STATE HOUSING REVIVAL.

SUSTAINABLE REGENERATION STRATEGIES FOR POST-WAR SUBURBAN STATE HOUSING IN NEW ZEALAND.

ELIZABETH DONOVAN 2014
Government funded housing for people in need is a challenge many countries face around the world. This thesis investigates how to sustainably regenerate post-war suburban state housing in New Zealand and in particular the suburb of Glen Innes in Auckland. Existing state housing communities need to be revived in order to change the current path of deterioration they are heading down. Reviving the community and regenerating the buildings will together improve the overall quality of the neighbourhoods both socially and physically. Achieving this in a holistic sustainable manner illustrates that there is alternatives to demolition and new builds as the answer to the current problems. Examining the history of state house in New Zealand and the needs of different cultures forms a base to better understand the context and current situation. A demand for flexible state housing for different cultures was established. Analysing four different state housing neighbourhoods from New Zealand, Scotland and Sweden revealed many findings that informed the design process especially that detached housing neighbourhoods can have a high population density. Comparing three different redevelopment schemes with those currently underway - in Glen Innes North illustrated that there are many different ways to approach the redevelopment and provided informed inspiration. Together the conclusions drawn from these three parts create a toolbox and guidelines that can be applied generally to state housing in New Zealand to create more socially, economically and environmentally sustainable neighbourhoods. The established guidelines and toolbox are applied to a specific neighbourhood at a master plan level and in-depth to an existing state house in Glen Innes. Creating a socially, economically and environmentally sustainable neighbourhood while also generating a more culturally flexible home, with environmental sustainable solutions to reduce financial and environmental pressures. The design proposal combines and retrofits two existing houses that have survived 70 years to regenerate one large family home of the same high quality that can stand for another 70 years. The history and familiarity of the neighbourhood is maintained while allowing new development and the revival of the community.
This thesis is written as part of the completion of the Masters of Science: Design for Sustainable Development at Chalmers University of Technology, Gothenburg, Sweden. It was undertaken during the spring semester 2014 within the Department of Architecture.

This thesis confronts the current dilemma New Zealand faces of what to do with its existing post-war state housing. It provides background research, as well as looking at different case studies of state housing communities and their redevelopments and concludes with different design and retrofit strategies and a final design proposal for a large family state house.

The importance of this topic occurred while studying in Chalmers and learning about the problems and issues that occurred with the construction of 'the million program'. It was reinforced while studying on exchange in Glasgow where similar construction of large social housing buildings occurred. Looking at these designs from the outside many years after construction it seemed so obviously why it failed and the problems that occurred. It was hard to comprehend how these designs were forecast to be successful. It was then apparent that New Zealand state housing was heading down the same unsuccessful path, planning to build large cheap high-rise state housing communities. This realisation helped cement an interest in the topic of state housing. This interest in state housing combined with an existing passion for old buildings which I discovered during my Bachelors of architecture degree at Victoria University of Wellington, New Zealand formed the basis for this thesis.

The more investigation that was done on the topic of state housing in New Zealand the more it was apparent that the new plans and redevelopment for state housing areas were not being received well by the inhabitants, politicians and public as well as there being obvious large issues in the design proposals. This gave me the inspiration to try find an alternative approach that included many issues I felt driven by such as cultural diversity, sustainability and giving life back to old buildings.

Researching and doing a design proposal on a very realistic scale has had its challenges and many benefits along the way. It has taught me many lessons about designing for the future. When setting out and choosing a building for the design proposal, I never would have guessed a simple roof could cause so much pain.

This pain was only bearable and successful because of the support and encouragement from a number of different people. Foremost, I would like to acknowledge my tutor Emilio Brandao for his guidance throughout this thesis. Secondly Krystyna Pietrzyk for examining this thesis and giving me invaluable feedback and lastly from Chalmers Professor Lena Falkheden, the director of the master’s programme Design for Sustainable Development for being so incredibly welcoming, organised and supportive, especially for us international students.

I would also like to thank both my family in New Zealand and my new Swedish family for their support and encouragement everyday. Particular gratitude goes to Annina Lehikoinen for being my other half, keeping me very strictly focused and motivated and using her eagle eyes to make sure I haven’t forgotten my windows. Also to Giandomenico for his love and support over the last four years and to Josh for motivating me and making me smile everyday.

In keeping with the domestic theme of this thesis, this large book is intended to be read as a coffee table book. It follows the order and process of my thesis but each chapter should be able to be read or flicked through independently of previous chapters. It is not designed to be read cover to cover in one sitting rather as a source of more thorough information of the particular topics covered.
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How can culturally inclusive regenerative design revive post war suburban state housing in New Zealand?

INTRODUCTION

Since the first state (social) house was built in Wellington over 70 years ago, New Zealand has seen the failure and deterioration of many state housing models, while the demand for housing continues to increase. Many state housing models are a quick fix to immediate problems and generic clones pop around a city with no real understanding of the context or culture of each area. State housing is a world-wide issue and there are many examples to take the opportunity to learn from in order to prevent making similar mistakes. Existing post-war state housing communities in New Zealand need to be revised in order to change the current path of deterioration they are heading down. Reviving the community and reorganizing the buildings will together improve the overall quality of the neighbourhoods - socially, environmentally and physically. This thesis showcases an alternative redevelopment in Glen Innes, New Zealand by sustainably regenerating and retrofitting existing state housing areas to reinvest in high-demand areas. Housing demands have shifted and the existing state housing areas need to adapt to the existing social and cultural needs rather than mainly the government’s budget. Examining architectural design will drive the redevelopment of a state-owned suburban housing in New Zealand. To achieve a successful design proposal for an existing post-war state house, research and analysis of different successful social housing models in New Zealand, Australia, Scotland and Sweden have been undertaken. In conjunction with this, redevelopment examples are analysed and compared. Collecting and summarising this information will form a strong platform to base design strategies on. This strategies are showcased in one state house to illustrate how the findings from the research could be applied to other buildings. As state housing issues extend beyond the four walls of a house, to the community, the urban environment around will also be included in these strategies.

SIGNIFICANCE OF THIS THESIS

State housing is constantly under debate and is constantly changing. The government body responsible for state housing in New Zealand is, Housing New Zealand Corporation (HNZC). HNZC and the general media identifies many current issues which have urban and architectural implications.

- There is a high current demand for lower socio-economic groups. In 2011 there were 8,886 people on the HNZC waiting list.
- Over 20,000 of the 69,000 properties owned or managed by HNZC have been identified for redevelopment, reconfiguration, disposal, or disposal and replacement.
- HNZC plans to sell off low-demand and premium state housing areas to reinvest in high-demand areas.
- Housing demands have shifted and the existing archetypal three-bedroom home is no longer in demand. Rather two or four/five-bedroom homes for elderly, disabled, single-parents and large families are in demand.
- The Social Housing Reform Bill was passed allowing the removal of tenants tenure who can afford to pay market rent.
- Many three bedroom houses only have one person living in them and there are plans to demolish these to build smaller one bedroom homes that supports a diversity of New Zealand cultures in addition to an overall redevelopment master plan of the neighbourhood.

AIM

This thesis aims to find sustainable design strategies to revive state housing communities in New Zealand. Sustainable regeneration of the existing post-war building stock will be the driving force to achieve this. Finding intelligent ways to sustainably reuse and utilise the potential of existing building in a way that supports and encourages cultural diversity is important and therefore the aim of achieving sustainable regeneration not only refers to the physicality of the buildings but also the social and cultural aspects. These aspects will be considered in conjunction to achieve successful research and overall design.

METHODOLOGY

This thesis is an equal combination of research and design. By thoroughly researching state housing not only on a local scale but on a worldwide scale, it provides the opportunity to produce a successful design proposal that aims to meet all the occupants' cultural needs rather than mainly the governments budget.

CULTURE

The thesis is made up of seven parts, Part one introduces the thesis and topic which will then be followed by a series of essays in part two. These essays cover all the basic historic and social issues surrounding state housing in New Zealand. The third part explores case studies and field work done in four different suburbs. Two explore different suburbs in New Zealand, the other two in Glasgow, Scotland and Malmö, Sweden. Evaluation of the theses are interpreted in terms of design issues and responses.

The fourth part explores sustainable redevelopment examples. They are compared in terms of planning, retrofit and new build redevelopments. In response to the earlier chapters part five establishes sustainable regenerative design guidelines based on previous findings as well as retrofit strategies for both site and architectural energy design.

Continuing on from part five, part six goes in depth in the analysis and sustainable regenerative design of one state house in Glen Innes, Auckland, New Zealand. Applying in detail the methods and strategies explored earlier in part five. Part seven concludes and discourses all the findings and design conclusions with additional information in the references and appendix.
Treaty of Waitangi, making New Zealand a British colony. Immigrant numbers increased sharply and conflicts escalated into the New Zealand Wars, which resulted in Māori land being confiscated in Ōtorohanga. New Zealanders make their living from the land. New Zealand has mild temperatures, moderately high rainfall, and many hours of sunshine throughout most of the country. New Zealand’s climate is dominated by two main geographical features: the mountains of the country. New Zealand’s climate is dominated by two main geographical features: the mountains and the sea.

New Zealand has a largely temperate climate. While the far north has subtropical weather during summer, and inland alpine areas of the South Island can be as cold as -10 ºC in winter, most of the country lies close to the coast, which means mild temperatures, moderate rainfall, and abundant sunshine. Because New Zealand lies in the Southern Hemisphere, the average temperature decreases as you travel south. The warmest months are December, January and February, and the coldest June, July and August. In summer, the average maximum temperature ranges between 20 - 30ºC and in winter between 10 - 15ºC (www.newzealand.com, 2014).

This means that when building the north side of the sunny side and the southern winds are the cold winds blowing from Antarctica.

HILLS ANGLES

The Hells Angels Motorcycle Club (HAMC) is a worldwide one-percenter motorcycle club whose membership typically are Harley-Davidson motorcycle owners, and is considered an organized crime syndicate. The Hells Angels motorcycle club was legally founded in Auckland in 1961 and has since taken over gangs in Wanganui. New Zealand had the first chapter of the Hells Angels outside the US.

ONCE WERE WARRIORS

Once Were Warriors is New Zealand author Alan Duff’s bestselling first novel, published in 1990. It tells the story of an urban-Māori family, the Heke’s, and portrays the reality of poverty, alcoholism and domestic violence in a fictional state housing neighbourhood in New Zealand.

MAORI

Māori are the indigenous Polynesian people of New Zealand. The Māori originated with settlers from eastern Polynesia, who arrived in New Zealand in several waves of canoe voyages at some time between 1250 and 1300 CE. Pacific people. They have their own language, a rich mythology, distinctive crafts and performing arts.

WIDGIE AND BODGIE

Widgies and Bodgies refer to a youth subculture that existed in Auckland and New Zealand in the 1950s, 60s and 70s; it is a subculture that is similar to the rocker culture in the UK or Greaser style in the United States. Widgies and Bodgies refer to a youth subculture that existed in Auckland and New Zealand in the 1950s, 60s and 70s; it is a subculture that is similar to the rocker culture in the UK or Greaser style in the United States.
PART TWO.

LITERATURE STUDY AND BACKGROUND INFORMATION OF STATE HOUSING IN NEW ZEALAND INCLUDING ITS HISTORY, THE PEOPLE AND THEIR HOUSES.

2.1 INTRODUCTION

Part two forms the basis of the research completed in this thesis. It provides vital information to help understand state housing in New Zealand, the issues around state housing and the culture of the people who occupy these buildings. It also helps to understand the typology of not only the state houses but also New Zealand homes in general. As this thesis is based heavily on New Zealand, this part is vital for the understanding of the New Zealand way of life. Sustainability is a major issue in this thesis both environmentally, culturally and socially and for this reason no only the history has been researched but also the occupants and their major cultures. Much of these findings are however based on generalisations of historic events, social and cultural concerns.

2.2 A BRIEF HISTORY OF STATE HOUSING IN NEW ZEALAND

This chapter examines literature and publications concerning the history of state housing in New Zealand and how it has developed over time to form the current housing situation. These findings help create a better understanding of New Zealand state housing, the New Zealand culture and they also help inform the design guidelines by highlighting what has been successful and failed in the past within New Zealand.

2.3 HISTORIC TIME-LINE

This summarises the events discussed in the previous chapter.

2.4 THE POST-WAR SUBURBAN STATE HOUSE

This chapter analyses the architectural qualities of the post-war suburban state house, from the concept of the houses through to the layout and materiality of them and how they are unique. It gives an understanding of the state houses that will be later the basis of the in-depth design in part 6.

2.5 CULTURAL DIVERSITY

This chapter looks at literature concerning three different cultures within the community of New Zealand. These cultures were selected based on the statistical profile of Glen Innes, Auckland. This chapter assess through general and historical research the predominant design characteristics of these three cultures. The findings create a basis from which design guidelines can be formed in relation to a dwelling that is inclusive of these cultures, their characteristics and needs.
Over 100 years later, our cities are once again full of what is perceived by the majority of the population as ghetto and slum neighbourhoods. The majorities of these slum neighbourhoods ironically are situated in what were once the successful and sort-after state housing neighbourhoods of the 1930s and 40s. Interestingly in a hundred years New Zealand has gone in a full circle and what was once the answer to the problem is now the problem itself.

In 1905, Liberal administrator John Seddon, in the form of the Worker’s Dwellings Act, introduced the first concept of state funded housing. Although it never prospered, this planted the seed for what was later a reasonably successful state housing program. With the first Labour government in 1935 came the first state housing. The first house was completed in 1937 at 12 Fife Lane, Miramar, Wellington (Schrader, 2012). With each change of government came a change to state housing policy, some for the better and some for the worse. One thing that did maintain the same throughout each government party as discussed by Schrader, (2012) was the agreement on wanting to provide homes for those New Zealanders who were unable to afford a home of their own. Helping create what was known as the ‘New Zealand dream’.

In the last 100 years there has been some major changes in the policy, physicality and occupants of state housing. What has happened in the past, not only in terms of state housing but also looking at private sector housing and the country as a whole, tells a story of how New Zealand has got to the situation it is in today and can influence the decisions we make in the future. Looking briefly to the past can help answer:

1. How does the history of state housing in New Zealand affect the way it is perceived today?
2. How can it influence the design decisions we make today?
3. What can be learnt or taken from our past to inform our future?

NEW WORLD IMMIGRATION

When compared to European countries, New Zealand is a very young country. While much of Europe experienced the squalid slum conditions, which developed with the unparalleled population growth and industrialisation of the eighteenth and nineteenth century, New Zealand was portrayed to offer a New World reprieve from these conditions (Arps, 2011). The purist rural vision was promoted in the 1840’s emphasizing ‘a labourer’s paradise,’ in which ‘towns were to be no more than embarkation points for the true purpose of emigration, rural settlement’ (Ferguson, 1994). Edward Gibbon Wakefield and the New Zealand Company set out to create a ‘Better Britain’ (King, 2003). This was not the reality.

The New World was not immune from poverty, inequality, and political conflicts that many had left behind in the Old World. Memories of the social and physical conditions of the Old World eventually shaped the colonial settlements. By the 1870s, with increased immigration and the concentration of settlement in developing towns, there was a perception that conditions in towns – particularly housing – were declining, and that for the first time there was a feeling that there was no longer a need to ‘improve’ the New Zealand housing conditions, which had been the work of the early settlers.

From the 1830s up until 1880s provincial governments were responsible for providing immigration barracks to accommodate new settlers for a short period while they found their feet and secured employment (Schrader, 2012). Conditions were basic and the new immigrants were fed and provided for ‘when government recognised that negative reports could deter future immigrants’ (Schrader, 2012). Around the 1880’s the barracks were no longer needed and, while the government provided specialist accommodation such as military barracks and asylums, it no longer provided general housing. This remained the case until the 1890 election of the reformist Liberal government. Local councils were given the power to erect workers housing but they were busy constructing infrastructure like road and sewers so the state took on the project instead (Schrader, 2012). This led to many of the former New Zealand barracks becoming permanent features of the New Zealand landscape.

These issues became the driving force for the government to create better living conditions for the poor and needy.
Workers’ Dwellings

By the start of the 20th century, over-crowded city slums and the rising cost of living forced living conditions to drop considerably. Workers were trapped in squalid living environments to remain close to work. In response to this premier Richard John Seddon initiated the liberal government Worker’s Dwelling Act 1905. Although the scheme did not take off, it planted the seed for future successful state housing acts in 1919 and more knowingly with the first Labour government in 1935.

One of the reasons the Worker’s Dwelling Act failed was because of the high rent prices, due to the high quality of materials and design. We can look back through the history of housing in New Zealand and especially at the low cost builds of the 1960s and 70s and can easily compare the two and can now call the 646 houses built under this act a success. The high quality of materials and design mean a large number of these buildings are still standing and although privately owned remain functioning homes.

To avoid creating areas that would be ‘slums-in-the-making’ “the Liberals insisted that each house be architecturally designed, well built, and indistinguishable from comparable private houses.”

Micael Savage as ‘a servant of the people’ (Schrader, 2006). ‘Pamure’s centennial history indicates that the new state housing settlements at Glen Innes and Point England ‘will, for all time, be a monument to its State Housing plan [...] The citizens of Pamure welcome their new neighbours and in the coming century they will always be able to work together for the good of all’ (Schrader, 2006).

These new neighbourhoods were supported by neighbouring communities and considered a desirable place to live. The need for state funded housing was now even more crucial following The Great Depression and other events surrounding WWI. The new Labour government sought to provide housing for low- to middle-class families (Schrader, 2012) as well as wanting to stimulate the local industry and provide work for those left jobless after these events. The first state house built at 12 Fife Lane was seen as a defining symbol, promoting the new Prime Minister, Michael Savage as ‘a servant of the people’ (Schrader, 2012).

This new scheme was hugely successful and hit the ground running with 50 000 state rental units being constructed between 1919 and 1949. This accounted for 40 percent of the nation’s new domestic building in the 1930s and 28 percent in the 1940s (BRANZ, 2011). By 1939 the state housing waiting list stood at 10 000 (Schrader, 2012). One of the reasons this scheme was so successful was because, like the Liberals, labour wanted to create new homes and not expand the slums and therefore their design and materials were of the highest quality, to the degree that the private sector had to copy them in the housing market (Ferguson, 1994). The standard of construction was so high it was criticised by the Nation MP Walter Broadhurst in 1940. He declared it too flash for ordinary folk: ‘he questioned whether the country could afford these luxuries – steel sinks, and so on’. He thought these houses started young people off where his generation left off after a lifetime of work (Ferguson, 1994).

