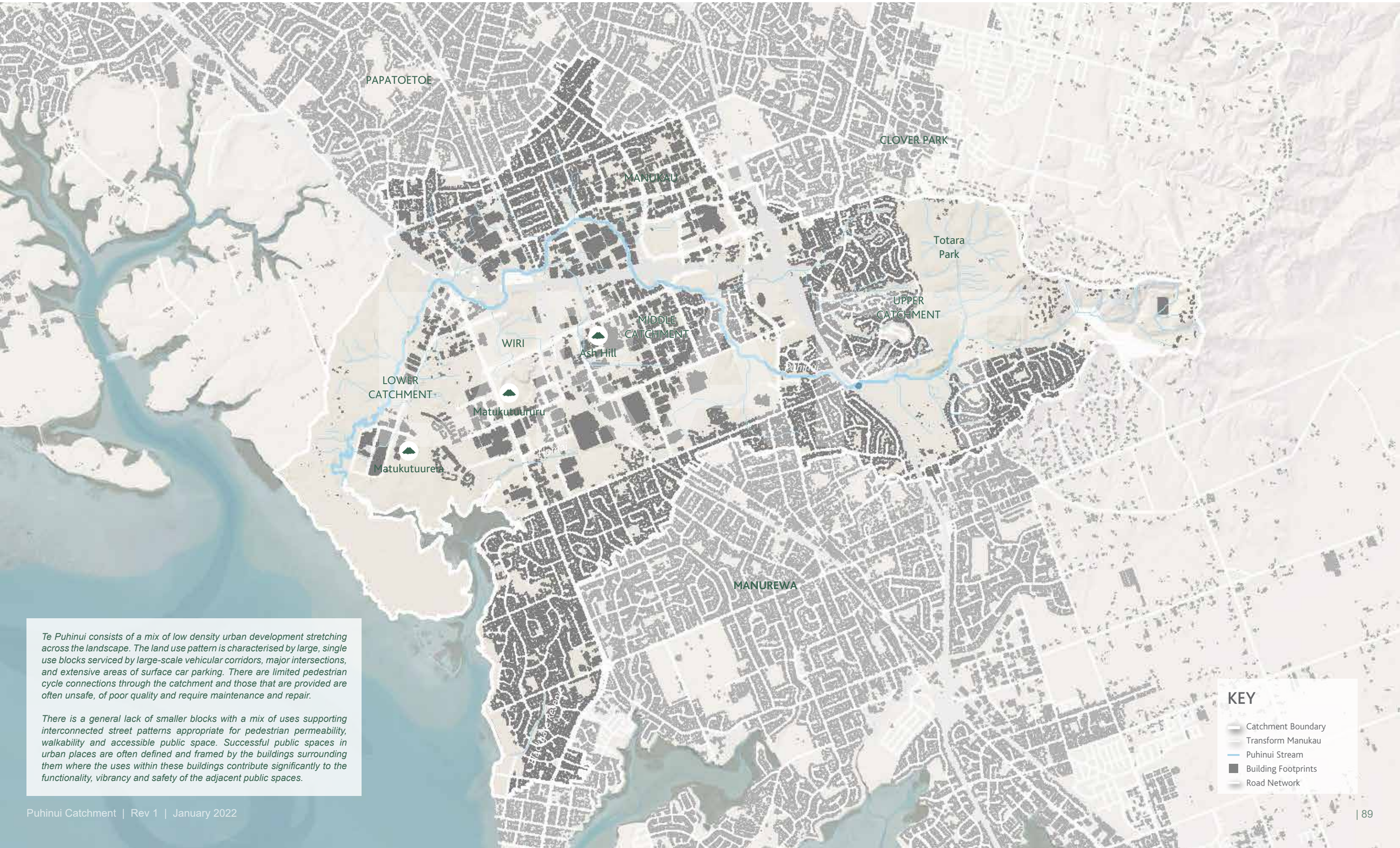
The Framework Plan identifies opportunities to optimise existing streets and open spaces that are not used to their full potential. In many cases these spaces are characterised by a single use such as car dominated street or monotonous open spaces, neglected by adjacent development and avoided by the community as is the case with Puhinui Stream as it meanders through the Wiri neighbourhood. In order to rectify this, Hayman Park and the streets and spaces of Manukau Central, are proposed to be re-imagined and progressively redesigned as people-places that can support much greater levels of public life and activity so it can become the vibrant heart of Manukau.

Puhinui Stream provides a significant landscape feature to the Transform Manukau area and presents a unique opportunity to maximise the role of the stream as a significant shaping, connecting and identity-defining element between neighbourhoods.

Urban morphology

Scale: 1_35 000@A3

0 1 3KM



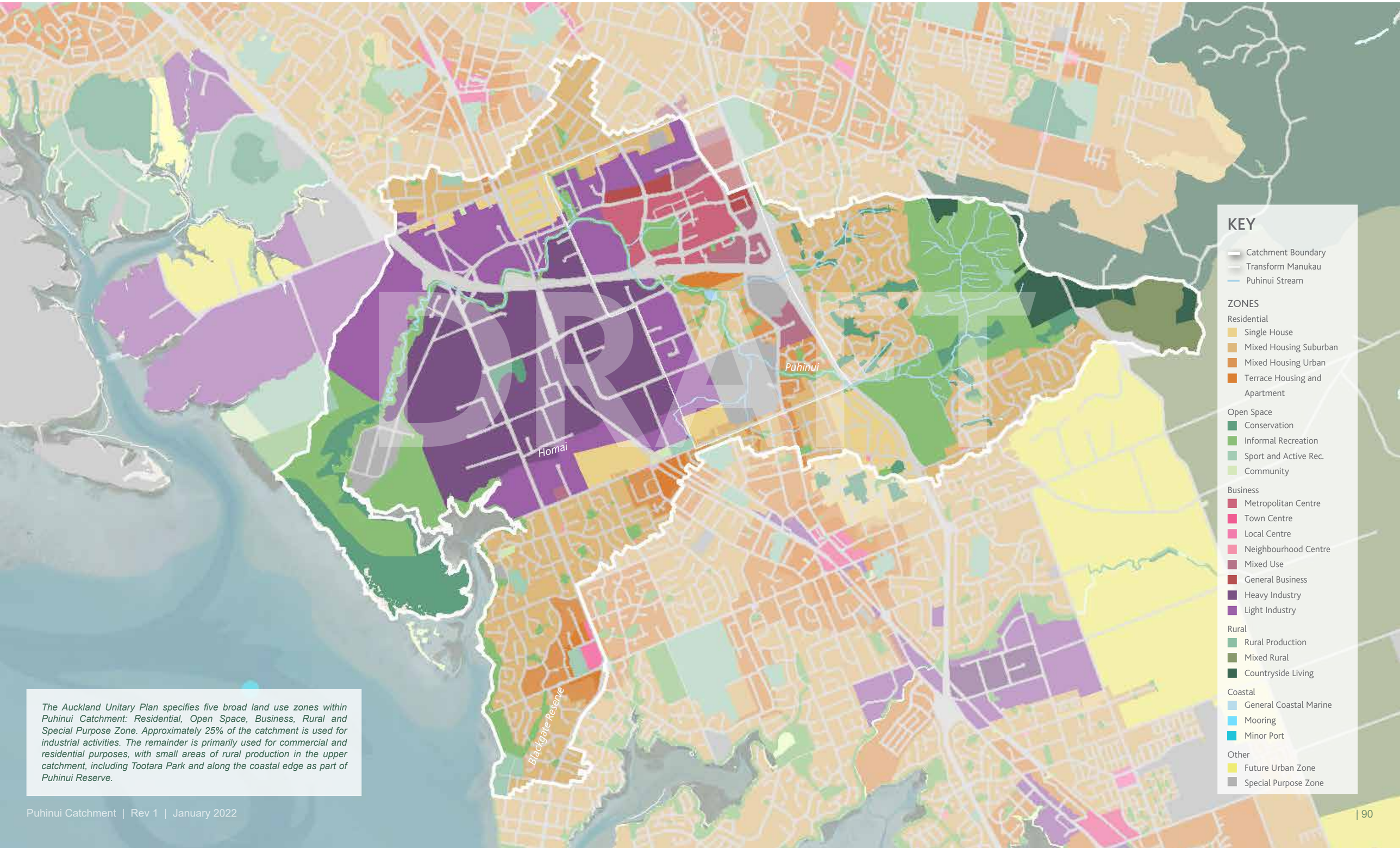
Te Puhinui consists of a mix of low density urban development stretching across the landscape. The land use pattern is characterised by large, single use blocks serviced by large-scale vehicular corridors, major intersections, and extensive areas of surface car parking. There are limited pedestrian cycle connections through the catchment and those that are provided are often unsafe, of poor quality and require maintenance and repair.

There is a general lack of smaller blocks with a mix of uses supporting interconnected street patterns appropriate for pedestrian permeability, walkability and accessible public space. Successful public spaces in urban places are often defined and framed by the buildings surrounding them where the uses within these buildings contribute significantly to the functionality, vibrancy and safety of the adjacent public spaces.

Planning and land use

Scale: 1_35 000@A3

0 1 3KM



The Auckland Unitary Plan specifies five broad land use zones within Puhinui Catchment: Residential, Open Space, Business, Rural and Special Purpose Zone. Approximately 25% of the catchment is used for industrial activities. The remainder is primarily used for commercial and residential purposes, with small areas of rural production in the upper catchment, including Tootara Park and along the coastal edge as part of Puhinui Reserve.

Built environment photo essay

The Auckland Unitary Plan specifies five broad land use zones within Puhinui Catchment: Residential, Open Space, Business, Rural and Special Purpose Zone.

Residential: Single house, mixed housing suburban, mixed housing urban and terrace housing and apartment.

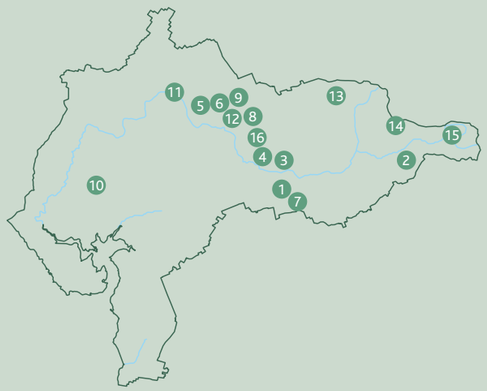
Open Space: conservation, informal recreation, sport and active recreation and community.

Business: metropolitan centre, neighbourhood centre, local centre, mixed use, general business, heavy industry and light industry.

Rural: countryside living and mixed rural.

Special Purpose Zones.

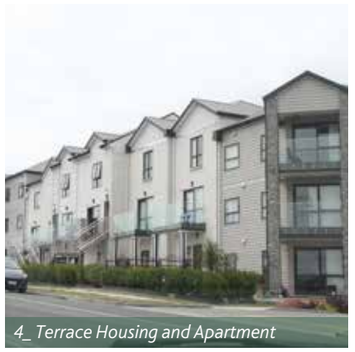
*Picture from Google Street view




1_ Single House


2_ Mixed Housing Suburban


3_ Mixed Housing Urban


4_ Terrace Housing and Apartment

5_ Metropolitan Centre


6_ Neighbourhood Centre*


7_ Local Centre

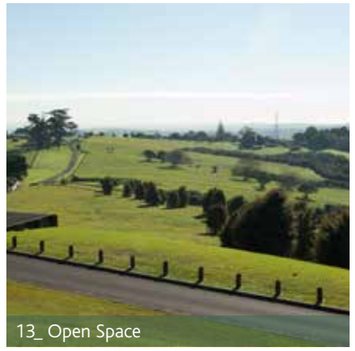

8_ Mixed Used*


9_ General Business


10_ Heavy Industry


11_ Light Industry

12_ Road Network*


13_ Open Space


14_ Countryside Living


15_ Mixed Rural


16_ Special Purpose Zone

Initial planning assessment[1]

The Initial Planning Assessment identifies early planning considerations that will contribute to a deeper understanding of the statutory context that applies within the catchment. This will help to inform the Regeneration Strategy and work programme.

While the Regeneration Strategy considers the entire Puhinui Catchment, the focus of the work programme development will be the Puhinui Stream Corridor, with greater emphasis on the Transform Manukau Area. Therefore, the Initial Planning Assessment provides initial advice on planning considerations at the following scales:

- *Relevant Auckland wide provisions of the Auckland Unitary Plan (Unitary Plan) that relate to Puhinui Catchment as a whole; and*
- *Site specific provisions that relate to key sites within the Transform Manukau boundary.*

AUCKLAND WIDE PROVISIONS

The primary objectives of the Regeneration Strategy are understood to be:

- Social and environmental health; creating a source of pride and identity for South Auckland, improved cycling, walking and recreational facilities and use; and
- To create a healthy and functioning water-system for surrounding communities.

The Initial Planning Assessment identifies key provisions of the Unitary Plan that provide opportunities to fulfill these project objectives.

SITE SPECIFIC PROVISIONS WITHIN 'TRANSFORM MANUKAU'

Planning considerations associated with spatial aspects of the Transform Manukau plan are then addressed. Given the early stage of the project, the assessment focuses on whether the intended uses in the Transform Manukau plan are provided for within each zone, as well as the planning implications associated within overlays in the area (such as protected trees, heritage areas and stormwater controls). When a detailed work programme has been developed, further advice on consent requirements would need to be provided.

1. *Puhinui Stream - Regeneration Strategy and Work Programme, Initial Planning Considerations, Done Ltd, October 2019*

Transport and movement

Urban expansion and population increases into South Auckland were driven by the historic road alignments of Great South Road and Wiri Station Road and increased as the State Highway 1 was constructed between the 1950s and the late 1970s. As a result of this growth, Manukau Central was developed as the civic and administration centre of South Auckland. The structure of South Auckland's road and motorway network led Manukau Central development as a car based centre with an emphasis on providing regional access for motor vehicles. Unfortunately this development pattern has been at the cost of accessible, safe and direct access for pedestrians and cyclists within Manuaku as well as access to and from neighbouring communities.

Regional Connectivity

Great South Road is one of the longest and oldest roads in Aotearoa and has been the historic spine of South Auckland with many of its town centres emerging and growing along its length. It was formed prior to the 1860s as far as Drury and was used as the main link to the agricultural areas of the south. In 1861, British army troops began a more formal construction of the road and over two years improved it to a level that considerably aided their campaign to invade the Waikato.

As Auckland's growth has continued to develop southwards it has also developed to the east and west of Manukau Central. Recent development around Auckland Airport, to the west, has contributed toward recognition of the area as a major destination with a growing commercial base. To the east there has been considerable growth in areas such as Botany, Flatbush and Ormiston.

Recent improvements have been made to Auckland's regional public transport network including the construction of a new rail station and bus interchange in the heart of Manukau. Additionally, Auckland Transport is currently undertaking investigations into a mass transit route, either bus or light rail, with the aim to provide a link between Botany and the airport, with connections to both the southern rail line at Manukau central and to the Auckland Manukau Eastern Transport Initiative Corridor. Development of this route will significantly strengthen east-west connections to and from Manukau.

Although Manukau Central was developed on land surrounding Great South Road, early development was set back from Great South Road in order to create large areas for car parks. This development pattern has left Manukau Central lacking a clear mainstreet, which is in stark contrast to the older town centres along Great South Road which front the road and provide active, vibrant, culturally rich main streets.

Te Araroa is a 3000km walking and cycling route stretching from Cape Reinga in the north of Aotearoa to Bluff in the south. A 10.2km section of the route runs through the catchment - the Puhinui Stream Track. In south Auckland Te Araroa runs from Onehunga to Maangere through Te Puhinui before continuing on to Mangataawhiri to the south. From Maangere it starts in Puhinui Reserve and from here the route follows the stream through the lower catchment, along Wiri Station Road, Wiri Reserves, Kerrs Road east up to Great South Road, through Raataa Vine and then onto Auckland Botanic Gardens and Tootara Park in the upper catchment.

Puhinui Catchment

Puhinui Catchment is easily accessible from the wider region with three train stations and two main highways within the catchment. On a local level however, this infrastructure restricts connectivity and accessibility within the catchment. Much of the existing residential population live a distance from Manukau Central which makes walking impractical and generally unappealing. These distances are often compounded by the large block size and structure and generally poor urban environment prevalent in Manukau.

Access to and along Puhinui Stream is highly restricted with few access points and several sections of the stream being fenced off or blocked by large industrial buildings. Access to major open spaces such as Puhinui Reserve is also particularly difficult and contributes to the underutilisation of the reserve.

Cycling infrastructure within the catchment is also poor and is generally based on the edge of busy roads and does not provide sufficiently safe infrastructure to attract new or younger users. This is despite the fact that there are a number of residential areas with distances to or across the centre that would be well suited to making trips by bicycle.

While the popularity of bicycles and electric bikes is increasing in some parts of Auckland, the uptake of cycling in South Auckland has not followed this trend. Notwithstanding, there are a range of opportunities to develop dedicated cycle paths throughout Te Puhinui. Some of the parklands and open spaces that run alongside Puhinui Stream present the opportunity to connect neighbourhoods and town centres within the catchment. Unfortunately there are several locations of the stream that are severed by the state highways, rail line and several arterial roads such as Kerrs Road and Wiri Station Road meaning that a continuous, uninterrupted path along the length of Puhinui Stream is difficult if not impossible.

According to the 2018 census, approximately 70% of people living in Manukau Central, Wiri East and Puhinui East travelled to work in a car, and around 40% of students travelled by car to educational facilities, either as passengers or drivers[1].

1. *StatsNZ, 2018*

Transport and movement

Freight

Approximately 80% of the oil used in New Zealand is used in the transport sector which accounts for about 40% of national energy demand. Of the oil used for transport, 50.8% is for heavy trucks; 26.6% is for light trucks, vans and utility vehicles; 15.8% is for cars and passenger vehicles; 3.5 % is for buses and 3.2% is for rail. While Auckland has been making improvements to public transport and cycling infrastructure, these investments only affect the 15.8% used for cars and passenger vehicles.

In 2017 New Zealand moved 25.3 billion tonne-kms (one tonne of goods traveling a distance of one kilometre) of freight, up 7.3% from 2016.

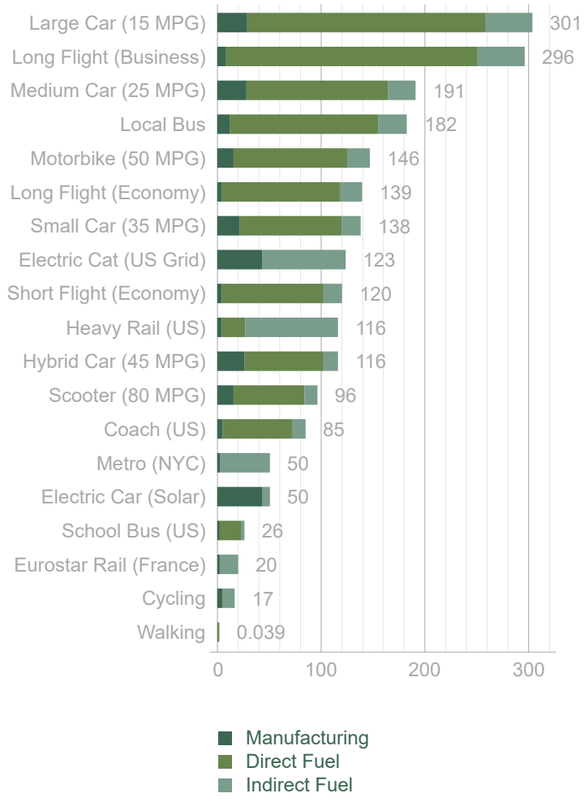
The modal share of freight operations in 2017/18:

	Tonnes		Tonnes-Kilometres	
Mode	Million tonnes	Percentage	Billion tonnes-kilometres	Percetage
Rail	15.9	5	3.5	12
Coastal Shipping	4.6	2	4	13
Road	269.8	93	23.1	75
Total	290.3		30.6	

Carbon Intensity of Travel

Agricultural activity accounts for approximately 48% of New Zealand's greenhouse gases and transport makes up approximately 20%. However, because Te Puhinui is primarily an urban catchment with limited agricultural activity, the proportion of total transport related greenhouse gas emissions will be much higher in Te Puhinui. As New Zealand transitions toward a renewable energy network and a reduction in carbon emissions, urban areas such as Te Puhinui will need to decarbonise its transport infrastructure and develop communities in a way that means most essential services are within walking distance[2].

The Carbon Intensity of Travel: g CO2e/pkm[3]



2. *https://www.resilience.org/stories/2015-01-21/our-renewable-future/*
3. *DEFRA, EIA, EPA, Chester & Horvath, shrikthatfootprint.com*

Transport and movement

Scale: 1_35 000@A3

0 1 3KM

Manukau development in the 1970s. Today Puhinui Catchment is easily accessible from the wider region with three train stations and two main highways within the catchment. On a local level however, this infrastructure restricts connectivity and accessibility within the catchment. Much of the existing residential population live a distance from Manukau Central which makes walking impractical and generally unappealing. These distances are often compounded by the large block size and structure and generally poor quality urban environment throughout the catchment. Access to and along Puhinui Stream is restricted with few access points and several sections of the stream being fenced off or blocked by the motorway or large industrial buildings.

Manukau Central Walking & Cycling

The Transform Manukau Framework outlines three strategic goals and five key moves. The three most relevant to walking and cycling are:

- Creating a vibrant heart by increasing access whilst minimizing the effects of motorized traffic.
- Realising the potential of the Wiri neighbourhood by establishing key north - south cycle connection along Puhinui Stream.
- Enhancing community connectivity by creating a safe cycling and walking network.

The town centre was also identified as a focus area in the Auckland Cycling Programme Business Case.

In 2017, Eke Panuku Development commissioned the Manukau Central Walking and Cycling Area Plan. The main objective of the Manukau Central Walking and Cycling Plan was to provide better access to the civic centre for all transport modes and to all users. The main priorities of the Walking and Cycling Plan are to improve the network and facilitate access to Manukau Central while reducing car traffic and congestion as the town centre shows great potential to increase the number of local journeys taken. While the plan focuses on walking and cycling, the improvement of public transportation is planned in order to support the development of the plan.

KEY MOVES

Build multi-modal streets

Street design must support safe, comfortable, attractive, and convenient access for all modes including pedestrians, cyclists, public transport, and motorists, and for all users including the elderly, children, and mobility-impaired users. By accommodating many modes, the street can move a significant number of people without sacrificing other street activities. By accommodating spatially efficient modes, walking can become a significant part of the transport system.

Ensure appropriate network density

A dense cycling network has the advantages of limiting out-of-direction travel and provides a variety of route options to each destination. More route options allow cyclists of different skill and comfort levels to identify the routes best suited for their transportation needs. Streets optimised for bicycle travel translate to savings in time and energy that help make cycling more attractive than other modes. A cycling facility should be provided every 250 metres. While this standard can not be achieved in all areas due to disconnected roadway networks, physical barriers, or terrain constraints, cycling facilities should be placed as close as possible to that standard.

Provide direct access to key destinations and follow corridors of high demand

A connected and functional cycling network will provide direct routes to key destinations from likely origins throughout the city. Because cycling is a people-powered transport mode, cycling routes should be planned and designed to afford users the most direct route between destinations, and to keep detours to a minimum. This is important as some people will opt for a different means of transport when a cycling facility is not more direct than other modes.

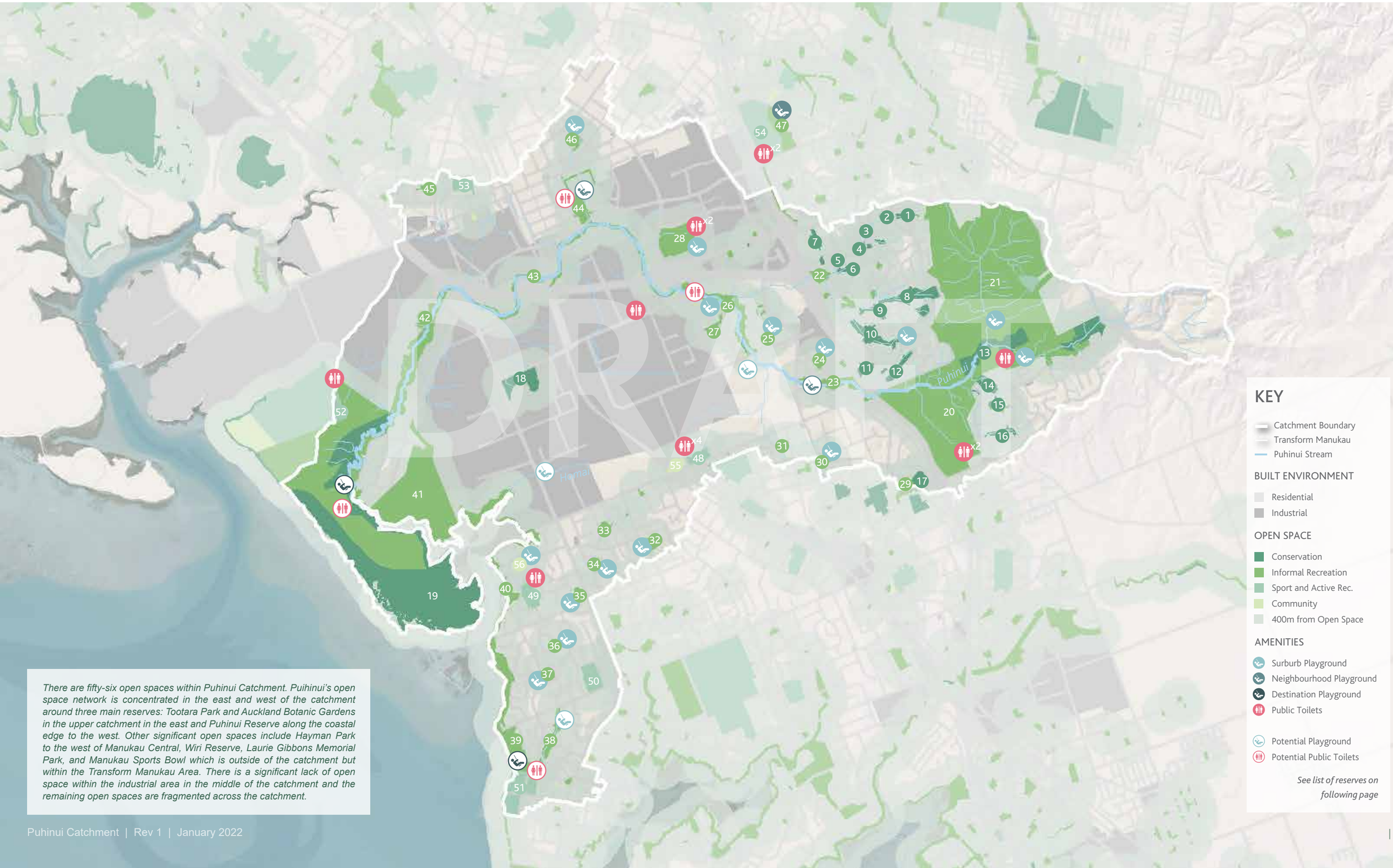
Address the human scale

Humans experience their environment at the scale of their own bodies. In order to create streets that attract people, all aspects of the street should meet and engage at that scale. Lighting, signage, plantings, and building facades can be used strategically to create a more inviting environment for people walking. Large buildings can be visually subdivided through these measures. This maintains interest along a street as well.

Open space network

Scale: 1_35 000@A3

0 1 3KM



There are fifty-six open spaces within Puhinui Catchment. Puihinui's open space network is concentrated in the east and west of the catchment around three main reserves: Tootara Park and Auckland Botanic Gardens in the upper catchment in the east and Puhinui Reserve along the coastal edge to the west. Other significant open spaces include Hayman Park to the west of Manukau Central, Wiri Reserve, Laurie Gibbons Memorial Park, and Manukau Sports Bowl which is outside of the catchment but within the Transform Manukau Area. There is a significant lack of open space within the industrial area in the middle of the catchment and the remaining open spaces are fragmented across the catchment.

Open space network

The Auckland Unitary Plan defines Open Space Zones as open space generally used for recreational needs. Most of these zones are public and owned by the Crown or council. They also generally provide for public use, although some restrict public use and access.

There are fifty-six open spaces within Puhinui Catchment. They are zoned as either Conservation, Informal Recreation, Sport and Active Recreation, or Community. The majority of these open spaces are zoned Conservation or Informal Recreation. The open space network is concentrated in the east and west of the catchment around three main open spaces: Tootara Park and Auckland Botanic Gardens in the upper catchment in the east and Puhinui Reserve along the coastal edge to the west. Other significant open spaces include Hayman Park to the west of Manukau Central, Wiri Reserve, Laurie Gibbons Memorial Park, and Manukau Sports Bowl which is outside of the catchment but within the Transform Manukau Area.

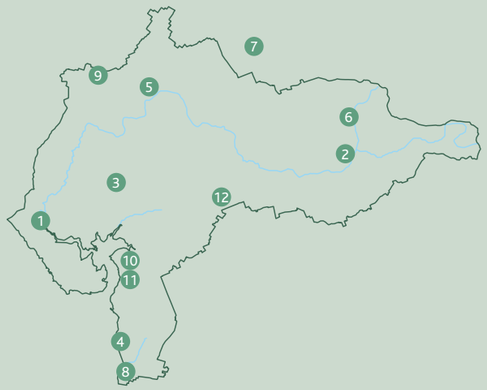
There is a significant lack of open space within the industrial area in the middle of the catchment and the remaining open spaces are fragmented across the catchment.

While Puhinui Stream and its tributaries start to stitch some of these open spaces together through the urban fabric of the catchment, the open spaces of Te Puhinui are better described as a patchwork rather than a network.

NAME	TYPOLOGY / CHARACTER	ACTIVITY/IES	APPROXIMATE AREA (M^2)
CONSERVATION			
1. Goodwood Drive Reserve	Local Reserve		7,100
2. Kingsclere Place Reserve	Local Reserve		4,750
3. Everglade Park			3,310
4. Everglade Drive Reserve	Local Reserve		5,020
5. Fairchild Park			5,460
6. DeHaviland Park		Walking	8,480
7. St. Johns Redoubt		Walking	11,100
8. Eugenia Rise Reserve	Local Reserve		44,700
9. Aronia Way Reserve	Local Reserve	Walking	13,250
10. Banyan Drive Reserve	Local Reserve	Walking	39,400
11. Everglade Drive Reserve	Local Reserve		10,810
12. Calluna Crescent Reserve	Local Reserve		16,440
13. Tootara Park Pools		Walking	111,880
14. Charles Prevost Drive Reserve	Local Reserve	Walking	21,600
15. Peretao Rise Reserve	Local Reserve	Walking	16,560
16. Lemonwood Place Reserve	Local Reserve		7,940
17. David Nathan Park Reserve	Local Reserve	Walking	14,590
18. Matukutururu Mountain			53,670
19. Puhinui Reserve	Regional Reserve	Walking, Horse Riding	1,853,900
INFORMAL RECREATION			
20. Ackland Botanic	Botanic Gardens	Walking, Education	662,320
21. Tootara Park	Forest	Children's Play, Picnicking, Cycling, Walking, Horse Riding	1,711,050
22. De Havilland Drive Drainage Reserve		Walking	17,950
23. Raataa Vine Stream Reserve		Walking	41,270
24. Felicia Park		Walking, Children's Play	6,340
25. Inverell Park		Walking, Children's Play, Community Hall	11,100
26. Wiri Stream Reserve		Walking, Children's Play	91,690
27. Trevor Hosken Drive		Walking	5,590
28. Hayman Park		Walking, Skate Park	101,880

NAME	TYPOLOGY / CHARACTER	ACTIVITY/IES	APPROXIMATE AREA (M^2)
INFORMAL RECREATION			
29. David Nathan Park		Walking	22,690
30. Anderson Park		Walking, Children's Play	8,640
31. Adams Park		Walking	4,330
32. Rowandale Reserve		Walking, Children's Play	15,240
33. Feasegate Gate		Walking	6,080
34. Pallant Park		Walking, Children's Play	5,510
35. Frobisher Park		Walking, Children's Play	5,860
36. Volta Park		Walking, Children's Play	4,900
37. Finlayson Park		Walking, Children's Play	6,210
38. Blackgate Reserve		Walking	23,190
39. Pitt Avenue Foreshore		Walking, Picnicking, Seashore	165,870
40. Hanford Place Foreshore		Walking, Workout, Seashore	75,520
41. Matukutureia Mountain			432,320
42. Aerovista Place Reserve		Walking	162,090
43. Plunket Avenue Reserve			65,000
44. Puhinui Domain		Walking	29,400
45. Wyllie Park		Walking	3,910
46. Sunnyside Domain		Walking, Children's Play, Tennis	10,660
47. Clover Park		Walking, Children's Play	59,560
SPORTS AND ACTIVE RECREATION			
48. Manurewa Netball Complex	Sports Park	Netball	23,820
49. Finlayson Ave Reserve		Sports and Recreation	32,380
50. Clendon Community Centre Reserve		Recreation	40,020
51. Laurie Gibbons Memorial Park		Sports and Recreation	94,610
52. Colin Dale Park		Recreation	444,450
53. Murdoch Park		Recreation	30,180
54. Manukau Sports Bowl	Sports Park	Stadium	154,350
COMMUNITY			
55. Dalgety Drive Corner		Walking	9,990
56. Finlayson Community House Reserve		Walking, Children's Play, Community House	12,500

Open space network




1_ Puhinui Reserve


2_ Tootara Park Pools

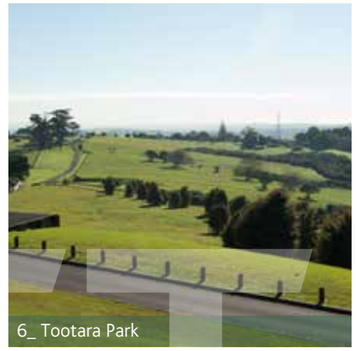

4_ Pitt Avenue Foreshore


5_ Puhinui Domain


3_ Matukutuururu Mountain

CONSERVATION [1-3]

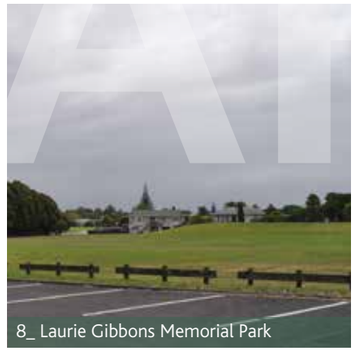
Conservation zone applies to spaces with natural, ecological, landscape, and cultural and historic heritage values. Recreation activities and development are limited and buildings can only be related to conservation, land management, education, park management or information.


6_ Tootara Park

INFORMAL RECREATION [4-6]

Informal Recreation zones are generally spaces used for a variety of outdoor informal activities and community uses. They are characterised by few buildings and structure, but are limited only in support of the enjoyment of the space for informal recreation.


7_ Manukau Sports Bowl


8_ Laurie Gibbons Memorial Park


10_ Finlayson Community House Reserve


11_ Finlayson Community House Reserve


9_ Murdoch Park

SPORTS AND ACTIVE RECREATION [7-9]

Sport and Active Rec. zones are used for indoor and outdoor organised sports, active recreation and community activities. It includes buildings and structures related to activities on site and commercial activities may be undertaken in appropriate locations.


