TOWARDS MAURI-ORA IN MEDIUM-DENSITY ARCHITECTURE

Lana Webster
Huri te Ao - School of Future Environments
Te Ara Auaha - Faculty of Design and Creative Technologies

A dissertation submitted to Auckland University of Technology
in partial fulfilment of the requirements for the degree of
Master of Architecture (Professional)

Primary Supervisor: Fleur Palmer

Abstract

How can mauri-ora be protected, enriched and enhanced in medium-desnity residential architecture, while maintaining high building performance?

This research engages with the mauri-ora compass tool, the Te Aranga design principles and building performance standards in the context of a co-designed multi-use intergenerational residence. By applying learnings from across the scope of technical industries and indigenous knowledge, we aim to develop a carbon-neutral, sustainable building outcome. The Hawke whānau of Ngāti Whātua Ōrākei is the "client", and the design outcomes align with their tikanga practices and unique world view.

The resulting design assesses mātauranga Māori principles in construction applications and works as a nodal guide for future architectural projects in the intensification of development on Ngāti Whātua land.

He Mihi Aroha

Fleur Palmer- our supervisor and guiding star.
Kathy Waghorn - the other supervisor who provided expertise and critique at every stage.
Rory, Holly, Rana, Allan, - our research cohort. Working alongside each of you has been a privilege.

The Hawke whānau - this project is their dream, their vision, and we had the honour to help them bring it to life.

Arohanui, Tui, Kema, Roimata, Ngahuia

Andrew Burgess, for your honest critique and guiding questions.
PB&A, for supporting me for the past two-years on this journey.
Kuan - my partner, for your unwavering support, you're my bunsen.
Mum & Dad - without you, I could not have been able to do this, from the bottom of my heart, thank you!

And finally, to my friends, family, and flatmates - thank you for all of the support.

Table of Contents

List of Tables

Tables

List of Images

Images

List of Diagrams and Drawings

Diagrams

Design Outcome Diagrams

Drawings

Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

Signed:

Name: Lana Webster
Date: 20/10/2022

Pepeha

Ki te taha o tōku papa

Mai matakana ki matakana

Ko Tainui te waka

Ko Ngaati Whanaunga toku iwi

Ki te taha o tōku mama, he Pākehā ōku tūpuna

Ko Rangitoto te maunga te ru nei toku ngakau

E mihi ana ki nga tohu o nehe, o Birkenhead e noho nei au

Ko Tāmaki Makaurau te kāinga inainei

Ko Lana Webster toku ingoa

He mihi nui Kia kotou

The Project Premise

The Hawke whānau have lived at 31 Kitemoana street for three generations. The original house was built by their father, Bob Hawke, and as his family grew over the years, he built extensions and renovated to comfortably house everyone. The family holds the property and house through ahi kā status (defined by the Māori dictionary as title to land through occupation by a group, generally over a long period of time) and has aspirations of holding ahi kā for generations to come.

The Hawke whānau are prominent members of their local community, with Bob Hawke and his wife Arohanui holding leadership positions as kaumātua (elders) in the Open Brethren Church and Oranga Tamariki . Bob and Arohanui offered safe haven in their home to members of their wider hapū, and over the years, have formalised this service through the Government organisations of: Oranga Tamariki and Kāinga Ora.

The whānau approached Fleur Palmer, our supervisor and associate professor at Auckland University of Technology (AUT) in Huri Te Ao, with the dream of rebuilding the house their father had built for them. Over the last few years, Bob's health had declined, and the house had fallen into disrepair. Bob sadly passed on in September 2021, though with his blessing the wheels of change were already in motion. The resulting thesis project is a co-design medium-density, mixed-use, intergenerational development created by five Masters of Architecture students at AUT's Huri Te Ao.

Image 1: Hawke whare, Author, September 20222

The five-storey building includes a basement carpark, common facilities and accommodation for groups as outlined next:

Basement
- 5 underground car parks with storage, refuse and plant rooms

Ground Floor
- Living, kitchen, dining area of 5 bedroom 2-storied apartment for the whānau.
- Gym, sauna, and associated bathroom facilities
- Whare nui and associated communal dining kitchen facility
- Tool storage and rain water tanks.

Level 1
- Bedrooms and bathrooms of 5 bedroom 2-storied apartment for the whānau.
- 1 bedroom apartment for visiting whānau or rental
- Co-working library space
- Oranga Tamariki accommodation for 5 at-risk young boys and their carer.
- Shared southern courtyard.

Level 2
- 3 bedroom apartment for whānau or rental
- 1 bedroom apartment for whānau or rental
- 2 bedroom apartment for whānau or rental
- Oranga Tamariki accommodation for three at-risk young mama and pepi.

Level 3
- 3 bedroom apartment for whānau or rental
- 1 bedroom apartment for whānau or rental
- 2 bedroom apartment for whānau or rental
- Communal terrace garden/deck area for the entire complex

Level 4 - Whare Taonga
- Library, archive, workshop, and studio space for hapū taonga and artist exhibitions
- Associated kitchen and dining facility
- Terrace garden/deck area.

In total, there are ten dwellings, 24 bedrooms, providing accomodation for between 30 and 46 individuals.

The Hawke Whānau & Ngāti Whātua Ōrākei

Ko Maungakiekie te Maunga

Ko Waitematā te moana

Ko Mahuhu-ki-te-rangi te waka

Ko Ngāti Whātua te iwi

Ko Ngāoho, ko te taou, ko Te Uringutu nga hāpu,

Ko Ōrākei te marae

E tu nga Uri o Tuperiri

Tāmaki Makaurau e ngunguru nei

Pre-Contact

A long-woven history of journeys, battles, pacts, and occupations brought Ngāti Whātua Ōrākei to their tūrangawaewae at Okāhu Bay, establishing their status as mana whenua around 1750, and where they flourished in prosperity for four generations.

Around 1820 began a period of unrest, marauding campaigns, and invasions. Ngāti Whātua began to lose their grip on the isthmus and upon returning from one such campaign, found Tāmaki laid waste and the remaining people taking shelter in the Waitākere ranges. Ngāpuhi from the north held the imminent threat of musket warfare, encouraging an alliance between Ngāti Whātua and Waikato iwis in a successful effort to secure their position. By 1840, small flourishing settlements had been re-established on both harbours of the isthmus, with notable presences at Māngere and Onehunga on the Manukau, and Horotiu and Okāhu on the Waitemata.

Post contact

The signing of the treaty of Waitangi took place on the sixth of February 1840 by about 40 chiefs of northern tribes. Ngāti Whātua signed on the 20th of March at Manukau with Crown's representative, Captain Symonds. Shortly following this event, seven senior chiefs travelled to the Bay of Islands to meet with Governor Hobson to invite the Crown to settle in Auckland as the capital. Salisbury remarked that this invitation made history as the only city in New Zealand (or arguably, the world) where the establishment of a settlement by an invading power was made at the express invitation of the indigenous people. (Salisbury, 2009)

Ngāti Whātua were said to regard the Crown settlers as "Ngāti Wikitoria" and gave Queen Victoria the name "Te Kotuku Rerenga Tahi," meaning the white heron of a single flight, acknowledging her as Ariki of her tribe (Salisbury, 2009). The invitation for Ngāti Wikitoria to settle and live amongst them was made with the intention of safeguarding the region from Ngāpuhi and fulfilling a prophecy made by a tohunga, Tītai that was recited at a meeting at Okāhu in 1780.

He aha te hau e wawara mai?
He tiu, he raaki
Nāna i mai te pūpū tarakihi kiuta.
E tikina atu i au te kōtiu,
Koia te pou whakairo
ka tū ki Waitematā
I aku wairangi e.

What is that wind that softly blows?
Is it the wind of the northwest, of the north?
That drives the nautilus (ship) on our shore.
If I bring from the north
The handsome carved post
And place it here in the Waitematā
My dream will be fulfilled.

(Wai 9, 1987, Page 21)

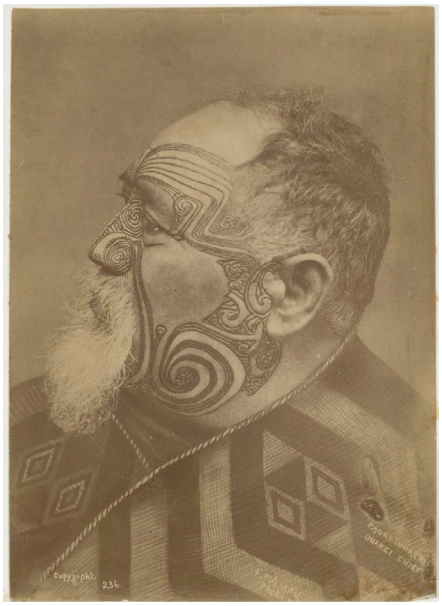


Image 2: Chief Paora Tūhaere of Ngāti Whātua, (Alexander Turnbull library, Pulman, Frederick, 1880)

What followed this invitation was the fallout from the misinterpretation of the colonists' concepts of exclusive land ownership and transactional agreements. The generous, amiable, and peaceful manner of Ngāti Whātua pervaded the fledging city, which gradually expanded from Point Chevalier to Howick and Onehunga.

Salisbury noted that during the 20 years following the signing of the Treaty, iwi in Tāmaki held faith in the treaty and upheld their responsibilities, though increasingly noticed Pākehā were not meeting theirs. Chief Paora Tūhaere of Ngāti Whātua declared at the month-long Kohimarama conference of 1860 that "the love of many is growing cold. It is past time that you began to listen to, and heed, our concerns" (Salisbury, 2009).

The Native Land Act of 1862 was brought into legislation without any consultation with Māori leaders and allowed for the individualisation of land titles with the clear objective of alienating Māori from their land, a deliberate violation of the spirit of the Treaty.

In 1886, the Crown used the Public Works Act 1882 to take ownership of 13 acres of Bastion Point for defence purposes. The Public Works Act allows the Crown to take possession of any land, if the Crown believes it is in the public's interest. When, in 1941, the Crown no longer needed Bastion Point for defence, it did not return it, but instead gave it to the Auckland City Council for a reserve.

When the land was taken in 1886, Chief Tūhaere immediately lodged a claim for £5000 compensation because this was the land he had planned to subdivide to create an economic base for the hāpu. The compensation Court ordered the Crown to pay £1500 for the land. This went to Tuhaere's lawyers to meet their legal costs and expenses. (Wai 9, 1987)

The early part of the 20th century brought further *mamae* (injury) to the hāpu with the commissioning of the Okāhu Bay sewerage pipe, which desecrated the papakāinga and violated the mauri of Okāhu Bay. Ngāti Whātua Ōrākei uri Moana Tamaariki-Pohe said that the contamination led to her whānau becoming sick and diagnosed with typhoid (Boynton 2021). A sea wall was built, and later a road, further cutting off the hapū's connection to its kai moana, and

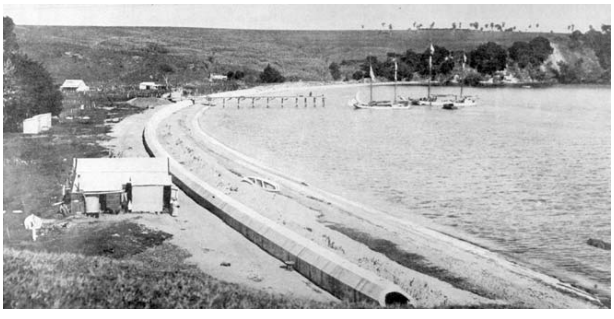


Image 3: Okāhu Bay sewer project, (Christine Dann, Auckland City library, 1910)

unfulfilled promises by the Government to provide and connect the area with fresh water and drainage resulted in a boggy quagmire, making the once thriving settlement a very inhospitable place in which to live. This is a prime example of systemic discrimination with the indisputable goal of displacing the hāpu.

In the following years, hāpu members were pinioned against each other by the Government. When the title of all hāpu land was granted to 13 Ngāti Whātua individuals in 1869, the majority of the tribe was legally disinherited. There was an assumption that the 13 members were granted trusteeship, however, they were in fact the legal owners. This spurred inter-tribal protests and divisions, as the only restoration was to bring the land back into tribal ownership (Wai 9, 1987).

Further divisions occurred through the indoctrination of youth through education and opportunity, for example, by Ngapipi Rewiti (Hawke). Hawke was motivated by reward (and opportunity for employment as an engineering cadet) to persuade hāpu families to sell their shares and was the filer of the counter-petition in opposition to Otene Paora in 1911. Paora appealed against the 1869 order and asserted that the 13 were merely representatives of the hapū, that females had been wrongfully excluded, and that most of the 13 were not resident on the Ōrākei block, and many who were resident, and who possessed superior rights, had been excluded. (Wai9,1987)

The Government, Auckland Council and private purchasers used tactics of this nature in various ways during the early decades of the 20th century. The acquisition of land interests took 37 years, from 1913 to 1950, with over 31 recorded legal acts of constant pleas from Ngāti Whātua to retain their turangawaewae, even though the Crown termed the hapū as "willing sellers". (Wai9,1987)

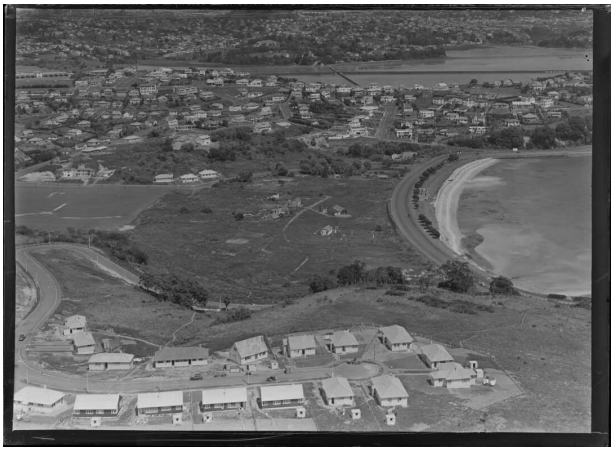


Image 4: Kitemoana St and Okāhu Bay Reserve (National Library 1951)

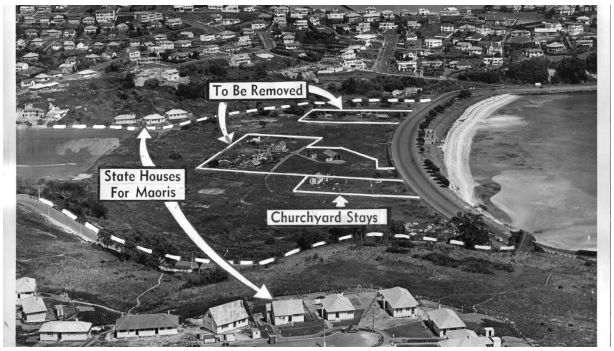


Image 5: Crown Plans for Ōrākei (Auckland Star on November 24, 1951)

In 1951, the Crown compulsorily took the remaining12 ½ acres in the possession of Ngāti Whātua. Apart from the Okāhu Cemetery, Ngāti Whātua of Ōrākei was now landless. The old village site was wanted by the Crown for a public park, so in 1952, the remaining inhabitants were evicted from their homes and relocated as tenants in state houses on Kitemoana Street on another part of the block. The marae and some homes were destroyed by fire, which was suspected to be an act of arson by neighbouring pakeha. The Crown demolished the remains of the village and marae. One reason for this was that the village was considered "a dreadful eyesore and potential disease centre" and was on the route the new Queen would take on her official visit.

For the remnants of Ngāti Whātua remaining at Ōrākei, the final evictions from the papakāinga were extremely traumatic, and they resisted being relocated to the end. Many were physically carried from their homes, and one distraught man threw himself back into his burning home. The state houses they were relocated to in Kitemoana Street were small, and built for nuclear families, so the extended family life of the hapū was broken down still further. Many of their elders died within a year of being evicted. (Wai9,1987)


Maori Shacks Go Up in Smoke

One of the ramshackle homes at Orakei set on fire after demolition yesterday.

Image 6: "Māori shacks go up in smoke," New Zealand Herald, 1951, from the Sir George Grey Special Collections, Auckland Libraries, 7-A14286A.

The hapū members who remained rebuilt the church in Okāhu Bay with the awarded "compensation" for the loss of their marae. There was widespread support from neighbouring churches and it was said to be the best thing to happen at Okāhu Bay in many years.(Salisbury 2009)

Shortly before the construction of the church, the Open Brethren began holding Sunday schools at Okāhu Bay. Before and after the fires, the Church was well attended by members of Ngāti Whātua and many worked with the church thereafter in roles of service and fellowship. Bob Hawke remarked that "...there seemed to be a spiritual awakening among our Māori people at this time. Quite a number of our kaumātua and also young people were coming to the Lord." (Salisbury, 2009)

Those who remained were nonetheless dispirited, with neither a marae nor a leader, but it is believed that the situation began to improve slightly in the post-war era. In 1960 there were an estimated 30,000 drifting and immigrant Māori living in the greater Auckland region. The City Council proposed a marae on Bastion Point, with Ngāti Whātua acquiescing after many years of refusal.

Construction began in the 1970s with grants from the Government and the marae was opened in 1973 with the traditional ritual associated with the founding of an ancestral meeting house. The marae was named after a powerful Ngāti Whātua ancestor, Tumutumuwhenua.

Image 7: Ōrākei marae, Ngāti Whātua Ōrākei Website

The Education Centre 1960's

The Education centre was an initiative brought about by two women, Ani Pihema (Ngāti Whātua) and Margaret Boyce (a local pakeha). Between them, these women brought together the somewhat frayed community under the common goal of cultural and educational improvement for the Māori children living on Kitemoana Street. What began with school lunches later turned into the Ōrākei Marae Education Programme opening in 1964, and was the first building to grace the site of the future marae and is said to have provided the heke (backbone) for the marae to be established. (Kingi, 1992)

The Education Centre hosted a library, Girl Guides, Scouts, Cubs, Brownies, and craft sessions for weaving, and became art studios for international officers of the New Zealand Government and businesses, and hosted conferences for schools and universities.

In the 1970s, the Bursary fund was launched, with the goal of raising money to support Ngāti Whātua *rangatahi* (youth) from secondary school - all the way through to tertiary education level. By 1992, over 2,000 students had benefited from this fund.

The 1970s were characterised by a strong and co-operative relationship between Ngāti Whātua and local pakeha, which was born out of a common determination to improve opportunities and educational achievement levels for Māori.

Image 8: Ngāti Whātua protesters, Bastion Point, March 1977. Photo / NZ Herald archive

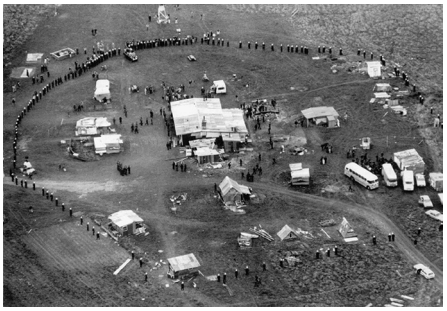


Image 9: Police Cordon at Bastion Point. May 25, 1978. Photo / NZ Herald archive

Image 10: Joe Hawke (standing) reads the Treaty of Waitangi during the protest in May 1977. Photo / NZ Herald archive

The Protest

The 1979 Land Use proposal

Led by Joe Hawke, the next generation of Ngāti Whātua defied their kaumātua and stood their ground in an unprecedented move away from the due process of law that had pervaded the previous 138 years of negotiation with the Crown. This inter-tribal conflict caused much mamae in some whānau, but helped others find their spiritual grounding as lost cousins reunited during the protest, and formed connections back to their tūrangawaewae for the first time in two generations (Wai 9, 1987).

The kaumātua held firm on their position, denouncing the action group and questioning their motives as they were in essence desecrating the tapu of Ngāti Whātua o Ōrākei, and "assailing the mauri of the tribal group to the point where they almost lost their tūrangawaewae and insulting the kaumātua by openly ignoring them and flouting their word" (Kawharu, 1977)

Five hundred and six days of occupation ended with the arrests of 222 people, but did not mark the end of protests at Ōrākei. By 1991, the occupied land became the first estate owned communally, finally reversing the Native Land Act of 1862 in this instance, and setting a precedent for other iwi to similarly move forward. The Ngāti Whātua Trust Board was formed to represent the three hapū groups - Te Taou, Te Ngāoho and Te Uringutu. These groups were united in ownership of the estate, merging modern and traditional expertise, and had an advisory panel of kaumātua serviced by a youth research support group (Wai 9, 1987).

In 2001, the historic treaty claims were settled for $NZ18 million. The maunga on the Tāmaki isthmus were returned through the Nga Mana Whenua o Tāmaki Makaurau (Tāmaki collective) deed of settlement, signed in 2012. Ngāti Whātua finally received financial compensation and Government acknowledgement for their losses at Ōrākei, and were able to step forward into the future as prominent players in the Auckland cultural and political domains.

The Future

The Board has progressed the iwi into an extraordinarily strong position in the years since the protests, finally gaining the title for the land their marae stands on in 2002.

The Trust owns two subsidiaries: Whai Rawa Limited and Whai Māia Limited. These subsidiaries have their own boards of directors, which are comprised of both whānau and independent directors and appointed by the Trust. These individuals are highly qualified and have been selected to represent the hapū in developing their ultimate goals.

From the Ngāti Whātua Ōrākei Website:

> *Whai Rawa Limited is a property development and investment company, whose principal objective is to maximise the financial or economic returns to the Ngāti Whātua Ōrākei Group, so it is able to support Ngāti Whātua Ōrākei whānau for generations to come. The funds generated by Whai Rawa are used to support the tribal development goals of Whai Māia.*
>
> *Whai Māia Limited is a charitable trust with the responsibility for the tribal development of our people. Its main areas of focus are Employment and Education, Health and Wellbeing, Arts and Culture, Toki Taiao, and managing key relationships. (Ōrākei, 2022)*

From their July 2019 Strategic plan:

> *By 2050, Ngāti Whātua Ōrākei aims to be a thriving and prosperous hapū that are leaders our communities, Tāmaki Makaurau, and throughout the world. The wellbeing of our whānau exceed national standards and our people experience meaningful Mana Motuhake. In aspiring to our vision, the cultural identity and wellbeing of the people and taiao of Ngāti Whātua Ōrākei are the cornerstone of our 2050 ambition and long-term strategy. To achieve transformational change over the next 30 years, we will invest across eight strategic priority areas to deliver cultural, environmental, social and economic outcomes for Ngāti Whātua Ōrākei. (Ōrākei, 2022)*

Kia rere arorangi te kāhu pōkere ki ngā taumata tiketike

To soar and fly to the highest heights

NGĀTI WHĀTUA ŌRĀKEI

Image 11: Ngāti Whātua Ōrākei logo, iwi website

Connecting Project to Research

The Hawke whānau had a dream to rebuild their whare. This dream was born out of a family kaupapa (purpose) of providing a safe and welcoming home to friends, whānau or those in need.

Bob and Arohanui Hawke, the parents of this whānau, have held their doors and arms open at 31 Kitemoana Street since they first started living there.

The house is nothing special, however the home it provides is. The goal in rebuilding their whare is to capture and express the essence of what this home provides to its guests and residence.

This project has been gifted a special name. Before Bob's passing in September 2021, he requested that this project be named "Kia Maumahara" which roughly translates to "Remember."

During the co-design process, collaborating artist Beronia Scott added the narrative of a Korowai Aroha (Loving Cloak) to symbolise what the home means to the whānau. Putting these two names together, Korowai Aroha Kia Maumahara - The Loving Cloak in Remembrance.

There are key values and principles which make up the Māori world view that is exemplified by this whānau, and as part of this thesis, I will explore these in-depth.

