Exploring Cultural Gateways
Designing a new international airport terminal that represents New Zealand's cultural identity

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Exploring Cultural Gateways

Abstract:

As a gateway to New Zealand, Auckland airport is one of the first impressions an international visitor will have, and the last impression they will have when leaving. This impression should convey our unique culture and do so through inspirational and innovative architectural forms.

The purpose of my project is to produce an architectural solution to the following questions:

- **How does one represent New Zealand's cultural identity through architectural form?**

- **How can these forms be applied to architecture in the form of an airport terminal?**

The reason for this choice of topic arose during a visit to the existing Auckland International Airport (AIA) late last year to collect family members on their first trip to New Zealand. I was left feeling disappointed with what was to be their first impression of our country. I consider the architecture of AIA to be an incoherent assortment of architectural styles with superficial allusions to New Zealand culture. Like most international airport terminals, AIA is undergoing a continual refurbishment process to try and stay in vogue. Over the years, this has resulted in a shed like structure with numerous disconnected architectural styles, and an over-reliance upon two dimensional cultural representations that conceal unimaginative architectural structure, and lack a sense of place.

The aim of this project is to design a new airport terminal in the Auckland area, with a greater sense of place than the current Auckland airport. My goal is to design an airport that gives a sense of place and provides an inspiring and welcoming first impression to visitors.
Acknowledgements:

To my wonderfully supportive wife, Bronwyn, and my two young children Keagan and Keira. I couldn’t do this without you. Thank you for being so patient and understanding, and for making me push myself to be more than I thought I could be.

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Introduction

“Aside from functioning as a strategic instrument for modernization process and economic development, international airports represent a material embodiment for the cultural identity of their host nations”\(^1\)

This thesis is composed of two integrated parts: The investigation of cultural representation in architectural forms, and the planning and design of an airport terminal. The planning component will be addressed later in this document. The investigation and analysis of cultural representation within architecture begins with the seemingly simple yet deceptively complex questions: What is New Zealand culture? What is culture?

Culture is customarily described as being a set of shared values, attitudes and beliefs that define a group of people, where behaviour depends on the capacity for symbolic processes. However a culturally linked group of people can come in countless sizes, and have overlapping sub cultures and differing opinions and perceptions. It is my intention to represent particular meaningful components of New Zealand’s vast multifaceted culture without being too contradictory and without devaluing cultural elements.

Geographically isolated, New Zealand is an ‘end of the line’ type place, where many journeys come to their conclusion. It is one of the least populated countries in the world, and the youngest country to be colonised (in terms of original inhabitants as well as other nationalities that came later). It is a multicultural society with significant Maori, Pacific island, European and Asian influences, making it a diverse and vibrant place with a wide range of architectural styles. Yet all of the parts that form this multicultural mosaic are not equal, and should not be measured in terms of population or influence. New Zealand has an identity that belongs here, that of the earliest arrivals, that of the Maori culture.

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Maori Cultural Influence in New Zealand Architecture

Maori cultural influence in contemporary architecture is the starting point of this thesis. As Hirini Moko Mead once wrote "all other traditions have a homeland elsewhere. In this sense, Maori art has Tangata Whenua (people of the land) status." This effectively makes Maori culture the base foundation of the cultural identity of New Zealand.

"It is hardly surprising that Maori art should attract the attention of a New Zealand nationalist discourse. That discourse itself wished to assert New Zealand’s isolation and independence, and from the proud solitariness of its community, to forge a distinct and unique style for the nation."3

The existing Auckland International Airport (AIA) acknowledges the importance of cultural representation, as stated on their website: the AIA has 'the responsibility of providing visitors with their first and last experience of our country... wanting to ensure that those first and last experiences are a strong reflection of our unique New Zealand culture and heritage. Much of the new international arrivals area features iconic and cultural New Zealand imagery reflecting the journey across the ocean'.4 This position taken by AIA is almost indistinguishable from the objective of my proposal. The one difference is that my goal is to implement the 'iconic and cultural New Zealand imagery' in a built form that is less superficial and more meaningful, through architecture rather than mis-placed ornamentation.

"National identities are, like everything historical, constructed and reconstructed; and it is our responsibility to decode them in order to discover the relationships they create and sustain".5

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2 Hirini Moko Mead, Te Toi Whakairo – The art of Maori Carving, Reed Publishing, 1986, p4
3 Francis Pound, The Space Between, Pakeha use of Maori Motifs in Modernist New Zealand Art, Workshop Press, 1994, p46

Auckland Airport arrivals gateway

Fig 4
Symbolism is a significant part of Maori architecture, where narratives are interwoven with built form to create spaces full of meaning. An example of this is the traditional Wharenui, or meeting house, that represents a tribal ancestry as a living entity, through its design, construction and decoration. The ornamentation of the Wharenui through carving, weaving and painting, is important to the building's significance; yet ornamentation within modern structures like airport terminals is not.

The reaction against misplaced ornamentation within international airport terminals is discussed in the essay: ‘The Passenger Terminal at Suvarnabhumi International Airport and Thai Identity in the Midst of Globalization Era’ by Koompong Noobanjong. The terminal in Bangkok, Thailand, is discussed in terms of its sense of place, and capacity to represent Thai identity. Although in spite of being an aesthetically pleasing and functional airport terminal, Suvarnabhumi International has been criticized for its lack of reference to the local and cultural identity.

“several so-called “visual amenities,” featuring traditional Thai artifacts and objects are devised and placed throughout the terminal. Yet, these visual amenities, such as Thai gazeboes (salas) in courtyards, mythical statues, wall murals, etched glass, etc., serve as decorative elements rather than holding any intrinsic value to the design. They, in fact, perform as “add-on” elements, that could easily be removed or changed. With little effort to harmonize the Thai decorative elements and the overall ultra modern appearance, the atmosphere of the passenger terminal has resulted in a simulacrum that is disharmonious and syncretic. Or, to put it more succinctly, the edifice presents “kitsch” with no “soul.” The “visual amenities” function merely as a device to appease public criticism.”

This critique of an otherwise successful international airport terminal serves as an example of what I hope to avoid in my design of a new terminal to act as a gateway to New Zealand.

