# Hinekirikiri

1. (noun) intertidal zone, foreshore, seashore, littoral zone, shore between high and low water marks - also as te marae o Hinekirikiri; Hinekirikiri is the female guardian of the intertidal zone.

## An Onehunga Port Development

**Victoria, Kirrily, Jen, Princeton, James**

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How can a waterfront development respond to the challenges of climate change, the social and cultural aspiration of stakeholders in particular mana whenua and make an economic return for the landowners?

**Resilience**
/rɪˈzɪlɪəns/
Noun: The capacity to recover quickly from difficulties; toughness.

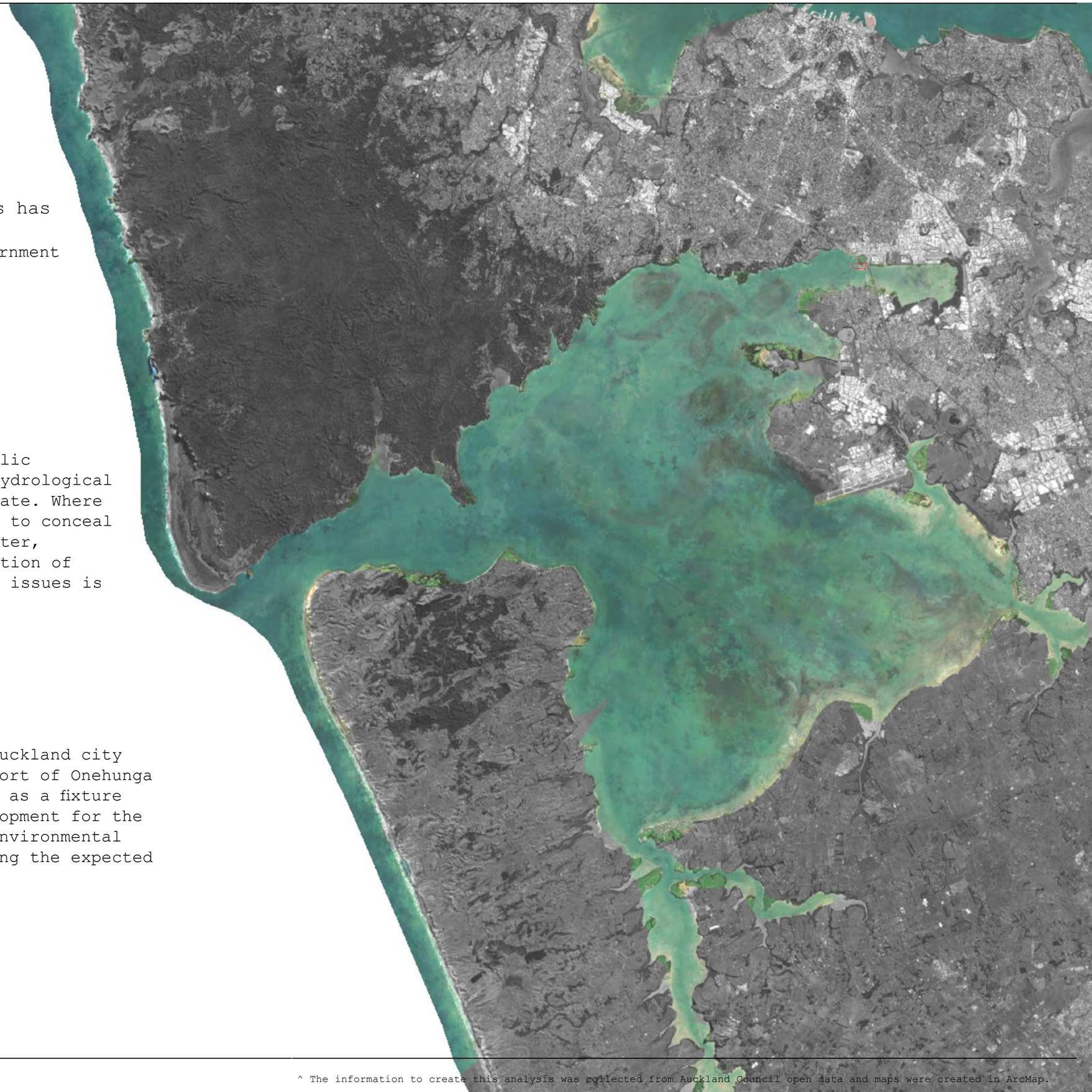
Hinekirikiri seeks to create an ecologically and socially resilient waterfront for the 21st century by:

- designing a waterfront development that addresses the critical questions posed by climate change,
- engaging with mana whenua, their issues, and the Te Aranga design principles,
- understanding how our site design affects both ends of the scale, from the whole region down to the smallest details,
- developing a methodology based on mapping the hydrological conditions affected by climate change, i.e. sea level rise, pluvial flooding, and stormwater contamination.
- using buildings and landscapes that explore the implications of the masterplan for the port zone.

The redevelopment of waterfront properties has proved an extremely lucrative real estate opportunity for many property owners—both government and corporate—for nearly fifty years.

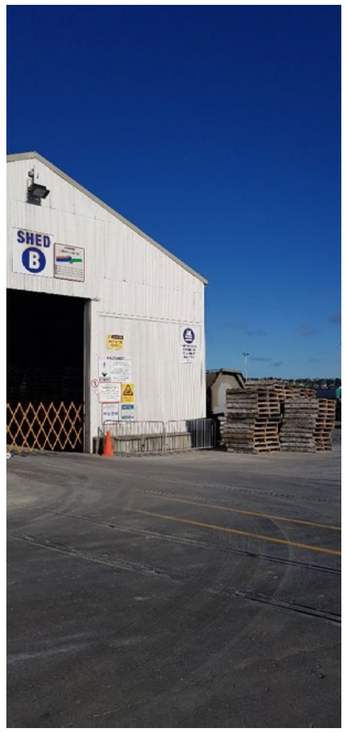
During this time there has been a rising public awareness of the serious environmental and hydrological problems that waterfront development can create. Where previously waterfront developments were able to conceal or ignore problems like contaminated stormwater, flooding, and rising sea-levels, the acceleration of climate change has meant that avoiding these issues is becoming less and less viable every year.

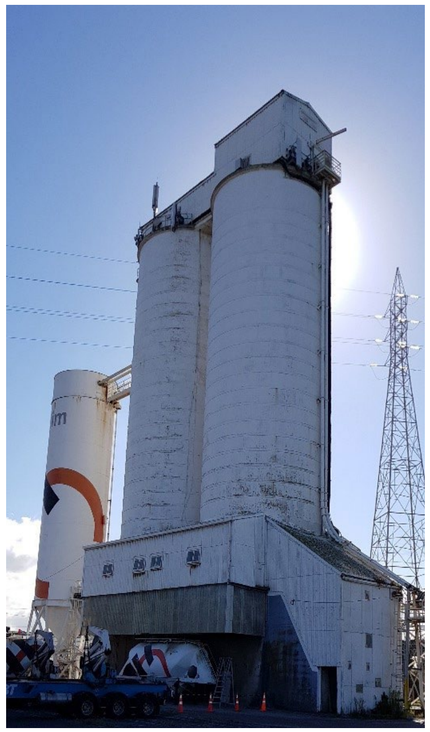
Panuku is the development arm of the Auckland city council and they have vpurchased the Port of Onehunga with the specific aim of reinventing it as a fixture on the Manukau Harbour. A modern development for the Onehunga Port needs to privilege the environmental and cultural factors while still meeting the expected financial targets of the client.

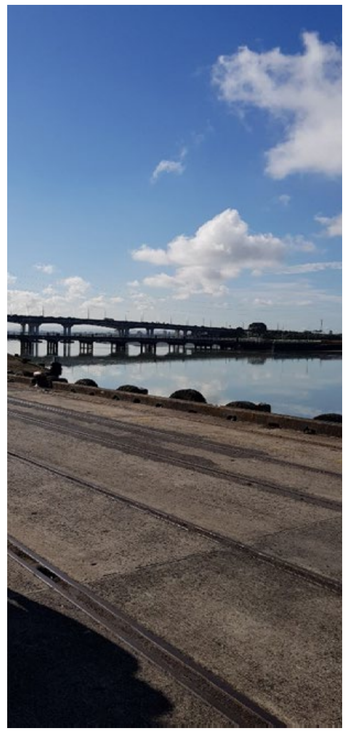


Map 1:200,000

^ The information to create this analysis was collected from Auckland Council open data and maps were created in ArcMap.





Panuku have provided a brief that requires our design to:
- Reflect the history and diversity of multi-cultural Auckland
- Reduce vehicle reliance in the area (Light Rail)
- Respond to the historical connection with Mangere Bridge
- Respect local Tohu (from Te Aranga: places of importance)

They also supplied these parameters:
- Retain the operational fishing industry
- Mitigate the risk of future sea level rise
- Address the heat island effect and introduce biodiversity to the wharf
- Design for no transmission lines
- Be aware of the Heritage Extent of Place Overlay

And these suggestions:
- Retain the 3 character shed and office buildings, as well as the Holcim cement silo
- Consider how a zero carbon precinct would look
- Plan for motorway noise
- Accommodate sustainable and active transport modes in the design.
- Around 910 units; 10000m2 commercial floor space, 2020 residents, 500 workers (in Light Rail enabled area)

**The First Inhabitants**

**900 AD** Saw Tamaki and Maruwi settle along the northern shores of Manukau Harbour

**950 AD** Saw the inter-mating of Tamaki, Maruiwi and the peope of Toi Kai Rakau

**Toi Kai Rakau**

**Tainui Canoe**

**1350** saw the arrival of the Tainui Canoe which came in through the waitamata harbour and was later hauled across tamaki isthmus to the manukau harbour

**1822** Saw the Nga Puhi war expedition led by Hongi, Rewa and Patuone

**Musket wars**

**Waikato Confederation**

**1834** Saw an agreement made in which the people returned to their homes after the invasions under the 3 protection of Waikato confederation

**1835** Saw European Settler, Thomas Mitchell, A Timber Merchant make his way into the Onehunga port

**First European Settler**

**The Unity of Tainui**

**1840** saw the unity of 120 collective voices of Tainui Marae and 20 Marae of the Manukau and lower Waikato Areas

**1841** Saw the first settlers arriving from Scotland on the Ship Brilliant

**"Brilliant"**

**The Golden age of Maori**

**1858** saw 53 small vessels registered in the port of Auckland as Native ownership. Annual Canoe total entering the harbour was 1700+