12_ Dalgety Drive Corner*

COMMUNITY [10-12]

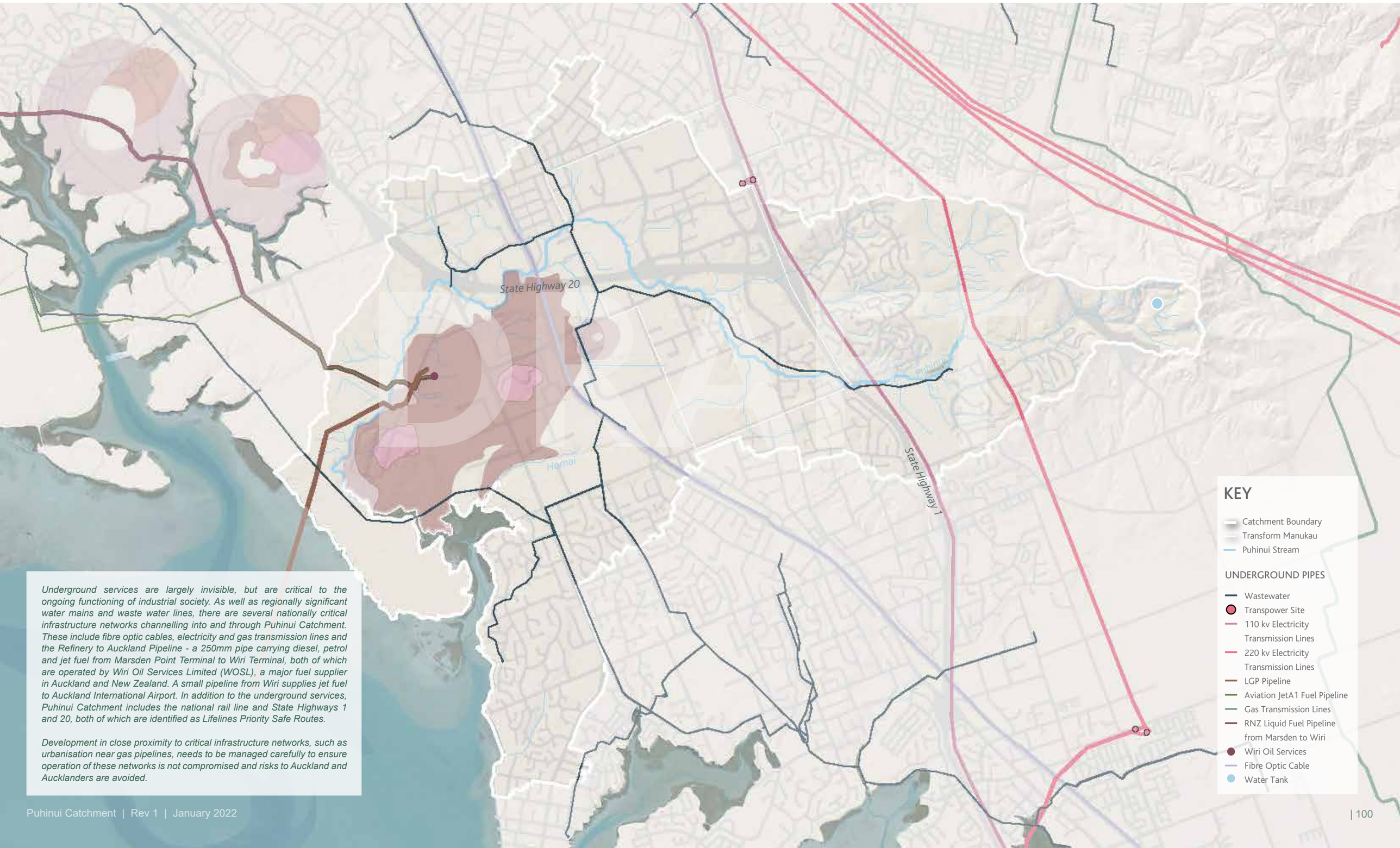
Community zones are generally located in centres, suburban and rural areas. These zones primarily accommodate community buildings and activities, such as libraries, arts and cultural centres, marae, community houses, halls, early childhood learning facilities and recreation centres.

**Picture from Google Maps Street View*
Text from 'Auckland Unitary Plan'

Critical services

Scale: 1_35 000@A3

0 1 3KM



Underground services are largely invisible, but are critical to the ongoing functioning of industrial society. As well as regionally significant water mains and waste water lines, there are several nationally critical infrastructure networks channelling into and through Puhinui Catchment. These include fibre optic cables, electricity and gas transmission lines and the Refinery to Auckland Pipeline - a 250mm pipe carrying diesel, petrol and jet fuel from Marsden Point Terminal to Wiri Terminal, both of which are operated by Wiri Oil Services Limited (WOSL), a major fuel supplier in Auckland and New Zealand. A small pipeline from Wiri supplies jet fuel to Auckland International Airport. In addition to the underground services, Puhinui Catchment includes the national rail line and State Highways 1 and 20, both of which are identified as Lifelines Priority Safe Routes.

Development in close proximity to critical infrastructure networks, such as urbanisation near gas pipelines, needs to be managed carefully to ensure operation of these networks is not compromised and risks to Auckland and Aucklanders are avoided.

8. Social, Human and Knowledge Capital

Social capital refers to the social networks of a community and the collective ability of a group to work together to achieve something.

Human capital refers to the capacity of an individual or population to participate in and contribute to society (often conceived of through the production of goods and/or services). It includes all of the knowledge, habits, skills, experience, social and personality attributes, including creativity accrued by individuals over the course of their life as well as the health of people and populations.

Knowledge capital, sometimes called 'intellectual', 'instructional' or 'technical' capital refers to transferable stores of knowledge that can be utilised to build other forms of capital.

This section starts with a brief photo essay of the people of Te Puhinui. It then maps and documents the 'heads, hands and hearts' of Te Puhinui community looking at existing organisations and groups, social networks, community connectors, activators, communicators and supporters in the catchment; the catchments deprivation and the major actors of Puhinui Catchment across three nested scales - Puhinui Catchment, Te Maanuka / Manukau Harbour catchment and the Taamaki Makaurau bioregion.

The section concludes with a summary of themes and insights gained through the workshops, interviews and focus groups that were undertaken as part of discovery and initiation phase of this project.

People of Te Puhinui photo essay

A snapshot of photos taken at various community events in Te Puhinui showing the diverse range of people, cultures and activities within Puhinui Catchment. People of Te Puhinui include those who live, work, play, and study in Te Puhinui, and connect with its diverse communities.







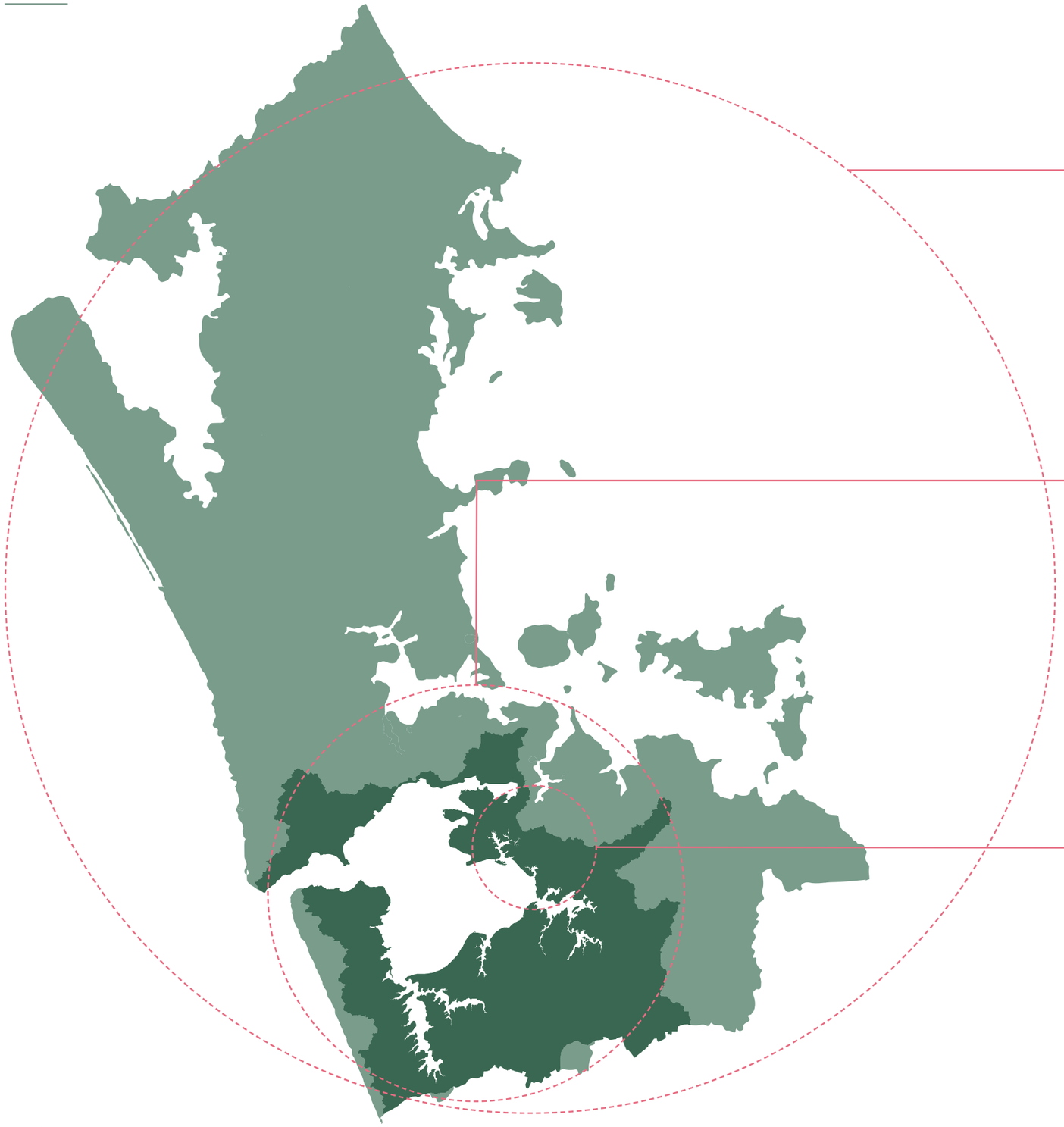








Leading actors of Puhinui Catchment



AUCKLAND REGION

Governance
Mana Whenua
Auckland Council
21 Local Boards
Other public agencies

Major Players
Watercare (Auckland Council CCO)
Waka Kotahi NZTA
Auckland Transport (Auckland Council CCO)
Kāinga Ora
Eke Panuku Development (Auckland Council CCO)

MANUKAU HARBOUR

Governance
Mana Whenua (namely Te Waiohua, Waikato Tainui)
Franklin, Manurewa, Ootara-Papatoetoe, Puketaapapa, Whau, Maangere-Ootaahuhu, Maungakiekie-Taamaki, Papakura, and Waitaakere Ranges Local Boards
Other public agencies

Major Players
Watercare (Auckland Council CCO)
Healthy Waters (Auckland Council)
Manukau Harbour Restoration Society
Manukau Harbour Forum

PUHINUI CATCHMENT

Governance
Mana Whenua, namely Te Waiohua tribes
Manurewa Local Board
Ootara-Papatoetoe Local Board
Kaainga Ora
Tuupuna Maunga o Taamaki Makaurau Authority
Auckland Council
Te Papa Atawhai / Department of Conservation
Other public agencies

Major Local Players
Manukau Beautification Charitable Trust
Manurewa Marae
Manukau Business Association
Wiri Business Association
Manukau Institute of Technology (MIT)
Auckland University of Technology (AUT)
Eke Panuku Development (Auckland Council CCO)
Healthy Waters (Auckland Council)
Community Facilities (Auckland Council)
The Southern Initiative
The Cause Collective
Piritahi
Manutahi (Transform Manukau collective)
Te Puu a Ngaa Maara
Auckland Botanic Gardens
Roots Creative Entrepreneurs
Sisters of Mercy
The Pride Project Aotearoa
Friends of Tootara Park
Community Guardians
Protectors of the Puhinui

People of Te Puhinui

Demographic information specific to Puhinui Catchment is limited, however, below is a summary of the information available broken down by the two local board areas that divide up the catchment - Ootara-Papatoetoe and Manurewa. These local boards are the most diverse in Auckland[1].

Manurewa Local Board

This area extends beyond Puhinui Catchment but covers Te Puhinui communities and neighbourhoods of Wiri, Homai, Weymouth, Clendon Park, Hill Park, The Gardens, Tootara Park and Goodwood Heights.

At the 2018 census, there were 95,670 people living in Manurewa, an increase of 16.3% since 2013. The area has one of Auckland's highest proportions of people under 25 years. Manurewa Local Board's Pacific population has grown by almost 9700 since the 2013 Census. Pacific people are now the largest ethnic group at 36%, followed by European at 29%. Maaori have increased to 26% and the Asian population make up 25%.

Manurewa has the highest Maaori population in Taamaki Makaurau / Auckland (more than 25,000) and eleven iwi have Mana Whenua interests in the area. 22% of Maaori residents can speak in te reo Maaori.

Manurewa is a significant exporter of labour, with 80% of residents working in southern employment areas, including Manukau, Auckland Airport, Highbrook and East Taamaki. Most workers in the local board area travel by car.

Compared with the rest of Taamaki Makaurau, more people in the area are unemployed and fewer people earn high wages. More young people leave school in the area without the skills and qualifications needed to find well-paid, sustainable employment and without being enrolled in tertiary study.

Ootara-Papatoetoe Local Board

This area extends beyond Puhinui Catchment but covers Te Puhinui communities and neighbourhoods of Te Puhinui, Manukau Central, and the southern extent of Papatoetoe.

At the 2018 census, there were 85,122 people living in the area, up 9,459 on the 2013 census. The 12.5% growth rate is higher than the wider Auckland region of 11.0%.

The area has a diverse ethnic composition, with Pacific people comprising 46%, 35% Asian, 21% European, 16% Maaori and many smaller groups. There is growth in the Asian population, an increase by 8,484 people, or 39.7% compared to the last census. While the largest groups are Pacifika, Indian, European and Maaori, Ootara-Papatoetoe is home to people of more than 100 ethnicities.

Children and young people under 15 years make up 24.2% of the population and 8.2% of residents are aged 65 years and over.

90% of the local board area residents are able to speak English, with Samoan being spoken by 13,602 people and Hindi spoken by 6,345.

7% of individual income levels are over $70,000 per year, compared to the regional average of 20% and the median personal income in the area is $25,900.

Home ownership is lower in the area than the regional average. 30% of local households owned the dwelling they lived in, compared to 45% across Auckland.

The 2018 census recorded the population of Pacific people in Manukau Central increased from 19.8% in 2006 to 25.3% in 2018.

According to Auckland's draft Climate Action Framework 2019, Maaori and Pacifika communities are particularly vulnerable to climate change impacts.

1. *(Statistics New Zealand, 2013)*

Puhinui Catchment deprivation

The South Auckland area has a high rate of social deprivation. As part of South Auckland, Te Puhinui is highly impacted by social deprivation, and the majority of Census Area Units (CAUs) in Puhinui Catchment are level 9 and 10, the most deprived on the New Zealand deprivation scale.

Maaori and Pacific populations are particularly concerned with deprivation in South Auckland as they are more represented in this area than anywhere else in the Auckland region. In 2018, Pacific and Maaori represented respectively 38% and 21% of the population of Ootara-Papatoetoe and Manurewa local boards combined. In 2006 and 2013, a vast majority of the Maaori (74% and 72%) and Pacific (83% and 82%) population were resident in the most deprived areas of South Auckland[1].

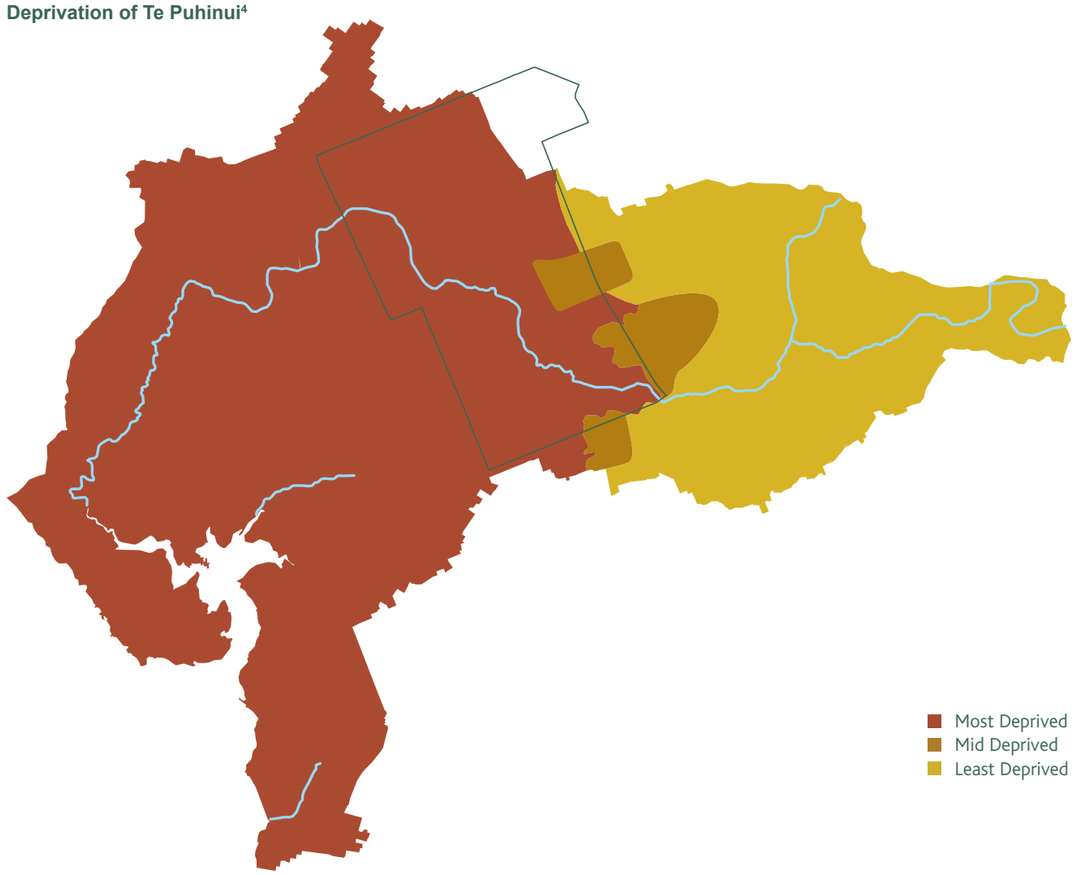
Indicators of deprivation include the employment rate and the average incomes of households. In Te Puhinui, median incomes are below the regional average and unemployment rates are very high. In this case again, Maaori and Pacific populations are the most impacted with a higher rate of unemployment compared to adults from Asian, European or other ethnic groups. They also have a lower proportion of adults with personal incomes of $30,000 or more per annum compared to other ethnicities as well as lower proportion of adults with a Bachelor degree or higher[2].

As a result, levels of home ownership are low, and this affects Te Puhinui area particularly. In Ootara-Papatoetoe (46%) and Manurewa (55%) local boards, the home ownership is low compared to the regional average (61%). Housing affordability is a significant issue in these communities and contributes to the transient communities phenomenon with a high proportion of renters[3].

There are two environments that can lead to food insecurity: food deserts and food swamps. A food desert is the lack of affordable and nutritious food and a prevalence of convenience stores, dairies and small independent stores over full-services supermarkets which leads to higher food prices, lower food quality and less variety. A food swamp is the abundance of fast food and junk outlets that outnumber healthy food outlets.

Deprived neighbourhood areas are most likely to experience higher exposure to unhealthy food outlets. In the most deprived CAUs, there is a 14% higher potential of food swamps. Puhinui Catchment presents a very limited amount of locally grown and healthy products and a large amount of unhealthy food outlets, with five supermarket/healthy food providers within the catchment compared to over forty-four unhealthy food outlets with over twenty four in Manukau Central. Maaori and Pacific population are once again most impacted by food insecurity as 20% of Pacific and 17% of Maaori children are considered obese in New Zealand. Those living in deprived areas suffer from higher rates of food-related ill-health and are also less likely to meet the daily recommended intakes of fruits and vegetables.

Deprivation of Te Puhinui[4]

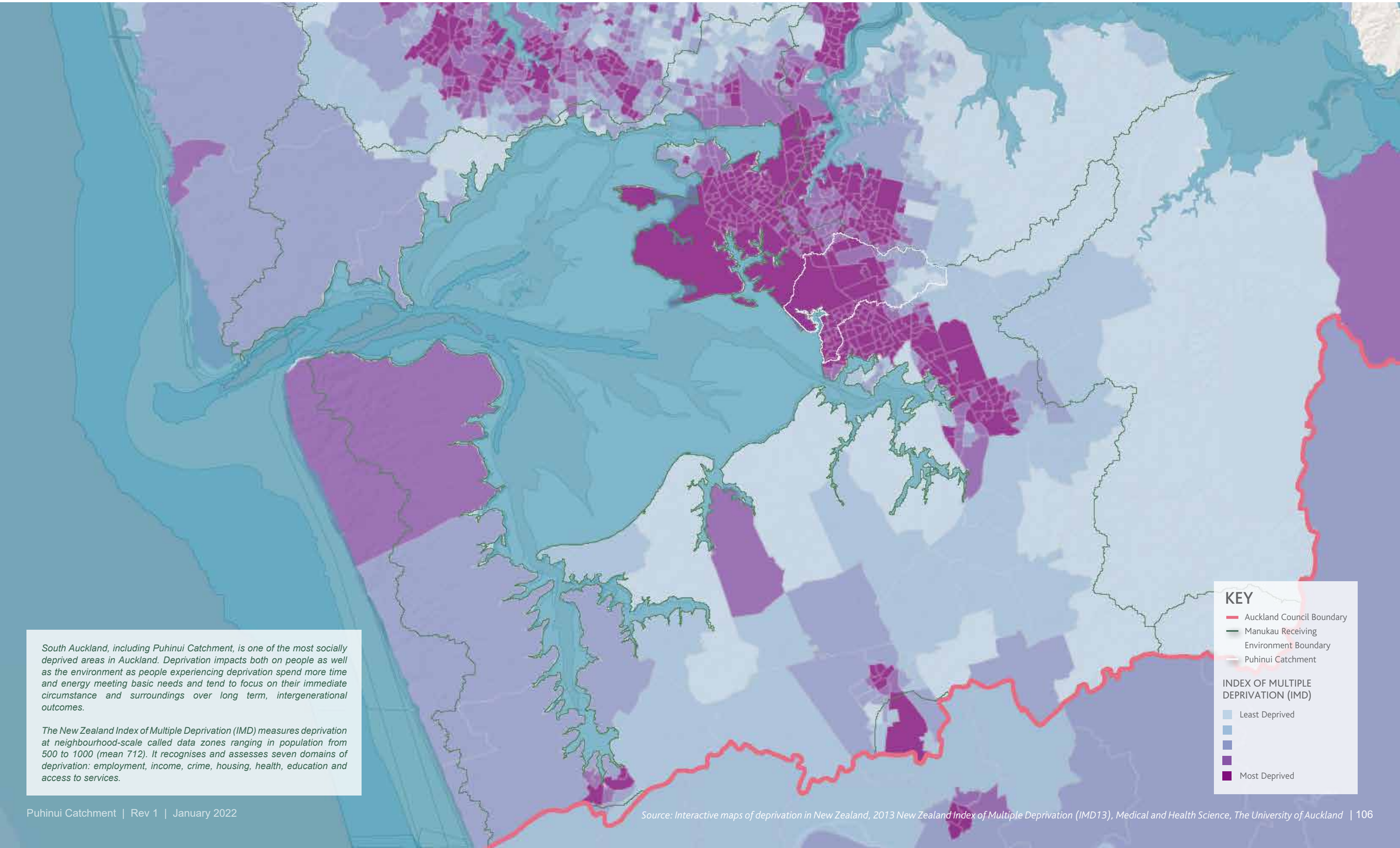


1. https://www.waipareira.com/wp-content/uploads/2017/11/TPM6.-Locality-Population-Snapshot-SOUTH-Auckland.pdf
2. https://do6qmrbufqcd2.cloudfront.net/1001/18-fn-investing-for-impact-in-south-auckland-report-full-%C6%923.pdf
3. https://do6qmrbufqcd2.cloudfront.net/1001/18-fn-investing-for-impact-in-south-auckland-report-full-%C6%923.pdf
4. Deprivation of Te Puhinui map originally created by AUT students Madelaine Janiga-Warren, Caity Alison, Nadine Carter and Caitlin Mitchell.

Puhinui Catchment deprivation

Scale: 1_200 000@A3

0 2 10 20KM



South Auckland, including Puhinui Catchment, is one of the most socially deprived areas in Auckland. Deprivation impacts both on people as well as the environment as people experiencing deprivation spend more time and energy meeting basic needs and tend to focus on their immediate circumstance and surroundings over long term, intergenerational outcomes.

The New Zealand Index of Multiple Deprivation (IMD) measures deprivation at neighbourhood-scale called data zones ranging in population from 500 to 1000 (mean 712). It recognises and assesses seven domains of deprivation: employment, income, crime, housing, health, education and access to services.

Source: Interactive maps of deprivation in New Zealand, 2013 New Zealand Index of Multiple Deprivation (IMD13), Medical and Health Science, The University of Auckland

‘Heads, hands and hearts’ of Te Puhinui

Scale: 1_35 000@A3

0 1 3KM

Pukaki Marae

Clover Park Community House

Kia Aroha College Marae

Hilltop Community Centre

Ootara - Papatoetoe Local Board - Funding

Friendship House He Whare Tangata

Tootara Park Mountain Bike Club -Planting

Water Quality Testing

Water Quality Testing

Water Quality Testing

Friends of Tootara Park - Revegetation / Plant Nursery

Wiri Central School - Clean up / Planting

Puhinui

The Gardens School - Clean up / planting

Auckland Botanical Gardens

Water Quality Testing

Boffa Miskell Prison Nursery

Manurewa High School - Clean up / Planting

BLENNZ Homai Marae

Homai

Manurewa Local Board - Funding

Manurewa Citizens Advice Bureau

Clendon Park Community House

Manurewa Marae

Te Matariki Clendon Community Centre

Te Wharekura O Manurewa - Stream monitoring

Randwick Park Community House

Manukau Beautification Charitable Trust - Funding / Support

Puhinui Catchment is made up of people, whaanau, groups, communities, organisations and cultures that have important roles to play in the regeneration of Te Puhinui. Working with the people and communities who live, work, learn and play in Te Puhinui and activating their inherent strengths and enabling their potential is critical.

This map shows some of the key heads, hands, and hearts of Te Puhinui. The heads refer to the decision makers, strategic thinkers and influencers, the hands are the key activators and ‘doers’ in the catchment while the hearts represent those focused on caring for and looking after people and places in Te Puhinui.

KEY

- Catchment Boundary
- Transform Manukau
- Puhinui Stream

COMMUNITY FACILITIES

- Taurahere Marae
- Institutional Marae
- Charitable Trust
- Council/Local Board
- Library
- Nursery
- Youth Centre
- Healthcare Facilities
- Place of Worship
- Community Services & Organisation

COUNCIL + COMMUNITY PROGRAMMES

- Planting
- Adopt-A-Park
- WaiCare
- Community Water Testing
- Clean ups

WORK

- Town Centre
- Business
- Industry / Factory

LEARN

- Preschool
- Primary - Secondary School
- Tertiary Institute

PLAY

- Built Infrastructure
- Open Space

LIVE

- Residential Zone

See list of schools names on following page

Schools

PRESCHOOL

1. Aorere Pre School
2. Aorere Kindergarten
3. First Steps Coronation Childcare
4. Ann's Preschool Centre
5. BestStart Kenderdine Road
6. Murdoch Park Kindergarten
7. Papatoetoe Playcentre
8. Little Feet Childcare Centre Ltd
9. St Georges Preschool Papatoetoe
10. Li'l Champs Childcare - Papatoetoe
11. BestStart Papatoetoe
12. Papatoetoe Tui Road Playcentre
13. Flat Bush Kindergarten
14. Sathya Sai Preschool Rongomai
15. Dawson PreSchool
16. Whakatipuranga Ki Ootara Te Kohanga Reo
17. St Peter Chanel Preschool
18. Tupu Youth Library
19. Chapel Downs Early Learning Centre
20. St Peter Chanel Preschool
21. Big Bear Childcare Centre
22. BestStart Manukau
23. Papatoetoe Footsteps Community Preschool
24. Play and Learn Early Education Centre
25. Te Kohanga Reo o Te Rangimarie
26. BestStart Lambie Drive
27. Little Kiwis Early Learning Centre
28. Redoubt North Kindergarten
29. Fun Kids Learning Centre
30. Toddlers Turf Childcare Centre
31. Blossoms Educare Wiri
32. Manukau Central Kindergarten
33. Bambinos Early Childhood Centre Manukau

PRESCHOOL

34. Manukau Central Christian Preschool
35. The Gardens Early Childhood Education
36. ChoiceKids Childcare
37. Homai Kindergarten
38. The Treasure Cove Early Learning Centre
39. Te Timatanga Kohanga Reo
40. Hillpark Kindergarten
41. White Heron Learning Centre
42. Little Bears Early Childhood Education Centre
43. Small Oaks Early Learning Centres
44. Choice Kid Childcare
45. Barnados Early Learning Centre Manurewa
46. Kea Kids Russell Road
47. Kiddy Winks Kindy
48. Alfriston Rd Kindergarten
49. Barnardos Early Learning Centre Clendon
50. BestStart Manuroa Road
51. Roscommon Kindergarten
52. BestStart Porchester Road
53. Te Ngaru Childcare Centre
54. YMCA Manurewa Early Learning Centre
55. Kindercare Learning Centres - Manurewa
56. Early Discoveries Centre Manurewa
57. Wee Wisdom Montessori Preschool
58. BestStart Wattle Downs
59. Conifer Grove Kindergarten

PRIMARY - SECONDARY SCHOOL

60. Akoteu Sia-ae-toutaiola
61. Aorere College
62. Papatoetoe West School
63. Holy Cross Catholic School Papatoetoe
64. Papatoetoe Central School

PRIMARY - SECONDARY SCHOOL

65. Papatoetoe High School
66. Papatoetoe East School
67. Flat Bush Primary School
68. Tangaroa College
69. Dawson Primary School
70. Chapel Downs Primary School
71. Kia Aroha College
72. Redoubt North School
73. Puhinui School
74. Papatoetoe South School
75. Everglade School
76. Destiny School
77. Wiri Central School
78. Manurewa High School
79. Homai School
80. BLENNZ Homai Campus
81. Clendon Park School
82. The Gardens School
83. Hillpark School
84. Te Kura Kaupapa Maori O Manurewa
85. Roscommon School
86. Te Wharekura O Manurewa
87. Rowandale School
88. St Anne's Catholic School
89. Manurewa Intermediate School
90. Manurewa West Primary School
91. Manurewa Central School
92. Manurewa East School
93. Randwick Park School
94. Alfriston College
95. Te Kura Akonga O Manurewa
96. Manukau Christian School
97. Greenmeadows Intermediate School
98. Waimahia Intermediate School

PRIMARY - SECONDARY SCHOOL

99. Leabank Primary School
100. Manurewa South School
101. James Cook High School
102. South Auckland Middle School
103. Elim Leadership College of NZ
104. Weymouth Primary School
105. Reremoana Primary School
106. Clayton Park School
107. Conifer Grove School
108. Takanini School
109. Holy Trinity Catholic School
110. Papakura Normal Primary School

TERTIARY INSTITUTE

111. Te Rito Maioha
112. Yoobee Colleges - Manukau Campus
113. NZ Career College
114. New Zealand Institute of Education (NZIE) - Manukau Campus
115. AUT South Campus
116. Te Whare Waananga o Awanuiaarangi Taamaki Campus
117. Active Institute New Zealand
118. Laidlaw College - Manukau Campus
119. NZSE
120. MIT Manukau Campus
121. NZMA Manukau Campus
122. Vertical Horizonz Auckland
123. Axiom Training Auckland
124. Ignite Colleges
125. NZ Welding School - Wiri Campus
126. Leader Training Institute

Empathic inquiry - Key themes and insights

As part of the process to understand the perspectives, wants, needs, aspirations and challenges of the people of Te Puhinui, interviews were conducted with community connectors and key stakeholders within the catchment area. This included representatives from Local Board Services, Manurewa Marae, Manukau Beautification Charitable Trust, Wiri and Manukau BIDs, Sisters of Mercy, Manutahi, and Auckland Council's Sustainable Schools, Parks, and Wai Ora (Healthy Waters). The summary below reflects the key themes and learning from this process about the communities of Te Puhinui.

Attitudes + Expectations

- Perception that council and most regional service providers are neglecting and forgetting about this community / place
  - "If the council/'they' don't care why should we?"
- Positive relationships with/connections to the stream are minimal
  - "We don't know, so we don't care"
- People expect quick results but the regeneration of Te Puhinui and Puhinui Stream is a long term initiative requiring ongoing investment. There is no quick fix!
- The main focus of people in the area is to provide for their family and put food on the table, often living day to day.
- Need to foster sense that local community are valued and appreciated
  - Value local people and knowledge.
- Provide things that support children and the parents will care.
- Limited sense of belonging and ownership.
  - There is a common perception of parks being unsafe.
  - Park gates aren't locked when they're meant to, which increases anti-social behaviours.
  - Desire for council to install lighting and cameras to increase perception of safety.

Community well-being

- People's well-being is dependent on the health of the local environment.
- Improve the area so that people will be lifted, providing healthy, safe, natural and accessible environments for children to play.
- Inequality in Te Puhinui is pronounced and impacts on well-being.
- Increase opportunities to work, learn and play in Te Puhinui.
- Promote economic development.
- Build trust with local communities.
- Focusing on enhancing the mauri and mana of the stream will result in enhancing the mauri and mana of the people.
- There needs to be processes and mechanisms implemented to support the well-being of communities in the area.

Current practices are problematic

- There is a lack of focus, vision, resourcing and coordination.
- There needs to be structured programmes in place to inform/focus businesses and community efforts.
- Projects are never resourced to adequately deliver a high quality outcome.
- Capitalism mindsets is a challenge to catchment and community regeneration.

Connection + access

- There is a lack of awareness of people knowing their neighbours and communities.
- Access along Puhinui Stream is fragmented and problematic.
- The people and ecosystem are disconnected.
- Getting people active in the area should be a priority.
- Need to improve public transport and accessibility.
- Connect people working in Te Puhinui, promoting collaboration and alignment of work.

Improve quality of public spaces

- Need quality public spaces:
  - for kids and families,
  - places for community pride and focus.
- Create walkways and cycleways.
- Encourage/foster interactions with the stream.
- Create engaging spaces along the stream that people can use.
- Explore local recreational opportunities - make the stream user friendly to entice families out into the environment.

Empathic inquiry - Key themes and insights

Improve and beautify natural environmental

- Promote environmental wellness.
- The stream has been neglected, looks dirty and is littered with rubbis.
- Illegal dumping is affecting the waterways.
- Clean the stream of rubbish.
- Create attractive paths and seating.
- Natural environment needs to have amenity value for local communities.
- Protect and enhance wildlife and vegetation.
- Establish catchment wide monitoring and evaluation
  - Establish an effective Te Puhinui monitoring programme.
  - Water testing and education are key.
- Plant out stream bank.

Local ownership and responsibility

- Connect people working in Te Puhinui, promoting collaboration and alignment of work.
- Create a clear vision that people can buy into.
- Foster local and support guardians/ stewards/tiakitanga.
- Incentivise families to engage.
- Need strategies/initiatives which increase local reciprocity and environment stewardship.
- Need to support locally run clean up and planting initiatives.
- Foster the development of (youth and adult) community groups to take part in regenerative activities along the stream.