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6 K. Noobanjong, The Passenger Terminal at Suvarnabhumi International Airport… p25
The Use of Metaphor within New Zealand Architecture

The significant use of metaphor within Maori architecture is a theme central to my investigation. It is not ornamentation that is of interest in this thesis, it is the meaning and ideas behind the ornamentation that are being investigated. The use of metaphor and symbolism is vitally important in Maori architecture, where the many elements of traditional Maori architecture are used to present a chronicle of the tribe’s history, for example:

“\textit{When you enter a wharenui, you enter through the embrace of the founding ancestor, the tupuna, the carved koruru figure at the apex of the roof is the face and the large bargeboards on each side are the outstretched arms. The interior walls are often adorned with ancestral figures that are carved, woven or painted. These connect to the main wharenui ancestors through the heke (rafters) and tahuhu (ridge beam) The tahuhu is the most sacred part of the wharenui and represents the backbone of the ancestor. Residing within it is the mauri, or the life spirit that binds the people and the building together.}\”\textsuperscript{7}

Wharenui have also been referred to as the built medium where the sky father Ranginui, and earth mother Papatuanuku touch one another again; after their separation at the hands of their children which stand between them as the uprights. The tears of Ranginui fall on to Papatuanuku as the rain falls from the roof on to the ground below. It is this personification of structure through the use of metaphor that permeates through all elements of Maori architecture. This is important to understand when endeavouring to design a building to represent New Zealand culture, which will be the vessel for so many emotion filled experiences.

\textsuperscript{7} Branz Fire Protections of New Zealand Traditional Maori Buildings, No SR128 (2004) p5
The use of metaphor in contemporary New Zealand architecture is a practice employed in the design of many of the local buildings investigated in this thesis. Te Papa museum in Wellington is one example. Designed and built in the early 1990’s by JASMAX architects and Fletcher construction, the briefing proposal called for “a National Museum that powerfully expresses the total culture of New Zealand. And provides ‘a means for each (culture) to contribute effectively to a statement of the nation’s identity.” Principal architect Pete Bossley proposed the use of a fault-line metaphor, where the central axis both gave the building a sense of orientation and represented the significant fault line that Wellington resides upon. In addition he felt it suggested the “ambiguous separation and linkage between the Tangata Whenua (the people of the land) and the Tangata Tiriti (post treaty settlers of New Zealand)” In the paper by Michael Linzey on this subject, it was mentioned that:

“The fault-line at Te Papa too can be said to be aligned with the mythical pathway to Hawaiki that is ubiquitous and readily understood in the culture of the tangata whenua. The same architectural gesture also points to the geographical openness of Wellington’s harbour, which in turn was a traditional life-line in the colonial connection with Europe (for the tangata tiriti)”

Whether the use of the fault-line as a metaphor was successful or not depends on your viewpoint. The success of metaphor as an architectural tool is dependent on its understanding, as interpretations and viewpoints differ depending on the interpreter. Yet the use of metaphor as an architectural device assists the conceptualization process, by creating an analogy between literal and figurative entities, in order to create a narrative that is aligning with the requirements of the brief.

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8 Michael Linzey, A fault-line at Te Papa: the use of metaphor, Fabrications, June 2007 p2
10 Michael Linzey, A fault-line at Te Papa...p2
Another example of contemporary New Zealand architecture which uses metaphor is the recently completed (2010) Waitomo Caves visitors centre, designed by Architecture Workshop. The local Maori people’s traditional use of eel traps (hinaki) in catching eels in the cave streams nearby inspired the design of the striking roof that shelters the visitors centre below, using an ETFE skin (Ethylene Tetrafluoroethylene) in two layers, inflated over a latticework of laminated high tension timber rafters that create the impression of a partially submerged eel trap.

“We wanted to emphasize a connection with the Waitomo stream and the flows of water running through the caves. The canopy grid shell is aligned with the curve of the stream. It reinforces the generating idea for this project of a simple lightweight ‘sky shell’ to counterpoint the subterranean cave space that is dissolved and moulded out of the ground. The canopy in combination with the caves, create a positive and a negative (space),”

Particular consideration was given to creating a sense of place in this design; the use of local materials (other than the ETFE roof) was deemed an important part of the overall design quality. The retaining wall made of tree ferns and the extensive use of timber sourced locally, was as important as the building’s form in presenting a sense of appropriateness of the building’s location.

New Zealand architect, Rewi Thompson, frequently makes connections between land and culture through the use of metaphor, and he also used the hinaki (eel trap) as a metaphor in one of his designs for the Te Wero bridge in Auckland Viaduct Harbour. Thompson’s scheme used the metaphor to create a “dynamic structural frame through which the roadway passed”. Thompson described his buildings as having elements within them that serve as analogies to topography, mythology, history and personification they communicate “cultural values and … stories that provide the context for the activities the buildings are designed to house.”

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11 www.archwksp.co.nz (accessed July 2010)
13 Ibid
In his paper ‘Maori Architecture: Transforming western notions of architecture’ Bill McKay investigates the proposition that “an understanding of Maori architecture can lead to a questioning of western architectural values”14 he hypothesizes that “We can discern underlying architectural conceptions related to culture, which may suggest possibilities for the development of an understanding of architectural form more appropriate to a South Pacific milieu than a European background.”15

The Unitec Wharenu (Ngakau Mahaki, part of the Marae complex Te Noho Kotahitanga) is a contemporary manifestation of traditional Maori principles, combined with progressive ideals that serve as one example of a new possibility of New Zealand architectural form. I visited and consulted with one of the building’s creators, Hohepa Renata, who explained the many facets of the design. Departing from the typical modern technique of Wharenu construction where the building is constructed and the carvings applied; the design of theNgakau Mahaki embraces the traditional methods where “the structure is the carvings; if you took the carving away the house would fall down.”16 The carvings are found throughout the building, and tell many stories, with the rear wall representing those who have gone before, and the front wall presenting an artistic representation of present day Auckland similar to that of a modern suburban road map of the surrounding area. Master carver and designer, Lyonel Grant, has combined traditional techniques with modern media to present an inspiring meeting house that emboldens those within it with enthusiasm for the future unknown, whilst educating about the past. He creates: “a place of physical and spiritual comfort; a place for sharing of all cultures.”17

Wharenu designs in general, throughout New Zealand, present a form of building with significant narrative, and strong sense of place, that have the potential to influence and transform contemporary ideas of architecture, thereby opening up “the possibilities of new architectural form and enrich(ing) our understanding of how one can live in the world of the South Pacific.”18

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15 Ibid
17 Ibid.
18 Bill McKay, “Maori Architecture: Transforming Western Notions… p1
"In an issue of ‘Art New Zealand’ James Cowan, in his essay ‘The art craftsmanship of the Maori’ remarked: “The wood carving and painting, and the weaving, plaiting and reed work designs evolved by the Maori from his study of nature for a thousand years in a very wonderful and beautiful environment certainly constitutes a fascinating study that cannot but yield reward. It is part of our national background, this art native to the soil; it is bound to have an increasingly important place in the scheme of the New Zealander’s life.”