**1867** saw first Mayor John Dickenson Jackson dealing with Issues such as the Onehunga water reserve

**First Mayor!**

**First Woman!**

**1893** saw the first female mayor elected in the entire British Empire, Elizabeth Yates

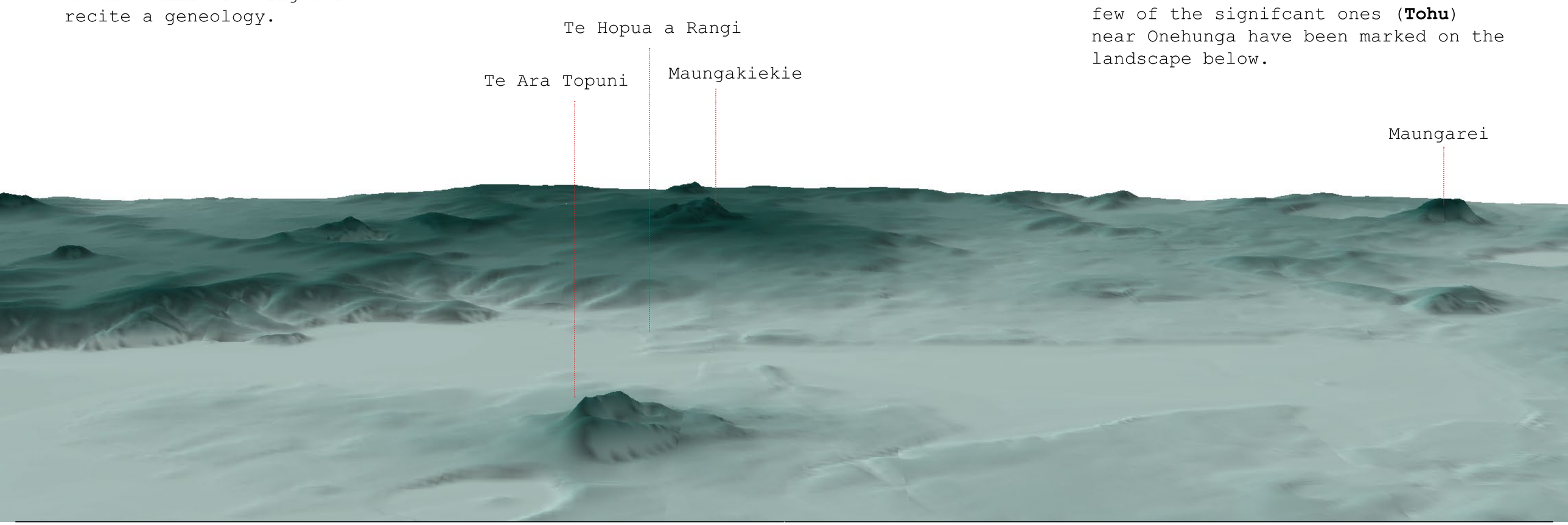
**Rapid Development**

**1962** Saw a population of over 15,000

**New Era of Growth**

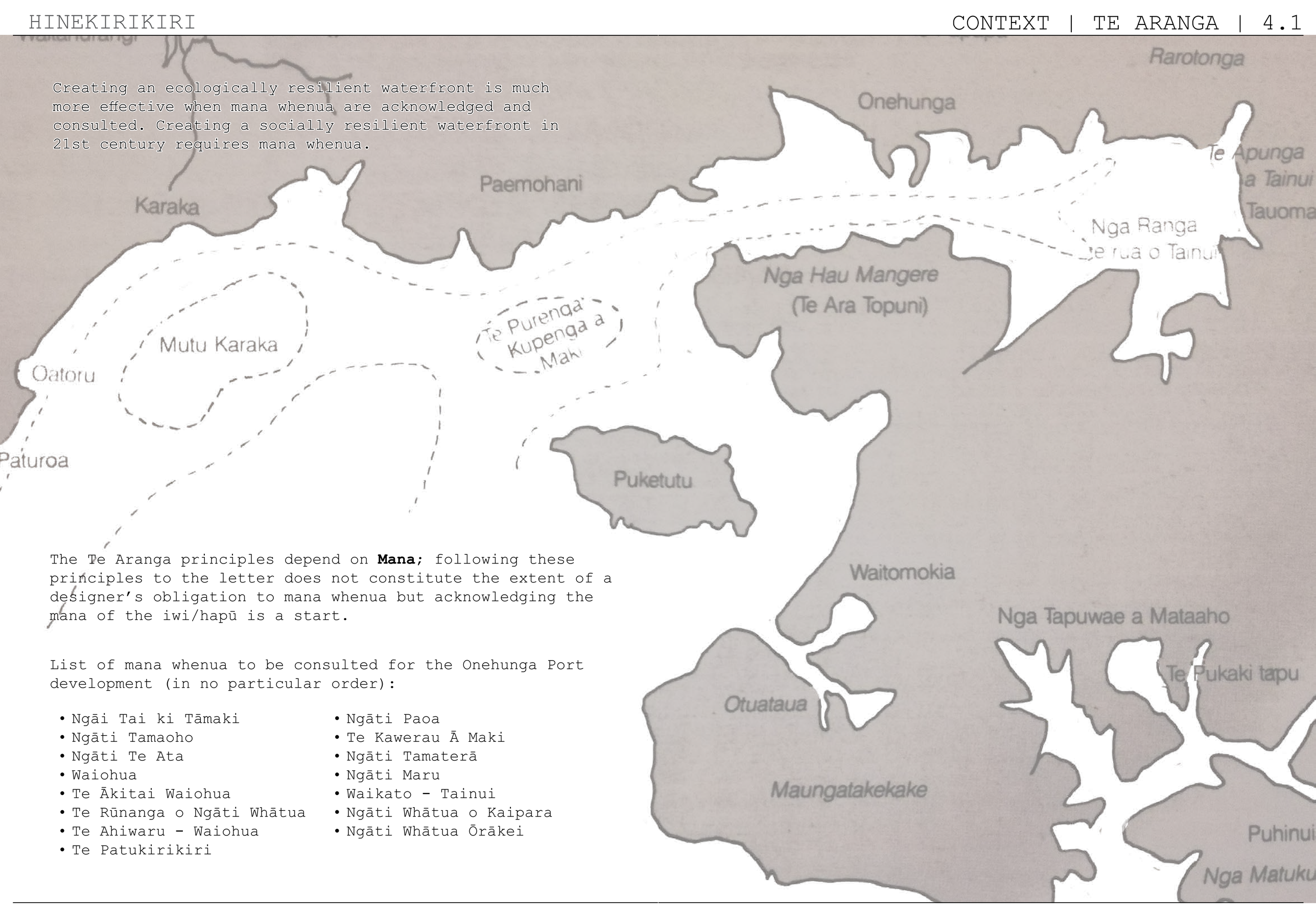
Whakapapa is a word that describes the Māori understanding of family geneology, as well as the skill of being able to recite a geneology.

The practical application of **Whakapapa** as part of the Te Aranga design principles involves the restoration and celebration of Māori names. A few of the signifcant ones (**Tohu**) near Onehunga have been marked on the landscape below.




^ The information to create this analysis was collected from Auckland Council open data and maps were created in ArcScene.

Creating an ecologically resilient waterfront is much more effective when mana whenua are acknowledged and consulted. Creating a socially resilient waterfront in 21st century requires mana whenua.




The Te Aranga principles depend on **Mana;** following these principles to the letter does not constitute the extent of a designer's obligation to mana whenua but acknowledging the mana of the iwi/hapū is a start.

List of mana whenua to be consulted for the Onehunga Port development (in no particular order):

- Ngāi Tai ki Tāmaki
- Ngāti Tamaoho
- Ngāti Te Ata
- Waiohua
- Te Ākitai Waiohua
- Te Rūnanga o Ngāti Whātua
- Te Ahiwaru - Waiohua
- Te Patukirikiri
- Ngāti Paoa
- Te Kawerau Ā Maki
- Ngāti Tamaterā
- Ngāti Maru
- Waikato - Tainui
- Ngāti Whātua o Kaipara
- Ngāti Whātua Ōrākei

"For the Manukau the critical questions are when is enough enough?—and what can we do now to repair the damage already done?"

-

Mana whenua with interest in the Onehunga Port development have a long history of occupation and cultivation related to the Tāmaki isthmus and the rohe surrounding the Manukau (or Manuka) Harbour.

After colonization and land wars deprived many of the iwi/hāpu of their land, the iwi responsible for the Manukau Harbour and surrounding environs were dispossessed of their authority and right of guardianship that iwi insisted had been guaranteed by the treaty.

In 1985 the Waitangi tribunal published the Manukau Report, which addressed the Manukau Claim that had been brought before the tribunal by a group of different iwi/hāpu with longstanding ties to the Manukau.

The iwi/hāpu sought to prove--among other things--that the pollution and destruction of the Manukau harbour was a direct breach of their treaty-guranteed rights as kaitiaki of the region.

The iwi/hāpu won what was at the time the largest case ever brought before the tribunal.


The Manukau Report played a significant role in advancing the conversation around the rights of mana whenua regarding development on lands they had customary rights to.

The mana whenua with an interest in the area around Onehunga Port have been consistently and actively exercising their rights as customary guardians: Ngāti te Ata made a formal submission in opposition to the proposed East-West Link because extensive harbour reclaimation violated their rights as mana whenua of the Harobour.

Any development that ignores iwi/hāpu interests in Onehunga (and the greater Manukau Harbour) area is ignoring a long history of ecological activism that predates the wider societal displeasure with sewerage and stormwater in Auckland by decades.

Where starting the necessary conversations with individual iwi/hāpu may be impractical, the Manukau Claim provides an example of activism of mana whenua in the region and outlines why we must follow the Te Aranga principle **Mana**.

"...They are developers too. Their plea is not to stop progress but to make better progress and to progress together. It is not that they would opt out of development in New Zealand. It is rather they need to know they have a proper place in it."

**Land Acts Passed**

**1844** Saw Two Land Acts pass allowing Settlers to buy land direct from Maori owners

**Highway Acts**

**1862** saw the introduction of highways act

**Maritime Disaster**

**1863** saw HMS Orpheus hit the manukau sand bar causing the worst maritime history in New Zealand history

**Electric Tram!**

**1903** Saw the introduction of modern electric tram into Onehunga

**Auckland Marine Dept.**

**1913** saw the responsibility of the manukau and the Onehuna port to the Marine Dept. and the Auckland Harbour Board

**Business District**

**1937** saw Onehunga Business Association incorperated to promote Buisness

**Rapid Development**

**1860** Saw the introduction of public bus transport

**Public Transport**

**1863** established important communications link to the rest of New Zealand

**N.Z Communication link**

**1873** saw rail link between Auckland and Onehunga

**Auckland and Onehunga link**

**1908** Saw the opening of the North Island Main Trunk Railway

**Railway Opens**

**1913** Saw the operation of an extensive drainage system

**Drainage system**

**1958** Saw the Completion of the Onehunga Wharf

**Onehunga Wharf**

The photos below show the progression of Te Hopua a Rangi, the land bordering Onehunga Port from prominent caldera to a (flat) infilled park, bisected by a busy motorway

1940

1996

2017

*Onehunga: "Friable earth". "burial place", referring to the Māori burial caves in the area, probably among the lava flows issuing from One Tree Hill (Maungakiekie), has also been suggested Another possible meaning is "beach" or "sand" for one and "people" for hunga.*

One of Auckland's original settlements, Onehunga borders the upper tidal reach of the Manukau Harbour, located just 10km from Auckland City and 11km from Auckland International Airport.

In the past Onehunga celebrated its connection with the Manukau but it s now cut off from the Harbour by SH20. The foreshore has been reclaimed by commercial development, infrastructure requirement, sediment build-up and tidal patterns, and is now primarily buffered by industry.

Onehunga township is visually removed from its port-- direct access to the port and surrounding foreshore is hindered everywhere but the taumanu reserve.

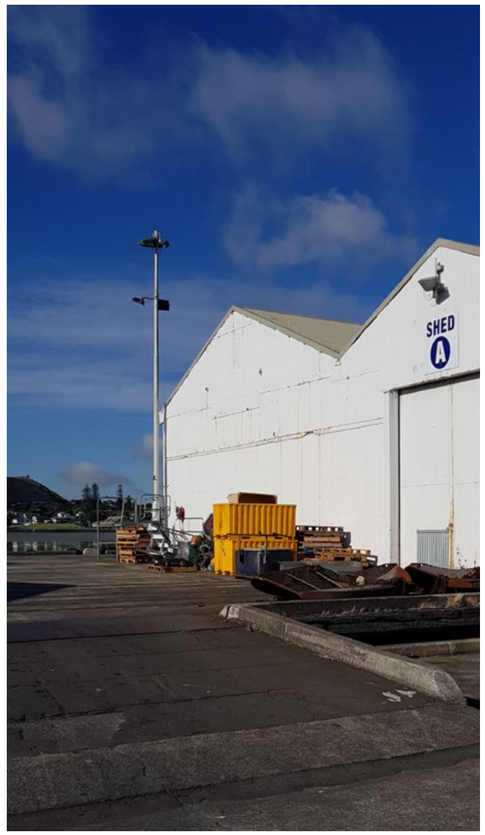
Manufacturing, making, and light industry dominate the Southern edge of Onehunga, where craftsmanship is sought and offers distinct characteristic to the area.

The town centre connects north where local development has been strongest. Residential growth has demanded a slow gentrification of the area, turning single level developments into multi-level ones and changing the face of this diverse, multi-cultural community.

The central location, proximity to main centres and diverse community make Onehunga a desirable place to live, work and visit, despite the loss of the foreshore.

Across the Harbour, Mangere Bridge retains it's connection with the Onehunga Wharf; the dominant silos can be seen from the main street and the wharf itself is clearly visible trom Mangere Bridge's esplanade and boat ramp, which provides Mangere Bridge residents access to the harbour.

The historic importance of the Manukau Harbour as food source, transport route and cargo entry has been severely impacted by silt degradation, land reclamation, environmental changes and technological advance.




THIS PAGE_CLOCKWISE FROM TOP LEFT: CORRUGATE CLAD PORTAL CONSTRUCTION HERITAGE SHED w. EXTENSION, TEMPORARY STRUCTURE OF INSULATED PANELS & REPURPOSED JOINERY, STEEL FRAMED CORRUGATE CLAD STRUCTURE SUPPORTING SILO, FIBRO-CEMENT CORRUGATE CLADDING w. STEEL FRAMED JOINERY AND SHIPPING CONTAINERS, STAINED TIMBER POST INSTALLATION AT MANGERE BRIDGE BOAT RAMP

Co-ordinates (Latitude / Longitude): -36.933705° / 174.7839°

Site 55 Onehunga Harbour Road, Onehunga AKL
Lots 5-7 DP 135212, Pt Allot 17 & 18 Sec 30 Village Onehunga, Land on DP 702

Area 9.6215 Ha / 96215m2

Local Board Maungakiekie-Tamaki

Completed in 1958, the Onehunga Wharf formalised a strategic link to greater New Zealand.

The diverse mix in this area comprises minor Port activity with Commercial fishing operations, heavy industrial, mixed use, town centre and informal recreation and coastal transition zones - each adjacent yet isolated by roading typology.

A central node for major regional utility provision, the general port location is primarily uncompromised National Grid yard hosting transmission lines, major arterial roads, network infrastructure and is proposed for future light rail access.

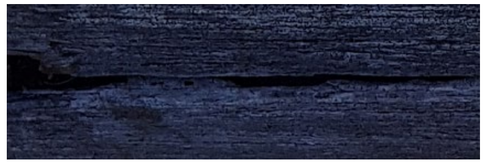
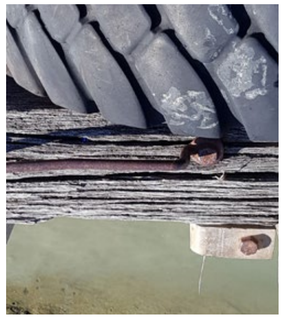
The Manukau Harbour is the only safe port for West Coast vessels along the 600km stretch from Cape Reinga to New Plymouth.

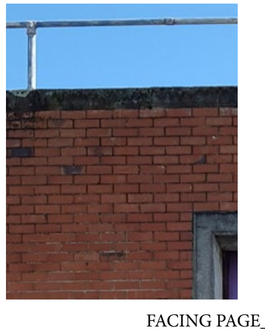
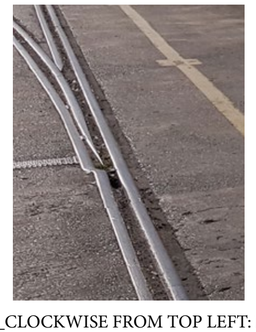
## MARITIME HISTORY

Onehunga Wharf hosted 180 years of commercial shipping activity on the Manukau Harbour. Operations ceased in 2016 when the Harbour was deemed to shallow for modern freight-shipping.

1982 Onehunga Container terminal opened
1988 Ports of Auckland acquires AHB land and assets, listed on NZSE. 80% held by Auckland Regional Authority, 20% by Waikato Regional Council
1992 Manukau Harbour dredged to allow Port entry to larger ships
1996 Onehunga Port operation increases to 24hour
2016 Freight operations cease at Onehunga Port



FACING PAGE_CLOCKWISE FROM TOP LEFT: MOORING MARKER, RUST DAMAGED PAINTED CORRUGATE CLADDING, LICHEN ON PAINTED TIMBER, RAIL TRACKS IN ASPHALT, STEEL RAILING ATOP BRICK CLAD STRUCTURE, PAINT FINISH TONGUE AND GROOVE DOOR PANEL, SALT ETCHED SOLID WOOD, TYRE FENDER ON WEATHERED TIMBER STRUCTURE