These state houses were erected in large suburbs on the periphery of cities, the suburb of Glen Innes being one of the first. These suburbs where targeted at low- to middle-income nuclear families – partly to encourage breeding (Schrader, 2012). These new neighbourhoods were supported by neighbouring communities and considered a desirable place to live.

To avoid creating areas that would be ‘slums-in-the-making’ “the Liberals insisted that each house be architecturally designed, well built, and indistinguishable from comparable private houses.” (Schrader, 2003). An example of the high quality was a Free Tudor style home featuring board and batten cladding, a rimu-panelled living room and tiled fireplaces in two of the three bedrooms (Schrader, 2003). Temple described the houses as including the latest conveniences, which was largely in response to the unhealthy conditions of the slums. It was the use of high quality native and locally sourced timber, well planned (for the time) designs, current amenities on parcels of land that were not too large to maintain and individuality that contributed to why they are still standing today.

The Labour government 1935-49

The Labour government followed in the same direction as the previous Liberal government. The need for state funded housing was now even more crucial following The Great Depression and other events surrounding WWI. The new Labour government sought to provide housing for low- to middle-class families (Schrader, 2012) as well as wanting to stimulate the local industry and provide work for those left jobless after these events. The first state house built at 12 Fife Lane was seen as a defining symbol, promoting the new Prime Minister, Michael Savage as a ‘servant of the people’ (Schrader, 2012).

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Workers’ Dwelling, Petone, NZ (McCracken, 2001)
They had generous terms of deposit and mortgage rates which resulted in thousands of tenants owning their own ‘little piece of New Zealand’.

(Schrader, 2012). By 1954 state home loans accounted for 54% of all new home mortgages. Demand for housing continued to outstrip supply (Schrader, 2012).

Secondly, multi unit blocks were constructed by ‘The Nash’ government who wished to curb financial urban sprawl as land prices were escalating. These large blocks provided accommodation to solve the housing shortage by 1970 (Schrader, 2012) but failed to provide services and facilities for the occupants and were not integrated with private sector housing, resulting in a feeding ground for crime and neglect.

Labour criticised these new flats by saying: ‘flats do not provide sufficient light or ventilation, and generally speaking, are undesirable for the housing of growing families’ (Schrader, 2012). The 1971 Commission of Inquiry into Housing reprimanded the state for building ‘slum’ housing of growing families.

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Politicians continued to change, the National government reform in 1991 saw the removal of income-related rents and established a government accommodation supplement instead. (Schrader, 2012) This increased some peoples rent by up to 500 percent. Labour argued against this that the state should intervene when the market cannot accommodate. Schrader (2012) explains that merely two years later, emergency housing workers in South Auckland reported that many people couldn’t afford to pay rent, and were moving in with friends or family often in overcrowded conditions. One emergency worker, Sister Anne Hurley, told the New Zealand Herald that: ‘it’s little wonder there are so many vacant houses.

In 1999, when the Labour Party was re-elected it reinstated income-related rents by which eligible state house tenants paid no more than 25 percent of their total income in rent (Schrader, 2012). The public’s awareness about state housing was further fuelled by the publication of Once Were Warriors, a novel set in a fictional state housing area called Pine Block, based on Duff’s experience of Fordlands in Rotorua. The lead character, Jake ‘the Muss’, is a brutal drunk who terrorises his family and lives in a community characterized by violence, broken relationships and loneliness. This was the nail that sealed the coffin in the public’s eye. It would be difficult to find a more negative portrayal of state housing life (Schrader, 2006). Some former tenants believe it is the recent generations of tenants that contribute to this perception. An interview with a former tenant, Rex, states ‘It’s used to be considered a privilege to live in a state house, but now people want one of each and don’t give a damn once they get into it.

It is however not always the case and it seems it is a few bad tenants that ruin it for the rest of the people who are in need. For example another interview conducted by Schrader (2006).

Glen Innes residents protest state housing eviction. (Tamaki Housing Group, 2014)

Glen Innes residents protest state housing eviction. (Tamaki Housing Group, 2014)

Cartoon about the removal of tenure in state housing. (Newkey, 2002)

Cartoon illustrating the condition of some state housing stock. (Winter, 2007)

The suburban community
New Zealand is one of the most urbanized countries in the world with 86 percent of the population living in cities. A great majority of the population, however, live in the suburbs around major cities. The growth of suburbs has been one of the most significant developments in shaping New Zealand society. (Schrader, 2006) This preference for suburban life grew from early European settlement and their desire to escape the crowded slums they came from.

In early colonial New Zealand land was relatively cheap, and houses were usually built of wood rather than more expensive and substantial stone. Single-storey homes on their own sections were the rule, even in the heart of the main cities. (Schrader, 2006) Many suburbs were designed with ‘garden suburbs’ principals influenced by this movement of Britain and America between 1938 and 1945. (Schrader, 2005) The controversy continues as most reports and articles blanket the redevelopment by saying 156 state homes will be removed creating 260 new homes. Most articles fail to highlight that of these 156 state homes will be removed creating 260 new homes. While 260 new homes only 78 will be state homes. 2014). The controversy continues as most reports and articles blanket the redevelopment by saying 156 state homes will be removed creating 260 new homes. Most articles fail to highlight that of these 156 state homes will be removed creating 260 new homes. While 260 new homes only 78 will be state homes.

The houses were situated around a large park where children could safely play, free from hazards of the streets. Long afternoon evenings could also be spent with other gathering families. Local friendship might be forged and strengthened.

Community means different things to different people, whether is having no contact with your neighbours or being good friends. These models aimed for the second, creating involved communities. This did not always prosper as not all suburbs actually built the community facilities and services because of The Great Depression following WW1.

This may have been an idealistic approach to communities at the time and many people said it failed. You can see in recent time with the protest in Glen Innes that there actually is a sense of community within the residents, both state housing and private sector. There is a desire and need to bring communities together and give them the facilities to be able to facilitate these meetings.

The waiting list for State Houses has risen by over a thousand in the past three months... while sadly, with National having reduced the state housing stock by 700 in the past year, most of the people on the waiting list don’t have a chance of getting a Housing NZ home.

Twyford (2014) continues to state that this is just gross mismanagement. Nearly 1,000 state houses are boarded up and vacant. Meanwhile National is selling off state houses and land in privatization by stealth. No one can now deny this is a housing crisis.

The combination of all these factors led communities to protest against the current management of state housing.

One community in particular, which has been protesting not only against new policies but also about the redevelopment of their community, is Glen Innes. The change in state housing tenure has allowed for a review of all contracts to assess who is the most ‘deserving’ poor. (Defend Glen Innes, 2014) This means that many elderly, pensioners, veterans and people with disabilities have had their tenure removed.

This has coincided with the redevelopment for Glen Innes that there actually is a sense of community within the residents, both state housing and private sector. There is a desire and need to bring communities together and give them the facilities to be able to facilitate these meetings.

In early colonial New Zealand land was relatively cheap, and houses were usually built of wood rather than more expensive and substantial stone. Single-storey homes on their own sections were the rule, even in the heart of the main cities. (Schrader, 2006) Many suburbs were designed with ‘garden suburbs’ principals influenced by this movement of Britain and America between 1938 and 1945. (Schrader, 2005) The controversy continues as most reports and articles blanket the redevelopment by saying 156 state homes will be removed creating 260 new homes. Most articles fail to highlight that of these 156 state homes will be removed creating 260 new homes. While 260 new homes only 78 will be state homes. 2014). The controversy continues as most reports and articles blanket the redevelopment by saying 156 state homes will be removed creating 260 new homes. Most articles fail to highlight that of these 156 state homes will be removed creating 260 new homes. While 260 new homes only 78 will be state homes.

The houses were situated around a large park where children could safely play, free from hazards of the streets. Long afternoon evenings could also be spent with other gathering families. Local friendship might be forged and strengthened.

Community means different things to different people, whether is having no contact with your neighbours or being good friends. These models aimed for the second, creating involved communities. This did not always prosper as not all suburbs actually built the community facilities and services because of The Great Depression following WW1.

This may have been an idealistic approach to communities at the time and many people said it failed. You can see in recent time with the protest in Glen Innes that there actually is a sense of community within the residents, both state housing and private sector. There is a desire and need to bring communities together and give them the facilities to be able to facilitate these meetings.

The waiting list for State Houses has risen by over a thousand in the past three months... while sadly, with National having reduced the state housing stock by 700 in the past year, most of the people on the waiting list don’t have a chance of getting a Housing NZ home.

Twyford (2014) continues to state that this is just gross mismanagement. Nearly 1,000 state houses are boarded up and vacant. Meanwhile National is selling off state houses and land in privatization by stealth. No one can now deny this is a housing crisis.

The combination of all these factors led communities to protest against the current management of state housing.

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SUMMARY

This history of state housing in New Zealand has been on of many ups and downs. For every success there has been equal failures and criticisms. (Arps, 2011).

Despite this, state housing has shaped New Zealand not only in its built form but also in regards to people themselves. Housing the poor and needy was a pressing issue in 1905 and it is still equally as important and relevant now and will continue to be for the foreseeable future.

The demise of state housing has been rooted both physically and in the mind of the public for a long time now. Recent NZHCL initiatives attempt to remedy some of these issues but these isolated developments have done little to relieving greater problems. As stated earlier this has not only to do with the physical design but also the urban and architectural environment of state housing is a significant contributor. Some of these factors are as follows:

• High quality and local materials were used.
• Building standards comparable to those of the private sector.
• Not being able to differentiate between private sector and state houses.
• Each house should seem different from its neighbors.
• New technologies utilized.

It was obvious with these designs that they were willing to invest more money in order to create a better building and quality of life for the occupants. This is something that could be better understood and implemented in current times. The entire life cycle cost of materials and process should be considered when designing. If consideration of the future of state housing is not considered it will just become mice running in the same wheel.

There have been many different failures and successes across many different aspects of state housing. How we respond to these dictates how we progress in the future. If we learn from our mistakes then we create a better tomorrow. This is however a very idealistic process, ensuring designs are interesting, individual and relevant now and will continue to be for the foreseeable future. Learning from these factors is import to ensure that over the past century with the change of each government stakes involvement. It is evident that common goals and agreements are not at the forefront of their thinking. Only, how can I one-up my opposition. This can be highlighted in the dips and downs of the number of state houses and the number of state houses built and sold.

What changed in the 1960s was state housing changed from targeting struggling families to housing the poor and those who face discrimination in the private rental market, including Maori, Pacific islanders and solo mothers.

Workers’ dwellings were built for Pakeha (New Zealand European) married couples with children, Maori, single people and the elderly need not apply’

This developed even further and in the 1970s fewer people lived in nuclear families and policy changed again to cater for single parent families (Schrader, 2012).

First Labour government saw a two sizes fits all approach. Most houses having two or three bedrooms and was fine for families up to five. Government argued it was uncommercial to build large houses as not many people could afford them. By 1942 they acknowledged they needed more large houses and constructed 4 and 6 bedroom homes in the larger cities. Since 1980s most big families living in state housing have been Maori and Pacific Island people. Since 2000 NZHCL started renovating existing houses to create large houses. Like removing dividing walls from semi-detached units. (Schrader, 2012).

It is now very evident that a diversity of state houses is needed while the majority of the housing stock is from the 1950s – meaning they are mostly two or three bedrooms houses. These houses can be too big for single pensioners and far too small for larger growing Pacific families. To be able to make housing more viable for the future these issues need to be addressed with future design.

The OCCUPANTS

Like the many governments, policies and building typologies have changed, in the same manner the occupants of state housing have also changed over the last century. The first houses were designed for working families, the development of the 1945 state housing brought with it the ideal nuclear family to encourage breeding, the 1950s National government reform limited the occupants to the poorest and most needy, and now with new culture diversity large extended families, single parents and the elderly are those seeking state housing.

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The sprawl of suburbs under ‘the cult of the quarter-acre’ (Schrader, 2003).
Due to wartime shortages, the government of state housing in New Zealand was established, managed to tenants for state and moratorium on workers’ dwellings, and promotes private home-ownership through State Advances Corporation (SAC) loans. Completion of first multi-unit state flats, Centennial Flats in Berhampore, Wellington State house construction virtually ceases due to wartime shortages Completion of 10-storey Dixon Street Flats in Wellington Opening of Symonds Street Flats and Grey's Avenue Flats in Auckland Election of National government, which in 1950s reintroduces state house sales \( \text{State housing street in Glen Innes. (Authors own image, 2014)} \)

The context and situation of New Zealand when Labour was voted into power had a great influence on the style of state houses that were to follow in later years. The desire to move away from slum living and that of the Old World are an important driver for these designs. Labour originally insisted that all houses be architecturally designed, sited on its own section, and that no two houses in a street would be exactly alike (Aps, 2011). Rows of identical housing would have been immediately unpopular, as would “huge barrack-like tenements of the Old World,” proclaimed John A. Lee, Labour’s Under-Secretary for Housing (as cited in Schrader, 1993). The choice of this design was not made by the architects of the time blindly. There was disdain towards the ‘jerry built’ bungalow while the English cottage was perceived as having attributes of quality and good taste, and therefore the best way to raise housing standards (Schrader, 2003). The choice of the English-style cottages that were proposed were familiar to the European population who still regarded Britain as ‘home’. 

The ‘English’ style cottages that were proposed were familiar to the European population who still regarded Britain as ‘home’ (Schrader, 2005). Architectural historian Peter Shaw (as cited in Schrader, 2005), also suggest that ‘Labour didn’t want to frighten the electorate’ given ‘huge barrack-like tenements of the Old World.’ Instead he suggested the ‘California bungalow’ (see figure bottom right) would have been a superior state house because its open planning and verandahs better suit local conditions (as cited in Schrader, 2005). The choice of this design was not made by the architects of the time blindly. There was disdain towards the ‘jerry built’ bungalow while the English cottage was perceived as having attributes of quality and good taste, and therefore the best way to raise housing standards (Schrader, 2003).

No two houses would be exactly alike so occupants would not be identified as state tenants. State housing areas would contain both better off and poor workers to avoid single class neighborhoods. Designed to last for 60 years, kitchens would face the morning sun and living rooms facing north would form the centre of family life. Fireplace would be the heart of the home. In every group of ten houses, each house was to have a different floor plan, and every house in a street was to have a different elevation and use different materials. Standard components such as joinery and fittings would be used in all houses to keep building costs low. These were all elements that together raised the standard of living. During and after WWII government financing rules meant that private sector housing closely resembled state housing.
of sun and views. Regardless of sun and views, whereas state house housing tended to be orientated towards the street, private housing was orientated on site. Private The main point of difference between state and more unified street effect, and to maintain a sense of 1940s were often left unfenced in order to create a provide a larger back yard. The house and fencing Street frontages of state houses built during the p provide a larger back yard. The house and fencing be moderately steeply pitched. Elevations were plain

TYPICAL FEATURES
• a hipped or gabled roof with a pitch of 30–40˚
• shallow, boxed awes
• a suspended timber floor usually with a concrete perimeter foundation wall
• a single fireplace and chimney
• bivel- back weatherboard, brick veneer, stucco or Fibrolite (asbestos-cement sheet); cladding – sometimes more than one cladding material was used
• small, multi-panel, timber-framed casement windows
• recessed front and rear porches.

THE LAYOUT
With early state houses, the internal layout ensured access from the back door to the rest of the house was often through the laundry. Rooms containing plumbing services – the kitchen, bathroom and laundry – were grouped together to reduce plumbing costs. Rooms containing plumbing services – the kitchen, bathroom and laundry – were grouped together to reduce plumbing costs.

KITCHEN AND DINING AREAS
The first state houses were designed with a dining alcove in the living room, and the kitchen was used for food preparation and cooking only. However, an early survey indicated that tenants preferred to have cooking and dining spaces combined, so floor plans were soon adapted.

BEDROOMS
The houses typically contained two or three small bedrooms, but in many cases as well as and five-bedroom homes were also built.

BATHROOMS AND LAUNDRIES
Rooms containing plumbing services – the kitchen, bathroom and laundry – were grouped together to reduce plumbing costs. Rooms containing plumbing services – the kitchen, bathroom and laundry – were grouped together to reduce plumbing costs.

LIVING AREAS
The living room was the largest room in the house and intended to be the hub of family life.

Other aspects that evidently influence the spatial organization of dwelling is kinship patterns, environmental conditions and economic systems. Rapoport (1978) expands on this by stating that the cultural diversity among human groups places individual demands on the built environment, which, in turn, results, in a greater variety of built forms. Anthropologists have noted that people can adapt to their environment in non-genetic ways through culture. The common and individual needs for each ethnic group are when designing homes for them, for they play such an influential part in their lives.

This is very evident and supported when analysing Maori and Pacific history within New Zealand state housing. In the 1970s and 80s large numbers of Pacific People migrated to New Zealand from Samoa, Tonga and the Cook Islands in search of a better lifestyle. However, a better life was not necessarily what the government of the time realized that discrimination against Maori and Pacific People was occurring with private rental landlords. They were limited to renting run-down houses in less desirable areas, with high rents resulting in occupants overcrowding.

Discrimination against non-European New Zealanders was not new. As discussed in the previous chapter, up until the 1940s, Maoris were excluded from state housing and were, to some extent, kept segregated from New Zealand Europeans as they viewed their living standards to be too low. In 1948, the Government finally decided to build state houses for Maori. They were unsure how to integrate these two cultures and the solution that was implemented was to ‘separate’ them. At this time, it was thought this would improve the living conditions of Maori and Pacific People.

Pepper potting is the process of interweaving a minority group (in this case Maori and Pacific Islands) among the majority (the New Zealand Europeans). The government of the time decided this was the best way to encourage the Maori and Pacific Islands into the ‘modern world’ by learning to live like New Zealand Europeans. Pepper potting was based on the idea that Pepper potting was based on the idea that Pepper potting was based on the idea that People would appreciate one another better and mutually adjust themselves easier if living together as neighbours rather than if living apart in separate communities (Cayford, 2009). The state was able to allocate houses to certain groups to create what they believed to be balanced neighbourhoods.

2.5 CULTURAL DIVERSITY

CULTURAL DIVERSITY AND ITS RELATIONSHIP TO THE BUILT ENVIRONMENT IN NEW ZEALAND

New Zealand has a vast cultural diversity with a range of different ethnic and cultural backgrounds, which is continuously increasing. While some of these cultures share similar general characteristics, cultural values are not held consistently among all individuals. This chapter aims to find general and common characteristics related to cultural diversity and the solutions from this chapter will be used to form the basis for design guidelines that are flexible and encompass as many characteristics from the three main ethnic groups (in Glen Innes – Maori, Pacific People and New Zealand Europeans (Pakeha)). These three are also the major ethnic groups in New Zealand as a whole and, therefore, this information can relate not only to the area of focus but also to state housing across the country.