The recently opened Wellington Whare Waka building serves as an example of another contemporary New Zealand building with significant cultural representation built into its architectural form. Designed by Athfield Architects, the building was created to serve as a home for the Wellington City Waka, Te Raukura, as well as a multi use space for exhibitions, performances and functions. The roof design is the primary feature, and is striking in its unique triangular grid arrangement. The roof and façade was based on the form of a Maori cloak (korowai), “The korowai design is based on the traditional sails of the waka fleet and louvered metal panels symbolise the cloak’s arms draping over the sides of the building. The Wharewaka’s maihi or bargeboards, where the external walls meet the roof, also reflect the design of a waka.” Yet the roof form has been likened to origami in the manner of its large folded panels. I would have thought a cloak to be less ridged in appearance, so can understand some of the reasons behind the controversial reception this new building has had. The ends of the building do have a distinct meeting house shape to them, and the detail in the surrounding landscape design has many traditional Maori shapes built into it. Although contentious, there is little doubt that it is a significant addition to the collective vernacular that is New Zealand cultural architecture.

19 James Cowan, “The Art Craftsmanship of the Maori,” Art New Zealand, p70
The foundation of my investigation into New Zealand cultural representation in architectural forms is Maori architecture. Through exploration of this subject an underlying theme occurs that can be drawn from in order to represent a broader section of New Zealand culture. Much of the narrative and metaphor of Maori architecture and sculptural form stems from the "natural incarnation of our environment… the essence distilled from our surroundings, and are therefore part of every New Zealander."  

A close relationship to the natural environment is something most New Zealanders share. The Tangata whenua, being the people of the land, hold particular regard for the importance and preservation of the natural resources of this land. Kaitiaki is the Maori term for the concept of guardianship over Papatuanuku (earth) and Ranginui (Sky). “The traditional concept of Kaitiaki and Kaitiakitanga is part of a complex social, cultural, economic and spiritual system that is established through the long association Maori have with lands and waters. The very basic meaning of ‘tiaki’ is to guard. It also means to preserve, to keep, conserve, nurture, protect and watch over.”

This relationship to the environment is not unique to New Zealanders (as many people from other nations would acknowledge similar affinity with the environment). Yet it is something that is common to most New Zealanders regardless of their ethnic background. The general perception of New Zealand overseas is that of an environmentally conscious country with a diverse natural landscape, with volcanic activity, mountain ranges, weaving coastlines, and untouched forest. This may be idealistic and open to debate, but it is our natural environment that most visitors come to New Zealand to experience.

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21 James Cowan, “The Art Craftsmanship of the Maori,” Art New Zealand, p71
The Maori legend of the sky father Ranginui, and earth mother Papatuanuku, and their separation at the hands of their children is one of the most memorable of the Maori legends taught in New Zealand schools. It is the tale of the many attempts by the gods’ children to let light into their world. The god of the forest, Tane, forces his parents (Ranginui & Papatuanuku) apart by lying on his back and pushing with his strong legs. (refer to appendix for more information) It is this legend of the separation of the earth and sky that inspired some of my early sketches of the proposed airport terminal.

The architect Rewi Thompson commented that his design philosophy questions the issue of “cultural values and what is an appropriate architectural response to the site. In this sense the site or context of the work is the land, but also the culture because the land is cultural. The land or site can be seen to be an emblem of these divergent expectations.”23 This, I believe, is an accurate reflection of the importance of site selection and analysis, particularly when designing for cultural purposes; which brings me to the discussion of the site selected for this project.

Site Location: Whenuapai, Auckland, New Zealand

Auckland is situated on the isthmus between the Waitemata and Manukau harbours in the upper half of the North Island of New Zealand. It is the largest population centre in the country with over 1.3 million inhabitants.

Auckland is a flanked by its harbours and the sea, a constrained geographic position that is reflected by its limited transport linkages. There are very few public transport solutions per km, and a heavy reliance on cars to get around the vast low density suburban sprawl that comes part and parcel with the quarter acre dream of living in New Zealand.
Access to the current Auckland International Airport in Mangere is by road only, with no rail or ferry link. There have been numerous calls for a rail connection to the airport, which was a contentious issue in the recent mayoral election. A new airport terminal should incorporate a viable public transport solution that does not put more stress on an already congested road network.

The chosen site for my architectural thesis proposal is the existing RNZAF Airbase at Whenuapai, located on the western edges of the upper Waitemata harbour between two distinct regions of Auckland’s population, North Shore, and Waitakere. This location has the capacity to serve almost half a million people within a 16km radius of the site. It is an existing airfield facility comprised of three concrete runways, including a main runway 2,031m long and 45m wide. Existing facilities include hangers, maintenance buildings, navigation aids and air traffic control buildings.

Whenuapai can handle aircraft up to Boeing 767 size, subject to certain weight restrictions. The airport is capable of accommodating 200,000 aircraft movements per annum. Currently, aircraft movements total about 20,000 movements per annum.

The airfield has been in use for the past 70 years, and the RNZAF is reducing the size of its operations at Whenuapai with a view to vacating the airbase some time in the next four years, and relocating to Ohakea airfield south of Auckland.

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24 Auckland Council Website: Auckland’s North Shore has a population of 200,000 is within a 16km radius, and Waitakere has over 180,000
The (former) Waitakere City Council has expressed concerns that the closure of the airbase “not preclude it functioning as a commercial airport” and that it should “support and promote the development potential of commercial activities at Whenuapai in the interests of wider economic development in a manner consistent with the growth objectives of the City.”