Corporate and local business buy in

- Activate corporates to take ownership and responsibility - mobilise business owners.
- Navigating the complicated catchment and multiple stakeholder groups (eg. council, CCO landowners and commercial land owners) is difficult for businesses.
- Two local Business Improvement Districts (BIDs) are well established within catchment representing hundreds of businesses.

Focus on Te Puhinui as a living system

- Bring focus to and raise awareness about Puhinui Catchment (as a living system).
- Acknowledge Te Puhinui as a living entity.
- Take a holistic, cultural and environmental approach to stream restoration.
- Reconnect to natural environment - we are all part of the ecosystem.
- Bring the community and lifeforce of Te Puhinui together.
- Foster strong connections between people and the environment.

Communication and education are important

- Need to keep stakeholders in catchment informed.
- Share learning and key messages with all stakeholders.
- Create awareness about Te Puhinui and local relationship to it (at neighbourhood scale).
- Encourage local communities to care about the stream by providing them information and educating people on the effects of their behaviours eg. dumping rubbish in the area
  - People don’t understand the connection between littering, dumping, polluting the stream etc. and their own health and well-being.
- Create educational campaigns along Te Puhinui (using signage).
- Use digital wayfinding and storytelling to connect people with place.

Empower youth

- Current youth engagement lacks access to good information and there are limited realistic opportunities for rangatahi to provide input and contribute.
- Need to provide support, guidance and educational opportunities for youth.
- Build rangatahi entrepreneurs to be innovators.
- Enable schools to support rangatahi with the relevant practical skills to participate in the regeneration of Te Puhinui.

9. Voices of Te Puhinui

Voices of Te Puhinui are stories of human and other sentient beings that live, work, learn and play in Puhinui Catchment. The section utilizes personas to tell a brief, but specific story of different people and living beings in Te Puhinui whose perspectives, values, needs and challenges need to be understood and integrated into the strategic regeneration of Puhinui Catchment.

Personas

Those contributing to the regeneration of Te Puhinui need to better understand and empathise with Te Puhinui's communities to ensure their investment, initiatives and actions are aligned with the wants, needs and aspirations of the large and diverse populations who live, work, learn and play in Puhinui Catchment. Therefore, having tools that help take into account a wider range of perspectives, values and circumstances of this diverse community who influence and are influenced by Puhinui Catchment is critical.

Personas are not intended to replace quality engagement or negate the need for decision makers and actors to work directly with and learn from locals. However, the Voices of Te Puhinui personas attempt to represent some of the perspectives and life circumstances of those who are not necessarily easy to reach or engage with - it is an attempt to give voice to segments of Te Puhinui's community that need to be considered when trying to understand the catchment and identify effective strategies and responses in its regeneration.

Personas are fictionalised representations of real people. Their usefulness as a tool comes from their ability to provide those working in Te Puhinui a window into the lives of those who their work should be in service to. Their limitation as a tool is that personas are only representations of real people - therefore it is important to not assume or use the personas as if they represent all people in the catchment. Wherever possible these ideas need to be tested and sense-checked with the actual communities of Te Puhinui.

The Voices of Te Puhinui personas tell a brief, but specific story of some of the different people and wildlife in Puhinui Catchment whose perspectives, values, needs, challenges and aspirations are important to consider. Giving voices to some of the sentient beings of this place provides an empathic framework and reference point from which we can further develop our understanding and insights about actions and initiatives on the ground to help regenerate Te Puhinui.

Te Puhinui personas are intended to support decision makers and actors in Te Puhinui to help frame and develop ideas about how to regenerate Puhinui Catchment and to help test thinking. These personas can help explore how different members of Te Puhinui communities might interact with and be impacted by proposed strategies and initiatives.

The Voices of Te Puhinui personas were developed through research during the discovery phase. A range of methods were employed to develop and refine Te Puhinui personas. These included the use of census data, local board plans, and other publicly available statistics as well as learning from similar work already undertaken in the area, namely Humans of South Auckland, Transform Manukau and the Wiri Central School playground co-design project. Te Puhinui personas were also developed using feedback and insights from interviews with a range of local key connectors as well as the lived experiences of project team members who have long standing relationships with the area and members of the local community. Draft personas were sense checked with Te Puhinui Cross-Council Collaboration Group and refined based on the feedback received.

Personas

See Appendix B for detailed description for each persona above

Sione

Ofa

Mere

Madika

Nalani

Antonia

Charlotte

Marcus

John

Cathy

Nick

Anahera

Joseph

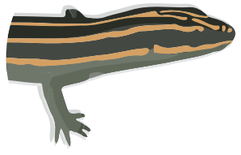
Ezra

Fern bird / Maataataa

Unowned cat

Eel / Tuna

NZ glow worms / Titiwai



Copper skink

Long tail bat / Pekapeka tou roa

Inanga / Matamata

Kaakaa

10. Financial Capital

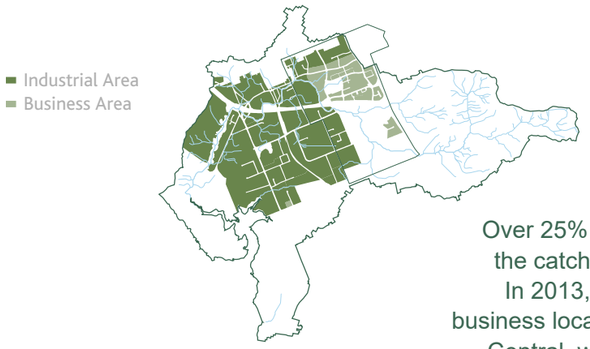
Financial Capital refers to stores of money in either tangible/physical and/or digital/abstract forms that exist or are available to work in Te Puhinui. While money is a form of financial capital, money is not capital in its own right but a mechanism for allocating and controlling other forms of capital.

It is assumed that most if not all top down initiatives rely on significant investment of financial capital while other initiatives or actions can happen with more modest amounts of financial capital if other forms of capital can be mobilised without money.

This section provides a snapshot of Te Puhinui's economy including local industry, businesses, and social enterprises, local employment, local economic development opportunities, and household incomes.

At the time of writing the economic impacts of the COVD-19 pandemic is still unfolding. Auckland Council and its CCOs' budgets and work programmes are in flux and the central government's 'shovel ready' investment in national capital works projects have not been confirmed. The impacts of COVID-19 and the predicted recession to follow will likely have financial implications for the regeneration of Puhinui Catchment and the Transform Manukau work programme.

Snapshot of Te Puhinui

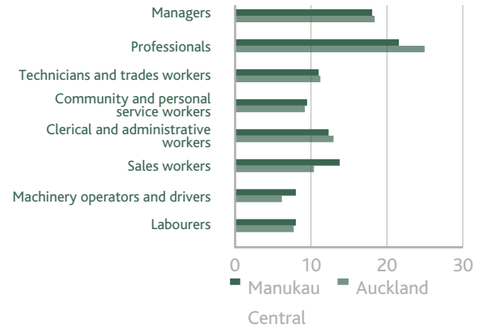


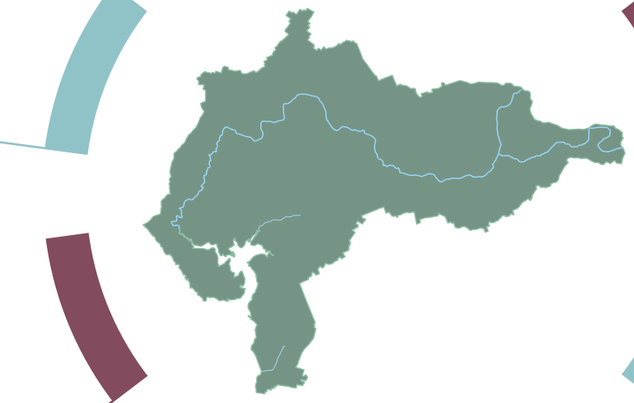
Over 25% of the land use in the catchment is industrial. In 2013, there were 1,209 business locations in Manukau Central, with an increase of 10.9% from February 2006.

Auckland Council owns 95ha of property in the Transform Manukau project area. About 20ha of this land has immediate and near-term development potential, and a combined existing rating assessment land value of about $100 million.

The unemployment rate in Manukau Central is 9.2% for people aged 15 years and over, compared with 8.1% for all of Auckland.

The most common occupational group in Manukau Central is ‘professionals’, and ‘professionals’ is the most common occupational group in Auckland.





A multi-million dollar investment in public facilities, future development and transport for the Manukau Ward has been committed, following a comprehensive period of consultation.

Transform Manukau will require significant funding for both operational and capital works. In order to realise the necessary anchor, exemplar and catalytic initiatives, an estimated $70 million worth of public good investment projects will be needed.

The largest industry in Manukau Central is manufacturing, although it is declining in importance. It currently represents 22.4% of the total employee count.

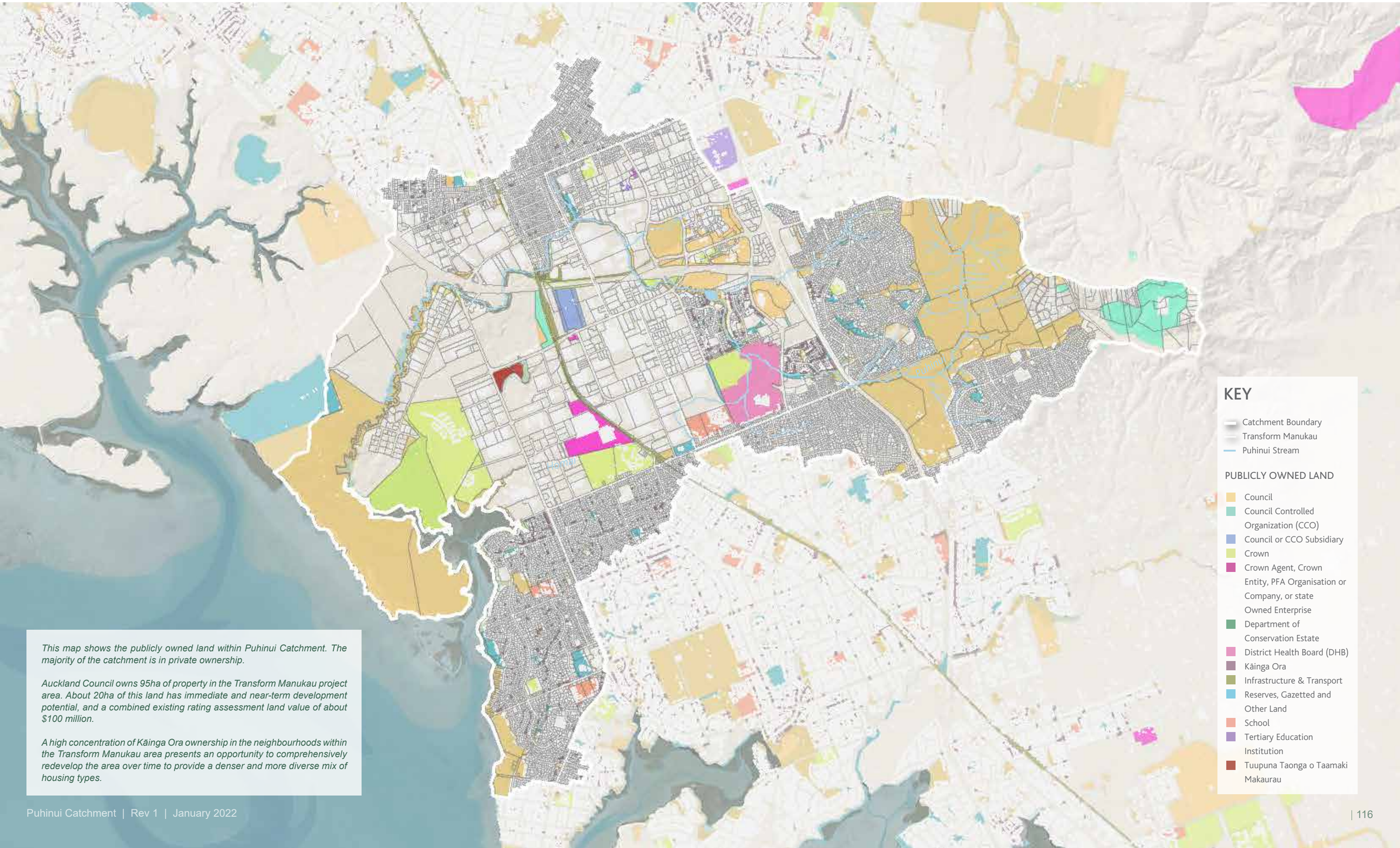
Manurewa and Ootara-Papatoetoe local boards have seen their advocacy reap significant investments in the area following Auckland Council’s recently announced 10-year Budget.

In 2015, Manukau contributed $16 billion to the economy or about 20% of Auckland’s GDP.

Land ownership

Scale: 1_35 000@A3

0 1 3KM



This map shows the publicly owned land within Puhinui Catchment. The majority of the catchment is in private ownership.

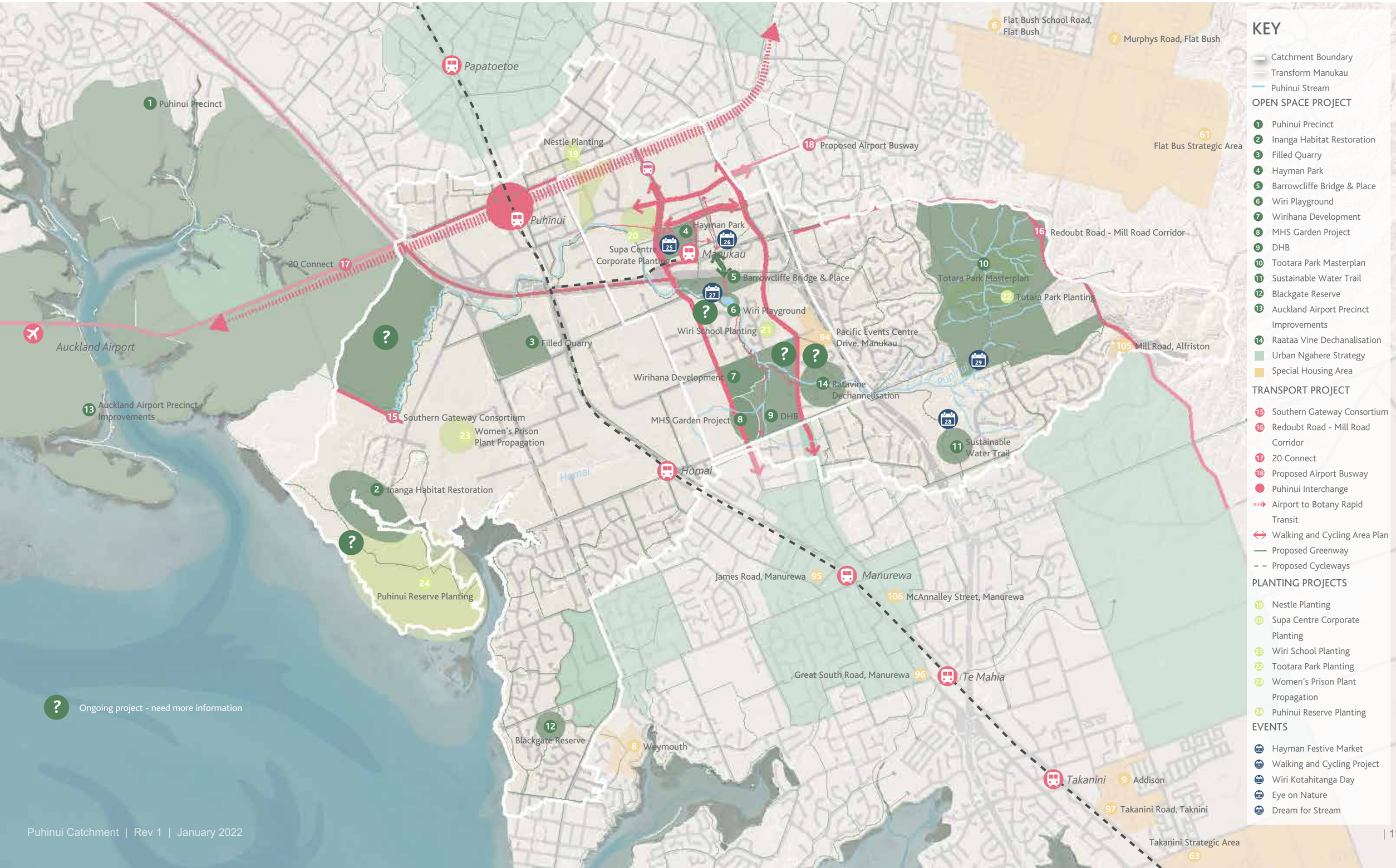
Auckland Council owns 95ha of property in the Transform Manukau project area. About 20ha of this land has immediate and near-term development potential, and a combined existing rating assessment land value of about $100 million.

A high concentration of Kāinga Ora ownership in the neighbourhoods within the Transform Manukau area presents an opportunity to comprehensively redevelop the area over time to provide a denser and more diverse mix of housing types.

Existing and proposed | Projects as of March 2020

Scale: 1_35 000@A3

0 1 3KM



KEY

- Catchment Boundary
- Transform Manukau
- Puhinui Stream

OPEN SPACE PROJECT

1. Puhinui Precinct
2. Inanga Habitat Restoration
3. Filled Quarry
4. Hayman Park
5. Barrowcliffe Bridge & Place
6. Wiri Playground
7. Wirihana Development
8. MHS Garden Project
9. DHB
10. Tootara Park Masterplan
11. Sustainable Water Trail
12. Blackgate Reserve
13. Auckland Airport Precinct Improvements
14. Raataa Vine Dechanalisation
- Urban Ngahere Strategy
- Special Housing Area

TRANSPORT PROJECT

15. Southern Gateway Consortium
16. Redoubt Road - Mill Road Corridor
17. 20 Connect
18. Proposed Airport Busway
- Puhinui Interchange
- Airport to Botany Rapid Transit
- Walking and Cycling Area Plan
- Proposed Greenway
- Proposed Cycleways

PLANTING PROJECTS

19. Nestle Planting
20. Supa Centre Corporate Planting
21. Wiri School Planting
22. Tootara Park Planting
23. Women's Prison Plant Propagation
24. Puhinui Reserve Planting

EVENTS

- Hayman Festive Market
- Walking and Cycling Project
- Wiri Kotahitanga Day
- Eye on Nature
- Dream for Stream

11. Constraints + Challenges, opportunities

Constraints, challenges and opportunities can be physical, social and/or intangible.

Constraints + Challenges

Constraints and challenges are not 'bad' in and of themselves, but represent characteristics intrinsic to Te Puhinui that need to be acknowledged, understood, and reframed as parameters that help to determine the scope and scale of any proposal for Te Puhinui.

A constraint typically represents a non-negotiable condition that can not be 'solved' and must be worked with, whereas a challenge is a parameter that can be managed or overcome and, in some instances, reconciling forces can reframe problems into solutions.

Opportunities

An opportunity can serve as a catalyst for a project or may help to leverage other related projects. An opportunity may be inherent to the existing condition, or manifested by reframing a challenge as an opportunity for action.

Constraints + Challenges
Environmental / Enviro-Spatial / Enviro-Social

Poor water quality

- In 2010, Puhinui Stream was considered the dirtiest of all 31 streams monitored by Auckland Regional Council.
- The water quality is degraded by runoff from streets and car parks, illegal outfalls and dumping directly into the stream and rubbish from surrounding properties that regularly ends up in the stream.
- The catchment suffers from acute industry pollution, contributing to diminishing fish populations.
- Sedimentation, contaminants, pollutants, nitrification are ongoing issues.

Flooding

- Urbanisation in flood plains has encroached on natural hydrological processes.
- Urban development within floodplains results in flooding of urban areas during large rain events. About 20% of the catchment is subjected to flooding, mainly in the industrial and urban areas.
- Urbanisation accentuates flooding during large rain events.
- Flooding represents a significant health and safety risk to people and property, particularly access for vulnerable residents.
- There are over 2000 buildings in Puhinui Catchment located within the floodplain. Approximately 123 of these are predicted to be under water during large storm events (1 in 100 year storm) and it is estimated that this number would increase to 203 with continued urbanisation and the ongoing effects of a changing climate.
- Large flooding events resuspends toxins from historic urban and industrial activities.
- Currently 29% of the catchment is impervious and this is expected to increase to approximately 44% once the development outcomes sought in the Auckland Unitary Plan and Manukau Framework Plan are achieved.

Degraded stream environment

- Long sections of Puhinui Stream and most of Blackgate Reserve Stream are concreted (over 1.5 km of Puhinui and 770 m of Blackgate Reserve Stream), resulting in low friction stream channels.
- There are extensive areas of high erosion.
- Several properties adjacent to the stream are not maintained impacting on the stream environment, particularly in residential and industrial areas.
- Unless mitigated, current and future urban development will continue to have a negative impact on the stream, through increased runoff and contaminant loads.
- The health of the stream impacts the physical and spiritual health of people.

Fragmented ecology + threatened and at risk biodiversity

- Areas of ecological habitat are fragmented throughout the catchment and provide limited ecological connectivity / wildlife corridors and patches between the top and bottom of the catchment and to adjacent areas.
- There is limited habitat for threatened and at risk species.
- Ongoing urbanisation threatens areas of ecological value.
- The catchment consists of low native biodiversity and is dominated by exotic plant and animal species which can outcompete indigenious species.

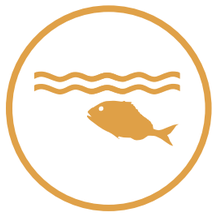
Impacts of climate change

- Puhinui Reserve and estuary environments face coastal inundation due to sea level rise.
- Increased frequency and intensity of storm events is likely to increase flooding in the catchment.
- The urbanisation of the catchment provides very little shade and relief against urban heat island effect.
- Te Puhinui is likely to experience less rainfall overall and more acute droughts.

Fragmented land use

- The catchment is primarily occupied by private land with limited public access.
- Private owners do not necessarily prioritise environmental and stream health or act in the interest of the environment.
- Large areas of the same land use (i.e. industrial, residential), are disconnected from each other and contribute to a vehicle dominated environment with poor walkability.
- There are no continuous physical links between the upper catchment and the lower catchment.
- Infrastructure including motorways and main roads and large block sizes make walking and cycling in and around Te Puhinui difficult and unappealing.

Constraints + Challenges
Environmental / Enviro-spatial / Enviro-social



Degraded aquatic environment

- Limited vegetation along the stream, especially in the urban area, provide limited shade, and increase water temperature and intermittent connectivity.
- Sedimentation, contaminants, pollutants, and nitrification are ongoing issues.
- Reduction of base flows in headwaters through imperviousness.
- Concrete channels limit range and types for habitats within the streams.

Extensive area of industrial land

- The industrial area represents over 25% of the land use of the catchment.
- Industrial land has a high percentage of impervious surface and its runoff often contains a high proportion of contaminants.
- Large areas of single land use contribute to a vehicle dominant environment and poor walkability.
- Industrial environments often have a poor interface with adjacent public spaces and do not contribute or help activate these spaces in any way, in particular the stream and streetscape.

Limited access to and along Puhinui Stream and a lack of stream related activities

- There is limited and isolated public interaction or interest in Puhinui Stream.
- People are visually and physically disconnected from the stream.
- Walkways along the stream are discontinued and provide limited public access points.
- One of the three regionally significant open spaces in the catchment, Puhinui Reserve, is difficult to access and not well known.
- A large section of the stream runs through industrial areas and is severed by the state highway, with very little activity and surveillance outside of work hours.

Sterile, monotonous, disorientating built environment designed for cars

- The urban form of the catchment is car-oriented and discourages the use of active modes of transport.
- The catchment has large industrial zones with limited access and connectivity for pedestrians and cyclists.
- The catchment has developed quickly without an overall strategy, resulting in a poor quality built environment.
- Many of the open spaces are neglected and under-utilised as recreational spaces.
- The state highways and railway line segregate the catchment and limit the movement of water, wildlife and people through the catchment.

Poor waste management and degraded environments

- The stream and surrounding areas are often neglected and used for illegal dumping. In 2017, 1,300 tonnes of rubbish were illegally dumped in the Auckland region, 800 tonnes in South Auckland[1].
- Approximately 10% of materials processed in Auckland are recycled into another product. The remaining material is managed as ‘waste’ in a linear process model from extraction through to production, use and disposal.
- On average, every Aucklander creates around 1 tonne of solid waste, processes 60 - 110 kgs of recyclable materials and produces 100,000 liters of wastewater per year.

Inefficient Energy Use

- The urban form of the catchment and the lack of efficient public transport encourages the use of private cars and creates a fossil fuel dependency.
- Appoximately 60% of energy supply in New Zealand is fossil fuel[2].
- There is no coordinated energy production or storage within the catchment area for local supply[3].
- The buildings of Puhinui Catchment are not designed to be energy efficient.
- Transport contributes to 39% of the GHG emissions[4].

1. *Sperber, R. Resources & Redefining Waste, Auckland Permaculture Workshop. 2020.*
2. *https://en.m.wikipedia.org/wiki/Energy_in_New_Zealand#/media/File%3ANZPrimaryEnergy2014*
3. *Wiri Oil Depot functions as a regional and national storage facility, not a local one.*
4. *Auckland Council Low Carbon Action Plan - http://www.aucklandcouncil.govt.nz/*

Constraints + Challenges
Socio-Cultural

Unsafe environments, both real and perceived

- There is limited surveillance over large sections of the stream and many open spaces are isolated.
- The open spaces along the stream are not used as places of gathering and are perceived as unsafe.
- The walkways along the stream provide limited choice of route and restricted access.
- Most fences along the stream are impervious and limit eyes overlooking the stream and casual surveillance.
- The poor quality of the stream and associated open space shows a limited sense of ownership and care which discourages further use and recreation in these areas.
- Off-leash dogs are often encountered in the few areas that provide public access along the stream which discourage locals, in particular children from visiting.
- Lighting along the stream is limited and of poor quality.

Limited communication about and within Te Puhinui

- There is limited communications from public agencies and service providers to the communities in Puhinui Catchment.
- There are limited effective local communication channels and platforms for people and organisations in Puhinui Catchment.
- There are diverse community groups with limited interactions and collaboration throughout the catchment.
- There is limited communication between landowners and Mana Whenua.

Disconnected and disengaged community

- People are disconnected from local streams and the natural environment.
- The lack of access to activities and quality open space along the stream contribute to Nature-Deficit Disorder.
- Urban form limits walking and cycling and doesn't encourage engagement with the stream.
- The poor condition of the stream doesn't promote health and well-being.
- Communities are locked out of meaningful participation in dialogue and/or decision making about environments and infrastructure that shape and impact on their daily lives.
- The lack of coordinated action on the ground limits community interest in the catchment and its regeneration.
- Historic and current engagement practices reduce and limit community interest and commitment to public participation and collaboration.
- Community engagement is challenged by the diverse population living and working in the catchment.

Low pride of place in Puhinui Catchment

- There is a general lack of local identity and sense of place in Puhinui Catchment. Most people of Te Puhinui don't know they are part of Puhinui Catchment.
- The stream, open spaces and the urban area more generally are often neglected, trashed and vandalised.
- The low percentage of home ownership diminishes experience of locals having a sense of 'roots' in place and secure land tenure.
- Te Puhinui suffers from a negative stigma, mainly created from outside of South Auckland.
- There is a perception of neglect and second rate services in many communities in Te Puhinui.

Not working effectively with Mana Whenua to align and authentically integrate values, aspirations and priorities

- Mana Whenua are stretched across multiple projects.
- Mana Whenua are asked the same or similar questions repeatedly by council family/Crown representatives.
- Eke Panuku Development and Mana Whenua are still building effective and productive working relationships.
- Project timeframes are tight, requiring project partners to move quickly which increases chances of a project moving forward without strong alignment with Mana Whenua values, aspirations and interests.

Coordinating multiple agency collaboration

- Multiple live and planned projects run by different agencies can make coordination, alignment, collaboration and effective engagement difficult.
- Discrete budgets, objectives, work programmes, and drivers.
- Projects within catchment are often uncoordinated.
- Agencies involved in Te Puhinui have different agendas and have limited obligation to work collaboratively or cohesively.
- No shared vision, collective will, purpose and direction for Puhinui Catchment.
- It is difficult to align different land users (public and private) to work together to rebuild the health of the stream and catchment.
- Coordination of investment and service delivery with different agencies is difficult.
- Private owners and governmental agencies have competing interests and priorities and do not necessarily focus on communities' priorities.

Constraints + Challenges
Socio-Cultural

Lack of Te Puhinui place-based knowledge

- There is limited knowledge of and access to place-based wisdom - E.g. maatauranga Maaori, maramataka etc.
- There is limited knowledge of place and narratives that give voice to Te Puhinui.
- There is a lack of environmental, socio-cultural and socio-economic data to use as a baseline for monitoring and evaluation.
- There is a lack of understanding of the cultural significance of Te Puhinui.
- Most people of Te Puhinui don’t know they are part of Puhinui Catchment.

Long term, catchment wide governance

- There is no existing agency, steering committee or other governance body to oversee the long term regeneration of the catchment.
- Puhinui Catchment is divided by two local boards.

Constraints + Challenges
Socio-Economic

High levels of social deprivation

- Te Puhinui is one of the highest areas of social deprivation in the Auckland region.
- Poor quality environment and open space contributes to a lack of use and compounds social deprivation.
- Social deprivation results in the lack of care and interest from people of Te Puhinui in their environment.

Extensive areas of private ownership

- Private property ownership limits public agencies' ability to change land use.
- Commercial and industrial operators may not have the discretion, financial resource or motivation to invest in environmental and social outcomes.
- Private owners and governmental agencies have competing interests and priorities and do not necessarily focus on communities' priorities.

Transient resident community

- There is a high percentage of state housing in Te Puhinui and a high percentage of short term renters.
- Renters often have limited sense of place and ownership resulting in limited investment in place, environment and community.
- Transient worker populations, who leave the catchment to work elsewhere or visit the catchment to work typically have limited investment and a low sense of ownership of Puhinui Catchment.

Historic lack of investment and service in Te Puhinui

- Significant areas of infrastructure are degraded or outdated (E.g. wastewater).
- There is a perception of neglect and second rate services in many communities in Te Puhinui.
- Lack of quality public realm and maintenance result in less people using public spaces, which often exacerbates further neglect and safety issues.
- The idea of regenerating Te Puhinui does not resonate with the community and does not align with their day to day experience of the area.
- There is a lack of buy-in from businesses adjacent to many sections of Puhinui Stream.

Inequality of communities in Te Puhinui

- Neighbourhoods within the catchment vary significantly in:
  - affluence and household income
  - level of influence in decision making
  - rates of employment and access to work
  - educational opportunities
  - educational attainment and academic achievement
  - school decile and social deprivation.
- There is a disparity in needs and wants of different communities within Puhinui Catchment.

Prospect of displacement through gentrification

- There is a significant risk that existing community members will be displaced through gentrification as the catchment is developed.

Constraints + Challenges
Socio-Cultural

Cultural Landscape has been erased

- Many sites of significance have been destroyed or have suffered extensive damage caused through deforestation, cultivation, urbanisation and sprawl, quarrying and coastal erosion.
- Large sections of natural and cultural landscapes are not easily accessible, making them largely invisible to the public including Ngaa Matukuturua, Matukurua stone fields, Wiri lava cave and Puhinui Stream.

Food insecurity

- 20.1% of New Zealand households' experience food insecurity.
- A significant number of Counties Manukau residents live in houses with 7 or more people. This demographic is more likely to experience food insecurity than households with less people. The 2013 census data shows that 15% of Counties Manukau residents live in houses with 7 or more people.
- Te Puhinui area has limited access to affordable and nutritious food.
- Despite having fertile soils, there is very limited food production within the catchment.

Opportunities
Environmental

Integrate water systems through the urban environment

- Reduce sedimentation, contaminants, pollutants and nitrification loads on stream through implementation of water sensitive design in streets, parks and buildings.
- Go beyond best practice standards for water sensitive design.

Reinstate the catchment's natural hydrological processes and function

- Where possible, reinstate flood plains.
- Remove / consolidate excessive impervious surfaces throughout the catchment.
- Remove concrete channel lining from streams and daylight and naturalise overland flow paths.
- Go beyond best practice in development to retain streams and maintain base flow.

Stream restoration

- Re-naturalise streams and integrate erosion mitigation.
- Plant riparian networks and create a continuous green corridor along the lengths of all streams.
- Increase canopy cover and shade over the streams.

Maintain and enhance habitat + threatened and at risk biodiversity

- Create ecological corridors along waterways and streets.
- Reinstate endemic ecosystems.
- Currently 1696ha of land is permeable and therefore suitable for planting in and amongst existing streets, parks, open spaces and yards.
- Maintain and enhance existing habitat for threatened and at risk species.
- Celebrate endemic wildlife.
- Implement a network of patches and corridors of native vegetation and tall woody species to create a self sustaining network of indigenous vegetation and habitat.
- Extend and establish areas of native vegetation to provide an ecological corridor and stepping stones to reconnect the upper and lower catchment and improve species' movement through the catchment.

Tap into the latent potential of Puhinui Stream to connect communities to each other and place

- Orient urban development towards the stream to turn attention and focus to the awa.
- Enhance open spaces bordering the stream for community uses.
- Leverage stream restoration projects to catalyse common interest and (re)connect communities.

Prospect of dislocation through gentrification

- Work with and enable existing active entities in the catchment including, but not limited to:
  - Manurewa Marae
  - Manukau Beautification Charitable Trust
  - The Pride Project Aotearoa
  - Community Guardians
  - Protectors of Te Puhinui
  - Friends of Tootara Park
  - Te Pu-A-Nga Maara
  - Manutahi (Transform Manukau collective)
  - Manukau and Wiri Business Associations.

Opportunities Environmental

Leverage Te Puhinui's three regionally significant open spaces

- Leverage Te Puhinui's three regionally significant open spaces, Tootara Park, Auckland Botanic Gardens, and Puhinui Reserve for ecological enhancement, amenity and community engagement.

Energy Use

- New buildings could achieve a 30-40% reduction in energy use by applying currently available technologies[1].

Reveal the cultural landscapes

- Make visible and reconnect Ngaa Matukutuurua and other sites of significance to the wider landscape that gives them context and cultural significance.
- Reclaim the footprint of where Matukutuururu stood for the benefit of the wider community.

Increase diversity of uses in existing underused land

- Develop higher density residential housing and mixed use developments on undeveloped sites within easy walking distance to Manukau Central.
- Progressively intensify and diversify existing residential areas.
- A high concentration of Kaainga Ora property ownership in some neighbourhoods presents an opportunity to comprehensively redevelop the area over time to provide a denser and more diverse mix of housing types.
- Progressively redesign parks and streets as places for people that support a wide range of public life and activity.

Extend the food production capacity of Te Puhinui

- Integrate intensive small-scale productive gardens and orchards for fresh fruit and vegetables and some livestock including:
- Intensively managed gardens for annual vegetables, salad mixes, fruits, herbs and small animal systems such as worms, bees, poultry and rabbits.
- Orchards and perennial cropping including annual and perennial vegetables and staple crops with long growing seasons.
- Food forests incorporating fruit and nut trees, shrubs, herbs, vines and perennial vegetables which have yields directly useful to humans including food, fibre and medicine.

1. *Auckland Council Low Carbon Action Plan - http://www.aucklandcouncil.govt.nz/*

Opportunities
Socio-Cultural-Economic

Maximise regenerative land use practices in publicly held land

- Influence land uses and practices on publicly held land to eliminate toxins, increase ecosystem function and bioproductivity, and work with natural processes in line with Te Ao Maaori.
- There is approximately 30% of land in public ownership in either streets, parks or crown owned land for housing, health care corrections that could be used for regenerative practices etc.
- Leverage existing crown strategic objectives, policies and frameworks to enable regenerative land use practices.