For the purpose of this thesis, spatial planning and privacy needs of each culture is considered in a generalised manner. Currently, Glen Innes’ population is made up of only 53 percent New Zealand Europeans, which mean 67 percent of the population come from different and diverse cultures, which are not catered for in terms of state housing (Statistics NZ, 2006).

Paul Oliver (1997) explains that Anthropologists have noted that people can adapt to their environment in non-genetic ways through culture. The common and individual needs for each ethnic group are when designing homes for them, for they play such an influential part in their lives.

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This did not go to plan and the Maori resisted abandoning their customs. It might have worked if they were still able to maintain some of their customs instead they were thrust into foreign homes, within foreign communities with foreign cultures and foreign technologies. Rather than removing themselves from the community, they were inclined to hide away and isolate themselves. Later policies changed as they saw this approach was failing. What occurred after this was even more of a failure not only for Maori and Pacific People but also for the cities’ development. Large concentrations of single ethnicities with low economic standing were emerging and, as discussed in an earlier chapter this worsened the negative perception of these neighbourhoods.

It can be assumed that if a greater understanding of Maori and Pacific cultures were considered at the time and regarded as important as New Zealand Europeans then a very different outcome would have occurred. The only need of these cultures that were met was the fundamental need to have a roof over their head and even then this was a very poorly built roof. It has taken many years and only in recent times more consideration has been given to other cultural needs, including them in the design of our environments.

INTRODUCTION

Maori are the indigenous people of New Zealand. The Maori originated with settlers from eastern Polynesia, arriving in New Zealand by canoe between 1250 and 1500 CE. Over several centuries they have developed a unique culture with their own language, a rich mythology, distinctive crafts and performing arts. In later years a prominent warrior culture emerged. This culture of tribal war is the most recent in history prior to European settlement.

Maori way of life had a drastic change in the 17th century with the arrival of Europeans to New Zealand. Gradually they adopted many aspects of western society and culture. The relationship between the two cultures was not one of ease. A treaty was signed between the two cultures in 1840 to coexist as part of a new British colony. Conflict was inevitable as tension rose over disputed land sales in the 1860s. The combination of years of conflict and war and epidemics of introduced disease took a large toll on the Maori population and it declined dramatically up until the 20th century when it began to recover.

Today Maori culture is still an important part of culture in New Zealand not only for Maori but also New Zealanders as a whole. Maori is the second largest ethnic group (14%) and te reo Maori (Maori language) is the second official language in New Zealand. Many tribes became very poor after the steady loss of Maori land by way of confiscation and purchase between 1840 and 1937 (see map on page 24). Poor and without land, tribes lived in unhealthy, overcrowded conditions that allowed disease to spread (Schrader, 2012). The spread of European diseases caused the most fatalities, even above tribal wars that were caused by the introduction of Muskets. Muskets were traded for flax and potatoes in the 1830s and 1850s, which led to the tribal wars killing many of the Maori population. The third influence from European settlers was the introduction to Christianity, although they were slow to convert, religion became and still is, an important part of Maori life.

There is a disproportionate number of Maori facing economic and social obstacles. They have lower life expectancy compared to other New Zealand ethnic groups, coupled with higher levels of crime, health problems and educational underachievement (Hail, 2008).

Food storage house in the background with food preparation house in the foreground at the historic rāpia fishing village of Rewi’s Village – Kerikeri, NZ. [Authors own image, 2005] - Highlights the separation of activities in traditional Maori living. [Authors own image, 2005]
by 1981 this figure had dropped to 45% (FCSPRU et al. 2006). This decline has continued to current times with higher ownership rates among Maori living in rural areas than those living in urban areas (Hall, 2008). The 2006 Census shows that only a quarter of Auckland’s Maori population own their own home, which is considerably lower than the total regional populations (47.5%). This suggests that a majority of Maori are renting their home. The tenure status of Maori means that the high numbers of renting in private and state housing makes the consideration of their cultural needs in regards to housing very important and a pressing issue.

CONCEPTS OF HOUSING – A HISTORICAL OVERVIEW

Within traditional Maori society a greater cultural and architectural emphasis is placed on the meeting house (marae) over individual dwellings. This is due to the society including the extended family (whanau) and well as clan (hapu) and tribe (iwi). This is in contrast with how NZ European society is structured; centered on the nuclear family and therefore emphasis is placed on the private dwelling (Armtrigt, 1986). This can be further supported by the following segments taken from Hall (2008): Toi, if ‘home’ means to the Pakeha the focus of family life, the basis of self-esteem a base for political action, a place of love, a source of authority and discipline, the location of people to whom one belongs, a place of refuge, of sleep, of nourishment, of attention, discussion, disagreement, caring, shelter, accommodation of guests, approval and rejection, then for the Maori this has not been provided by the house but rather by the marae (Austin, 1976 cited in Hall, 2008).

There was limited understanding of Maori values by the first European settlers when they arrived in New Zealand. As a result European styled housing was imposed on the Maori as a way of ‘civilising’ them. Wanhalla (2006) discusses how the poor health outcomes of Maori were often viewed as a manifestation of unhealthy customs and unhygienic living conditions. Many believed that by adopting western-style housing Maori social and cultural practices could be transformed. For this reason housing became a key site of official intervention and reform (Wanhalla, 2006). Wanhalla (2006) also explored the issues that occurred from the very start of colonisation due to the differences between Maori and western-style houses. The Maori sleeping house (wharepuni) was built on the ground with the extended family sleeping together in one single room. The state and its officials had no regard for the extended family model and labelled it ‘overcrowding’ when they imposed small, individual, two-bedroom houses. Another cultural concept that was not considered by officials was the concept of tapu (restricted) and moa (accessible), which have cultural significance in terms of where activities and belongings are located (Wanhalla, 2006). One example of this is the creation of different structures to sleep, eat, store food, clothes and other belongings that is very typical of the traditional Maori culture (Kohere, 2004). This is not the case in Western-style houses, which have all of these activities under one roof, and very often they are beside each other (Kohere, 2004). These differences were emphasised when Maori moved to urban environments and the housing policy of the time enforced Maori households to be ‘pepper-potted’ among New Zealand European households. This is discussed further in the Pacific communities chapter following, however one different challenge that Maori faced during this transition was the absence of marae which had implications for how people function both socially and culturally (FCSPRU, 2006).

Without a marae the ability to hold community gatherings, especially funerals became difficult and adaptations had to be made. This usually meant that houses often became a

![Marae - Te Hau ki Turanga. New Zealand oldest wharenui built 2800 BC](Image 25x25 to 493x560)

MAORI LAND HOLDING

![Marae land holding in the North Island from 1860-1939 (Orange, 2001)](Image 325x540 to 626x780)

![Contemporary marae - Te Hau Aroha Marae - Bluff, New Zealand. (Authors own image, 2013)](Image 635x419 to 916x660)

![Bedroom relationship matrix - The matrix is a quick reference guide to the basic design of a Maori housing solution. It highlights what are Essential spaces that must be connected (tapu) when designing Maori housing solution. Acceptable spaces that may be connected, but it is not essential in a Maori housing solution; spaces that should be avoided connecting (tapu).](Image 1401x636 to 1627x787)

![Reference guide to the basic design of a Maori housing solution. It highlights what are Essential spaces that must be connected (tapu) when designing Maori housing solution. Acceptable spaces that may be connected, but it is not essential in a Maori housing solution; spaces that should be avoided connecting (tapu).](Image 1399x447 to 1628x597)
CONCLUSION

Maori history has been unfair in terms of the suppression of culture and the imposition of western customs. A lot of history and culture has been lost or adapted over time and for this reason it is very important to provide housing and spaces that allow Maori culture to thrive. Maori are the native people to New Zealand and, in many respects, their culture is part of everyones everyday life. However this is not usually the case in terms of housing and this is an area that greatly needs improving. While it is an important issue for the nation as a whole, it is especially relevant for state housing as the Maori population along with Pacific people account for a large amount of state housing tenants.

LIVING SPACE

The living room is used for a variety of purposes including a space where guests are welcomed and sleep, meetings and celebrations take place and where a deceased family member (iapapa ka) will lie.

As such, the living room should be large (approximately 5m x 6m) and able to accommodate up to 20 people. A secondary living space may also be appropriate especially when guests are occupying the main living room. Teenagers and children could use this secondary space during whanau gatherings or as a spare bedroom for whanau who stay for an extended period of time.

KITCHEN AND DINING AREA

The kitchen should be large enough to accommodate two or more people which is particularly important when catering for large gatherings. The kitchen should have adequate storage space for bulk food and large pots. The driveway should be large and connected to both the kitchen and living room.

BATHROOMS, TOILETS AND LAUNDRY

There should be at least two toilets in a house and they should be separate from the bathrooms. The bathrooms, toilets and laundry rooms should be separate from the kitchen area as having them located within close proximity is considered tapu.

PASSAGEWAYS

These are often seen as wasted space and instead, bedrooms could be located of the main living room area.

BEDROOMS

The bedrooms should be large enough for two or more children or two adults with a study space. While the maximum number of bedrooms will depend on the site, most can have a maximum of five bedrooms.

KEY CHARACTERISTICS

The key characteristics can be grouped into two main concerns: pressures of larger families and spaces, and importance of Noa (secrecy) and Tapu (restricted). These represent in figure above, diagrammatically the relationships between each space:

• Concept of Noa and Tapu - bathroom, kitchen, laundry all separate.
• Bedrooms big enough to accommodate communal living and extended family.
• Good relationship between indoor and outdoor.
• Large living space to large formal gatherings.
• Flexible multi-use spaces for gatherings for extended guests.

LIVING ROOM

Transitional indoor/outdoor living environments have a number of benefits including relieving pressure on internal areas and promoting healthy living as well as providing an area for large whanau gatherings and a covered area for children to play. Outdoor cooking and dining is an important part of Maori culture to thrive. Maori are the native people to New Zealand and, in many respects, their culture is part of everyones everyday life. However this is not usually the case in terms of housing and this is an area that greatly needs improving. While it is an important issue for the nation as a whole, it is especially relevant for state housing as the Maori population along with Pacific people account for a large amount of state housing tenants.

Recently a number of studies have been conducted to explore the housing design needs and preferences of Maori and also as discussed later for Pacific people. The most comprehensive publication was prepared for Housing New Zealand Corporation (HNZC) by Hoskins et al (2002) entitled Kit e Hau Kainga: New Perspectives on Maori Housing Solutions. It is beneficial for planners and developers to inform and help consider the diverse needs of Maori. It includes design layouts for both individual homes as well as papaakianga (community owned Maori land block or village). The design guidelines were based primarily on discussions with reference group members and key informants. A second report, which has developed guidelines mainly for new housing, was under the organisation of Otara Health Inc and Housing Reference Group. They consulted approximately fifty community members to consider how housing in the Otara area might be changed to meet the local needs of the people. The third report by FCSPRU and RCMHD (2006) also includes sections on design issues by providing a brief literature review on the topic and conducting interviews and focus group discussions with key informants and individuals. These design guidelines were reviewed and found to be quite similar. The common findings have been incorporated and areas follows.

CHARACTERISTICS

HOUSING LAYOUT

Housing (in general) designed for whanau (family) should be open plan and adaptable to the changing needs of the family (whanau) and fluctuating occupants. This can involve the inclusion of a sleep out, multi purpose rooms or removable walls in bedrooms and living rooms.

OUTDOOR SPACE

Characteristics of indoor and outdoor living will be of concern to maintain ancestral gardening skills and promote healthy activity and healthy eating.

These represented in figure above, diagrammatically the relationships between each space:

"little mares" where often living spaces were cleared to make room for a funeral or for visiting guest to sleep, the building literally overflowed and cooking facilities would be set up outside and carpots and garages would be used for eating (FCSPRU, 2006). The housing models do not value the social, spiritual, cultural, historical and economic aspects of housing will probably be inadequate in addressing issues for Maori housing expectations and aspirations (Hall, 2008).
**PACIFIC COMMUNITIES**

**INTRODUCTION**

There are at least thirteen distinct cultural groups that represent Pacific People in New Zealand. The Pacific population is both people born in the Pacific Islands and New Zealand. The primary Pacific ethnicities represented in New Zealand are (in order of population) Samoan, Cook Islanders, Tongan, Niuean, Fijian and Tokelauan (Statistics NZ 2006).

A communal way of life is what traditional Samoan culture is based on. It derives from Fa’a Samoa (the Samoan way) a unique socio-political culture. A communal way of life is what traditional Samoan culture is based on. It derives from Fa’a Samoa (the Samoan way) a unique socio-political culture.

Most Samoan cultural activities are done together. They are broken into three main groups: faith, family and music.

Traditional houses (fale) contain no walls and up to fifteen (Housing New Zealand Corporation 2004) has stated that state housing needs do not take into consideration the size of Pacific families, their cultural values and practical needs. Larger gatherings and hosting guests for both short and extended periods of time are cultural ties that are predominantly kept by many Pacific people. Accommodating large numbers of people is a very ‘natural’ aspect of their family life, but most houses in New Zealand are not designed to house such large gatherings. (Hall 2008)

**DEMOGRAPHICS**

In 2006, 26,650 people in New Zealand were identified as belonging to a Pacific ethnic group (statistics New Zealand, 2006). This represents 6.9 percent of the total population. 27 percent of households with people of Pacific ethnicity experienced overcrowding because of their larger family size. Hall (2008) noted that often the number of people living in a dwelling could be up to fifteen (Housing New Zealand Corporation 2004) has stated that state housing needs do not take into consideration the size of Pacific families, their cultural values and practical needs.

Large gatherings and hosting guests for both short and extended periods of time are cultural ties that are predominantly kept by many Pacific people. Accommodating large numbers of people is a very ‘natural’ aspect of their family life, but most houses in New Zealand are not designed to house such large gatherings. (Hall 2008)

**FREQUENT GATHERINGS**

An example of this is that it is not uncommon for households to accommodate multiple generations (Grey, 2001) or to host overseas guests for both short and extended periods of time. (Otara Health Inc., 2001). Households are also not fixed in terms of the number of people that reside there. (Otara Health Inc., 2001). This is a hard cultural factor for many people to understand and then take into consideration. There is a lot of uninformed stereotypes around Pacific people all being in the low economic bracket, while things like financial obligations that are not commonplace like financial obligations that are not commonplace.

**FINANCIAL OBLIGATIONS**

This is a hard cultural factor for many people to understand and then take into consideration. There is a lot of uninformed stereotypes around Pacific people all being in the low economic bracket, while things like financial obligations that are not commonplace in New Zealand European communities are therefore not considered. The three main financial costs associated with cultural obligations are identified in Chew et al. (2002) and include funeral costs, church donations and remittances. In their...
House relationship matrix - The matrix is a quick reference guide to the basic design of a Pacific housing solution. It highlights what are Essential spaces that must be connected when designing a Pacific housing solution; Acceptable spaces that may be connected, but it is not essential in a Pacific housing solution; avoided connecting unacceptable spaces. (Adapted from Pacific Housing Design Guide, 2002)

**HOUSE DESIGN NEEDS AND PREFERENCES**

A number of studies have been made to investigate the housing needs and challenges of Pacific people but often these focus on affordability, poor housing conditions and health implications rather than the design issues and preferences. The following section is based on information from two different reports; the first report is the Pacific Housing Design Guide (2002), which was developed by Faumuina, and Associates for HNZC. The second report is the Otara Health Inc., 2001) report that was also reviewed in this section on Maori community housing design needs.

**DURABILITY OF MATERIALS**

Durability of materials is not only limited to the structure of the home but also to internal fixtures and fittings. This is relevant because standard New Zealand homes have not been designed to cope with the pressure of large families that can be around 15 people in one home. (Chee et al., 2002)

**LOCATION OF THE HOUSE**

The positioning of the house on the site is important (Faumuina and Associates, 2002). It should ideally be positioned to maximise exposure to the sun (north facing) to ensure maximum solar gain. Secondly a master plan should be made to plan and ensure provisions are there for extensions to the building. The Otara Health Inc. report (2001) also stated that houses should be positioned at ground level, as this will make the home more accessible. It also increases the ability for indoor/outdoor flow as well as helping keep the house warmer during the winter.

**OUTDOOR SPACE**

Landscaping and vegetable gardens, outdoor cooking space and suitable fencing were three important aspects highlighted by the Pacific Housing Design Guide (Faumuina and Associates, 2002). Vegetable gardens are particularly important for economic, health and cultural reasons. For many Pacific people, an underground cooking space is important because it allows food to be cooked in a traditional way and to extend hospitality to guests during large gatherings. Suitable fencing is also important for both security and privacy reasons.

**KITCHEN AND DINING AREA**

The kitchen is an important part of the house and should be big enough to cater for larger families and frequent visitors. It should ideally be big enough for two or three people to be working at the same time. Addition it should also have adequate storage space for bulk supplies of food and cooking ware (Faumuina and Associates, 2002). The larger household sizes of most Pacific people means that the separation between the bathroom and toilet will help to ease the pressure for their use. Bathrooms and toilets should also be located away from the main entrance and at least one should be accessible for the disabled or elderly with a minimum width of 1.2m.

**BEDROOMS**

There are two main factors relating to bedrooms in Pacific households:

- Most Pacific cultures separate the living quarters of single females and males.
- Pacific households tend to be fluid and, therefore, need to be flexible in terms of how many people the house can accommodate. The Faumuina and Associates (2002) Pacific Housing Design Guide recommends that a minimum of five to six sleeping areas be available for busy times when there are lots of family members or friends visiting. Storage areas are also important so that large items such as fine mats can be stored when not in use.

**BATHROOMS AND TOILETS**

The larger household-sizes of most Pacific people means that the separation between the bathroom and toilet will help to ease the pressure for their use. Bathrooms and toilets should also be located away from the main entrance and at least one should be accessible for the disabled or elderly with a minimum width of 1.2m.

**HOUSE DESIGN REQUIREMENTS**

A number of studies have been made to investigate the housing needs and challenges of Pacific people but often these focus on affordability, poor housing conditions and health implications rather than the design issues and preferences. The following section is based on information from two different reports; the first report is the Pacific Housing Design Guide (2002), which was developed by Faumuina, and Associates for HNZC. The second report is the Otara Health Inc., 2001) report that was also reviewed in this section on Maori community housing design needs.