The existing Whenuapai airport facilities are the second most substantial of all the existing airport facilities throughout the Auckland region, after Auckland International Airport. They have significant established resources, as well as being located in close proximity to SH18, and the upper Waitemata harbour, which could help serve as a public transportation alternative, in the form of a ferry link, to downtown Auckland city.

“Approval for a future airport operation will therefore depend on comprehensive investigation, consideration, resource consent application procedure and approval. Any approval would be subject to operating conditions designed to ensure that there would be no more than minor adverse effects on the environment.”

Whatever form the investigation takes towards a new architectural intervention; it will need to be as environmentally friendly as possible, preserving the natural character of the coastline, with particular attention paid towards the effects on the marine environment in terms of stormwater runoff as well as erosion caused by ferry traffic.

The undeveloped eastern side of the Whenuapai airbase will serve as the location for the new airport terminal proposal. The primary reason for this is its close relationship to the coast. This has significant advantages and disadvantages; in the sense that:

- New Zealanders have a strong relationship to the coast and the natural environment, and what better way to be welcomed into New Zealand than being immersed into that environment through a maritime journey?
- On the other hand, positioning an airport terminal so close to a sensitive coastal environment, great care must be taken that the design is not detrimental to the environment which it is embracing.

The Auckland regional district policy has highlighted key concerns of the local Tangata Whenua in regards to any future development, which are:

- The preservation of existing features and qualities, which are significant in terms of natural or cultural heritage.
- The cumulative effects on the region’s transport network, and the effects which intensification has on the safe and efficient functioning of local roads.
- The effects on the coastal environment, and the need to preserve the natural character of the coastal environment.
- The effects of intensification on the quality of natural water bodies, with particular reference to storm water and waste water treatment and disposal.
- Recognize and provide for the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, wāhi tapu (sacred locations) and other taonga (prized possessions).  

Looking westwards towards Whenuapai Airbase

Looking westwards across Waiaroha Inlet towards the site
Site Investigation

As part of my early investigation into the suitability of my chosen site, I overlayed the outlines of existing terminals around New Zealand on to the site at the same scale, in order to get a feel for the scale of the development that was required. I took these diagrams along to the first site visit to walk around and visually map out the possibilities in my head.

The site had a number of immovable elements that had to be worked around. The primary constraints were the runway and the parallel road heading to the upper Whenuapai community and Herald Island. The space between these immovable elements was essentially linear, yet there was considerable space on the other side of the road in which to develop. Early conceptual design explored the possibility of building the terminal over the road, yet the idea of bridging the road with the building was eventually abandoned because of the complicating security issues of having traffic below an airport terminal.
Some site photos

Clockwise from top left:
- View from road towards upper harbour bridge
- View southwards down road
- View across estuary towards site
- View westward towards site from greenfield site
- Site with contours

Fig 26
Conceptual Form Considerations from Site Possibilities

“Auckland has a unique and distinctive natural and cultural heritage which is central to the identity of communities, groups and individuals in the region. It is also important for the economic, social and cultural well-being of the region. In addition, the intrinsic values of Auckland’s ecosystems and natural areas and their biodiversity are important and in need of protection.”

The consideration of the site constraints allowed preliminary ideas to be moulded into rough arrangements of the terminal building’s form; these expeditious conceptual arrangements helped define the hierarchy of requirements; setting out such things as aircraft docking arrangements, car park positions, and a link to the sea in the form of a ferry wharf. In particular, the positioning of the arrivals hall was considered fundamental that arriving passengers’ first impressions were enhanced to create an inspirational experience, was considered fundamental.

The general requirements of airport terminal planning had been investigated at this point and it was found that arrivals halls were customarily positioned centrally within terminals. So much of the early conceptual arrangements looked to position the arrivals hall centrally whilst still allowing for views of the harbour, in order to create an arrivals experience that was unlike other typical airport arrivals: where the first impression once leaving the airport is that of a sprawling mass of road networks and car parks. Therefore the positioning of the car parks was a crucial element in the building’s arrangement, and had to be functional as well as being offset from the arrivals hall.

As the primary focus of this project was in the design of the airport terminal, there were some elements that had direct correlation with the design of the terminal that had to be investigated and outlined. The positioning of access roads, car parks and transport links is of crucial importance to the functionality of any airport terminal, and the positioning of these services on the site at an early stage was necessary in defining the position of the building. The early site analysis focused on the transport network around the building, the aircraft docking positions, possible links to the sea for the access of a ferry wharf, as well as the framing of the view being a significant characteristic worth enhancing.

The orientation of the building generated by site constraints established the architectural parameters early on, leading to two terminal shape possibilities, the linear, and the semi-circle.

One of the functional disadvantages of the current Auckland International Airport is its separation from the domestic terminal. International passengers must proceed through immigration and customs, before (in the case of AIA) exiting the building and making their way approximately 500m to the domestic terminal in order to catch a connecting domestic flight.

My proposal will integrate the international and domestic terminals into one building, and provide an additional form of public transport access, in order to create a functional point of difference from the existing Auckland airport. This combination of domestic and international procedures being combined in conjunction with the linear or semi-circular arrangements, lead to the next stage of analysis: the floor level configurations.
There are four principal types of arrangement of floor levels possible within the linear (or semi-circle) terminal configuration, they are:
- Single level, side by side arrangement.
- Side by side arrivals and departures, in two levels.
- Vertical stacking of arrivals and departures.
- Vertical segregation of two totally separate levels for arrivals and departures.

High volume of traffic (in comparison to other international terminals) is not foreseen in this proposal, considering the serviceable population base being under 1 million. Therefore the arrangement was likely to be either the single level, or side by side two level approach.

Early analysis explored both options, and ultimately came to the conclusion that the single level option would not fulfill the future capacity requirements of an international terminal, albeit a relatively small one.