My contribution to this co-design kaupapa is to develop and resolve the technical details involved in designing the building.

I will adapt existing frameworks and principles and develop a matrix by which to measure and resolve key design decisions, taking into account far-reaching concepts, such as marui-ora, living building systems, building performance standards and embodied carbon.

By grounding my research in mātauranga Māori, I aim to create a matrix that transcends the measurable and accounts for all living systems.

Image 12: Hawke whānau, Author, September 20222

Image 13: Bob Hawke, Author, September 20222

Image 14: Hawke whānau, Author, September 20222

Mauri-Ora & The Cosmos

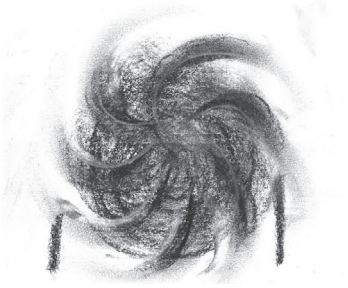
Māori philosophers and seers have a vast body of foundational knowledge that includes myth and folklore. Ideas that underpin numerous stories share a similar theme and point of emphasis that Western colonists have disregarded as outdated and superstitious notions from preliterate, prehistoric tribes. They are however, intentional constructions used by ancient seers and sages to distil their understanding of the world, ultimate truths, and the relationship between the Creator, the cosmos, and the people, into readily digestible forms. Their worldview serves as the foundation for their value system and permeates all element of their society. (Marsden 2003)

Te Korekore

To describe the creation of the universe, I include an excerpt from the Ngā Puhi creation story as relayed by artist Cathy Livermore in her article "Dancing from Te kore to Te Ao Marama."

"All begins with AIO, the universal creative life force from which all things have been birthed.
From stillness movement was manifested and the dance began as AIO manifested the possibility of life through IO and continued to transform in cycles of rebirth and incarnation many times rolling toward Te Kore and the state of sacred potential and emptiness.
From this still, empty space of sacred potential and emptiness was birthed the energy of life, its pulsing unconscious desire and purpose expanding out of Te Kore the potential to birth the creation of Te Ao Marama...
. . With this desire and purpose was born Te Hihiri: the spark of life force that energises and charges all possibility in this universe and gives life . . ..
From which births imagination and dreaming possibility from the unknown and subconscious/Te Mahara . . ..
Which expands and grows, and in its expansion begins stretching and carving pathways of memory, recollecting and repeating, starting to dance in infinite directions, birthing consciousness out of the unknown/Te Hinengaro . . ..
From which is birthed the possibility for the sharing of inspiration and exchange in collectives of new possibilities, directing consciously the force of intention/ Te Wananga . . ..
From which is birthed experience, reflection, and knowing/Te Whakaaro.
From the oscillating interplay of these potent spaces the force of sound is created /vibration and frequency/intention and the force of thought, sending waves of potential through the universe/ Te Whe . . ..
And as these waves start to travel and dance shape and form become possible, filled, and sculpted by all that has come before/ Te Ahua and Te Atamai arise….
As these shapes and forms start to dance, they create relationships that births time and space/Te Wa and Te Atea . . ..
And with Te Hau Ora gifted the physical world becomes possible as Ranginui and Papatuanuku were born, giving birth to the elemental possibilities for creating life . . ..
Te Ao Marama was actualized."
(Livermore, 2016, p.2)

Methods

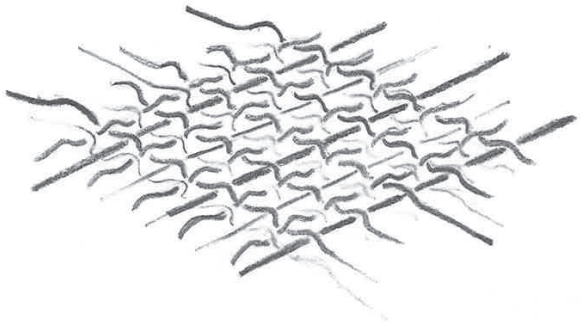


Drawing I: Abstract sketch of Te Korekore - The Void, Author Oct-2022

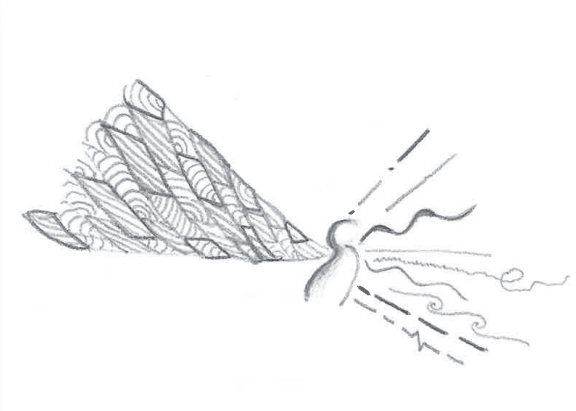
Drawing 2: Abstract sketch of Te Ao Marama - The World of Light, Author Oct-2022

Mauri is a Force

Mauri is a force that interpenetrates all things to bind and knit them together and as the various elements diversify, mauri acts as the bonding element creating unity in diversity, (Selby, 2010). This is further explored next as baskets of knowledge. In this instance, mauri is the divine power manifested in our natural environment as everything that ever was and everything that will come to be. For this thesis, humans are represented as youth considering all existence, and the agents of caretaking – or kaitiakitanga - of what already exists.



Drawing 3: Abstract sketch of Mauri - The Binding Force, Author Oct-2022



Drawing 4: Abstract sketch depicting Youth as the Caretakers of everything that presently exists, Author Oct-2022

Whakapapa as ecological genealogy - maunga, awa, moana,

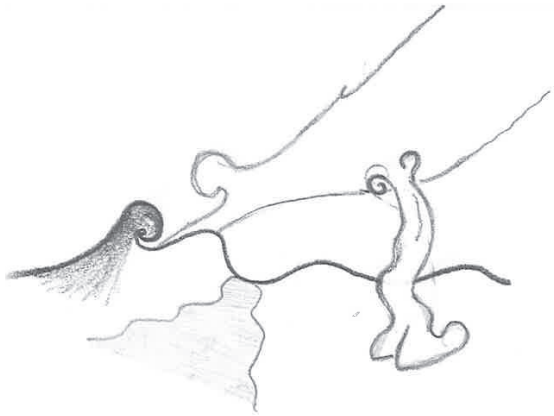
When we say our pepeha, we are following the water cycle, and reciting our whakapapa to the Taiao (environment). We start with our maunga (mountain), which means to hold, and it's the maunga that makes first contact with te ua, the rain. And it holds water, along with snow, hail, and it feeds into our rivers, our awa. That then flows onto our iwi, our hapū, and our marae. Then to us, or our whānau. What's left over, flows out to our nga roto mete moana. But eventually the water will evaporate, rise up to Ranginui, and remembering the separation from his love Papatūānuku, the cycle restarts, e heke nga roimata a rangi, the tears of rangi are falling, through western science we know that the tāngata (people) is 60% water, and so if we follow modern science and mātauranga Māori, or korero tuku iho, (words of wisdom) it becomes common sense, no matter how you look at it, if we want to protect humanity, we have to prioritise the health of our life giving waters (Opai 2021)

Drawing 5 shows my sketch of this concept.

Kaitiakitanga is a link between the past and the future

Kaitiakitanga is embodied by the act of guardianship, caretaking, and protection. It weaves the relationship between the taonga (treasure) of the natural environment and tāngata whenua. The natural environment is located between Ranginui and Papatūānuku and is shared by their descendants. Drawing 6 shows my sketch exploration of this story. It is an inherent commitment that links mana atua, mana Tāngata and mana whenua (Selby, 2010).

Drawing 5: Abstract sketch of Whakapapa, Author Oct-2022



Drawing 6: Abstract sketch of Kaitiakitanga, Author Oct-2022

Baskets of Knowledge

Tua-uri, Aro-nui and Tua-atea - drawing 7 shows my sketch explorations of the baskets.

Te Kete Te Tua-atea – The Basket of Darkness

This basket represents the world beyond space-time, eternal and infinite, before Tua-Uri and towards which the universal process is tending. It is the ultimate reality. In this basket lies the unknown.

Te Kete Te Aro-nui – The Basket of Pursuit

This basket represents all the knowledge that humans currently seek. It is all that came before us, and before our senses, and constitutes the natural world as we sense it.

Te Kete Tua-Uri – The Basket of Light

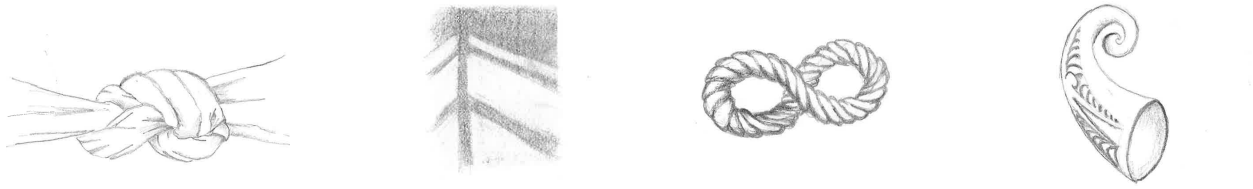
Beyond in the world of darkness there were 27 long nights which spanned eons of time. This world is behind our perception and is where a complex series of rhythmical patterns of energy operate to uphold sustain and replenish the energies and life of the natural world and bring te ao marama.

Drawing 7: Abstract sketches of The three baskets of Knowledge - Tua-uri, Aro-nui and Tua-atea, Author Oct-2022

Four processes existing in balance

Mauri - binding force
Hihiri - pure energy manifested in light
Mauri-Ora - life principle, binding force further refined beyond pure energy to make life possible
Hau-Ora - breath or wind of spirit which was infused into the process of birth to animate life.

These four processes weave together to create our universe.
"Te Kahu o Te Ao" is the name of the epistemological woven fabric of our universe. Raranga (weaving) epistemology is grounded in the whakapapa (genealogical) relationships between Papatūānuku (Earth Mother), the natural environment, and the very fabric of the universe.(White 2022)



Drawing 8: Abstract sketches of The Four Processes - Mauri, Hihiri, Mauri-Ora, Hau-ora, Author Oct-2022

Whakapapa (Genealogy)

Genealogy is used as a tool for transmitting knowledge and pervades Māori storytelling. For example, Tane (the god of the forest) married several different wives to produce different families of trees, i.e., healing trees, building trees, etc. In mātauranga māori, Genealogy is used a tool for classifying, identifying, and ordering processes. The same can be said about a pepeha – the way in which a person identifies themselves in the context of their environment, and their family and wider hapū.
Marshall Sahlins, a cultural anthropologist notes that when Māori chant karakia or perform pepeha, they're not reflecting a worldview, but rather expressing a world objectively from within it.

> *"The Māori universe is a gigantic kin, a genealogy a veritable ontology, a way of being that patterns the world based on whakapapa, cast intricate networks of relations in which all forms of life are linked, generated by exchanges between complementary pairs, animated by te Hau." (Sahlins, 1985, p.29)*

It has been important for me to understand that I am taking an ontological turn in undertaking this research. My ontology is based on the key assumption that reality and its underlying patterns may differ across different groups of people and that these differences can be investigated. (Stebletsova 2021)

Reflections

Writing an introduction to mauri raises the question of what creation story Ngāti Whātua align with. My findings revealed that it is the story of Ranginui and Papatūānuku, and their children emerging from te kore. Their story has been passed down through many generations and is a part of our whakapapa in Aotearoa New Zealand. The world we live in today is referred to as "te ao Marama" - the world of light. This is where we place our narrative, linking te kore with mauri-ora - the life principle, and the binding force further refined beyond pure energy that makes life possible.

My journey can be characterised by two symbols. I set forward as hukatai - sea foam – I recognise that I am on a quest for knowledge. Seafoam is generated by the wake of a waka in motion, which metaphorically relates to my pursuit of knowledge, which is an accumulation of facts collected along the way, unorganised and unrelated to my centre. Drawing 9 is my sketch of this concept.

Drawing 9: Abstract sketch of Hukatai, Author Oct-2022

My journey concludes with rehutai - sea spray. At the centre of our being is where we create an orderly system of ideas about ourselves and the world to regulate the direction of our lives and answer ultimate life questions. There is a moment when sunlight moves through sea spray to create a rainbow, which represents the amalgamation of all ideas into an integrated whole. Drawing 10 is my sketch of this concept. It is here that knowledge is transformed into wisdom. (Marsden, 2003)

Drawing 10: Abstract sketch of Rehutai, Author Oct-2022

<u>Personal Reflection</u>

Reading and learning about the lore of wananga, specifically the path of Tane evoked in me an immense emotional response. I am learning and developing my understanding of the basis of Māori world views and the creation of our world, and what lies beyond, behind, and outside of our perception, and this has made me feel immense sadness. I sit on the edge of the Māori world, with an ancestral thread holding me to the whenua. Drawing 12 is my sketch of this concept.

The people that I have grown up around have little or no respect or appreciation for the hardship and suffering of Māori, and a similar disdain for mātauranga Māori. Drawing 11 is my sketch of this concept. I know that early learning and primary education now includes more mātauranga than was offered in my own education, and I hope as we evolve in society away from colonial frameworks that these stories are taught and celebrated alongside similar intelligent design stories, such as those from Christianity and Hinduism.

I have experienced abject dismissal when speaking on my thesis subject to acquaintances, whom I never expected to display such subtle and deeply obstinate racism. I believe that education is the antidote to bigotry, and if mātauranga Māori were included in our education system, compassion and appreciation for Māoritanga as a complex and rich culture would outweigh the prejudices in the general population, and we would see a paradigm shift in society towards the multi-cultural golden horse New Zealand claims to be. Drawing 13 is my sketch of this concept.

Drawing 11-13 : Abstract sketches of Sadness, Māoritanga & Hope, Author Oct-2022

Te Aranga Design Principles

The Te Aranga design principles were developed by Māori design professionals as a response to the New Zealand Urban Design Protocol in 2005. Over time, the principles have evolved and been adopted by the Auckland Council with the support of Ngā Aho. They are now promoted across all council-built projects as a method of engagement with mana whenua, and used to measure how a project aligns with and fulfils Te Aranga's key values.

Diagram 1:The Te Aranga Design Principles

Table 1: Te Aranga Design Principles & Values,

Value	Principle									
	Mana *Authority*	Whakapapa *Naming*	Taiao *Natural Landscape Elements*	Mauri Tu *Environmental Health*	Mahi Toi *Creative Expression*	Tohu *Wider Cultural Landscape*	Ahi Ka *Enduring Living Presence*
Rangatiratanga *Self-Governance*	•	•			•	•	•
Kaitakitanga *Guardianship*			•	•	•		•
Manaakitanga *Hospitality*	•	•		•	•	•	•
Wairuatanga *Spiritual Connection*	•			•	•	•	•
Kotahitanga *Unity*				•			•
Whanaungatanga *Belonging*	•	•			•	•	•
Mātauranga *Knowledge*		•	•	•			

The values and principles fulfil each other in a woven network. However, for the purpose of this investigation I've noted with bullets the principles and values where the crossover is particularly interesting.

I believe that rangatiratanga, whanaungatanga and ahi kā are fulfilled through the premise and purpose of this thesis and are inherent to the process of co-design.

Mauri tu, taiao, and tohu are the three leading principles that I focus on in developing a matrix by which to measure the building details.

Mauri Tū - Environmental health is protected, maintained and / or enhanced
Taiao - The natural environment is protected, restored and/or enhanced
Tohu - Significant mana whenua sites and cultural landmarks are acknowledged

Table 2: Te Aranga Design Principles & Values, Kaitakitanga, Wairuatanga, Mātauranga

Principle	Value		
	Kaitakitanga *Guardianship*	Wairuatanga *Spiritual Connection*	Mātauranga *Knowledge*
Mauri Tu *Environmental Health*	Careful resource planning	Protecting the lifeforce of the more-than-human ecologies	Employing mātauranga Māori
Taiao *Natural Landscape Elements*	Resource management ensuring biodiversity and enhancement	Connecting to the whenua through ancestral knowledge, karakia and collaboration	Employing mātauranga Māori through ancestral knowledge
Tohu *Wider Cultural Landscape*	Protecting the significant sight lines and landmarks	Creating meaningful visual connections to the maunga and moana	Employing mātauranga Māori

Mauri-Ora Compass

The Mauri-Ora compass tool was developed for the Building Better Homes, Towns & Cities National Science Challenge. The challenge is a call for the transformation of dwellings and places where people can live in homes and communities that are hospitable, productive, and protective. Its vision is to create built environments that build communities. Creating homes, neighbourhoods, towns, and cities that enrich people's lives, allowing them to reach their social, cultural, and economic potential.

The Compass is a collaboration between AUT and the University of Canterbury, research partners Te Tatau and SCION, and Manaaki Whenua groups with the aim of increasing urban mauri ora - social, cultural-ecological wellbeing. The Compass also addresses other wicked problems defined by Rittel & Webber as climate, biodiversity, health, economic, and energy crises (Rittel, 1969).

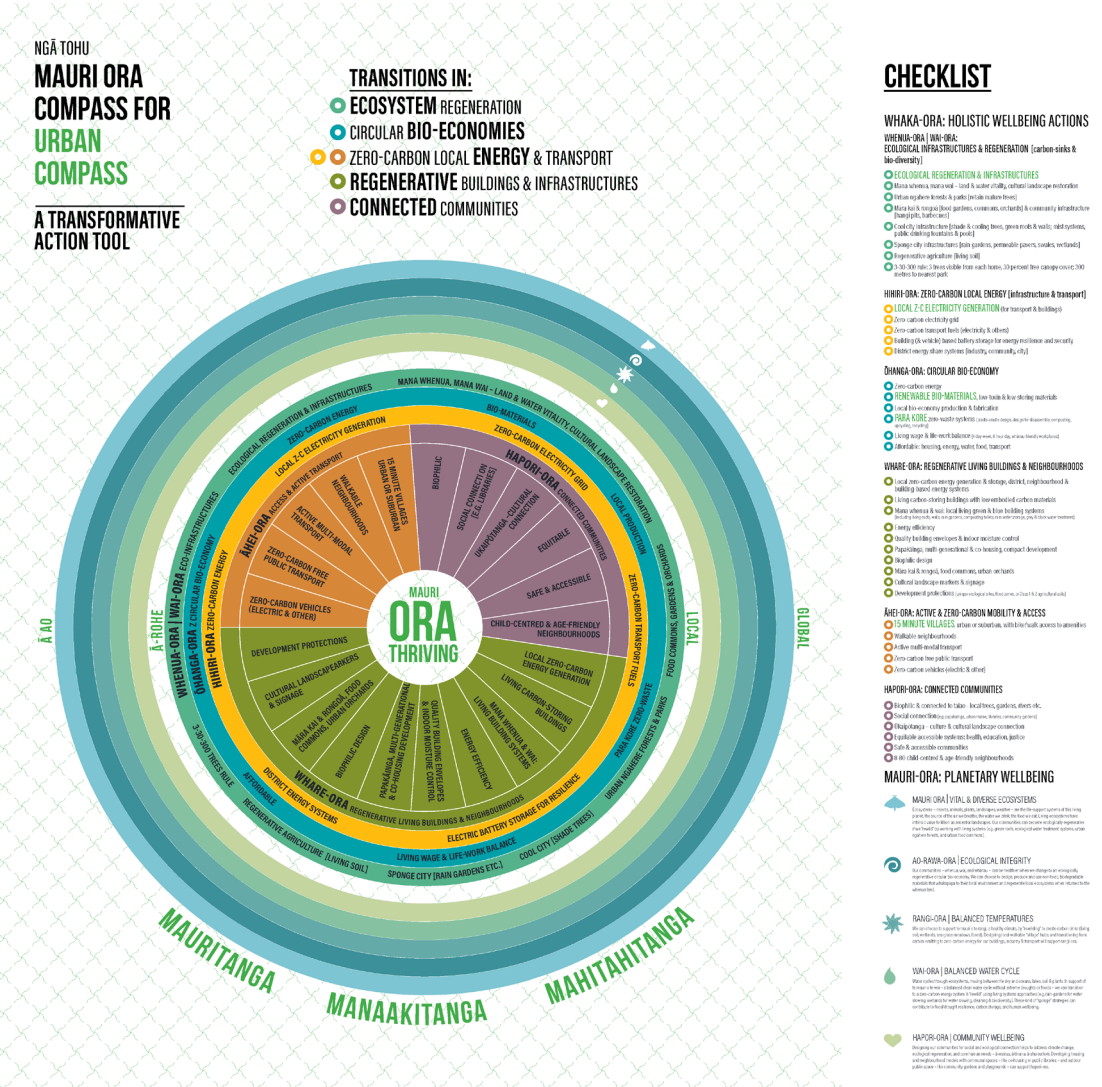


Image 16: The Mauri-Ora Compass

Leading this research was Dr Amanda Yates from AUT. I encountered Dr Yates' earlier writing on immanence ethics and onto-ecology while planning my research topic. I propose to use the Compass as a measure and guide for a multi-unit, mixed-use residential development for our mana whenua, Ngāti Whātua Ōrākei.

The radial nature of the compass imbues its holistic nature. At the core of the compass is thriving mauri ora, reaching outwards in defined segments, fulfilling the categorised arcs: Āhei-ora (access and active transport), hapori-ora (connected communities), and whare-ora (regenerative living buildings and neighbourhoods). These are encircled by a ring of hihiri-ora (zero carbon local energy), then a ring of ōhanga-ora (circular bio-economy), and a ring of whenua-ora (ecological regeneration and infrastructure). An open ring then defines these inner rings as local, and the outer rings thereafter are classed as planetary wellbeing – and having global outcomes. The compass shows that by enhancing mauri at a micro-scale (local), there will be a macro effect.

In table 3, I have positioned the selected values of the Te Aranga design principles against the Mauri-Ora Compass segments, bullets indicate the links between them.

Table 3: Te Aranga Design Principles & Values vs. Mauri-Ora Compass

Principles / Value	Mauri Ora	Ao-Rawa-Ora	Ranga-Ora	Wai-Ora	Hapori-Ora	Ōhanga-Ora	Whare-Ora	Hihiri-Ora	Whenua-Ora	Āhei-Ora
Mauri Tu	•	•	•	•			•	•	•	•
Taiao	•	•	•	•			•	•	•	•
Tohu	•		•	•	•	•	•	•	•	
Kaitiakitanga	•	•	•	•	•	•	•	•	•	•
Wairuatanga	•				•		•		•	•
Mātauranga	•	•	•	•	•	•	•		•	•

I believe that in a larger project I could address every segment with an architectural response, however for the purpose of this thesis, I have excluded the economic factors. I do not exclude them entirely; however, further investigation of this subject is better undertaken by an expert in the field of economics. My field is architectural intervention, and so whenua-ora, wai-ora, whare-ora, ao-rawa-ora, and mauri-ora are my leading principles from the Mauri-Ora Compass that I am including in the development of the matrix.

Whenua-ora - ecological infrastructures and regeneration.
Wai-ora – balanced water cycle.
Whare-ora - regenerative living buildings and neighbourhoods.
Ao-Rawa-Ora – ecological integrity in building products.
Mauri-ora - vital and diverse ecosystems (as defined in the compass)

Developing the Matrix

This matrix combines the Te Aranga design principles with the Mauri-Ora compass to guide design decisions and against which the nodal details can be measured. In diagram 2, I have organised the selected concepts on a scale depicting from natural to built environments.