Where appropriate, reveal, explain, and celebrate Te Puhinui's rich natural history and cultural heritage

- Te Puhinui contains one of New Zealand's oldest archaeological sites.
- Te Puhinui, and more generally South Auckland, has one of the highest percentage of Maaori populations in Auckland, and the highest percentage of Pacifika population in the world.
- Develop and leverage a cultural pride narrative to support Te Puhinui regeneration - use it as a tool to reframe and craft a new story of place.
- Despite significant quarrying, the two maunga, Matukutureia and Matukutuururu (collectively known as Ngaa Matukurua), are still visible from some areas in the lower catchment and are of deep cultural significance to Mana Whenua as cultural landmarks and historic settlements.

Develop place-based knowledge

- Reinvigorate local matauranga.
- Develop baseline data/knowledge and Te Puhinui specific monitoring and evaluation programme to evaluate change over time and learn through action research. For example Genuine Progress Indicators (GPIs).
- Develop Te Puhinui citizen science programme.
- Work with existing education providers, cultural elders and knowledge keepers.
- Develop place-based narratives and promote Te Puhinui focused storytelling and knowledge sharing.
- Encourage business and industry to turn their attention to the awa.

Develop a new form of indigenous urbanism

- Create a new form of urbanism that integrates ecological regeneration, cultural foundations, decolonised landscapes and human scale development.
- Create place-based and ecological identity. E.g. I am Puhinui / Ko Te Puhinui ko au.

Leverage Te Puhinui's excellent regional access

- Puhinui Catchment is very accessible from the Auckland region:
  - Two state highways are crossing the catchment, including state Highway 1, which links Cape Reinga to Wellington.
  - Three train stations connect the catchment to central Auckland and the rest of the region.
- There are lots of discontinuous tracks for walking and cycling through Te Puhinui that can be built upon and linked together: Puhinui Stream Track, Tramping track, Puhinui Reserve, Price Road to Tootara Park and Wairere Road.

Leverage the existing policy, planning, interest, investment and collaborative approach in Te Puhinui

- National public agency investment - E.g. Kāinga Ora, Waka Kotahi, MSD, MoH, MBIE.
- Regional public agency investment - E.g. Auckland Council, Eke Panuku Development, Auckland Transport, Counties Manukau DHB, TSI.
- Manurewa and Ootara Papatoetoe Local Board prioritisation and investment - Local Board Plans & Priorities, Parks renewal and redevelopment programmes, Community development programmes.
- Eke Panuku Development endorses the Green Star Communities framework as a benchmark.
- Align and coordinate existing work programmes.

Opportunities
Socio-Cultural-Economic

Connection to and along Puhinui Stream

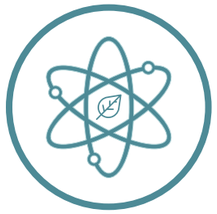
- Mai te Maunga ki te Moana - Create a walkway and cyclepath connecting the upper catchment to the harbour and back along Puhinui Stream.
- Create walking and cycling connections for daily needs for live, work, play, learn communities.
- Improve access to and opportunities for quality immersive interactions with the awa throughout the catchment.
- Promote people physically engaging with the stream for a range of activities.

Te Puhinui community development

- Use social procurement to employ locals as a core aspect of the regeneration of Te Puhinui.
- Provide local employment through regeneration programmes.
- Establish Puhinui-based education and training.
- Te Puhinui placemaking - focus on tactical urbanism, small wins, demonstrating and celebrating pride of place to engender community participation, pride and support.
- Engage youth through schools to bring new ideas, thinking and ownership.
- Involve local companies and employees in regeneration projects as a core aspect of the regeneration of Te Puhinui.

Promote active transport modes

- A number of residential areas are within walking and cycling distance from key destinations.
- Develop dedicated cycle paths along wide road corridors throughout Puhinui Catchment area.
- Create connections along Puhinui Stream to connect neighbourhoods and town centres within the catchment.



Personify Te Puhinui as a living system

- Recognise, celebrate and honour the role and place of te taiao / natural world as our kaitiaki and teacher.
- Designate Te Puhinui with the status of a legal person to give it the same rights, protections, privileges, responsibilities and legal liability of a legal personality.

Engage and collaborate with businesses, industry and private landowners to build biodiversity

- Work with private landowners on initiatives to increase biodiversity outcomes in private spaces and improve ecological connectivity.
- Work with the two Business Improvement Districts (BIDs) in Te Puhinui to improve environmental best practice and compliance and actively participate in local stewardship.

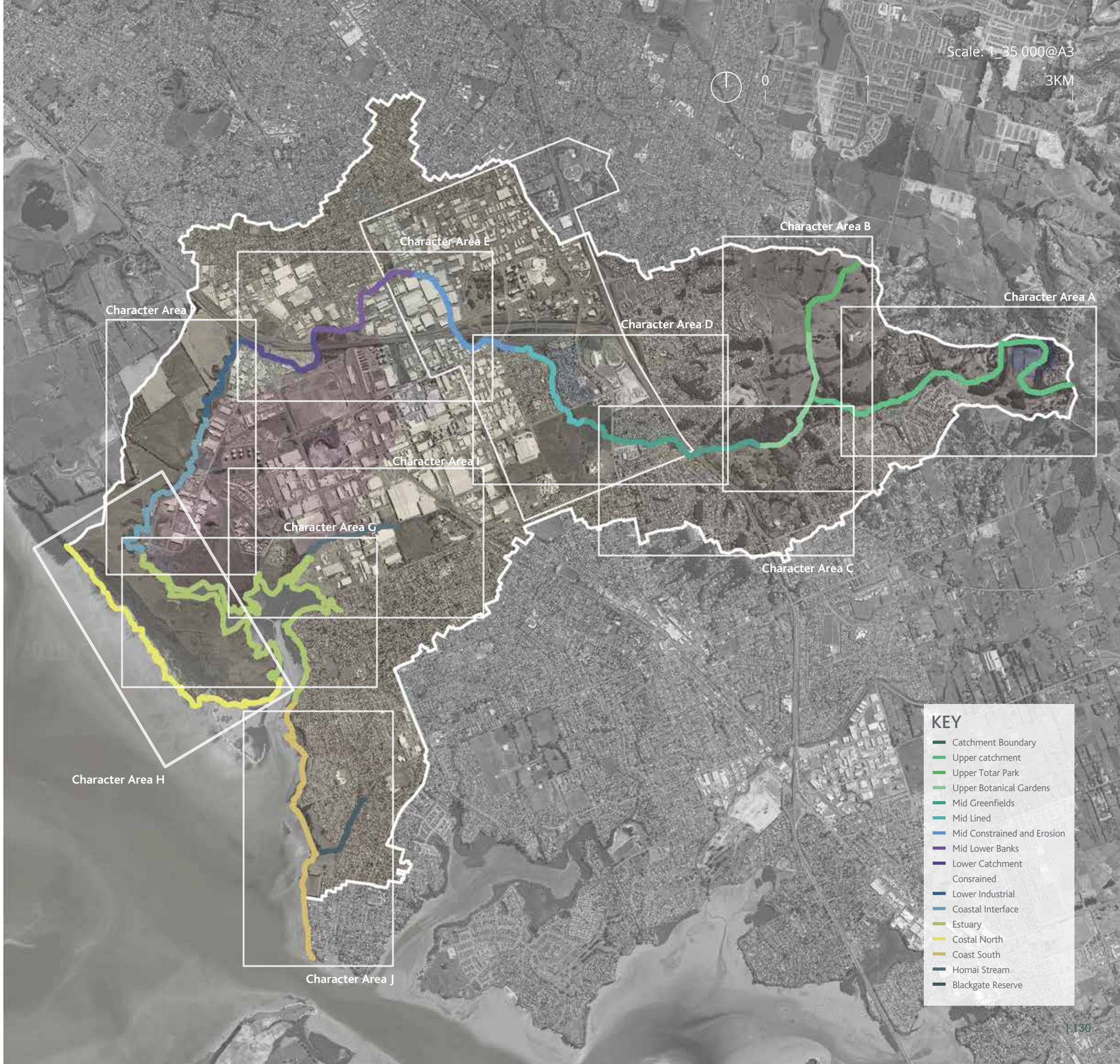
12. Appendix

Appendix A: Puhinui Character Areas
Appendix B: Personas
Appendix C: Case Studies
Appendix D: Initial Planning Considerations

Puhinui Stream character areas overview

This section documents Puhinui Stream along its length as a series of character areas. A character area is a section of the stream with similar stream profile, natural processes and common features and characteristics such as adjacent land uses. climate, landform, soils, water and vegetation. Because each character area has its own characteristics it has its own constraints and opportunities which lend themselves to different approaches to design, management and maintenance. Puhinui Stream has been divided into 10 character areas.

- Character area A: Headwater
- Character area B: Tootara Park
- Character area C: Botanic Gardens
- Character area D: Wiri Neighborhood
- Character area E: Manukau + Wiri Industry
- Character area F: Te Puhinui Industry
- Character area G: Puhinui Estuary
- Character area H: Puhinui Coastal
- Character area I: Homai Stream
- Character area J: Weymouth Coastal



Character Area A | Head Water

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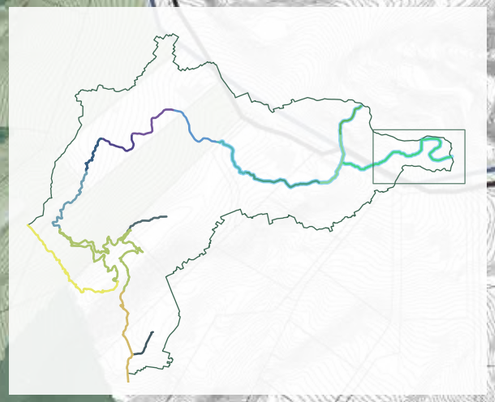
0 100 500M



Redoubt Road

TOOTARA PARK

A1

Dawood Place

Charles Prevost Drive

Hill Road

Mill Road

16

Redoubt Road -
Mill Road Corridor

KEY

- Catchment Boundary
- Manukau Area of Interest
- Puhinui Stream
- Contours
- Vegetation
- Open Space

ACCESS AND CIRCULATION

- Existing Walkways
- Fence
- Pedestrian Access
- Pedestrian Bridge
- Gate
- Car Parking
- Vehicle Access

NATURAL CONSTRAINTS

- Flood Plains
- Existing Bank Erosion

OUTLET EROSION

- Moderate
- Severe

OVERALL UPPER BANK STABILITY SCORE

- Excellent
- Good
- Fair
- Poor

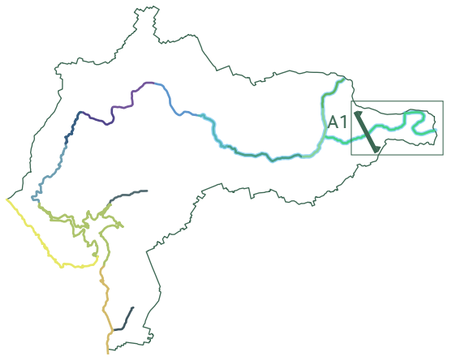
RIPARIAN OVERHEAD COVER

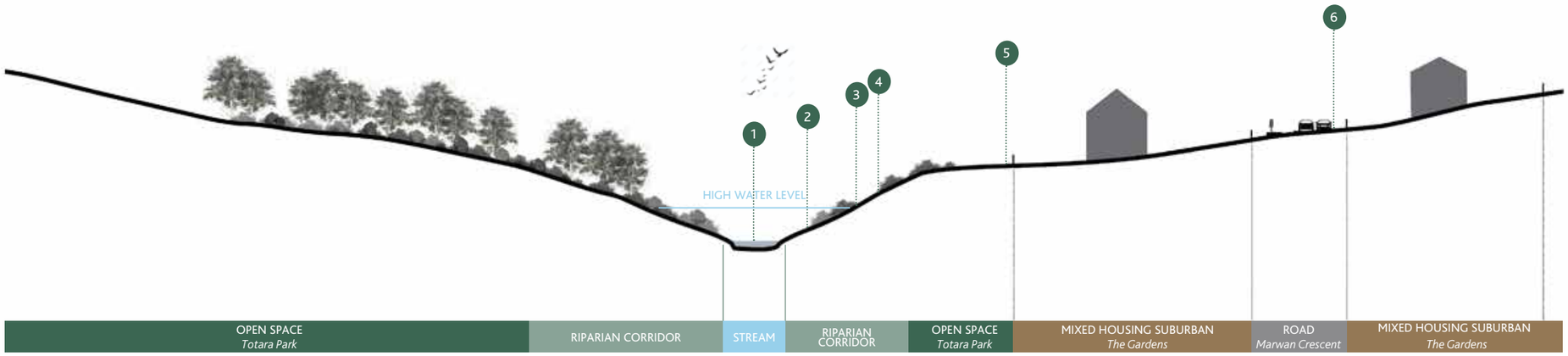
- <10%
- 10-30%
- 30-50%
- 50-70%
- 70-90%
- >90%

Character Area A | Head Water

Scale: 1_500@A3

0 10 50M





Cross Section A1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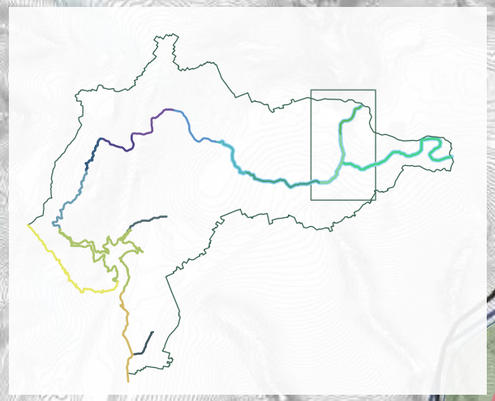
Character Area B | Tootara Park

Scale: 1_6 000@A3

0 100 500M



Redoubt Road - Mill Road Corridor

Redoubt Road

Tootara Park Planting

Tootara Park Masterplan

B1

Goodwood Drive

AUCKLAND BOTANICAL GARDENS

KEY

- Catchment Boundary
- Manukau Area of Interest
- Puhinui Stream
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- Vegetation
- Open Space

ACCESS AND CIRCULATION

- Existing Walkways
- Fence
- Pedestrian Access
- Pedestrian Bridge
- Gate
- Car Parking
- Vehicle Access

NATURAL CONSTRAINTS

- Flood Plains
- Existing Bank Erosion

OUTLET EROSION

- Moderate
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OVERALL UPPER BANK STABILITY SCORE

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- Fair
- Poor

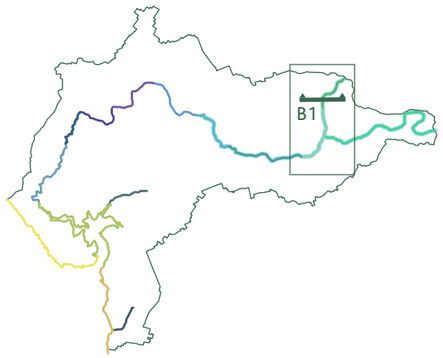
RIPARIAN OVERHEAD COVER

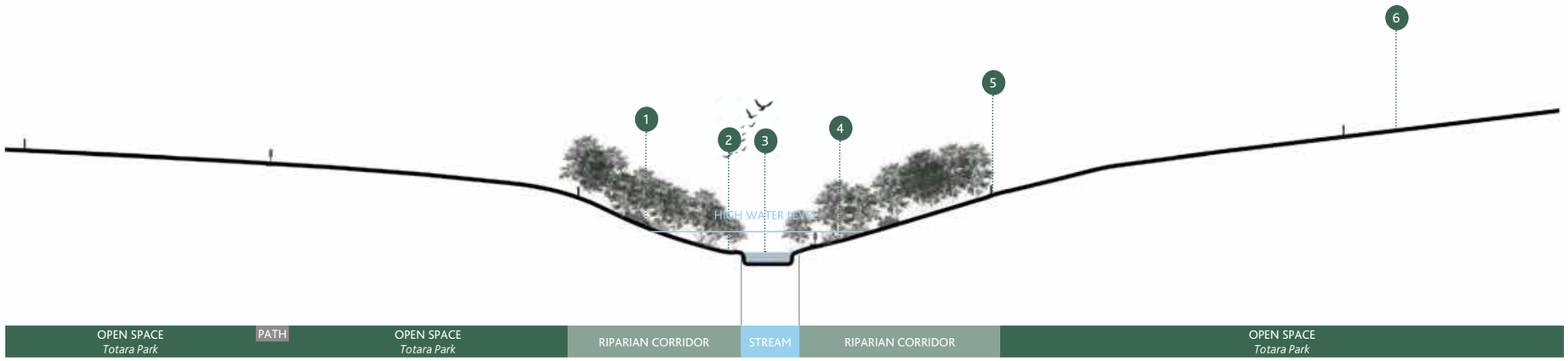
- <10%
- 10-30%
- 30-50%
- 50-70%
- 70-90%
- >90%

Character Area B | Tootara Park

Scale: 1_500@A3

0 10 50M





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Character Area C | Botanic Gardens

Scale: 1_6 000@A3

0 100 500M

TOOTARA PARK

C1

Eugenie Rise

14 Raataa Vine Dechannelisation

Orams Road

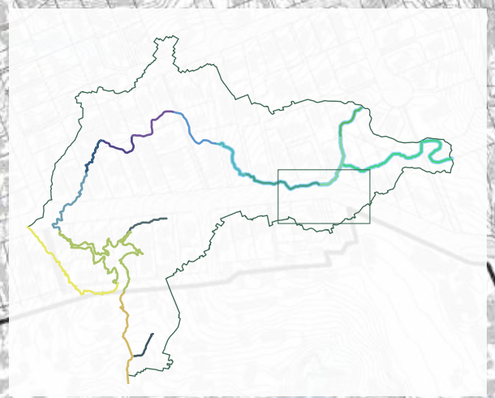
State Highway 1

Grand Vue Road

Charles Prevost Drive

Hill Road

11 Sustainable Water Trail



KEY

- Catchment Boundary
- Manukau Area of Interest
- Puhinui Stream
- Contours
- Vegetation
- Open Space

ACCESS AND CIRCULATION

- Existing Walkways
- Fence
- Pedestrian Access
- Pedestrian Bridge
- Gate
- Car Parking
- Vehicle Access

NATURAL CONSTRAINTS

- Flood Plains
- Existing Bank Erosion

OUTLET EROSION

- Moderate
- Severe

OVERALL UPPER BANK STABILITY SCORE

- Excellent
- Good
- Fair
- Poor

RIPARIAN OVERHEAD COVER

- <10%
- 10-30%
- 30-50%
- 50-70%
- 70-90%
- >90%

Character Area C | Botanic Gardens

Scale: 1_500@A3

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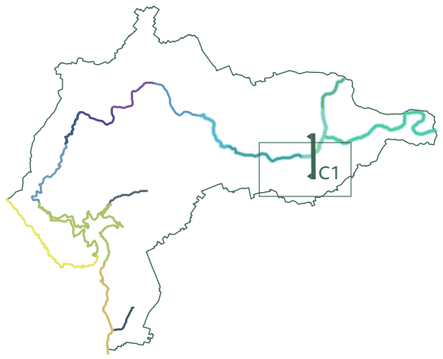

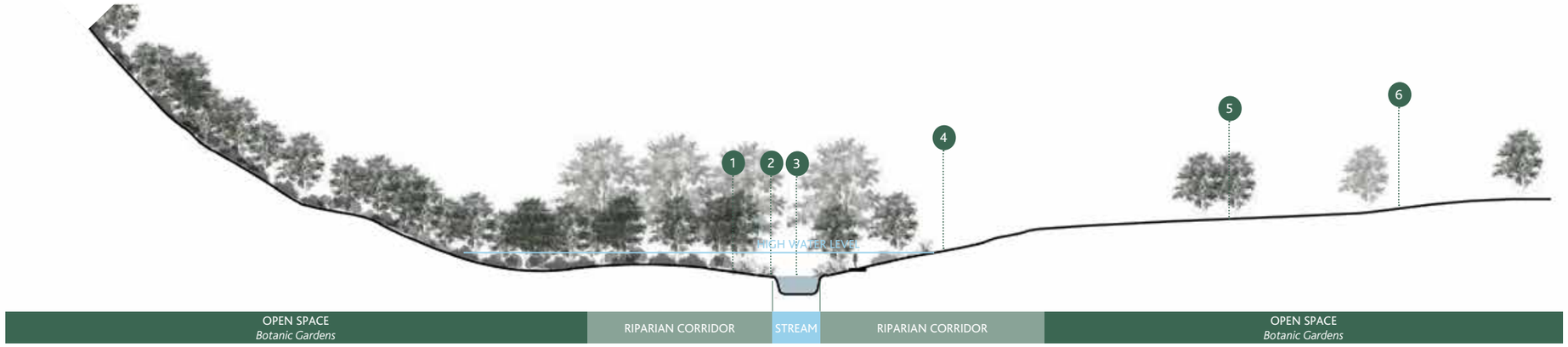

Cross Section B2


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Character Area D | Wiri Neighbourhood

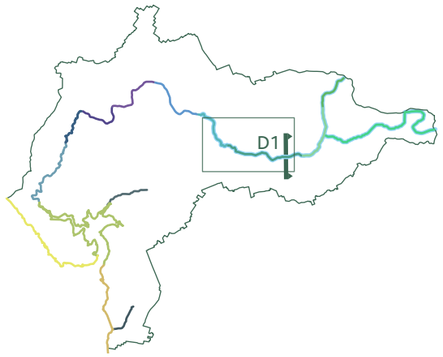
Scale: 1_6 000@A3

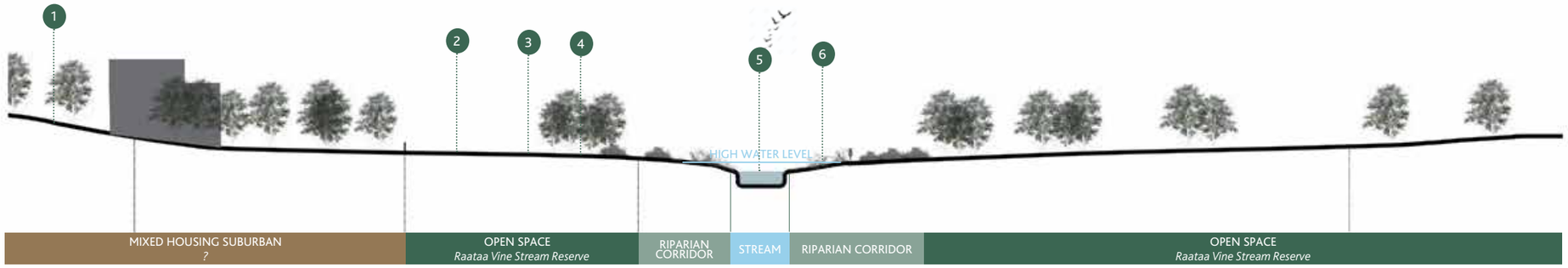
0 100 500M

Character Area D | Wiri Neighbourhood

Scale: 1_500@A3

0 10 50M





Cross Section D1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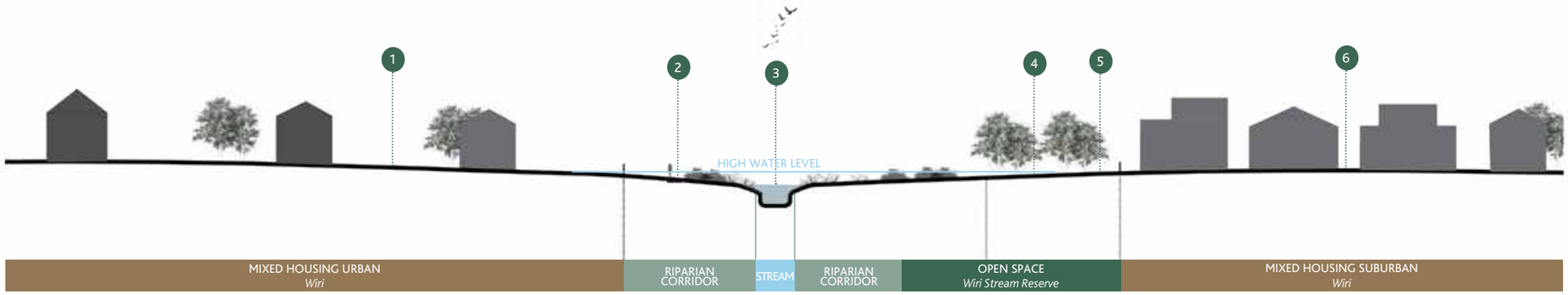
Character Area D | Wiri Neighbourhood

Scale: 1_500@A3

0 10 50M



Cross Section D2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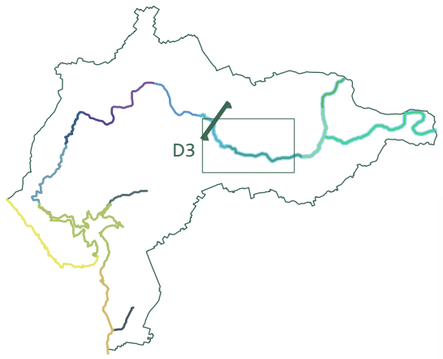
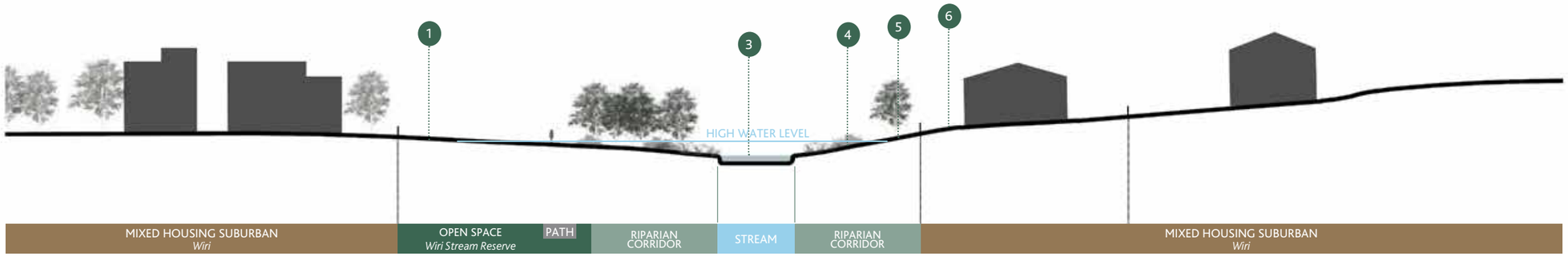
Character Area D | Wiri Neighbourhood

Scale: 1_500@A3

0 10 50M





Cross Section D3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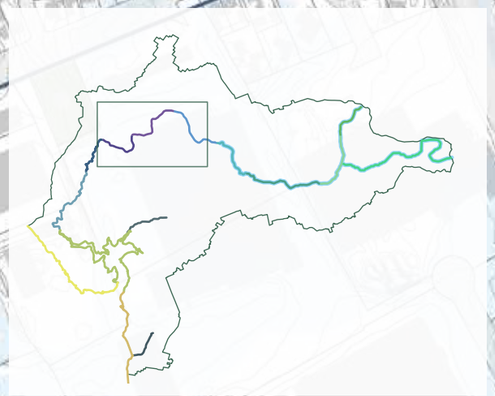
Character Area E | Manukau + Wiri Industry

Scale: 1_6 000@A3

0 100 500M



Nestle Planting 19
Supa Centre Corporate Planting 20
Proposed airport busway 18
Walking and Cycling Area Paln
Ronwood Avenue
Davies Avenue
Cavendish Drive
Plunket Avenue
HAYMAN PARK
Hayman Park
Manukau Station Road
Lambie Drive
E1
E2
E3
State Highway 20
20 Connect 17
Wiri Station Road
Roscommon Road
3 Filled Quarry

KEY

- Catchment Boundary
- Manukau Area of Interest
- Puhinui Stream
- Contours
- Vegetation
- Open Space

NATURAL CONSTRAINTS

- Flood Plains
- Existing Bank Erosion

ACCESS AND CIRCULATION

- Existing Walkways
- Fence
- Pedestrian Access
- Pedestrian Bridge
- Gate
- Car Parking
- Vehicle Access

OUTLET EROSION

- Moderate
- Severe

OVERALL UPPER BANK STABILITY SCORE

- Excellent
- Good
- Fair
- Poor

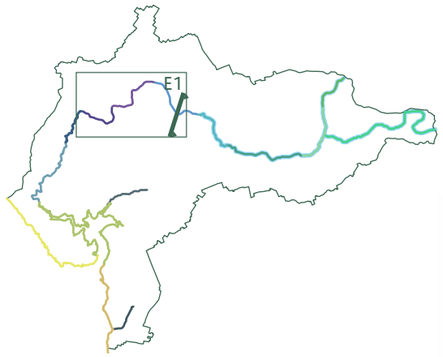
RIPARIAN OVERHEAD COVER

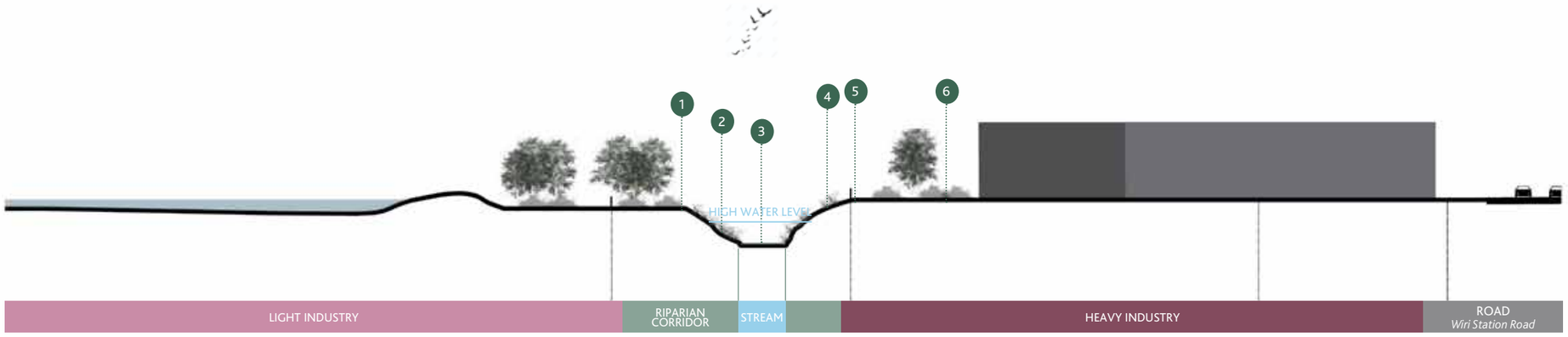
- <10%
- 10-30%
- 30-50%
- 50-70%
- 70-90%
- >90%

Character Area E | Manukau + Wiri Industry

Scale: 1_500@A3

0 10 50M





Cross Section E1


1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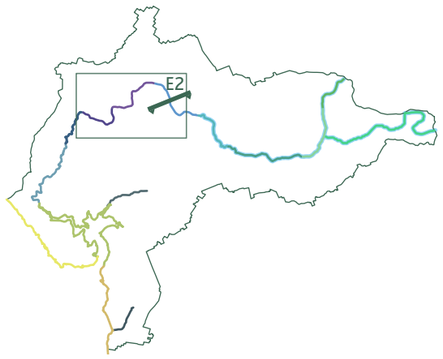
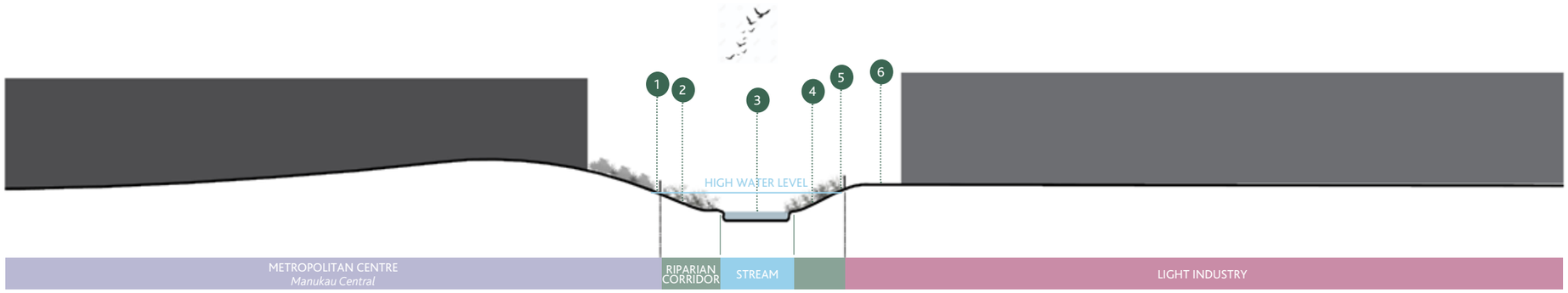
6

Character Area E | Manukau + Wiri Industry

Scale: 1_500@A3

0 10 50M

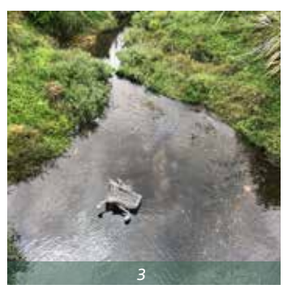




Cross Section E2


1


2


3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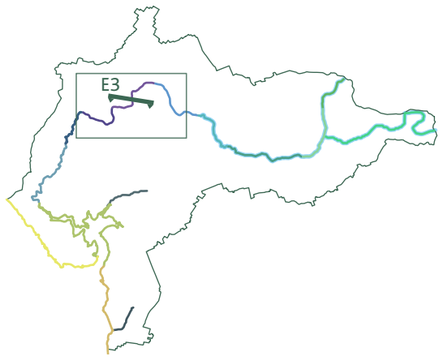
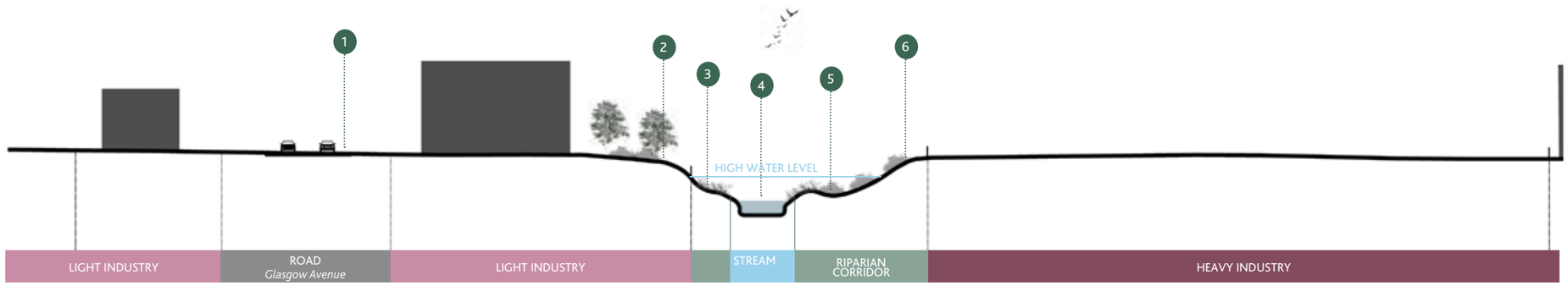
Character Area E | Manukau + Wiri Industry