The advantages of the multi level, side by side arrivals and departures option were:
- The main landside entrance could be on ground level.
- The departures concourse for both international and domestic could be on the first floor, with air bridge access inclined downwards towards aircraft.
- The arrivals area with customs and immigration could be located on the ground floor, (downwards from the aircraft) with close proximity to the arrivals gate.
- The connection between the international, and domestic areas could be located centrally in order to achieve a simple transfer passage between the two.
- The service requirements, such as baggage handling will be on the ground floor, adjacent to the arrivals hall requirements at the same level as the runway.\(^{(30)}\)

“The role of architect and architecture has been to the design of a swooping roof the glorified shed, gestures eventually subsumed, collaged, and adapted for larger capacities and newer technologies. The airport is a species of ‘bigness’ to use Koolhaas’ term.”

Airport terminal design must be optimised for future expansion and alteration as traffic demands change over time. As “Successful airports must exist in a constant state of change as they adapt to changing circumstance”, the immovable infrastructure that is put in place must be valid in terms of size and location, so that the non-infrastructure elements are moveable. The location of fixed service requirements such as toilets and stairs, and larger immovable components such as floor positions, need to be positioned with possible future alterations of layout considered. It is for this reason that most airports worldwide are designed with all encompassing roof forms that create expansive concourses below.

With the preliminary spatial requirements of key components and site parameters mapped out, the building’s envelope began to take shape, and to use Rem Koolhaas’ terminology, the terminal’s ‘bigness’ presented itself.

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Three Influential Examples of International Terminals investigated for their aesthetic, cultural, and structural forms, are outlined over the next three pages. This is in order to give reference to some of the designs that stimulated my conceptual form design stage, of which I will discuss later.

Barajas Airport, Madrid Terminal 4 was designed by a consortium of Richard Rogers Partnership, Estudio Lamela and engineering firms TPS and Intec. It was opened in 2006, and is Europe’s fourth largest airport.

The building was designed with four key design principles in mind:
- Integration into the landscape taking into account the topography of the local area.
- Energy conservation, and the use of passive environmental systems where possible.
- Spatial clarity in the form of a clear progression of spaces for passengers’ movements.
- Flexibility with the potential for future building extensions.33

The design process focussed on creating an “attractive, peaceful atmosphere. This led to the utilisation of materials and finishes which would convey a sense of calm.”34 The inside of the modular curved roof is lined with bamboo strips that help create a comfortable atmosphere that has a more natural feel than steel structures, and better acoustic properties. The buildings undulating shapes have reference to the surrounding hills of the area and have been described as emulating the forms of a seagull in flight.35 A bird like symbolism that is synonymous with airport design since Eero Saarinen first designed the TWA terminal at the JFK airport in 1968

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34 Ibid
Kuala Lumpur International Airport was designed by Kisho Kurokawa, and opened in 1998 in time for the Commonwealth Games. The design is rectangular in plan with a linear concourse enclosed by an elaborate roof of *hyperbolic paraboloids*, (a doubly ruled surface in the shape of a saddle.) The roof structure is supported by conical columns that contain and distribute electrical services and downpipes. These forms have been described as being “Inspired by Islamic forms (of the region) and the dynamics of flight”36 The terminal’s design is also intended to allow for future expansion of the airport, where the hyperbolic paraboloid roof elements can be added incrementally to the terminal as future demands necessitate.

Kurokawa’s architecture is synonymous with carefully detailed connections and finishes; it is in this attention to detail that the KLIA terminal stands out in my opinion as one of the finest examples of airport terminal design in the world.

The terminal has an extensive use of natural materials in combination with a steel framework. The use of timber “alludes to the vernacular Malaysian timber structures strengthening as sense of local identity”37. Malaysian vernacular architecture is one of monumental and complex structures with high ornamentation and Islamic references, The terminal’s appropriateness, and innovative response, create a sense of place “within its surrounding physical and social context distinguish a built environment as representative of a culture’s architecture”38.

37 Stefanie Sim, Redefining the Vernacular in the Hybrid Architecture of Malaysia, Thesis 2010
38 Kisho Kurokawa, The Philosophy of Symbiosis, p110
Kansai International Airport was designed by Renzo Piano and Arup engineers, and built on a man made island off the coast of Osaka Bay, Japan in 1994. It is the longest airport in the world, measuring 1.7km in length along the main concourse.

“Aesthetic, practical, economic and technical considerations combined powerfully in the design engineering of the Kansai main terminal building. Piano’s elegant, flowing design was driven by his belief that the building itself, the refraction of light through it and even the movement of air within it should reflect passengers' movement from landside to airside, with a visual connection between the two.”

The building’s sweeping form was also reminiscent of two long wings of aeronautical imagery; with an aerofoil shape tapering in height from the central hub to the outer edges, in order to help with sightlines from the control tower to the planes. Piano’s intention was that of a simple building to navigate, that was light, bright and spacious, built with low energy consumption in mind, as well as structural strength against the earthquake and typhoon prone region. The Kobe earthquake occurred within a year of the terminal’s opening, with an epicentre 20km away from the airport, yet it suffered no damage.

The linear concourse, with the arrangement of arrivals and departures traffic combined, was investigated in this terminal, for the possible implication of a similar layout arrangement within my terminal, only to a considerably smaller scale.

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Experiments with Form

Once the basic dimensional requirements had been estimated, and general configuration established, built form was to be designed. This chapter concentrates on creative conceptual design and does not deal with the issues of detailed technical development, or the interior planning information.

Early conceptual analysis was non-specific and to some extent only directed by the constraints implied through site investigation. Early forms tended to be generated haphazardly, drawing from in-built experiences to generate sketches in a kind of brain-storming process.

Using visual analogy as a problem solving strategy, the link between the earth and the sky was one of the first concepts explored by drawing on the legend of Ranginui and Papatuanuku as inspiration. Early conceptual investigations explored the idea of the weave as a technique of bringing together various systems, earth and sky, past and future, Maori and Pakeha.
The basic idea of weaving is an established architectural analogy used to describe various systems in our world. As discussed in the online paper (author unknown) ‘Weaving as an Analogy for Architectural Design’

“The concept of weaving is so accessible, it is often used as an analogy to describe various systems in our world. It describes fabrics of different races, religions, beliefs and values, all co-existing. It is used as an analogy for the natural world to explain the delicate web of climates, plants, animals and organisms that depend on each other. In terms of sociology we read about the urban fabric with its interweaving of people, neighbourhoods, homes, work places and institutions. It is an apt analogy for how systems overlap and work together to create a harmonious living environment.”