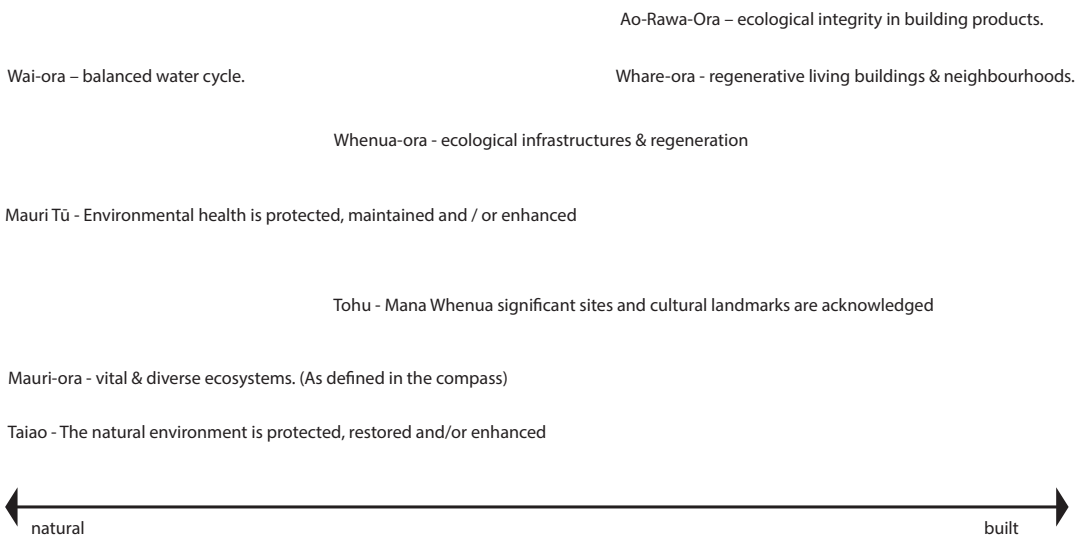


Diagram 2: Developing the matrix, v1

There are three distinct groups on this scale: natural environment, an in-between natural and built, and then the built environment. In diagram 3, by organising these categories in a circular configuration, I began to recreate the mauri-ora compass. Through this process I aimed to understand their relationships with each other, and whether there were any hierarchical connections.

The four light green bands represent our natural environment, the two mid-green bands represent the in-between, and the two purple bands represent the built environment.

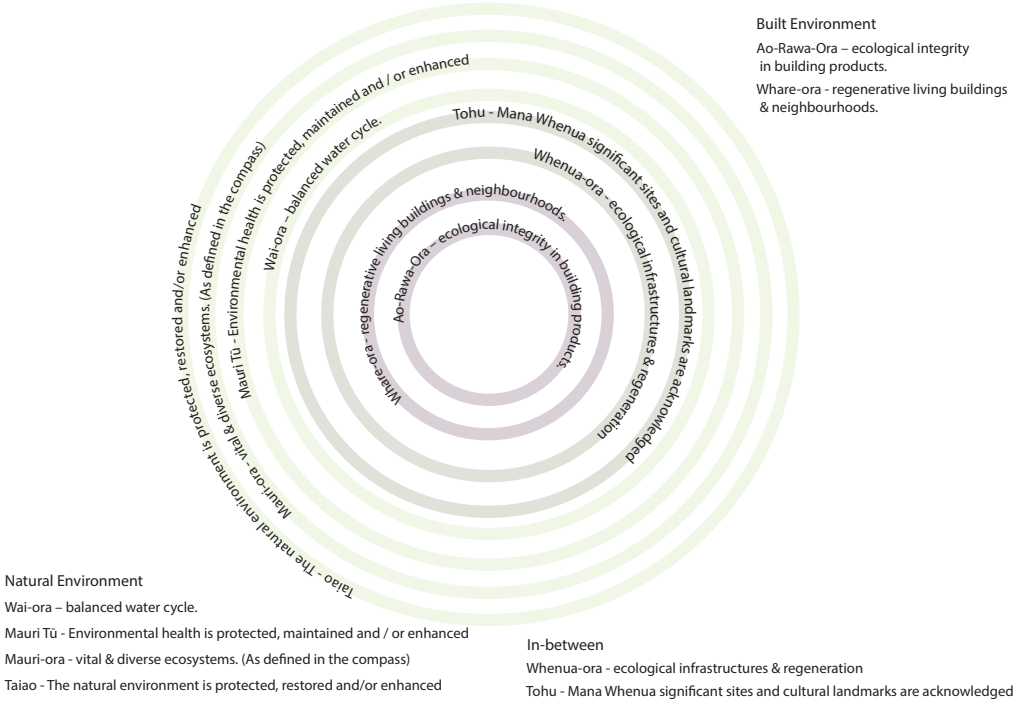


Diagram 3: Developing the matrix, v2

To Reflect the spiraling nature of the universe, the values are placed into a spiral configuration and are explored in diagram 4, whether it's viewed as convergent or divergent, the values all work in harmony and balance with each other. The universe, seen through a mātauranga Māori lens is perceived as woven; the weaving of a spiral form is represented in carving techniques throughout Aotearoa.

Diagram 4: Developing the matrix, v3

The three categories can also represent a state of permanence and order: that which existed before humans (light-green), that which exists because of humans (mid-green), and that which humans endeavour to exist (purple).

Diagram 5: Developing the matrix, v4

In Diagram 5, I suggest these should be weighted in terms of importance to environmental sustainability (light-green), cultural recognition (mid-green), and improving the built environment (purple).
In this diagram, the natural environment is the leading spiral, with the in-between riding the back edge, taking cues from its host. The built environment takes its cues from the in-between, perhaps mimicking the natural environment in the process of its execution.

It would be remiss to assume the spiral exists in a vacuum. I have therefore added climate into the spiral as indigenous knowledge and design practice has proven to be inherently resilient to climate changes.

In diagram 6, the spiral now features four aspects. Leading the spiral is that which brought everything into existence (light blue), that which existed before humans (light-green), that which exists within humans (mid-green), and that which exists because of humans (purple).

Diagram 6: The Spiral Matrix

Building Performance Standards

Following this methodology, I explored the following factors.

Table 4: Building Performance Factors and Methods

Factor	Method of Comparison
Thermal Performance	H1 Energy Efficiency Building Code H1/AS2 – updated 4/08/2022
Acoustic Performance	G6 airborne & impact sound building code – 1/12/1995
Embodied Carbon	Whole-of-Life Embodied Carbon Assessment: Technical Methodology – MBIE 25/02/2022
Maintenance & Warranty	Affordability and ease of maintenance compared. Terms, conditions and length of warranty compared.
Supply	Affordability, availability and locality of products compared
Accessibility	NZS 4121- Design for access and mobility – updated 2001

I compiled these various codes and documents into a matrix which will be used to test and develop the building envelope at identified intersections between the built environment, the natural environment and the cultural environment.

It will then be possible to ascertain which combinations are suitable for the Hawke whānau's project.

Who develops these standards and for what purpose?

The Ministry of Business Innovation and Employment (Building System Performance) has funded many of the building standards, used for Building Code compliance to ensure all buildings are safe, healthy and durable for everyone who uses them.

There are many networks that influence building codes and standards. Political influence can range from public health outcomes, to the World Health Organisation, and the United Nations Climate Summit.

Nationally, some events have influenced building codes and standards, such as the leaky building saga of the 1990's and natural disasters such as the Christchurch earthquake of 2011.

The building industry has an influence over how these codes and standards are implemented, which has an economic influence. Builders and developers are financially motivated to build to the minimum acceptable standard, especially in publicly funded projects. Some building products are developed to meet the minimum acceptable standards, influencing the wider market, and providing consumers with a financial incentive to buy and use such products in their private projects, limiting the choice of products that exceed the minimum acceptable standard.

This brings into question whether the minimum acceptable standards are, in fact, the optimal standards.

Thermal Performance

Thermal performance is measured in R-Values. This is the insulation co-efficient that measures the amount of thermal resistance in any given construction method. A high R-Value indicates good thermal resistance.

The new H1 code has different acceptable solutions depending on the size of the building. As the proposed building is over 300m2 I refer to H1/AS2. The documentation states three methods of compliance.

a) the Schedule method in Subsection 2.1.2
b) the Calculation method in Subsection 2.1.3
c) the Modeling method in H1/VM2.

"For mixed-use buildings that include housing, the H1/AS1 Subsection 2.1.2 "Schedule Method", or H1/AS1 Subsection 2.1.3 "Calculation Method" shall be used for the parts of the building containing housing. For the other parts of the building, the methods in Paragraph 2.1.1.1 can be used." (H1/AS2 Building Code, 2022)

As less than 50% of the building envelope is windows and doors, the schedule method can be applied. The proposed building includes embedded heating systems in the floors and is in Climate Zone 1.

Image 15: Tables from H1/AS2 of Building Code

TABLE 2.1.2.2B: Minimum construction R-values for building elements that do not contain embedded heating systems

Paragraphs 2.1.2.2 b), 2.1.3.11

Building element	Construction R-values ($m^2 \cdot K/W$)[1]					
	Climate zone 1	Climate zone 2	Climate zone 3	Climate zone 4	Climate zone 5	Climate zone 6
Roof	R3.5	R4.0	R5.0	R5.4	R6.0	R7.0
Wall	R2.2	R2.4	R2.7	R3.0	R3.0	R3.2
Floor	R2.2	R2.2	R2.2	R2.4	R2.5	R2.6
Windows and doors	R0.33	R0.33	R0.37	R0.37	R0.40	R0.42
Skylights	R0.42	R0.42	R0.46	R0.46	R0.49	R0.51

Notes:

(1) Climate zone boundaries are shown in Appendix C.

(2) In *roofs* with a *roof space*, where the insulation is installed over a horizontal ceiling, the *roof R-value* may be reduced to R3.3 for a distance of up to 500 mm from the outer edge of the ceiling perimeter where space restrictions do not allow full-thickness insulation to be installed.

TABLE 2.1.2.2A: Minimum construction R-values for heated roofs, walls or floors

Paragraph 2.1.2.2 a)

Building element	Construction R-values ($m^2 \cdot K/W$)[1],[2],[3]					
	Climate zone 1	Climate zone 2	Climate zone 3	Climate zone 4	Climate zone 5	Climate zone 6
Heated roof[4]	R6.6	R6.6	R6.6	R6.6	R6.6	R7.0
Heated wall	R2.9	R2.9	R3.0	R3.2	R3.4	R3.6
Heated floor	R2.9	R2.9	R2.9	R3.0	R3.2	R3.4

Notes:

(1) R_{IN}/R-value < 0.1 and R_{IN} is the *thermal resistance* between the heated plane and the inside air.

(2) Floor coverings, for example carpet or cork, will reduce the efficiency of the *heated floor*.

(3) Climate zone boundaries are shown in Appendix C.

(4) In *roofs* with a *roof space*, where the insulation is installed over a horizontal ceiling, the *roof R-value* may be reduced to R3.3 for a distance of up to 500 mm from the outer edge of the ceiling perimeter where space restrictions do not allow full-thickness insulation to be installed.

This standard applies only to the parts of the building considered as housing. The Hawke whānau residences, and both the Oranga Tamariki provisions are included in this. The Whare Taonga on the 4th floor will be constructed with the same methodologies to maintain as much thermal efficiency as possible and keep the wall types consistent.

Table 5: Building Performance Matrix v1

Factor		Minimum Requirements
Thermal Performance *R-Value*	*Wall / Floor*	R2.2
	Floor	R2.9
	Roof	R3.5
	Windows / Doors	R0.33

Acoustic Performance

Acoustic performance is measured in STC and IIC ratings. STC relates to airborne sound and IIC relates to impact sound. The IIC/STC is a single number that provides an estimate of the performance of a partition in certain common sound insulation situations. The New Zealand Building Code requires that for floors, walls, and ceilings, the STC rating must be no lower than 55, and that floors must have an IIC rating no lower than 55.

G6/AS1 outlines the following construction techniques to minimize sound transmission through building elements:

- Physical separation of building elements that separate the two occupied spaces.
- Smart use of "noise control" building elements, and product mass.
- Mindful design of rigid building services – avoiding services passing through two separate occupied spaces.
- Making the noise control installation airtight by sealing all joints between building elements, and around penetrations and service fittings.

Acoustic performance can now be added to the matrix in various ways.

Table 6: Building Performance Matrix v2

Factor		Minimum Requirements
Thermal Performance *R-Value*	*Wall*	R2.2
	Floor	R2.9
	Roof	R3.5
	Windows / Doors	R0.33
Acoustic Performance *STC & IIC Rating 55*	*Separation / Air Gap*	Present - Explained
	Mass / Noise Control Products	Present - Explained
	Controlled, Sealed	Present - Explained

Embodied Carbon

The "Whole-of-Life Embodied Carbon Assessment: Technical Methodology" measures the efficiency of a new building, along with material efficiency and carbon intensity to calculate the whole-of-life embodied carbon.

The Building Research Association of New Zealand (BRANZ) CO2mpare tool determines the carbon intensity of each of our building products, using the Embodied carbon (kg CO2eq/qty) measuring tool. This tool compiles embodied carbon, embodied total energy, embodied non-renewable energy, and embodied renewable energy. The too also grades each source of data on a scale of reliability, citing certain or general standards, specificity of products tested, use of proxy products, data gaps, published vs non-published data, modelling methods, and local conditions of that modelling.

This tool was used where possible to ascertain the embodied energy of each building product, as the tool was developed by BRANZ - the leading science-based research organisation for building products; the reliability of the information provided by BRANZ is accepted by the Government.

Table 7: Building Performance Matrix v3

Factor		Minimum Requirements
Thermal Performance *R-Value*	*Wall*	R2.2
	Floor	R2.9
	Roof	R3.5
	Windows / Doors	R0.33
Acoustic Performance *STC & IIC Rating 55*	*Separation / Air Gap*	Present - Explained
	Mass / Noise Control Products	Present - Explained
	Controlled, Sealed	Present - Explained
Carbon	*Embodied Energy*	Kg C02eq/qty
	Reliability of Data	Low / Medium / High

Maintenance & Warranty

The resulting building should be easy to take care of. It is important to ensure that this building, through its lifetime, is maintained properly and often, by choosing systems that are durable and uncomplicated in their construction – and therefore in their maintenance. Products that do not require harsh chemicals or highly specialised tools or personnel to carry out routine care are preferred. The warranty periods can be tracked so that correct use and durability is assured, and any failure of building products can be addressed through the necessary channels. These factors have been added to the matrix.

Table 8: Building Performance Matrix v4

Factor		Minimum Requirements
Thermal Performance *R-Value*	*Wall*	R2.2
	Floor	R2.9
	Roof	R3.5
	Windows / Doors	R0.33
Acoustic Performance *STC & IIC Rating 55*	*Separation / Air Gap*	Present - Explained
	Mass / Noise Control Products	Present - Explained
	Controlled, Sealed	Present - Explained
Carbon	*Embodied Energy*	Kg C02eq/qty
	Reliability of Data	Low / Medium / High
Maintenance	*Frequency*	5 Years
	Specialist Trade	Yes / No
	Specialist Products	Yes / No
Warranty	*Installation*	5 Years
	Product Life	25 Years

Supply

The issue of supply can affect project timelines. It is therefore important to note the affordability, availability, and locality of products.

Accessibility

The document referenced for this factor is the Design for Access and Mobility – Buildings and Associated Facilities (NZS4121:2001). This is a 130 page document that has been amalgamated where feasible, with the general building code. For this factor on the matrix, where applicable, this document is referenced to ensure that the building complies with the standards. The co-design process with the Hawke whānau has had the end-user at the drawing board; their principles for inclusive design has influenced the process so the resulting design is certain to provide acceptable access for those with accessibility issues.

Table 9: Building Performance Matrix v5

Factor		Minimum Requirements
Thermal Performance *R-Value*	*Wall*	R2.2
	Floor	R2.9
	Roof	R3.5
	Windows / Doors	R0.33
Acoustic Performance *STC & IIC Rating 55*	*Separation / Air Gap*	Present - Explained
	Mass / Noise Control Products	Present - Explained
	Controlled, Sealed	Present - Explained
Carbon	*Embodied Energy*	Kg C02eq/qty
	Reliability of Data	Low / Medium / High
Maintenance	*Frequency*	5 Years
	Specialist Trade	Yes / No
	Specialist Products	Yes / No
Warranty	*Installation*	5 Years
	Product Life	25 Years
Supply	*Cost per qty*	eg. $50/m2
	Lead time	6 Weeks
	Location of Manufacturing or storage facility	Auckland
Accessibility	*Cross-referenced NZS4121*	Yes

Combining

The spiral configuration exists in a high-trust and values-based system. There are no data to collate, and the concepts could be considered immeasurable. However, the building performance standards are the exact opposite, and rely on quantified data to deliver a minimum accepted building solution. As the spiral is based on values and principles, and the building performance matrix is data-driven, to combine them into one tool would mean compromising one of their measuring systems.

We can however ensure that the building performance matrix aligns with the spiral matrix. Values above the minimum acceptable standard for thermal performance indicates high performance in climate resilience. Low values in embodied energy indicate high performance in Taiao - the natural environment is protected, restored and / or enhanced, Ao-Rawa-Ora - ecological integrity in building products, and Whare-ora - regenerative living buildings. Simple maintenance with non-specialist products achieves Wai-Ora - a balanced water cycle.

Diagram 7: Spiral Matrix

Table 10: Building Performance Matrix

Factor		Minimum Requirements
Thermal Performance *R-Value*	*Wall*	R2.2
	Floor	R2.9
	Roof	R3.5
	Windows / Doors	R0.33
Acoustic Performance *STC & IIC Rating 55*	*Separation / Air Gap*	Present - Explained
	Mass / Noise Control Products	Present - Explained
	Controlled, Sealed	Present - Explained
Carbon	*Embodied Energy*	Kg C02eq/qty
	Reliability of Data	Low / Medium / High
Maintenance	*Frequency*	5 Years
	Specialist Trade	Yes / No
	Specialist Products	Yes / No
Warranty	*Installation*	5 Years
	Product Life	25 Years
Supply	*Cost per qty*	eg. $50/m2
	Lead time	6 Weeks
	Location of Manufacturing or storage facility	Auckland
Accessibility	*Cross-referenced NZS4121*	Yes

These two tools were used co-operatively to develop the building and justify design decisions.

Co-Design Process

Preparation

Before meeting with the Hawke whānau, we prepared two topography models of the site at 30 Kitemoana Street, giving a shoulder context of ten metres for each site boundary.

By creating scale models, we ensured a consistent and globally understood design language to facilitate our co-design process. Understanding and contributing to architectural plans and sections is a learnt skill and by working with three-dimensional media, all members of the whānau and design group contributed equally to the process.

Image 15-16: Co-design Sketch Models

We had broken down existing apartment models into unit sizes to use as metaphorical Lego-pieces for placeholders in discussions, working as a design resolution mechanism.

We prepared a context and feasibility study of the site and project, outlining the community services, social infrastructure, civil infrastructure and proposed bulk and location concepts for the site.

Next, I have included several images from the study next, and the rest can be found in the appendix.

31 Kitemoana Street Orakei, Auckland

Feasibility Study

Document prepared by the Auckland University of Technology for the Hawke Whānau, Te Puni Kōkiri & Oranga Tamariki

17 August, 2021

Who, What & Why?

Who are we engaging with, what are designing for, and why are we doing it?

We will be working in close collaboration with the Hawke whānau, who have deep roots within Ngāti Whātua Ōrākei, to create an inter-generational whare at 31 Kitemoana Street, to support and accommodate future generations. The family have been providing services to Oranga Tamariki (The Ministry for Children), bringing in troubled boys, and mothers and their new-borns to stay at their home in Ōrākei, giving them a safe environment to learn and reground themselves. The current house has been informally extended from 3 bedrooms, to now accommodating up to 14 people living there at once – which is not ideal nor structurally safe for the Hawke family and those coming into the space.

The project aims to create a welcoming, efficient, and economically sustainable whare whānau facility that provides shelter and care for up to 40 residents (including the Hawke whānau) in affiliation with Oranga Tamariki. We aim to build upon and enhance the existing business relationship between Oranga Tamariki and the Hawke whānau and provide a home that can help support Hauora for all residents.

Working together on this project is a knowledgeable group of 20 first-year Master of Architecture students and second-year Bachelor of Architecture and Future Environments students. AUT's recently established School of Future Environments (SoFE) aims to illuminate the importance of designing for a better tomorrow by teaching the students of today efficient and sustainable practices that maximise the utilisation of land and materials.

The land on which the house is situated is Māori land; due to the complex nature of ownership structures including multiple stakeholders, it is difficult for iwi owned land to be developed with the aid of loans as banks are reluctant to lend in these circumstances.

It is due to these circumstances that AUT's SoFE has become involved. The students will be developing a scheme in co-design with the Hawke family, with input from the stakeholders at Kāinga Ora and Oranga Tamariki. The resulting feasibility study will include in-depth analysis of construction techniques, resolved plan layouts, and development staging strategies to be taken forward to a proposal as described below.

This feasibility study will be used to develop a proposal to apply for an Infrastructure Grant through Te Puni Kōkiri, the government's policy advisor on Māori well-being and development. Through this project we hope to create more liveable environments for the Hawke whānau to allow them to accommodate their family as well as at-risk boys and the mothers and their new-borns, extending their services to Oranga Tamariki and creating positive changes in our communities.

"A co-design methodology, coupled with indigenous wisdom ensures our designs support all the aspirations of this community."

Our stakeholders

Ngāti Whātua o Ōrākei

The project's site is on Ngāti Whātua Ōrākei land. Ngāti Whātua Ōrākei is one of three hapū (sub-tribe) to the wider Ngāti Whātua Iwi (tribe). There are 6,000 members of the hapū. Ngāti Whātua began occupying Tamaki Makaurau in the 17th Century, lead by rangatira (chief) Tuperiri and are the only tribal group to own land in Auckland.

Ngāti Whātua Trust

Manage the assets of the trust to ensure benefits for all members.

Whai Rawa – Commercial Arm | **Whai Māia – Social Arm**

The Hawke Whanau (client)

The Hawke whānau of Ngāti Whātua Ōrākei are currently occupying 31 Kitemoana Street, Ōrākei. They usually have around 14 people living in their home at once. Growing issues of overcrowded and unaffordable housing in New Zealand has left the family wanting to create a high density living complex to replace their current home. Providing for their family and extending their services to Oranga Tamariki, creating more communal and economically sustainable living and encouraging typographies like this to increase throughout New Zealand.

Oranga Tamariki
Oranga Tamariki work to support children in New Zealand whose wellbeing is at a risk, including young people who may have offended or are likely to offend. The Hawke Family has affiliations towards this organisation and have been providing services to bring mums and their newborns, and at-risk boys into their home to accommodate for them.

Runanga
Te Runanga o Ngāti Whātua is the representative body and voice who are responsible for dealing with issues affecting Ngāti Whātua. They are responsible for providing a licence to occupy, which is done through the Maori Land Court.

Māori Land Court
Māori Land Court is part of the Ministry of Justice, to provide court service for Māori landowners and their whānau. Licence To Occupy is the most common type of licence on Māori land allowing the occupier permission to use the space for its stated purpose.

Te Puni Kōkiri
Te Puni Kōkiri is the government's principal policy advisor on Māori wellbeing and development. They aim to promote and increase the level of achievement of Māori in education, training, and employment, health, and economic resource development. For 2021, Te Puni Kōkiri has allowed for $1.4 billion to go towards Māori infrastructure. This feasibility study will be part of a proposal to apply for Te Puni Kōkiri's infrastructure Grant to allow the Hawke whānau to begin developing the project.