Map 1:2000

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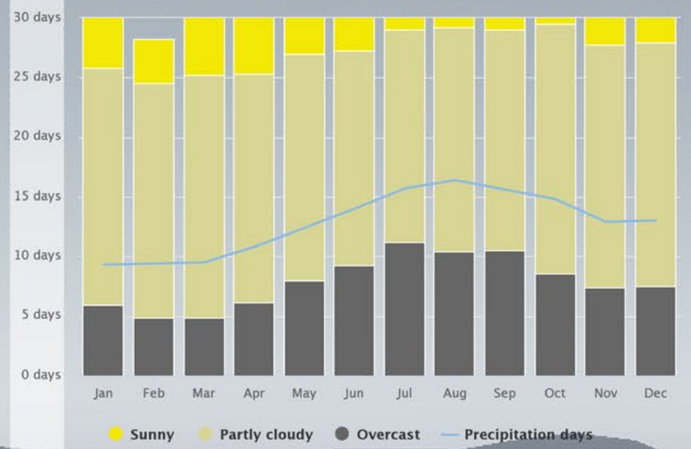
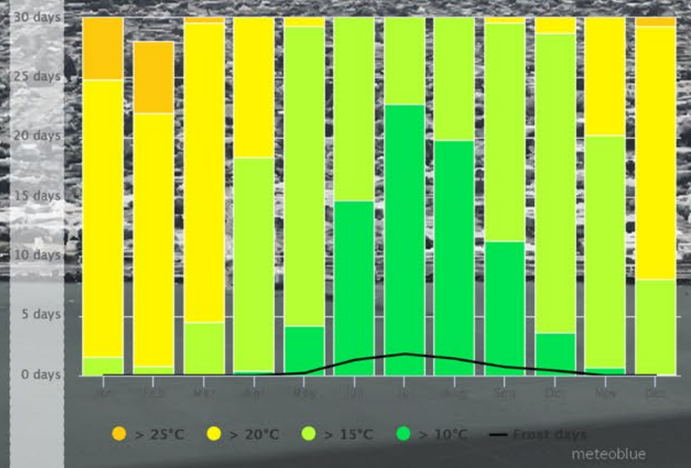
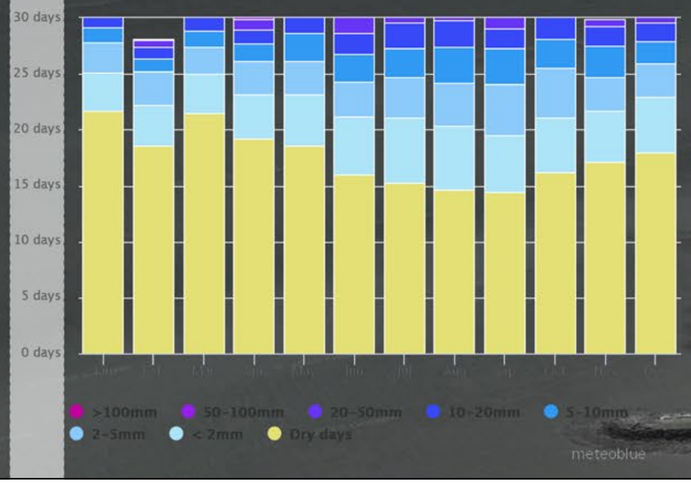
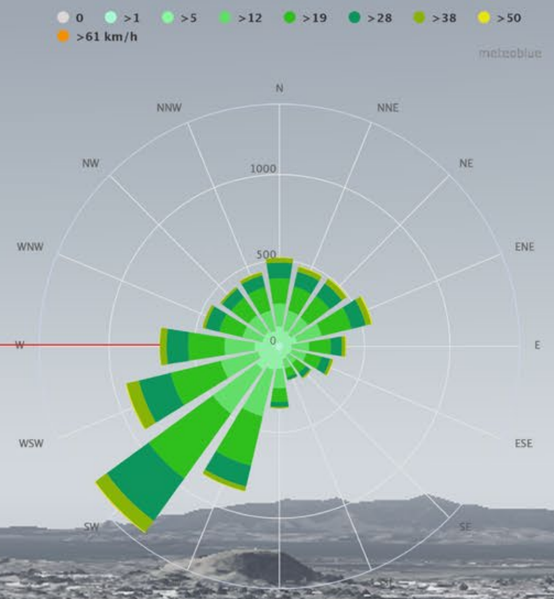



A one time record of 213Kp/hrs recorded



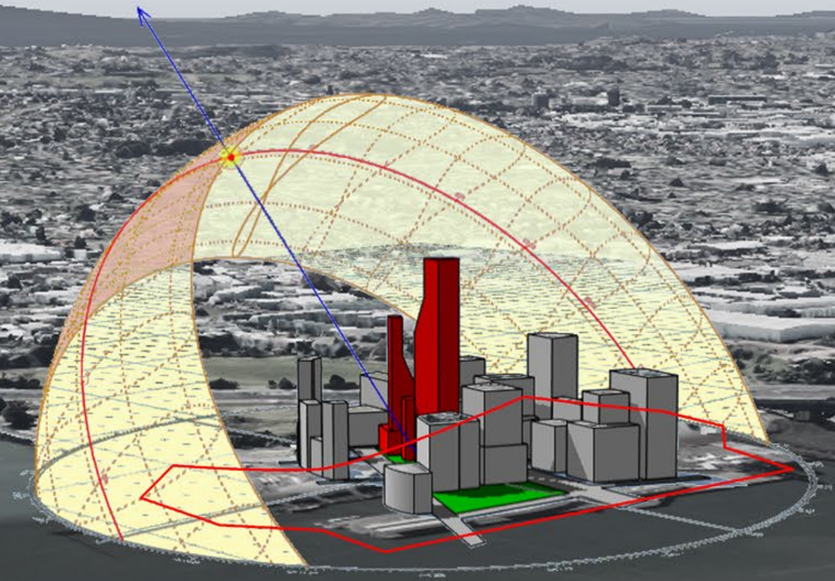






Image credits: Geomaps, Auckland Council 2019_ Scale 1:8000

Special development circumstances apply to any development proposed for this unique port location.

Preliminary research into iwi priorities preclude further reclamation and prioritise the best outcome for the mauri of the inner harbour. Dialogue with iwi will create further opportunties to advance relationships with iwi and discuss use of the wharf, foreshore and historic buildings on the site.

Local controls in effect include,

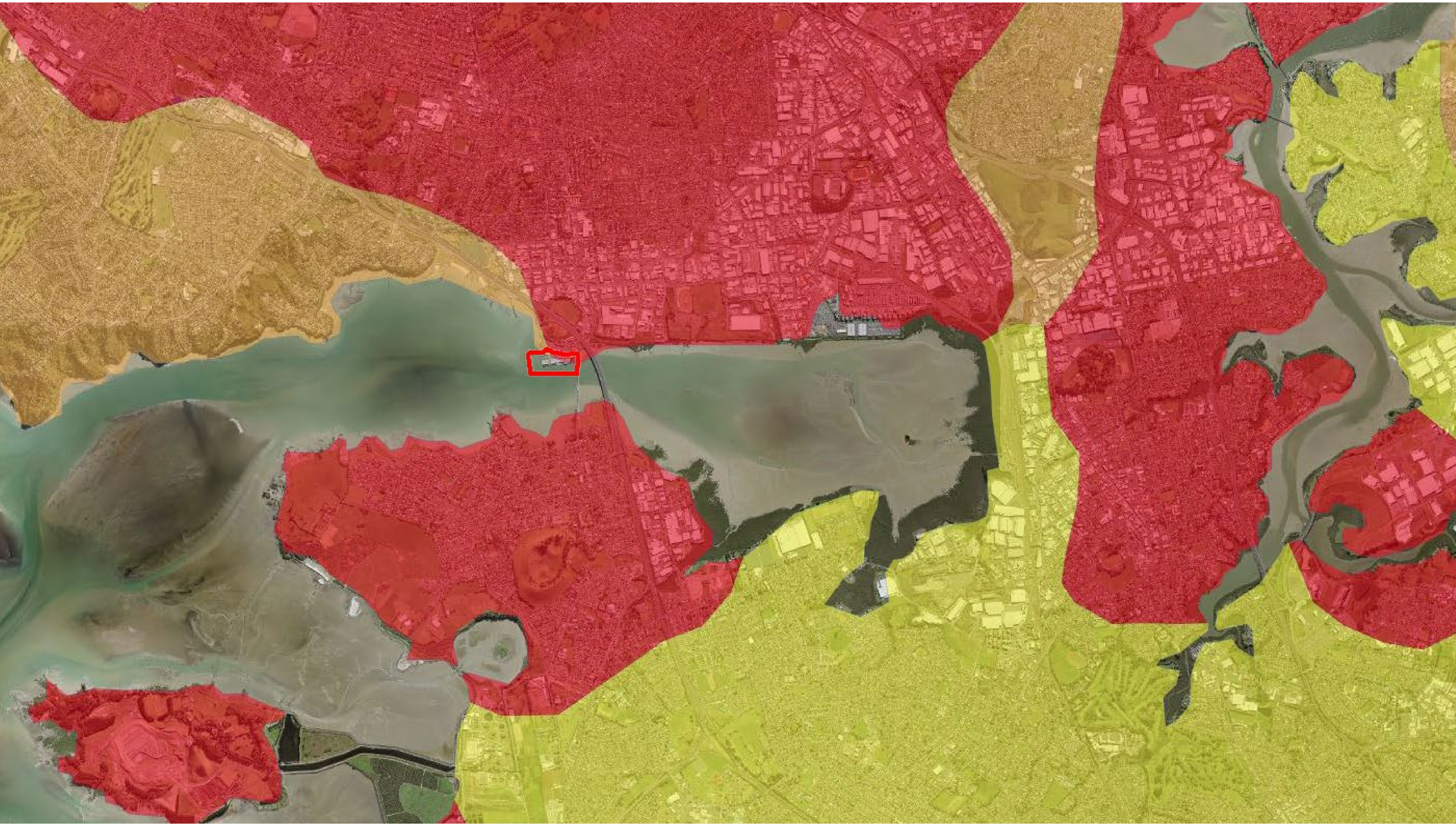
- Minor Port zone
- Coastal Transition & Inundation zones
- Conflicts with Regionally significant volcanic viewshafts.
- Outstanding Natural Features in Te Hapua
- Historic Heritage Overlay: Extent of Place
- Height variation controls adjacent

## SITE CONSTRAINTS


Bound by SH20 to the North, existing access to this site is limited, aesthetically uninviting and with risk in high speed, heavy traffic movement areas. Commercial operations have reclaimed the foreshore and caused heavy, impermeable, and utilitarian construction.

Two major stormwater catchments egress near this location with risk of waste-water outflow which combines with sediment run-off, impermeable residue run-off, toxicity levels of all waste streams entering Manukau Harbour, and tidal silt movements. Built form, infrastructure, industrial hazards and human intervention negatively impede the foreshore access, biodiversity and aesthetic in the upper tidal reach.

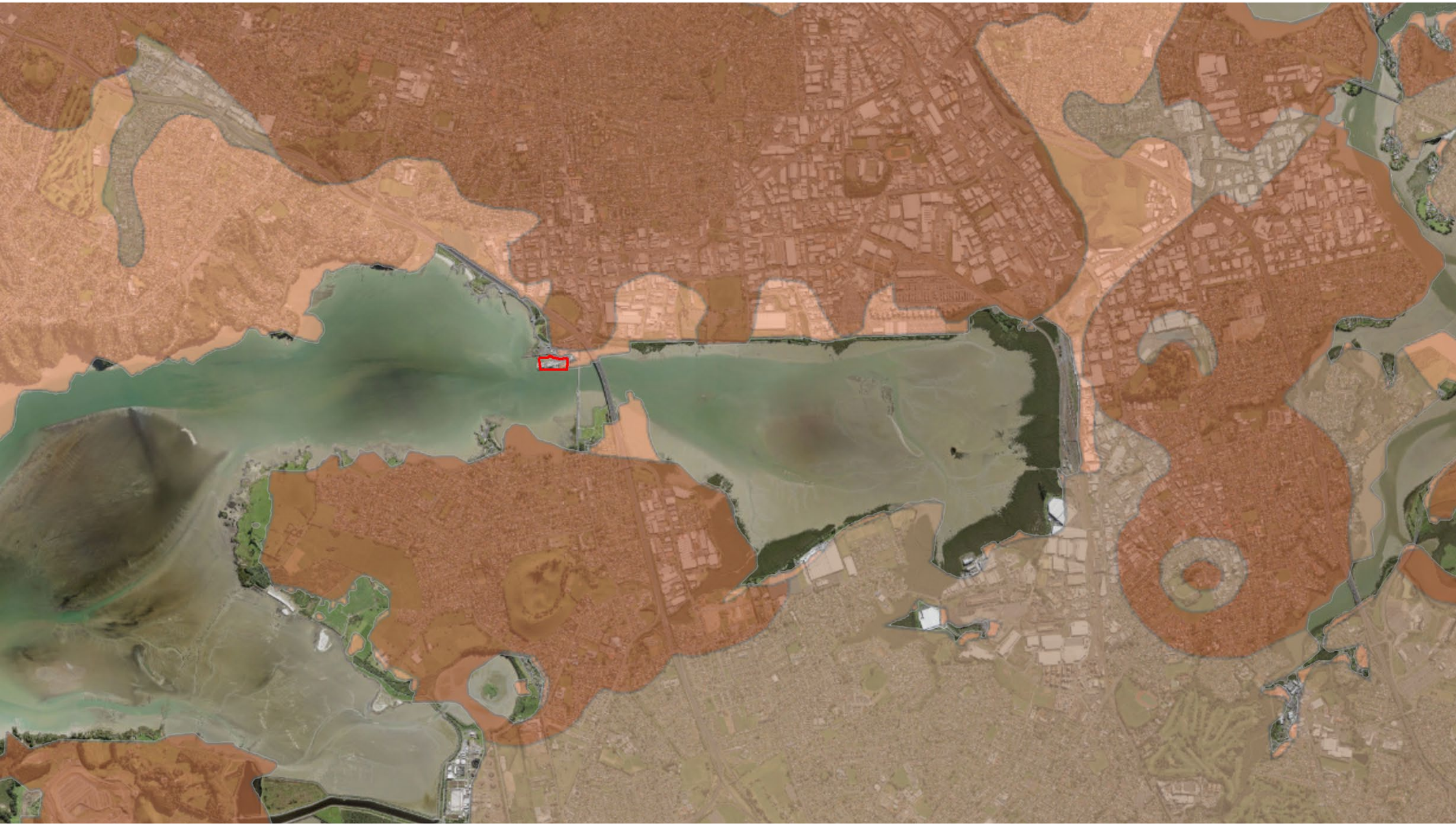
It is noted that the National grid intersects at this location where core infrastructure feeds Auckland and north, access must remain open and isolated from general public movements.



basalt, brecia, ash, lapilli, tuffite

gravel sand, mud, ligmite, peat, pyrodastic material, tephra, silt

sandstone/siltstone, mudstone, brecia,conglomerate, limestone



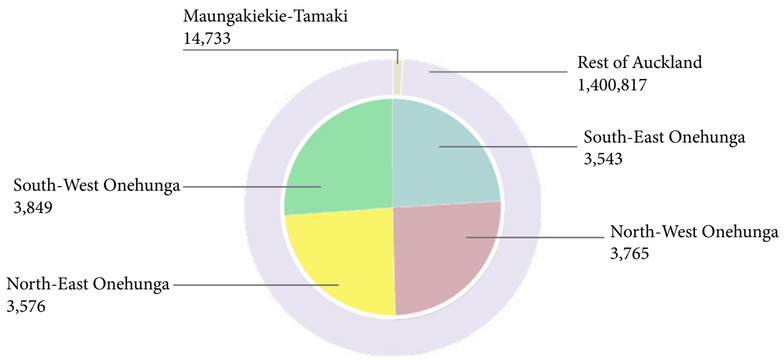
Onehunga is an alluvial soil or a beach composed of mixed sand and mud. ‘Oneone’ is the Māori word for soil. ‘One’ is a prefix used when naming different soil types.