Scale: 1_500@A3

0 10 50M





Cross Section E3


1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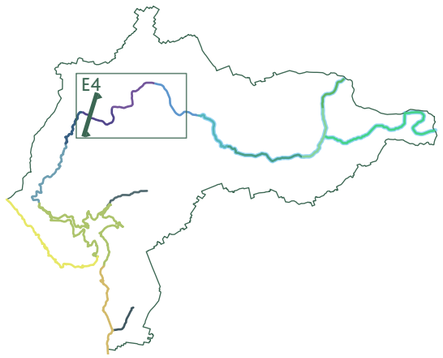
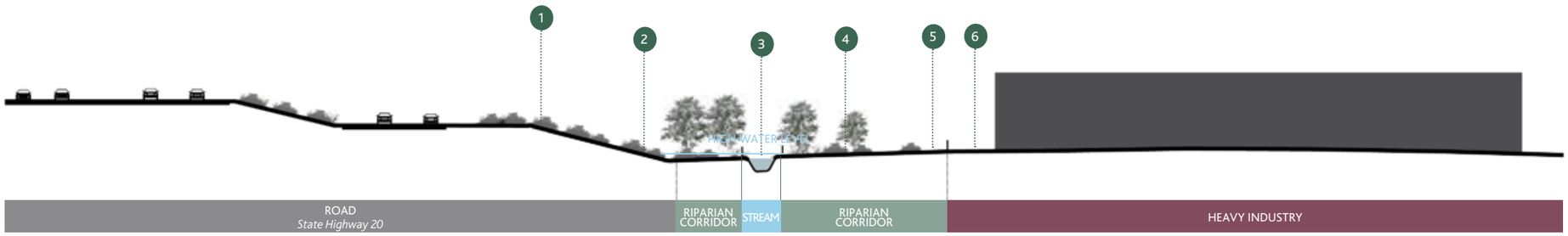
Character Area E | Manukau + Wiri Industry

Scale: 1_500@A3

0 10 50M





Cross Section E4


1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4


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6

Character Area F | Te Puhinui Industry

Scale: 1_6 000@A3

0 100 500M

State Highway 20
Roscommon Road
McLaughlins Road
F1
F2
E
MATUKUTUREIA MOUNTAIN
Puhinui Precinct 1
Southern Gateway Consortium 15
Inanga Habitat Restoration 2
Puinui Reserve Planting 24

KEY

- Catchment Boundary
- Manukau Area of Interest
- Puhinui Stream
- Contours
- Vegetation
- Open Space

NATURAL CONSTRAINTS

- Flood Plains
- Existing Bank Erosion

ACCESS AND CIRCULATION

- Existing Walkways
- Fence
- Pedestrian Access
- Pedestrian Bridge
- Gate
- Car Parking
- Vehicle Access

OUTLET EROSION

- Moderate
- Severe

OVERALL UPPER BANK STABILITY SCORE

- Excellent
- Good
- Fair
- Poor

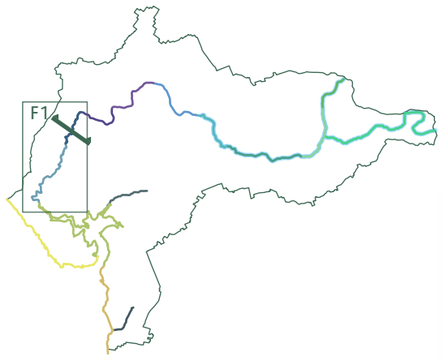
RIPARIAN OVERHEAD COVER

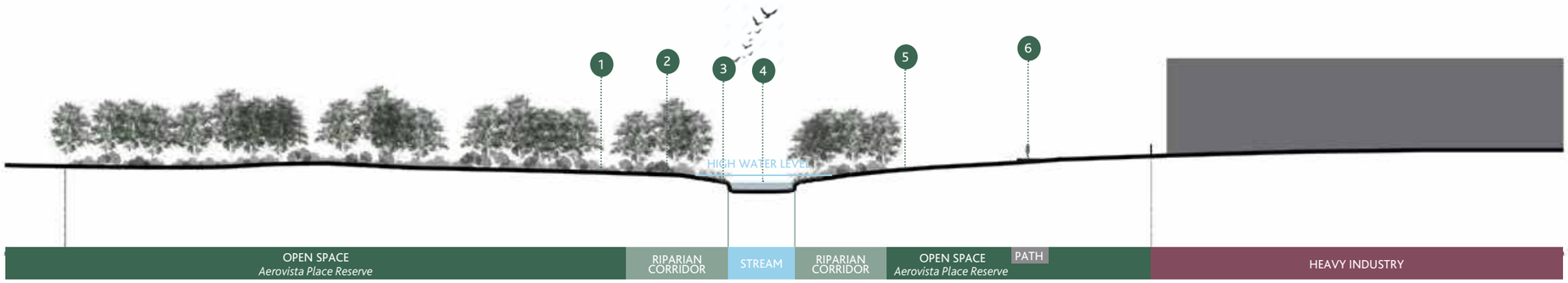
- <10%
- 10-30%
- 30-50%
- 50-70%
- 70-90%
- >90%

Character Area F | Puhinui Industry

Scale: 1_500@A3

0 10 50M





Cross Section F1


1


2


3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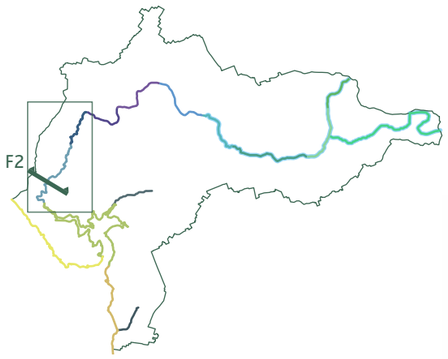
5

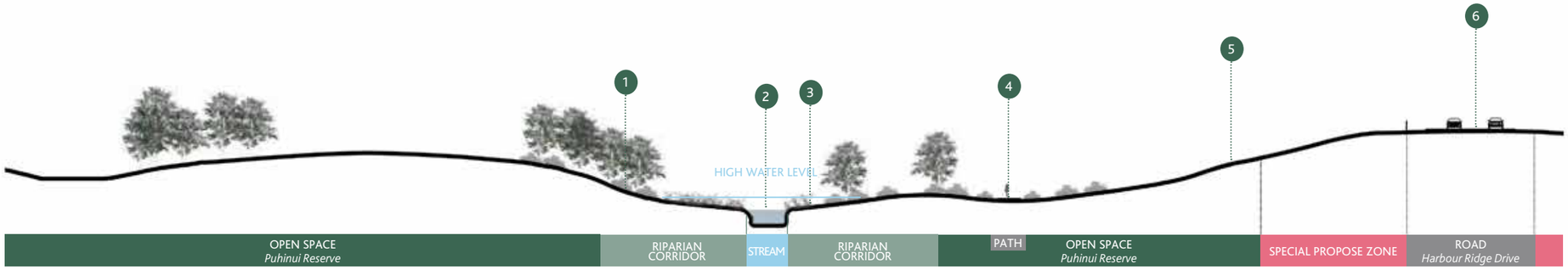

6

Character Area F | Te Puhinui Industry

Scale: 1_500@A3

0 10 50M





Cross Section F2


1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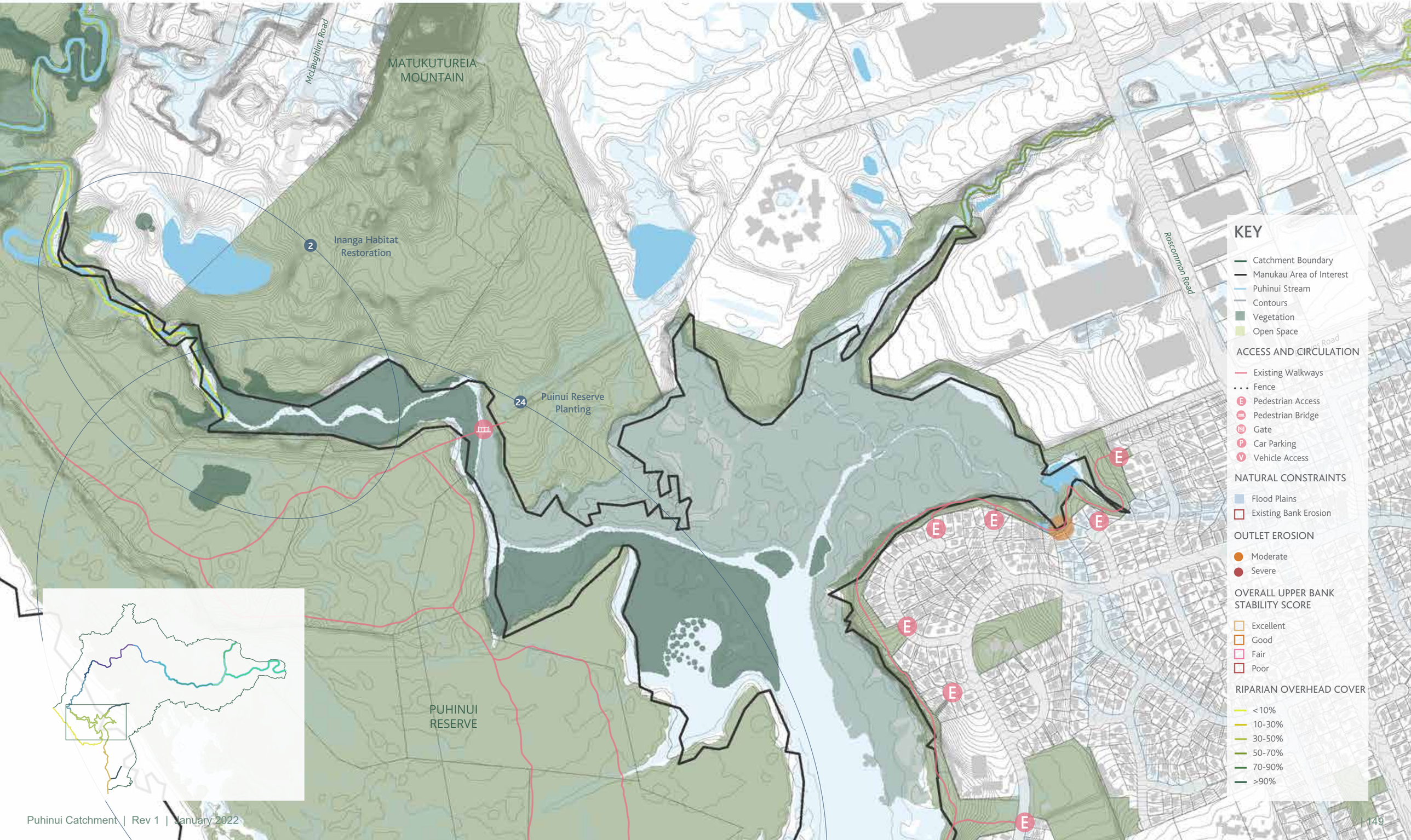
Character Area G | Puhinui Estuary

Scale: 1_6 000@A3

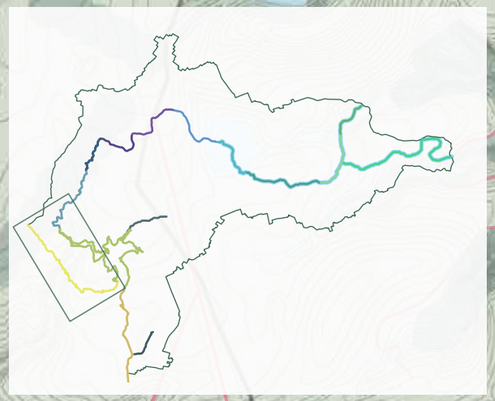
0 100 500M



Character Area H | Puhinui coastal

Scale: 1_6 000@A3

0 100 500M



MATUKUTUREIA MOUNTAIN

Inanga Habitat Restoration
2

Puinui Reserve Planting
24

H1

H2

MANUKAU HARBOUR

PUHINUI RESERVE

KEY

- Catchment Boundary
- Manukau Area of Interest
- Puhinui Stream
- Contours
- Vegetation
- Open Space

NATURAL CONSTRAINTS

- Flood Plains
- Existing Bank Erosion

ACCESS AND CIRCULATION

- Existing Walkways
- Fence
- Pedestrian Access
- Pedestrian Bridge
- Gate
- Car Parking
- Vehicle Access

OUTLET EROSION

- Moderate
- Severe

OVERALL UPPER BANK STABILITY SCORE

- Excellent
- Good
- Fair
- Poor

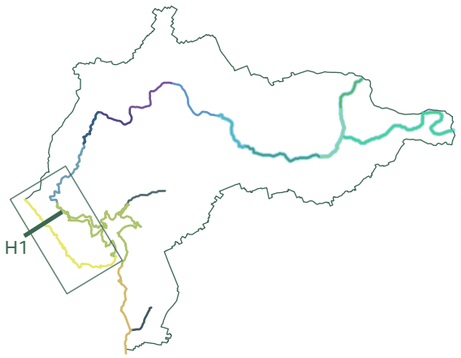
RIPARIAN OVERHEAD COVER

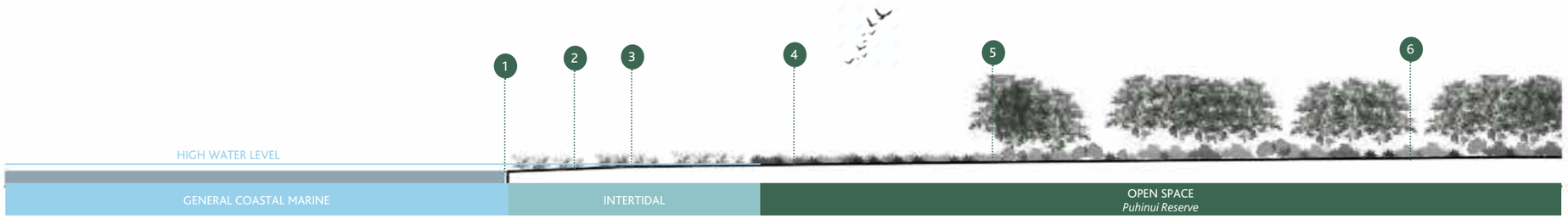
- <10%
- 10-30%
- 30-50%
- 50-70%
- 70-90%
- >90%

Character Area H | Puhinui coastal

Scale: 1_500@A3

0 10 50M





Cross Section H1


1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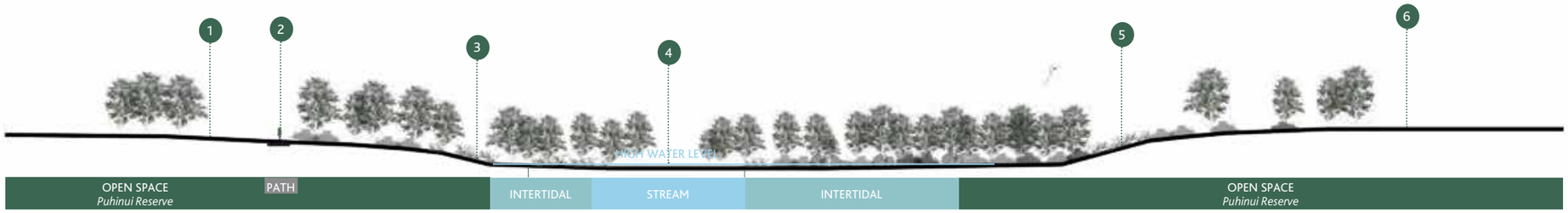
Character Area H | Puhinui coastal

Scale: 1_500@A3

0 10 50M



Cross Section H2


1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4


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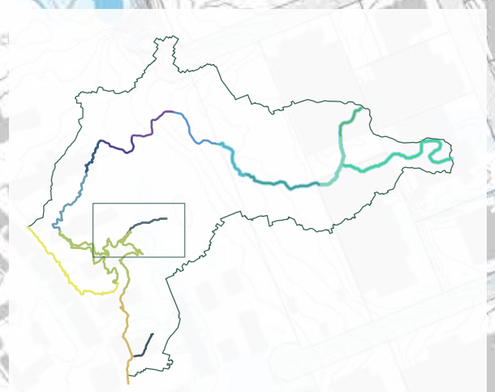
6

Character Area I | Homai Stream

Scale: 1_6 000@A3

0 100 500M



I1

I2

I3

Rascommon Road

Browns Road

KEY

- Catchment Boundary
- Manukau Area of Interest
- Puhinui Stream
- Contours
- Vegetation
- Open Space

NATURAL CONSTRAINTS

- Flood Plains
- Existing Bank Erosion

ACCESS AND CIRCULATION

- Existing Walkways
- Fence
- Pedestrian Access
- Pedestrian Bridge
- Gate
- Car Parking
- Vehicle Access

OUTLET EROSION

- Moderate
- Severe

OVERALL UPPER BANK STABILITY SCORE

- Excellent
- Good
- Fair
- Poor

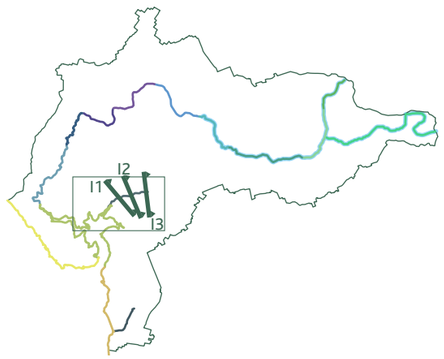
RIPARIAN OVERHEAD COVER

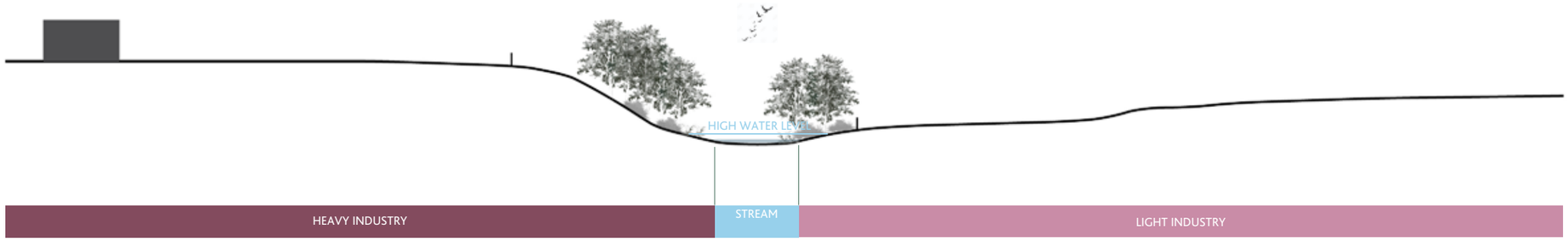
- <10%
- 10-30%
- 30-50%
- 50-70%
- 70-90%
- >90%

Character Area I | Homai Stream

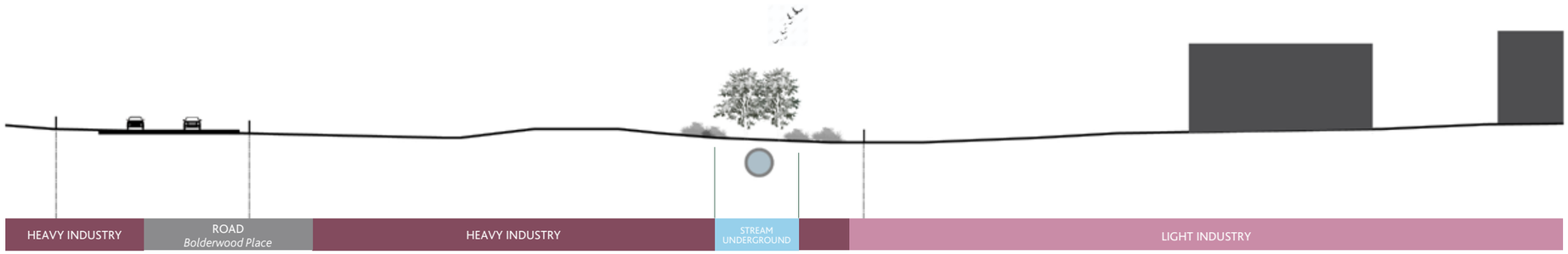
Scale: 1_500@A3

0 10 50M

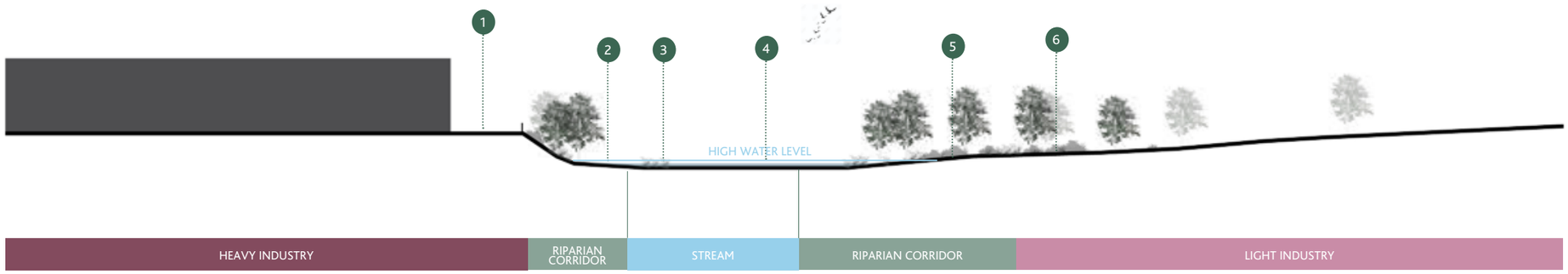




Cross Section I1



Cross Section I2



Cross Section I3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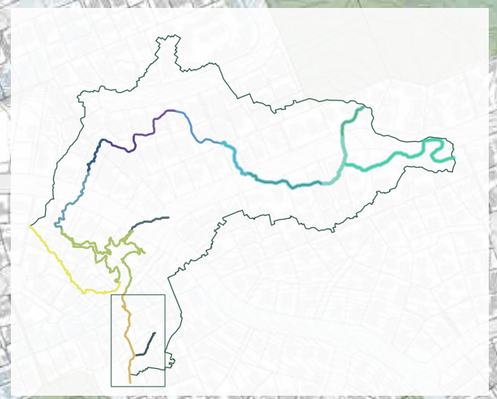
Character Area J | Weymouth Coastal

Scale: 1_6 000@A3

0 100 500M



Blackgate Reserve

12

Weymouth Road

Palmers Road

Cibbons Road

Etherton Drive

Finlayson Road

Domain Road

LAURIE GIBBONS MEMORIAL PARK

J1

J2

MANUKAU HARBOUR

KEY

- Catchment Boundary
- Manukau Area of Interest
- Puhinui Stream
- Contours
- Vegetation
- Open Space

NATURAL CONSTRAINTS

- Flood Plains
- Existing Bank Erosion

ACCESS AND CIRCULATION

- Existing Walkways
- Fence
- Pedestrian Access
- Pedestrian Bridge
- Gate
- Car Parking
- Vehicle Access

OUTLET EROSION

- Moderate
- Severe

OVERALL UPPER BANK STABILITY SCORE

- Excellent
- Good
- Fair
- Poor

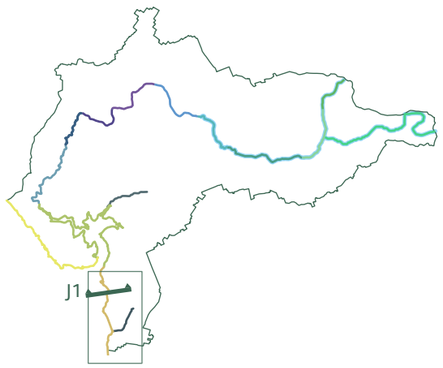
RIPARIAN OVERHEAD COVER

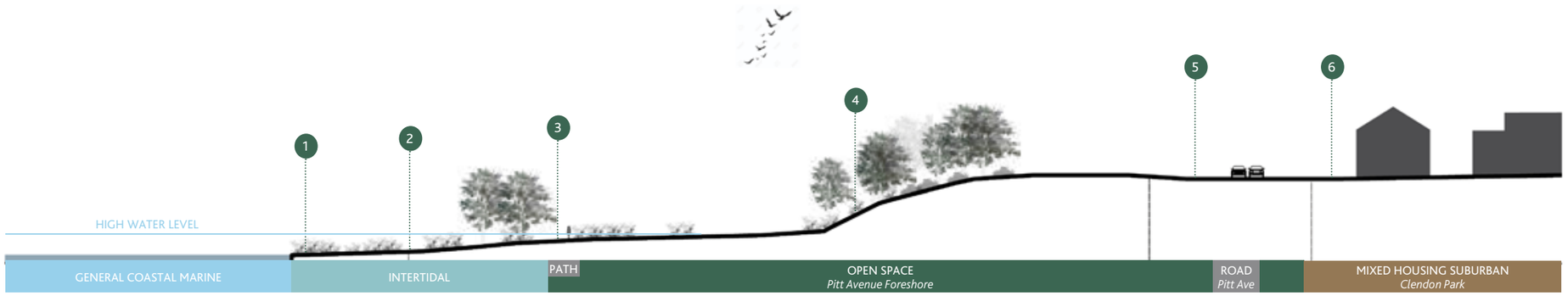
- <10%
- 10-30%
- 30-50%
- 50-70%
- 70-90%
- >90%

Character Area J | Weymouth Coastal

Scale: 1_500@A3

0 10 50M





Cross Section J1


1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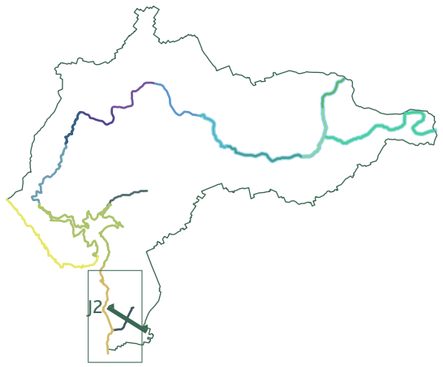
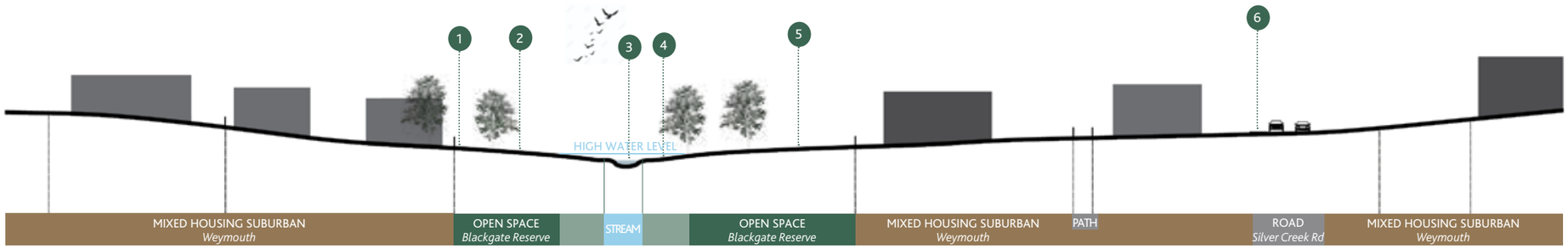
Character Area J | Weymouth Coastal

Scale: 1_500@A3

0 10 50M





Cross Section J2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Sione

I am a religious, humble family man who lives in an extended family single household with my wife, parents, five children and three grandchildren. I am proud of my cultural heritage and have strong family connections. Due to my parents' limited mobility, I am their main caregiver; this includes taking them to all their appointments and doctor's visits. To ensure that I am able to provide for my family both in NZ and overseas (back home in Tonga), I work multiple shifts at my warehouse job. However, due to my high debt load I struggle to save. Despite this I am always grateful and am a proud man. I hope to obtain job security and own a bigger house to accommodate for my growing family.

AGE: 50's

EMPLOYMENT: Warehouse shift worker

RELATIONSHIP: Married

ETHNICITY: Tongan

VALUES • INTERESTS • ACTIVITIES • PRIORITIES

- I am a devout Christian and active church member
- I am a proud, honest man
- I am committed to my family and live my life the 'traditional way'
- I value large scale family outings and gatherings on the weekend
- I have a strong interest in my children's education
- I am a patriarchal Tongan
- Taking care of my parents is a top priority in my day to day life
- I financially support family overseas
- I strive to be grateful for what I have
- I believe everything happens for a reason

CHALLENGES • CONCERNS • FEARS

- I fear being isolated from my culture
- I am concerned about my ability to provide for my large family
- I struggle to interact outside the 'safe' pillars of my own community
- I fear that I do not spend enough time with my family due to constantly having to work
- I cannot find a balance between work and family life without finding myself in a compromising position
- Financial stability is a significant concern for me
- I have a high debt load
- My job is physically challenging for a man my age

NEEDS • HOPES • ASPIRATIONS • GOALS

- I want to dedicate time solely for my family on the weekend
- I hope to keep the Tongan heritage and language alive in myself and my family's day to day life
- I yearn to travel back to Tonga regularly to visit relatives
- I need to maintain job security
- I dream of purchasing a bigger house to ensure that my large family can comfortably live together
- I hope to give my children a fulfilling childhood and bright future
- I aspire for my children to obtain a higher education / university degree and own their own homes

Ezra

I am a born and bred Manurewa boy who has lived a rough life since a young age. Up until the age of four years old, I had lived a pretty simple life, until my father left. After that my mother struggled and we had many temporary father figures in our life - each of my siblings have different fathers. Therefore, I feel like I never had positive role models as a child. Since leaving home, I have done whatever I needed to survive and this has often meant doing many things that I am not proud of such as petty theft, drug and substance abuse and going to juvenile detention. I no longer have one place that I call home and am often couch surfing at friends' places in the area until it's time to move on to the next location. Despite the unfortunate deck of cards I've been dealt, I dream of turning my life around, getting an education and a good job so that I do not have to spend my days washing windows for spare change.

AGE: 17

EMPLOYMENT: UNEMPLOYED

RELATIONSHIP: ESTRANGED FROM FAMILY

ETHNICITY: COOK ISLAND / SAMOAN

VALUES • INTERESTS • ACTIVITIES • PRIORITIES

- I love sport and creative expression. I am a talented artist and athlete (with limited formal training/mentoring in either)
- I have strong friend connections and am committed to 'the boys'
- I am part of a strong party culture - 'boozy'
- I am free spirited - I find importance in having fun, enjoying life, minimising stress and my responsibilities. I live my life day by day
- I have learnt to be street smart due to being on my own at a young age
- I did well at school before dropping out

CHALLENGES • CONCERNS • FEARS

- I have no formal education - I left school at the age of fourteen
- I have transient living arrangements
- I left home at the age of thirteen but still live in the area
- I have struggled to find a place where I belong but have fallen in with a crew in a similar situation to me
- I fear I have nothing going for me
- I have limited life skills to support me to make different life choices and limited exposure to positive role models
- I am embarrassed to share my dreams, aspirations and feelings with anyone, afraid that they'd make a joke of it
- I avoid responsibility whenever I can
- I struggle to trust people

NEEDS • HOPES • ASPIRATIONS • GOALS

- I aspire to find my 'purpose' in life
- I hope to reunite with my younger siblings I lost contact with after moving out of home
- I dream of making an honest living
- I do not want to end up in Jail like many other people I know
- I hope that one day I will be able to positively turn my life around
- I aspire for my art to contribute to community spirit and be recognized for my artistic talents
- I hope to play sport at every opportunity I am offered

Ofa

I am a caring, quiet, retired bookkeeper who dedicated my life to my work and partner. I migrated to New Zealand fifteen years ago with my husband, leaving behind both of our large extended families only for my life to change not long after. Two years ago my husband passed away suddenly and I have been alone ever since. Having no children, all I know is a life with my husband in it. At present I am struggling to readjust to life alone and often feel lonely living at the St John's Retirement Village. Although I have no children, I often treat my sibling's children as my own, however due to the distance we have significantly grown apart. I look forward to attending church on the weekends as it allows me to interact with my community, but because I am reliant on those around me my attendance normally depends on their schedules which in most cases has limited availability on the weekends.

AGE: 70+

EMPLOYMENT: Retired bookkeeper

RELATIONSHIP: Widow; No family in New Zealand

ETHNICITY: Samoan

VALUES • INTERESTS • ACTIVITIES • PRIORITIES

- I value nature, open space and low congestion
- I value fono and community but have limited access to either in my current living situation
- I am a religious woman and make it a priority to attend church
- Because I relied heavily on my husband to get around, I now stick to a small geographical area and areas that I know well enough to travel to alone
- I value connecting with people who hold values similar to mine
- I love learning about other people's interests, aspirations, religions and cultures
- Bingo and scrabble nights at the village is one of my favourite pass time activities

CHALLENGES • CONCERNS • FEARS

- Having a limited support network is a significant challenge for me
- I feel isolated from my local and cultural communities
- Although I know many people in my community I have no way of keeping in touch with them as technology does not come easy to me
- I am struggling to adjust to life without my husband and fear I will not overcome this life hurdle
- I have no form of transport now and I often attempt to take public transport for short distances
- Because of my limited mobility, I struggle to get around by myself and often need assistance
- I am only offered limited help and support from the in-home facility care at the retirement village

NEEDS • HOPES • ASPIRATIONS • GOALS

- My hope is to connect to the local Samoan community as well as other diverse communities in my area
- Due to my limited mobility I need a support person for my day to day life
- I find joy in companionship
- I hope that one day I can reconnect with my family in Samoa or receive visitors from my home village
- My goal is to purchase a smart phone to stay in contact with both my local community and family back home

Mere

I am a strong, independent woman who is committed to my children, grandchildren and the wider community. I am well known and respected by many in the community as an involved kuia. Having lived a full life, my main focus is on the younger generation and understanding the importance of uplifting the young generation as tomorrow's leaders. Owning a home on family land, I live a traditional life that models traditional Maaori values. I hold strong cultural ties to my heritage and maintain a strong connection and presence with hapuu and marae. My greatest fear is that the younger generation will lose interest in their culture / roots, therefore I am very involved with my grand-childrens' kura and education. I aspire to incorporate Maaori culture in day to day life of my whaanau, promote Maaori customs and culture and keep the community well connected.

AGE: 65+

EMPLOYMENT: Three children; Seven Grand-children.

RELATIONSHIP: Retired

ETHNICITY: Maaori

VALUES • INTERESTS • ACTIVITIES • PRIORITIES

- I am supportive, caring, loving and understanding
- I am a proud Maaori woman
- I am strongly involved in all aspects of my family's life.
- I am committed to my children, grandchildren and the wider community
- I have an open door policy for anyone in the community who is in need of guidance or support
- I have a significant interest in the younger generation and understand the growing importance of uplifting the younger generation as tomorrow's leaders
- I live a traditional life and model traditional Maaori values
- Because I know what it feels like to not have much, I make certain that I always give back to those in need in any form that I can

CHALLENGES • CONCERNS • FEARS

- My greatest concern is that my cultural roots will be lost in the western world
- I struggle to keep the younger generation motivated in Maaori culture, heritage and practices
- I am concerned that I can't keep up with technology, how fast life and society is evolving and the impacts these have on the next generation.
- I find it challenging to balance between the Maaori and kiwi / western culture for the younger generation

NEEDS • HOPES • ASPIRATIONS • GOALS

- I need to find new, enticing ways to keep the younger generation interested in old cultural customs and practices
- I hope to maintain my role as a respected Kuia in the community
- I aspire to keep the community well connected
- I hope to support my grand-children's quality of life and well-being
- I need to continue building relationships with the younger generation so they feel that they are valued

Madika

I am a hard working, strong and generous single mother with a three year old daughter. I work multiple jobs to generate income as I have no family support in NZ or India, my home country. Between work and looking after my three year old daughter, I have no time for social activities. However, I consciously make an effort to attend community events when I can, to connect with people around me and in the community. I rent a one bedroom apartment in Manurewa. When I am at work I have enrolled my daughter in a 20 hour free early education centre in the area, however I struggle to find affordable care when I receive last minute jobs in the evenings. Although I find it hard to communicate due to the language barrier, I hope to meet like minded people who have gone through similar experiences and I am optimistic about my future in NZ despite current circumstances.