KiwiBank
Shared landholding over Māori land means that it cannot be sold for equity by banks, therefore Māori are not able to obtain loans from banks to develop their land. KiwiBank in this case is an anomaly due to the potential they are able to loan this project $200,000 - through the Kāinga Whenua loan.

Traditional Maori communities were always centered around communal living.

How are doing this?

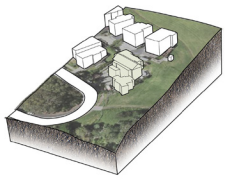
What are the challenges and opportunities within our project's vision?

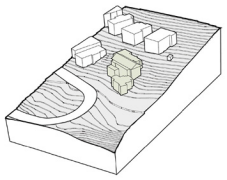
The design of Māori papakāinga is supporting integral communities and allowing people to grow closer and flourish together. We are committed to using a Māori worldview as a fundamental design philosophy. Our design methods and practice, guided by Mana Whenua.

We aim to build a hub that is home to a sustainable community, through mātauranga Māori and co-design methods. A co-design methodology, coupled with indigenous wisdom ensures our designs support all the aspirations of this community.

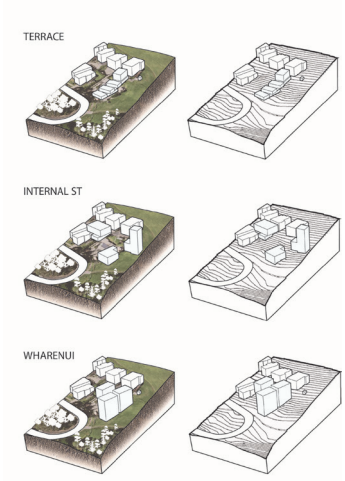
Original Site Massing

31 Kitemoana Street





Massing Concepts Overview

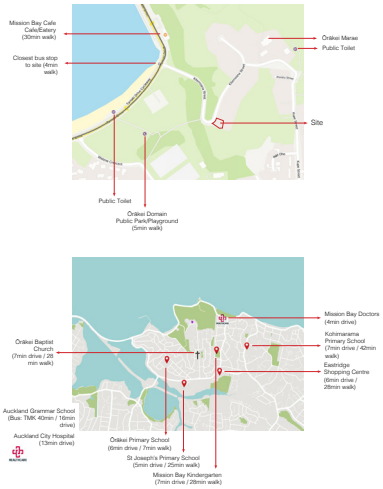


Site Map – Sun Path & Wind Directions

Underground Services

Water
Wastewater
Stormwater

Nearby Amenities



Potential Parking Situations

Option 1 would be to employ a similar strategy as the site currently has: an onsite driveway and park.

Currently the Hawke family can fit around 6 cars with this plan, however it does mean the vehicles fit in awkwardly and there can be cars that get blocked in by others.

A parking strategy at the front of the housing will leads to a vehicle-focused complex and outdoor landscape.

Above ground parking however does mean that there does not need to be any excavation of soil.

Carparking Option 1 - Existing Carpark Onsite + Off-street parking

Option 2 is an underground parking strategy which could accommodate 6-8 cars, and potentially bicycle parking as well. The proposed underground parking is on the shallow end of the site.

Underground parking means removing a vehicle-focus to the housing unit, opening up the landscape to more people-communal, people-focused programmes.

Soil excavation is needed for this, approx. 400m³ of soil. This soil could be potentially be re-used out another area of the site.

Carpark spaces would be all planned to the standard of disable/pram parking for accessibility (3m x 5m).

Carparking Option 2 - Underground Carpark Onsite + Off-street parking

Option 3 makes use of the existing driveway to the left of 31 Kitemoana Street, which is used by the houses 33A & 33B to the back of the site.

Parking for vehicles would then turn into a shared zone. This option is a strategy for implementing above-ground parking without crowding the front of the apartment complex with cars.

This strategy would require the approval of sharing the adjacent driveway from 33A & 33B Kitemoana St.

Carparking Option 3 - Shared Driveway-in-Back Onsite + Off-street parking

Image 17-25 : Feasibility Study August 2021

Tikanga of Co-Design

Establishing an environment of respect and manaakitanga was crucial for our undertaking as we needed to ensure we were honouring the collective knowledge of the whānau and their position as mana whenua.

Accordingly, we structured the session as follows.

1) Karakia - to open a space of wananga and korero.
Arohanui opened with this karakia:

Whakataka te hau ki te uru,
Whakataka tō hau ki te tonga.

Kia makinakina ki uta,
Kia mataratara ki tai.

E hi ake ana te atākura
he tio, he huka, he hauhu.

Haumi e! Hui e! Taiki e!

The wind swings to the west
then turns to the south, settles down.

Making it prickly cold inland
Making it piercingly cold at sea.

The glowing morning will rise
on ice, on snow, on frost.

Join! Gather! Intertwine!

2) Whaikorero – Whānau
The whānau explained the premise of the project, the role of the whānau with Oranga Tamariki and its goals for future generations.

3) Whaikorero – Design Group
The design group acknowledged the whānau's korero and explained how we aimed to help the whānau achieve these goals.

4) Whakamarama – Design group
The design group presented the whānau with the feasibility study in a presentation format, explaining what we had done so far and why, and we also explained what we had identified in our context study, and presented our bulk and location concepts.

We split into two groups with two whānau members assigned to each workspace. Each workspace explored a different bulk concept.

5) Mihi and Whanaungatanga
We spent time introducing each person, with a short pepeha to establish relationships with the whānau and each other.

6) Mahi
- We spent 30 minutes exploring the different configurations of bulk concepts.
- This brought to light new spatial programs required by the whānau.
- Design group members recorded these conversations.
- After the 30 minutes, the design group members switched workspaces and spent the next 30 minutes working with the other whānau members.

7) Manaakitanga - sharing food together
There are many reasons why sharing food is an important part of any process in Māori culture. It removes any tapu associated with the activities, but also builds rapport, celebrates success, and is an act of manaakitanga.

8) Waiata

Song is another important part of Māori culture. We sang a waiata describing the whakapapa of Ngāti Whātua to show that we supported the whānau and what they were trying to achieve.

Māhuhu te waka
Tuawhare te maunga
Kaipara te moana
Titiro ki Maunganui
Ngā iwi kia ora rā
Pūpuritia, kia mau, kia mau,
Te aroha, te mana Māori ee
Māhuhu te waka
Tuawhare te maunga
Kaipara te moana
Titiro ki Maunganui
Ngā iwi kia ora rā






Image 26-31: Co-design session, August 2021

During session - discussion of needs, wants, desired outcomes,

The key points in this part of the discussion in relation to my thesis were as follows:
- We need to rethink how we build on Māori land
- Current housing does not work for Māori ways of living.
- Current new builds and housing on Māori land is too expensive.
- We want to set an example for other Māori landowners to do the same thing with their land.

Co-Design Outcomes

After the co-design session, we set out to design a scheme for the whānau. This was intended to be a collaborative process, but Auckland was put into a four-month Covid lockdown, and classes were conducted online. This meant each student ultimately designed an individual scheme. These schemes were presented to the whānau at the end of the semester in October 2021.

My scheme explored the idea of vestibular space adjacent to private accommodation within an intergenerational home. The image of Level 2 of the Hawke whānau residence in my scheme (see image 21) shows a variety of ways the vestibule spaces can be used. In one instance, a wall with a cavity slider creates extra accommodation, private work-from-home set-ups, or children's bedrooms. For the *kaumātua* (elders) room (green), there is an open sitting room that can be used for reading, with high-quality natural light filtering in through the windows.

The atrium space (see image 24) in my scheme was designed to emulate the staircase from the original Hawke whare. The staircase was in the centre of the home, with windows that extended up into a skylight; an up-right piano was tucked into the top landing of the staircase. The children grew up practising the piano, so the house was filled with the sounds of music through the central staircase. In the new scheme, this atrium staircase brings solar gain to the centre of the building, connecting the stories through the acoustics of the piano on the lower storey, and capturing far-reaching views of the upper Waitematā.

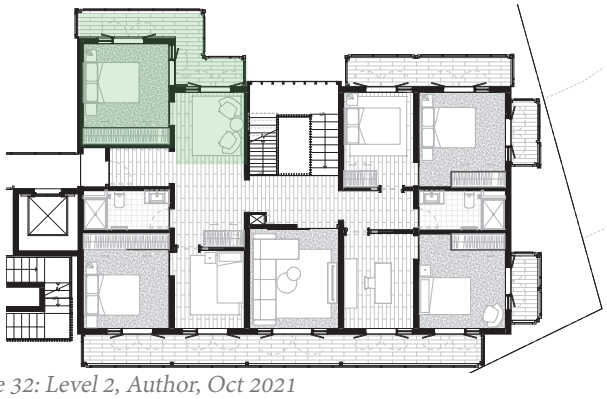


Image 32: Level 2, Author, Oct 2021

Image 34: Long Sectional Perspective, Author, Oct 2021

Image 33: Short Sectional Perspective, Author, Oct 2021

Image 35: Atrium, Author, Oct 2021

Individual Scheme, October 2021







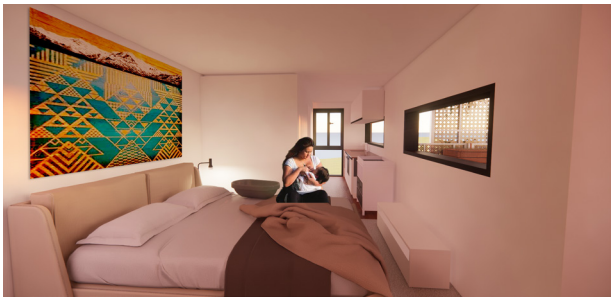


Image 36-43: Authors individual Scheme, October 2021

The Next Steps for The Hawke Whānau

The Hawke whānau selected a scheme designed by one student with which to move forward. A group of five students, (including myself) worked together in a research cluster to refine and further develop the scheme into a full Resource Consent packet. Each student determined their own research question with the aim of developing this building to work as a methodology, and the outcome for their thesis.

From my research into the intelligent design story and the plight of Ngāti Whātua Ōrākei, I became mindful of self-governance concepts. I developed a design guide of construction methodologies and construction details that could be used for future developments of homes and buildings and to align new or renovated buildings with the matrix I had produced. This aimed to provide positive outcomes for vital and diverse ecosystems, ecological integrity, carbon sinks, water-sensitive design, and improved thermal building performance, acoustic performance, and individual health outcomes.

Housing developments undertaken by the trust board so far have aligned with Western concepts of development and are at a density lower than is required for the future of Tāmaki Makaurau.

I identified key nodes within the Hawke whānau development, where interactions between the built environment, the existing sites of cultural significance, and the natural ecosystem encompassing all living systems take place. The investigation of the junctions at these nodes can be tested by the matrix so I will be able to produce a design guide that meets all the required criteria. The process of inspecting the nodes will include placing them within a larger aspect, and within the journey between the two scales I will explore the boundaries, and how they are negotiated.

SECTION A-A

Images 44-46: Rory Norton's design outcome, Oct-2021

Research Cluster

Five master's students worked together as a research cluster, as mentioned. We met twice a week to integrate our individual work into this project. Each person had a unique research question, as follows.

Image 47: Research Cohort :Rory Norton, Holly Anaru, Lana Webster, Fleur Palmer (Supervisor), Rana Fatoohi, Allan Phan.

Table 11: Research Cohort - Individual Research Questions

Student	Research Question
Lana Webster	Title: Towards Mauri-Ora in Medium-Density Architecture Research Question: How can mauri-ora be protected, enriched and enhanced in medium-density residential architecture while maintaining high building performance?
Rory Norton	Title: He Korowai Aroha Kai Maumahara: Mana Motuhake in Practice Research Question: In the context on a national housing crisis; how can Mana Motuhake - self determination –be used to combat issues rooted in colonialism?
Holly Anaru	Title: Housing in Aotearoa: Creating regenerative environments to support Māori and their Whenua. Research Question: How can an exploration of Te Ao Māori influence the development of the Hawke Whānau Whare to create sustainable housing on iwi land that supports Māori and whenua?
Rana Fatoohi	Title: Whakahoi – Weaving culture through architecture Question: How can we bring culture into the built environment through sustainable and eco-friendly building materials to improve the mental health and well-being for the occupants and surrounding communities?
Allan Phan	Title: Whanaungatanga – an approach in co-living housing toward sustainable living for Māori Question: How can Whanaungatanga – a Māori core value be embedded in a co-living approach to form a medium-density housing for Māori that promote a sustainable lifestyle?

The scheme selected by the whānau was designed by Rory Norton. His scheme captured the atmosphere and aesthetic values the whānau wanted and provided the required spaces in a way that delighted and enriched the whānau's *mahi* (work).

The co-design process is ongoing. We meet with a whānau representative at least once a month to review the design process and amalgamate any changes or comments received.

We arranged a meeting with two Ngāti Whātua Ōrākei artists: Beronia Scott and Lawrence Makaore. The purpose of this meeting was to begin including appropriate visual narratives and motifs into the project. The outcome of the meeting was a new name for the project and two strong visual narratives which tie strongly to the Kaupapa of the project.
“Korowai Aroha Kia Mau Mahara” (loosely translates as the loving cloak in remembrance)

Beronia Scott sugested “korowai aroha”, as a praise to the mahi by the whānau in their whare. “Kia mau mahara” was coined by the late Bob Hawke, the father of the whānau, who sadly passed away at the very beginning of this project.


Image 48-49: Co-design session August 2022

One of the visual narratives of the project is a korowai cloak, which will be represented in the woven nature of solar screens and balcony balustrades. In relation to the idea of korowai turuturu whatu– two pegs used in the act of weaving the korowai, there are turuturu displayed at the Auckland Museum, one of the turuturu is ornately carved and the other is plain and utilitarian.
The other visual narrative chosen for the project was that of poutama, a stair-like pattern. It will have twelve steps and could use the Ngāti Whātua Ōrākei colours of yellow, white, and black.

The co-design process within the research cluster involved a process we called “trimming the scheme.” This included pairing back the internal spaces to minimum dimensions determined through collaborative discussion to ensure design efficiencies, and as a means of cost control. Through this process we were able to combine the best aspects of all our individual schemes and develop a highly efficient floor plan, and through iterative discussions between members of the research cluster, we developed the scheme into a developed design outcome for the Hawke whānau to review.

My particular contribution to this process was by drawing on work experience. I have been working in an architecture firm since 2017; the firm specialises in apartment and townhouse design, and works with a range of clients, from private developers to Kāinga Ora. I used my experience to determine the minimum requirements of spatial layouts for bedrooms, hallways, common circulation space, bathrooms and kitchens. The efficiency of these spaces is crucial in large developments as the cost per square metre is determined from developed design plans. These dimensions become locked contractually, and variations require complicated negotiations between the contractors, clients, and architects, and can be costly and time-consuming.

Design Outcomes

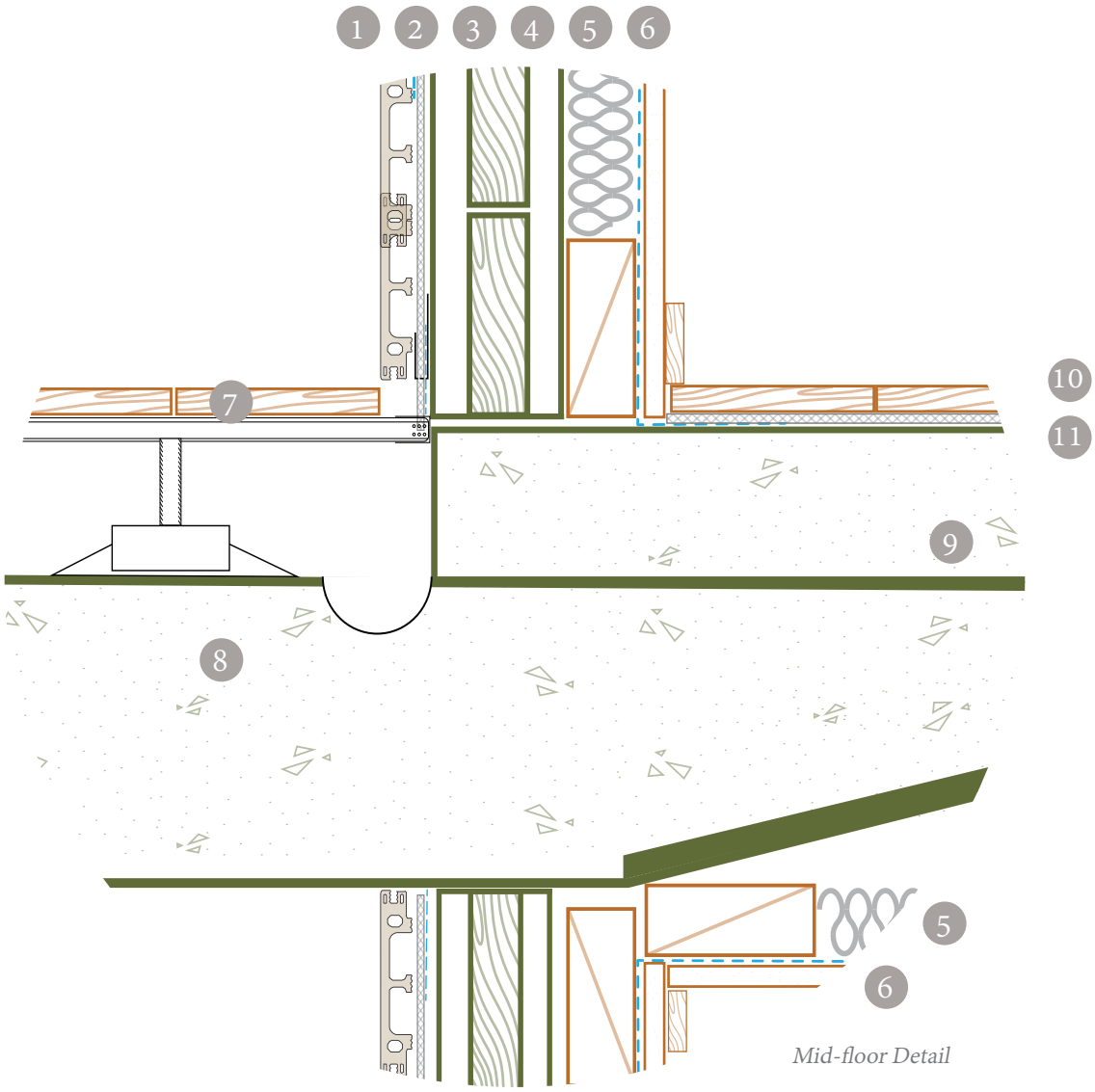
The nodes I have identified are key interatctions between the natural environment, the social/cultural environment and the built environment. I will explore and develop these nodes as architectural details, breaking down the components, assessing them against both matrices, and producing a rating using a colour system.

I will provide a discussion on the systems used and provide reasons, justifications and where more information is required to make a fair assessment.

The nodes I have identified are as follows.

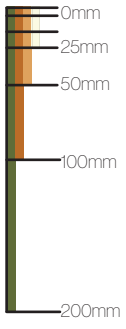
Design Outcome Diagrams

Mid-floor Junction



Mid-floor Detail

1. INNOWOOD Composite Timber Cladding - Horizontal
2. 4.5mm Rigid Air Barrier, James Hardie
3. James Hardie R.A.B flashing tape.
4. 90mm CLT Wall Panel.
5. 45mm Timber wall framing with Pink® Batts® Ultra® R2.6 Wall insulation.
6. 13mm GIB Braceline Noiseline Plasterboard wall lining, with vapour barrier.
7. Outdure Qwickbuild proprietary deckframe and support system with Casadeck composite timber decking
8. Cantilever concrete balcony - 1800mm maximum overhang
9. 100mm In-Situ Concrete Ribs with 25mm timber Infills and 100mm Concrete topping, with Ductile SE72 reinforcing mesh with 30mm top cover.
10. 20mm Reclaimed native timber flooring, nail fixed
11. 6mm Cork acoustic underlay - STC 61



Breakdown of Components

1 INNOWOOD Composite Timber Cladding - Horizontal

Go to summary of material classes	Material	Qty	Embodied carbon (kg CO_2eq/qty)	Embodied energy (total) (MJ (NCV)/qty)	Embodied energy (non-renewable) (MJ (NCV)/qty)	Embodied energy (renewable) (MJ (NCV)/qty)	Notes (see below table)	Data quality
	Composite timber							
PR_20_76_88_6_1_1	Composite timber, INNOWOOD, InnoClad shiplap cladding (product WC17533), imported (China)	m²	13.98	407.63	313.63	93.99	wc3, wc24	A
PR_20_76_88_6_1_2	Composite timber, INNOWOOD, InnoClad v-joint shiplap cladding (product WC13625), imported (China)	m²	15.55	453.38	348.84	104.54	wc3, wc24	A
PR_20_76_88_6_1_3	Composite timber, INNOWOOD, InnoClad v-joint shiplap cladding (product WC20025), imported (China)	m²	13.97	407.21	313.31	93.90	wc3, wc24	A
PR_20_76_88_6_3_1_2	Composite timber, INNOWOOD, InnoScreen screening (external use), face and rear fixing (product FS04030), imported (China)	m²	14.40	419.80	323.00	96.80	wc3, wc24	A

2 4.5mm Rigid Air Barrier, James Hardie

Go to summary of material classes	Material	Qty	Embodied carbon (kg CO_2eq/qty)	Embodied energy (total) (MJ (NCV)/qty)	Embodied energy (non-renewable) (MJ (NCV)/qty)	Embodied energy (renewable) (MJ (NCV)/qty)	Notes (see below table)	Data quality
Product code	**Rigid air barrier**							
PR_25_71_14_30_3	Fibre cement, rigid air barrier (4.5 mm thickness), imported	m²	4.44	53.10	22.43	30.68	tp1	C

3 James Hardie R.A.B flashing tape.

Go to summary of material classes	Material	Qty	Embodied carbon (kg CO_2eq/qty)	Embodied energy (total) (MJ (NCV)/qty)	Embodied energy (non-renewable) (MJ (NCV)/qty)	Embodied energy (renewable) (MJ (NCV)/qty)	Notes (see below table)	Data quality
	Tape							
PR_35_90_87_64_1_1	Adhesive air sealing tape, polyethylene based, double-sided, width 50 mm x length 25 m, imported (3M, Europe)	m²	2.60	94.74	61.20	33.54	en5	A
PR_35_90_87_64_1_2	Adhesive air sealing tape, polyethylene based, double-sided, width 20 - 25 mm x length 25 m, imported (3M, Europe)	m²	3.04	107.54	70.51	37.03	en5	A
PR_35_90_87_64_2_1	Adhesive conformable air sealing tape, polyethylene based, width 60 - 1210 mm x length 25 m, imported (3M, Europe)	m²	8.06	215.38	168.44	46.94	en6	A
PR_35_90_87_64_3_1	Adhesive waterproof flashing tape, polyethylene based, width 50 - 200 mm x length 25 m, imported (3M, Europe)	m²	1.33	57.96	34.32	23.64	en7	A

4 90mm CLT Wall Panel.

Go to summary of material classes	Material	Qty	Embodied carbon (kg CO_2eq/qty)	Embodied energy (total) (MJ (NCV)/qty)	Embodied energy (non-renewable) (MJ (NCV)/qty)	Embodied energy (renewable) (MJ (NCV)/qty)	Notes (see below table)	Data quality
Product code	**CLT**							
PR_20_85_8_17_1_1_A	Engineered wood (Radiata), cross-laminated timber (CLT) panel, 85 - 315 mm thick, untreated, visual / non-visual appearance grade [with wood sourced from sustainable forest management practices], imported (Xlam, Australia)	kg	-0.61	35.31	10.52	24.79	ew1, ew11	A

5 45mm Timber wall framing with Pink® Batts® Ultra® R2.6 Wall insulation.