Alluvial Soils

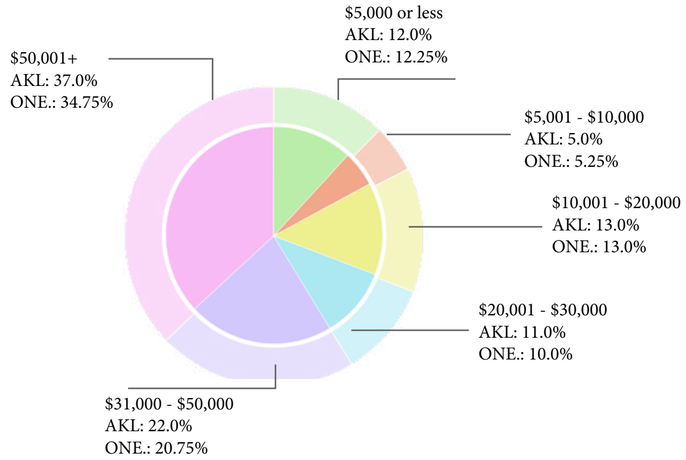
Waitemata Residual Soils

Isthmus Volcanic Soils

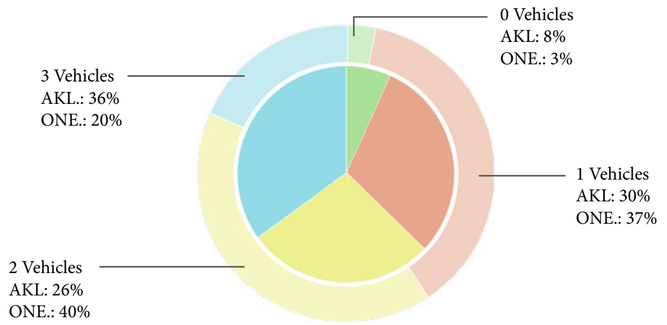
## Population



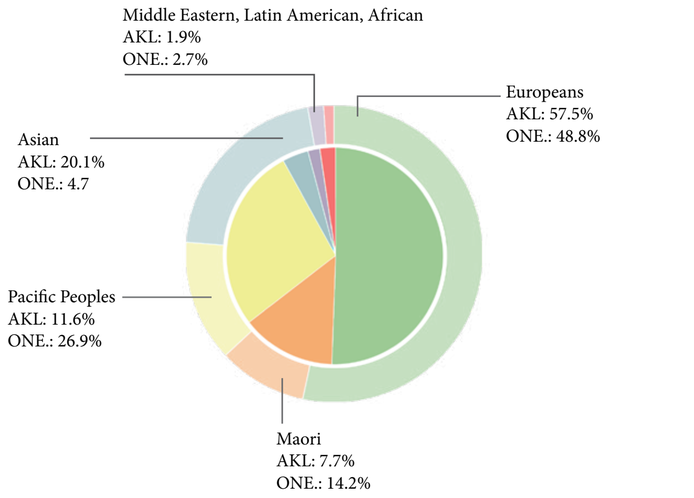

## Income



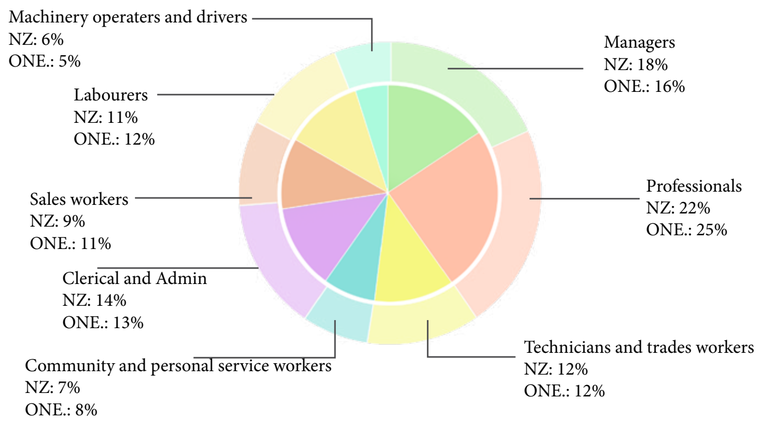

## Vehicular Access



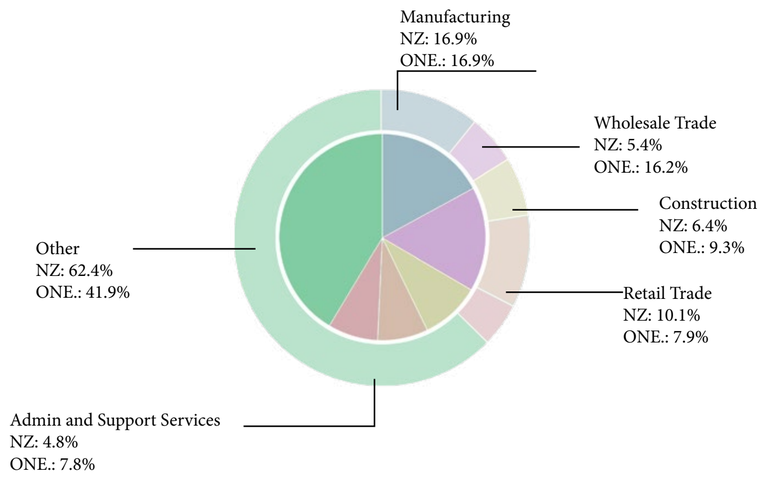

## Ethnicity



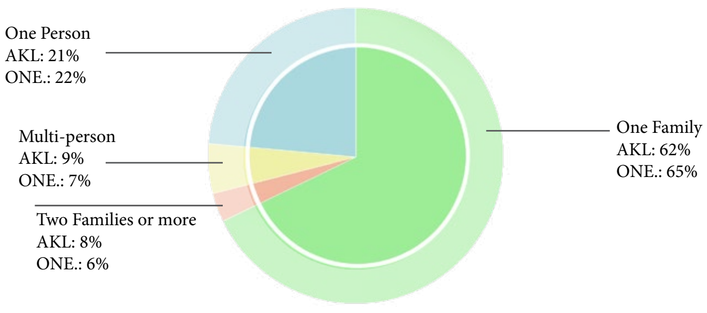

## Work Type



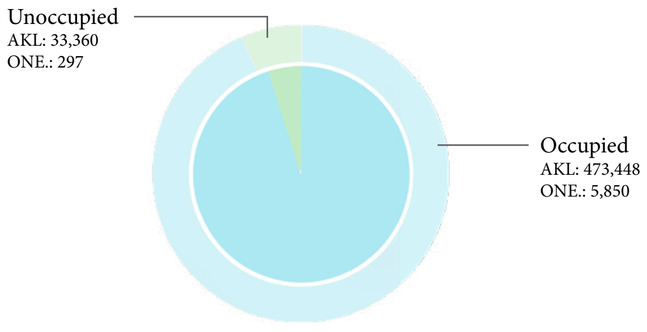

## Industries




## Household Composition




## Dwelling



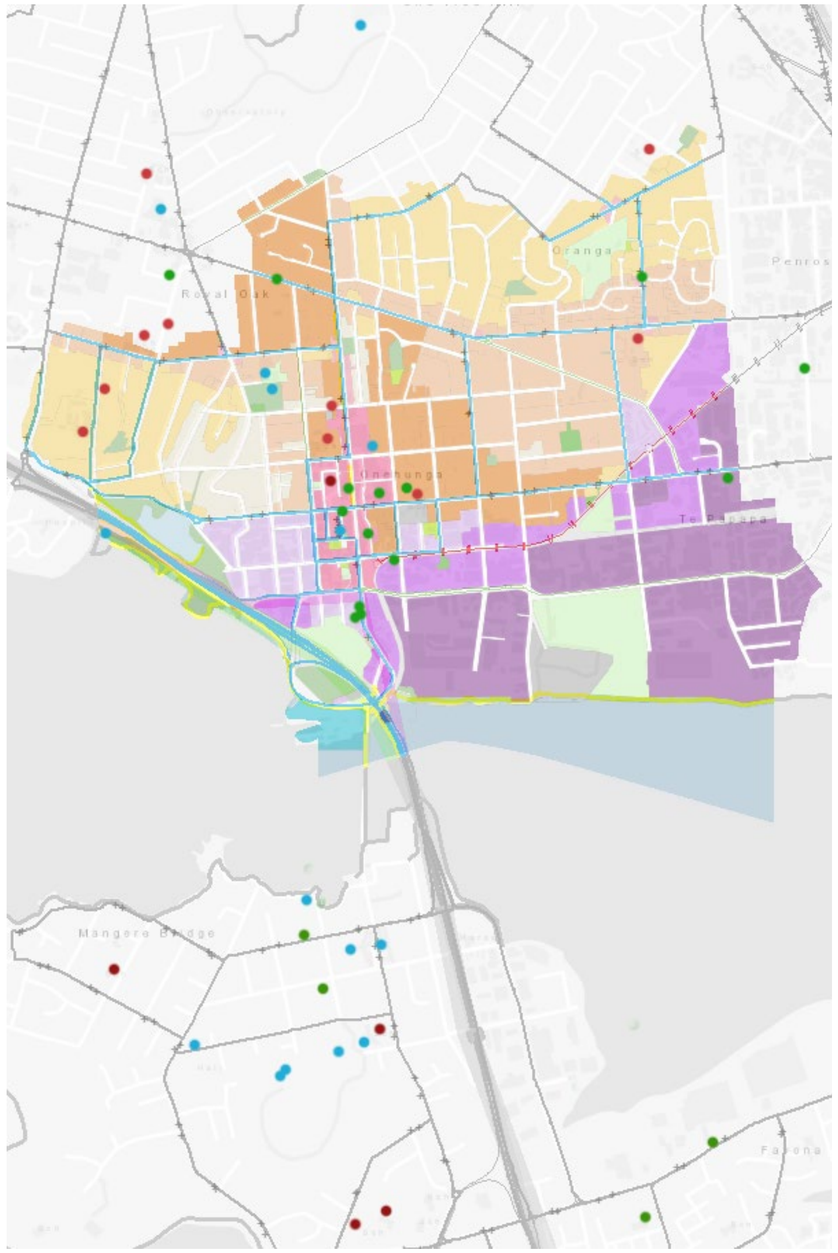
1:7500

Under the Auckland Unitary Plan, Onehunga has a lot of land zoned as Heavy or Light Industrial. Combined with the a relatively high amount of land being zoned for higher density developments this Industrial land use speaks to the working culture of Onehunga.

Ideally, any development on the port would pay homage to both the post-colonization history of skilled tradesmen and the pre-colonization tradions surrounding Māori arts and crafts that ties into Mahi Toi, the aspect of Te Aranga that relates to the creative and appropriate expression of iwi/hapū narratives.

Establishing a connection with mana whenua to advise on artists capable of doing iwi/hapū narratives justice will be essential for getting high quality art works designed for andinstalled in public spaces.

Developers should also draw inspiration from Mahi Toi when they look for any non-Māori artists they employ: these artists should be chosen from around Onehunga.




Legend

Road Network

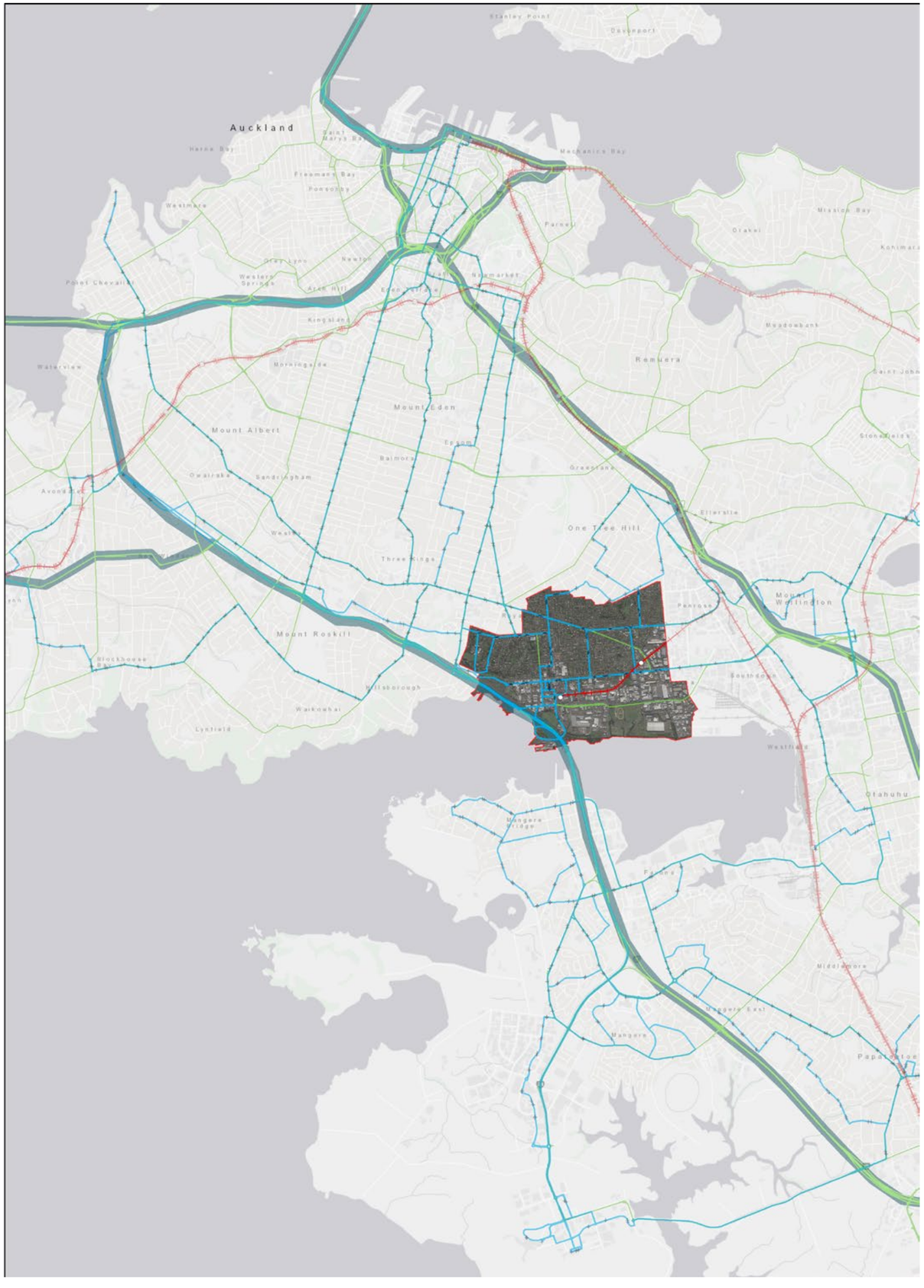
- Arterial Road
- Cycle path
- Bus Stop
- Bus Route
- Train Route

Unitary Plan

- Residential - Terrace Housing and Apartment Building Zones
- Residential - Large Lot Zone
- Residential - Mixed Housing Urban Zone
- Residential - Single House Zone
- Open Space - Informal Recreation Zone
- Open Space - Sport and Active Recreation Zone
- Open Space - Conservation Zone
- Business Town Cente Zone
- Business - Mixed Use Zone
- Business - Light Centre Zone
- Business - Heavy Industry Zone
- Special Purpose Zone
- Water

Communial Facilities

- Religious
- Education
- Recreational




This map shows ow the different forms of transportation available in Auckland access Onehunga township (and by extension the port).