**DURABILITY OF MATERIALS**

Study, it was found that many Pacific people would go to extremes in order to fulfill these cultural obligations even if the needed finances were not available. In some cases, meeting cultural obligations resulted in taking out loans or ‘discounting’ food and utility bills (Chee et al., 2002).
KEY CHARACTERISTICS (see figure to right)
The key characteristics can be grouped into two main concerns: pressures of larger families and spaces, and importance of interior and exterior connections:

• large spaces with emphasis on the need to accommodate large formal occasions
• large sleeping spaces to accommodate extended family
• easy connections to the exterior
• open space available to allow formal occasions to overflow
• maximise sun and solar gains.

CHALLENGES ASSOCIATED WITH HOUSING DESIGN IN NEW ZEALAND
There are many challenges faced by Pacific people; however, the fundamental challenges associated with New Zealand’s housing design is the rigidity of the houses designed for New Zealand Europeans (Macpherson, 1997). The smaller, nuclear family designed houses do not meet the needs physically or socially of Pacific People. This mismatch in terms of what Pacific people want and what the market has supplied means that many Pacific people have resorted to the use of garages as a solution to the inadequacies of the standard New Zealand home. The evolution of this trend from ‘garage space’ to ‘social space’ has been documented in Macpherson (1997) for the Samoan community and Alati (2004) for the Tongan community. For these cultural groups (and others), the garage has been, and still is, a cost effective and simpler alternative to acquiring more indoor space. During earlier settlement for the Samoan community, garages were used as a space for unmarried men to sleep, informal entertainment, large meetings, informal living areas, social events, kava ceremonies, chapel services, language ‘huts’, bingo and music studios (Macpherson, 1997). However, as affordability becomes a greater issue, garages have been increasingly used as temporary accommodation for extended family members who are unable to afford their own place (Macpherson, 1997).

CONCLUSION
Pacific communities are an important part of New Zealand society today. Their increasingly large population in New Zealand makes them one of the larger minority ethnic groups. They also make up a large amount of state housing tenants especially in the Auckland region. Their culture and way of living is also very different from New Zealand Europeans, and while they have adapted in many respects to Western customs there should be some flexibility in the way they live to be able to express and enjoy their traditional culture and activities. More consideration needs to occur when planning for Pacific communities in terms of the size of family units and also they way in which they use the house and its relationship to the outdoors.

NZ EUROPEAN COMMUNITIES

• entry
• living space
• open plan living
• informal living
• reception space separate from main living area

CIRCULATION: circulation simple and direct
• door swings minimise obstructions within rooms
• visual or physical connection to the exterior
• rooms large enough for their specific function

ENTRY: one main entry visible from the street
• reception space inside, and separate from living spaces

LIVING SPACES:
• visual or physical connection to the exterior
• shield noise-sensitive living areas

KITCHEN:
• easy connection to the living and dining area
• often acts as a hub to the living area

BATHROOM AND TOILET:
• away from main entry and kitchen
• limited views from exterior

BEDROOMS:
• large enough to contain a double bed
• access is easy through circulation

COURTYARD:
• windows providing daylight and ventilation to circulation also provide a glimpse view of the outside

OVERALL:
• rooms large enough for their specific function
• windows positioned to restrict direct outdoor so that the short-range view from one dwelling is not directly into the main internal living areas of any neighbouring dwellings.

KEY CHARACTERISTICS
• open plan living areas
• outdoor living and connections to the exterior
• usually split into two main zones (living and sleeping) off a central entrance way
• rooms of sufficient size for functions.

Diagram of connections required between New Zealand European spaces

Entry
Living
Dining
Bathroom
Garage
Living
Living
Living
Living
Bedroom
Bedroom
Bedroom
Bedroom
Bathroom
Bathroom
Bathroom
Bathroom
Dining
Dining
Dining
Dining
Kitchen
Kitchen
Kitchen
Kitchen
COURTYARD
COURTYARD
COURTYARD
COURTYARD
OUTDOOR AREA
OUTDOOR AREA
OUTDOOR AREA
OUTDOOR AREA
Typical NZ European ‘Lockwood’ home - Vision.

Typical NZ European ‘Lockwood’ home - Poppi.

Looking forward, it is anticipated that Maori and Pacific ethnic groups will continue to be a significant part of the Auckland regional population. According to Statistics New Zealand ethnic projections, New Zealand’s Maori, Asian and Pacific populations are projected to continue growing faster than the European or Other (including New Zealanders) population. The growth of the Maori and Pacific populations is driven by births, which can be attributed to higher fertility rates and a young age structure. The latter also provides a built-in momentum for future growth. By comparison, the expected slower growth of the ‘New Zealand European or Other’ population largely reflects lower fertility rates and an older age structure.

This thesis focuses on state housing and achieving a house that meets the cultural requirements for every culture while being low cost is unrealistic. Therefore the most common elements should be incorporated into state housing to meet at least the basic cultural requirements.

As discussed in Schrader (2005), many of the design elements required by Maori and Pacific people are compatible with other cultural groups and are not exclusively desired by Maori and Pacific people. In fact, the market does supply houses that meet their requirements, however, affordability is a big issue and generally these houses are located relatively far from family and associated communities. Thus, it appears that a mismatch exists because it is difficult to find a house that meets design requirements at an affordable price and appropriate location.

Oliver (1997) states that numerous dwellings have porches, verandas and upper storey balconies, which make spatial connections to the outside world, while preserving their functional purposes as extensions of living space and providers of privacy. How society regards the relationship of internal to external space is often a measure of the importance they place on privacy. There are many common spatial requirements that align across multiple cultures (see lessons learnt). However, there are also many requirements, which are unique to a particular culture and these should be addressed within a design.

Cultural and demographic differences have implications on the housing designs required by both Maori and Pacific groups. For example, the concept of tapu and noa in Maori culture, and the importance of extending hospitality in Pacific culture have impacts on space requirements. Differences in the demographic and household characteristics of these population groups also impact on housing requirements. Maori and Pacific households tend to be large and to have many children.

2.2 - A BRIEF HISTORY
- It is better to invest more and build higher quality, long lasting homes.
- There shouldn’t be a visual difference between private sector housing and state housing.
- Large plots of land can be good but it should not be too big to maintain and have a purpose.
- Neighbourhoods need to be supported by community facilities.
- Types of tenants are constantly changing and the design should be flexible enough to accommodate different users in the future.
- Post war state housing is iconic in New Zealand and should be appreciated and looked after.

2.3 - THE POST-WAR STATE HOUSE
- Long lasting, durable materials are important to prolonging the life of the building.
- Insulations is required everywhere.
- It is better to achieve more than the minimum standard of insulation required.
- The most up to date technology should be used to prolong the life of a building.
- Even in low cost buildings, individuality is important.
- Designing a building for a single user that is not adaptable should not leave houses empty.
- Design should be a better interaction between the indoor and outdoors.

2.4 - HISTORIC TIME LINE
- Occupants and circumstances are constantly changing and state house should be flexible for this.

2.5 - CULTURAL DIVERSITY
Different cultures have different needs and buildings should be flexible to meet these needs, while a mix of cultures should be looked at when designing to find a common solution. Common characteristics between Maori and Pacific housing needs are:
- Housing of larger families and extended families.
- Desire for connections with landscape and nature.
- Privacy and separation of formal and informal spaces.
- The placement of the bathroom away from the formal.
- Requirements for optimising solar gains to be able to heat the dwelling efficiently.

Looking forward, it is anticipated that Maori and Pacific ethnic groups will continue to be a significant part of the Auckland regional population. According to Statistics New Zealand ethnic projections, New Zealand’s Maori, Asian and Pacific populations are projected to continue growing faster than the European or Other (including New Zealanders) population. The growth of the Maori and Pacific populations is driven by births, which can be attributed to higher fertility rates and a young age structure. The latter also provides a built-in momentum for future growth. By comparison, the expected slower growth of the ‘New Zealand European or Other’ population largely reflects lower fertility rates and an older age structure.

This thesis focuses on state housing and achieving a house that meets the cultural requirements for every culture while being low cost is unrealistic. Therefor the most common elements should be incorporated into state housing to meet at least the basic cultural requirements.
Many different state housing examples exist around the world, and while they are all very different they tend to show some similarities. This section will illustrate four different ‘state housing’ case studies, looking at an overview of the area, the demographics, historical and current situations, as well as general analysis of the area, concluding with a SWOT for each case study.

The four chosen areas are two neighbourhoods in New Zealand, Glen Innes (the area considered for the in-depth proposal in part 5 and 6) and Naenae, as well as the neighbourhoods, Govan, Scotland and Augustenborg, Sweden. These specific case studies were chosen for a variety of reasons to compare similarities and differences with the suburb of Glen Innes. The reason for this is to get a greater understanding of how Glen Innes, as a state housing suburb and community, sits within the other similar suburbs throughout the world.

In addition to providing interesting comparisons, each of the areas have been chosen from cities that I have lived in and currently live in Melbourne, so I have, therefore, chosen a suburb in the area I am in. During the fall 2013, I spent a semester on an ERASMUS exchange at the University of Strathclyde in Glasgow, Scotland. All of these different cities have had an interesting influence on my education as an architecture student and, therefore, using them as a base for my research into state housing suburbs seems fitting as they are relevant and accessible.

The case study of Naenae was chosen because it is built in the same historical and cultural environment, using the same style houses and techniques as Glen Innes. The designed had a slightly different approach with more focus on the garden city design principles. It has also had different development over the years with different demographics, and this illustrates interesting differences about the how the residence influence a suburb.

Govan, although it has a very different housing typology current has many of the same crime and gang related issues as Glen Innes. Also because of its location to the city water and other developments it is starting to undergo many new developments and redevelopments, threatening to gentrify the area similar to Glen Innes.

Augustenborg, similar to Govan has a very different housing typology to Glen Innes and can be compared in terms of contrasting approaches to the housing stock, but it shares a similarity in terms of culture. Both suburbs have a majority of international cultures, and while Glen Innes is only just starting to approach this in a harmonious way, Augustenborg has already established and embraced this diverse community. Augustenborg is also a successful example of redeveloping an area in a sustainable manner.

There are many differences between each case study, but there are also many common elements between all four of the suburbs. They are all suburbs of a major city. They were all planned or developed for poverty, partly due to over-population and, therefore, using them as a base for my research into state housing suburbs seems fitting as they are relevant and accessible.

The analysis and comparison of these four state houses is concluded with a discussion and the lessons learnt which later influence the design guidelines and in-depth design proposal.
Glen Innes was part of the Tamaki state housing scheme that started after the election of the first Labour government and spanned for twenty-years from the early 1940’s. The Tamaki scheme included neighbouring suburbs Glen Innes, Point England, and Northern Panmure.

It was designed to accommodate 30 000 people making it ‘the most ambitious Department of Housing Construction scheme to date’ (Schrader, 2006). The later construction of this part meant urban sprawl was a pressing issue and the area became a testing ground for new building types, including imported houses, multi-units, duplexes and housing for single people.

In the 1940’s and 50’s Glen Innes had a great reputation and state housing here was sort after, it’s reputation soon began to deteriorate. After the National government, came into power many of the poorest families especially from the slums moved into urban peripheries such as Glen Innes.

During the 1950’s and 60’s many Maori and Pacific people started moving into the area to be close to the booming industrial areas nearby. Many families could not afford housing so moved in with extended families and friends resulting in an overcrowded, single user community. By the 1970s, Glen Innes was a suburb riddled with crime and gang activity. Up until current times the perceived image of Glen Innes has been one of high crime, gang activity and poor inhabitants.

Recent gentrification, however, has led to more modern, developed housing in the area, including apartment-style properties, making the area even more desirable to live for higher income families.
Glen Innes is a community that faces many opportunities but also threats. Currently due to new development by HNZC and its opportunities but also threats. One major strength is its high population density. Auckland suburbs gentrification is a realistic threat. Close proximity to sea views and other desirable environments. Despite the most common building typology being 'good' suburbs, there is a need for a diversity of housing both in size and shape as well as flexibility for different cultures.

Crime and neglect are also two issues that have occurred because of the inhabitants but also because of poor planning that created unsafe, unused, neglected areas. To have a safer suburb these areas need to be developed. This increases job opportunities and quality of life. The high ethnic diversity of the inhabitants means there is a need for a diversity of housing both in size and shape but also flexibility for different cultures.

One major strength is its high population density. Despite the most common building typology being detached housing it has a high population density because of the high number of people per dwelling average. This is a strength but is also a threat because of over crowding and unhealthy living environments.

Many of the weakness are due to the inhabitants and their low education, low income and high unemployment. To stop these becoming threats many social changes need to happen in the community, however this is also an opportunity as there is already an existing sense of community that can be expanded. The existing railway connection to the city give Glen Innes has the opportunity for it's inhabitants to commute to the city centre for work, this increases job opportunities and quality of life.

High crime rate
Industrial area
No community facilities
Low education
Low income
High unemployment

There is a community spirit among state housing tenants and they want to stay in their neighbourhood.

Excessive crime is a free grabs of a housing suburb due to large amount of state houses.

Internal factors

HISTORY

Currently due to new development by HNZC and its opportunities but also threats.

Auckland suburbs gentrification is a realistic threat. Close proximity to sea views and other desirable environments.

Recently due to new development by HNZC and its opportunities but also threats.

FINDINGS

EXTERNAL FACTORS

HNZC wanting to develop the suburb mostly for private sector housing.

Transport connection
Location - Sea views other good suburbs
Large amount of housing owned by NZHC

3.3 NAENAE

After World War II in 1945 under the Labour government, Peter Fraser chose Naenae as an ideal site to become a new state housing 'designer community'.

It was planned to be a model suburb where a suburban state housing estate would support a reasonable shopping centre, which would serve as a social hub for the area. The plan hoped nuclear family life would thrive in such an environment. Due to the high demand for housing the shopping centre was only partially realized. Plischke's design for the Naenae community was based on Venice's social nexus, San Marco Square. [...] [He] hoped his scheme would become an equally busy and vibrant living space (Schrader, 2005).

Although a strong sense of community was evidently forged in Naenae, it did not evolve as its planners had intended (Schrader, 2005). With non-existent footpaths, unpaved streets, and unfenced front gardens that were unsafe for children and devoid of trees, plants, and lawns, many people were brought together through common adversity resulting from the conditions of their new suburban environment.

Today the suburb of Naenae houses a population who are some of the most deprived in the country and the centre reflects the associated social and economic problem (Boorman, 2003). Despite this, it was evident from the case study that a sense of community still exists in Naenae, even with their economic problems’. (Bowman, 2008). Despite this, it was evident from the case study that a sense of community still exists in Naenae, even with their economic problems (Bowman, 2008).

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48% of Naenae’s population is European lower than Wellington’s 69.8%.

2.9 PEOPLE is the average number of people per household in Naenae this is higher than the 2.6 average for the Wellington region.

80% of the housing stock in Naenae North and South are detached housing.

2856 is the combined number of occupied dwellings in Naenae North and South, 1.7% of Wellington’s housing stock.

65% of the housing stock in Naenae North and South are detached housing.

42% of Naenae’s population is European lower than Wellington’s 69.8%.

1025.9 inhabitants per km² is the density for Naenae North and South, lower than the overall average density of 1586.8 inhabitants per km² for the Wellington region.

658m² is the average plot size in Naenae North and South.

80% of the housing stock in Naenae North and South are detached housing.

A lot of the issues Naenae face are from the original planning and that there was no consideration of the context and users. This lack on contextual consideration resulted in spaces that were not used and spaces that were required but not provided. This shows how important it is to consider the context and design for the users. However, New Zealand is a young country with a constantly changing demographic and therefore new design solutions need to be flexible to accommodate for these changes to ensure the longevity of the area and the buildings.

Like many other state housing communities crime in Naenae is a big problem because of the lack of community facilities and the uneducated low income inhabitants. While new crime prevention pilots have been implemented by the police, these will only succeed if the are supported by the community facilities. It can be seen that the areas that are looked after and maintained are those with the most community involvement.

In order to get the community to respect and look after it, there needs to be a sense of ownership and responsibility over certain areas. The green belts in Naenae show how this has been unsuccessful. They do not serve a specific purpose and therefore do not have a particular user and left unused and unsafe. While they are flexible in ways that they do not provide and specific function they also create an environment where people are not sure if they are allowed or how to use it.

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In the 18th and 19th centuries, textile mills and coal mining were important; in the early 19th century shipbuilding emerged as Govan’s principal industry. In 1864, Govan gained borough status and was Scotland’s fifth largest burgh. It was incorporated into the city of Glasgow in 1912 (Manly, 2012). However, the people of Govan often proclaim to be Govanites first and Glaswegians second.

19th century shipbuilding emerged as Govan’s principal industry. In recent years, the decline of shipbuilding meant that the main industry in the area was winding down. This has defined the district, and not in a good way. More recently Govan has come a long way partly due to the opening of the Transport Museum and the construction of a new hospital complex. After shipbuilding drastically decreased, subsequent remedial approaches followed with a ‘top down’ approach to solving problems, distributing funding and maintaining housing. Housing maintenance spiralled out of control along with social problems. A large number of housing in Govan is council housing or social housing. The low economic band of the inhabitants has made turning the area around more of a challenge.

The tenement houses (mostly council/social housing) is only standing as an asset today because of the community in the 1970s. When inhabitants were told they were going to tear them down because they did not have the modern amenities – they still have to go outside to use toilet blocks – they rallied together and were the driving force to get toilets implemented in the buildings. It is the community involvement which save the iconic sandstone tenements which are still standing today.
Govan has the reputation of being one of the most dangerous and crime-ridden areas in Glasgow. Organisations and the community are working together to develop Govan out of this stereotype. Organisations and the community are working together to develop Govan out of this stereotype. For example, the two football teams in Glasgow have such devoted supporters people are very often stabbed for wearing the wrong football colours in the wrong neighbourhoods. Issues like this are not often considered but have a huge impact on the success of a community.

As the population aged and children became older, it was evident that employment for youth was missing, it was not any longer about ‘meaningful leisure’. As the area started to change residents became to feel insecure. The turnover of tenants was increasing and the area became less manageable. The majority of housing is tenement housing which makes it more difficult to bring new people and cultures into the area. For example the two football teams in Glasgow have such devoted supporters people are very often stabbed for wearing the wrong football colours in the wrong neighbourhoods. Issues like this are not often considered but have a huge impact on the success of a community.

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Augustenborg is an example of how public housing/state housing neighbourhoods can be redeveloped successfully so that the community is involved and their neighbourhood is indistinguishable from private sector neighbourhoods. They have taken two problems they had; flooding and social issues and turned both of them into new features that enhance the area. The problem of flooding was address by creating visually appealing sustainable systems that enhance the aesthetics of the entire area in combination with green roofs that has transformed the neighbourhood creating jobs, education, getting recognition through awards and being a showcase redevelopment all on top of solving the original issue of flooding.