AGE: Late 20's

EMPLOYMENT: Multiple Job Worker

RELATIONSHIP: No family support in New Zealand

ETHNICITY: Indian

VALUES • INTERESTS • ACTIVITIES • PRIORITIES

- Generous, caring and strong woman
- Quiet and introverted
- I love partaking in cultural Indian dance and music
- I am a highly motivated hard worker
- I am reliant on my own capabilities
- My main priority in life is looking after my daughter
- Given my past experiences, I believe that I am a survivor
- I pride myself on remaining positive and taking each day as it comes, instead of constantly fretting and fearing what is next
- I have a can do attitude and won't give up until I know I have exhausted all options
- I have a glass half full attitude

CHALLENGES • CONCERNS • FEARS

- A significant challenge for me is that I do not qualify for government help
- I often feel unsafe
- I struggle to communicate due to language barriers and on some days I long for the comfort of my old home
- I have no formal qualifications and fear that this may hinder me finding a stable job
- I constantly am worrying about money and the strain my work puts on my relationship and bond with my daughter
- Because I cannot drive, I rely on public transport or walking because it is more affordable
- I am always tired and often feel run down
- I often feel that my household is chaotic, despite it just being myself and my daughter
- A big concern for me is constantly waiting for my next paycheck

NEEDS • HOPES • ASPIRATIONS • GOALS

- I hope to obtain a sense of order in my life
- I need job security
- One of my greatest aspirations is to obtain formal qualifications at university
- I need to provide for my daughter so that she doesn't ever have to question our family's stability
- I hope to put down roots in New Zealand so my daughter can grow up a Kiwi, finish her education and continue to start a family of her own in the future
- I hope to meet a partner who can be a positive male figure / role model in both my own and my daughter's lives
- I hope to create as many positive memories as I can for my daughter
- I hope to build a supportive mesosystem around me and my daughter to feel secure and supported

Anahera

I am a fun and outgoing 17 year old high school student in my second to last year of college. Like most people my age, I love hanging out with my friends. Because we all live in different areas, we usually travel by bus to meet and hang out at Manukau mall. When I'm not with my friends, I am a dedicated member of my school's Kapa Haka group and spend four days a week practicing after school and on weekends. Despite having such a social and positive outlook on life, I experienced a significant life event that altered the way I see life today. When I was sixteen years old my friend took her life and since that day I promised myself that I would find a way to contribute to those who suffer from mental health issues. One of my biggest dreams is to move overseas after I complete university to explore and research a range of cultures and meet different types of people. Then return home and implement my findings in practices here.

AGE: 17

EMPLOYMENT: Student

RELATIONSHIP: Dependent

ETHNICITY: Maaori

VALUES • INTERESTS • ACTIVITIES • PRIORITIES

- I am passionate about people and the environment
- Every month, I spend a day volunteering my time hanging out with children who have learning disabilities
- When I am not at Kapa Haka practice, most of my free-time is spent hanging out with my friends. I have a strong social media presence and am up to date on all of the latest trends
- Because I don't have a part time job yet, I use most of my pocket money opp shopping as I can get more for less and am not contributing to fast fashion
- Although I have many short term goals, I am also future focussed- I have big dreams for the life I hope to live
- I pride myself on being patient, mindful and generous
- I am very proud of my cultural heritage
- I love interacting with strangers and learning about their lives

CHALLENGES • CONCERNS • FEARS

- It frustrates me when I am not taken seriously by adults when I talk about my goals and future aspirations
- Because my main form of transport is the bus, unreliable public transport is a big challenge for me
- I want to become more independent so that I don't have to rely on my parents all the time, which includes getting a part time job and drivers licence
- I struggle to stay vibrant and positive when the world is constantly changing around me
- I find it difficult to live without my devices and have everything in one place at the touch of a finger
- I struggle to stand by and watch as teenagers around me suffer from many forms and measures of mental health issues, without getting the help they so desperately require
- The constant struggle of competing with others in high school has become overwhelming and I fear it will be a recurring cycle

NEEDS • HOPES • ASPIRATIONS • GOALS

- I hope to have a positive impact on society and the environment
- When I turn eighteen I want to get a customer facing job so that I can get as much human and customer experience I can
- I aspire to travel the world
- My goal is to learn as many languages as I can so that I can relate and converse with a wide range of people
- I want to overcome the stigma and negative stereotypes around teenagers
- In the future I hope to be less dependent on my devices
- I hope to advocate for mental health
- I aspire to be someone young children and teens can look up to in the future
- My goal is to go to university and gain qualifications as a psychotherapist and open a subsidised clinic where youth and teenagers can get the help they need

Nalani

I am a hard-working university student who has overcome many adversities despite my young age. After a rough upbringing in and out of foster care with my two siblings, I now live with my aunty and 7 year old sister in a town house. My older brother is in prison and I make it a priority to visit him regularly. In addition to this, my main priority is caring for my sister; this includes dropping her off and picking her up from school, taking her to the park or the bungee trampoline. Getting around can be difficult as I share a car with my aunty. When I don't have the car, I have to travel with my sister on public transport, which at times is not always reliable. In addition to studying at MIT, I also work at Manukau mall part time to contribute to household expenses with my aunty. I also play touch most week nights with the community's social team. I believe that my purpose is to help people in similar situations as me and aspire to finish my degree as a social worker and get a good job to help others.

AGE: 20's

EMPLOYMENT: Part time job at Manukau Mall.

RELATIONSHIP: Two siblings; older brother and younger sister.

ETHNICITY: Pacifika

VALUES • INTERESTS • ACTIVITIES • PRIORITIES

- I am a fun, smart, driven, capable and talented individual
- I love spending time with my siblings, despite us being separated
- I am interested in hearing other peoples stories and experiences
- I am committed to staying fit, even though I've given up my dream of being a professional athlete
- I love meeting up and feeling a part of a team up during the evenings with my social touch team
- Getting good grades in university is a significant priority for me
- At times I can be closed off and wary of others in order to protect myself and my siblings
- I am extremely self disciplined, mostly because I cannot afford a slip up
- I am committed to realising my dreams and goals for my future
- I enjoy practicing mindfullness as a form of self care

CHALLENGES • CONCERNS • FEARS

- I cannot experience life the way others my age would
- Because of my family situation, I've had to grow up too fast to ensure that my younger sister was taken care of
- I have to be responsible and secure for my siblings
- As I continue my studies, it's becoming increasingly difficult to balance family, work and university priorities
- Because my sister is my number one priority and regularly needs my attention, I often fall behind in university and miss shifts at work
- I fear that I am seen as just another statistic of a foster care child
- People my age don't understand my circumstances and assume that I am making up excuses when I miss social events
- At times I feel isolated from people at my university because my priorities and values are different to theirs
- Given my past experiences, I am not always the most trusting of strangers

NEEDS • HOPES • ASPIRATIONS • GOALS

- I need to stay strong for my siblings
- I aspire to graduate and secure a good job and financial stability
- One of my biggest goals is for my family to live a comfortable, stress free life
- I hope to overcome the stigma around foster children
- I dream of creating a stable life for my sister- something that I was not fortunate enough to have
- My goal is to help my brother integrate back into society and the community when he is released from jail
- I aspire to live a more spontaneous life
- When I complete my education I hope to provide a safe and supportive environment where children who are / were in similar situations like myself can hang out together
- I hope to find a personal passion project

Antonia

I am a social, loving and caring 12 year old girl who lives in an extended family household with my parents, two siblings, grandparents, aunty and two cousins. I love going to church to hangout, see my friends at youth group and sing traditional Niuean hymns that my parents taught me when I was younger. I stay inside most of the day after school playing video games as I am not allowed to walk around or play outside alone. Because of this I often accompany my mum to the supermarket every week so I can hang out and play (I like the park best). I love hanging out with my siblings, cousins and friends, so I need a safe place where the adults will allow me to play outside without supervision. Being the budding Counties Manukau netball player that I am, I hope one day that I can play professionally and represent my country.

AGE: 12

EMPLOYMENT: Primary School Student.

RELATIONSHIP: Dependent

ETHNICITY: New Zealand born Niuean.

VALUES • INTERESTS • ACTIVITIES • PRIORITIES

- I am an extroverted, fun and free spirited girl
- I love socialising with my friends and family
- Singing and participating in my church choir is one of my favourite activities
- I am a talented athlete with a particular passion for netball
- Going to church, netball practice and playing video games at home are a few of my main hobbies
- I am often responsible for helping prepare family meals and love watching cooking shows on television
- Although my house is crowded, I love living with my extended family as it means I never am alone and there is always someone there to support me, especially when my parents are at work

CHALLENGES • CONCERNS • FEARS

- I don’t want to be indoors all the time when I am home
- I find it hard to reason with my mother that it is safe for me to play outside without adult supervision
- I desperately want to represent either New Zealand or Nuie in netball but fear I won’t get the chance
- I find balancing school work and sport very difficult
- Although they try to hide it, my growing involvement in competitive netball is putting increasing pressure on her parents

MOTIVATIONAL FOCUS

NEEDS • HOPES • ASPIRATIONS • GOALS

- I dream to be a professional athlete
- I hope I can be successful when I grow up so that I can provide and give back to my parents, family and the community
- I aspire to be a role model for young female athletes
- I want more safe places for children to play in the area
- Being able to play freely in the neighbourhood with my friends and neighbours is one of my main goals for the area
- I hope to get a netball scholarship at Kings College. This will give me a greater chance of being exposed to the right platforms for my sporting career and give my parents some financial ease
- Along with becoming a professional athlete, I also aspire to get a degree in nutrition and dietetics to ensure that I have a secure future

Nick

I am the ultimate ‘grom’ kid who lives for the thrill of adventure and the outdoors. I love going mountain biking with my dad at the Totara Park mountain bike trails and am passionate about all outdoor activities. Whenever I get a chance, I take my scooter or skateboard out to Clendon Skatepark after school. With my fearless, curious and easy going nature I seek regular stimulation. However, I can only do so under the supervision of my parents or someone older than me - something I struggle to grasp. Unlike most children my age, I am not a fan of video games, but often play them to fit in with my friends at school. However, my goal is to be a professional sportsman when I am older and hope to spread positivity through the outdoors. There is no stopping me from achieving a goal I set my mind to and I am committed to being the best version I can be of myself. I love spending time with my grandparents and helping them out as their physical abilities are declining.

AGE: 10

EMPLOYMENT: Primary School Student.

RELATIONSHIP: Dependent

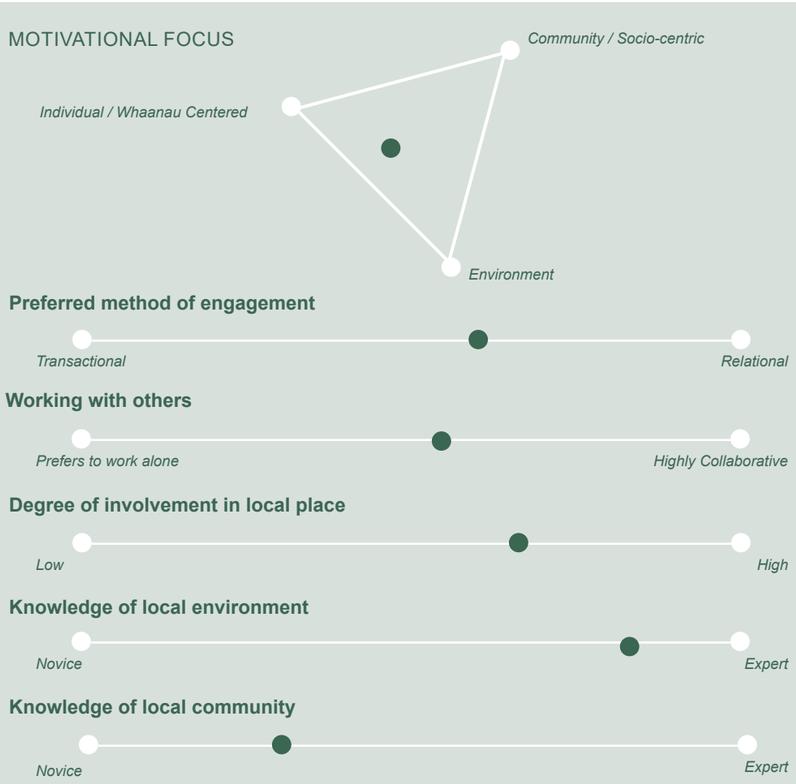
ETHNICITY: Paakehaa / European NZer

VALUES • INTERESTS • ACTIVITIES • PRIORITIES

- I am an easy, outgoing and adventurous young boy
- I am a nature lover and love all things outdoors and I value being fit and active.
- I love to hang out with my mountain bike club friends
- Every free moment I get, I am on my bike or skateboard. As soon as I am done with my homework and can get find an adult I’ll go to the park and stay there until dark
- My mum always says she is lucky to have such a patient and selfless child like me
- I have a high degree of tenacity and will often fail and fail until I learn from the failure
- I have the ability to consciously challenge myself with the thrill of thriving where others fear to tread

CHALLENGES • CONCERNS • FEARS

- A significant challenge for me is that I am unable to go to the park alone
- I struggle to fit in with kids at school because I don’t latch on to current technological trends
- I fear that I will lose my school friends if I stop playing video games
- People do not understand that skateboarding is a serious sport
- Because my education normally comes second to sport, I usually fall behind on my school work or hand in work late
- Seeing how careless and destructive people are to the environment really bothers me
- I struggle to communicate that skateboarding and biking is much more than just a hobby or past time, it’s a way of life
- It concerns me that skaters and skateparks often carry some negative assumptions or are known for attracting illicit behaviours. However, it also provides a sanctuary and outlet for many excluded from mainstream society



NEEDS • HOPES • ASPIRATIONS • GOALS

- My greatest dream is to be a professional athlete
- I want to build an epic skatepark in the area where children from the community can hang out
- I aspire to inspire young children and adults to spend time outdoors
- I hope that one day skating and extreme sports get recognised on the same level as other sports such as rugby
- I hope that one day I can enter the X Games and have a trick named after me
- I dream of becoming a well known name in extreme sports
- In the future, I hope I get sponsored by the biggest names in the industry and use my popularity to advocate for the environment

Charlotte

I live a comfortable life in Totara Heights with my husband and our three children - two boys and a girl. We own a successful family business in the light industrial area. My family's world has recently been turned upside down when my eldest daughter (17 years old) was admitted to Counties Manukau Health Taunaki and Te Puawaitanga. While I was usually confident and in control, I am now constantly worried, anxious and struggling to sleep. I need to find a balance between family and work life. Despite my husband encouraging me to focus on family, I don't feel comfortable taking time off work as I need to keep our business afloat. However, I constantly fear that I am not dedicating enough time to my boys. My sons go to primary school in the area and now that I spend a lot of time at the clinic, they also attend an after school care programme at the local community centre. Although I have a very supportive family, I struggle to accept help easily as I don't want handouts.

AGE: Late 40's

EMPLOYMENT: Business Owner

RELATIONSHIP: Married; Mother of three (two boys and a girl).

ETHNICITY: Paakehaa / European NZer

VALUES • INTERESTS • ACTIVITIES • PRIORITIES

- I am very passionate about my family
- I am upper class and proud that I am able to provide a stable and comfortable life for my children
- I am an active school mother. I sit on the school board and chaperone all my children's school events
- I am heavily motivated by success
- I am socialite and often described as the 'hostess with the mostess'
- My life revolves around my children, husband and family business
- I always need to be in control and try to be prepared for everything
- I impose perfection on my family and hold high expectations of myself, my family and others around me.

CHALLENGES • CONCERNS • FEARS

- I become flustered and overwhelmed very fast when I am not in control
- I do not accept help easily and do not feel like I need handouts from anyone
- I avoid change in all aspects of my life
- I am constantly anxious
- I've been struggling to come to terms with the changes in my family
- I fear that I am not spending enough time with my family while I run the business
- I am concerned that I am pushing my friends away as I try to deal with my personal troubles on my own
- I fear that I am an overprotective mother and I hover over my children

NEEDS • HOPES • ASPIRATIONS • GOALS

- I need to maintain my social status
- I hope to have high achieving children
- I need to maintain my family's prestige and reputation
- I hope to always have a healthy, happy family
- I need to be a supportive, present parent
- I need to learn how to loosen up and 'go with the flow'
- I dream of being a risk taker

Marcus

I am a compassionate and respectful man who works as a nurse at Middlemore Hospital. I come from a large Filipino family and have only recently moved out of my parents' home in Ootara into an apartment closer to my workplace. As a devout Catholic I regularly go to church in the area where I grew up when I am not working and am often involved in community activities. I hope to find a house in the area to be close to my family and community so I can help people and make a difference in the future. Additionally, my career goal is to become a well respected senior nurse.

AGE: Early 30's

EMPLOYMENT: Nurse

RELATIONSHIP: Single

ETHNICITY: Fillipino; First generation Kiwi

VALUES • INTERESTS • ACTIVITIES • PRIORITIES

- Maintaining strong family ties and connections is one of my highest priorities
- I love to help people and feel that I am meaningfully contributing to society
- As a child my parents raised me the old fashioned way. I was taught to be respectful, honest and kind. These values have now shaped who I am and how I carry myself as an adult today
- I have an incredible work ethic and will help any of my colleagues out if they need their shifts to be covered
- I live by the motto of "what goes around, comes around", marking God as the centre of my life, I have surrendered my future to fate
- Despite moving out of my parents' house, I still go to church and pray at my family home every week as my religion is important to me. This allows me to maintain my strong bond with both my family and my religion
- I am passionate about people and my patients. Therefore, I am not afraid to speak up for the sake of those in my care

CHALLENGES • CONCERNS • FEARS

- I fear that I won't be taken seriously in the industry by older, more experienced professionals
- I worry that in today's society my younger siblings will disregard the way my parents have nurtured us and will be influenced by modern day societal expectations
- Now that I have moved out of the family home, I fear that I am missing out on valuable family bonding time
- I am afraid that people mistake my generosity and humility as a way to walk over me
- A significant challenge for me is becoming too emotionally connected to my patients
- Seeing patients treated unfairly is one of my greatest fears

NEEDS • HOPES • ASPIRATIONS • GOALS

- I aspire to be well respected in my career
- I hope to find a partner to settle down with and start a family
- I dream of being in a position to take care of my parents financially
- I hope to own a house similar to the one I grew up in and in the same area
- My dream is to raise my children the same way my parents raised me and give them a happy and secure childhood filled with love
- I hope to be an active member of the community
- I aspire to become a mentor in the nursing industry, so I can help and coach young nurses entering the industry.

John

Following a successful career as an engineer and being a career driven individual, I have realised that there are greater and simpler things in life that I am passionate about. Now that I have retired I have the capacity to refocus and devote my time to more projects that I am passionate about such as becoming immersed in the community and the environment not only for myself but for those around me. As I am no longer engrossed by all things engineering, I have readjusted my lifestyle to one of a more simpler scale. Instead of driving around in the latest model cars I have taken up traveling by bike and have joined a cycling and running social club. Seeing people my age settle down and spend time with their grandchildren has really made me notice the gap in my life being estranged from my children.

AGE: 65+

EMPLOYMENT: Retired Engineer

RELATIONSHIP: Married; Estranged from family

ETHNICITY: British

VALUES • INTERESTS • ACTIVITIES • PRIORITIES

- I am an outspoken, extroverted individual
- I am willing to share my opinions, knowledge and experiences with those around me to help them advance themselves
- Because of my career I am very detail oriented. I am a logical and analytical thinker
- I 'always' knows what's best and believe I am and 'expert' on everything, especially engineering
- I have a new found love for the environment and social justice
- I have become increasingly interested in community, the environment and health
- I spend my time getting invested in the community as a volunteer at places such as the Botanic Gardens
- I am confident in my beliefs and sharing them with others
- I am a frequent user and contribute to the Botanical Garden and other community services and facilities (in the social justice space)

CHALLENGES • CONCERNS • FEARS

- A significant challenge in my life is my strained relationship with my children
- I have poor listening skills
- I want Auckland to change, but not necessarily open to it
- I am concerned about the lack of wider community interest in the environment and social issues
- I fear that the younger generation are disinterested in the outdoors and nature
- I find it challenging that there are limited opportunities to share knowledge, experiences and skills related to conservation and stewardship
- I am finding it difficult to start up a neighbourhood environment group

NEEDS • HOPES • ASPIRATIONS • GOALS

- I want less traffic congestion
- One of my biggest goals is to reconnect with my children
- I want to be listened to and influence decision making
- I hope I can share my knowledge with the younger generation
- I strive to start up a thriving neighbourhood environment group
- I have the capacity to have a wider outlook now that my time and resources are not as constrained
- I hope for a healthy, vibrant local environment
- I want to see the whole catchment re-vegetated and reconnected

Joseph

I am your everyday businessman who enjoys the finer things in life, even if it means taking out an extra loan. I commute into the catchment to work at my full-time job in a business backing on to the stream. I don't spend much time in the area aside from working, the odd shopping trip or a quick lunch at the mall. I didn't even realise there was a stream until the local business association told me about it. I am an all round family man and am determined to provide them a life of comfort filled with happiness and love no matter what it may entail. I often work long hours during the week but make sure I am always home before my children are asleep and dedicate my weekends to family time.

AGE: 40's

EMPLOYMENT: Manukau Commercial

RELATIONSHIP: Married; Family

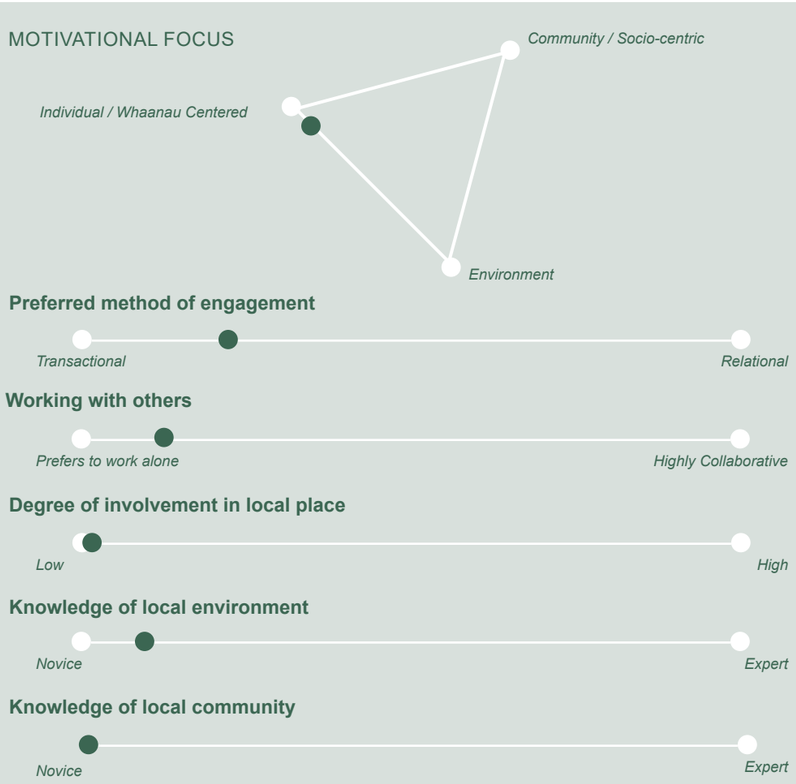
ETHNICITY: Paakehaa / European NZer

VALUES • INTERESTS • ACTIVITIES • PRIORITIES

- I am committed to my family
- Keeping up with the Jones
- I pride myself on being a hard worker and strive to build a an exemplary career profile
- I am fascinated by Netflix crime documentaries as a form of weekend evening entertainment
- I ensure that I spend time with my children on the weekends, taking them to sports and doing things that they are interested in
- I enjoy watching sport and have a seasonal membership pass to the Blues and Warriors home games
- I am tech savvy and future focused
- I am driven by external validation
- I work well under pressure and have a strong drive for success

CHALLENGES • CONCERNS • FEARS

- Commute times into Manukau central is too long and public transport is unreliable
- I am concerned that my income won't match my current lifestyle
- As I get older I worry about job security, career opportunities and I fear an economic recession
- I am concerned for my children's educational opportunities
- Overcoming Auckland's house prices has proven to be a significant challenge
- Maintaining my lifestyle has meant that I have a high debt load
- A significant challenge for me is that I am susceptible to the latest trends
- No matter how unnecessary a product is, I will still purchase it for the sake of having it
- I fear that my children will become spoilt because I make sure they have whatever they want



NEEDS • HOPES • ASPIRATIONS • GOALS

- I hope to buy a nicer home in the near future
- I need to maintain my social status
- Working closer to home is one of my future goals
- I hope to get a pay rise to match my lifestyle
- I need my children to get a good education
- I need to have the latest gadgets and devices
- In order to maintain my current lifestyle I need significant disposable income
- I aspire to live a life debt and mortgage free

Cathy

After a decade of travelling and working overseas, I have returned home to New Zealand to put my roots down in the country I was born and raised in. While residing overseas I realised that there is no place like home and I long to reconnect with Kiwi culture. Having lived a hectic life in Europe and strived to excel in my professional career, I am keen to develop my portfolio of Auckland work experience. However, as important as having a successful career here is, I am ready to settle down and start a family with my long term partner. I hope to provide my child with a similar experience in the same neighbourhood I had growing up.

AGE: Mid 30's

EMPLOYMENT: Professional

RELATIONSHIP: De-facto Partnership

ETHNICITY: Paakehaa / European NZer

VALUES • INTERESTS • ACTIVITIES • PRIORITIES

- I love to champion for the underdogs
- I am very family and community orientated
- I advocate for social equity and fairness
- I believe it is important to be involved and give back to my community
- I spend most weekends coaching young equestrian students at Totara Park Equestrian Centre
- I am politically inclined and like being informed
- I pride myself on my giving nature and having a kind heart
- I am both outspoken and well spoken
- I am logical, rational and need to know the facts before making a decision

CHALLENGES • CONCERNS • FEARS

- Getting in to the Auckland housing market is a significant concern for me
- Because south Auckland has changed dramatically over the last decade, it is taking me longer to adjust to my old neighbourhood and I find it almost unrecognisable
- I fear the increase in crime
- I am concerned for the prevalence of social inequity
- I am struggling with the increase in the cost of living in Auckland
- Congestion and traffic is a significant challenge for my commute to work
- The decrease in environmental health has been a significant concern

NEEDS • HOPES • ASPIRATIONS • GOALS

- I want to feel proud of my community
- I constantly need to be well informed
- I aspire to buy a home and raise my family in my childhood neighbourhood
- I hope to build a career portfolio and gain work experience in Auckland
- I want to see a healthy, vibrant and prosperous south Auckland
- I hope to re-establish my roots in the area and community

Eel / Tuna

I am one of three eels species found in New Zealand. As a short-fin eel, I am shorter in length than my cousin the long fin eel. I have a silvery belly compared to a yellowish one on long-fins, but our colours can vary quite a bit. I spend part of my life cycle in seawater and part in freshwater. Being good climbers we are well adapted to upstream migration. I have an important ecological role as top predators in streams and lakes once I grow beyond a metre, feeding on koura, insects and fish. In the wild, we reach sexual maturity after 20–50 years and we then migrate back to the tropics to spawn, after which we die. We are a traditional food source for Maaori, with high cultural and spiritual significance.

LIFESPAN:	Up to 100 years
STATUS:	At risk
HABITAT:	Freshwater and seawater
ECOSYSTEMS FUNCTION / SERVICES:	Pest control; food source for humans

CHARACTERISTICS • BEHAVIOURS • NICHE

This section describes this my behaviours and role in the local ecosystem

- I am a carnivore and my diet mostly consists of stream insects, snails and shrimps. However when I grow larger I will add fish to my diet. I will eat koura / fresh water crayfish and even small birds like ducklings.
- I am known to be a good climber and can often climb up walls and dams that block the paths of other fish, such as the banded kookopu
- I live most of my life in in lowland freshwater like coastal creeks, streams, rivers, estuaries and wetlands before swimming through out the Manukau Harbour into the Pacific
- I typically live upstream among logs and along river banks. Between the ages of 20-50 years old, I will migrate downstream and out into the Pacific Ocean and Tonga to mate where I will lay between one and three million eggs. After hatching and turning one-and-a-half years old, our young swim back to the catchment, to a river or creek and turn a brown colour.

CHALLENGES • CONCERNS • FEARS

This section describes the trials and barriers to my thriving in Puhinui Catchment

- I am fairly tolerant to poor water quality, however acute pollution events can kill me
- I fear loss of habitat and habitat degradation due to disturbance and modification
- I fear human interaction - when we are caught we are not always returned to the water unharmed
- I fear pollutants entering my waterways

This section describes my relationship to others and the wider catchment

Degree of sociability to meet needs

Lives / Works Alone — *Highly Collaborative*

Range of involvement in catchment and beyond

0 | 10 | 100 | 1,000 | 10,000+KM

Home/habitat in catchment

I live in Puhinui Stream, Homai stream and Blackgate Reserve. However, channeling along a lot of the stream and poor water quality have reduced my range

NEEDS • GOALS

This section describes what I need to survive, reproduce and thrive in Puhinui Catchment today

- I need planted trees along stream banks to create shade (certain trees also provide a food source) for protection from dehydration, extreme temperatures and UV radiation
- I like deep pools in streams
- I eat macro-invertebrates and other food sources from the stream
- I need stormwater treatment, interventions and incentives to prevent pollutants entering the waterways

Kaakaa

I am a medium-sized olive-brown parrot with a grey-white crown, red-orange under-wing and deep crimson belly and under-tail feathers. I measure 45cm in length and can weigh between 390 to 560grams. You can find my home in lowland and mid-altitude native forest. I am closely related to the kea, although I am mainly live in trees and occupy mid to high canopy. Historically, you would often see me flying across valleys or calling a harsh, repeated, rhythmic “ka-aa” from the top of emergent trees. I am very sociable and move in large flocks when our numbers are large enough. However, these days are numbers are few around Te Puhinui. We gather early morning and late evenings to socialise. Our amusing behaviours and raucous voices have led Maaori to refer to us as chattering and gossiping. We are mainly active during the day but also active at night during fine weather or a full moon.

LIFESPAN: 20 years

STATUS: Endangered Population: 10,000

HABITAT: Podocarp forest types

ECOSYSTEMS FUNCTION / SERVICES: Seed distributor and native tree pollinator; Insect pest control

CHARACTERISTICS • BEHAVIOURS • NICHE

This section describes this my behaviours and role in the local ecosystem

- I am an omnivore, I eat both plants and invertebrates. My diet consists of seeds, berries, flowers, buds, sap, plant nector, fruit, honey dew and tree dwelling, especially wood boring, invertebrates
- I am a seasonal specialist therefore I can fly from forest patch to forest patch in search of different foods as they become available
- I am an adept flier and am capable of long distance flights
- When alone I am cryptic. However, in a group we are easily seen
- I congregate with others at localised food sources such as flowering rata. Although, I often forage alone for wood boring insect larvae, fruit and seeds
- My breeding season is usually August - September. I make my nests in hollow trees, laying clutches of 2 to 4 eggs in late winter. Both parents assist in feeding the chicks. In a good fruiting year pairs can double clutch often utilising the same nest hole for the second clutch

CHALLENGES • CONCERNS • FEARS

This section describes the trials and barriers to my thriving in Puhinui Catchment

- Historic forest clearance for agriculture and human settlement have significantly reduced my habitat and places I can live in the area
- The biggest threat to my survival is introduced mammalian predators such as possums, stouts, cats and rats; especially to nesting females. As cavity nesters with a long incubation period that requires our mothers to stay on the nest for at least 90 days, we are particularly vulnerable to predation. Stoats are the main cause of death of nesting adult females, nestlings and fledglings, but possums are also important predators of adult females, eggs and nestlings. There is strong evidence that predation of chicks and females has led to a serious age and sex imbalance, even amongst ostensibly healthy populations
- I often have to compete with wasps and bees for the honeydew excreted by scale insects which is very important for those of us who are breeding
- Human interaction is a large concern. People often feed us unsuitable food such as nuts, various grains and cheese which has resulted in metabolic bone disease in our chicks

This section describes my relationship to others and the wider catchment

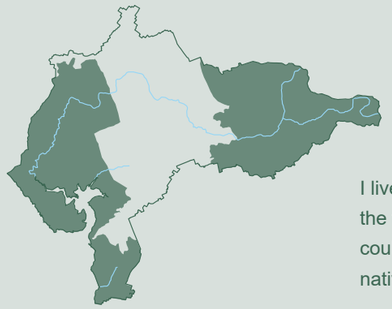
Degree of sociability to meet needs

Lives / Works Alone — *Highly Collaborative*

Range of involvement in catchment and beyond

0 — 10 — 100 — 1,000 — 10,000+KM

Home/habitat in catchment



I live in podocarp forest (patches). Currently the top of the catchment is my habitat but I could live in the lower catchment with more native forest cover and predator control

NEEDS • GOALS

This section describes what I need to survive, reproduce and thrive in Puhinui Catchment today

- I need large tracts of forests to survive and mature fruiting trees all year round
- I need forest patches and corridors for quality nesting sights and to move through landscapes
- I thrive in areas where control of mammalian predators is undertaken
- In the right environments, I can co exist with rats and possibly possums, but not stoats
- My population can recover when stoats and other pests are controlled by trapping or poisoning
- I need to nest in deep hollow tree holes / cavities at least 5 metres above ground

Unowned Cat

I am a nocturnal creature that is normally classed as a pet or companion. Unfortunately for me, I have been displaced and no longer have a ‘forever’ home. As an unowned cat I find food wherever I can - it is in my nature to hunt. I have limited human contact, however as a source of food supply I will interact with local humans. I am a carnivore and regularly survive with limited access to water as I use moisture from my prey.

LIFESPAN: 2-16 years

STATUS: Common

HABITAT: Urban, rural, wild

ECOSYSTEMS FUNCTION / SERVICES: Predator control

CHARACTERISTICS • BEHAVIOURS • NICHE

This section describes this my behaviours and role in the local ecosystem

- I am indirectly dependent on humans and limit my interactions with their species to a casual or temporary basis
- I live in groups with other unowned cats in common aggregation sites infrequently visited by humans such as forest patches, food outlets and coastal fishing spots associated with urban environments
- I can establish territories that vary considerably in size, which can range from 7 to 28 hectares (17–69 acres)
- Unlike domestic cats who use many vocalisations to communicate, I am generally quiet
- I am a skilled hunter often known to prey on small mammals and native wildlife including, birds, bats, reptiles, amphibians, fish and insects, killing prey up to the size of a brush-tail possum

CHALLENGES • CONCERNS • FEARS

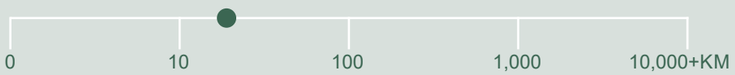
This section describes the trials and barriers to my thriving in Puhinui Catchment

- My habitat relies on the presence of food and shelter
- I am seen as a threat to native animals
- I fear the risk of disease and infection
- I am challenged by weather extremes and the endless cycle of pregnancy
- Competition for territory and food often results in injury and infection

This section describes my relationship to others and the wider catchment

Degree of sociability to meet needs

Range of involvement in catchment and beyond



Home/habitat in catchment

I am present throughout the catchment

NEEDS • GOALS

This section describes what I need to survive, reproduce and thrive in Puhinui Catchment today

- I need responsible pet ownership
- Return (TRN) Programmes are great for controlling the population, health and welfare of cats living in colonies and managing our and manage our impact on native environments
- Adoption and re-homing is my life long goal

Copper Skink

I am the smallest of New Zealand's lizards at 120mm long, half of which is my tail. I am brown on top with a cream underbelly, and have a light coppery line from my eye to the base of my tail. When I have offspring, I do not lay eggs but I have live young. You'll mostly find me in moist areas such as rock gardens or compost heaps. As an adult, I maintain a small solitary home range.