40 http://faculty.philau.edu/griffenc/weaving_analogy.htm (Unknown Author, accessed August 2011)
Conceptual form investigation evolved from using the weaving metaphor as a starting point, exploring concepts such as: aeronautical forms, natural patterns found in New Zealand’s landscape, and elements of carvings found in Maori sculpture. I was particularly interested in the methods of fastening that are used throughout Maori architecture, sculpture and clothing; the use of interconnecting joints and ropes, knots and stitching, presented an aesthetic that I believed could be useful to some of the required large scale structural elements that would be required in the terminal design.

It was the small-scale elements of traditional Maori garments, in particular the Korowai (cloak), predominantly covered with feathers, or tags of flax, that presented an interesting study of non-architectural structural form. I drew parallels in forms used for shelter, between the connections found in traditional cloaks, to the connections that were required within the roof structure, such as the rafter, purlins, and beams.
The synthesis of conceptual design and research into the components of the brief, led to clarification of the key requirements of the building, in order to provide an inspiring and welcoming first impression to visitors. To summarize briefly, the important elements of the new terminal design were:

- To embrace the link to the environment, in particular the coast and the native bush, highlighting Auckland’s unique location on a narrow isthmus.
- To create an inspiring entrance into New Zealand through a combination of modern innovative structure and traditional structural techniques.
- To have a purity of form reflecting the purity of New Zealand as it is commonly perceived internationally.
- To be built using local materials, to suit our climate.
- To pay tribute to those whose origins are in this land.
- To have reference to flight, and the link between land and sky.

There were many integrating factors that shaped the building during the conceptual design stage, but it was during the investigation into the weave of feathers within the korowai cloaks that I sketched a shape of a terminal in the shape of a feather; with a long arching curve bearing into the harbour as a bridge to a ferry wharf, and a sweeping roof form evocative of an aeroplane’s wing.

The possibility of using a feather as an all-encompassing form, with applicable metaphoric possibilities of flight, shelter, purity and lightness, seemed particularly appropriate to this brief. There was also the built in structural capacity of a feather’s components: the quill, shaft, barbs and barbules, and their likeness to the ridge beam, rafters, and purlins found in traditional Maori architecture. With so many of the important elements of the new terminal building’s design being encapsulated in one form, that form was definitely worth pursuing as a design stimulus.
Fig 45  
Feather concept sketch
Design Development

The concept of an airport terminal in the form of a feather underwent continued design development, in the form of sections, elevations, models and internal planning. The planning was a significant component explicitly intertwined with the building’s form, with numerous requirements. I aim to describe the design process in terms of form, next. I shall discuss the many elements of the internal planning after that.

I started by getting a typical feather from a nondescript bird of flight, and examining it intensely; pulling apart the barbules to form openings, pushing and pulling at its sleek curvatures. It is simple yet remarkably complex, functional and aesthetically pleasing, strong yet delicate. It has an extensive potential for intricate and interesting shapes and forms.

The characteristics of the feather, in terms of its pliability and capacity for separations, stimulated analysis of possible roof forms in relation to the ground. Experimentation with the airside elevation in particular, led to the roof being designed to curve down towards the ground between aircraft docking positions, and splitting along the rooftop to let light through, in the form of an elongated triangular roof light, at the docking positions.
Flexibility of open spaces is a key aspect of airport terminal design. Taking this into consideration, conventional design procedures to plan the construction with few connections between an overall roof form and the components below, may be of benefit to the building’s adaptability. Regardless, the roof structure does need to be supported in some way, with the supports positioned to function structurally as well as to not conflict with the layout arrangements.

Working holistically throughout the building, I first looked to try and make the roof structure as free-floating as possible, with the roof rafters touching the ground in some places in order to limit the interference of supports on the spaces below. The design of the rafters and supports was conducted in tandem, with experimentation in layout arrangements of a variety of forms, ranging from methodical to eclectic. There were also investigations into the juxtaposition of woven forms with feather-like elements. I postulated that the majority of the structural elements should be expressed to the occupants of the building, in the same way that the structural components of a Wharenui are expressed. It is important that elements such as the ridge beam (quill, or backbone), and the rafters are expressed, in order to reflect the figural complexity of natural forms.
The conceptual structural support arrangement that I settled on for development, was a combination of aesthetic, functional, and metaphorical resolutions. As shown in image fig 48 the diagonal arrangement of inclined columns was positioned to free up the ridge beam from over-complication, balancing each section of roof on essentially two points inclined towards the centre of the radius formed by the curvature of the roof in section at right angles to its’ ridge beam. In parallel to the ridge beam the support posts have been arranged in a diagonal configuration, with allusion to the diagonal weave of tukutuku panels. At the top of each diagonal post I have proposed the connection to the rafters to be similar to that found in traditional lashings, where the two diagonal members run past each other, before being bound at the junction to the horizontal member.

Before determining the arrangement of the roof rafters, the overall shape of the roof was modelled in a variety of ways. From the starting point of examining the capacities of an actual feather, cardboard shapes were repeatedly cut, folded and twisted into shapes, wire marquettes were hastily assembled, and modelling foam was sanded, for the cognitive analysis of possibilities of form. A 1:500 scale foam model was shaped then cut into sections along its ridgeline, in order to scale the shapes into individual rafters on CAD.
The digital modelling process began with modelling the skeletal roof structure. This underwent a number of changes, particularly regarding questions arising from the complexity of shapes generated during the physical modeling. The main complication was that each structural component was a different shape, and there were countless components. During the analysis of existing airport terminals around the world, the airport terminal at Barajas struck a chord for its orchestrated elegance. One of the main conditions within the architecture of the Barajas terminal was the repetition of structural elements to ease manufacturing costs. It occurred to me however, that the feather form was not geometrically repetitive. I had to question whether there was a way I could simplify the structural components without compromising the dynamics of the sculpted forms generated by the physical models?