To improve the area and its sustainability the used the inhabitants input and involved them in the process. This not only helped solve some of the social issues and brought the community together it also helped develop a stronger and more successful design. Bring the community together for this also acted as a platform for more social improvements to happen. Now the community feels like they have more responsibility for their community and have implemented many social changes the include many cultures and age groups.

Creating an overall more sustainable neighbourhood was one of the driving forces for this redevelopment and includes it early on in the process as well as community input is evident in the success of the project.
By comparing these four different case studies conclusions can be drawn and lessons learnt from each country’s and city’s approach to their state housing. There are many similarities and differences between each case study and it is these findings help form well thought out design guidelines.

They all dealt with different cultures and contexts however it was clear with each case study that there was a key theme to the issues or success of the area. The four themes taken from the case studies are:

- **Culture**
- **Design and context**
- **Community**
- **Sustainability**

The different cultures in Glen Innes is very important and has not been integrated into planning or houses so far, to have successful neighbourhoods in the future this needs more considerations like in Govan. Govan is only dealing with one main ethnic groups, but they do have to consider different cultures within that and through throughout community involvement in redefining their identity they are succeeding.

It is evident in Naenae how important design that considers the context is. If it had been planned for a New Zealand town rather than a Venetian town there may have been more success in the project. Understanding the place and people is key to creating a successful design.

Community refers to sense of community, community involvement and the actual community and its assets. Govan deteriorated after the industries stopped, they realised that their strengths were their community and community spirit - even if it was coming together for bad things, the existing building and their heritage. Using these for the driving force they have started turning their district around in a holistic manner.

Sustainability refers to environmental, social, financial and cultural sustainability. Augustenborg has manage to redevelop what was a problem public housing neighbours into a thriving public housing neighbourhood that functions sustainably across all four sections. By including all of these elements in early stages of the design process and using it as a driving force for the design they have managed to develop a very successful and functioning neighbourhood for people in need.

Each suburb fails and succeeds in different ways but lessons can be learnt from all of them to help inform design strategies in part 5 and to create a more holistically sustainable final in-depth design in part 6. This understanding of how Glen Innes sits within the context of other state housing communities has been crucial in forming strategies for future development to ensure that it is the most sympathetic and understanding design approach for the location and inhabitants.

**3.3 NAENAE**
- Culture should be utilised to make neighbourhoods unique and interesting.
- There is a choice to take the best out of a bad history and highlight it or turn your back and pretend it didn’t happen.
- Use the assets and resources that have been inherited.
- Community involvement can reawaken the soul of a place.
- Community established what the identity of a place can be.
- If the community is involved there are less protest about development.

**3.4 GOVAN**
- Ownership over areas to give a sense of responsibility.
- Community involvement is needed.
- Planning and implementation of entire master plans is important.
- The consideration of context and the user.
- Forward thinking.

**3.5 AUGUSTENBORG**
- Sustainability should be implemented in a holistic manner.
- Community involvement is important.
- Redevelopment can create permanent jobs and education.
- Redevelopment should thrive for the best not just band-aids.
- Sustainability can be implemented creatively.
- Utilise issues as a driving force for solutions.
- Sustainability should be integrated from the start of the design process not stuck on after.

**3.6 DISCUSSIONS**

Sustainability refers to environmental, social, financial and cultural sustainability. Augustenborg have started turning their district around in a holistic manner. Sustainability is essential to environmental, social, financial and cultural sustainability. Augustenborg has managed to transform what was a problem public housing neighbourhood into a thriving public housing neighbourhood that functions sustainably across all four sections. By including all of these elements in early stages of the design process and using it as a driving force for the design they have managed to develop a very successful and functioning neighbourhood for people in need.

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**3.7 LESSONS LEARNT FOR DESIGN**

**3.2 GLEN INNES**
- New development shouldn’t push existing tenants out.
- New development should involve more community engagement.
- Crime prevention should be incorporated into the planning.
- Different cultures should be catered for.
- Sustainable connections to public transport should be encouraged.
- High population density can be achieved with detached housing.

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Redevelopment projects can be small or large ranging from a single building to entire new neighbourhoods. Some redevelopment projects have been incredibly controversial. Controversy usually results either from the use of eminent domain, from objections to the change in use or increases in density and intensity on the site or from disagreement on the appropriate use of tax-payer funds to pay for some element of the project. The redevelopment in Glen Innes North is one that has caused a large amount of controversy. The controversy is over state housing tenants being forced to move from their homes (some elderly have been in their state home for 50 years) in order to create this new development which will be mostly for the private sector gentrifying the area. The redevelopment itself does not seem to improve the community enough to outweigh the hardship it causes to people already in need.

This part examines and compares three different ‘state housing’ redevelopment design (excluding Glen Innes) that have recently been implemented in three different areas. The examination and comparison of these different redevelopments is important for three reasons. Firstly there is no other large state housing redevelopment in New Zealand at the present time, so it is not possible to make comparisons. Also because of how isolated New Zealand is, often thinking and design is very inward and not always the most successful solution. Secondly the state housing redevelopment comparisons are a continuation from part three where the suburbs as a whole were analysed. Thirdly this thesis aims to illustrate an alternative redevelopment in Glen Innes and therefore there are many conclusions and findings that can be found by examining and comparing these examples.

The way in which this part is structured is that it provides an overview of each redevelopment project and then each project is compared to the redevelopment of Glen Innes on three different levels. On a planning level Augustenborg highlights the lacking of sustainable consideration in Glen Innes. The comparison of the retrofit in Glen Innes and in Govan illustrates how retrofitting can be done in a way that modernises the buildings technology as well as aesthetics. Thirdly as there is no redevelopment in Naenae, Lilyfield in Sydney, Australia has been chosen to compare how new build redevelopment can be sustainable and creative. These comparisons will illustrate different things that can be learnt for the existing redevelopment in order to make part five and six of this thesis more successful.

The conclusions drawn from this part in combination from the other research will help form design guidelines and inform the final in-depth design.
4.2 Glen Innes Overview

The project

The Northern Glen Innes Housing redevelopment project is a partnership between Housing New Zealand (government body) and Creating Communities (private body) to provide more houses and healthier homes, for a growing Auckland. Creating Communities has contracted to buy and redevelop 156 existing sites from Housing New Zealand. The total development area is approx. 13 hectares. Creating 260 new homes of which only 78 will be state housing.

Some of the sites are zoned to permit construction of apartment buildings however Creating Communities thinks that there is more demand for modern terrace housing in Glen Innes, than for apartments. Most housing, though, will be free-standing. We expect less than 50 homes (15%) of the proposed housing to be state-housing.

The design

According to the creative communities website, they strive to achieve the best urban outcomes including the houses engaging with the street and open spaces – contributing to a safer neighbourhood. They think that there is more demand for modern terrace housing in Glen Innes, than for apartments. Most housing, though, will be free-standing. We expect less than 50 homes (15%) of the proposed housing to be state-housing.

THE PROJECT

The Glen Innes Housing Redevelopment Masterplan (Creating Communities, 2012) included the following:

- Diversity
- Character
- Designed to ensure accommodation is also available to wheelchair users.

Other principal they include are density, character and engagement with the street and open spaces. Other priorities include are diversity, character and safety and sustainability. Some of these aspects are as followed:

- Context
- Landscape
- Use of mixed building materials to create variety.

A variety plants, specifically chosen, will be planted in the front yards to create a unified appearance from the street.

SUSTAINABILITY

New houses will have modern living standards, where the building is warm and dry. Upgrades to storm water infrastructure will be evidenced.

Lilyfield Housing Redevelopment (Sierins, 2011).

The Lilyfield redevelopment project was the first multi-unit residential project in Australia to be awarded a 5 star Green Star rating and the first social housing scheme in Australia to gain a Green Star rating. This project sets a new standard for social housing developments and demonstrates that environmental, economic and social sustainability outcomes are achievable.

The project involved the demolition of 40 low-rise residential dwellings in the construction of an 88 dwelling multi unit housing facility. The selection of the site was based on stock condition, safety concerns, location and size. The redevelopment provides additional housing in an inner city location and was designed to meet current and future housing priorities.

THE DESIGN

The new dwellings are located in six separate low-rise, two and three-storey buildings, which are arranged around the perimeter of the site. The buildings consist of one, two and three-bedroom configurations with entries oriented to the street and private balconies or courtyards oriented to the large central courtyard.

The built form is fully integrated and in keeping with the character of the neighbourhood.

The introduction of bright, contemporary colours echo Sydney’s vibrant cityscapes.

Recessed balconies and projecting balcony slabs create articulation and shadows and add visual depth to the facades.

ESD considerations, assisting in the control of solar penetration.

Generous open spaces and courtyards.

Each dwelling has private open space in the form of a ground level courtyard or at least one balcony with optimum solar orientation north/ east aspect.

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The Lilyfield redevelopment sets a new standard for sustainable social housing in Australia (Housing NSW, 2012).
Riverside retrofitting in Govan. Photo taken from the other side of the River Clyde (Authors own image, 2014).

Along with the physical history they have tried to reclaim the ‘true identity for Govan’ (Manly, 2012). This concept has been echoed through different redevelopments that recognise Govan’s inherent assets and resources. The redevelopments try to showcase everything positive about Govan, and it’s unique history.

‘Govan is rich in stories. It’s people, resilient and strong. From the Rent Strike campaigns during the First World War, to the loss of shipbuilding and associated prosperity, the demise of local cultures and tradition has hit the community hard. Despite such strong connection to Glasgow, the area has suffered extensive neglect’ (Manly, 2012). This concept has been echoed through different redevelopments that recognise Govan’s inherent assets and resources. The redevelopments try to showcase everything positive about Govan, and it’s unique history.

Ambitions aims are set to create a high well-being and low carbon community. Organisations are trying to achieve this by ‘promoting grass roots, people-centred approaches to engage younger, often marginalized sections of the community, within a vision for bettering themselves and acquiring necessary skills and respect for gaining a sense of belonging, purpose and value for Govan’ (Manly, 2012).

The considerations of the history of the area and cultural ideas have been considered and future development aims to enlive these two ideas while also ensuring both economic and cultural enterprise is mutually beneficial. The considerations of the history of the area and cultural ideas have been considered and future development aims to enlive these two ideas while also ensuring both economic and cultural enterprise is mutually beneficial.

The heritage buildings predominantly social housing is only standing as an asset today because of the community in the 1970s. When inhabitants were told they were going to tear them down because they did not have the modern amenities – they still have to go outside to use toilet blocks – they rallied together and were the driving force to get toilets implemented in the buildings. It is the community involvement which save the iconic sandstone tenements which are still standing today.

There are several groups an organisations focusing on implementing positive change in the streets, buildings and public spaces of Govan. There has been a significant focus on the heritage buildings, which has spearheaded a lot of the current efforts. Although there is a high cost and further investment to achieve this, saving the heritage can greatly benefit the area.

Existing Glasgow Housing Association property has been given a new lease of life with this Eden project on the Riverside Estate. The complete renovation involved re-roofing and cladding of properties. The redevelopment also included fitting new kitchens and bathrooms and all the houses have been rewired. The complete renovation involved re-roofing and cladding of properties. The redevelopment also included fitting new kitchens and bathrooms and all the houses have been rewired.

In addition to flood protection and social redevelopment they also renovated 1600 MKB apartments improving their energy efficiency, improving their waste management as well as implementing renewable energy sources (WWF, 2012). These apartments are predominantly seven storeys and while it is dense in buildings it has a very low population density as many people live in smaller families or alone.

In addition to the social issues that were occurring in Augustenborg another issue was flooding during heavy rain (Aun, 2009). To solve this problem they integrated flood protection into beautiful outdoor environments by building dams and open water channels that were aesthetically functional to lead the water away. This was the first sustainable measure that was implemented, and they wanted to continue to see Augustenborg develop in a broader ecological context.

Ekotriad Augustenborg developed as is a collaboration between the organisations, agencies, associations and companies in the area. Extensive work with the change infarm environments, vegetation and common areas began with the residents (Aun, 2009) wishes first. There is also a communal activity, called Green Roofs, which organizes conferences and lectures with ecological themes (Aun, 2009). There are also many other collaborations with many different cultures and age groups that have improved the social sustainability of the community as well as making use of the resources they have.

For example, ‘from the start residents were given a leading role in the project. They were engaged via surveys, workshops, and festivals. They contributed to the design of the waste separation system, green spaces, and Melin’s first carpool, and to choosing the renewable energy sources. One-fifth of the residents participated actively, and 40 people who were educated in sustainable development later got jobs’ (WWF, 2012).

In addition to flood protection and social redevelopment they also renovated 3400 MKB apartments improving their energy efficiency, improving their waste management as well as implementing renewable energy sources (WWF, 2012). These apartments are predominantly seven storeys and while it is dense in buildings it has a very low population density as many people live in smaller families or alone.

This pioneering project which included water management, green roofs and social transformation are why ‘In 2010, Malmö received the UN’s prestigious World Habitat Award for its Ecodistrict Augustenborg’ (WWF, 2012). What was a low-income public housing area with many social and environmental problems has transformed into a sustainable city district. It has become a centre for green roofs and home of the Scandinavian Green Roof Association with the world’s first botanical roof garden, with a living exhibition of green roofs and a sustainably inclusive community (WWF, 2012).
The two neighbourhoods of Augustenborg in Malmö, Sweden and Glen Innes North in Auckland, New Zealand share many similarities while being on the opposite side of the world. They were both originally state housing communities with a very diverse ethnic make up of inhabitants. While the redevelopment of Augustenborg was also more of a sustainable retrofit of the buildings, the land and the community Glen Innes is very opposite as it is some retrof, but mostly new. ‘New is better’ is something far to many people consider as true, but as you can see with the comparison of these two neighbourhoods, Glen Innes could improve a lot by learning from what has taken place in Augustenborg.

The most obvious difference between these two plans is level at which sustainability has been considered. Augustenborg had one main problem, its flooding. The way they approached the redevelopment of this was not just to extend their infrastructure but to consider the problem holistically and work out how to accommodate this issue in a sustainable manner within the community as a whole. The result of this is a very environmentally and socially sustainable community which no longer has a flooding problem and in turn has a improved community. This is not the case with Glen Innes while they talk about the sustainability of the project it is just smoke and mirrors. Some credit is due for taking a step in the right direction however, that is all that has been done.

Augustenborg has also used the problems they had as a driving force for better solutions. They have gone beyond just fixing the problems and have utilised them to create new jobs, more education and to make the area and attraction from all over the world. They have made a real long term investment in the neighbourhood where Glen Innes seems like a quick fix solution.

Retrofitting is usually perceived as being as waste of money especially with older buildings. Researching state housing that has been retrofitted has been a challenge as in most cases new build has been the desired goal. Retrofitting offers many positive however and not just because you are extending the life cycle of a building. It keeps the same context in the building fabrics and reduces gentrification and gives the community a sense of familiarity. When it does come to retrofitting in general not just for state housing it all tends to be very minimal and functional not adding much to the aesthetics of the building.

In the case of Glen Innes when you compare the before and after photos there is a huge amount of difference between the two and even the choice of colour in the new building can look as if it was already old instead of being completed in recent years. The approach at Glen Innes has also been very unobtrusive and cheap to do. No major issues were tackled only minor things such as insulation and upgrading windows as we as surface things like a new coat of paint.

Similarly in Govan the retrofit of this building leaves a lot for the imagination. While it has tackled some major functional issues the aesthetics have not been considered. While in the new build redevelopment in Govan there is a lot of lovely bright architecture popping up it is not the case here. By added more colour or some form of customisation it would create greater pride of the building and the area. One positive to this retrofit is it extended past just the building and a lot of care has gone into upgrading the surrounding public green space at the same time. The combination of these two together is what makes this redevelopment successful. There is also a very strong sense of community in Govan and they have had involvement in a majority of the redevelopment in Govan which has reduced in many ways the community. While there was some community involvement in Glen Innes it was the wrong kind now that work is being completed the community is coming together to protest. While this has encouraged a sense of community it is better that this is established in a positive way rather than an angry one.

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Similarly in Govan the retrofit of this building leaves a lot for the imagination. While it has tackled some major functional issues the aesthetics have not been considered. While in the new build redevelopment in Govan there is a lot of lovely bright architecture popping up it is not the case here. By added more colour or some form of customisation it would create greater pride of the building and the area. One positive to this retrofit is it extended past just the building and a lot of care has gone into upgrading the surrounding public green space at the same time. The combination of these two together is what makes this redevelopment successful. There is also a very strong sense of community in Govan and they have had involvement in a majority of the redevelopment in Govan which has reduced in many ways the community. While there was some community involvement in Glen Innes it was the wrong kind now that work is being completed the community is coming together to protest. While this has encouraged a sense of community it is better that this is established in a positive way rather than an angry one.

The two neighbourhoods of Augustenborg in Malmö, Sweden and Glen Innes North in Auckland, New Zealand share many similarities while being on the other-side of the world. They were both originally state housing communities with a very diverse ethnic make up of inhabitants. While the redevelopment of Augustenborg was also more of a sustainable retrofit of the buildings, the land and the community Glen Innes is very opposite as it is some retrof, but mostly new. ‘New is better’ is something far to many people consider as true, but as you can see with the comparison of these two neighbourhoods, Glen Innes could improve a lot by learning from what has taken place in Augustenborg.

The most obvious difference between these two plans is level at which sustainability has been considered. Augustenborg had one main problem, its flooding. The way they approached the redevelopment of this was not just to extend their infrastructure but to consider the problem holistically and work out how to accommodate this issue in a sustainable manner within the community as a whole. The result of this is a very environmentally and socially sustainable community which no longer has a flooding problem and in turn has a improved community. This is not the case with Glen Innes while they talk about the sustainability of the project it is just smoke and mirrors. Some credit is due for taking a step in the right direction however, that is all that has been done.

Augustenborg has also used the problems they had as a driving force for better solutions. They have gone beyond just fixing the problems and have utilised them to create new jobs, more education and to make the area and attraction from all over the world. They have made a real long term investment in the neighbourhood where Glen Innes seems like a quick fix solution.