The two most prominent lines are the motorways. The smaller green lines are the roads. This map makes it obvioius just how strongly Onehunga Port is affected by State Highway 20.

The red, crossed lines are the train tracks whilw the blue and green crossed lines belong to the bus routes. While there are bus lines that go through Onehunga none of them stop at the port. The train track that used to finish at the wharf is no longer running.

The Onehunga port is in dire need of some form of public transport. One of the solutions is for the proposed CBD to Airport light rail system to stop at the port. This would allow for ready access and an easier commute.

What would be even more interesting to explore is the possible harbour-borne connection: rather than becoming fixated on Onehunga’s potential as one stop on the light rail path, Hinekirikiri would consider increasing the infrastructure (ferry terminals) around the southern coast of the Manukau out to Glenbrook.

Ths would be linked to a concerted effort to restore the foreshore along the ferry’s route. The Te Aranga principle of Taiao necessitates the protection, restoration, and/or the enhancement of the natural environment. Restoring foreshore and reducing the need for new land-based infrastucture, like roads, could only benefit the environment.

Mana whenua would be consulted about taking control of the ferry routes and terminals which, along with the restoration of the foreshore, would create employment opportunities that align more readily with a iwi/hapū cultural and ecological priorities.

Accessibility is key to the long term financial, social, and cultural resilience of any development.

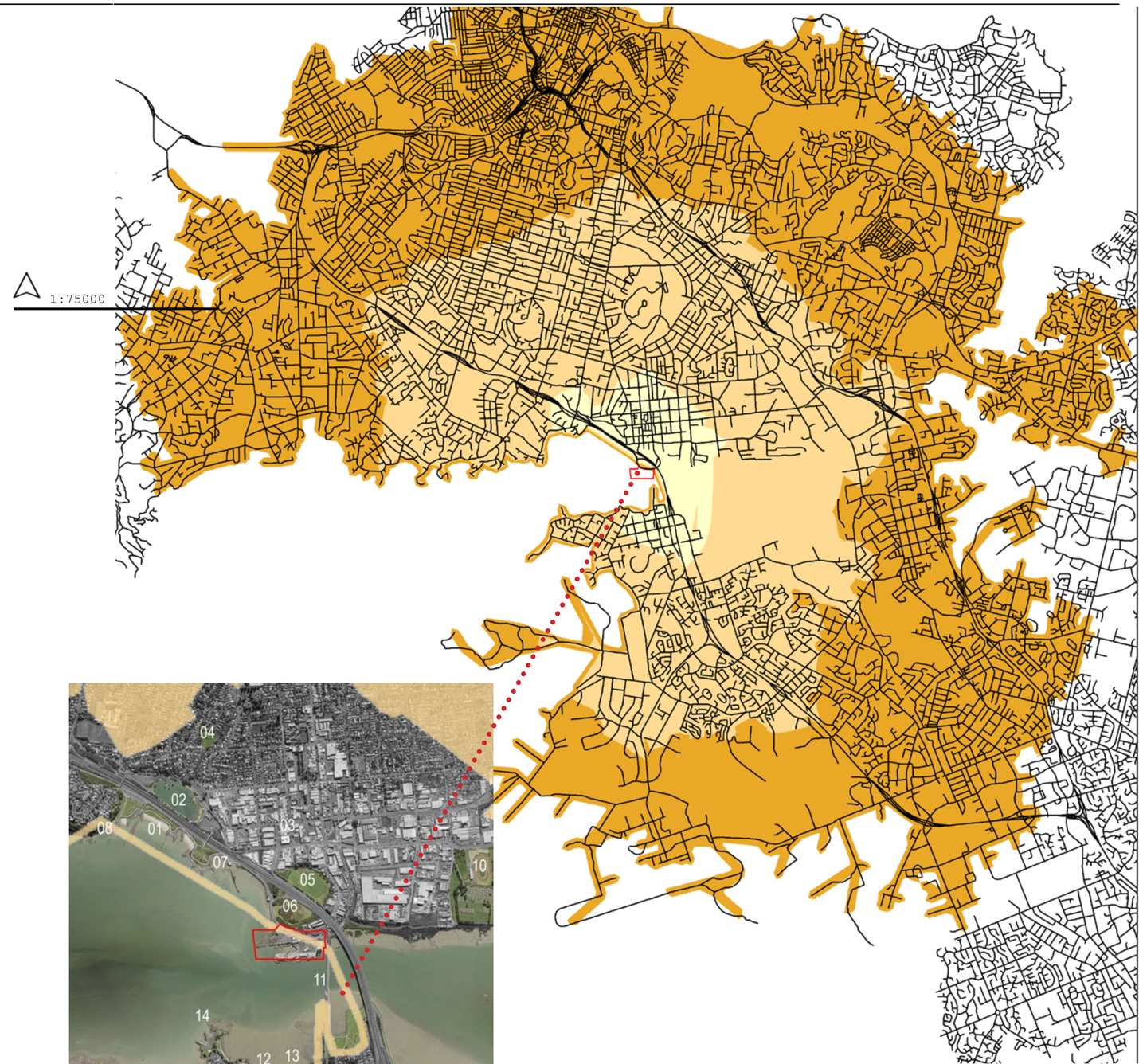
The Te Aranga principle of Ahi Kā requires that iwi/hapū have a living and enduring presence and are secured and valued within their rohe.

Where it is not possible for mana whenua to live in the near the Onehunga Port and foreshore, it is an obligation to make work and play in the area as readily accessible as possible.

This will also allow easier acces to any natural resoureces that are established in line with the principle of Taiao.

The map to the right indicates the distance a person is able to walk, cycle, and move via light rail (like the one proposed to link the Auckland central business district to the Airport, via Onehuna). The colours get darker for each, faster mode of transport.

The inset is a blown up map of the proposed development site and its context that shows significant amenities in both Onehunga and Mangere Bridge.







No scale

1. Taumanu Bay Reserve
2. Onehunga Bay reserve Ski Bowl
3. Sir William Jordan Recreation Centre
4. Jellicoe Park
5. Gloucester Park
6. Gloucester Reserve
7. Manukau Cruising Club
8. Waikowhai Coastal Boardwalk
9. Waikaraka Park
10. Waikaraka Family Speedway
11. Mangere Bridge boat ramp
12. Kiwi Explanade
13. Allan Park
14. Mangere Boating Club & Playground
15. Mangere Domain
16. Ambury Park

## MANGERE BRIDGE TO ONEHUNGA WHARF


## ONEHUNGA WHARF TO MANGERE BRIDGE

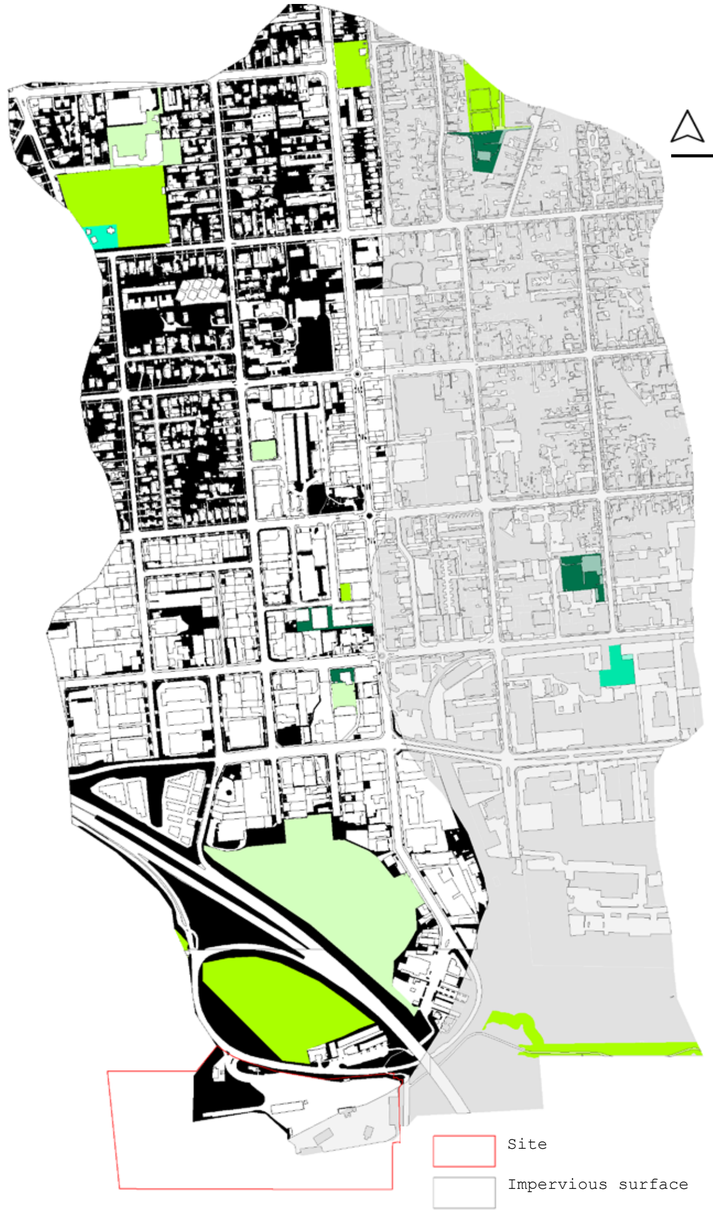
CATCHMENT A

CATCHMENT B

This research report considers the Northern Manukau Catchment (A) + the Mangere Catchment (B). Our site sits within the Northern Manukau Catchment but we achknowledge the underground infrastructure, stormwater run off and overland flow paths that flow from the Mangere Catchment.

NO Scale

^ The information to create this analysis was collected from Auckland Council open data and maps were created in ArcMap.




NORTHERN MANUKAU CATCHMENT (A)
964, 126 sq/m

64.4% IMPERVIOUS SURFACES + BUILDING FOOTPRINTS

9.96% URBAN PARKLAND + PUBLIC OPEN SPACE

MANGERE CATCHMENT (B)
810680.27 sq/m

58.5% IMPERVIOUS SURFACES + BUILDING FOOTRPINTS

6.6% PUBLIC OPEN SPACE

^ The information to create this analysis was collected from Auckland Council open data and maps were created in ArcMap.

# 0.0 INFRASTRUCTURE


NORTHERN MANUKAU CATCHMENT (A)
964, 126 $m^2$

Worst case climate change scenario (RCP 8.5 H+) for the period 2031-2050

Annual Exceedence Probability (AEP) = 0.633
Rainfall intensity = 25.9 mm/hr
Runoff Co-efficient = 0.5
Peak Disharge = 3.44 $m^3/s$

Annual Exceedence Probability (AEP) = 0.010
Rainfall intensity = 61.8 mm/hr
Runoff Co-efficient = 0.5
Peak Disharge = 8.21 $m^3/s$

MANGERE CATCHMENT (B)
810680.27 $m^2$

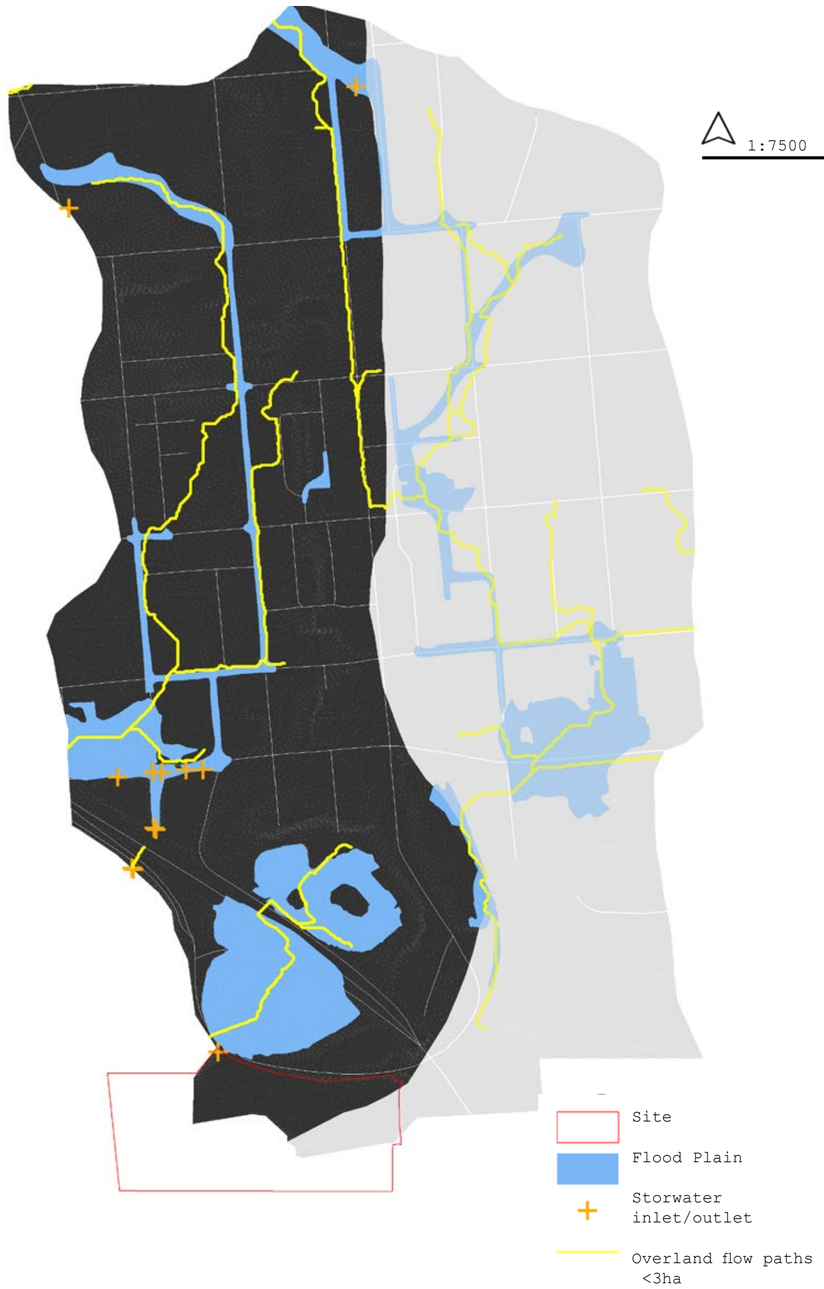
Worst case climate change scenario (RCP 8.5 H+) for the period 2031-2050

Annual Exceedence Probability (AEP) = 0.633
Rainfall intensity = 25.9 mm/hr
Runoff Co-efficient = 0.5
Peak Disharge = 2.90 $m^3/s$

Annual Exceedence Probability (AEP) = 0.010
Rainfall intensity = 61.8 mm/hr
Runoff Co-efficient = 0.5
Peak Disharge = 6.90 $m^3/s$

^ The information to create this analysis was collected from Auckland Council open data and maps were created in ArcMap.