I entered into a phase of investigation that looked to identify possible ways to simplify the building’s form. In arranging the components, I had to consider construction costs and the necessity of the building’s capacity to be expanded at a future date, without compromising the integrity of the design. These investigations took the design to a point where the fundamental form of the feather became lost, and had to be brought back from over abstraction. During this process of investigation, it was ascertained that the portion of the building on the airside of the central ridge beam, could be the same dimensions in plan along the concourse. This would enable a component based system of the same profile rafters to be varied in pitch to form high points at the points where the air-bridges were to be docked, and low points in the roof edge between aircraft. This arrangement could also be easily added to in future, if required.
The shape of the building between the ridgeline and the landside was not as geometrically disposed, with the end of the building nearest the sea being larger than the other end, each rafter needed to be a different length. The sections cut through the physical foam model were useful in working out the shapes of the rafters on this side of the building, as there were sections where the roof edge was to be turned upwards, presenting the impression of a roof with a capacity for ponding water. Had the form not been modelled physically first, the capacity of roof water to be shed away from the sectional plane would probably not have been seen, and the impression of ponding would have led to a design change.

The continuation of the ridge beam (quill or backbone) arching into the harbour, as a walkway bridge to a ferry wharf, presented an interesting design challenge. The structure was to be approximately 300m long, wide enough to take a pod shuttle and pedestrians side by side, and as self-supporting as possible so as to not require too much additional structure that would interfere with the perception of an elongated quill. The diagonal structural supports inside the building were continued outside and along the bridge at a smaller scale. The triangulated structure of the bridge was used because of its efficiency to accommodate both vertical and horizontal loads, as well as being an aesthetic reference to the sails in the harbour beyond.
The front entrance to the building was designed to have large overhangs, as well as a covered walkway leading to the car park. The design of the walkway in relation to the entrance needed to have a continuity of form, in order to not detract from the simplicity of the building. The surrounding landscape, with all the necessary roads, planting, street furniture and walkway canopies, have been designed with the intention of unifying the building with its surroundings aesthetically as well as environmentally.

Airports generally don't have a very good reputation when it comes to environmental concerns, due to the significant emissions that aircraft generate. In order to offset these environmental concerns as much as possible, every effort has been made to create a ‘sustainable’ airport terminal. The consideration of natural lighting and ventilation principles, have been applied throughout the interior of the building. The exterior landscape has been designed with the conservation of the natural environment as a primary goal, with some of the environmental considerations being:

- The use of rain gardens, and collection ponds to collect storm water runoff from impermeable areas.
- Minimising car parking areas in order to encourage public transport use, such as buses and ferries.
- Minimising the removal of existing trees and vegetation, particularly around the coast.
- Preserving the natural water features of the site.
- Recycling roof water collection for grey water use, and irrigation.
Planning Methodology:

The functionality of the terminal’s inner workings is as important as its aesthetics in leaving visitors with a good impression. Efficient space planning is one of the most significant factors in successful airport design; the following chapter of this document shows my approach to the internal planning aspects of the terminal design.

Initial investigation of existing airports with similar requirements as my proposal was a starting point of my research. I conducted site visits of the two existing Auckland International and Domestic airports, and Wellington airport; as well as investigating plans of Christchurch and Hamilton airports in order to understand the state of existing terminals within New Zealand at this time.

Along with the examples of overseas international airports previously discussed, there was research into international airport terminal design through the many books on the subject. The general requirements of airports have been thoroughly documented and seem to hold few surprises between the texts available; however it is the arrangement of these requirements that is an inherently complex process with many design possibilities.

In order to plan the spaces required appropriately, it is necessary to briefly outline the type of airport terminal to be designed. Summarizing the planning requirements of the brief, such as: What numbers of travellers are to be expected and how many passengers will arrive or depart on adjoining flights?

The proposed terminal will not be anywhere near as large as the current Auckland International Airport, the runway length is restrictive to aircraft no bigger than the Boeing 787 which enables one of the furthest destinations to be Vancouver Canada at 11,300km with up to 250 passenger per plane.
The existing Auckland International airport currently processes 100 international flights, and up to 300 domestic per day.\textsuperscript{41} Comparatively the proposal at Whenuapai is to be designed to handle roughly a third of AIA’s capacity, based on the size of the runway, and the population within a 20km radius. This roughly equates to 35 international flights, and 100 domestic flights per day. The terminal is to be designed to be approximately half the size of the AIA to enable capacity to increase over the next ten years without the need for significant alterations.\textsuperscript{42}

One of the first strategies utilized in the planning process was the visual organization of the many requirements of the airport terminal, using the matrix format. The use of matrix charts was necessary to establish the architectural parameters of the terminal brief. The compilation of contextual data and quantitative factors, such as: area required per person, per activity, were summarized in conjunction with spatial adjacency factors and relationship diagrams to help with early sketch plans.

Once the analysis of spatial requirements was completed, I undertook numerous diagrammatic sketch plans, to visually represent the spatial arrangements in terms of size and adjacency. This analysis was primarily in the form of bubble diagrams and block plans, with emphasis on the relationships between zones of public and private, airside and landside, as well as the analysis of the flow of movement through spaces.

Through the use of conceptual diagrams, a basic arrangement of spaces appropriate to the terminal requirements was determined early in the planning stage, prior to attempting any considerations of built form.

\textsuperscript{41} www.aucklandairport.co.nz/AirportInformation (accessed April 2011)

The building’s form was significantly governed by the site constraints, which in turn helped bring the diagrammatic analysis into more applicable spatial arrangements. The internal arrangements of spaces were positioned as the extent of the building began to take shape. The next stage of planning involved more accurate spatial refinement, through the use of computer aided design (CAD). Spatial requirements ascertained through the matrix analysis were modelled in scaled block form in CAD in order to better understand the size of each space required.

The arrangement of spaces was heavily influenced by a series of circulation diagrams; where areas of movement, dwelling, queuing and processing were a focus of investigation. Some of the most important criteria to be considered in the planning of the terminal are adaptability and circulation. It is important that the terminal is capable of future expansion and alterations, without compromising the current design and serviceability. Fixed areas such as plumbing & stairway hubs, and baggage conveyors have been grouped in order to allow for ease of adaptability to the remaining areas.