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LESSONS LEARNT FOR DESIGN GUIDELINES

New build developments gives freedom of choice that is not always available to retrofitting older sites. While the wasted resources and embodied energy is high in demolishing existing building stock sometimes what can be achieved with new build redevelopment can outweigh or at least have a significant impact on the future use of the site. In order to achieve this the long term picture needs to be accessed. Designing for the future and not for the present is something that is always an issue and especially when it comes to state housing when these redevelopments are funded by the state or similar group. It is often about what is the cheapest, quickest solution that will see change the fastest. While this can be seen as a necessity for the government bodies or organisations so it is perceived that they are doing something about current issues. It is not always the most environmentally, financially or socially correct solution.

Lilyfield has set new standards for public housing developments in Australia. It demonstrates that highly sustainable state housing outcomes are both realistic and achievable in terms of function, project demographics and housing affordability.

The project features passive solar design attributes, with all units having north or east facing living areas and housing affordability.

The redevelopment of Augustenborg forces on the need to keep a successful design. How something ages should be considered more. There are many different ways to achieve standard outcomes. How something ages should be considered more. Threw and threats can become opportunities

4.5 NEW BUILD COMPARISON

LILYFIELD

STRENGTHS
- Colourful and cheerful.
- Sustainable building
- Community have stood behind and have pride in.
- Colour can add more life to a retrofit development

WEAKNESSES
- Boring and cheap looking.
- Welcome street frontage.

GLEN INNES

STRENGTHS
- Colourful and cheerful.
- Sustainable building
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- Colour can add more life to a retrofit development

WEAKNESSES
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4.6 DISCUSSION

Through-out this part the many different approaches to redevelop have been discussed in depth. The variety of options is even more vast than those just covered in these examples. It is evident that there is not only one successful solution for how to redevelop the neighbourhood of Glen Innes. It is obvious that it needs to be a combination of many different approaches to become successful. Also the most successful, redevelopments are those that the community have stood behind and have pride in.

The most obvious thing highlighted are the strengths as a community to make it flourish. Sustainability needs to be encouraged in building design and every day life.

4.7 LESSONS LEARNT FOR DESIGN GUIDELINES

GLEN INNES

- It is better to invest more for better results and long life spans.
- How something ages should be considered more.
- The overall design should be sustainable in all areas not just quick fixes.
- Quick fixes are not the best solution.
- Sustainability needs to be encouraged in building design and every day life.
- Cars should no longer have hierarchy over green spaces and pedestrian routes.

LILYFIELD

- It is important to redevelop not only the building but also the surrounding area.
- Community should be used as much as possible to keep a successful design.
- Retrofit should be more than just functional. Colour can add more life to a retrofit development
- There should be involvement from the community.
- It should encourage a sustainable every day life.

Retrofit examples are often the most exciting development as budgets are low and plans are often as less invasive as possible. The Govan retrofit redevelopment is the least exciting development happening in the area mostly because it is basic. While it is not very exciting there has been a large community involvement and it is good that some of the familiar and existing building stock remains aesthetically similar to reduce too much gentrification. In addition to the retrofit of the buildings the surrounding landscape has also been redeveloped and this helps to create a more holistic and complete development to the area.

4.5 - PLANNING COMPARISON

- Threats and weaknesses can become opportunities and strengths.
- Should be looked at as challenges.
- There are many different ways to achieve standard outcomes that can be much more beautiful.
- Go beyond fixing problems and work out how these can give back to the people and the community.
- Cars should not have hierarchy in the plan.

4.4 - RETROFIT COMPARISON

- A place to be proud of.
- Colour can easily bring life.
- Sustainability should be a driving concept not after thought.
- It is possible to have affordable sustainable state housing.
- Colour can add more life to a retrofit development.
- There should be involvement from the community.
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4.6 NEW BUILD COMPARISON

- Create a place to be proud of.
- Colour can easily bring life.
- Sustainability should be a driving concept not after thought.
- It is possible to have affordable sustainable state housing.
- Colour can add more life to a retrofit development.
- There should be involvement from the community.
- It should encourage a sustainable every day life.

The redevelopment of Augustenborg forces on turning their weaknesses and threats into positives which have now been developed even further and make it an even more successful neighbourhood in terms of the environment, create jobs and also integrating many different cultures.
PART FIVE

PART FIVE COMBINES THE FINDINGS FROM THE PREVIOUS RESEARCH TO FORM GENERAL DESIGN GUIDELINES AND THEN ILLUSTRATES HOW THEY CAN BE APPLIED TO A SPECIFIC SITE. IN ADDITION IT EXPLORES ENERGY RETROFIT STRATEGIES IN GENERAL AND APPLIED TO A SPECIFIC SITE.

The purpose of part five is to take all of the conclusions, findings and lessons learnt from the previous research to form general, regenerative design guidelines for post-war state housing in New Zealand. The design and sustainability guidelines are ‘general’ so the benefits can be applied to a wider group. The state housing typology across the country is very similar (apart from some climatic conditions that can be easily managed in the design protocol). Therefore these guidelines can be applicable for state housing and private sector housing across the country. In addition to this 5.7 showcased how these design guidelines can be applied to a specific site – in this case it is the site of 7 Leybourne Circle, Glen Innes, which will be used for the in-depth design proposal in part 6. This also shows generally the design concept and strategies for the proposal in part 6.

These guidelines are important to help cohesive designs be created and ensure that sustainable regenerative design principals are considered from the conceptual level. In addition to this, design guidelines look at the wider picture and help ensure that the redevelopment considers the site as well as the building.

The guidelines are based on findings from the previous research in combination with the guidelines set by HNZC as well as regenerative design principals and sustainability principals based on the book ‘A Green Vitruvius’ with further research related specifically to New Zealand.

In addition to regenerative design guidelines the start of this part explores energy retrofit strategies to first understand how to make the existing building stock healthy and give it new life. This part is organised with introductory information about the typical New Zealand home and the condition they are in as well as their main energy use. Following the introductory information there are arguments behind retrofit versus demolish and rebuild and then a brief introduction to regenerative design to help explain why this design approaches have been chosen.

Sustainable retrofit strategies explore in-depth strategies specially for light weight timber frame homes. All of these strategies aim to meet the New Zealand Building Code and go beyond it where possible. The retrofit strategies are also accompanied by a cost effective analysis to demonstrate clearly the differences between each strategy. These strategies like the guidelines are explained in general and then how they can be specifically applied to the chosen site of 7 Leybourne Circle.

The combination of both regenerative design guidelines and energy retrofit strategies forms a very solid foundation of information to then build a cohesive and successful design concept on.
et al. carried out research on life cycle
State house and mass housing (1930–1970)

prior insulation and post insulation. there were no insulation requirements for housing in
much of New Zealand's building stock. Mandatory
generalisations can be made about the majority
housing is very similar in terms of dwelling size and
The housing stock for both private and state
floor and ceiling insulation.
in recent years some have been fitted with under
some have had next to no improvements and only
change ownership about every seven years, and it is
this change of ownership that give opportunities for
change ownership

Census showed that of the total number of houses
being built each year (Storey et al. 2004). Mithraratne (2007)
did a survey across 5316 houses in New Zealand. The survey
covered the current state of their home and what their future improvement preferences are.
Some of these findings are:

45% of existing homes are modestly.
16% of homes have no insulation at all.
21% of people aged 18–24 say their home is cold and uncomfortable.
86% of household say they do not have the financial means to make energy-saving
renovations.
60% of homes in New Zealand were built before insulation became a legal requirement in 1979—
just over one million properties.
25% of the nation's homes could be making their
occupants ill.
75% of people who rented or bought a home
in the past two years did not check insulation, hot water cylinders, heaters and other water and
energy efficiency.

Many of the state homes in New Zealand are not
healthy. While they are physically sound, they are in
desperate need of retrofitting to make them
dry and warm. Affordability is a big hindrance to
the work being initiated. There are some government
subsidies for insulation, but it is not always enough.
This research suggests that the typical house in New
Zealand is a single storey, detached, cold and damp
home. In 2008, NZ$2.5 billion was spent by
its homes. In 2008, BRANZ (2008) research also indicates
that are rough enough to make any energy they are
responsible for using. See figure below.

This shows that water heating is the biggest single
contributor followed by space heating and lighting,
appliances and refrigeration all about 10% that
make up the remainder 37%. This presents a clear
contributor then space heating and lighting,
Appliances and lighting are often overlooked;
however, they are big and simple energy saving
areas. New technology is growing and becoming
more affordable making it possible for simple to
implement features to be installed.

All of these features are cost and energy saving
with space heating also affecting the comfort of the home.
These are all this are very important particularly
for state housing as the states budgets are often low,
and the occupants are from low income brackets, so,
therefore, homes that are healthy and cheap to run
are very important.

5.2 TYPICAL NZ HOUSE

A house retrofit feasibility ranking system based on
the houses physical characteristics was developed by
Fung and Fung (2008). The physical characteristics
considered were factors such as access of ceiling and
door, construction features of wall and windows
and the possibility to replace space heating systems and
closets. The research concluded that villas, 1920
bungalows and 1940s 1960s state housing groups
were among the most favourable to retrofit (Page and
Fung 2008). The state housing that is focused on within
this thesis is mostly constructed in the
1950s, and this research confirmed the relevance
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Bungalow (1920–1935)

Villa (1880–1920)

Early housing (pre-1890)

State house and mass housing (1930–1970)

Early 1990s (1990–1996 before code upgrade)

Last decade (1994–2007, after code upgrade)

1960s multi-units

1970s house (pre-1978 insulation)

This house that is focused on within this thesis is mostly constructed in the
1950s, and this research confirmed the relevance

1950s (1950–1959)

Wall - Timber weatherboard (51%)

Roof - Galvanised painted steel (31%)

Windows – Timber frame (44%)

Timber framed exterior walls with weatherboard
cladding.

Timber pitched truss roof with corrugated metal
cladding.

Single glazing windows.

The amount of energy used in space heating has
SPACE HEATING RETROFIT

Due to the poor insulation in New Zealand homes, they generally waste energy. It is only since the
1970s that insulation has become mandatory in the building code and, therefore, much of the
building stock has inadequate insulation and uses a lot of energy to heat and run.

12% of New Zealand's total energy use is from
insulation

25% of the nation's homes could be making their
occupants ill.
75% of people who rented or bought a home
in the past two years did not check insulation, hot water cylinders, heaters and other water and
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1.6 million households and 30 000 new homes are

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important areas in which change needs to be made.
It can be hard to come to a black and white conclusion on which is the most appropriate form of action, as every case is different and every house is different. Where possible, retrofit should be the first choice. Most old homes are worth preserving. However, if it’s not possible to retrofit, then demolition must be done by relocation. Only when there are no other options, and the outcomes are good for the environment, should we consider demolition. It’s important to reuse, retain, and recycle the buildings and not demolish them, as well as make sure communities are undergoing more changes than necessary.

The negative environmental impact of retrofit for green health was between 12 and 38 percent less than for new construction. It is more clear than ever that there are human health reasons to re-use rather than rebuild. (Hughes, 2012)

Recycling old state housing materials is especially important as a majority of them were built with imperial measurements. It can be seen that the requirement of building element R-value has been gradually increased, since insulation became statutory in 1978. In 1978, energy efficiency has been improved in new houses. The Building Act 2004 includes sustainability as one of its key principle and requires energy efficiency and conservation be taken into consideration for each clause of the new regulations (Stoney et al., 2004).

BRANZ estimate that there are about 2000 (0.13% of the total houses) house demolitions every year (Page, 2008). This indicates that we are not so much replacing our housing stock as adding to it. This means that the problem with substantial houses is not fixing itself over time, but rather that as houses deteriorate, the problem will get worse unless we take timely action. Stoney et al. (2004) mentioned that no detail of the old house has been collected on the numbers, age, location, condition, or the instance for demolition of NZ houses, and there are big variations in the estimated annual number of house demolitions (1000-7000). Little is known of the process of demolished houses, their age, type, size, location, ownership, etc. A survey to find out these factors would be valuable in assessing the impact of demolitions on the housing stock. Since insulation became statutory in 1978, energy efficiency has been improved in new houses. The Building Act 2004 includes sustainability as one of its key principles and requires energy efficiency and conservation be taken into consideration for each clause of the new regulations (Stoney et al., 2004).

The scheme currently occurring in Glen Innes is that older houses are not required to be upgraded to meet the most recent (2007) Building Code upgrading. Comparing buildings with the same energy savings from re-use are between 4 and 46 percent over new construction when comparing buildings with the same energy performance levels. (Hughes, 2012)

Currently in Auckland buildings uses up to one third of the city’s energy and produces about the same percentage of greenhouse gas emissions. For these reasons it is a key focus of Auckland Council. They aim to reduce emissions to 40 per cent below 1990 levels by 2020. Even if the city was to remain stagnant in size and population this would be a tough challenge. This issue is even more pressing when we consider that the areas are normally very weak points for reducing energy through more efficient operations, the result also showed the importance of government’s interventions in sustainable house development.

Older houses are not required to be upgraded to meet the most recent (2007) Building Code, but in some cases roof and floor have been voluntarily insulated at the code required level. It is thus obvious that existing houses that do not have this level of insulation could be deficient. The scheme currently occurring in Glen Innes is that the government is removing old state houses and selling them as relocatable houses and developing on the empty plots. This has merits because they are recycling the buildings and not demolishing them, but it also means communities are undergoing more turmoil than necessary.

The Government Building report states that retrofits won the content (financial payback) when it comes to returns on investments, showing a 19.2 percent increase in returns on investments for retrofits versus 9.9 percent for new buildings. (Hughes, 2012)

Regenerative design is part of sustainable living although it is not the same as sustainable design. ‘Regenerative design’ implies that something endures over time without degrading, but it does not regenerate itself or create anything new. A plastic bottle sustains a plant (regenerative), and a plastic bottle sustains a plant (renewable). (Regenerative, 2012)

Regenerative design uses the biomimicry and study of ecological systems to help find solutions to problems created by humans. Biomimicry uses all species within a system and according to regenerators who explain it is better to recognise that humans are part of the ecosystem and that it should be incorporated into it rather than segregating humans and nature. This is similar to permaculture and other models for sustainable living that rely on synergies. While a lot of regenerative design research is focused on the landscape, it can also be applied to the built environment.

Natural building emphasizes sustainability and minimal environmental impact without sacrificing the health or comfort of the human inhabitants. It too seeks optimum levels for multiple factors to reduce the amount of energy required for ventilation and temperature control. (Regenerative, 2012). By obtaining goals like this, it not only provides a symbiotic role in their environment rather than a destructive role. While not possible to have a closed loop system that 100% regenerates itself, it is possible to strive for close to this.

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The refubishment of our homes and buildings is one of the greatest challenges we face. The majority of our existing stock requires some level of retrofit to enable us to live and work more sustainably.

As concluded earlier the typical New Zealand house is mainly built of timber structure with weatherboard cladding and metal roof cladding. The buildings focused on for the in-depth design proposal are similar to this with tiles roof cladding instead of metal.

**INSULATION LEVEL**

New Zealand Building Code clause H1, Energy Efficiency—Third Edition (2007), specifies minimum levels of insulation to be achieved for new houses, and it does not require insulation to be applied to the houses constructed before the implementation date. However, to ensure better building energy performance, the R-value required by it can be used as a threshold level for building element insulation retrofit. It is recommended that, for house insulation retrofit, benefits to the occupants should be realized by providing more than the minimum.

Insulation is applicable in four main components of a building envelope: ceilings, walls, windows and roofs. Insulation reduces energy use, by providing more than the minimum.

Within a building, heat loss is determined by the total loss from each element of the building envelope, and the loss from each element is proportional to its area. Also, diminishing return principles apply to each building element. This means that insulated elements cannot be compensated by applying higher insulation level to other elements (McChesney et al., 2008). A modest level of insulation throughout all of the building elements is better than a high level in one building element and nothing in other ones, as heat will be lost at the unafrated area.

**THERMAL COMFORT**

New Zealand houses are reported to be constantly between 10°C to 24°C (WHO, 1987). If ventilation (2006) discovered that housing type, climate, and house age are the main drivers of indoor temperatures. The HEEP project monitored the winter temperature for 397 houses around New Zealand, and found that the average winter indoor room temperature is 15.7°C with the mean range from 10°C to 23.8°C (Izasa et al., 2006).

BUILDING ENVELOPE RETROFIT

Generally, the aim of retouching housing in buildings, insulation, thermal mass, window size and position, orientation and location of existing houses are hard to modify. Therefore insulation upgrading is the major focus for building envelope retrofit. The key benefit of building envelope retrofit is being able to reduce the amount of energy used for heating while maximizing the internal comfort levels.

The same theory is applicable to the whole house—partially or non-insulated areas result in high heat loss. Therefore, from the whole building envelope point of view, all of the elements should have a certain basic level of insulation to achieve better performance, and partially or non-insulated elements should be avoided. This principle plays a very important role in house envelope insulation retrofit, because numerous existing houses are only partially insulated in ceiling or floor. Clark et al. (2005) found out that 15% of houses had either no ceiling insulation at all, or it was installed in less than half of the roof area. McChesney et al. (2008) estimated that about 600,000 houses without floor insulation would be able to be insulated. The potential for small trade-offs exists between the different building elements.

By installing more insulation, for instance, a thicker layer for ceiling insulation, the thermal performance will be improved greatly with extra cost due only to the increased material cost. In addition, insulation material durability is something of which one needs to be aware and it needs to be improved. Material that is insufficiently durable may cause insufficient insulation and cut down the thermal effect.

**GENERAL**

BRAH 2005 House Condition Survey shows that 60% of ceiling insulation is insufficient therefore it is assumed that if post-war state houses have existing insulation it is probably minimal and should be increased to above the minimum standards. The New Zealand Building Code recommends the minimum level of insulation of R2.8 while the optimum level of insulation for the roof and ceiling that is sort after in this thesis is R4.6. This can be achieved by two layers of basic insulation or one layer of 195mm Pink Batt Ultra (PINK BATTs, 2020). In addition to this where the soft board ceiling is in good condition it will be maintained with a new layer of GIB board placed on the underside to further increase insulation levels.

**SPECIFIC TO THE IN-DEPTH SITE**

Both roof structures at 7 and 5 Leybourne Circle are 25 degree hipped roofs with ceramic tile cladding. It is assumed there is access to the attic space through the ceiling, which is currently soft-board. R4.6 can be achieved by two layers of basic insulation. This would be used to increase existing insulation or one layer of 195mm Pink Batt Ultra can be used if no insulation exists (see figure below).

**SPECIFIC TO THE IN-DEPTH SITE**

As the internal plasterboards in both 7 and 5 Leybourne Circle are original and are in bad condition and need to be replaced and therefore the first option that is most invasive is the more effective. R8.4 can be achieved by removing the existing soft-board and fitting with bulk insulation then re-lining the wall, with materials such as Ecofoam and painted with low VOC paint.