Go to summary of material classes	Material	Qty	Embodied carbon (kg CO_2eq/qty)	Embodied energy (total) (MJ (NCV)/qty)	Embodied energy (non-renewable) (MJ (NCV)/qty)	Embodied energy (renewable) (MJ (NCV)/qty)	Notes (see below table)	Data quality
	Softwood							
PR_20_76_88_4_2_A	Softwood (Radiata pine), surfaced, kiln-dried (H1.2 boron treated), e.g. framing [from sustainable forest management practices] (WPMA)	kg	-1.49	29.58	1.54	28.04	ew4	B
PR_25_57_6_30_1_2_1_6	Insulation (90 mm wall), Pink® Batts® Ultra® R2.6 Wall (glass wool)	kg	0.96	23.95	14.70	9.25	in5	A

6 13mm GIB Braceline Noiseline Plasterboard wall lining

Go to summary of material classes	Material	Qty	Embodied carbon (kg CO_2eq/qty)	Embodied energy (total) (MJ (NCV)/qty)	Embodied energy (non-renewable) (MJ (NCV)/qty)	Embodied energy (renewable) (MJ (NCV)/qty)	Notes (see below table)	Data quality
PR_25_71_52_37_4_2	Plasterboard (GIB braceline® GIB noiseline® 13 mm)	kg	0.21	5.71	3.95	1.76	wa4	A

7 Outdure Qwickbuild proprietary deckframe and support system with Casadeck composite timber decking

8 Cantilever concrete balcony - 1800mm maximum overhang

9 100mm In-Situ Concrete Ribs with 25mm timber Infills and 100mm Concrete topping, with Ductile SE72 reinforcing mesh with 30mm top cover.

Go to summary of material classes	Material	Qty	Embodied carbon (kg CO_2eq/qty)	Embodied energy (total) (MJ (NCV)/qty)	Embodied energy (non-renewable) (MJ (NCV)/qty)	Embodied energy (renewable) (MJ (NCV)/qty)	Notes (see below table)	Data quality
	25 MPa in-situ, no reinforcement – Allied Concrete							
PR_20_31_16_3_4_1_1_1	Concrete, 25 MPa, in-situ, no reinforcement, (OPC) (Allied Concrete) (Auckland)	kg	0.13	0.66	0.61	0.04	ci1, ci10	A

10 20mm Reclaimed native timber flooring, nail fixed

11 6mm AcoustiCork acoustic underlay R60 - STC 61

	Test Reference	Subfloor	AcoustiCORK Product / Thickness	Suspended Ceiling	Overlay	Floor Covering	Sound Ratings IIC STC
CONCRETE FLOOR SYSTEMS	RAL IN95-3•RAL TL95-256	4" Slab	R60 - 6mm	Yes	1-1/2" Mortar Bed	Ceramic Tile	59 60
	RAL IN95-37•RAL TL95-256	6" Slab	R60 - 6mm	Yes	**None**	Ceramic Tile	61 60
	RAL IN95-43•RAL TL95-366	6" Slab	R60 - 6mm	Yes	**None**	Glued Wood	61 62
	RAL IN95-42•RAL TL95-365	6" Slab	R60 - 6mm	Yes	3/4" Plywood	Nailed Wood	61 61
	RAL IN95-41•RAL TL95-364	6" Slab	R60 - 6mm	Yes	**None**	Floating Wood	63 60
	RAL IN95-2•RAL TL95-40	6" Slab	R60 - 6mm	Yes	1/2" Cement Backer Board	Ceramic Tile	60 60
	RAL IN98-4•RAL TL98-27	6" Slab	R60 - 6mm	**No**	**None**	Floating Wood	50 52

ENVIRONMENTAL PROPERTIES

Recycled Content (LEED MR-4)
85% + Recycled Content by Weight
Rapidly Renewing Content (LEED MR-6)
85% + Cork Granules by Weight

Mid-Floor Matrix

Good
Acceptable
Not Acceptable

Table 12: Mid-Floor Matrix

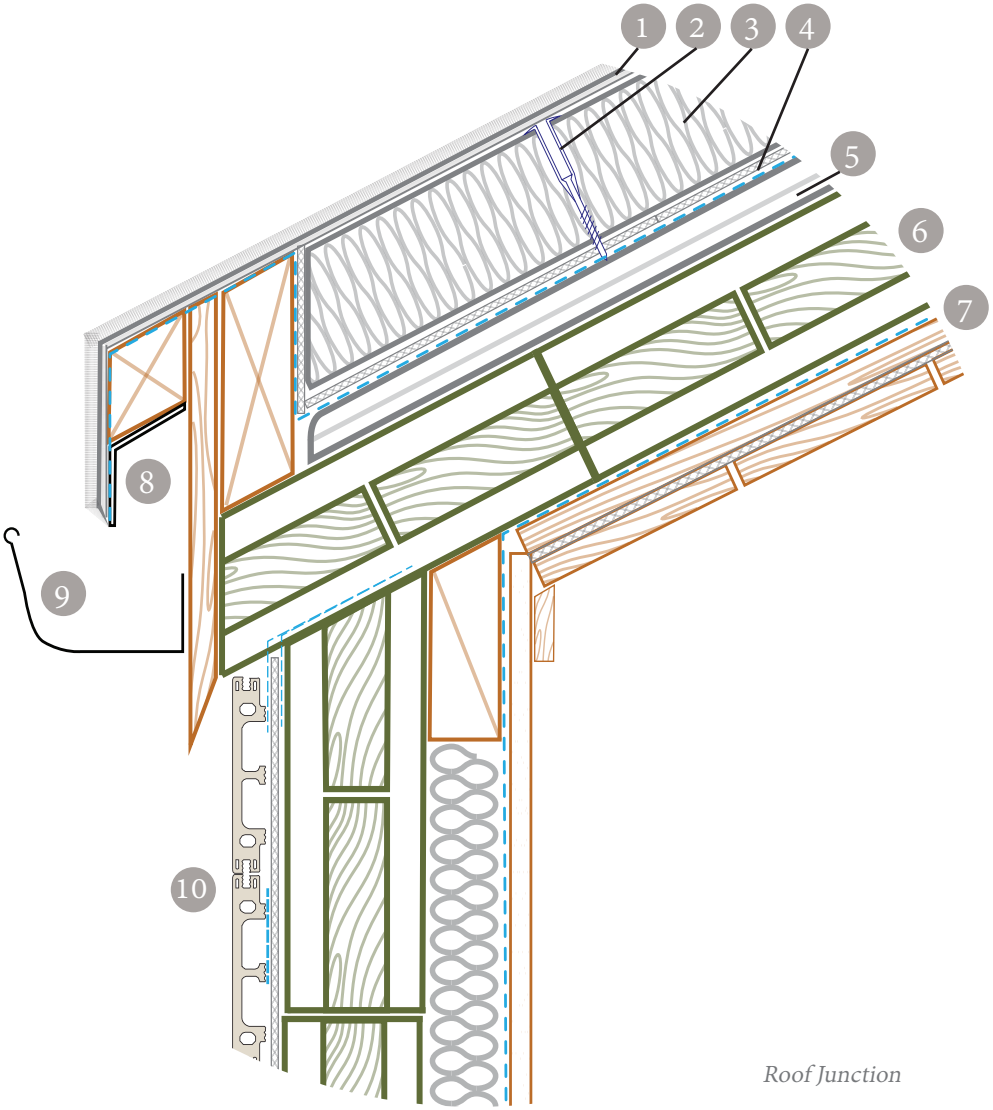
Typical Wall Detail		Minimum Requirements	Yes/ No
Thermal Performance *R-Value*	*Wall*	R3.2 Total	
	Floor	R2.4 Floor Structure	
	Roof / Ceiling	R2.6 Ceiling Insulation	
	Windows / Doors	N/A	
Acoustic Performance *STC & IIC Rating 55*	*Separation / Air Gap*	Isolated ceiling	
	Mass / Noise Control Products	Present - acoustic flooring underlay, acoustic ceiling insulation, acoustic wall insulation	
	Controlled, Sealed	Present	
Carbon	*Embodied Energy*	27.25 Kg C02eq/m^2	
	Reliability of Data	A- average	
Maintenance	*Frequency*	low maintenance external cladding - Outdure & aluminium cladding	
	Specialist Trade	No	
	Specialist Products	Yes	
Warranty	*Installation*	5 Years	
	Product Life	25 Years	
Supply	*Cost per qty*	- still waiting for quotes	
	Lead time	12-15 Weeks	
	Location of Manufacturing or storage facility	Auckland	
Accessibility	*Cross-referenced NZS4121*	N/A	

This detail prompted a decisive discussion regarding the overall structure of the building. Originally, a full CLT structure was chosen, however through debate and discussion, an insitu concrete primary structure was selected for its inherent acoustic performance, fire performance (outside of scope for this thesis), maintenance and durability. There is a short lead-time for supply and the supply chain is local and readily available. When compared to CLT, there is one manufacturer in Rotorua with a significant lead-time; the acoustic performance would require additional layers of insulation and isolation techniques, and the product requires specialist trades in short supply. Considering that the whānau intend to use this building for the next 50 years (at least), I believe that a concrete primary structure is suitable and appropriate even though it performs poorly in embodied carbon. CLT panels will be used where appropriate, such as non-structural external walls and partition walls.

The cladding system selected - INNOWOOD is a highly durable composite timber product. It was selected for its easy maintenance, wood-like qualities, and low embodied energy. The cladding can be laid vertically and horizontally, and can provide a natural timber finish without the heavy maintenance requirements, with water as the main method of cleaning - supporting wai-ora - balanced water systems.

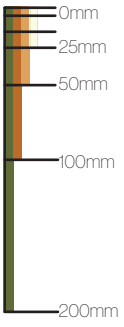
Rigid air barriers are used in this project to equalise air pressure within the exterior wall cavity, making the structure airtight and offering improved weather-tightness, structural bracing, and fire safety, that standard flexible wall underlay cannot provide. They are also easier to install, and more durable once installed, allowing them to act as temporary cladding prior to the installation of the actual exterior cladding (which allows interior work to continue prior to final enclosure), while also providing a solid substrate for the installation of flashing tape to window and door openings and exterior penetrations (GIB, 2019).

Roof Junction



Roof Junction

1. Top Layer - Bitumen - Nuraply 3PM system in selected colour,
   Second Layer - Membrane - Nuraply Base sheet 3PV-SA
2. Ikofix fastener at 600 centres.
3. Insulation - Enertherm PIR insulation depth 80mm R3.6
4. Nuraply ALU Vapour Barrier on Nuraflux Primer (blue dash)
5. Nuralite NPM 900 metal tray roof screwed to supporting CLT roof structure
6. 90mm CLT Wall Panel.
7. 20mm Plywood Ceiling with vapour barrier and decorative reclaimed native timber battens fixed over 6mm cork acoustic underlay.
8. 50mm minimum overhang, with aluminium angle drip edge.
9. Metalcraft Box Gutter 175 - Zincalume finish, selected colour.
10. Wall Assembly as per Mid-Floor Junction



Breakdown of Components

1. Top Layer - Bitumen - Nuraply 3PM system in selected colour,
   Second Layer - Membrane - Nuraply Base sheet 3PV-SA
2. Ikofix fastener at 600 centres.
3. Insulation - Enertherm PIR insulation depth 80mm R3.6
4. Nuraply ALU Vapour Barrier on Nuraflux Primer (blue dash)
5. Nuralite NPM 900 metal tray roof screwed to supporting CLT roof structure

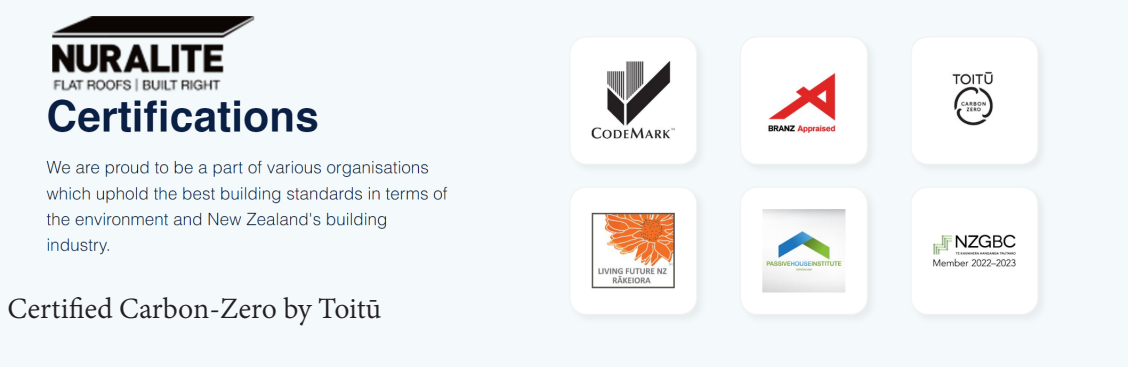


Image 50: https://www.nuralite.co.nz/sustainability#

6. 90mm CLT Wall Panel.

Go to summary of material classes	Material	Qty	Embodied carbon (kg CO_2eq/qty)	Embodied energy (total) (MJ (NCV)/qty)	Embodied energy (non-renewable) (MJ (NCV)/qty)	Embodied energy (renewable) (MJ (NCV)/qty)	Notes (see below table)	Data quality
Product code	**CLT**							
PR_20_85_8_17_1_1_A	Engineered wood (Radiata), cross-laminated timber (CLT) panel, 85 - 315 mm thick, untreated, visual / non-visual appearance grade [with wood sourced from sustainable forest management practices], imported (Xlam, Australia)	kg	-0.61	35.31	10.52	24.79	ew1, ew11	A

7. 20mm Plywood Ceiling with vapour barrier and decorative reclaimed native timber battens fixed over 6mm cork acoustic underlay.

Go to summary of material classes	Material	Qty	Embodied carbon (kg CO_2eq/qty)	Embodied energy (total) (MJ (NCV)/qty)	Embodied energy (non-renewable) (MJ (NCV)/qty)	Embodied energy (renewable) (MJ (NCV)/qty)	Notes (see below table)	Data quality
	Plywood							
R_25_71_97_33_1_A	Engineered wood, plywood (A bond, floor, tongue and groove) [from sustainable forest management practices], imported	kg	-0.74	44.46	15.00	29.46	fl6, fl10	B

8. 50mm minimum overhang, with aluminium angle drip edge.

Go to summary of material classes	Material	Qty	Embodied carbon (kg CO_2eq/qty)	Embodied energy (total) (MJ (NCV)/qty)	Embodied energy (non-renewable) (MJ (NCV)/qty)	Embodied energy (renewable) (MJ (NCV)/qty)	Notes (see below table)	Data quality
	Flashings							
R_35_90_30_1_1_1_1	Aluminium, flashing, flat sheet 0.9 mm BMT, powder coated (one side 0.08 mm) (primary manufacture using mainly renewables-generated electricity)	kg	12.43	184.78	130.34	54.44	wc9, wc27, wc28, wc31	F

NB: Nuralite System is Certified Carbon-Zero by Toitū

9. Metalcraft Box Gutter 175 - Zincalume finish, selected colour.

No data available - nominate the same value as the aluminium previously.

Roof Junction Matrix

Good
Acceptable
Not Acceptable

Table 13: Roof Junction Matrix

Roof Junction Detail		Minimum Requirements	Yes/ No
Thermal Performance *R-Value*	*Wall*	N/A	
	Floor	N/A	
	Roof / Ceiling	R-Value 3.6	
	Windows / Doors	N/A	
Acoustic Performance *STC & IIC Rating 55*	*Separation / Air Gap*	N/A	
	Mass / Noise Control Products	Mass present, acoustic wall insulation, acoustic underlay in ceiling to dampen internal STC. Roof - STC37, IIC50 for rain sound.	
	Controlled, Sealed	Present	
Carbon	*Embodied Energy*	11.08 Kg C02eq/m^2	
	Reliability of Data	A- average	
Maintenance	*Frequency*	Low maintenance external cladding - Outdure & aluminium cladding	
	Specialist Trade	No	
	Specialist Products	Yes	
Warranty	*Installation*	5 Years	
	Product Life	Roof - 20 years, 5 year inspection required.	
Supply	*Cost per qty*	- still waiting for quotes	
	Lead time	12-15 Weeks	
	Location of Manufacturing or storage facility	Christchurch	
Accessibility	*Cross-referenced NZS4121*	N/A	

I have selected a "warm" roof assembly for this project. The benefits include a high R-Value of 3.6, airtight construction, vapour barriers, durability, allows pedestrian traffic for maintenance and has a long product life when maintained regularly. Nuralite is a certified carbon-zero partner with Toitū - which aligns with our project goals of Ao-Rawa-Ora – ecological integrity in building products.

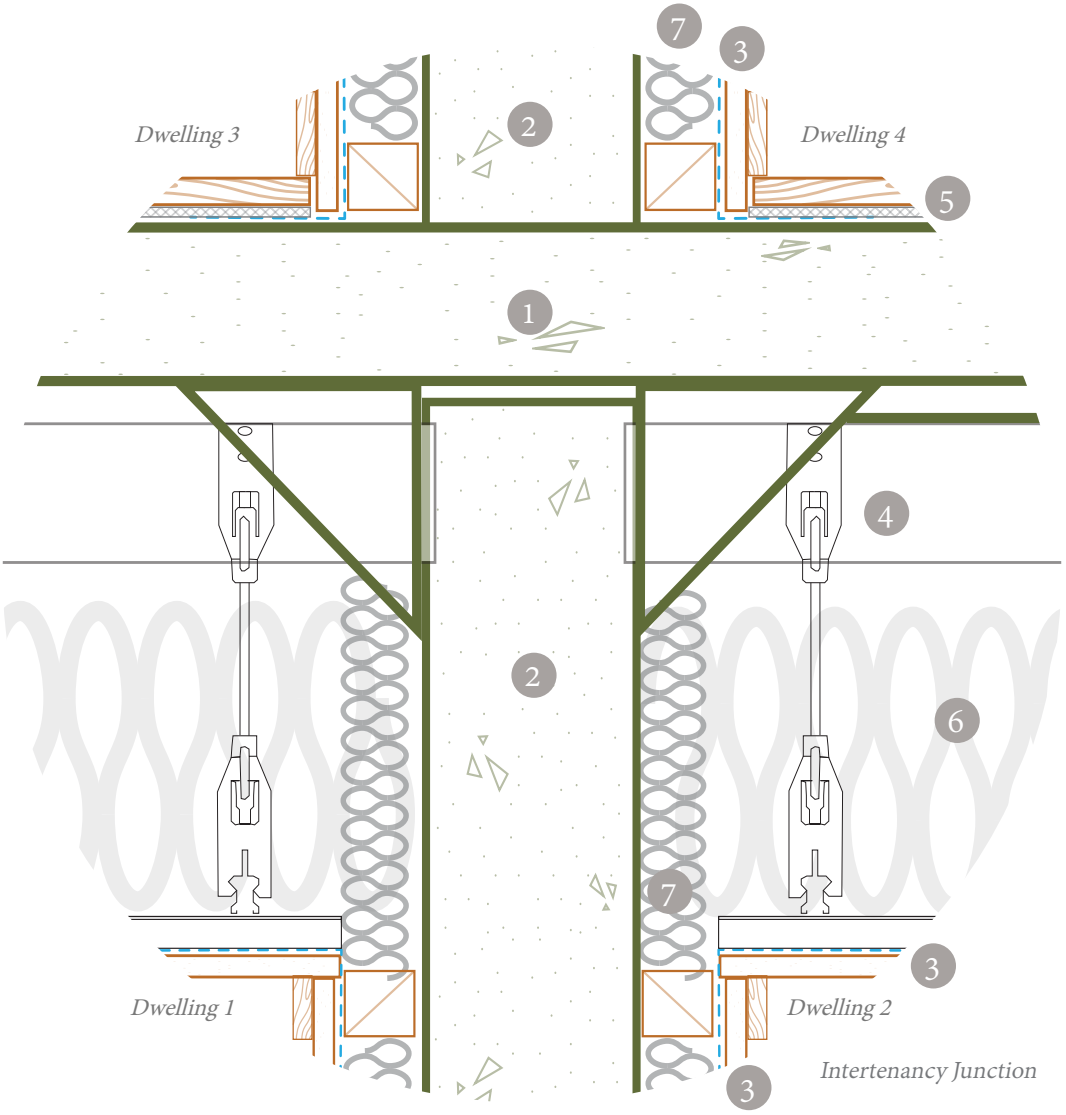
The energy efficiency that comes with a highly insulated building envelope provides a comfortable internal environment without supplementary heating or cooling. This in turn reduces the general running costs and maintenance of the building.

The use of reclaimed timber as decorative ceiling battens aligns with the whānau's aesthetics for the Whare Taonga on level 4. By providing a cork underlay, airborne sound will be dampened as it hits the ceiling surface, providing an optimal internal environment fit for purpose in the Whare Taonga.

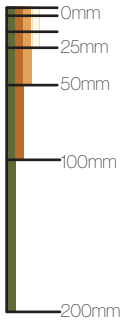
The reliability of the data collected for this junction is not optimal. Substitutions for certified products is preferred.

The overall acoustic performance for this junction is acceptable. As the main noise instance for the Whare Taonga would be environmental sounds such as wind, rain, and hail. I believe it is appropriate for there to be environmental sounds in this space as it connects the inhabitants with the Atua and wider natural environment, which aligns with the value of Taiao - the natural environment is protected, restored and enhanced.

Intertenancy Junction



1. 100mm In-Situ Concrete Ribs with 25mm timber Infills and 100mm Concrete topping, with Ductile SE72 reinforcing mesh with 30mm top cover.
2. 140mm Precast Concrete with Ductile SE72 reinforcing mesh with 30mm top cover.
3. 13mm GIB Braceline Noiseline Plasterboard wall / ceiling lining, with vapour barrier.
4. Rondo suspended ceiling system
5. 20mm Reclaimed native timber flooring, nail fixed 6mm Cork acoustic underlay - STC 61
6. Pink® Batts® Ultra® R4.0 Ceiling insulation 195mm thick.
7. 45mm Timber wall framing with continuous Pink® Batts® Ultra® R2.6 Wall insulation



1 100mm In-Situ Concrete Ribs with 25mm timber Infills and 100mm Concrete topping, with Ductile SE72 reinforcing mesh with 30mm top cover.

2 140mm Precast Concrete with Ductile SE72 reinforcing mesh with 30mm top cover.

Go to summary of material classes	Material	Qty	Embodied carbon (kg CO_2eq/qty)	Embodied energy (total) (MJ (NCV)/qty)	Embodied energy (non-renewable) (MJ (NCV)/qty)	Embodied energy (renewable) (MJ (NCV)/qty)	Notes (see below table)	Data quality
	25 MPa in-situ, no reinforcement – Allied Concrete							
PR_20_31_16_3_4_1_1_1	Concrete, 25 MPa, in-situ, no reinforcement, (OPC) (Allied Concrete) (Auckland)	kg	0.13	0.66	0.61	0.04	ci1, ci10	A

3 13mm GIB Braceline Noiseline Plasterboard wall / ceiling lining, with vapour barrier.