LIFESPAN: 60+ years

STATUS: Not threatened

HABITAT: Moist areas

ECOSYSTEMS FUNCTION / SERVICES: Pollinator of native shrubs; Insect pest control

CHARACTERISTICS • BEHAVIOURS • NICHE

This section describes this my behaviours and role in the local ecosystem

- I am bold and well established in urban and residential areas.
- I am able to adapt relatively well to habitat change
- My preferred living environment is on the ground in open or shaded areas with sufficient cover. However, I am a big fan of moist and humid areas such as compost bins
- I am most active early and late in the day
- I am largely carnivorous and my diet consists of insects, spiders, crustaceans and small snails
- Like all skinks, we copper skinks readily shed our tails to escape predators
- We mate in spring before giving birth in 3-4 months to between 3-7 relatively large offspring in late summer

CHALLENGES • CONCERNS • FEARS

This section describes the trials and barriers to my thriving in Puhinui Catchment

- I pose a threat to human health as lizards are known to be carriers of diseases such as salmonella and cryptosporidium
- I fear habitat loss and predation by introduced animals such as cats, rodents and hedgehogs
- I am often in competition with Rainbow Skinks for habitat and resources

This section describes my relationship to others and the wider catchment

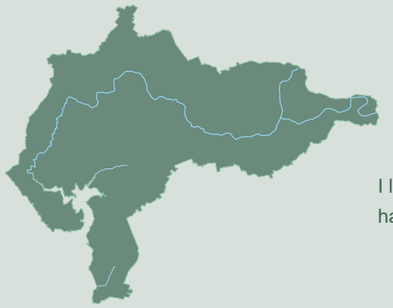
Degree of sociability to meet needs

Lives / Works Alone — *Highly Collaborative*

Range of involvement in catchment and beyond

0 | 10 | 100 | 1,000 | 10,000+KM

Home/habitat in catchment



I live throughout the catchment in moist habitats

NEEDS • GOALS

This section describes what I need to survive, reproduce and thrive in Puhinui Catchment today

- I need a form of protection against predators and other species competing for habitat and resources
- I need re-vegetation and enhancement of habitat

Long-tail bat / Pekapeka tou roa

I am one of two surviving bat species endemic to New Zealand. I am a small brown bat weighing between 8–12 g with a long tail connected by a patygium to my hind legs which is a distinguishing feature from the lesser short-tailed bat. I can fly at 60 kilometres per hour, and have a very large home range of up to 100 km². I am very selective when choosing roost trees and prefer tall roosts of large diameter located in areas of lower tree density. We roost in small cavities within the trees that have high temperatures and humidity. By the age of 2, females are able to give birth to their first pup during summer. Gathering with other females in maternity roosts of up to 120 bats we are able to provide sole care for our young.

LIFESPAN:	9+ years
STATUS:	Endangered
HABITAT:	Old tree cavities
ECOSYSTEMS FUNCTION / SERVICES:	Insect pest control

CHARACTERISTICS • BEHAVIOURS • NICHE

This section describes this my behaviours and role in the local ecosystem

- I like streams and other corridors that can be used for hunting and travelling
- My echolocation calls include a relatively low frequency component which can at times be heard by some people
- I love to snuggle under loose bark of kauri trees
- During the summer, I fly out and feed on warm nights and sleep upside down during the day in small groups inside old trees or under loose bark. I roost in native and exotic trees.
- I am known as an insect generalist, although flies and mosquitoes are my most significant food source, I will consume insects that are abundant in my environment which may include moths and beetles - I can eat up to 1000 mosquitoes per night
- Female and males co habitat in the same roost until the female gives birth. When the pups are born, the males move to a different roost

CHALLENGES • CONCERNS • FEARS

This section describes the trials and barriers to my thriving in Puhinui Catchment

- 3/4 of roost trees are over 100 years old. Therefore I fear the loss / removal of big, old trees that I can roost in such as typical old trees in Te Puhinui like kauri
- Lack of nature corridors
- Kauri dieback
- My population is forecast to drop by 70% in the next few years
- Poor stream quality reduces my source of food
- I fear local predators such as ruru / morepork, wasps, stoats, ferrets, rats, cats and possums
- When the temperature drops below 10 degrees, I stay in roost and go into hibernation. In this state I cannot be disturbed and become very vulnerable to tree felling and predators as we are often attacked during this time.

This section describes my relationship to others and the wider catchment

Degree of sociability to meet needs

Range of involvement in catchment and beyond

Home/habitat in catchment

I live in areas with large old trees, and live to hunt along vegetated corridors like streams. Currently our potential habitat is limited to the upper catchment

NEEDS • GOALS

This section describes what I need to survive, reproduce and thrive in Puhinui Catchment today

- I am dependent on hunting grounds that are inhabited by flying insects
- I need to be able to navigate open corridors like streams to feed and have connected corridors to areas of suitable roosting habitat
- I require old trees to roost in such as puuriri, pine and kauri trees
- I am most vulnerable when I go into hibernation and need protection from predators
- Stream planting initiatives and regulation of cutting down big old trees could increase our habitat

NZ Glow worm / Titiwai

I am the larvae of a fly family known as a fungus gnat. In Maaori I am known as titiwai, meaning lights reflected in water. I can glow at all stages of my life cycle except as an egg and am my brightest as a larva. On the banks of Puhinui Stream I only glow at night. However, when I am disturbed, I hide my light by slithering into a crevice. I can set up to 70 snares that vary in length from under 1 cm to 50 cm.

LIFESPAN: One year life cycle

STATUS: Rare, threatened

HABITAT: Covered native bush. High humidity

ECOSYSTEMS FUNCTION / SERVICES: Insect pest conrtol; Food source for birds

CHARACTERISTICS • BEHAVIOURS • NICHE

This section describes this my behaviours and role in the local ecosystem

- To catch prey, I set up snares of sticky silk, beads of mucus threads. Insects then fly toward my light, mistaking it for the moon and freedom. Once caught in my snare, their struggle alerts me to pull the thread with my mouth allowing me to kill and eat my prey
- In forest dwellings I can only set up 1-2cm long lines in my snare because they can get tangled in the breeze if they are longer
- I live side by side other titiwai on a damp sheltered surface such as a roof of a cave or overhanging bank in the forest or streams edge
- I glow to attack my prey which includes small midges, moths, mayflies and other small insects that may get caught
- As a larva I am terrestrial, and will fight if my space is invaded

CHALLENGES • CONCERNS • FEARS

This section describes the trials and barriers to my thriving in Puhinui Catchment

- A significant threat for me is flooding as I get washed away in large rain events
- Lack of stream vegetation and cover is a significant challenge
- I fear bank instability and erosion
- Poor water quality is a challenge as it limits the food that usually live in and around the stream
- I fear local predators such as long legged harvestman (relatives of spiders)

This section describes my relationship to others and the wider catchment

Degree of sociability to meet needs

Lives / Works Alone — *Highly Collaborative*

Range of involvement in catchment and beyond

0 — 10 — 100 — 1,000 — 10,000+KM

Home/habitat in catchment

I live on stream banks in the upper catchment of Puhinui Stream, primarily in Totara Park and Botanic Gardens. With more stream planting my range could increase

NEEDS • GOALS

This section describes what I need to survive, reproduce and thrive in Puhinui Catchment today

- I need bank stability to protect me from flooding and large rain events washing me out
- Stream cover and shelter is important for my habitat
- I need regular stream base flow
- I thrive in damp places where air is humid and still to construct snares such as moist banks besides streams or ravines

Fern bird / Maataataa

I am a small, long-tailed songbird that is streaked brown above and pale below. I have a chestnut cap and my brown tail feathers have a distinctive tattered appearance. I am 18cm tall; I weigh 35 grams. I am a poor flier and prefer to live out of sight in wetlands and dense vegetation where I feed on insects as well as fruit and seeds. You won't often see me, but you can hear my characteristic 'u-tick' call which I sing in a duet with my partner. We are extremely secretive and often remain hidden in thick vegetation, creeping around like a mouse when we venture out. We prefer not to fly, however, when we do, our flight is weak, noisy and low to the ground. However, we often approach observers closely, especially in response to mimicked calls.

LIFESPAN:	6.5 years
STATUS:	At risk - Declining
HABITAT:	Wetlands and dense vegetation
ECOSYSTEMS FUNCTION / SERVICES:	Insect control; seed distributor and pollinator

CHARACTERISTICS • BEHAVIOURS • NICHE

This section describes this my behaviours and role in the local ecosystem

- I live in wetlands but can also be found in dense vegetation
- I can lay up to 4 eggs in a deep, woven feather-lined nest made of fine grass and sedge
- My nests are in dense vegetation and are usually less than one meter above the ground
- I feed on insects, especially caterpillars, flies, beetles, moths, spiders and other small invertebrates but can also eat seeds and fruit
- I am a bad flier and tend to scramble through dense vegetation, flying for only short distances at a time
- I control the population of pest insects and spread seeds across my habitat, I also help pollInate plants

CHALLENGES • CONCERNS • FEARS

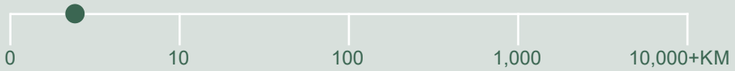
This section describes the trials and barriers to my thriving in Puhinui Catchment

- I am a bad flier, so I am very susceptible to predation from domestic and pest animals such as rats, cats, dogs and mustelids
- Loss of habitat is a big impact for me, and I cannot easily fly to a new home
- Because my nests are near the ground, they can be destroyed by animals and humans, which is a constant fear
- Drainage of wetlands and conversion to pasture, combined with predation by introduced mammals has resulted in a significant decline in my population

This section describes my relationship to others and the wider catchment

Degree of sociability to meet needs

Range of involvement in catchment and beyond



Home/habitat in catchment

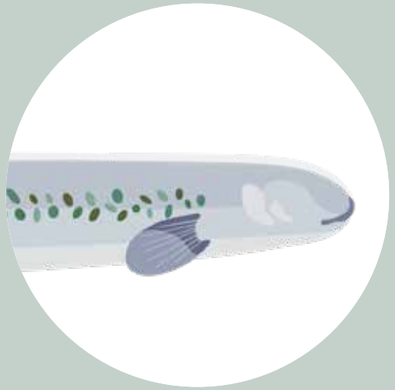
My primary habitat in Te Puhinui is in the wetlands along the Manukau harbour

NEEDS • GOALS

This section describes what I need to survive, reproduce and thrive in Puhinui Catchment today

- I need wetland and native bush protection and restoration
- I am dependent on the presence of high quality and ecologically diverse habitats and rich food supplies
- Habitat destruction and predation from domestic and pest animals are my biggest threat, therefore, pest / animal predator control is important
- In order to successfully breed our nests cannot be disturbed
- Dogs need to be kept away from dense vegetation or put on a leash in areas where I may be nesting

Inanga / Matamata



I am one of whitebait species found in New Zealand and am the smallest migratory galaxiid. I have a long, slim body with a distinctive silver belly and olive coloured spots. I can grow to 11 cm in length and have no scales. I live in gently flowing coastal streams and rivers where I feed on tiny insects. I spend part of my life cycle in freshwater and part at sea. I lay eggs in dense shady vegetation along the stream edge near the saline interface. When my eggs hatch, the larvae are carried out to sea and grow quickly into juvenile fish (whitebait). The juveniles then swim back upstream to where they were born and mature. As we swim upstream, we serve as an important food source for eels and birds. We also are caught as whitebait during our migration.

LIFESPAN:	1- 2 years
STATUS:	At risk - Declining
HABITAT:	Gentle sloping lowland freshwater environments near the coast
ECOSYSTEMS FUNCTION / SERVICES:	Food source for aquatic fauna and birds

CHARACTERISTICS • BEHAVIOURS • NICHE

This section describes this my behaviours and role in the local ecosystem

- I live in freshwater environments such as streams, rivers, wetlands and lakes close to the coast for 6 months of my life and spend the other 6 months at sea
- I am a food source for a variety of aquatic fauna and birds that inhabit riparian margins. I am an important food source for eels and birds that live near streams and rivers. Humans also like to eat me
- You can tell me apart from other whitebait because I have a tiny black mouth and a long slim body with spots
- I lay eggs in the dense shaded vegetation along the stream
- Our larvae go out to sea through the Manukau Harbour where they grow into juveniles before swimming up the the estuaries and back into the streams where they were born
- I feed on small insects and can grow to 11cm in length

CHALLENGES • CONCERNS • FEARS

This section describes the trials and barriers to my thriving in Puhinui Catchment

- I am a bad climber, so artificial barriers prevent me from migrating upstream to lay eggs and find habitat to feed and mature
- Habitat loss, restricted fish passage and overfishing are my biggest threats
- I fear whitebait fisherman as they catch many of us
- Competition from invasive species reduce our numbers
- Modifications and loss of streams and riparian vegetation take our habitat away, including the coastal habitat that we need to lay our eggs
- Erosion and bad water quality is a constraint to our habitat and our health
- I don’t travel long distances inland

This section describes my relationship to others and the wider catchment

Degree of sociability to meet needs

Lives / Works Alone — *Highly Collaborative*

Range of involvement in catchment and beyond

0 | 10 | 100 | 1,000 | 10,000+KM

Home/habitat in catchment

I can be found throughout Puhinui Catchment but find it difficult to reach the upper catchment due to artificial stream barriers that prevent me from swimming upstream

NEEDS • GOALS

This section describes what I need to survive, reproduce and thrive in Puhinui Catchment today

- I need low elevation, gentle sloping and shaded stream banks near the coastal environment to lay eggs in
- Stream-side plants will protect us from extreme temperatures. We need instream habitat such as undercut banks, vegetation and woody debris
- A clear path upstream free of artificial barriers will allow me to travel upstream without difficulty
- I need good water quality, treatment, interventions and incentives to maintain a healthy habitat
- Fishing regulations will prevent fisherman from catching too many of us

Project Twin Streams

Location_ *West Auckland*

Size / Scale_ *56km of stream banks*

Date_ *Started 2003 - today*

Who is involved_ *Waitaakere Ranges and Henderson-Massey Local Boards, Parks, Sports and Recreation, Community Waitakere, EcoMatters, MPHS and Te Ukaipo and local community members.*

Website Links_
http://projecttwinstreams.com

Source: Auckland Council

Purpose of Initiative / Project Drivers

Project Twin Streams (PTS) is an innovative multi-faceted large scale project focused on long-term catchment management of the Henderson Creek and Huruhuru Creek catchments through a community development approach. Multiple agencies and organisations work collaboratively to engage West Auckland communities around sustainability and ecological restoration of the streams in their local neighbourhoods. At the heart of PTS is an approach that puts local people at the centre of thinking and action. It seeks to work in ways that achieve wider environmental, social, cultural and economic outcomes with stream restoration being the catalyst for achieving these.

Project Scope

Project Twin Streams was, until November 2010, delivered by Waitaakere City Council (WCC) in partnership with local organisations and communities. It is now maintained by Parks, Sports and Recreation within Auckland Council. The area covered in the project needed to be broken down into geographical areas for ease of management. A new style of contract and contracting process established by PTS meant that four local community organisations had significant input into what was to be delivered and how it was delivered. The contracts had base funding plus a planting incentive where the community organisations were paid a per plant amount for each plant in the ground. Community organisations are still involved in the ongoing maintenance of stream corridors.

Resources / Funding / Costs

The funding for the stream restoration component of Project Twin Streams came from an Infrastructure Auckland grant administered by Auckland Regional Holdings with the remainder of the ‘big picture’ work funded through existing council programmes – based on the former Waitaakere City Council’s strategy of doing things in an integrated and ecologically focused way.

Lessons Learnt

- Community art and education are effective means of engaging otherwise disengaged communities in the environment.
- Have council and community champions who understand the process and the benefits.
- Trust building between council and the community takes time and patience.
- Give organisations the resources they need – don’t over or under resource.
- Enable and support the opportunity for creative thinking.
- It may be necessary for the local authority to let go of control.
- Resist attempts to have a “one size fits all” approach.
- Socially procuring community organisations to engage and work with locals builds multiple forms of capital which lead to long term community capability and capacity building.
- Arts has a key role to play in keeping community groups and schools interested and participating.
- Ensure that values and outcomes for both the council and the contracting organisations are aligned.
- The long term strategic costs of not developing a sustainable catchment are huge.
- An agreed approach to accountability and dialogue systems need to be clearly established early on to create equal partnerships.

Limitations / Issues / Challenges

- A lack of an evaluation framework and base data make demonstrating effectiveness on several metrics difficult.
- It took a long time to frame the delivery of the programme in a community development model.
- How to measure community cohesion and social capital remains problematic.

Achievements & Successes

- 8,881,446 native trees and shrubs planted.
- 4212.8km^2 of weed removal.
- 65,000 hours of volunteer hours engaged in restoration and education (so far).
- 9.3km walkways created.
- 37.3hectares bought and converted to stormwater reserves.
- Over 98 art projects completed.
- 81 house and land purchases.
- Developed Project Twin Streams branding for whole project as well as local PTS area branding, creating strong sense of identity.
- Community engagement approach has built community responsibility, a sense of pride and resilience.

Te Auaunga Stream Restoration

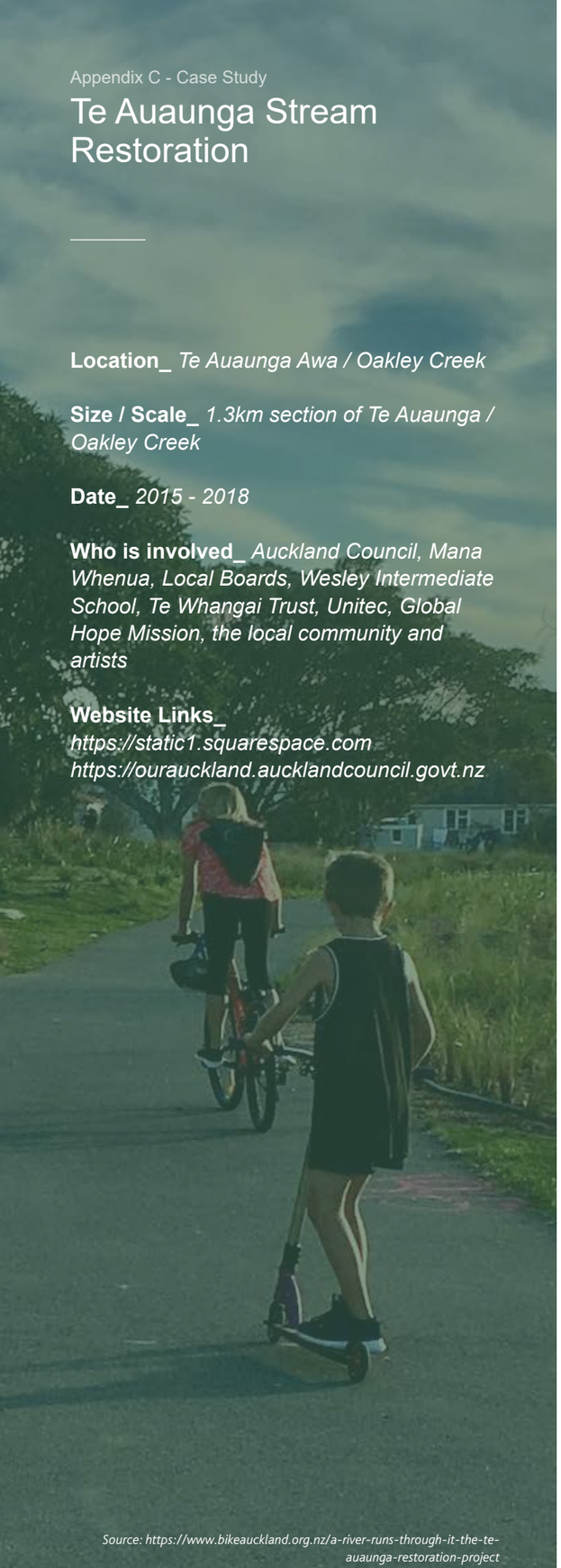
Location_ *Te Auaunga Awa / Oakley Creek*

Size / Scale_ *1.3km section of Te Auaunga / Oakley Creek*

Date_ *2015 - 2018*

Who is involved_ *Auckland Council, Mana Whenua, Local Boards, Wesley Intermediate School, Te Whangai Trust, Unitec, Global Hope Mission, the local community and artists*

Website Links_
https://static1.squarespace.com
https://ourauckland.aucklandcouncil.govt.nz



Source: https://www.bikeauckland.org.nz/a-river-runs-through-it-the-te-auaunga-restoration-project

Purpose of Initiative / Project Drivers

Te Auaunga stream restoration was a council led initiative to naturalise and restore the health of the awa and reduce flooding risks to surrounding residences. The long-term aim was to integrate maatauranga Maaori and environmentally sustainable practices to revitalise the mauri of Te Auaunga / Oakley Creek through kaitiakitanga / guardianship. Auckland Council's Healthy Waters adopted a holistic community engagement approach involving a partnership with Mana Whenua and engagement with schools, tertiary institutes, and the local community to develop the concept and design. Wider sustainable outcomes were pursued via two specific social procurement avenues:

- A youth employment initiative - a trade training certificate (arranged, verified and delivered by Unitec Institute of Technology) was offered to seventeen local unemployed young people.
- The establishment of a native plant nursery in partnership with Te Whangai Trust and Wesley Intermediate School to provide the 100,000 native plants required for the project.

Project Scope

The project area is located along Te Auaunga / Oakley Creek, through Underwood and Walmsley Parks in Mount Roskill. It has included 1.3km of the awa being restored, seven piped tributaries daylighted and eight hectares of open space revitalised through a series of shared pathways, pedestrian bridges, community orchards, an outdoor classroom, and a community fale and aatea space. Natural play areas with ngaa taonga taakaro interpret the environmental and cultural narratives of the site.

Co-design and governance was facilitated through meetings and design workshops with Mana Whenua, community liaison groups, public open days, and schools.

Resources / Funding / Costs

The budget was $25 million provided by Auckland Council.

Lessons Learnt

- The importance of understanding the difference between engagement with a Tiriti partner and consultation with the public.
- Robust project officer support is required to manage relationships with treaty partners, key stakeholders and local community engagement.
- Terms of Reference with strategic parties outlining how the relationship will function needs to be developed at the start of a project.
- Improvements to the cultural competence of council staff, knowledge and appreciation of the history of Te Tiriti o Waitangi, the role of iwi as Tiriti partners, and familiarity with Maaori language and customs.
- Engage early to avoid time pressures encroaching on the engagement process.
- Investigate more creative ways of engaging the community and ways to connect community groups and Mana Whenua.
- Applying an adaptable approach to the design process helps accommodate changes that occur during the construction process.
- Materials found on site can be a great unplanned asset to integrate into design details.

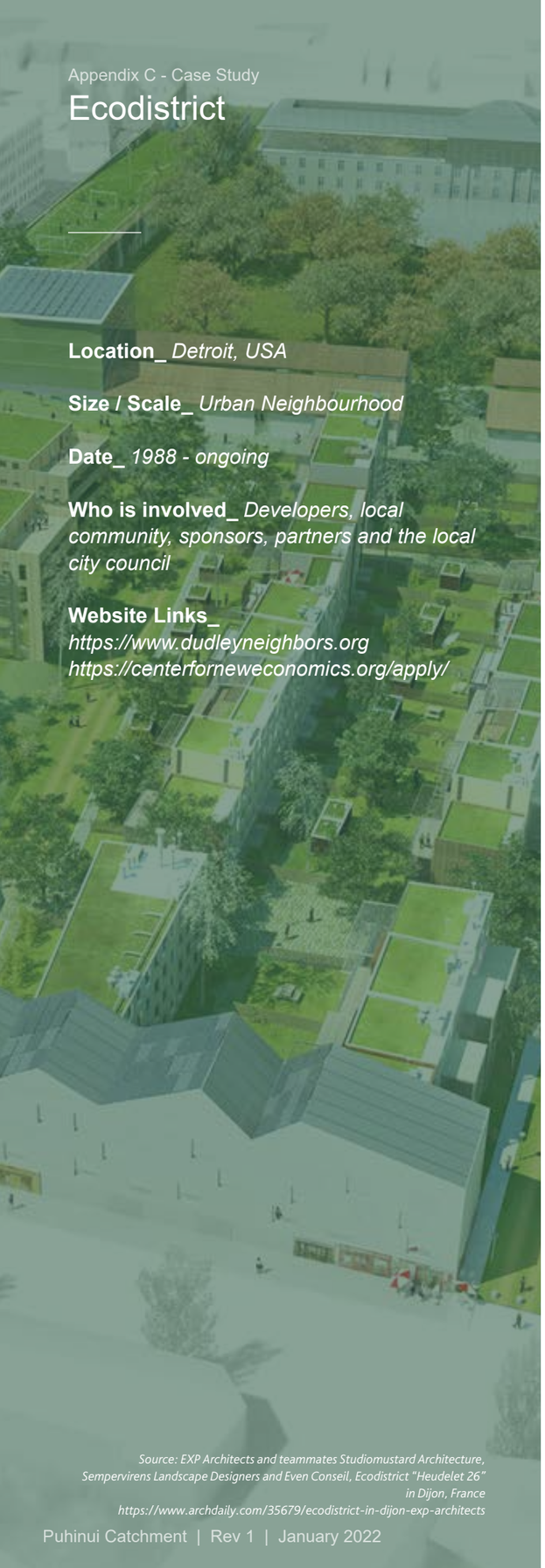
Limitations / Issues / Challenges

- The council's Healthy Waters department didn't have a relationship with Mana Whenua at the start of the project.
- Lack of consistent coordination with Mana Whenua resulted in Mana Whenua feeling that they had been excluded from some major decisions and at times felt they had been dropped from the project.
- Some partners and stakeholders – Mana Whenua in particular – reported significant capacity constraints for attending project meetings.

Achievements & Successes

- Completed on time and on budget
- The project reduced flooding and improved water quality of the awa, as well as increased access to and amenity of the creek and surrounding open space.
- A measurable improvement in quantity and quality of the native habitat of the awa and its surrounds.
- The establishment of a native nursery facilitated ongoing supply for riparian planting.
- The partnership with Te Whangai Trust produced employment for over 20 unemployed locals.
- Benefits to Wesley Intermediate School:
  - The new nursery raised the profile of the school and improved the community's perception of the school.
  - Rent/ lease payments from nursery and a reduced grounds maintenance cost.
  - Reduced vandalism.
  - Curriculum development - a new context for children to engage with their natural environment and extend the boundaries of the classroom.
- The evaluation as a whole shows that this project's engagement was a meaningful shift in the way the council involves key partners and stakeholders in major infrastructure projects.

Ecodistrict



Location_ *Detroit, USA*

Size / Scale_ *Urban Neighbourhood*

Date_ *1988 - ongoing*

Who is involved_ *Developers, local community, sponsors, partners and the local city council*

Website Links_
https://www.dudleyneighbors.org
https://centerforneweconomics.org/apply/

Source: EXP Architects and teammates Studiomustard Architecture, Sempervirens Landscape Designers and Even Conseil, Ecodistrict "Heudelet 26" in Dijon, France
https://www.archdaily.com/35679/ecodistrict-in-dijon-exp-architects

Purpose of Initiative / Project Drivers

Ecodistricts are urban areas designed and organized with a commitment to sustainable development principles and are driven by three main objectives: to limit their environmental impact, to promote social cohesion, and to develop economic viability through smart infrastructure and behavior. The ecodistrict approach views buildings not as individual entities but as nterconnected structures capable of producing and sharing resources like water and energy. It is considered that only through such interconnectedness that carbon neutral design will be possible on an economically viable scale.

Project Scope

The goals and potential of sustainable cities is focused on individual neighbourhoods as the key unit to building sustainable cities. These are neighbourhoods that;

- Share infrastructure such as heat generation and ventilation, rainwater harvesting facilities, wastewater management, on-site renewable energy generation, and local food production;
- Prioritises pedestrians and cyclists and access to public transport;
- Combines mixed residential and commercial developments, neighbourhood scale parks, schools, community centres and services, and enhanced IT infrastructure.

Resources / Funding / Costs

Local councils, private developers, land and business owners or philanthropists exploring and investing in a systemic approach to sustainable design and community governance.

Lessons Learnt

- What a district will look like, or how exactly it will operate, is still being debated and considered – there is no fixed representation as they are often highly case-specific.
- It is important to the viability of an eco district that social systems are supported and vibrant.

Limitations / Issues / Challenges

- Neighbourhood development is complex, can be messy and requires strong leadership and collaboration.
- Legislation along with council codes and policies need to support green infrastructure.
- Further investigation into on site renewable energy generation in high density urban areas is required.
- Surface area constraints exist for solar collection and wind generation in dense urban environments.

Achievements & Successes

- Revitalized healthier communities
- Creation of new education and employment opportunities
- There is a shift to seeing sustainability, especially as it relates to resilience, as a potential economic engine.
- The technology around green energy and biogasification systems have developed and can now be augmented with other renewable energy sources, increasing their viability. Methane and carbon dioxide rich biogas produced from locally sourced food waste can be utilised for on site energy production.
- Ecodistricts have made on-site wastewater treatment scalable, spreading the cost of the system over more users and utilizing treated water for more uses.
- Green technology has increased in popularity and an increased profile and development of green buildings
- General waste is reduced and recycling is increasing in eco district neighbourhoods
- Green water management and harvesting reduces flow and demand on municipal stormwater systems
- Composted food waste is used as nutrient rich fertilizer on a larger scale.
- Waste heat generated from composting has started to be used to generate hot water within eco districts.

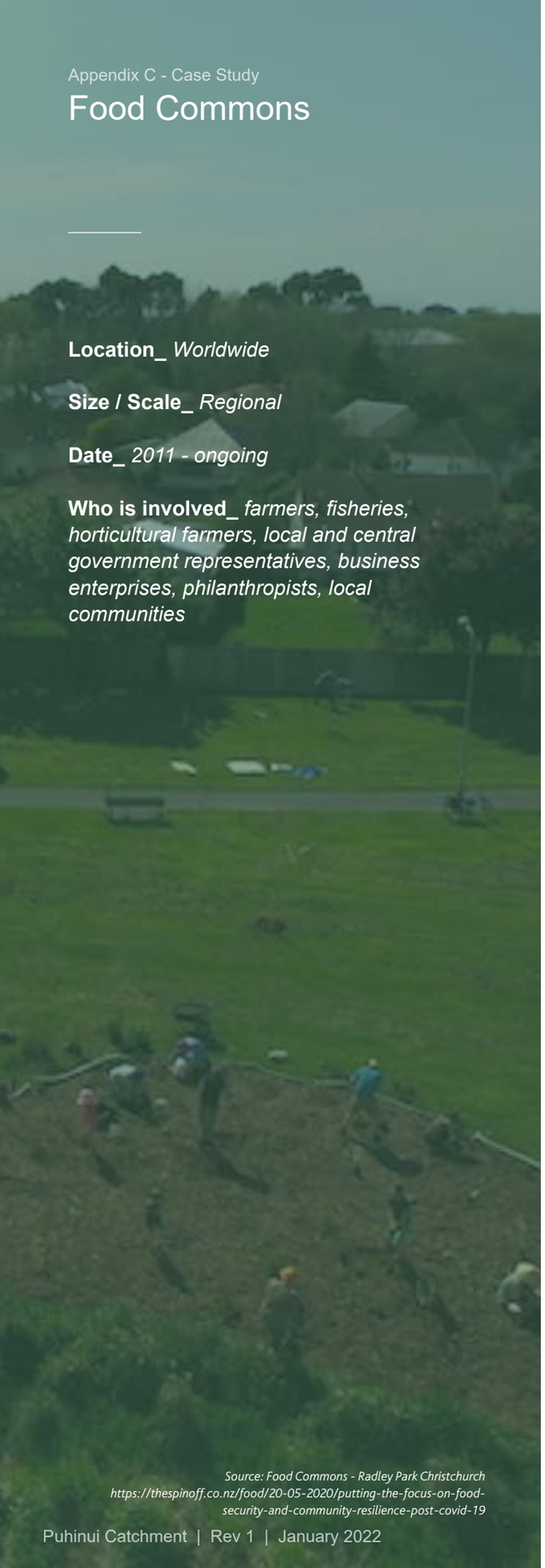
Food Commons

Location_ *Worldwide*

Size / Scale_ *Regional*

Date_ *2011 - ongoing*

Who is involved_ *farmers, fisheries, horticultural farmers, local and central government representatives, business enterprises, philanthropists, local communities*



Source: Food Commons - Radley Park Christchurch https://thespinoff.co.nz/food/20-05-2020/putting-the-focus-on-food-security-and-community-resilience-post-covid-19

Purpose of Initiative / Project Drivers

Urged by a wake up call of the 2008 recession the Food Commons concept was born. It is a regional, whole systems demonstration project, which can serve as a model for actualizing a food revolution in communities everywhere. It has taken an alternative path by re-envisioning and re-creation of the local and regional food systems that preceded the current global industrial food systems.

The objectives of Food Commons is to:

- Make healthy and sustainably produced food accessible and affordable to all.
- Enable food enterprises within and across foodsheds to efficiently produce and exchange goods and services that meet high common standards.
- Capture benefits of scale in infrastructure, asset management, financing, information systems, marketing, and learning, while preserving local identity, ownership, control, diversification and accountability.
- Transparently and equitably distribute common benefits along the value chain from farmers, and fishers to distributors, processors, retailers, workers, consumers, and communities.
- Harness underutilized foodshed assets and protect and steward those assets for current and future generations.
- Create a wealth of new small businesses and jobs and build a skilled and respected 21st-century food system workforce .

Project Scope

The Food Commons is a nationally networked system of physical, financial and organizational infrastructure that allows local and regional markets to operate efficiently and foodshed-based enterprises to cooperate, compete and thrive according to the principles of sustainability, fairness, and public accountability. It is a whole systems approach to localized food economies.

Resources / Funding / Costs

Government grants, donations of assets and equipment, philanthropic funds, investors.

Lessons Learnt

The vision is to strengthen the overall food system by expanding and diversifying the number of individuals and businesses participating in food supply chains, providing communities with the opportunity to invest in and control the means of their own food security, and increasing consumer choice and access to foods produced in accordance with commonly shared principles of fairness, sustainability and accountability.

The most effective way to establish the commercial viability and value of the Food Commons model will be to create a highly successful prototype in at least one major metropolitan area and demonstrate the goals clearly.

Important to locate the Food Common Centres:

- To be easily accessed by foot, bike or public transport.
- In proximity to main road networks for efficient movement of goods.
- Availability in or near unused facilities such as retail or warehouse space.

The process of creating and implementing a prototype will include 4 phases:

- Feasibility study and system design-assess potential profitability;
- Business planning - approach investors for start up funding;
- Financial development - secure capital through the guidance of the business plan;
- Operation - employees primarily drawn from residents of the community served.
- Feasibility to launch likely to take around 5 years but component enterprises may be able to begin after 1-2 years.

Homesteading / RetroSuburbia

Location_ *Hubert Street, Perth, Australia*

Size / Scale_ *Suburban and Urban proportion*

Date_ *2007 - ongoing*

Who is involved_ *Property owners and the local community*

Oliver Holmgren
Source: https://retrosuburbia.com/mec-events/hibi-farm-home-tour

Purpose of Initiative / Project Drivers

Retrosuburbia refers to the desire to change and upgrade a suburban house/apartment and available outdoor space by applying permaculture ethics and principles to be more self-sustained, less dependent on industrial society and become more in tune with local surpluses and limits.