**Ceiling insulation retrofit**

R8.4 insulation is required.

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By installing more insulation, for instance, a thicker layer for ceiling insulation, the thermal performance will be improved greatly with extra cost due only to the increased material cost. In addition, insulation material durability is something of which one needs to be aware and it needs to be improved. Material that is insufficiently durable may cause insufficient insulation and cut down the thermal effect.
The majority of post-war state housing has a suspended timber floor frame. They are usually raised off the ground and while this reduces insulation levels it allows for easier retrofitting. At least 400mm deep space is needed for the installation of insulation materials. Common floor retrofit insulation materials are fibreglass bulk insulation or polystyrene sheet insulation. Both of these can be installed into the spaces between the floor joists.

Polythene is commonly either supported by friction fit, or with clips. Bulk insulation can be supported by netting or a sheet of lining material fixed at the bottom edge of floor joists. This sheet-lining layer not only acts as support for the insulation material, but also helps to reduce air infiltration heat loss to the house. Normally, a layer of polystyrene is laid to cover the natural earth under the house to give some dampness control for the under-floor area. Insulating an existing to timber frame floor provides some extra benefits; improve airtightness, giving warmer floors, as well as reducing condensation and mould risk.

The amount of insulation installed between the floor joists depends on the depth of floor joists. It is assumed that common timber floor system is 190mm x41mm joists at 400mm spacing. Bulk insulation R4.4 with fibre cement board fixed at floor joist bottom. A layer of polystyrene covering can be placed on top of the fibre cement board. This protects the floor against frost action. As the figure (top left) shows, metal angle brace is fixed at the bottom edge of floor joist. A layer of ply or support is needed in the advantage of this solution is that bulk insulation is easily fitted in and the bottom board can be lifted and removed for future check or service pipe maintenance.

SPECIFIC TO THE SITE

7 Leybourne Circle are raised 600mm off the ground so insulation is possible. When number 5 is relocated to the new site it will be 1200mm off the ground which allows for easier insulation installation. This means that the minimum level of insulation is possible for both buildings.

VENTILATION AND AIR TIGHTNESS

New Zealand based MagicSeal claims that magnetic or a thermal strip secondary glazing has a K-value of 0.37m2K/W (MagicSeal, 2007). The income from this is that one whole layer of magnetic or a thermal strip secondary glazing of inside the window frame makes the window effectively fixed. Also, air tightness control of this option is not as good as new window unit. So, the thermal performance of attached acrylic sheet is a bit lower than the replacement window. Although, some work can be done on the existing windows by adopting this option. Lloyd’s house upgrading study (Lloyd and Callau, 2006) finds that work carried out in a second pane was more expensive than replacing with new double glazing units window. New window units can also be fitted out and regular maintenance, and timber shrinkage can easily reduce airtightness.

Many old timber frame state houses window suffer from weak airtightness, which makes excessive amount of infiltration heat loss. Therefore, reducing air infiltration through windows will be a particularly important part for retrofitting. Draught seal strips can be a low cost solution for reducing existing windows infiltration heat loss. Double glazing was introduced in the 2007 Housing Insulation Standard. Typically, double glazing can reduce heat loss from 1.6KWh/m2/day to 0.6KWh/m2/day (BRANZ, 1995). Further thermal performance improvement for double glazing window can be made by adopting low emissivity (Low-E) coating panes, which would cover the inside of the glazing. Currently, there are a range of options for retrofitting double glazing (Wimpey et al., 2004) including:

- Magnetic framed acrylic window to add the inside of aluminium frames
- Plastic film – taped and heat-shrunk to the inside of the glazing
- Frames with acrylic glazing screwed to the outside of existing window frames.

GENERAL

Ventilation is essential for indoor air quality and normally it is not a major consideration in house retrofit. Currently, New Zealand house ventilation is either too much or too little in most homes. New housing shows a trend of more airtightness in construction. Air leakage is also of the utmost importance as an airtight home with rooms often cost the same as rooms are very well insulated and accurately manufactured building components (Bassett, 1992). Achieving proper ventilation to avoid too little air infiltration heat loss. New Zealand standard (NZS 4218:2009) recommends that minimum infiltration should be 0.5 m3/h per hour for housing.

Mechanical heat recovery and ventilation systems can also be implemented to ensure there is a good quality of air flow in the buildings.

SPECIFIC TO THE SITE

Air tightness are two issues that need to be addressed with 7 and 5 Leybourne Circle, however with increased insulation in the floor/void and ceiling as well as new windows with draught proofing this will improve drastically without needing a large amount more. However there is also a risk of the houses becoming too airtight and consideration needs to made in order to accommodate this. Windows with attached secondary glazing of open-able doors and windows and natural cross ventilation can occur and a mechanical heat recovery system which has been installed to ensure a good air quality is maintained.

Once a reasonable level of insulation is installed in the building fabric, air infiltration becomes the largest element of heat loss. However, a certain rate of ventilation is essential to provide air for the occupants living in the building. Draught sealing insulation materials are available for retrofitting to openings around doors and windows, where most of the air leaks in a house occur. Airtightness is also dependent on the spaces between the floor boards.

Occasionally occupied rooms require 0.5Ach to 1.0 Ach to provide fresh air and reduce moisture (BRANZ, 1999). Too little ventilation will result in condensation problems, but too much ventilation will result in much heat loss. New Zealand standard (NZS 4218:2009) recommends that minimum infiltration should be 0.5 m3/h per hour for housing.

Mechanical heat recovery and ventilation systems can also be implemented to ensure there is a good quality of air flow in the buildings.

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5.5 COST EFFECTIVE ANALYSIS

The previous section analyzed the improvement in thermal comfort and heating energy with different retrofit strategies. As this thesis focuses on state housing, which is constantly under pressure to be cost effective as possible, considering the cost in a particular way is important in making appropriate decisions. The cost in conjunction with life cycle cost and effectiveness are considerations in the final selection of retrofit strategies. Due to the hypothetically nature of the design proposal, all costs calculations are educated estimates collected from Rawlinsons handbook 2009, as well as from phone calls with materials supply companies.

Each step of retrofit work generally includes the cost of material and labour work. Some retrofit work also incurs some extra costs for building inspection required by the local building authority or for a secondary process, such as removing existing wall internal lining and installing insulation retrofit, and then re-facing the wall. There are many different ways and levels of insulation that can be achieved; however, this comparison only deals with the minimum building code requirement and the chosen optimum levels chosen from the previous information.

## WALL

There are two methods for wall insulation retrofit considered in this thesis. Option one is using AIRFOAM insulation. Option two needs the removal of the internal lining before insulation material can be fitted between wall studs and noggings. For this wall insulation retrofit option, R-value can be assured by installing bulk insulation.

### WALL RETROFIT COSTS

<table>
<thead>
<tr>
<th>Total Area (including exterior walls only): 21.7 m²</th>
<th>Material/ Labour/ HOURS/ m²</th>
<th>Total Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnetic attached acrylic</td>
<td>Insulate, $22</td>
<td>$21</td>
</tr>
<tr>
<td>Replace with new dbl glazing</td>
<td>Other $64.45</td>
<td>$85</td>
</tr>
</tbody>
</table>

### FLOOR

Similar to ceiling insulation retrofit costs, costs of two different floor insulation options were calculated for Building Code level and optimum level. These floor insulation retrofits can be carried out with the assumption of under floor accessibility. For optimum level, bulk insulation R4.6 with fibre cement board fixed at floor joint bottom. A layer of polythene covering can be put on the natural ground to provide some moisture control. The calculation did not include polythene covering.

### FLOOR RETROFIT

<table>
<thead>
<tr>
<th>Total Area (including new build): 215m²</th>
<th>Material/ Labour/ HOURS/ m²</th>
<th>Total Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit cost</td>
<td>Insulate @600-Dwangs @800</td>
<td>$2608.4</td>
</tr>
</tbody>
</table>

### WINDOWS

For window retrofit, two options were compared. Option one gives a double glazing solution by adding a layer of acrylic at the side edge of the window frame fixed by magnetic tape. Secondly replacing with new double glazing window units. New window frames also reduce an infiltration heat loss. This solution is adopted as option two for double glazing retrofit.

### WINDOWS RETROFIT COSTS

<table>
<thead>
<tr>
<th>Total Area: 6.0m²</th>
<th>Material/ Labour/ HOURS/ m²</th>
<th>Total Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnetic attached acrylic</td>
<td>Insulate, $22</td>
<td>$21</td>
</tr>
<tr>
<td>Replace with new dbl glazing</td>
<td>Other $64.45</td>
<td>$85</td>
</tr>
</tbody>
</table>

### CEILING

For a house with pitched hip roof, ceiling insulation retrofit can be done by access into the roof loft. Options can be chosen with different levels of insulation materials. Option one is one layer of basic level insulation, R2.8, as required by the Building Code. Option two is the optimum level insulation of R4.6. Apart from more insulation material cost, labour and delivery costs of the two options should be the same.

### CEILING RETROFIT COSTS

<table>
<thead>
<tr>
<th>Total Area (including new build): 215m²</th>
<th>Material/ Labour/ HOURS/ m²</th>
<th>Total Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code required</td>
<td>Insulate @600-Dwangs @800</td>
<td>$2608.4</td>
</tr>
</tbody>
</table>

### AIR TIGHTNESS

Currently, there are many draught seal strips on the market with reasonable price. This is also a simple house upgading solution and can be done by householders. The required length of seal strips was calculated with the gap dimension of windows and doors.

### AIR TIGHTNESS RETROFIT

<table>
<thead>
<tr>
<th>Total Length: 180.2m</th>
<th>Material/ Labour/ HOURS/ m²</th>
<th>Total Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Draught control seal strips</td>
<td>$470</td>
<td>$847</td>
</tr>
</tbody>
</table>

### SUMMARY

The tables and graphs in this section illustrate the large difference between energy retrofit solutions that just meet the building code standards and the optimum level of insulation. It also shows the contrast in cost between them. While the optimum level has a substantially higher cost it delivers a greater level of comfort and quality. Therefore the optimum level of insulation is chosen. It is a largest investment but in the long term it would give the biggest pay off in energy savings as well as extending the building life not only of the retrofit but also the buildings as a whole. Another consideration is the building code is always changing and insulation levels will only increase therefore to only meet standard levels, this investment would become redundant quickly and in fitting with sustainable design principals and research from the case studies in part 5 is evident that it is better to invest more for better and longer lasting results, especially when considering creating healthy homes.
PARKS AND GARDENING
- Provide vegetable garden for economy, health and cultural reasons.
- Provide a garden for more natural and sympathetic border between neighbouring properties and shelter outdoor living spaces from prevailing winds.
- Provide gardening and composting infrastructure on-site for household food waste and plant clippings.
- Access to community gardens for further gardening facilities and shared knowledge.

COMMUNITY GARDENS
- Provide access to community gardens when garden space is limited at a site.
- Encourage communal activities at the gardens – especially between different ages.
- Provide good establish facilities such as compost and irrigation.

VEGETATION
- Maintain and restore vegetation.
- Provide native and appropriate non-native plants adapted to site conditions and climate.
- Place vegetation in strategically.
- Low maintenance vegetation.
- Existing trees maintained where possible.
- New trees native species.

STORM WATER
- Maximize permeable surfaces.
- Design site to capture, slow, and treat storm-water runoff by reducing impervious surfaces, harvesting rainwater, and directing remaining storm-water runoff to soil- and vegetation-based water treatment methods such as vegetated bioretention facilities, rain gardens, wetlands, and bioswales.

LIVING ROOM (FORMAL)
- Heart of the house (modern Maori)
- Where visitors are received/welcome/seize/sleep
- For formal meetings/private use
- Separate from formal living space
- Large covered entry porch for receiving and direct heat gain through correctly orientated windows.
- North facing solar hot water system.

LIVING ROOM (INFORMAL)
- Not exclusively formal living room.
- Dining room
- Connected to outdoors

BEDROOMS
- Big enough for 2 or more people.
- Adaptable for large families and visitors.
- Large enough in doors (most important reason)
- Separation of young single males and females. Positioned away from main living areas

MATERIALS
- Ecological.
- Respect for nature, Natural look and feel, Durable, Security and familiarity.
- Long lasting and not easily outside

ENTRANCE
- Obvious, Welcoming.
- Two entrances (front and back).
- Large covered entry porch for receiving guest (north)
- Secondary entry (south) for refuse/storage

VENTILATION
- Openable windows for natural ventilation.
- Mechanical, heat recovery system.

BATHROOM
- Bath for young children
- Toilet separate from bathroom.
- 2 toilets, 1 one with easy Access from outside.
- Bathtub for young children.

DOORWAYS
- Insulated with foam or polyurethane (Common in NZ)
- If a solid door then insulated.
- Frames R2.
- Resorted or replaced timber window frames.
- Provide double glazing.
- New trees native species.
- Existing trees maintained where possible.
- New trees native species.

GARDENS AND PLANTING
- Provide vegetable garden for economy, health and cultural reasons.
- Provide a garden for more natural and sympathetic border between neighbouring properties and shelter outdoor living spaces from prevailing winds.
- Provide gardening and composting infrastructure on-site for household food waste and plant clippings.
- Access to community gardens for further gardening facilities and shared knowledge.

VEGETATION
- Maintain and restore vegetation.
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STORM WATER
- Maximize permeable surfaces.
- Design site to capture, slow, and treat storm-water runoff by reducing impervious surfaces, harvesting rainwater, and directing remaining storm-water runoff to soil- and vegetation-based water treatment methods such as vegetated bioretention facilities, rain gardens, wetlands, and bioswales.

LAUNDRY
- Separate from kitchen and bathroom.
- Access to outside.

BATHROOM
- Toilet separate from bathroom.
- 2 toilets, 1 one with easy Access from outside.
- Bathtub for young children.

WALL INSULATION
- 90mm of recycled glass wool insulation
- Installed from the interior by removing existing plasterboard.

FLOOR INSULATION
- 70mm bulk insulation (85% recycled glass wool insulation) supported on sheet of lining to reduce an infiltration heat loss.
- Additional layer of polythene to cover ground, controlling dampness.
- Installed via access from below the house.

WINDOW INSULATION
- Existing windows replaced with Low-E and argon double glazing, R1.1, Light transmission 77%, solar transmission 65%.
- Replaced or replaced timber window frames. R.2.7

MATERIALS + FINISHES
- Re-use, local, sustainable materials.
- Recycled, reused, salvaged, or recycled.
- Presently available or recycled material.
- Traditional and modern.
- Historical, luxurious, or functional.
- Provides visual interest or designed for outdoor living.
- Effective.

WASHING LINE
- Washing lines provided to minimise energy usage, positioned to receive good drying air movement.

OUTDOOR COOKING
- “Space for” grilling or macro cooking. Requires space for cooking underground with fire.

DISABLED ACCESS
- Ramp for disabled access.

EXTENSIONS + ADDITIONS
- Carpet to allow for future extensions to the house and additional structures.

WINDOWS
- Windows not directly facing windows of a neighbouring dwelling.
- Windows not directly overlook neighbouring private outdoor spaces.
- Windows are positioned to overlook the street and the approach to a neighbouring property.

SECURITY
- Visual connection between the street and the house.
- The approach to the house from the street overlooked from within the house, and well lit.
- Areas of loose gravel can add to site security, as the noise of footsteps can indicate an intruder.

VEHICLE CROSSING/PATHS
- Vehicle crossings not taking up prime outdoor area.
- Physical and visual separation between vehicle access and children’s play areas.
- Combined pedestrian and vehicle access to minimise hard surfaces.
- Paths used hard even non-slip surfaces - especially to front door of dwelling.

PRIVATE OUTDOOR SPACE
- Used to receive good sun through much of the day and towards rear of the site.
- Sufficient shade for people to be outside protected from strong prevailing winds and sun.
- Double size for outdoor furniture.
- To provide a children’s play area.
- To provide relaxing space.
- Direct access to indoor living areas.
- At least partially hard landscaped (e.g. paved or concrete) maximising evaporation efficiency.

SIDE FENCES
- Side and rear fences may need to be higher than front fences to provide security and/or privacy.

HOUSE LOCATION
- Locate facing to maximise exposure to the sun and north facing outdoor areas, ensuring maximum solar gain and natural warmth.
- Locate to minimise prevailing wind.
- North facing grazing for solar gain and making-eaves and shading devices more effective.

FRONT YARDS
- Where children will play in front yards appropriate fencing must be provided.
- Careful division between vehicle access and child play areas to avoid accidents.
- Provide visually interesting fencings, or planting, prevent the edge of the site from appearing barren.
- Decorate the public/private space.

REAR YARDS
- Fencing should add to the security and privacy of the rear yard.
- Where private outdoor space is provided in a rear yard, fencing should contribute to the appearance.

PRIVATE OUTDOOR SPACE
- Used to receive good sun through much of the day and towards rear of the site.
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- Double size for outdoor furniture.
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GENERAL DESIGN GUIDELINES-HOUSE

RAMP FOR DISABLED ACCESS
- Ramp for disabled access.

ENCLOSE SUB-FLOOR
- Enclosing timber sub-floors improves the house energy rating for lightweight cladding systems.
- Totally enclose the sub-floor and insert wall vents at the correct spacing.

MISCELLANEOUS
- Dual flush toilets.
- Compact fluorescent lighting.
- Resource efficient appliances.
- Visible energy use metre.

CEILING INSULATION
- 35mm of 85% recycled glass wool insulation. R.6.6.
- Installed via opening in ceiling.

WALL INSULATION
- 90mm of recycled glass wool insulation
- Installed from the interior by removing existing plasterboard.

FLOOR INSULATION
- 70mm bulk insulation (85% recycled glass wool insulation) supported on sheet of lining to reduce an infiltration heat loss.
- Additional layer of polythene to cover ground, controlling dampness.
- Installed via access from below the house.

WINDOW INSULATION
- Existing windows replaced with Low-E and argon double glazing, R1.1, Light transmission 77%, solar transmission 65%.
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- Vehicle crossings not taking up prime outdoor area.
- Physical and visual separation between vehicle access and children’s play areas.
- Combined pedestrian and vehicle access to minimise hard surfaces.
- Paths used hard even non-slip surfaces - especially to front door of dwelling.

PRIVATE OUTDOOR SPACE
- Used to receive good sun through much of the day and towards rear of the site.
- Sufficient shade for people to be outside protected from strong prevailing winds and sun.
- Double size for outdoor furniture.
- To provide a children’s play area.
- To provide relaxing space.
- Direct access to indoor living areas.
- At least partially hard landscaped (e.g. paved or concrete) maximising evaporation efficiency.