Go to summary of material classes	Material	Qty	Embodied carbon (kg CO_2eq/qty)	Embodied energy (total) (MJ (NCV)/qty)	Embodied energy (non-renewable) (MJ (NCV)/qty)	Embodied energy (renewable) (MJ (NCV)/qty)	Notes (see below table)	Data quality
PR_25_71_52_37_4_2	Plasterboard (GIB braceline® GIB noiseline® 13 mm)	kg	0.21	5.71	3.95	1.76	wa4	A

4 Rondo suspended ceiling system

Go to summary of material classes	Material	Qty	Embodied carbon (kg CO_2eq/qty)	Embodied energy (total) (MJ (NCV)/qty)	Embodied energy (non-renewable) (MJ (NCV)/qty)	Embodied energy (renewable) (MJ (NCV)/qty)	Notes (see below table)	Data quality
Product code	**Rondo - ceiling product**							
PR_20_29_5_1_1	Rondo, ceiling product, bulkhead trim, aluminium (product 321), imported (Australia)	kg	9.07	173.30	121.00	52.30	cs1	A
PR_20_29_5_1_2	Rondo, ceiling product, ceiling batten, GALVABOND® steel G2 Z275 (product NZ31, 310), imported (Australia)	kg	3.29	39.23	37.80	1.43	cs1	A
PR_20_29_5_1_3	Rondo, ceiling product, ceiling batten, ZINCALUME® steel G550 AM125 (product NZ301, 303), imported (Australia)	kg	3.11	36.50	34.90	1.60	cs1	A
PR_20_29_5_1_4	Rondo, ceiling product, concealed T-spline, ZINCFORM® steel G300 Z200 (product 371), imported (Australia)	kg	3.13	43.41	38.30	5.11	cs1	A
PR_20_29_5_1_5	Rondo, ceiling product, furring channel, GALVABOND® steel G2 Z275 (product 309A), imported (Australia)	kg	3.35	40.23	38.70	1.53	cs1	A
PR_20_29_5_1_6	Rondo, ceiling product, furring channel, GALVABOND® steel G2 Z275 (product 129, 155, 308, 333), imported (Australia)	kg	3.29	39.23	37.80	1.43	cs1	A
PR_20_29_5_1_7	Rondo, ceiling product, primary section cross tee, aluminium (extruded) (product 357, 359), imported (Australia)	kg	9.07	173.30	121.00	52.30	cs1	A
PR_20_29_5_1_8	Rondo, ceiling product, primary section cross and main tee, plain & polyester-coated ZINCFORM® steel G300 Z200 (product DU01, DU02), imported (Australia)	kg	3.13	43.41	38.30	5.11	cs1	A
PR_20_29_5_1_9	Rondo, ceiling product, section joiner and seismic deflection track, GALVABOND® steel G2 Z275 (product 272), imported (Australia)	kg	3.09	36.21	35.10	1.11	cs1	A
PR_20_29_5_1_10	Rondo, ceiling product, suspension rod, OneSteel rod (product 121, 122), imported (Australia)	kg	2.50	29.50	28.10	1.40	cs1	A
PR_20_29_5_1_11	Rondo, ceiling product, top cross rail, GALVABOND® G2 Z275 (product 125), imported (Australia)	kg	3.29	39.23	37.80	1.43	cs1	A
PR_20_29_5_1_12	Rondo, ceiling product, top cross rail, GALVABOND® G2 Z275 (product 127, 128), imported (Australia)	kg	3.09	36.21	35.10	1.11	cs1	A
PR_20_29_5_1_13	Rondo, ceiling product, wall track, GALVABOND® steel G2 Z275 (product 140, 142, 143, 340), imported (Australia)	kg	3.29	39.23	37.80	1.43	cs1	A
PR_20_29_5_1_14	Rondo, ceiling product, wall track, GALVABOND® steel G2 Z275 (product 141), imported (Australia)	kg	2.94	34.08	33.20	0.88	cs1	A
PR_20_29_5_1_15	Rondo, ceiling product, wall trim, aluminium (extruded) (product 242R, DU07, DU08, DU09), imported (Australia)	kg	9.07	173.30	121.00	52.30	cs1	A
PR_20_29_5_1_16	Rondo, ceiling product, wall trim, polyester-coated GALVABOND® steel G2 Z275 (product DU05, DU06), imported (Australia)	kg	3.29	39.23	37.80	1.43	cs1	A

5 20mm Reclaimed native timber flooring, nail fixed 6mm Cork acoustic underlay - STC 61

6 Pink® Batts® Ultra® R4.0 Ceiling insulation 195mm thick.

7 45mm Timber wall framing with continuous Pink® Batts® Ultra® R2.6 Wall insulation

Go to summary of material classes	Material	Qty	Embodied carbon (kg CO_2eq/qty)	Embodied energy (total) (MJ (NCV)/qty)	Embodied energy (non-renewable) (MJ (NCV)/qty)	Embodied energy (renewable) (MJ (NCV)/qty)	Notes (see below table)	Data quality
PR_25_57_6_30_1_2_1_6	Insulation (90 mm wall), Pink® Batts® Ultra® R2.6 Wall (glass wool)	kg	0.96	23.95	14.70	9.25	in5	A
PR_25_57_6_30_1_3_8	Insulation (roof), Pink® Batts® Classic R4.0 Ceiling (glass wool)	kg	0.96	23.95	14.70	9.25	in5	A

Intertenancy Junction Matrix

Good
Acceptable
Not Acceptable

Table 14: Intertenancy Junction Matrix

Roof Junction Detail		Minimum Requirements	Yes/ No
Thermal Performance *R-Value*	*Wall*	R4.3	
	Floor	R4.2	
	Roof / Ceiling	R4.0	
	Windows / Doors	N/A	
Acoustic Performance *STC & IIC Rating 55*	*Separation / Air Gap*	Yes 150mm separation between levels, 45mm separation from I.T wall	
	Mass / Noise Control Products	Mass present - Concrete wall achieves STC55 , concrete floor achieves STC52, wall insulation, ceiling insulation	
	Controlled, Sealed	Present	
Carbon	*Embodied Energy*	2.26 Kg C02eq/m^2 for everything except the rondo system (64.71 Kg C02ew/m^2) which unfairly represents the embodied carbon as the components are around 400mg each.	
	Reliability of Data	A	
Maintenance	*Frequency*	None	
	Specialist Trade	No	
	Specialist Products	No	
Warranty	*Installation*	10	
	Product Life	50 Years	
Supply	*Cost per qty*	- still waiting for quotes	
	Lead time	- still waiting for quotes	
	Location of Manufacturing or storage facility	Christchurch, and Australia	
Accessibility	*Cross-referenced NZS4121*	N/A	

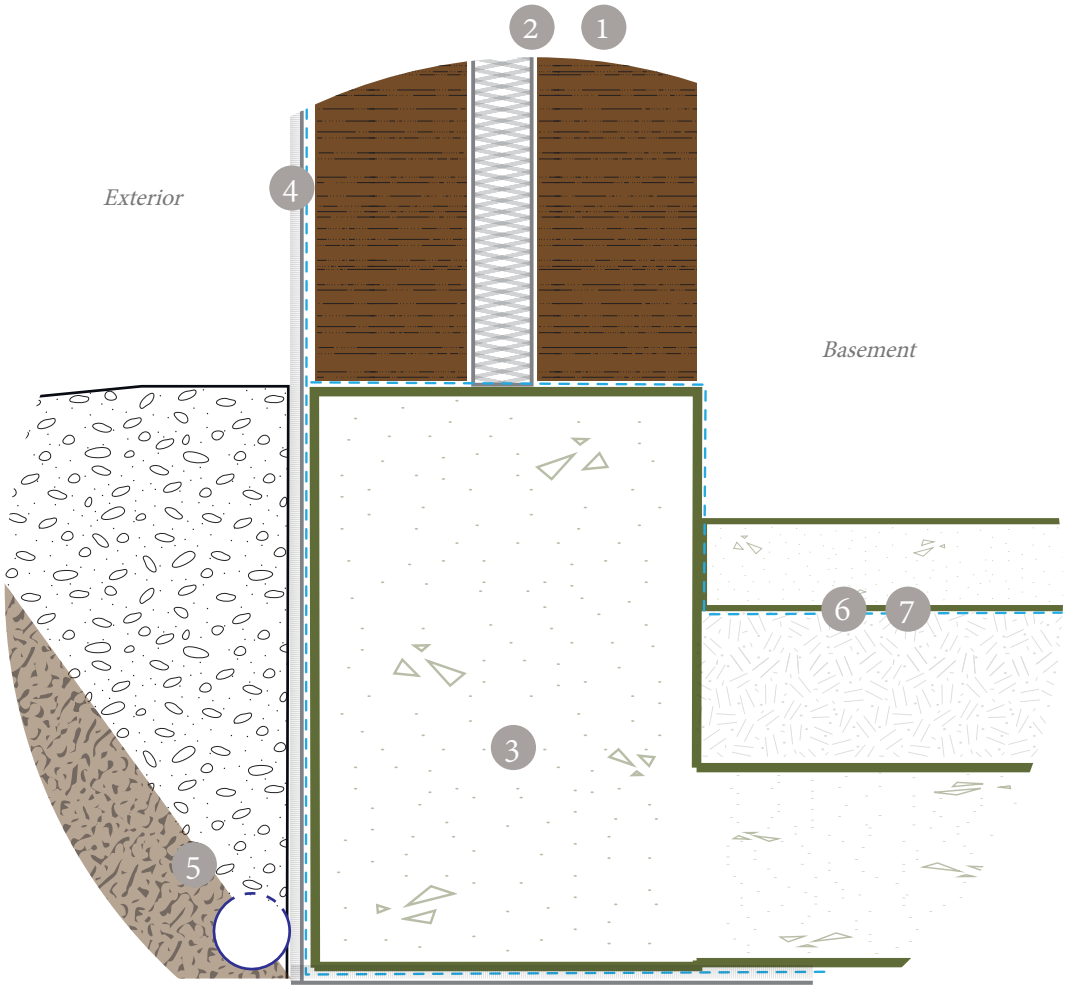
The concrete structure provides an excellent base acoustic performance with STC55 for the walls, and STC52 for the floors. With the ceiling assembly, the floors achieve IIC59 for impact sound which is above the acceptable minimum standard. With the added framing and insulation, the walls will achieve an STC above the acceptable minimum standard. This will provide a quiet and peaceful interior environment for each dwelling, with minimum service and neighbouring sounds, which is very suitable for the whānau and the way this building will be used.

The thermal performance of this junction is second to none. The achieved R-values are double the acceptable standard, meaning these dwellings will be extremely energy efficient and require minimal mechanical internal climate control. This means the building will be resilient in the climate crisis.

The maintenance of the products used is in-line with everyday cleaning practices and the warranty for the Rondo suspended ceiling system is acceptable.

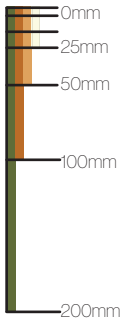
The embodied energy in this junction is difficult to ascertain without an intricate knowledge of the Rondo system and detailed plans of the ceiling design. What I understand is that the embodied energy in the Rondo components skews the matrix unfairly, as comparatively, there will not be hundreds of kilograms of these components used. I have separated these two quantities to show that in the matrix. This would need to be assessed with a developed design provided to form a quote of quantities.

Foundation Detail



Foundation Detail

1. Whareuku - Rammed earth wall 250mm thick.
2. Rigid Insulation Panel 100mm thick.
3. Reinforced concrete footing - 250mm thick, 500mm deep per structural design.
4. Double layer waterproof membrane extending above the ground cover level.
5. Loose scoria fill with slotted perimeter drain
6. 100mm Concrete Slab on grade with Ductile SE72 Mesh reinforcing with 30mm top cover on damp-proof membrane DPM, 25mm sand blinding, 150mm compacted hardfill
7. Damp proof membrane - Kingspan Thermakraft Thermathene Orange



1 Whareuku - Rammed earth wall 250mm thick.

Earth								
Go to summary of material classes	Material	Qty	Embodied carbon (kg CO_2eq/qty)	Embodied energy (total) (MJ (NCV)/qty)	Embodied energy (non-renewable) (MJ (NCV)/qty)	Embodied energy (renewable) (MJ (NCV)/qty)	Notes (see below table)	Data quality
Product code								
PR_15_31_26_26	Earth (straw stabilised adobe)	kg	-0.01	0.15	-	-	ea1	E
PR_45_31_63_84	Strawbale	kg	-1.66	0.24	-	-	ea1	E

2 Rigid Insulation Panel 100mm thick.

Go to summary of material classes	Material	Qty	Embodied carbon (kg CO_2eq/qty)	Embodied energy (total) (MJ (NCV)/qty)	Embodied energy (non-renewable) (MJ (NCV)/qty)	Embodied energy (renewable) (MJ (NCV)/qty)	Notes (see below table)	Data quality
PR_20_65_60_85_1_5	Wall panel, Kingspan Insulated Panel, KS1000 RW, 100mm thick, R5.36 and KS1000 AWP and Evolution, 100mm, R5.15, imported (Australia)	m^2	55.50	950.03	905.00	45.03	wc11	A

3 Reinforced concrete footing - 250mm thick, 500mm deep per structural design.

6 100mm Concrete Slab on grade with Ductile SE72 Mesh reinforcing with 30mm top cover on damp-proof membrane DPM, 25mm sand blinding, 150mm compacted hardfill

Go to summary of material classes	Material	Qty	Embodied carbon (kg CO_2eq/qty)	Embodied energy (total) (MJ (NCV)/qty)	Embodied energy (non-renewable) (MJ (NCV)/qty)	Embodied energy (renewable) (MJ (NCV)/qty)	Notes (see below table)	Data quality
	200 kg/m^3 steel reinforcing							
PR_20_31_16_8_2_4_1	Reinforced concrete, 50 MPa, in-situ, inc. 200 kg/m^3 steel reinforcing, (OPC)	kg	0.50	5.45	4.94	0.51	ci3, ci10	F

4 Double layer waterproof membrane extending above the ground cover level.
No Data.
Samson Services in Auckland can provide detailed design of a basement waterproof membrane (WPM) system using locally manufactured brands such as Allco. This system will likely be high in embidied energy due to its synthetic nature. WPMs require regular maintenance and checks for damage, ensuring the product doesn't fail.

5 Loose scoria fill with slotted perimeter drain

7 Damp proof membrane (DPM)- Kingspan Thermakraft Thermathene Orange

No Data.
Kingspan Thermakraft are working towards being a Carbon-Zero company, though as their products are, by nature, synthetic and are designed to be resilient, there is no compromise over quality products of this nature, even at such expense.

Foundation Detail Matrix

Good
Acceptable
Not Acceptable

Table 15: Foundation Detail Matrix

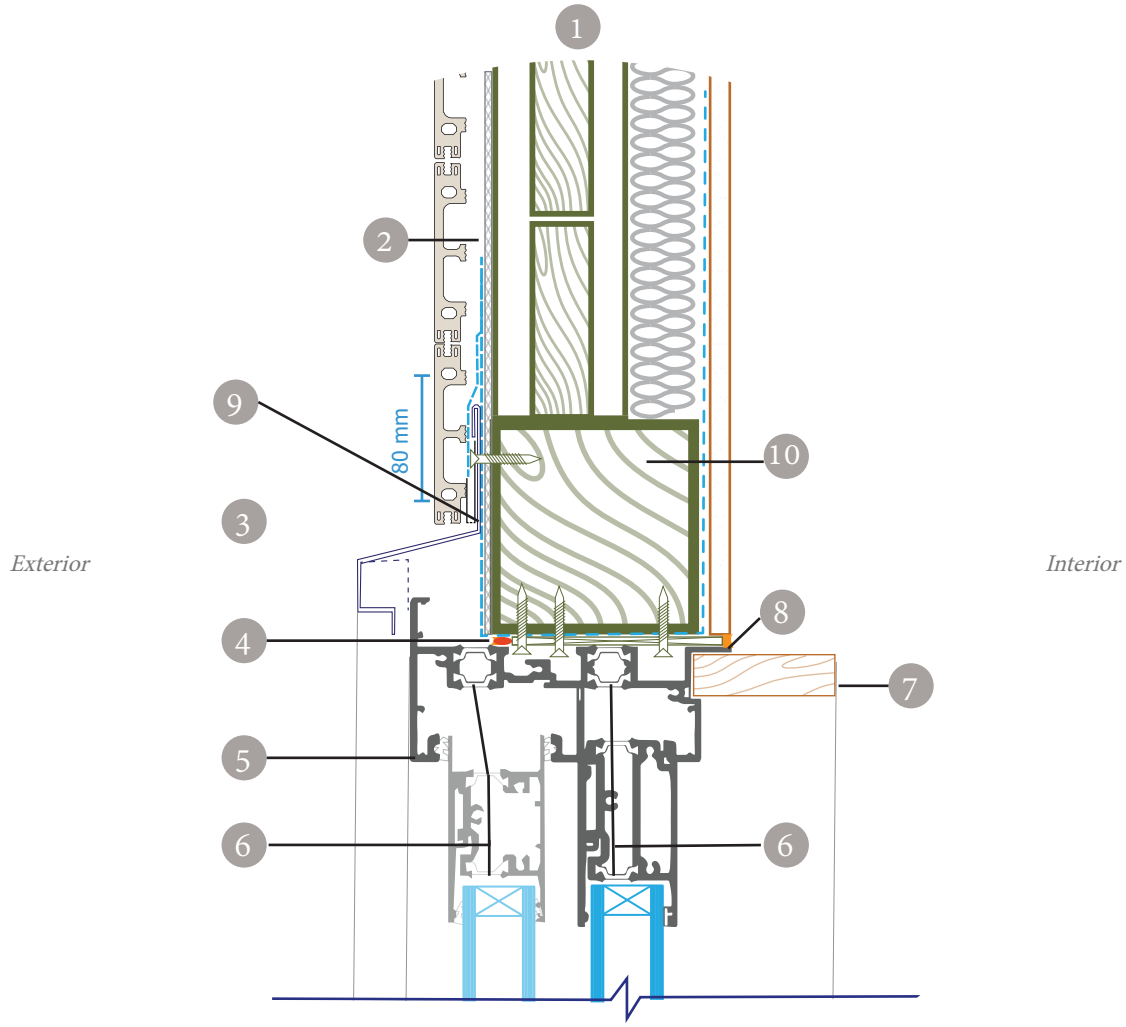
Roof Junction Detail		Minimum Requirements	Yes/ No
Thermal Performance *R-Value*	*Wall*	N/A - not a living space, but R5.6 for the thermal break.	
	Floor	N/A - not a living space	
	Roof / Ceiling	N/A - not a living space	
	Windows / Doors	N/A	
Acoustic Performance *STC & IIC Rating 55*	*Separation / Air Gap*	N/A	
	Mass / Noise Control Products	Mass present - concrete floor achieves STC55,	
	Controlled, Sealed	Present	
Carbon	*Embodied Energy*	Insufficient data	
	Reliability of Data	F	
Maintenance	*Frequency*	2 years	
	Specialist Trade	Yes	
	Specialist Products	Yes	
Warranty	*Installation*	DPM 25 Years, WPM - on design	
	Product Life	25+ Years	
Supply	*Cost per qty*	- still waiting for quotes	
	Lead time	- still waiting for quotes	
	Location of Manufacturing or storage facility	Whare Uku - On-site, Concrete & Steel- Auckland, DPM - Australia, WPM - New Zealand	
Accessibility	*Cross-referenced NZS4121*	N/A	

The use of Whare Uku walls is limited to where the wall is entirely above ground level, so all basement walls will have to be concrete for structural and waterproofing integrity.

Its difficult to ascertain the embodied energy with so little data avaliable, however I believe in this instance, it is integral to have high-performing products, as the failure of these systems would be catastrophic. The synthetic and highly engineered nature of these products implies a high embodied energy cost, though this could be balanced throughout the entirety of the building by use of systems such as whare uku, so then the tanking of the foundation can be treated as an exception due to its purpose.

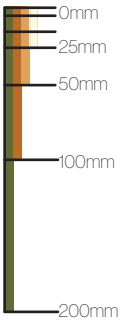
The maintenance of the WPM system is crucial to its performance, which doesn't align with the project goals, though similar to previously mentioned, this detail could be treated as an exception and detailed instructions within a building manual could be provided, along with a contact to a dedicated service provider to undertake periodic maintenance.

Window Head Junction

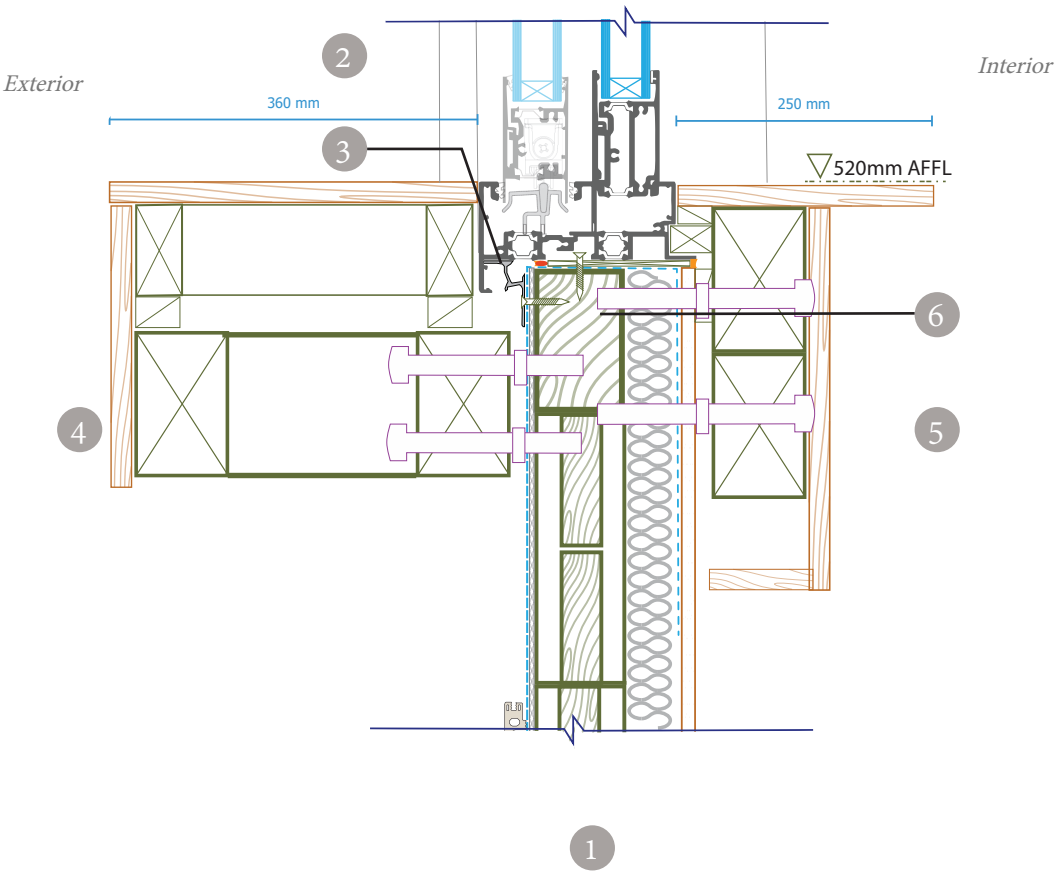


Window Head Junction

1. Wall Assembly as per Mid-Floor Junction
2. Flashing tapes, 2 layers lapping under and over flashing, extending 80mm above junction.
3. Aluminium window flashing with 80mm cladding overlap, 15° fall. Jamb flashing dashed.
4. Weather and air seal and backing rod.
5. Metro Series Altherm Sliding window series.
6. Thermal Break
7. Dress Timber Reveal & Frame
8. Internal Seal
9. Wall protection membrane over rigid air barrier, wrapped into window opening.
9. Gluman timber lintel beam.