# 0.0 FLOOD PLAINS




Application of thvrepresent the floof plains, and indicate where the water will tend to collect when there is too much of it.

The yellow lines denote the overland flow pathwhichs which are the result of piped drainage systems struggling to cope and forcing significant accounts of water to find its way downhill. There are a great many solutions available to solve the problems of overflowing, polluted stormwater. Many of them overlap with the Mauri Tu and Taiao princples to some degree. Others don’t over lap at all.

Both Taiao and Mauri Tu (closely related as they are ( will all prefer solutions that re-establish local bidiversity and encourage planting of indigenous flora in public spaces.

Auckland Council’s information booklet Stormwater Management Devices in the Auckland Region uses five criteria s it broadly sums up the applicabilty of each of these devices. The criteria are:

- 1% AEP detention
- 50% and 10% AEP detention
- Detention for stream protection
- Retention (unlined)
- Water Quality

^ The information to create this analysis was collected from Auckland Council open data and maps were created in ArcMap.

Pervious Pavement

- Any form of hard pavement or road that allows water through and into basecourse before it eventually gets to the stormwater system
- Aligns with Kaitiakitanga, Taiao, and Mauri Tu if combined with water quality treatment. hand weeding and maintenance helps as well.
- Holds and releases peak flow stormwater in a controlled manner.
- Looks good
- Prone to clogging, particularly when set into the ground
- Not great for volume control or extreme storms, and can’t be used for areas of high traffic acceleration forces (Stopping starting and turning).

Bioretention Devices

- Includes rain gardens, planter boxes, bioretention swales etc.
- A sunken garden that allows stormwater to pass through both soil and plants
- Allows for the planting of native species (Taiao), and the cleaning of wai (Mauri Tu).
- Can provide detention, retention, and water quality treatment.
- Looks good
- Very specific construction, operation, and maintenance
- Not great for volume control or extreme storms

Green Roof

- A roof covered in vegetation
- Can be intensive (requiring lots of structure and supporting quite large plants) or extensive (lightweight, typically designed for succulents.
- With iwi consultation intensive roofs can align with Taiao by planting native species.
- Looks excellent, and creates more pleasant urban spaces.
- Decreases urban temperatures (tempers heat island effect)
- Good for a little retention but not much else.
- Expensive to build and maintain

Rainwater Tank (non-potable)

- More efficient use of water; lower demand on the public water supply.
- Lower annual site runoff, and capture a lot more of the first flush pollutants.
- Potable use requires extra treatment
- Can be hard to design around, aesthetically
- Require regular inspection and maintenance.
- Not great for volume control or extreme storms

Swale

- A broad, planted channel used to treat stormwater runoff.
- Directs stormwater across vegetation helping to filter sediments, nutrients and contaminents before it heads downstream.
- Can align with Taiao, especially if little to no mowing, and planted with the native flora.
- Fragile and can be difficult to maintain
- can require a lot of land, and land can’t be too steep > 8% slope.
- Not great for volume control or extreme storms

Infiltration devices

- Trenches and pits that retain water for disposal into the groundwater table.
- Can be used to recharge groundwater and can be used for retention of up to 50% AEP storms if sized correctly.
- Out of sight.
- Complex set up with high failure rate if all variable aren’t ccounted for
- Upstream drainage must be completely stabilised
- Not great in large storms
- Difficult to gauge effectiveness

Wetlands

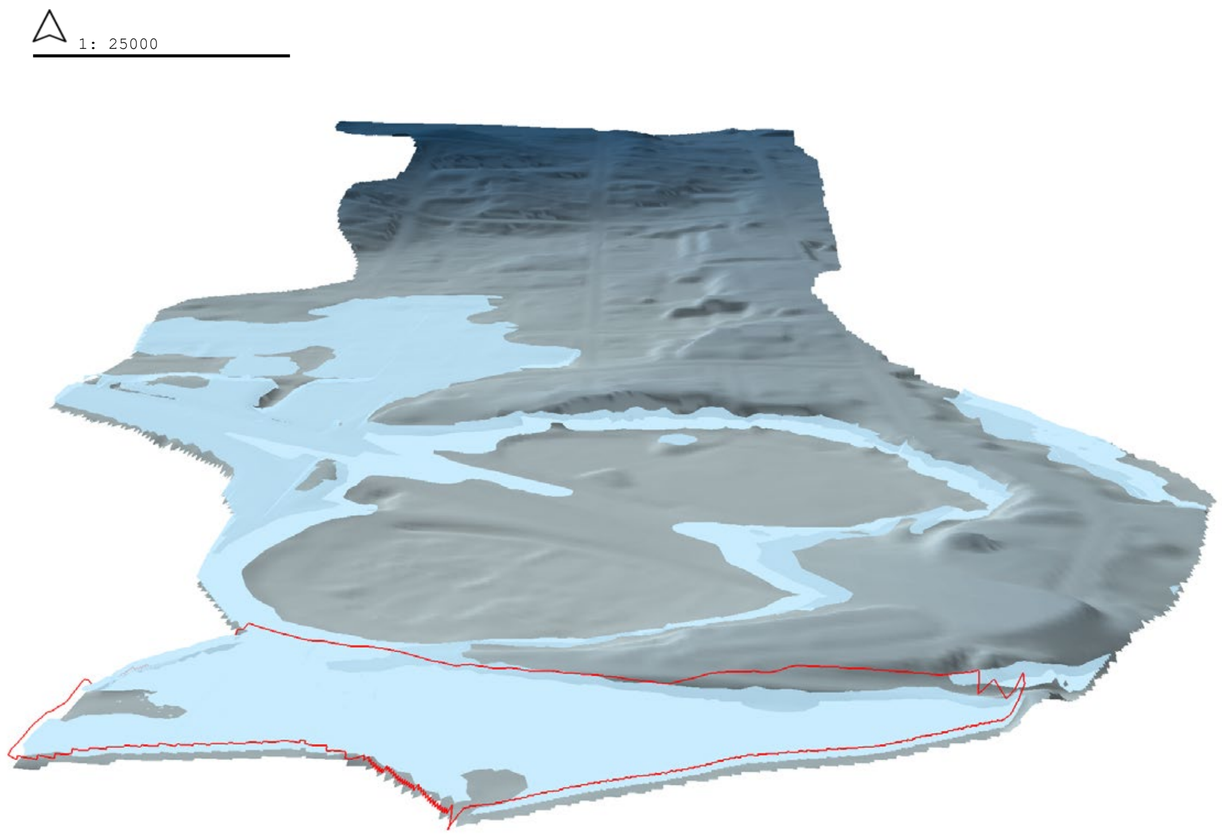
- Constructed wetlands, engineered to mimic their natural conterparts.
- As long as iwi are consulted early and have a say in the design process wetlands align with just about every part of Te Aranga.
- Can do everything except provide retention.
- Prone to clogging, particularly when set into the ground
- Can manage volume control and extreme storms, and they minimise the downstream erosion.
- Can be very pleasant to look at.
- Can take up a lot of space.
- Is a potential safety hazard e.g., drowning, bacteria.

Dry Ponds (detention basins)

- Consist of a temporary pool with a planted base that releases trapped stormwater slowly between storm events.
- Can align with mana whenua values with consultation, specifically regarding native species selection and ongoing maintenance contracts.
- Reduce downstream flood potential and erosion.
- Can manage extreme storm flow and volume.
- Easier to maintain than wet ponds.
- Enhance green corridors (an attribute of **Taiao**).

Ponds (Wet)

- Not supported by mana whenua
- Can reduce downstream flood potential
- Provides a naturalised haven for birds and water creatures
- Does provide retention or w=decent water quality treatment.
- Requires resources consent when discharging into stream.
- Same safety risk as a wetland with fewer positives.




Above is 3D model to visualise worst case predicted scenario of sea level rise; 100yr2m Sea level rise.

Coastal inundation due to rising sea levels is an increasingly pressing threat to all existing and planned coastal developments. The speed that the sea level is rising changes from place to place, ue to differences in tides, currents, and ice meltwater distribution.

Relative sea level change is a combination of mean sea level rise and the movement of the landv; the sea can appear to be rising more slowly if the land is also rising.

The relative sea level rise can also be much faster where the coast is also sinking. This is called subsidance.

These factors make it important to use the projections for relative sea level change when planning for the Onehunga port development. The Ministry for the Environment provided 100-year projection figures based around four possible scenarios in their booklet *Preparing for Coastal Change*. These sea level rise projections vary between approximately 0.6 m (RCP2.6 M) and 1.5 m (RCP8.5 H +) depending on how effective the response to climate change is.

*Preparing for Coastal Change* lists the main responses to coastal change as: **accomodate**, **protect**, **retreat**, and **avoid**.

**Retreat** involves steadily moving people and assets out of the way of rising tidesor erosion and inundation damage. **Avoid** involves planning so that future developments don’t put people and assets in harm’s way. Neither is of any use to the proposed development at Onehunga Port. It will need to be designed to either accomodate and/or protect.

^ The information to create this analysis was collected from Auckland Council open data and maps were created in ArcMap.

The **accomodate** response to climate change is built around the idea of adjusting existing developments and ensuring new developments are designed for a future where the land they are built on is either routinely or perminently submerged. Some development examples of an **accomodate** response include:

Elevated:

- Allows structures to be built in places that are already undergoing coastal change and avoid the threat of flooding.
- It is probably not cost effective to elevate old buildings
- Short term solution that puts off the problem for a while.
- Whatever structural member is raising the building above the oncoming tide also changes the shoreline and will require the same protectiion as low-lying development.

Floating:

- Handles earthquakes and rising tides well, but doesn't handle being exposed to storms as well.
- Any building can be built to float, but not modified to do so.
- Becomes a public transport and planning problem if not located lose to jobs and amenities.
- The Sluishuis Building designed for IlBurg by BIG is an example.

Floodable:

- Considered a "low impact' approach to designing structures that can withstand flooding and/or retain stormwater.
- Has the potential to be hazardous with existing infrastructure, particularly when waste water and stormwater systems are known to interact (like Auckland) and when their aren't sufficient systems in place to ensure water quality.

Sluishuis Building, Ilburg

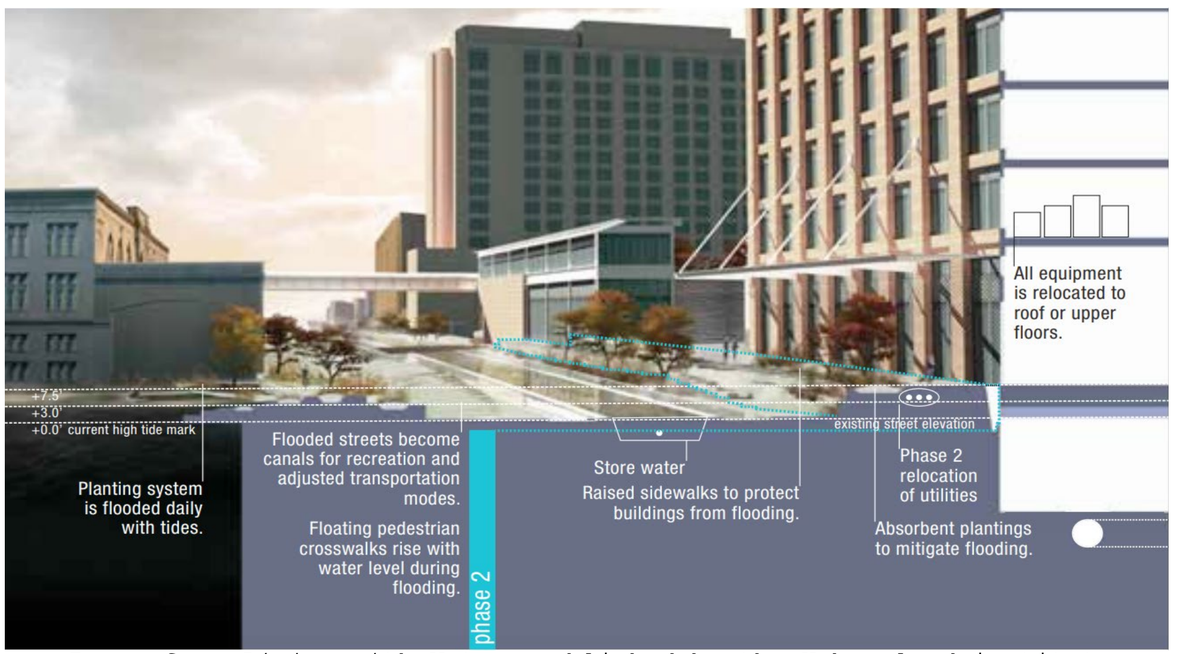



Image from *Living with Water*, published by the Urban land institute

The **protect** response to climate change is built around the idea of building walls or natural barrier to slow or stall the advancing tide. Some examples of a **protect** response include:

Barrier:

- A large dam, gate, or lock
- Can protect large areas of land at once e.g., if constructed accross the manukau heads.
- protect eveyone (less of a social inequality problem
- Extremely expensive
- Potential to do massive damage to the ecology, flying in the face of the Te Aranga principles

Coastal Armour:

- Hard solution. Also known as a wall.
- Familiar solution, easy sell.
- Short term, limited ability to deal with large storms.
- Increase vulnerability by not dissipating any of the tidal energy
- Water will go around the wall.

Wetlands:

- **Mauri Tu** necessitates that Environmental health is protected, restored and/or enhanced. Wetlands filter pollutants, store carbon, and provide habitats for wildlife.
- Need time, space, monitoring and management to succeed.
- Require more land than coastal armouring solutions.

Soft Engineering:

- Significantly reduces the impact of waves on the shoreline, lowering erosion.
- Can be natural (e.g., wetlands) or made from geotextiles (durable fibre containers of many potential sizes.
- Geotextiles can be placed around stormwater oulets release a lot of silt. they have proved viable for water filtering.
- New design possibilites available with the creation of artificial reefs

# TYPOLOGY_

TIDAL FLATS

The case studies collated refer built form on the foreshore, responsive to climate change and increased sea level.

In our research we recognise the importance of a returning biodiversity at this location, and the foreshore access by all.

In doing so, we celebrate that space on the shore line, between high and low tides. Once the bountiful grounds for kai moana, now silt covered and oyster ridden.

That space, the Hinekirikiri, nourished mind, body and spirit in times past, and has the potential to do so again once this area is unlocked for public return.

These brief typology studies refer projects that might inspire or inform Urban Planning along this coastal foreshore; beyond the esplanade ideal - promoting an appreciation of history & environment. Atypical design acknowledges marine structures, and that anomoly of industrial sea wall form in the path of Mother Earth, Papatūānuku.