Permaculture ethics and design principles:
- Earth care
- People care
- Surplus share

Project Scope

Ecoburbia is an infill development created out of a quarter acre section with a 1970s house that was surrounded by subdivided blocks in suburban Melbourne. The property was converted into five self contained units, an urban farm of chickens, goats, composting infrastructure, fruit trees and large veggie patch.
Water to the property is supplied by a 35m deep bore, serving the toilet, bathrooms and gardens, additionally a 50,000 litre tank was built underground and is used for rain collection and drinking water. Grey water is collected and is used to water the vege gardens and trees.
7.5 kilowatt solar array powers all five residences and a series of wood burners in the south facing dwellings provide winter heating. A shared space in the main house is used for community activities and education such as evenings learning about upcycling.

The goats are milked daily and cheese is made from their milk. Excess produce created on the property is used to trade/ barter for other products needed. The enthusiasm within this sustainable eco property spread around local streets and resulted in creating a more sustainable, inclusive, resilient and connected community.

Resources / Funding / Costs

Self funded, income is received from the four rental dwellings on the property. Street activities developed from lots of volunteering and recycling or upcycling of goods and a shared resource system.

Lessons Learnt

- Designing the site using permaculture principles utilises every space on the property to its highest productivity level.
- Driven by a desire to live more sustainably, the owners of the property started sharing and engaging with their street neighbours.
- Communal activities started small - such as a street gathering to make mosaics for the ugly water tank at end of the street, and weekly afternoon tea sessions.
- Creating fun activities led to more people feeling comfortable to get involved. Community street parties, street verge planting days, the building of a shared skateboard ramp, the street started to become more about people, connections and community rather than cars.

Limitations / Issues / Challenges

- Living more communally may limit acceptance by the local community or neighbours.
- Council regulations may cause some restrictions to land use.
- Soil needs to be of a quality to sustain a variety of crops, trees etc.
- Harvesting enough water storage for house and garden.
- Leaving the garden for a few weeks.
- Attacks by local dogs or other animals on yard stock i.e chickens.
- Developing clear and healthy relationships with people involved in shared living.

Achievements & Successes

- Creation of a very strong unintentional community based on fun, trust and sharing.
- The establishment of guerilla gardens for extra veggie production on public owned land - no permission sought.
- A mobile street cafe used for Friday night hangout.
- On street movie nights.
- A mobile pizza oven which is owned by the street community.
- An annual street fiesta celebrating sustainable living has grown huge and extended into the wider neighbourhood.

Dudley Neighbourhood Initiative

Location_ *Boston, USA*

Size / Scale_ *12 hectares*

Date_ *1988 - ongoing*

Who is involved_ *Local community, sponsors, partners and the local city council*

Website Links_
dudleyneighbors
centerforneweconomics

Source: https://www.dudleyneighbors.org

Purpose of Initiative / Project Drivers

A Community Land Trust (CLT) structures ownership in several distinctive ways:

- Land is treated as a common heritage, not as an individual possession. Title to multiple parcels is held by a single nonprofit owner that manages these lands on behalf of a particular community, present and future.
- Land is removed permanently from the market, never resold by the nonprofit owner.
- Land is put to use by leasing out individual parcels for the construction of housing, the production of food, the development of commercial enterprises, or the promotion of other activities that support individual livelihood or community life.
- All structural improvements are owned separately from the land
- A ground lease lasting many years gives the owners of these structural improvements the exclusive use of the land beneath their buildings, securing their individual interests while protecting the interests of the larger community.

Project Scope

Dudley neighbourhoods is an area in central Boston,U.S.A that in the early 80s was a very run down, low income, multicultural area.
By the late 80s the Dudley Neighbourhood Initiative (DNI) was established to clean up and gather residents together to address and change the situation. The DNI developed a masterplan by employing and working with local planners and designers. The local city council supported this initiative and adopted the plan and granted power of eminent domain over much of the vacant land.

50% of the homeowners on the land trust earn between US $20-40k/year (approx 60 - 70,000 $NZ) and 80% of families earn less than $70k/yr (approx $NZ 100,000).

Dudley Neighbourhoods is now a 30 acre area of community controlled land and consists of:

- 225 permanently affordable homes - includes 95 owner- occupied units, along with 77 cooperative units and 53 rental units;
- urban farm sites;
- parks and open space; and
- commercial properties for use by local small businesses, not-for-profit organizations, and affordable rental housing providers.
-

Decisions about the land trust are made by a community board that includes residents, leaseholders and representatives from city and elected officials. Homes are deed-restricted so the sale price cannot inflate along with the market.

Resources / Funding / Costs

The project has cost $134 million U.S dollars of public funding.
Community volunteer work has created many of the planting and garden projects. Youth have been activated from the very beginning to participate in many of the volunteer projects.
Collaboration with some major partners and supporters, such as the Ford Foundation, The National Community Land Trust Network, The Urban Farming Institute and The Food Project, among others.

Lessons Learnt

The area had been used as an illegal dumping ground for a long time. As the community voluntarily started to clean up the streets and empty lots, the area started to be noticed again by developers and the threat of gentrification became a very noticeable threat to the DNI vision. This was when the DNI stepped up their programme and employed planners/designers to help design their masterplan and get serious about delivering their vision.

Having a local city council receptive to the vision, the masterplan and then granting power of eminent domain over the land.

Limitations / Issues / Challenges_

The key challenge expressed by one of the key players in developing the DNI was to develop confidence in the community and individuals to speak and stand up, to strive, fight and maintain hope to activate change.

Getting relevant information out to the multicultural and multilingual community was also a challenge. Using various radio shows was one of the key ways this was managed.

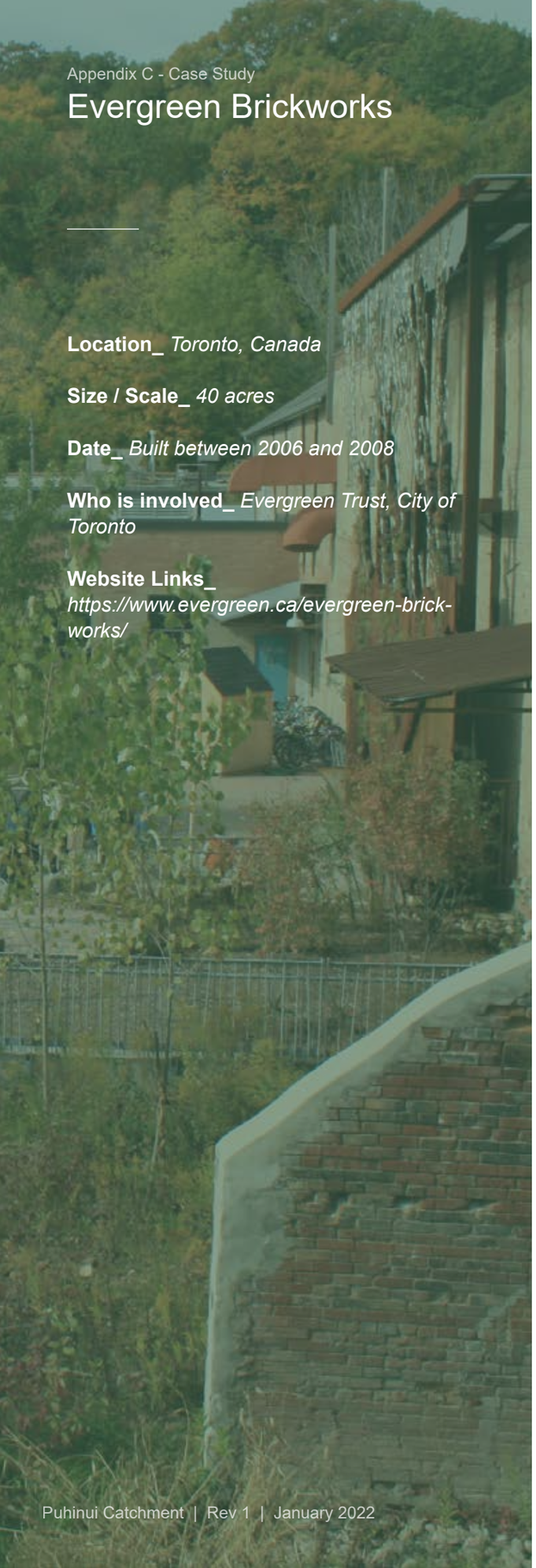
Achievements & Successes

Only 4 homes have foreclosed since DNI started. Even though banks are not obliged to, so far, all banks have opted to keep the foreclosed homes as part of the land trust.

After buying a house the DNI provides support by organizing quarterly (or as needed) workshops on different topics including home maintenance and repair, refinancing, financial planning, taxes and residential tax exemption and anything that homeowners are looking for.

The West Cottage Farm is a 1 1/2 acre site that was transferred from the City of Boston to Dudley Neighbours Inc. in 2013. DNI has a long-term lease with partner The Food Project to manage this urban farm and to use the food grown to support the Dudley Town Common farmers' market and several local hunger relief organizations.

Evergreen Brickworks



Location_ *Toronto, Canada*

Size / Scale_ *40 acres*

Date_ *Built between 2006 and 2008*

Who is involved_ *Evergreen Trust, City of Toronto*

Website Links_
https://www.evergreen.ca/evergreen-brick-works/

Purpose of Initiative / Project Drivers

Evergreen transformed a collection of deteriorating heritage brickwork buildings into a global showcase for green design and an award-winning public space. The purpose of the project is to inspire action to green cities driven by the belief that people have the power to enact change and improve the health of our cities.

Project Scope

Evergreen Brick Works is Canada's first large-scale community environmental centre,. It is a dynamic venue for exploring ideas and leading-edge green technologies, and a vibrant public space where visitors can engage in a broad suite of hands-on environmental programming.

Throughout the campus, people can experience new practices that challenge the way they live in cities: Evergreen Brick Works is a dynamic hub that connects citizens, business, academia and government in order to shape our cities for the better.

Resources / Funding / Costs_

$55 million Canadian dollars over 8 years

Lessons Learnt

Originally having the great idea of what to do was seen as being 80% of the project. However it became clear that having good leadership was 90% the most important part of the project.

Limitations / Issues / Challenges

It took a lot of convincing city council and investors that there was value in the dilapidated heritage site.
Working out how to effectively use the degraded and unused urban space.

Achievements & Successes

Creation of education hubs for children and youth, provided hands-on play in natural environments to help them develop confidence and empathy, constructive problem-solving and a range of other skills.
Establish areas of public markets that act as incubators for small businesses.
The establishment of a regular farmers market.
Creation of several onsite enterprises including a cafe and maker spaces.
The formerly disused site has become a popular weekend destination for locals.
Spaces that educate people about:

- food gardens
- greenhouses
- indoor vertical farming systems
- composting and waste management
- cooking classes

The TD Future Cities Centre is a dynamic year-round space that acts as a hub for Futures Cities, Canada - an initiative that brings together people, platforms and innovations from across sectors to find new ways to address the challenges facing cities.

Common Unity Project Aotearoa

Location_ *Lower Hutt, Wellington*

Size / Scale_ *Across Lower Hutt*

Date_ *2012 - ongoing*

Who is involved_ *Local community, schools and organisations*

Website Links_
www.commonunityproject.org.nz

Purpose of Initiative / Project Drivers

Community Unity Project Aotearoa was established to help build a local food ecosystem to address the lack of accessible, affordable, healthy food in Lower Hutt.

Project Scope

The Community Unity Project is a registered charity that works collaboratively with community, schools and organisations across Lower Hutt. The Common Unity Project Aotearoa is supported by an active Board of Trustees with diverse backgrounds and skills. The Common Unity Project Aotearoa was founded in a partnership with Epuni Primary School.

The project has been developing a self-fertilising ecosystem through the creation of a range of complementary social enterprises and community initiatives that meet existing and latent community needs. A large focus of Common Unity's efforts have been on providing affordable, accessible and nutritious food to the local community. It has been facilitating growing food across the Hutt Valley while creating employment, feeding hungry school children and increasing accessibility of healthy food via a co-operative grocery. Common Unity also provides multiple programmes and initiatives that foster community inclusion, connection and pride of place.

Initiatives and programmes that run throughout the community project include:

- Unity Kitchen
- Gangsta Food Gathering
- Beeple Honey Collective
- Knitting and Sewing groups
- Unity Catering
- Project Sunshine Aotearoa
- Unity Exchange timebanking
- ReCycled Rides
- Urban Kai Farms
- The ReMakery

Resources / Funding / Costs

Staff funding and training is covered by various local charities, community trusts and the Ministry of the Environment.

Community grant schemes and Give a Little donations also provide revenue to run various initiatives and local business sponsor by donating time and products.

Partnerships include various schools, refugee forums, marae, churches, public health providers, Unicef and the Women's Refuge.

Lessons Learnt

Collaboration and vision are critical success factors.

Limitations / Issues / Challenges

Reaching out to Maaori community took a while.

Achievements & Successes

- Was a finalist in the Transforming Food category of the 2017 NZI Sustainable Business Network Awards.
- In 2016 the Trust gave 250 heritage fruit trees to the city and in turn they provided nine different community parks which became community fruit forests.
- Work with Corrections and Probation, particularly with building work.
- Testing a new curriculum that has been developed on beekeeping in the hope that young people, including those still at school, can get a qualification in honey production.

Renaissance Block Challenge

Location_ *Oswego, USA*

Size / Scale_ *Neighbourhoods*

Date_ *2013 - ongoing*

Who is involved_ *Local Community, banks, sponsors and philanthropy foundations, government agencies*

Website Links_
https://www.oswegonyonline.com/

Purpose of Initiative / Project Drivers

The period from 1950 to 2000 was characterized by a physical shift from cities to suburbia leaving city centres run down and empty. In that time Oswego in upper New York State lost 21.6% of its population.

A cycle of disinvestment permeated through Oswego's blocks. Deferred home maintenance led to degraded home conditions. Degraded home conditions led to reduced home values. Reduced home values led to decreased pride. Decreased pride led to decreased incentive to invest in the home and further deferment of home improvement.

Project Scope

Oswego Renaissance Association (ORA) is a nonprofit organisation that was formed in 2013 with the purpose of restoring local neighbourhood and community quality of life in the inner city of Oswego. The mission of ORA is to promote the restoration, beautification and preservation of healthy, vibrant neighborhoods. This is done through the Renaissance Block Challenge Grant, which provides a matching grant encouraging groups of neighbours to collaborate on exterior improvements to their properties. Grants are matched with participants available funds and are obtainable to groups of 5 or more houses. The grants have to be spent on exterior home improvements, landscaping or street improvements.

Resources / Funding / Costs

Grants are made possible through a series of partnerships and sponsors such as with the Shineman Foundation, Pathfinder Bank, Novelis, Step One Creative and the City of Oswego. They also seek to expand partnerships with other nonprofit foundations, government agencies and local businesses.

Limitations / Issues / Challenges

Needed to do a lot of ground work to identify selected neighbourhoods and create an inventory of where the money should be targeted. ORA used their first grant to commission a neighborhood planning firm, czb, to perform a comprehensive study and assessment of housing in the city to help inform strategic investment and focus.

Achievements & Successes

- Neighbourhoods have been revitalised and now invoke a sense of community and pride with residents
- Neighbourhoods are forming community bonds
- Communities are restoring parks and upgrading their streetscapes themselves
- Over $3.4 million of private investment has been leveraged into Oswego neighbourhoods.
- Neighbours re-engage with each other, work together and unlock the power of "crowdsourcing" to revitalize their neighborhoods how they would like them to be.

Initial Planning Considerations

PUHINUI STREAM – REGENERATION STRATEGY AND WORK PROGRAMME

INITIAL PLANNING CONSIDERATIONS

PREPARED FOR PANUKU DEVELOPMENT AUCKLAND

JANUARY 2021 | FINAL

done.
project planning + delivery

DOCUMENT CONTROL

Date Issued	26 January 2021
Version	FINAL
Prepared by	Kristen Spooner
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1. SCOPE

This project involves the creation of a coordinated Regeneration Strategy and Work Programme in order to fully realise the potential of the Puhinui Stream as a community asset and urban waterway.

The programme of work is to be delivered in two phases; planning and execution. Done Ltd have been engaged, in collaboration with Resilio Studio and others, to deliver the planning phase of this project.

Due to the emergent stage of the project, the purpose of this planning report is to identify early planning considerations that will contribute to a deeper understanding of the catchment which will ultimately help to shape the Regeneration Strategy and Work programme.

While the Regeneration Strategy will need to consider the entire Puhinui Stormwater Catchment, the focus of the work programme development will be the Puhinui Stream corridor, with greater emphasis on the Transform Manukau area. Therefore, this assessment provides initial advice on planning considerations at the following scales:

- Relevant Auckland wide provisions that relate to the Puhinui Catchment as a whole; and
- Site specific provisions that relate to key sites within the Transform Manukau boundary.

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2. AUCKLAND WIDE PROVISIONS

Section 3.6 of the Request for Proposals issued by Panuku Development stated that *"The Auckland Unitary Plan (Unitary Plan) includes the objectives, policies and standards for the site. The Unitary Plan therefore forms part of the design brief."* The purpose of this section is to identify objectives and policies of the Unitary Plan that provide opportunities to realise the primary project objectives which are understood to be:

- Social and environmental health, creating a source of pride and identity for South Auckland, improved cycling, walking and recreational facilities and use; and
- To create a healthy and functioning water-system for surrounding communities.

The Regeneration Strategy for the Puhinui Catchment should ensure that it encourages development that aligns with these objectives and policies. Standards that relate to the site (in particular the Transform Manukau area) are addressed in the next section.

B2.7 – Open space and recreation facilities

The objectives and policies of this section aim to ensure that:

- Recreational needs of people and communities are met through the provision of a range of quality open space and recreation facilities
- Public access to and along Auckland's coastline, coastal marine area, lakes, rivers, streams and wetlands is maintained and enhanced
- Reverse sensitivity effects between open spaces and recreation facilities and neighbouring land uses are avoided, remedied or mitigated.

B7 – Natural resources

The objectives and policies of this section aim to ensure that:

- Areas of significant indigenous biodiversity value in terrestrial, freshwater, and coastal marine areas are protected from the adverse effects of subdivision use and development
- Indigenous biodiversity is maintained through protection, restoration and enhancement in areas where ecological values are degraded, or where development is occurring.
- The permanent loss and significant modification or diversion of lakes, rivers, streams (excluding ephemeral streams) and wetlands and their margins, is avoided.

B10 – Natural hazards and climate change

The objectives and policies of this section aim to ensure that:

- Communities are more resilient to natural hazards and the effects of climate change
- The risks to people, property, infrastructure and the environment from natural hazards are not increased in existing developed areas
- New subdivision, use and development avoid the creation of new risks to people, property and infrastructure
- The effects of climate change on natural hazards, including effects on sea level rise and on the frequency and severity of storm events, is recognised and provided for

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- The function of natural systems, including floodplains, are protected from inappropriate subdivision, use and development
- The conveyance function of overland flow paths is maintained.

E1 – Water Quality and Integrated Management

The objectives and policies of this section aim to ensure that:

- Freshwater and sediment quality is maintained where it is excellent or good and progressively improved over time in degraded areas
- The mauri of freshwater is maintained or progressively improved over time to enable traditional and cultural use of this resource by Mana Whenua
- Stormwater and wastewater networks are managed to protect public health and safety and to prevent or minimise adverse effects of contaminants on freshwater and coastal water quality.

E2 – Water Quality Allocation and Use

The objectives and policies of this section aim to ensure that:

- Water in surface rivers and groundwater aquifers is available for use provided the natural values of water are maintained and established limits are not exceeded
- Water resources are managed within limits to meet current and future water needs for social, cultural and economic purposes
- Freshwater resources available for use are managed and allocated in order of priority to provide for domestic and municipal water supplies, animals, and economic development
- Water resources are managed to maximise the efficient allocation and efficient use of available water.

E3 – Lakes, Rivers, Stream and Wetlands

The objectives and policies of this section aim to ensure that:

- Auckland's lakes, rivers, streams and wetlands with high natural values are protected from degradation and permanent loss
- Auckland's lakes, rivers, streams and wetlands are restored, maintained or enhanced
- Significant residual adverse effects on lakes, rivers, streams or wetlands that cannot be avoided, remedied or mitigated are offset where this will promote the purpose of the Resource Management Act 1991
- Structures in, on, under or over the bed of a lake, river, stream or wetland are provided for where there are functional or operational needs for the structure to be in that location, or traverse that area
- Activities in, on, under or over the bed of a lake, river, stream and wetland are managed to minimise adverse effects on the lake, river, stream or wetland
- Reclamation and drainage of the bed of a lake, river, stream and wetland is avoided, unless there is no practicable alternative.

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E10- Stormwater Management Area, Flows 1 and 2

The objectives and policies of this section aim to ensure that high value rivers, streams and aquatic biodiversity in identified urbanised catchments are protected from further adverse effects of stormwater runoff associated with urban development and where possible enhanced.

E15 – Vegetation management and biodiversity

The objectives and policies of this section aim to ensure that:

- Ecosystem services and indigenous biological values, particularly in sensitive environment, and areas of contiguous indigenous vegetation cover, are maintained or enhanced while providing for appropriate subdivision, use and development
- Indigenous biodiversity is restored and enhanced in areas where ecological values are degraded, or where development is occurring.

E27 – Transport

The objectives and policies of this section aim to ensure that:

- Land use and all modes of transport are integrated in a manner that enables the benefits of an integrated transport network to be realised and the adverse effects of traffic generation on the transport network to be managed
- An integrated transport network including public transport, walking, cycling, private vehicles and freight, is provided for
- Parking and loading supports urban growth and the quality compact urban form
- The provision of safe and efficient parking, loading and access is commensurate with the character, scale and intensity of the zone
- Pedestrian safety and amenity along public footpaths is prioritised
- Road/rail crossings operate safely with neighbouring land use and development.

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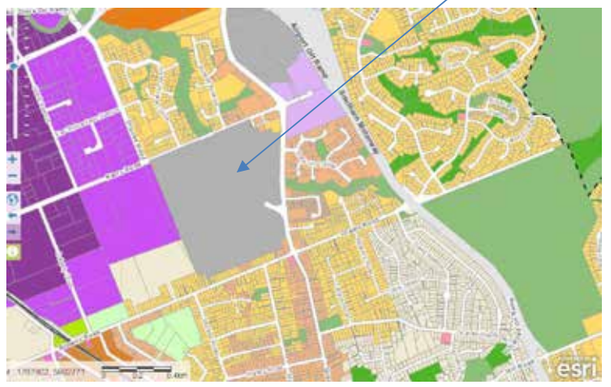
3. TRANSFORM MANUKAU AREA

3.1 Zones

Planning considerations associated with spatial aspects of the Transform Manukau plan are addressed below. As the purpose of this report is to provide initial, high level planning advice, not all Unitary plan provisions related to each site are identified. Information associated with Unitary Plan overlays within the Transform Manukau boundary is provided in the following section.

Given the number of sites involved in these key moves and the limited information associated with each 'project' at this stage, this assessment focuses on whether the intended uses are provided for within the zones. When a detailed work programme has been developed, a Preliminary Planning Assessment can be carried out to confirm consent requirements. It is at this stage that consent requirements associated with physical works would be addressed; such as those that relate to earthworks and land disturbance, tree removal etc, as these aspects require very detailed, site specified information in order to provide accurate planning advice.

Key move one - Realising the potential of Puhinui Stream – Puhinui Stream will become a high-amenity neighbourhood link, recreational open space and a focus for social interaction, as well as an exemplar project for ecological, social, cultural and economic transformation.

Linking key destinations:	Planning considerations:
Completing the 'missing link' through the DHB block.  	This site is zoned Special Purpose – Healthcare Facility and Hospital Zone. Activities provided for within the zone include public amenities[1], artworks, informal recreation and leisure which would all support the intention to work with the DHB to complete the missing link where is passes through this land, to allow people to have direct access to and between Manukau Central, the Wiri neighbourhood, the SuperClinic and the Auckland Botanic Gardens.
Creating better connections to the Manukau Harbour. While most of this route falls outside the project area, Panuku will help build connectivity from Hayman Park and Manukau Central to the	Aside from where it passes under the motorway, the length of the Puhinui Stream between Hayman Park and

[1] Facilities established for the convenience and amenity of the public. Includes: • landscaping and planting; • public toilets; • seating and picnic tables; • bicycle stands and cycle parking structures; • fountains; • drinking fountains; • rubbish bins; J1 Definitions Auckland Unitary Plan Operative in part 98 • directional signage and information boards; • barbeques; • lighting; • shelters; • changing facilities; and • playgrounds and playground equipment.

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stream, and work with other partners and the community to improve connections to the sea. 	Puhinui Reserve is zoned Open Space Informal Recreation Zone, which would support functions associated with public access, including recreation trails, parks infrastructure[2], parks maintenance[3], public amenities.
Creating better connections to Auckland Botanic Gardens. Involves an improved link from Rata Vine to the botanic gardens through an upgraded State Highway 1 underpass, and potential for botanic gardens related activities and public art to stretch northward along the stream's course.	An upgraded SH1 underpass is likely to fall within the definition of parks infrastructure, which is provided for with the Informal Recreation Zone. Artworks are also provided for as a permitted activity within the zone.
Creating a Manukau Central diversion (conceptual). This involves a conceptual 'diversion' of the Puhinui Stream through Manukau Central. This will involve creating a green walkway running through Hayman Park and along the upgraded public realm along Putney Way and Osterley Way, before crossing State Highway 20 across Barrowcliffe Bridge. The Barrowcliffe Bridge will be enhanced as a key pedestrian and cycling connection for north-south movement.	A green walkway through the park and within the road corridor and Strategic Road Corridor zone (relates to the Motorway portion), as well as enhanced pedestrian and cycling provision within the road reserve is provided for within the permitted activities for these locations.
Expanding open spaces and facilities - Developing key open spaces, and improving their recreational and other uses (e.g. Hayman Park, Barrowcliffe, and new Wiri Wetland Domain, and the Auckland Botanic Gardens).	Generally provided for as permitted activities within the parks zones, as described above.

[2] Parks infrastructure: General infrastructure located in Open Space zones to support management of, and access to open space Includes: buildings for storage and maintenance purposes; entry gates; track marking bollards; traffic management infrastructure such as bollards and chains; non-boundary post and rail fences; farm fencing or similar fencing; foot bridges and/or boardwalks; culverts; subsoil drainage; minor storm water management devices e.g. rain gardens; and porous paving.

[3] Parks maintenance: Maintenance and repair undertaken within parks and cemeteries. Includes: maintenance and repair of any buildings and structures; maintenance and repair of footpaths (concrete, gravel and shell); track and trail maintenance and repair including re-metalling and re-surfacing of bush tracks; clearing or reforming drainage channels; re-topsoiling, reseeding, sandslitting for parks sports fields and parks; weed management; grass mowing; replacement, repairs, maintenance or upgrading of existing bridges, boardwalks, and culverts; resealing and sealing metal parking and access drives and internal park roads; maintenance of jetties and boat ramps; ecosystem restoration by replanting and re-vegetation; and maintenance and construction of sand carpet surfaces.

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Key move two – Creating a vibrant heart – redeveloping multiple sites throughout Manukau Central, overhauling the public realm, and creating places to live, work, play and celebrate.

The key elements of this move are summarised as follows:

- Supporting substantial intensive residential development
- Enriching leisure and cultural destination opportunities, including Te Papa Manukau and new hotel developments, and improving physical, marketing and operational links between existing attractions and anchor destinations
- Consolidating and improving civic facilities, with an extension to the Civic Building and associated uses for Kōtuku House
- Consolidating at-grade car parking in shared parking buildings
- Expanding and diversifying the retail offer to include large-scale mixed use developments on the Westfield Manukau City car parks
- Developing new commercial office space for key tenants
- Overhauling the public realm, including Manukau plaza, Putney Way as a main street, Osterley Way as a north-south link, Amersham Way as a hospitality focused residential street, Hayman Park as a destination park and Manukau Station Road as a boulevard
- Adopting a repositioning strategy.

Section Four: Delivery, of the Transform Manukau Document identifies development opportunity sites and their potential predominant building uses to deliver on the elements described above. The development sites and their potential uses are listed below for reference. All are located within the Business – Metropolitan Centre Zone.

Development opportunity sites	Potential predominant building uses (as identified in Transform Manukau document)
1. MIT, 25 Davies Avenue, Manukau Central	Education, public building, residential, office
2. 1+6 Manukau station Road	Residential, office, hotel
3. 50 Manukau Station Road	Residential, office, hotel
4. 59A Manukau Station Road	Residential, office
5. 59B Manukau Station Road	Residential, hotel.
6. Clist Crescent	Residential, office, hotel
7. 2 and 8 Davies Avenue	Residential, hotel
8. 14 Davies Avenue	Residential, hotel, education
9. 9 Osterley Way	Residential, hotel
10. Kōtuku House	Residential, hotel
11. Westfield Manukau City	Retail, residential, office
12. Civic block	Public building, office

The Business – Metropolitan Centre Zone applies to centres located in different subregional catchments of Auckland. These centres are identified for growth and intensification and are second only to the city centre in overall scale and intensity and act as focal points for community interaction and commercial growth and development. The zone provides for a wide range of activities including commercial, leisure,

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high density residential, tourist, cultural, community and civic services. Notwithstanding, buildings within the zone require resource consent to ensure that they are designed to a high standard, which enhance the quality of the centres streets and public open spaces.

Key move three – Developing the Wiri healthy neighbourhood – Working in partnership to create healthy homes and neighbhourhoods in the Wiri neighbourhood centered around the Puhinui Stream.

Defining feature to support key move three:	Planning considerations:
Increased housing supply and choice in Wiri through the following key sites/neighbourhoods: 1. Trevor Hoskens neighbourhood 2. Invernell neighbourhood 3. Land recently released by the DHB 4. Pacific Gardens 5. Rātā Vines	Sites/neighbourhoods 1 and 2 are zoned Mixed Housing Suburban. Site 3 is zones Mixed Housing Urban and Mixed Housing Suburban. Site 4 is zoned Mixed Use and Site 4 is zoned Mixed Housing Urban. All of these zones provide for some form of intensive residential development. The Residential - Mixed Housing Urban Zone is a reasonably high-intensity zone enabling a greater intensity of development than historically provided for. Over time, development in this zone will typically be up to three storeys in a variety of sizes and forms, including detached dwellings, terrace housing and low-rise apartments. This supports increasing the capacity and choice of housing within neighbourhoods as well as promoting walkable neighbourhoods, fostering a sense of community and increasing the vitality of centres. Up to three dwellings are permitted as of right (without resource consent) subject to compliance with the standards. This is to ensure a quality outcome for adjoining site and the neighbourhood, as well as residents within the development site. Resource consent is required for four or more dwellings and for other specified buildings in order to: achieve the planned urban built character of the zone; achieve attractive and safe streets and public open spaces; manage the effects of development on adjoining neighbouring sites, including visual amenity, privacy and access to daylight and sunlight; and achieve high quality on-site living environments. The resource consent requirements enable the design and layout of the development to be assessed recognising that the need to achieve quality design is important as the scale of development increases. The Residential – Mixed Housing Surburban Zone enables intensification, while retaining a suburban built character. Development within the zone will generally be two storey detached and attached housing in a variety of types and sizes to provide housing choice. The height of permitted buildings is the main difference between this zone and the Residential – Mixed Housing Urban Zone which generally provides for three storey predominately attached dwellings. Up to three dwellings are permitted as of right subject to compliance with the standards. This is to ensure a quality outcome for adjoining sites and the neighbourhood, as well as residents within the development site. Resource consent is required for four or more dwellings and for other specified buildings. The Business - Mixed Use Zone provides for residential activity as well as predominantly smaller scale commercial activity. New development requires resource consent in order to ensure that it is designed to a high standard which enhances the quality of streets within the area and public open spaces. Like the two zones described above there are no specific density provisions; rather the focus is on providing a high quality residential environment through compliance with development standards.
New street patterns and movement networks	Reconfiguration of old subdivision block patterns would be assessed as part of subdivision and land use consent applications associated with the residential developments described above.
Focusing on the Puhinui Stream and new Wiri Wetland Domain	Refer to key move one
Increasing community facilities, services and amenities, with a focus on children and young people including new leisure facilities	The facilities described are all proposed within existing community facilities spaces, and additional consents are unlikely to be required depending on the nature and scale of proposed services within each facility.

Key move five –Enhancing community connectivity – further developing the public transport network, and spreading a safe cycling and walking network, to improve community connections, near and far.

Upgrading Great South Road, creating a comprehensive cycle network and making easy, safe and attractive to walk.	As these components of the key move all relate to works within the road corridor such as intersection improvements, safety measures and cycle paths, any consent requirements would likely relate to the physical works rather than the uses themselves.
Delivering a mass-transit route	Likely to require numerous consents given length of the route and number of different land holdings and zones. Would need to be addressed when further detail known including confirmed route, mode of transport (bus vs. light rail), etc.

3.2 Overlays

The table below identifies key overlays that apply within the Transform Manukau boundary and associated planning implications.

Overlay	Planning Implications
Controls: - Stormwater Management Area Control – Flows 1 and 2	The control seeks to protect and enhance Auckland's rivers, streams and aquatic biodiversity in urban areas. The provisions require stormwater hydrology mitigation in Stormwater management area control – Flow 1 and Flow 2 areas where there are: (a) new impervious areas; (b) redeveloped impervious areas; or (c) entire sites where the area of development or redevelopment comprises more than 50 per cent of the site area.
Control: - Macroinvertebrate Community Index - Urban	The macroinvertebrate community index provides an indicator of stream health, and is used to manage discharges, subdivision, use, and development that affect freshwater systems to: (a) maintain or enhance water quality, flows, stream channels and their margins and other freshwater values, where the current condition is above National Policy Statement for Freshwater Management National Bottom Lines and the relevant Macroinvertebrate Community Index guideline or (b) enhance water quality, flows, stream channels and their margins and other freshwater values where the current condition is below national bottom lines or the relevant Macroinvertebrate Community Index guideline.
Designations:	Designations in the area include Manurewa High School (Designation 4953); Wiri Central School (Designation 5008). Any changes to these sites would require approval of the Minister of Education as the Requiring Authority. The Airspace Restriction Designation – Auckland Airport (Designation 1102) applies to the majority of the Transform Manukau Area. Applies an obstacle limitation (effectively a height limit) to ensure aircraft safety. Varies by site.
Historic Heritage and Character:	St David's Church and Graveyard at 813 Great South Road is identified within the Historic Heritage Overlay – Extent of Place. Any works proposed on the site itself would require resource consent, and any development surrounding the site should be cognisant of the heritage values of the site.
Infrastructure: - Aircraft noise overlay	Applies to the northern portion of the Transform Manukau Area. Contains provisions to manage residential intensification and activities sensitive to aircraft noise within areas identified for accommodating urban growth in a way that avoids reverse sensitivity effects as far as practicable.
Natural Heritage - Tree on Events Centre site	Notable tree 1476 (1 Rata Tree) is identified on the Pacific Events Centre site. Consent required for any impacts (works within dripline, trimming, removal).
Natural Resources: - Natural Stream Management Areas overlay - High Use Aquifer Management Areas overlay	The Natural Stream Management Areas Overlay identifies river and stream reaches with high natural character and high ecological values. The rules for this overlay relate to water takes, discharge, land disturbance and vegetation management. Aquifers identified in the High-use Aquifer Management Areas Overlay are managed by rules to ensure they can continue to meet existing and future water take demands and provide base flow for surface streams. Resource consents are required for most proposals to take or use groundwater from aquifers.

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