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Fig 59 Preliminary concept layout
Airports tend to be divided into two areas: airside and landside, airside being the secure side for passengers and workers only, and landside being open to the public. One of the original concepts investigated involved the separation of the airside and landside by an opening in the building for native landscaping to be planted, thereby creating a need for inbound passengers to have to cross through a small hint of New Zealand landscape before arriving. This idea went through many variations, and was an on-going theme through most of the conceptual arrangements, as shown in Fig. 60. Yet the complexities of significant planting in regards to light attenuation and irrigation, as well as the difficulties in arranging service movement between landside and airside, led the concept of a planted division to be scaled back to a more confined proposal, centred on the arrivals gate.

**Arrivals:**
The arrivals gate was to be centrally located within the building and oriented to allow visitors a direct view to the harbour upon their arrival. The design for the arrivals area evolved to be something of a concaved bowl-like green wall, planted with native tree ferns to the height of the ceiling. This large enveloping space, complete with native bird songs (recorded) and waterfalls, is intended to be a surprising and inspiring first impression for overseas passengers. The arrivals hall is also designed to have enough space for the waiting public as well as the option of traditional Maori welcomes (powhiri) on select occasions.
Many compromises between conflicting criteria were made during the planning process, in analysing the different configurations available, some of the early plans involved the combination of the arrivals and departures corridors into one concourse – an option that would allow for a more open experience, from one end of the terminal to the next, yet an option that would also require a second line of security before each aircraft gate, to check boarding passes; which in turn would require that all departing passengers be held behind a barrier until all passengers have departed the plane and arrived in the terminal. The option a combined arrivals and departures concourse was revised late in the design phase in order to position the arrivals and departures concourse on two separate levels.
The revised plan with separated arrivals and departures areas, meant that the arriving international passengers would need to disembark the aircraft and enter the terminal building on the ground level, where baggage collection, immigration and customs await them. Due to the small amount of international transfers that would occur, a small secondary staircase was positioned between the arrivals and departures lounges, controlled by a security desk.

The passengers that intend to transfer to domestic flights will still need to go through customs and immigration, so they will still need to go through the arrivals gate; where many of the other passengers will be meeting up with family and friends, only for them to have to navigate their way back upstairs to the domestic departures gate. The option of a more direct connection to the domestic departures gate after customs and immigration processing, in order to avoid the arrivals hall was considered, yet the space planning arrangements led to the conclusion that an exit to the landside (with double height space, arrivals hall feature etc.) was more preferable than an arrangement of smaller corridors. It is for this reason that the departures (both domestic and international) and arrivals gates need to be reasonably close together despite being on separate levels.

"It is not economical or sensible to create airport terminals in which each area is only used for one purpose at one time. As such, multi-use spaces must contend with different groups of people attempting to do different things, often at different speeds and/or in different directions."

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43 Landrum & Brown. Airport Passenger Terminal Planning and Design: Guidebook National Research Council (U.S.) Federal Aviation Administration, p193
**Departures:**
Before entering the departures concourses (international and domestic), passengers and carry-on baggage must be examined by airport security. The security areas must have enough space for queuing passengers, conveyors, x-ray machines, and walk through scanners. Some security offices are required to be located directly adjacent to the departures security area. The basic requirements of the security area is well documented, and has been planned according to average square meter ratios found in the many books on airport terminal design. A higher level of detail is to be shown in the final architectural presentation of this assignment.

**Check in areas:**
The check-in counters have been arranged in a semi-circular format facing towards the main entry. They have been located between the arrivals hall and the bridge to the ferry wharf, in order to reduce the distance between the arrivals hall and the upstairs departures gates.

**Retail areas:**
There is a significant portion of the terminal layout that is devoted to retail areas, such as souvenir shops, food courts, rental car services etc. The sizing of these areas is no less important than anywhere else in the terminal, with prominent shop-frontages being the primary concern. The tenancy requirements have been based on the plans of the existing Auckland and Wellington airports as well as floor plan analysis of St Lukes shopping mall, available from Auckland Council’s records.

‘The modern airport terminal has to balance the requirements of an operating facility at the same time as being a means of generating income through retail activity. ‘The trend at terminals is … to exploit ‘dwell-time’ by providing a range of facilities and entertainments to distract the traveller between arrival at the airport and departure on the plane. Commercial needs rather than social ones are normally given priority at the design briefing stage.’

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Conclusion:

Airport terminals are dynamic spaces of movement and interaction. They are gateways to new lands and are emotion-filled spaces that warrant architecture that is responsive to dynamic human interaction. The architecture of International Airports is one that requires grand statements to be made; it is an architecture that should cry out ‘welcome to our land, this is what we have to offer.’

‘The success of an airport is conventionally measured by its efficiency, by its ability to manage the arrival and departure of planes on time for the minimum of passenger effort... Architecture is called upon to do many things here, but one of its principal tasks - even if this appears in any briefing document - is to calm the nerves and lift the spirits, we have to feel confidence in our airport buildings... and airport terminal should provoke a sense of delight and pleasurable anticipation.’

It was my intention to explore the possibilities of architectural form, in representing New Zealand culture. I have tried to express architecturally some of the ideals found in the culture of this land, without resorting to accessories which could be interpreted as being out of place, such as traditional sculptural adornments in non-traditional settings. The investigation into the elements of New Zealand culture produced such a wide range of representational options, it was a challenge bringing the many components together and interlacing them into a cohesive solution. The use of metaphor was a tool in the design process that enabled me to bring many of the elements of New Zealand culture, site location, and airport architecture together as one.

The architecture of airport planning has many requirements, and is an extremely complex subject. Through the design of the proposed airport terminal at Whenuapai, I have learnt a great deal about the functional and aesthetic planning processes that are involved in creating buildings of such magnitude and complexity.

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“Human beings must continue to explore how architecture and urban space evoke a sense of belonging, which in return provides a sense of place to a built environment thus contributing to its dwellers’ image of self-identity.”

The final architectural resolution presented to accompany this document, is one interpretation of the many possibilities of form that could represent the diverse subject that is New Zealand culture. The proposal of a new international airport terminal is intended to be many things: inspirational, representational, modern and authentic. Yet above all, it should stimulate a sense of belonging.

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Fig. 10 Typical Hinaki, Maori eel trap  www.terea.maori.tki.org.nz/he-reo-komanawa/class_H.html
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