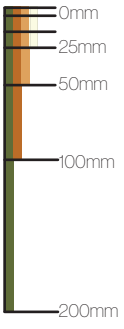


Window Sill Junction



Window Sill Junction

1. Wall Assembly as per Mid-Floor Junction
2. Metro Series Alltherm Sliding Window. Flashed and taped in line with Window Head Junction
3. Sill support bar screw fixed at 300mm centres.
4. External Window Seat - 140mm H1.2 treated timber frame, fixed to wall with 2x M12 bolts, with 15mm separation gap at 300mm centres. 20mm H1.2 Timber sill liner and H1.2 timber packer under 20mm dressed timber screw fixed to top surface, flush with window track.
5. Internal Window Seat - 140mm H3.2 treated timber frame, fixed to over wall lining with 2x M12 bolts, with 15mm separation gap at 300mm centres. H3.2 Timber packers under 90mm H3.2 timber framing, with 20mm decking timber screw fixed to top surface, flush with window track.
6. Glulam Sill trimmer.



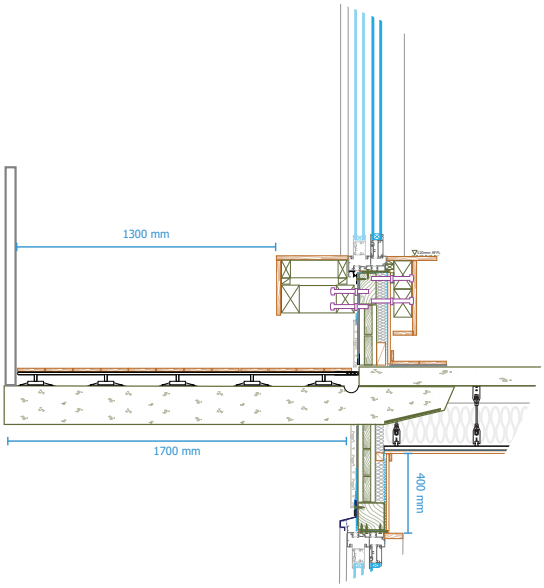


Diagram 8: Balcony Section showing window seating,

Image 51: Window seating along breezeway balcony, Rory Norton, August 2022.

3 Aluminium window flashing with 80mm cladding overlap, 15° fall. Jamb flashing dashed.

Go to summary of material classes	Material	Qty	Embodied carbon (kg CO_2eq/qty)	Embodied energy (total) (MJ (NCV)/qty)	Embodied energy (non-renewable) (MJ (NCV)/qty)	Embodied energy (renewable) (MJ (NCV)/qty)	Notes (see below table)	Data quality
	Flashings							
PR_35_90_30_1_1_1_1	Aluminium, flashing, flat sheet 0.9 mm BMT, powder coated (one side 0.08 mm) (primary manufacture using mainly renewables-generated electricity)	kg	12.43	184.78	130.34	54.44	wc9, wc27, wc28, wc31	F

5 Metro Series Altherm Sliding window series.

6 Thermal Break

No Data - however, the manufacturer APL uses aluminum billet is sourced for the hydroelectric powered Te Wai smelter, 99.9% of unused aluminum is recycled, and they are the only window and door manufacturer in nz that uses a chromate-free powdercoating process. Over 70% of the trucks are euro 5 star rating – the second highest rating for exhaust emissions.

7 Dress Timber Reveal & Frame

Go to summary of material classes	Material	Qty	Embodied carbon (kg CO_2eq/qty)	Embodied energy (total) (MJ (NCV)/qty)	Embodied energy (non-renewable) (MJ (NCV)/qty)	Embodied energy (renewable) (MJ (NCV)/qty)	Notes (see below table)	Data quality
PR_20_76_88_13_A	Softwood (dressed, kiln dried), framing, interior (untreated), imported [from sustainable forest management practices]	kg	-1.27	24.34	2.92	21.42	ew9, ew11	B

8 Seals, Adhesives and Flashing tapes

Go to summary of material classes	Material	Qty	Embodied carbon (kg CO_2eq/qty)	Embodied energy (total) (MJ (NCV)/qty)	Embodied energy (non-renewable) (MJ (NCV)/qty)	Embodied energy (renewable) (MJ (NCV)/qty)	Notes (see below table)	Data quality
Product code	**Adhesive**							
PR_20_31_2_35_1	Adhesive, baseboard and multi-use, in a 290 ml cartridge, cord of 1 m x 5 mm diameter, imported (3M, Europe)	m	0.06	1.72	1.41	0.31	en1	A
PR_20_31_2_35_2	Adhesive, in a 600 ml sausage, required to bond 1 m^2 of two substrates, imported (Europe)	m^2	2.59	78.71	63.17	15.54	en2	A
PR_20_31_2_35_3	Adhesive, in 2 x 3.5 kg bags in a pail, required to bond 1 m^2 of two substrates, imported (Europe)	m^2	2.73	83.84	68.86	14.98	en2	A
PR_20_31_2_35_4	Adhesive, in 2 x 7 kg bags in a pail, required to bond 1 m^2 of two substrates, imported (Europe)	m^2	2.71	82.12	67.41	14.71	en2	A
PR_20_31_86_67_1	Reactive resin based on polyurethane or silane modified polymer (SMP), imported (Europe)	kg	8.10	177.48	171.00	6.48	en3	A
	Sealant							
PR_30_31_76_77_1	Sealant, silicone based, transparent or pigmented, imported (Europe)	kg	7.08	172.00	135.00	37.00	en4	A
	Tape							
PR_35_90_87_64_1_1	Adhesive air sealing tape, polyethylene based, double-sided, width 50 mm x length 25 m, imported (3M, Europe)	m^2	2.60	94.74	61.20	33.54	en5	A
PR_35_90_87_64_1_2	Adhesive air sealing tape, polyethylene based, double-sided, width 20 - 25 mm x length 25 m, imported (3M, Europe)	m^2	3.04	107.54	70.51	37.03	en5	A
PR_35_90_87_64_2_1	Adhesive conformable air sealing tape, polyethylene based, width 60 - 1210 mm x length 25 m, imported (3M, Europe)	m^2	8.06	215.38	168.44	46.94	en6	A
PR_35_90_87_64_3_1	Adhesive waterproof flashing tape, polyethylene based, width 50 - 200 mm x length 25 m, imported (3M, Europe)	m^2	1.33	57.96	34.32	23.64	en7	A

9 Wall protection membrane over rigid air barrier, wrapped into window opening.

No Data

9 Gluman timber lintel beam.

Go to summary of material classes	Material	Qty	Embodied carbon (kg CO_2eq/qty)	Embodied energy (total) (MJ (NCV)/qty)	Embodied energy (non-renewable) (MJ (NCV)/qty)	Embodied energy (renewable) (MJ (NCV)/qty)	Notes (see below table)	Data quality
PR_20_85_8_33_2_A	Engineered wood, glulam, Radiata pine softwood (H1.2 boron treated) [from sustainable forest management practices] (WPMA)	kg	-1.35	35.03	4.19	30.84	ew4	B

3 Sill support bar screw fixed at 300mm centres.

No Data

4 External Window Seat - 140mm H1.2 treated timber frame, fixed to wall with 2x M12 bolts, with 15mm separation gap at 300mm centres. 20mm H1.2 Timber sill liner and H1.2 timber packer under 20mm dressed timber screw fixed to top surface, flush with window track.

5 Internal Window Seat - 140mm H3.2 treated timber frame, fixed to over wall lining with 2x M12 bolts, with 15mm separation gap at 300mm centres. H3.2 Timber packers under 90mm H3.2 timber framing, with 20mm decking timber screw fixed to top surface, flush with window track.

Go to summary of material classes	Material	Qty	Embodied carbon (kg CO_2eq/qty)	Embodied energy (total) (MJ (NCV)/qty)	Embodied energy (non-renewable) (MJ (NCV)/qty)	Embodied energy (renewable) (MJ (NCV)/qty)	Notes (see below table)	Data quality
PR_20_76_88_4_2_A	Softwood (Radiata pine), surfaced, kiln-dried (H1.2 boron treated), e.g. framing [from sustainable forest management practices] (WPMA)	kg	-1.49	29.58	1.54	28.04	ew4	B
PR_20_76_88_4_5_A	Softwood (Radiata pine), surfaced, kiln-dried (H3.2 CCA treated), e.g. framing [from sustainable forest management practices] (WPMA)	kg	-1.46	29.96	1.91	28.06	ew4	B

Window Junction Matrix

Good
Acceptable
Not Acceptable

Table 16: Window Junction Matrix

Roof Junction Detail		Minimum Requirements	Yes/ No
Thermal Performance *R-Value*	*Wall*	R3.2 Total	
	Floor	N/A	
	Roof / Ceiling	N/A	
	Windows / Doors	R0.32	
Acoustic Performance *STC & IIC Rating 55*	*Separation / Air Gap*	Present	
	Mass / Noise Control Products	acoustic wall insulation	
	Controlled, Sealed	Present	
Carbon	*Embodied Energy*	Seals, Adhesives & Tapes: 38.84 CO_2eqKg/m^2 Balance: 6.83 CO_2eqKg/m^2	
	Reliability of Data	B Average	
Maintenance	*Frequency*	Cleaning every 3 months	
	Specialist Trade	No	
	Specialist Products	No	
Warranty	*Installation*	5 years	
	Product Life	25+ Years	
Supply	*Cost per qty*	- still waiting for quotes	
	Lead time	- still waiting for quotes	
	Location of Manufacturing or storage facility	Cambridge, Waikato	
Accessibility	*Cross-referenced NZS4121*	Seat at accessibble level of 475mm from finished floor level.	

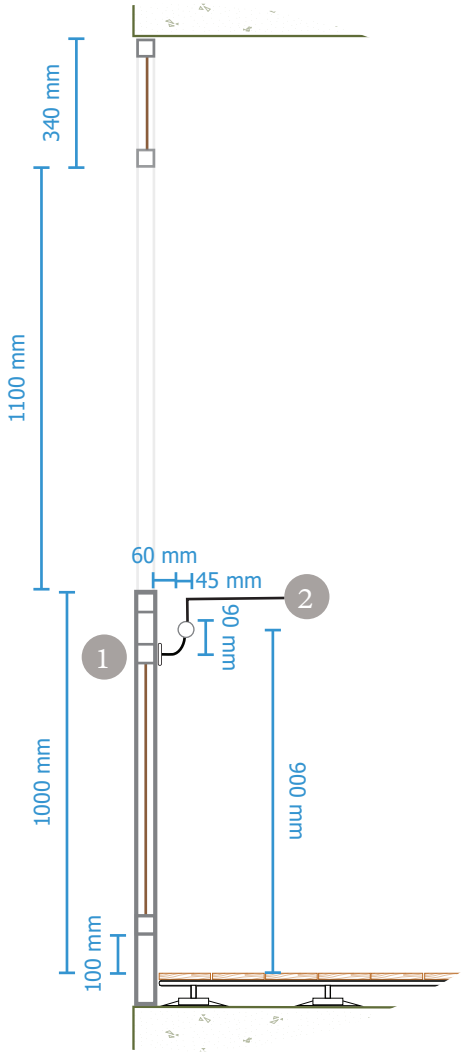
The window joinery selected for this project is Alltherm Thermal Heart - which is a thermally broken window assembly, limiting thermal bridging from the cold exterior of the building to the warm interior. This reduces condensation on the aluminum joinery, contributing to a dryer internal environment, with wide ranging health benefits. This window joinery is extremely energy efficient, and complies with the H1 energy efficiency building codes. It provides an R-value of 0.32, just below the standard of R0.33. I believe this is acceptable due to the provisions of thermal breaks, as noted on the window head detail. This supports the whare-ora - regenerative living buildings.

The embodied energy of these details are skewed, similar to the the inter-storey junction, as the total quantity of seals, adhesives and tapes used would equal less in ratio to the other building products. I believe it is acceptable for these products to have high embodied energy as their functions are crucial in building performance, providing weather-tightness, a durable line for drainage and moisture barriers.

The window seat detailed in the window sill junction is the result of our co-design process (see image ##). The whānau wanted a way to open the units out onto the shared breezeway balconies, that activated the space as usable and amenable. The window seats work perch while the window is closed, and a seat when they are open. Placing a table on either the interior space or the exterior space creates a portal between the semi-public breezeway and the private apartment interior. On a sunny day, residents can extend their private space while inviting chance encounter with their neighbours, building an informal community through chance encounter.

The window joinery has easy mainteance which aligns with standard practice, using no harsh chemicals, supporting wai-ora - balanced water systems.

Balcony Railing Detail



Balcony Railing

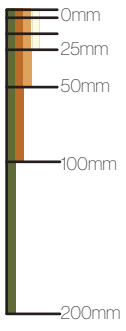
1 Aluminium Ballustrade - Mesh Screen Infill

Go to summary of material classes	Material	Qty	Embodied carbon (kg CO_2eq/qty)	Embodied energy (total) (MJ (NCV)/qty)	Embodied energy (non-renewable) (MJ (NCV)/qty)	Embodied energy (renewable) (MJ (NCV)/qty)	Notes (see below table)	Data quality
Product code	**Aluminium**							
PR_30_59_48_2_1	Aluminium, louvre blades 2.0 mm BMT, anodised (one side 0.02 mm) (primary manufacture using mainly renewables-generated electricity)	kg	10.35	154.86	99.29	55.57	wi1, wi3, wi4, wi7	F

No data for expanded mesh.

2 Native timber grab-rail

Go to summary of material classes	Material	Qty	Embodied carbon (kg CO_2eq/qty)	Embodied energy (total) (MJ (NCV)/qty)	Embodied energy (non-renewable) (MJ (NCV)/qty)	Embodied energy (renewable) (MJ (NCV)/qty)	Notes (see below table)	Data quality
PR_20_76_88_13_A	Softwood (dressed, kiln dried), framing, interior (untreated), imported [from sustainable forest management practices]	kg	-1.27	24.34	2.92	21.42	ew9, ew11	B



Balcony Railing Matrix

Good
Acceptable
Not Acceptable

Table 17: Balcony Railing Matrix

Roof Junction Detail		Minimum Requirements	Yes/ No
Thermal Performance *R-Value*	*Wall*	N/A	
	Floor	N/A	
	Roof / Ceiling	N/A	
	Windows / Doors	N/A	
Acoustic Performance *STC & IIC Rating 55*	*Separation / Air Gap*	N/A	
	Mass / Noise Control Products	N/A	
	Controlled, Sealed	N/A	
Carbon	*Embodied Energy*	9.07 CO_2eqKg/m^2	
	Reliability of Data	C- Average	
Maintenance	*Frequency*	Cleaning every 3 months	
	Specialist Trade	No	
	Specialist Products	No	
Warranty	*Installation*	5 years	
	Product Life	25+ Years	
Supply	*Cost per qty*	- still waiting for quotes	
	Lead time	- still waiting for quotes	
	Location of Manufacturing or storage facility	Cambridge, Waikato	
Accessibility	*Cross-referenced NZS4121*	Accesible width, and rail designed in accordance with NZS4121	

The breezeway balcony acts as semi-public common space, providing access to the apartment units, as well as chance connection between the residence. The window seats, mentioned earlier, turn this space into an extension of two dwellings on levels 1-3 as it is their main northern face.

The railing works as a safety barrier, as well as a light filter. In winter months, the afternoon sun will flood this space with solar gain, and the railing and mesh screens work as a permeable sunshade, allowing dappled light and air through, while keeping the sun at bay.

The railing was design in accordance with NZS4121, ensuring it is suitable for people of all abilities. By designing these requirements in, the solution provided is cohesive with the design intent, and embodies the ethos of whānau - everyone is welcome here.

The embodied energy in this detail is relatively high, however, the use of aluminium provides a strong, durable, long-wearing solution, with easy mainteance which aligns with standard practice, using no harsh chemicals, supporting wai-ora - balanced water systems.

Critical Reflection

The process of dissecting the Te Aranga Design Principles and the Mauri-Ora together proved useful in my research as it highlighted the parallels of the two tools, namely that they operate as an interconnected web of principles and values which work cohesively to uphold and promote themselves. One value or principle would not exist or function without the support and existence of the others.

The same can not be said about the building performance matrix, however it was a useful exercise to explore the vast networks that influence and shape these standards. I think this process showed me that architecture could be seen as a commercial product. It is many different things to many different people, and a commercial product is one of them.

The two matrices together tackle both ends of architecture on a spectrum. On one end, its an experiential art installation in which our lives take place; through the middle, it is the place we seek shelter and nourish our bodies; and on the very far side, it is a commercial product which is the end result of resource - design, development, manufacturing, testing, and delivery of an amalgamation of building products with a formal line from various suppliers, through distributors, installers and finally, purchasers/end users.

Applying the matrices to the building details introduced information of varying degrees of reliability, from many different sources. I was grateful for the BRANZ CO2NSTRUCT data sheets for the indepth information they provided, however it was difficult to find data of that quality elsewhere.

During the investigation of manufacturing and locality of the building products, I was suprised to learn how much manufacturing occurs in New Zealand, and that companies are partnering with Toitu to becoming certified as carbon-zero, to align their goals with the Governments 2050 Zero-Carbon initiative.

Companies, such as APL and Nuralite, that supply membrane and adhesive products have low-emission fleet vehicles, and use renewable energy sources in their manufacturing. I believe that this is due the nature of their building products, which are made of highly-enginnered, synthetic materials which have high embodied energy. As their products tip the scale with embodied energy, the company processes and procedures must over-compensate as a balance.

Conclusion

Response to Research Question

How can mauri-ora be protected, enriched and enhanced in medium-desnity residential architecture, while maintaining high building performance?

I believe that, like the woven nature of Te Ao Māori, the answer to this research question is woven into the design solutions presented in this thesis. Each resolution plays a role in protecting, enriching and enhancing mauri-ora, and they are inter-reliant on each other.

Outlined next are some examples of this:

Mauri-ora can be protected in many ways through using a combination of low-embodied-energy building products, that are durable, easily maintained, and regularly cleaned with water alone.

Mauri-ora can be enriched, for example, by exceeding the minimum acceptable standards of thermal performance. This will provide a highly energy-efficient space, which is resilient to extreme climate events and increases in energy costs. This will also make the building a healthier place to live, as there will be less moisture and condensation, which cause mold and mildrew to form causing illness.

Mauri-ora can be ehanced through appropriate balancing of acoustic performance where appropriate, for example, in the Whare Taonga; letting the sounds of the environment into the space connects the interior space to the wider natural environment, allowing a passive connection to the Atua.

Constraints & Limitations

This research was constrained in its scope, being limited to readily avaliable data, from sources of varying reliability. In some instances, the data used was generic, which I believe was acceptable alternative to no data.

As the climate crises continues to grow in its intensity, I believe that more private companies will follow suit, and produce sustainability statements, partner with a carbon-zero certifier, and have data avaaliable for all their products, though as this is a fairly new initiaive, there is limited (but growing) commercial pressure.

When using the Spiral Matrix, I was limited by the extend of the drawn detail. If I had produced a building systems plan as well, I believe I could have proven how the project achieved all aspects of the spiral matrix indepth. This would include a rainwater detention system, green corridors, solar panels and energy storage.

My Hopes Moving Forward

I believe I have merely scratched the surface on this topic.

In a perfect world, I would follow down the path of a doctorate with this research. In reality, I am working towards registration with the NZRAB.

The company I work for has begun the process of becoming Toitu certified, and has been engaging with frameworks, systems and suppliers who are passionate about the climate. I am part of a team that is engaging matauranga maori, and how it can be implemented company-wide, from professional development and whanaungatanga in the workplace, to engaging in meaningful co-design with mana whenua partners. I bring all that I have learnt during this thesis research into my professional practice and hope to have a meaninful impact on how the company operates in the changing world.

My hopes moving forward are that this research is continued in the context of all architectural interventions. As mauri is a part of everything that has ever existed, I believe it should be protected, enriched and enhanced in everything that comes to be in the future.

Through the careful consideration of the concepts outlined in this thesis, future architecture has the ability to balance (and amend) the wrongs of the past. I hope that this research is part of the movement towards this future.

I hope the Hawke whānau has their dream come true, and that this project provides everything we have collectively worked towards. I hope to be involved until the ribbon it cut and the whānau can move in. This project has been an honour to be a part of and it has been a privilege to share this journey with the Hawke whanau.

Image 52: View across upper Waitematā from 31 Kitemoana Street, Author September 2022

Glossary of Terms

Aroha	Love
Atua	The Māori Gods such as Tāwhirimātea (god of the wind) and Tangaroa (god of the sea)
Awa	Stream, River,
Hapū	Extended family group
He mihi aroha	Acknowledgements
Iwi	Tribe
Kainga Ora	The Ministry for Housing
Kaupapa	Purpose or topic
Korowai	Traditional feather cloak
Mana	Respect and Status
Mana Whenua	Iwi that has authority over an area
Māoritanga	Māori culture, traditions, way of life
Mātauranga Māori	Māori knowledge
Maunga	Mountain
Mauri	Life force
Mauri Ora	Binding life force energy
Moana	Ocean
Motu	Island - referring to New Zealand
Oranga Tamariki	The Ministry for Children
Pepeha	Personal introduction (traditional)
Rohe	District
Tāngata	People
Tāngata Whenua	"People of the Land"
Whānau	Family
Whare Hui	Meeting House
Whare Nui	Large House
Whare Taonga	House of sacred artifacts
Whenua	Land

References & Appendices

Bibliography

APL. (2022). About Altherm. Information Page on Altherm Window Manufacturers webpage describing the benefits of their product - specifically the thermal insulation qualities and associated R-Values. Retrieved September 8 from https://www.altherm.co.nz/about-us

Blair, N. (2002). Tamaki - Kaitiakitanga in the Concrete Jungle. In M. Kawharu (Ed.), Whenua : managing our resources (pp. 61-74). Reed.

Boynton, J. (2021, 21/12/2021). 10-year project to restore Ōkahu Bay with kūtai reaches end, already helping water quality [Online Article]. https://www.newshub.co.nz/home/new-zealand/2021/12/10-year-project-to-restore-okahu-bay-with-kutai-reaches-end-already-helping-water-quality.html

BRANZ. (2021). CO2NSTRUCT (Study 1; Version 2) [Categorization of embedded carbon in common building products and systems]. BRANZ (Building Research Association New Zealand) funded by building research levy. https://doi.org/https://www.branz.co.nz/shop/catalogue/co2mpare_1006/

CO_2NSTRUCT provides values for embodied greenhouse gas and energy for a range of construction materials and products. These are organised according to level 2 classes in the Coordinated Building Information (CBI) coding system.

Gaicon, A. (2021). Te Kore - The Void, The Great Nothingness. The Weaver Prophecy. Retrieved 11/05/2022 from

GIB. (2019, March). Let's colour the building sites purple. [Section of monthly newsletter]. https://www.gib.co.nz/assets/Uploads/GIB-News-March-2019-WEB.pdf

Information regarding the new GIB-Weatherline rigid air barrier system, and the opportunites it presents to designers and builders.

Kake, J. (2020). Spatial Justice--Decolonising Our Cities and Settlements [Article]. Counterfutures: Left Thought & Practice in Aotearoa(9), 123-135. https://ezproxy.aut.ac.nz/login?url=https://search.ebscohost.com/login.aspx?direct=true&site=eds-live&db=asx&AN=149625928

Kawharu, I. H. (1977). Māori land tenure : studies of a changing institution. Clarendon Press.

Kingi, P. (1992). A study of the Orakei Marae Centre : kia kotahi. Orakei Marae Centre for Education and Cultural Exchange.