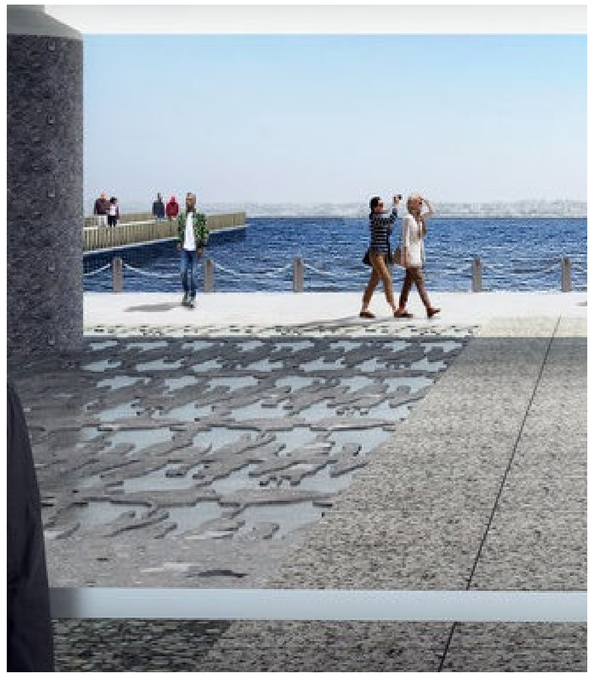
Low tide view from the Wharf access toward the Manukau Heads

# TYPOLOGY_LOW TIDE REVEAL

INTERNATIONAL AFRICAN AMERCIAN MUSEUM, CHARLESTON
HOOD DESIGN STUDIO

IMAGE CREDIT: HOOD DESIGN STUDIO

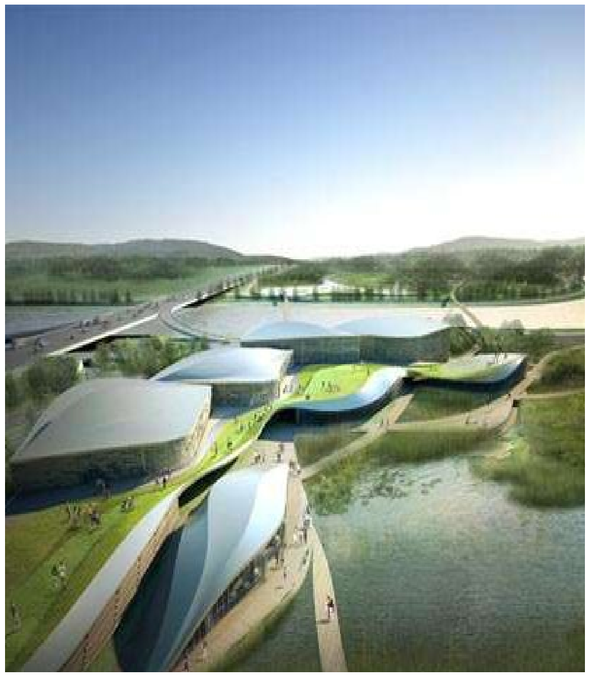
The affirmation of history at this important location is best served by the tidal reveal of the Brooks Map - the infamous scale drawing of enslaved men, women and children packed into the hull of a slave ship. Once lost to history, this site is now acknowledged as the port of entry for almost half of the enslaved Africans arriving in America. Tidal shift conceals and then reveals this confronting time in history, at 1:1 context.



SUNCHEON INTERNATIONAL WETLANDS SOUTH KOREA
GANSAM ARCHITECTS, G.LAB

IMAGE CREDIT: TREND HUNTER

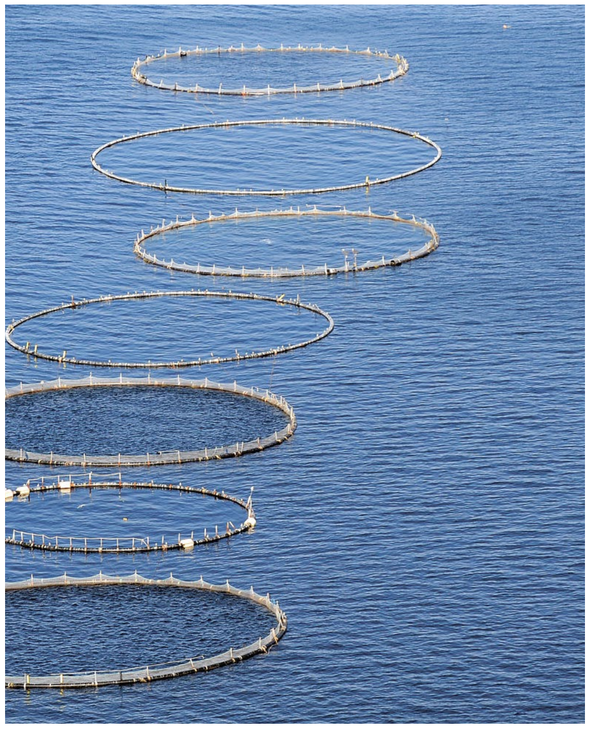
The architecture of Suncheon Wetlands mimics the residual waterline marks at low tide. Stepped access allows shoreline entry to the wetland via sacrificial design elements covered, in high tide. Large wetland and pervious development areas buffer the impact of both storm water and tidal fluctuation while green design principles of solar study and low impact materials minimise built form impact on one of the world’s largest wetlands



# TYPOLOGY_TIDE RESPONSIVE

SEMI-SUBMERSIBLE STRUCTURE
CROATIA
IMAGE CREDIT: J-Trading

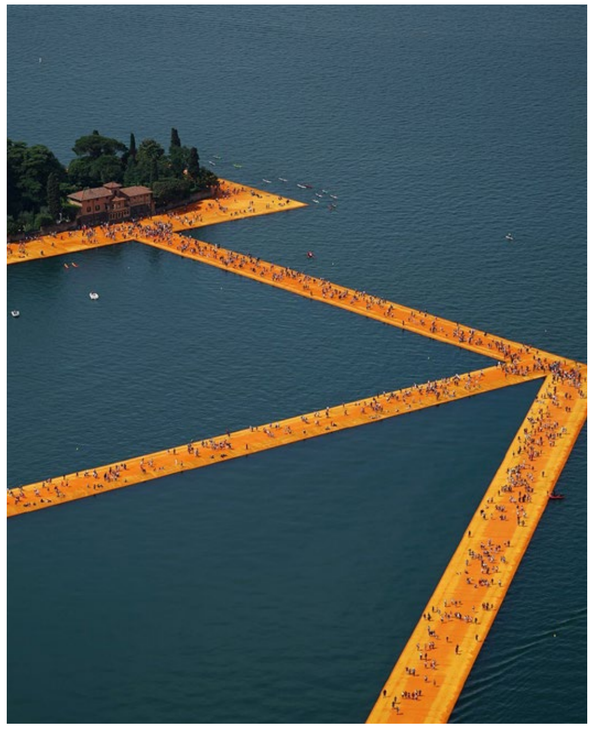
Designed to withstand extreme conditions the major structure is housed below sea level, slowed by weighted forms allowing free movement of the sea. Daylight filters to the sea floor, however the structure risks pollution by material fibre and farm waste, with capture risk to passing sea life and food chain capture heavily impacting the enviroment. Offshore oil drilling, utilises a similar design with ballast hull to stabilise heavy structure.



FLOATING PIERS, LAKE ISEO.ITALY
CHRISTO AND JEANNE-CLAUDE
IMAGE CREDIT Architect magazine

An oversize, textile-wrapped floating pontoon, this installation by Christo and Jean-Claude investigates movement, access, identity and community.

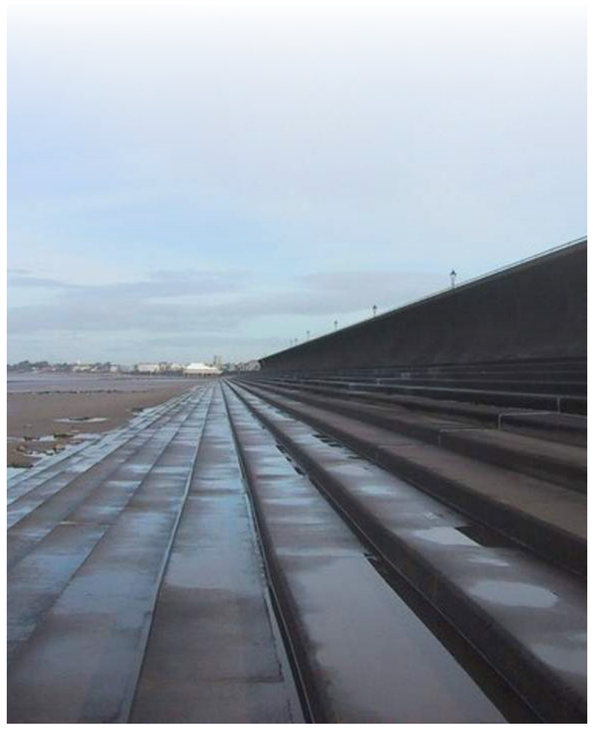
Secured to concrete bases constraining movement, and comprised of 220,000 high density polyethylene cubes, the pier connects locations and people, creating relationships otherwise seperated by water mass.



# TYPOLOGY_TIDE REJECTING

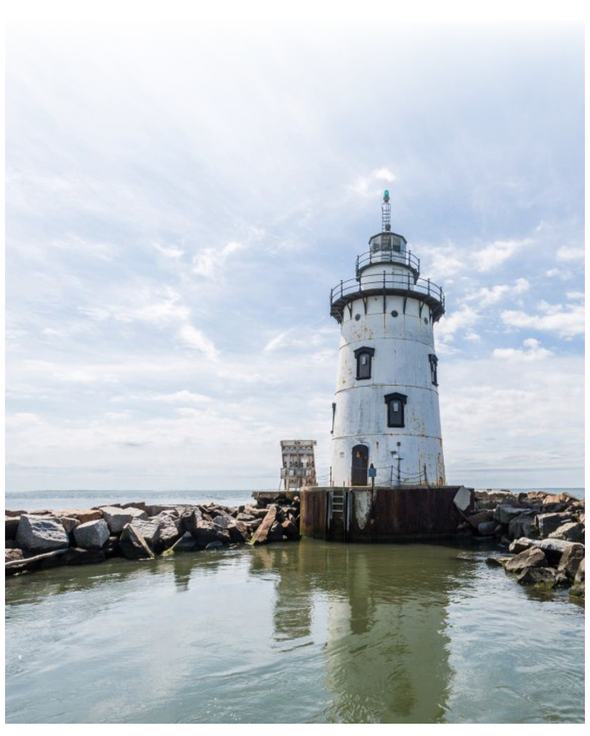
PROPOSED TSUNAMI (SEA) WALL
JAPAN
Image credit: Independent

Responding to increased extreme weather exposure, Japanese authorities have proposed a 250 mile, 12.5m high sea barrier to protect the low-lying coast from storm surge, sea-level rise and tsunami. The proposed solid concrete structure, allows stepped access to the foreshore, otherwise isolating coastal access. Environment impact replicates the urban city - wind, sun & daylighting buffered by the equivalent of a 4 storey building.



SAYBROOK BREAKWATER LIGHTHOUSE
FENWICK,CONNECTICUT. AMERICA
Image credit:NY POST

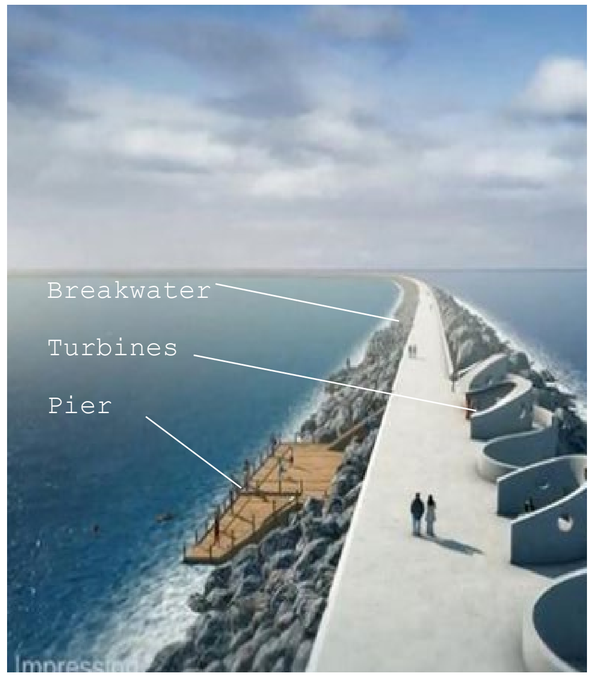
Lighthouse structures have long endured extreme locations through reclaimed or rock base, solid construction, sacrificial lower levels with limited surface penetrations and structural design allowing extreme weather to pass with limited impediment. Breakwater design offers safe refuge from tidal surge.



# TYPOLOGY_TIDE RESTRICTING DESIGN

SWANSEA TIDAL LAGOON
DESIGNERS: LDA DESIGN
IMAGE CREDIT: LDA-DESIGN

Intended as the first tidal range power station in the world, the Swansea tidal lagoon harnesses renewable carbon free energy production in a masterplan which promotes active marine recreation, community facilities and hosts a new beach and saltwater marsh. A designed solution that includes the user in foreshore activity where commercial activity has precluded user interaction previously.

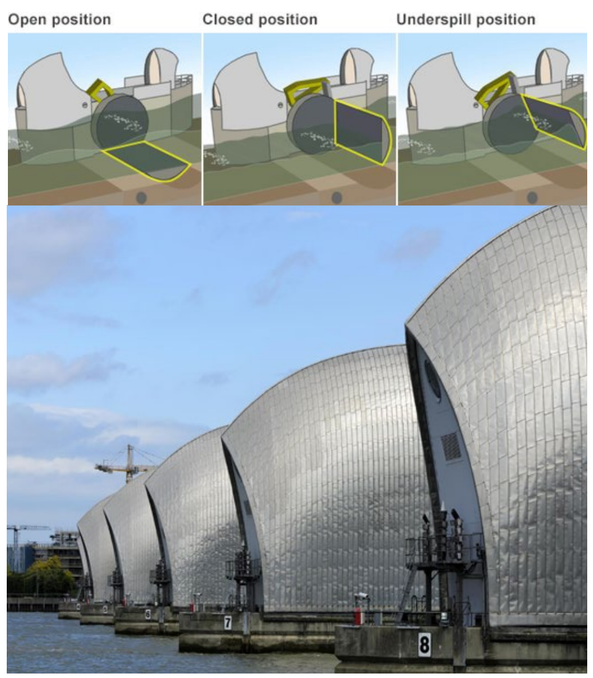



THAMES BARRIER, LONDON.
DESIGNERS: RENDEL, PLAMER & TRITTON
IMAGE CREDIT: BBC

Constructed in 1984 the Thames Coastal defense barrier spans 520m with a series of 10 lockable gates housed to restrict tidal surge on an incoming tide.