Livermore, C. (2016, 01/01/). Dancing from Te Kore into Te Ao Marama. Te kaharoa the e-journal of indigenous Pacific issues. https://ezproxy.aut.ac.nz/login?url=https://search.ebscohost.com/login.aspx?direct=true&site=eds-live&db=edsinz&AN=edsinz.998920843702837

Macfarlane, L. (2021). Turangawaewae [Online Journal]. Bypass(4). https://bypassjournal.com/Turangawaewae

Marsden, M. (2003). The woven universe : selected writings of Rev. Māori Marsden. Estate of Rev. Māori Marsden.

MBIE - Ministry of Business, I. E. (February 2022). Whole-of-Life Embodied Carbon Assessment: Technical Methodology. Retrieved September 18, 2022, from https://www.building.govt.nz/getting-started/building-for-climate-change/emissions-reduction/embodied-carbon-assessment-technical-methodology/

Mead, S. M. (2001). Nga pepeha a nga tipuna = The sayings of the ancestors. Victoria University Press.

Opai, K. (2021). Tikanga : an introduction to te ao Māori. Upstart Press Book published by Upstart Press Ltd.

Ōrākei, N. W. (2022). STRUCTURE AND SUBSIDIARIES. Retrieved 15/09/2022 from https://ngatiwhatuaorakei.com/structure-and-subsidiarie/

Parata, W. R. P. (2022). Beauty in the Eye of the Indigenous: A Maori approach to beauty in contemporary aotearoa architecture [Speculative Design Thesis, Victoria University of Wellington]. Wellington, New Zealand.

Paul, J., & Kake, J. (2019, 01/01/). Integrating Kaupapa Maori and Te Aranga urban design principles into the development of policy to inform better design processes [Journal Article]. Historic Environment, 31(3), 64-74. https://doi.org/10.3316/informit.822682965152837

Pohatu, T. W. (2011). Mauri - Rethinking Human Wellbeing [Article]. MAI Review, 3, 1-12. https://search.ebscohost.com/login.aspx?direct=true&db=sih&AN=76131084&site=ehost-live&scope=site

Richard, S., & Trudie, C. (2017). Turangawaewae : Identity and Belonging in Aotearoa New Zealand [Book]. Massey University Press. https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=2963692&site=ehost-live&scope=site

Rittel, H. W. J., & Webber, M. M. (1969). Dilemmas in a General Theory of Planning. Policy Sciences, 4(2), 155-169.

Royal, M. (2019, July 2019). Ngāti Whātua Ōrākei Ki Tua

Sahlins, M. (1985). Hierarchy and humanity in Polynesia. Transformations of Polynesian culture, 207.

Salisbury, J. N. (2009). Peep through the ponga : Ngāti Whātua ō Ōrakei their story. J. N. Salisbury.

Selby, R., Moore, P., & Mulholland, M. (2010). Māori and the environment : kaitiaki. Huia.

Stag, R. (2022). Red Stag CLT Design Guide V1.3.

Standards New Zealand. (1995). G6 Airborne & Impact Sound (G6/AS1).

Standards New Zealand. (2001). Design for Acess & Mobility - Buildings and Associated Facilities (NZS4121).

Standards New Zealand. (2006). Methods of Determining the Total Thermal Resistance of Parts of Buildings (NZS4214).

Standards New Zealand. (2022). H1 Energy Efficiency (H1/AS2). (Acceptable Solutions H1/AS2, Issue.

Standards New Zealand. (varies). C Protection from Fire (C1-5/AS1).

Stebletsova, G. (2021, 04/03/). The Tears of Rangi: experiments across the worlds. POSTCOLONIAL STUDIES, 24(2), 304-307. https://doi.org/10.1080/13688790.2019.1596528

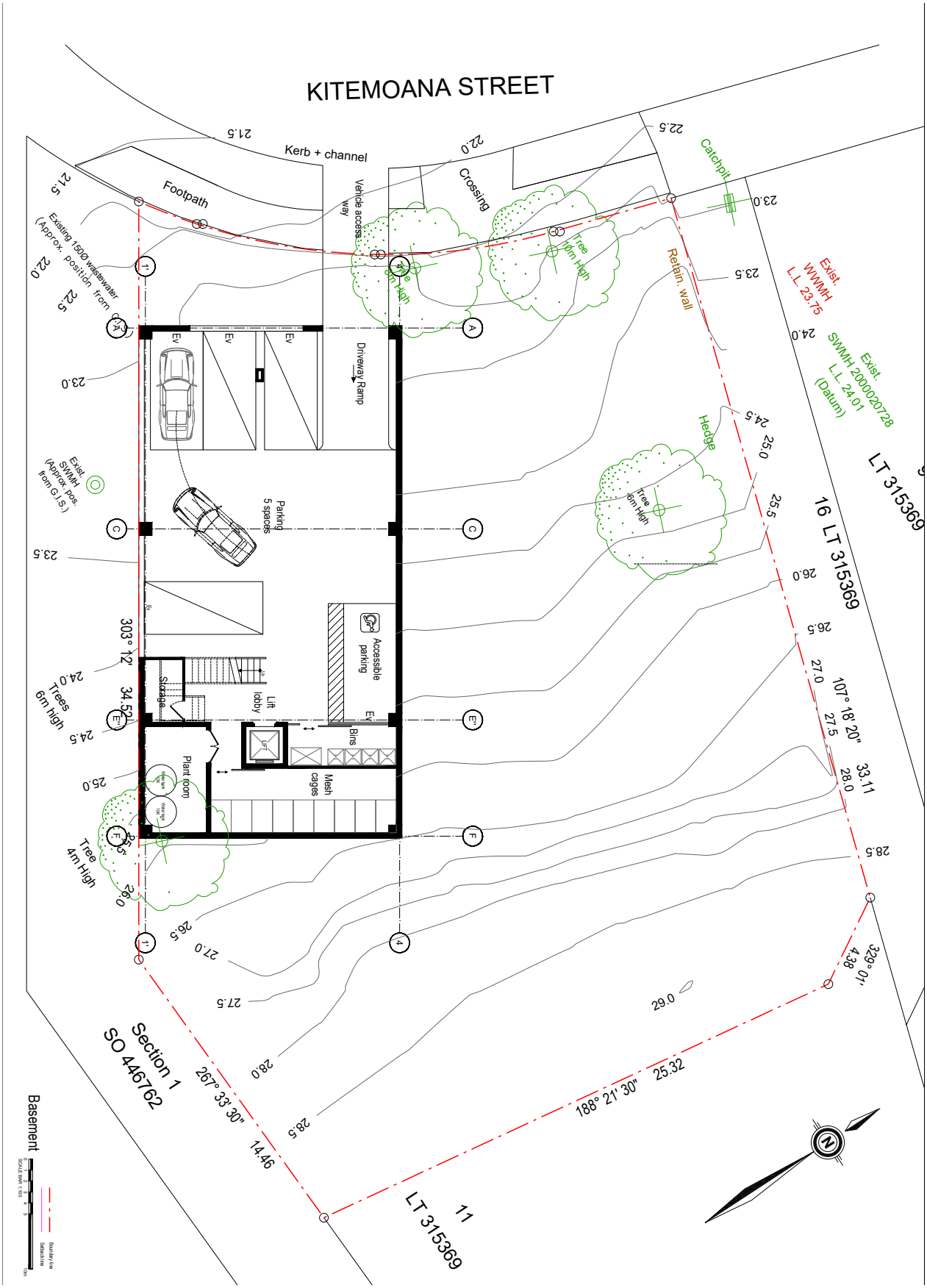
Te Matapihi. (2020). Papakāinga Housing Toolkits. Retrieved 31-03-2022 from https://www.tematapihi.org.nz/papakainga

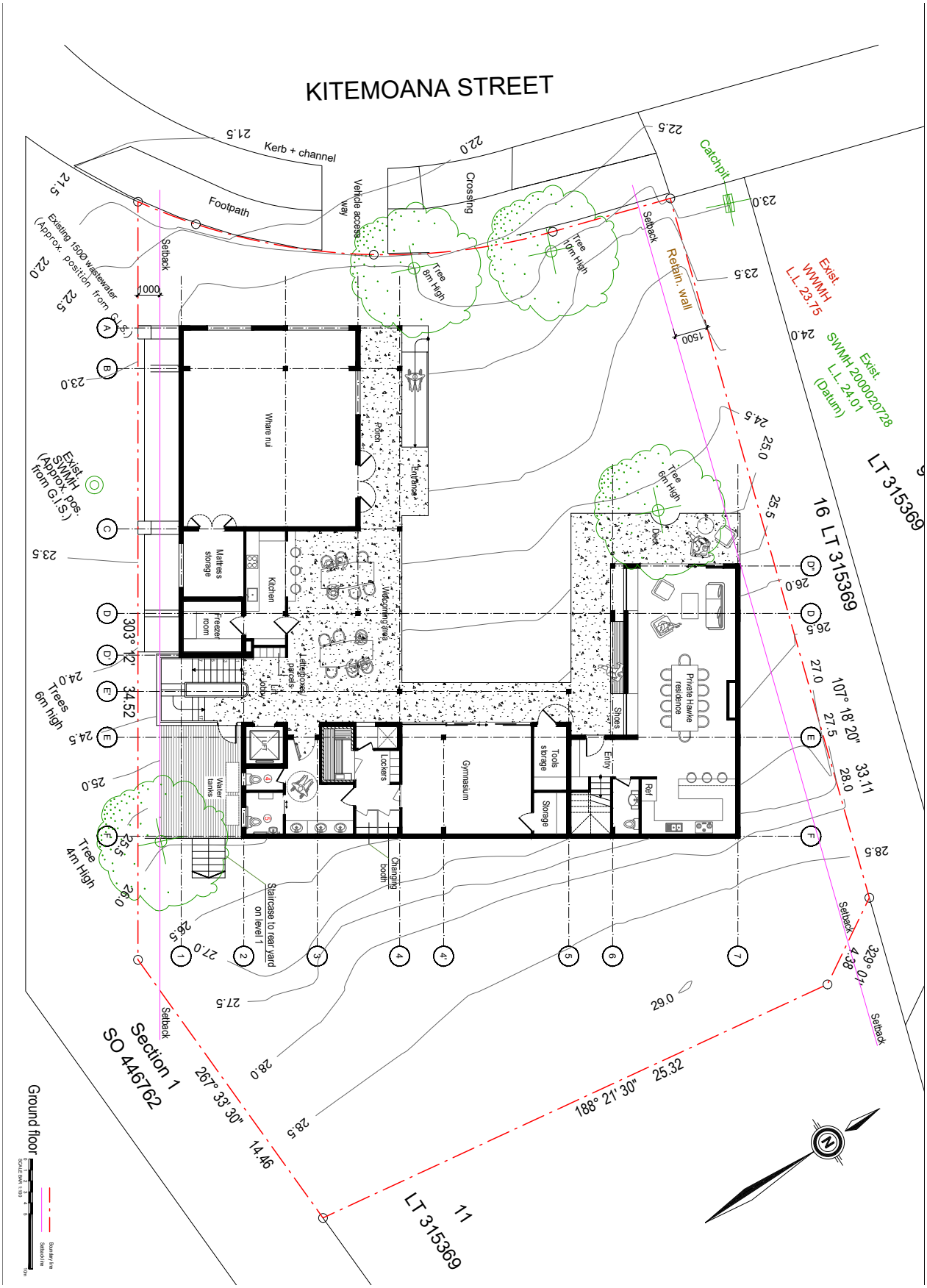
Waitangi Tribunal. (1987). Report of the Waitangi Tribunal on the Orakei claim (Wai-9).

White, T. (2022). Wānangatia Te Wahakura. The Vessel(3).

Yates, A. (2017). Mauri-Ora: Architecture, Indigeneity, and Immanence Ethics [Article]. Architectural Theory Review, 21(2), 261-275. https://doi.org/10.1080/13264826.2017.1288638

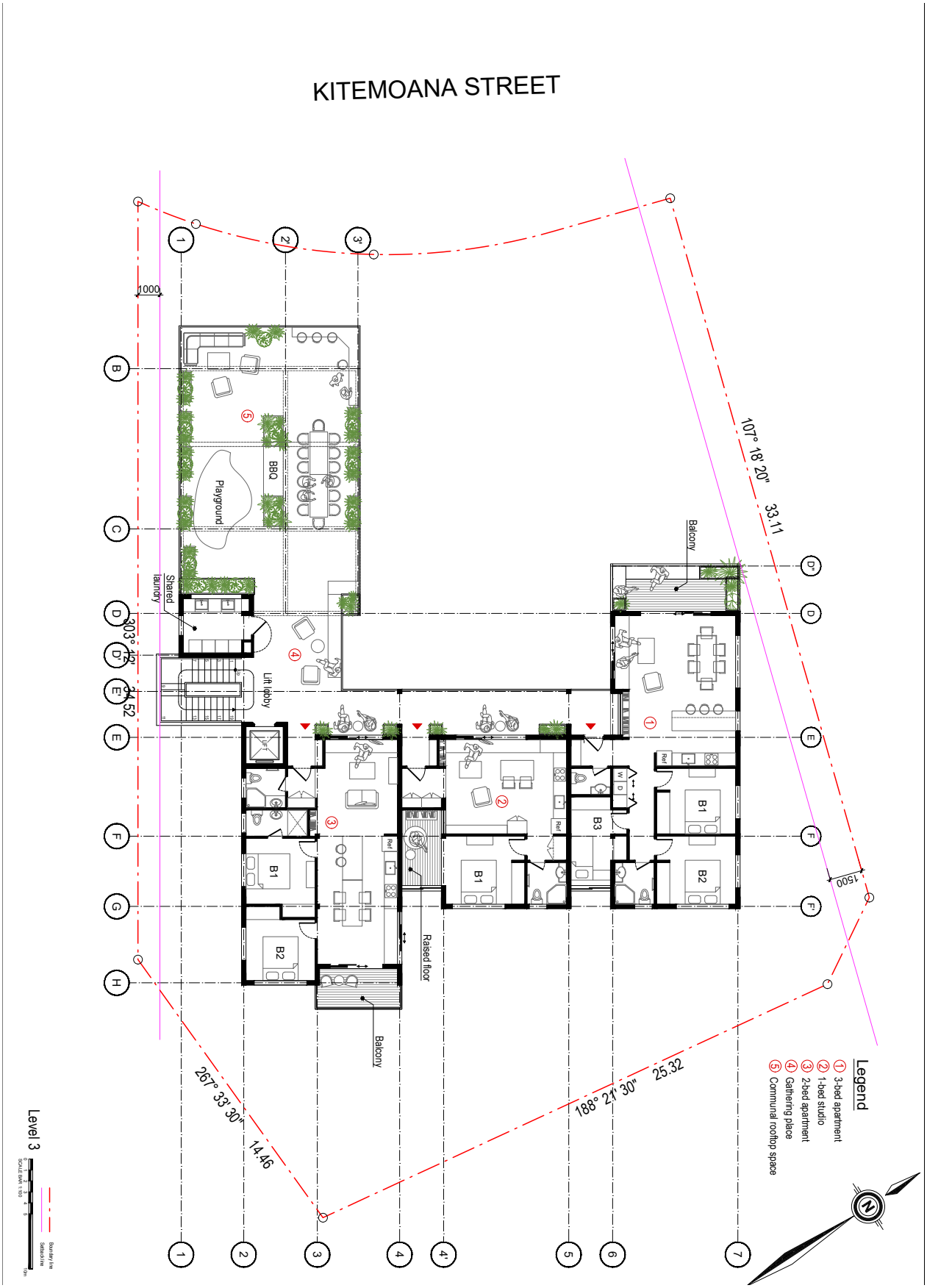
Appendices

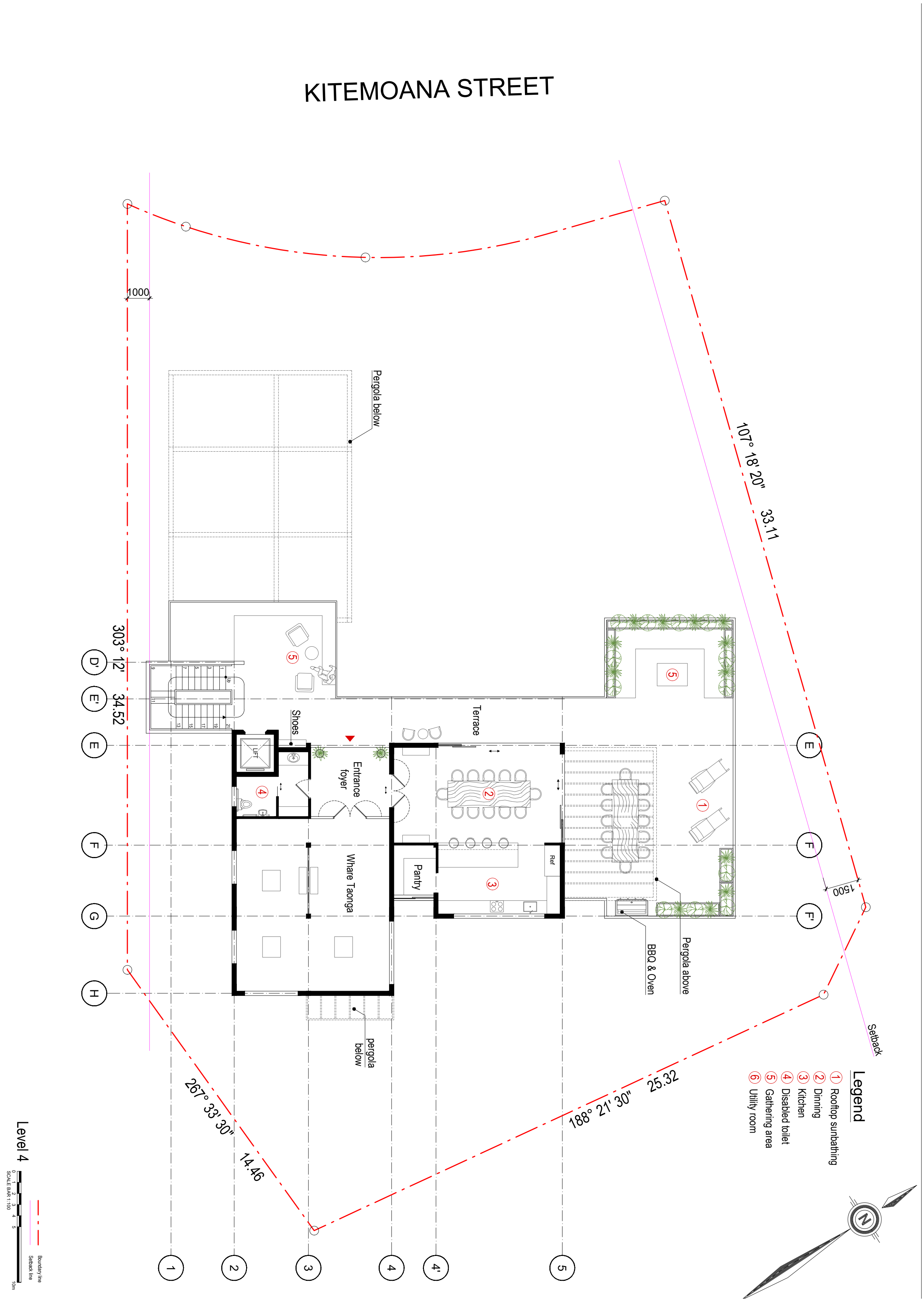

KITEMOANA STREET
Kerb + channel
Footpath
Vehicle access way
Crossing
Catchpit
Existing 150Ø wastewater (Approx. position from
Tree 8m High
Tree 10m High
Retain. wall
Exist. WWMH L.L. 23.75
Exist. SWMH 2000020728 L.L. 24.01 (Datum)
Hedge
Tree 10m High
Driveway Ramp
Ev
Parking 5 spaces
Exist. SWMH (Approx. pos. from G.I.S.)
Accessible parking
Lift lobby
Storage
Bins
Plant room
Mesh cages
Trees 6m high
Tree 4m High
16 LT 315369
LT 315369
11 LT 315369
Section 1 SO 446762
303° 12'
34.52
107° 18' 20"
33.11
267° 33' 30"
14.46
188° 21' 30"
25.32
329° 01'
4.38
Basement
N


KITEMOANA STREET
Kerb + channel
Footpath
Vehicle access way
Crossing
Catchpit
Setback
Retain. wall
Existing 1500ø wastewater (Approx. position from G.I.S.)
Tree 6m High
Tree 10m High
Exist. WWMH L.L. 23.75
Exist. SWMH 2000020728 L.L. 24.01 (Datum)
Exist. SWMH (Approx. pos. from G.I.S.)
LT 315369
16 LT 315369
11 LT 315369
Section 1 SO 446762
Whare nui
Porch
Entrance
Mattress storage
Kitchen
Freezer room
Welcoming area
Deck
Private Hawke residence
Lockers
Gymnasium
Tools storage
Storage
Entry
Ref
Shoes
Lift
Lobby
Ladies changing rooms
Water tanks
Changing booth
Staircase to rear yard on level 1
Trees 6m high
Tree 4m High
303° 12'
107° 18' 20"
267° 33' 30"
188° 21' 30"
329° 0'
Ground floor


KITEMOANA STREET
Kerb + channel
Footpath
Setback
Vehicle access way
Crossing
Catchpit
Existing 150Ø wastewater (Approx. position from G.I.S.)
Tree 6m High
Tree 10m High
Retain. wall
Exist. WWMH L.L. 23.75
Exist. SWMH 2000020728 L.L. 24.01 (Datum)
Hedge
Tree 6m High
LT 315369
16 LT 315369
Balcony
Entry
Caregiver
Lift lobby
Passage
Water tanks
Utilities
Entry
Deck
Vege Garden
Garden Shed
Section 1 SO 446762
11
LT 315369
Exist. SWMH (Approx pos from G.I.S.)
Trees 6m high
Tree 4m High
303° 12'
34.52
107° 18' 20"
33.11
267° 33' 30"
14.46
188° 21' 30"
25.32
329° 0'
4.38
Legend
① Hawke whanau privated residence
② 1-bed studio
③ Library & Co-working space
④ Gathering place
⑤ O.T boys dormitory
⑥ Communal yard
Level 1


KITEMOANA STREET
Setback
Balcony
1000
107° 18' 20"
33.11
303° 12'
34.52
267° 33' 30"
14.46
188° 21' 30"
25.32
329° 01'
4.38
1500
Store
Entry
Laundry
Lift lobby
Raised floor
Ref
B1
B2
B3
Level 2
Legend
1 3-bed apartment
2 1-bed studio
3 2-bed apartment
4 Gathering place
5 Moms & Babies apartment
Boundary line
Setback line
SCALE BAR 1:100


KITEMOANA STREET
1000
107° 18' 20"
33.11
1500
303° 25' 30"
34.52
267° 33' 30"
14.46
188° 21' 30"
25.32
Playground
BBQ
Shared laundry
Lift lobby
Balcony
Raised floor
B1
B2
B3
Ref
W
D
Legend
1 3-bed apartment
2 1-bed studio
3 2-bed apartment
4 Gathering place
5 Communal rooftop space
Level 3
SCALE BAR 1:500
Boundary line
Setback line
N


KITEMOANA STREET
1000
Pergola below
107° 18' 20"
33.11
303° 12'
34.52
Terrace
Shoes
LIFT
Entrance foyer
Whare Taonga
Pantry
Ref
BBQ & Oven
Pergola above
pergola below
1500
Setback
267° 33' 30"
14.46
188° 21' 30"
25.32
Legend
① Rooftop sunbathing
② Dining
③ Kitchen
④ Disabled toilet
⑤ Gathering area
⑥ Utility room
Level 4
SCALE BAR 1:100
Boundary line
Setback line
N