Closed just after low tide the gates allow the river reservoir to fill without pressure of incoming tide.

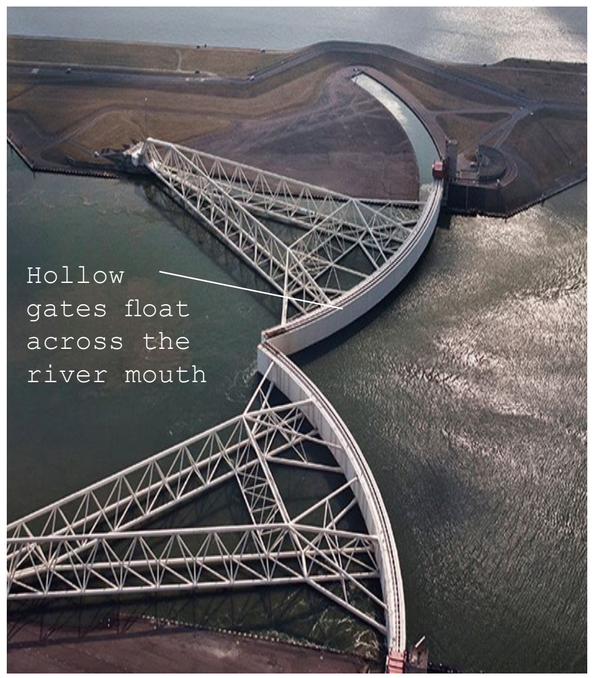
On outgoing tide the gates are released and residual water dissipates.




# TYPOLOGY_TIDE & SILT MANAGEMENT

PORT OF ROTTERDAM TIDE GATES
IMAGE CREDIT: Gizmodo

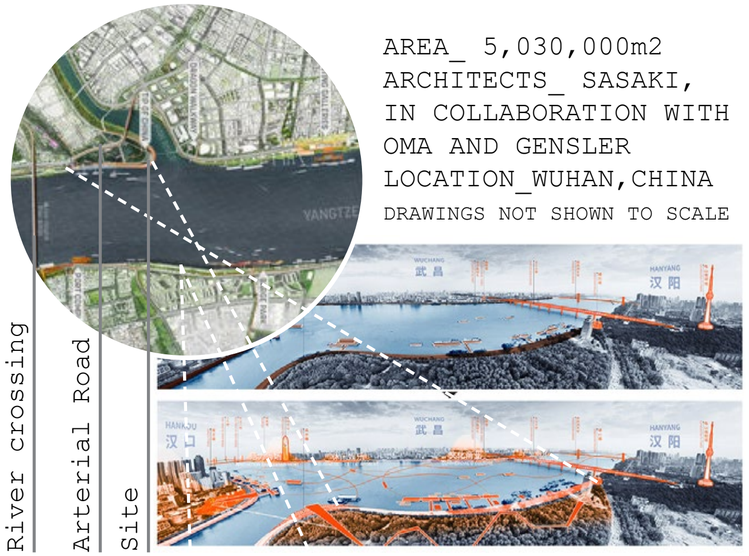
The Rotterdam port surge gates protect an area of 106sqkm, over 40km of shoreline. Spanning the mouth of the River Scheur, these gates operate on weather sensitive deployment. The hollow gates float across the river mouth, opening reservoirs once in place to fill the gates and sink to the riverbed limiting incoming tidal surge, protecting inland development, the Port and mitigating shoreline degradation by weahter event.




GEOTUBE INSTALLATION
IMAGE CREDIT: GeoLogic Now

Geotube is constructed of a synthetic polymer geotextile, strung across a water body to restrict pollution, limit silt build-up and offer shoreline protection.

Silt is dredged from the harbour floor & pumped into synthetic tubes clearing the residual seabed build-up and repurposing waste material. The tube then filters sea water, buffering tidal impact, storm surge and pollution. Risks include degradation of the introduced textile & environmental impact of dredging.




AREA_ 5,030,000m2
ARCHITECTS_ SASAKI, IN COLLABORATION WITH OMA AND GENSLER
LOCATION_WUHAN,CHINA
DRAWINGS NOT SHOWN TO SCALE


Architecture studio Sasaki embrace flooding as 'an essential dynamic of the public realm,' in the design of the Wuhan Yangtze Riverfront Park.

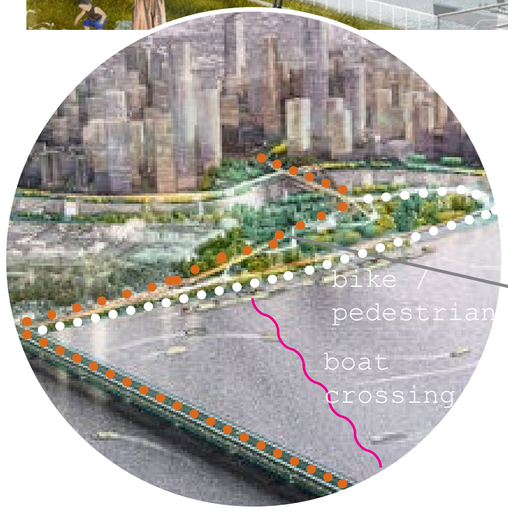
Large expanse pervious areas hosting diverse plant communities offer a dynamic green lung/ flood sponge to the rivers' edge.

Bound to the north by major arterial road & light rail, all other edges are by river frontage thus isolating, and 'greening' the site, offering refuge as an ecological island.

Access is by way of riverfront esplanade, across river by boat and via public transport.

Across the river, the design embraces flood rise, absorbing & polishing water for slow release wetland run-off. Incremental steps buffer freshwater rise &/or flood.

Above: Elevated roads
Below: Stepped tiers to flood wall

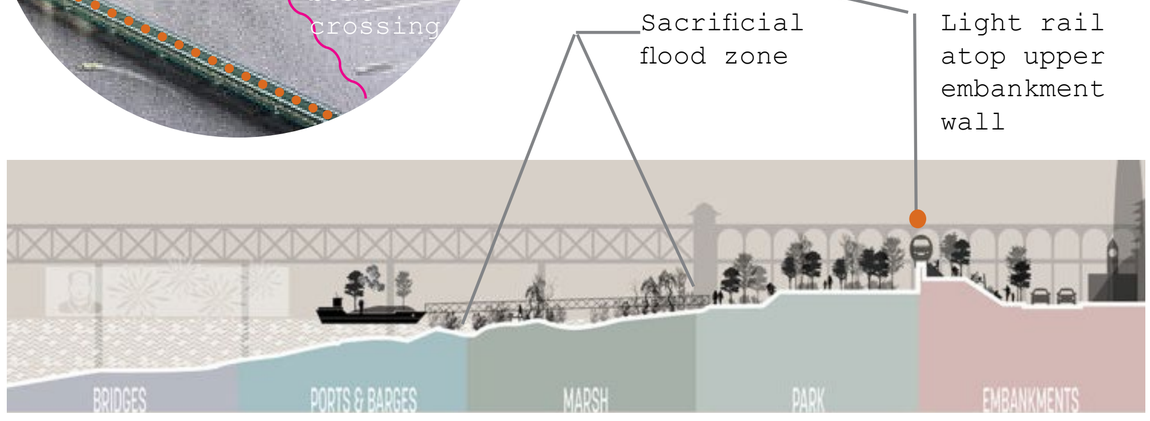



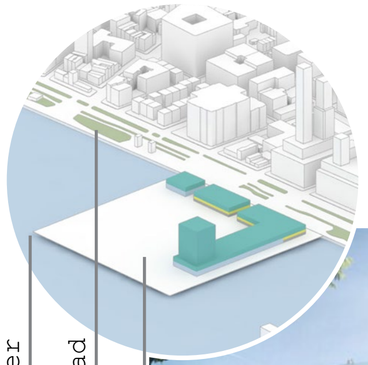

Free river access is created through stepped embankments that tend toward the river. Open expanse public area offers active recreation, community & river connections.

The near vehicle isolation to/from the site is embraced with effective public transport, multiple pathways of varying degree and interest, shaded public places, and the contrast on arrival at the healthy edge of the river.

Embankment erosion is addressed where marshes are disrupted by impervious, graded esplanades - found underwater in peak wet season.

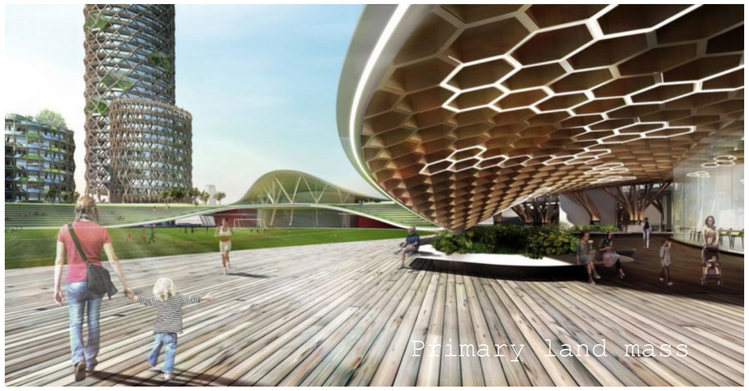
This development allows large scale public buildings, but excludes mixed use residential in favour of low level structures maintaining sight lines and creating moments of fun & nature within a recreation zone.






AREA_ 56656m2
ARCHITECTS_ D40

NEW YORK
DRAWINGS NOT SHOWN TO SCALE





Residential set 1.6m above SS sea level

Forecast storm surge (SS)

Forecast sea rise

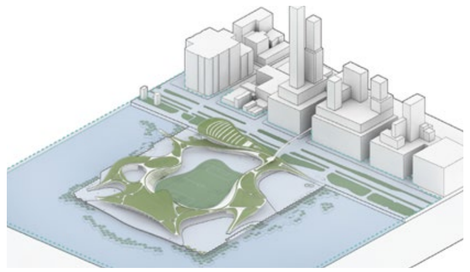
This smaller scale, 'floating' development by d40 embraces proposed sea level rise with a sacrificial ground floor public space opening into a coastal wetland zone.

The towering, cylindrical structures limit impervious footprint and host green wall and green roof installations. The structures are forecast to accomodate 1.8m of sea level rise in the next 50 years.

Breakwater path into elevated land bridge connects the site across the main highway route.

Land massing allow raised forms on the existing pier will form flood islands, with accessways through the mixed use de-velopment by way of elevated path connect-ing pavillions.

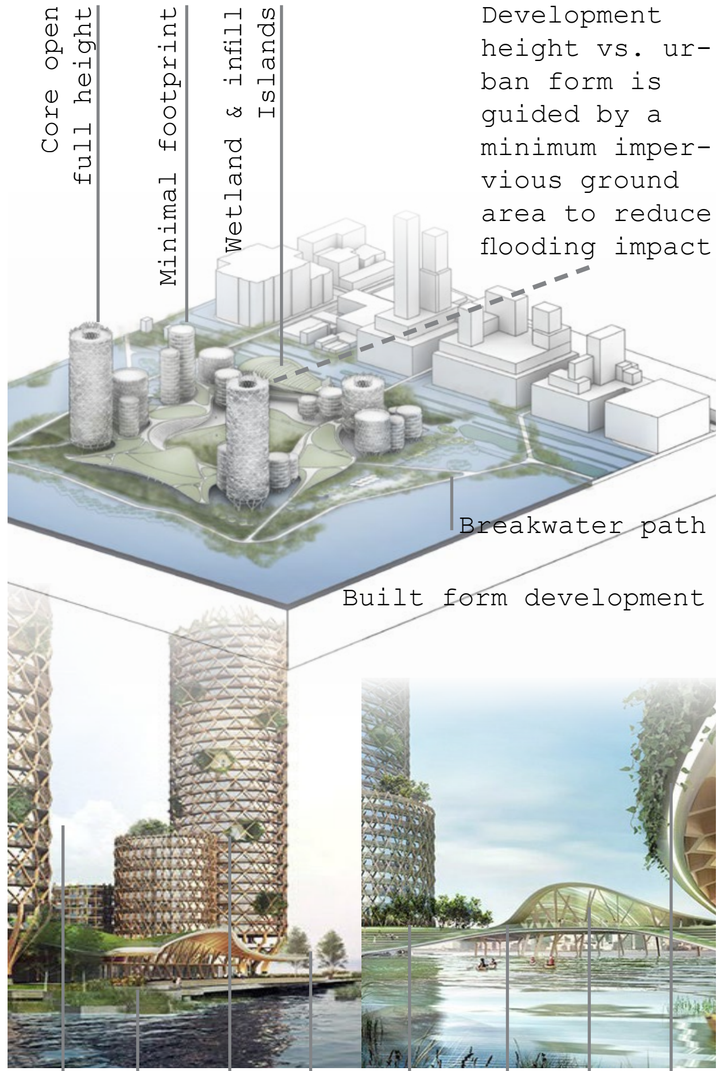
Primary land mass



Flooded land mass

Existing site use of football feld and car parking facilities limits usage restrictiion and other impact by flooding. The new design embraces sea level rise, capturing overflow in wetland areas, polishing water in vertical, roof and wetland gardens and allows continuous ground floor and elevated access despite water levels.

The impervious footprint is restricted to building platforms only, all other ground areas offer permeability, and in the wetland, capture for slow release.




AREA_ 250,000m2
ARCHITECTS_ HENNING LARSON w.A2P2 ARCHITECTURE & BBGK ARCHITECTI
DRAWINGS NOT SHOWN TO SCALE

INCITY Mega is proposed as a dramatic landscaped district cutting through the urban fabric of Wenzhou. Comprising 2 of the 8 plots of the Central Green Axis masterplan.

Plot 1, the INCITY Mega Mall responds to a rapidly growing consumer population, hosting mixed use, retail, plaza's etc. The inner courtyard is the heart feature, pushing structure to the edge. Open air platforms vertically connect back to the waterfront edge and views.

Plot 2 hosts a narrow waterfront boutique district: retail, hospitality and leisure attractions on the ground floor, commercial space above.

The mix of communal spaces and activities offer all weather activity, encouraging destination activity, with all function turning to the water edge.


Site access is managed by pedestrian access and light rail, with pontoon access across the River. The development faces away from the immediately adjacent cityscape, utilising the benefit of depth outward, capturing views across the rivers edge and through the city opposite.

Activity 'pockets' encourage movement through the development. Areas of pause, passive and active recreation interspersed under the umbrella of a green design ethos. Environmental connections are focused, the greater impermeable surface area in this design restricts water run-off opportunity, but the design allows a scarificial ground floor to accomoadte this flaw.

Connectinos are strong in this design, vertically, across the ful width of the site, over the river and into and through adjacent spaces. This is an environment the user will be seen and can interact with community and the environment.

The site isolation by major network is served sand vehicle access rqeuiring an able Publi to naviage. Stretches of built form limit pathways through and shortcuts, movement is orchestrated under the guise of a calming green urban forest.

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