SIDE FENCES
- Side and rear fences may need to be higher than front fences to provide security and/or privacy.

HOUSE LOCATION
- Locate facing to maximise exposure to the sun and north facing outdoor areas, ensuring maximum solar gain and natural warmth.
- Locate to minimise prevailing wind.
- North facing grazing for solar gain and making-eaves and shading devices more effective.
### Design Guidelines - Site

#### Outdoor Cooking

- Space for 'hangi' or 'umu' cook. Requires space for cooking underground with fire.

#### Gardening Infrastructure

- Gardening infrastructure provided. Low maintenance vegetation.
  - Trees shelter from prevailing winds.
  - Vegetation that promotes a regional identity and a sense of place.

#### Private Outdoor Space

- Vegeable garden for economic, health and social interaction. Moderate outdoor exercise.
  - Access to community gardens for further gardening facilities and shared knowledge.

#### Water Use

- Recycling grey water for toilet flushing and irrigation. Site designed to minimize or eliminate use of potable water for irrigation.

#### Storm Water

- Rainwater harvesting for portable water. (Common in NZ)

#### Vegetation

- Infrastructure for vegetable gardens provided. Composting infrastructure on-site for household food waste and plant clippings.

#### Security

- Ramp for disabled access

#### Applied Regenerative - Site

- Minimised disruption to existing habitats. Vegetation that promotes a regional identity and a sense of place.
  - Native and appropriate non-native plants adapted to site conditions and climate.

#### House Location

- North facing glazing for solar gain and making eaves solar gain and natural warmth.

#### Side Fences

- Located facing north east to maximize exposure to the late morning and north facing outdoor spaces, ensuring maximum solar gain and natural warmth.

#### Washing Line

- Washing lines provided to minimize energy usage, positioned to receive good drying air movement from prevailing wind.

#### Private Access

- Site to receive good sun through much of the day and towards rear of the site.

#### Windows

- Windows not directly facing windows of a neighbouring dwelling.

#### URBAN HEAT ISLAND EFFECTS

- Shade provided within landscape installation. Roof covered with solar photovoltaic panels, and/or with surfaces with a solar reflectance index (SRI) of at least 20.

#### Community Gardens

- Access to community gardens. Encourage communal activity at the gardens - especially between different ages.

#### Prevailing Winds

- Roofs covered with solar photovoltaic panels, and/or with surfaces with a solar reflectance index (SRI) of at least 20.

#### Community Gardens

- Slow to capture, slow, and treat storm-water runoff by reducing impervious surfaces, harvesting rainwater, and directing remaining storm-water runoff to soil and vegetation-based water treatment methods such as vegetated bioretention facilities, rain gardens, wetlands, and biowalls.

#### Benefits

- Reduce energy consumption.
- Lower maintenance costs.
- Lower water consumption.
- Reduce combined sewer overflow, thus minimizing effects on aquatic habitat.
APPLIED REGENERATIVE DESIGN GUIDELINES - HOUSE

ENTRANCE
Obvious, welcoming
Three entrances (front, carport and back)
Large covered entry porch for receiving guest (north)
Secondary entry (south) for refuse/storage

LIVING ROOM (FORMAL)
Heart of the house (modern Marae)
Where visitors are received/welcome/sleep
For formal meetings/private
Accommodate 20 people
Connection to outdoors
Flexible and can increase in size.

LIVING ROOM (INFORMAL)
Does not disturb formal living room.
Join dining room
Connected to outdoors

BEDROOMS
Big enough for 2 or more people
Adaptable for large families and visitors
Flimsy for elderly to be in the most important room
Flexible for separation of young single males and females.
Positioned away from main living areas

BATHROOM
Toilet separate from bathroom
3 toilets, 1 one with easy access
Bath for young children

LAUNDRY
Separate from kitchen and bathroom. Access to outside

MATERIALS
Ecological
Respect for nature, Natural look and feel, Durable, Security and familiarity
Long lasting and not easily outdated

KITCHEN + DINING
Large for more than 2 people
Ability to watch children play from kitchen interior + exterior
Joining dining and social space
Separate from formal living space

APPLIED REGENERATIVE DESIGN GUIDELINES - HOUSE

CEILING INSULATION
195mm of 83% recycled glass wool insulation. R4.6
Installed via opening in ceiling.

WALL INSULATION
90mm of 83% recycled glass wool insulation. R3.4
Installed from the interior by removing existing soft-board.

WINDOW INSULATION
Existing windows replaced with Low-E and argon double glazing. R1.5. Light transmission 77%, solar transmission 65%
Resorted and replaced timber window frames. R2.7

FLOOR INSULATION
190mm bulk insulation (83% recycled glass wool insulation) supported on sheet of lining to reduce an infiltration heat loss. Additional layer of polyethylene to cover ground, controlling dampness.
Installed via access from below the house.

RAPID WATER COLLECTION
Rainwater collection from roof through gutter system to storage tank.
Grey water recycled and used for irrigation and flushing toilets.

GAS INSULATION
195mm of 83% recycled glass wool insulation. R4.6
Installed via opening in ceiling.

MISCELLANEOUS
Duel flush toilets.

MATERIALS + FINISHES
Recycled materials first.
Local materials used when possible.
Long life, low embodied energy materials.
Low VOC paint such as 'Resene eco paint' used.
Plasterboard replaced with sustainable alternative such as 'Ecorock'.
Existing timber floors renovated.

INCLOSE SUB-FLOOR
Enclosing timber sub-floors improves the house energy rating for lightweight cladding systems.
Totally enclose the sub-floor and insert wall vents at the correct spacings.

SOLAR GAIN
Direct heat gain through north orientated windows.

SOLAR SHADING
Reduced heat gain and glare during the day, and heat loss at night.
500mm eave act as external shading reducing heat gain by 82%

INCLOSE SUB-FLOOR
Enclosing timber sub-floors improves the house energy rating for lightweight cladding systems.
Totally enclose the sub-floor and insert wall vents at the correct spacings.

SOLAR PANELS north-east facing at 30 degree angle. (30x30) North-east facing solar hot water system.

OPENABLE WINDOWS FOR NATURAL VENTILATION.

MECHANICAL HEAT RECOVERY SYSTEM.

AIR-VENTILATION
Open-able windows for natural ventilation.

MECHANICAL HEAT RECOVERY SYSTEM.

SOLAR PANELS
North-east facing solar hot water system.

SOLAR PANELS
North-east facing solar hot water system.

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PART SIX.

THIS PART SHOWCASES THE PREVIOUS DESIGN CRITERIA APPLIED TO AN IN-DEPTH DESIGN PROPOSAL FOR ONE LARGE FAMILY STATE HOME IN GLEN INNES, NEW ZEALAND.

6.1 INTRODUCTION

The specific site of Leybourne Circle was chosen because it is close to other areas that are planned for or already undergoing state housing redevelopment. This specific neighbourhood also has a high number Maori and Pacific Islanders currently residing there in conjunction with a high number of existing state houses.

Part six explores how all the previous regenerative design guidelines can be applied to an existing building and site in a successful way to create a new home for a large Maori and Pacific state housing family.

The specific site of Leybourne Circle was chosen because it is close to other areas that are planned for or already undergoing state housing redevelopment. This specific neighbourhood also has a high number Maori and Pacific Islanders currently residing there in conjunction with a high number of existing state houses.

The guidelines from part six are showcased both at a master plan level of the neighbourhood and also in depth in one specific property - 7 Leybourne Circle.

This section includes background information about the brief, the family and the limitations of the district plan for the area as well as site analysis and the some of the conceptual process to reach the final design proposal. Plan, sections, elevations and renders illustrate the in depth design proposal on a multiple of levels. It is then concluded with the cost evaluation that verifies the success of this approach.

This design proposal is however a hypothetical proposal and while it is based on many real facts it still remains a fictional project. In order to analyse the site and the existing structure many generalisations have had to be made.
Auckland District Plan

The district plan is a legal document which sets out the council’s policies and strategies for managing the natural and physical resources of the Auckland isthmus for the future. The plan imposes various rules to control the effects of activities and development on the Auckland isthmus.

The plan is made up of a set of maps and a written document (the text). The maps show all properties on the isthmus. They show the various zones which limit the activities and development allowed on a property. They also show any other limitations which may apply to particular properties (e.g. special height restrictions, protected trees, public works).

Zoning

Zoning is used as the primary management techniques determining the future distribution of residential activities on the isthmus. It takes a traditional approach to the extent of identifying specific locations, but the distribution pattern is performance orientated. It is based on the actual physical characteristics and functions of activities and their effects on the local environment. This approach will ensure that the level of development permitted in each locality is compatible with the ability of the area to cope with additional development.

The zoning is not necessarily orientated towards providing greater flexibility for developers appropriate to the local environment, while attempting to maintain or even enhance the amenity values experienced by the local community.

The distribution of the residential zones across the isthmus has been determined by the interaction of the following principal factors:

- Infrastructure constraints (in particular, drainage and landing);
- Access to services, shopping, and leisure opportunities;
- Local environment (topography, existing developments, etc.).

The zoning pattern is qualified by the identification of exceptional areas which warrant special controls or safeguards. There are certain areas where controls are applied to maintain the particular elements or qualities which give each area its character, such as development intensity and form, lot sizes, building height, street layout, mature trees, etc.

The site and the surrounding area is all zone 5.

ZONE 5

The site and the surrounding area is all zone 5.

OBJECTIVE

To protect and maintain the low intensity character of certain areas:

i) in order to secure their generally appreciated pleasantness and coherence;
ii) in selected locations to assist in preserving the overall integrity of the special character zones by ensuring developments occurring in adjacent residential neighbourhoods are sympathetic;
iii) in order to reflect the limited capacity of the existing environment to sustain additional developments.

The residential 5 zone has been applied generally to areas characterised by detached homes, mainly low rise (2-3 storeys), at lower densities (2-3 units per site) on sites with relatively generous areas of open space to accommodate landscaping and leisure activities. These areas exhibit a pleasantness and aesthetic coherence which is particularly appreciated by the resident community. The purpose of the zone is to maintain or even enhance the environment of these areas. In certain areas, while development is unlikely to be constrained by aspect and slope, access to public transport, community facilities and business areas is poor. In addition, some areas are also constrained by drainage infrastructures that is operating at capacity and are experiencing isolated storm water problems and minor drainage problems.

ZONE 5 REGULATIONS

- DENSITY RESTRICTION
  1 residential unit per 500m² gross site area
- MAX HEIGHT
  10m
- HEIGHT IN RELATION TO BOUNDARY
  (taken from 2 metres)
  - East and west boundary 55°
  - Southern boundary 35°
  - Northern or road boundary 15°
- MAX BUILDING COVERAGE
  55% of net site area
- MINIMUM LANDSCAPED PERMEABLE SURFACE
  Not less than 10% of net site area
- MAXIMUM PAVED IMPERMEABLE SURFACE
  Not more than 25% of net site area
- FRONT YARD
  4.5 metres except that on sites either on new sites not less than 50% of that part of the site between the road boundary and a parallel line 6 metres from shall comprise landscaped permeable surface.
- PRIVATE OPEN SPACE
  All units shall have an outdoor living area complying with the following -
  • Minimum size: 10m²
  • Minimum dimension: 3m measured at right angles to the perimeter of the area
  • Each area must be capable of containing a 6m diameter circle.
- Obstructions - Private open space shall not be obstructed by buildings, parking spaces or vehicle access and maneuvering areas.
State housing and their neighbourhoods are durable, activities and involvement.

State housing supports and encourages community response.

State housing responds to the existing context in terms of cultures.

State housing is designed for and supports a diversity of cultures.

SUSTAINABILITY

Community

Design and context

State housing responds to the existing context in terms of location, style, size and liveability.

State housing utilises its existing resources as a first response.

Community

State housing supports and encourages community activities and involvement.

Sustainability

State housing and their neighbourhoods are durable, healthy places to live with a long building life span.

Stake holders

- HNZC (Housing New Zealand Corporation)
- Existing tenants
- WINZ (Work and Income New Zealand)
- New Zealand Government
- New Zealand residents with low incomes

Communities with a large state housing population

Actors

- HNZC
- WINZ
- New Zealand Government
- Existing tenants

GOALS AND STAKEHOLDERS

THE CONCEPT

Intensification through existing building stock.

The neighbourhood of focus has an existing high population density per building because of the high number of people per building. However, the land is still under utilised and many small two or three bedroom houses are on 800m² plots. By reducing the plot size in half it allows for more manageable plots serving a similar density. Rather than building new stand alone houses in these second plots, relocating existing buildings to them is a better use of resources. Plots where these buildings were can then be used to develop larger new buildings for young professionals or the density that doesn’t require a family home.

House relocation is cheap, easy and common practice in New Zealand. The process is as follows:

The house is lifted with hydraulic jacks and the house trailer backed under the house.

House arrives on site, jacks are set up and the house trailer is pulled out.

The piles are screwed, the building is lowered onto its foundations.

The piles installed, the building is lowered onto its foundations.

House relocated - ready for services and baseboards.

House relocated - ready for services and baseboards.

Regenerative design

Regenerative design principals heavily apply to the environment and how buildings interact with it. Their core ideas about reusing the existing to create new and prolong the life and life cycle of an object can be applied to this specific design concept. The concept for this design is not only to regenerate state housing physically but also to regenerate the image and the perception around it as well as regenerating suburbs that have been in decline and giving the occupants the ability to expand and flourish socially and culturally. By using regenerative design communities can be supported and enhanced while having smaller impacts on the environment. The idea of having things as closed loops and integrated is also an important aspect in the design. Rainwater harvesting in New Zealand is common practice and is even used as portable water but these systems can be expanded and connected with other systems to create more holistic approaches to building and site.

Culturally inclusive

As spoken about earlier in this thesis, the culture of the inhabitants is very important. It is also important to make sure many different cultures are considered so that in years to come if the ethnics in the area switch there isn’t buildings left unused. In saying that this thesis design focused on designing a house for a large Pacific and Mauii family. Aspects in how this effect the design is how it is laid out, and the relationship between different spaces. How each space is used and the number of people that will be using it. The flexible and changing nature of the house is good and giving the occupants a sense of control over the house. The physical needs of the house in order to cope with so many inhabitants. The variety of ages within the house and the needs for each one of them.

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Current situation in Glen Innes

Glen Innes is currently undergoing a state housing redevelopment which the inhabitants and residents are not happy about. There has been much protest and they are still on going even now. There are many different factors that have played a role in the stress and pressure that is being felt and the inhabitants are not happy.

It has been an on going process but a lot of what was told to the community can now be seen as twisting of the truth. One of the starting factors that has started to prompt this turmoil is the policy that allows tenure status to be reviewed. The government announced that there were many people abusing the system such as a man in the South Island who was earning 100,000 dollars annually but remained in his state house while he had tenure. Outraged by these few examples this policy was passed. However, in reality it can be seen that, it was just propaganda to get the policy passed as the majority of tenants that have been evicted or relocated after it was passed is elderly and veterans especially in the areas of redevelopment.

The next event that happened was the community was asked to take part in the early planning process where they were told that 116 state houses would be relocated to make room for a new development of 210 houses. The community was happy with this plan believing that they would be getting new homes and even more than there were originally. What was not made clear to the residents was that of these 270 houses only 78 would be state houses meaning many people would have to relocate to other parts of the city. The government has completed the first stages of the redevelopment and is in the process of relocating more houses to make room for further development. The government argument for relocating old houses and building new houses is that the current ones are cold and damp and in very bad condition, however, they are advertising the relocated houses for sale as in good condition and great houses. There has been a large amount of misleading information and much of this is what is causing controversy.
The Auckland region enjoys a warm, coastal climate without any extremes of temperature.

Summers in Auckland are generally warm with high humidity, while winters are mild and damp. Plenty of rain is experienced throughout the year, but mainly in winter (June, July, August). The average daily temperature in Auckland during the summer is 23°C, while winter temperatures are on average 14°C.

Auckland is one of New Zealand sunniest regions with 2060 annual sunshine hours. The region is also very lush, with a mean annual rainfall of 1240mm.
Many of the problems that may occur when retrofiling is that when they were built NZ was still using the Imperial System and now we use the metric.

The original design and layout and subsequent unsympathetic or poorly carried out alterations may need to be addressed to rectify issues such as:

- a desire for better indoor/outdoor flow arrangement of rooms to benefit from passive solar heating
- lack of a variety of living spaces that are associated with modern houses
- lower natural indoor light levels
- more modern houses
- insufficient power outlets
- lack of proximity of bathroom and bedrooms
- inadequate vehicle access and/or garaging.

The level of lateral support required by the current version of NZS 1304. Those with foundation walls are likely to have resistance to lateral loads, but the condition of the fixings of the floor structure to the foundation should be checked to ensure that they are not corroded.

If there has been a failure of the foundations, it will be evident in the unevenness and movement (springiness) of the floor. A floor that is not level may be due to:

- soft ground that has resulted in settlement
- piles or bearers that have been removed during a previous alteration
- the floor not being levelled when the building was re-piled
- the floor joint spanning being too great for the size of the joints
- damaged floor joints.

Insufficient sub-floor ventilation or very wet soils may result in damp to the underside of the boards due to a lower moisture content on the upper surface than the underside of the boards. If there has been a failure of the foundations, it will be evident in the unevenness and movement (springiness) of the floor. A floor that is not level may be due to:

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**FOUNDATION AND FLOORING**

Generous ground clearances and generally good sub-floor ventilation of houses with suspended timber floors mean that the underside is likely to be dry. Although deterioration of sub-floor framing is unlikely to be a major problem as dry timber is less susceptible to fungal or insect attack, the sub-floor framing should still be checked.

Settlement of foundations or internal evidence of settlement may indicate that the house was built on unsuitable ground such as:

- peat
- soft or expansive clay
- uncompacted backfill.

Poor ground bearing or soft ground may be the result of wet soil which should be addressed if possible.

Existing piled foundations (without any in-situ concrete foundation walls) are not likely to have the level of lateral support required by the current version of NZS 1304. Those with foundation walls are likely to have resistance to lateral loads, but the condition of the fixings of the floor structure to the foundation should be checked to ensure that they are not corroded.

Many of the problems that may occur when retrofiling is that when they were built NZ was still using the Imperial System and now we use the metric.

**STRUCTURE**

Uninsulated framing or inadequate bracing, particularly due to the removal or modification of load-bearing walls.

Where the structure has been modified by the removal of an internal wall or by installing a larger window this may have affected the amount of bracing provided. Bracing requirements for houses of this period were also less than that required now.

**FOOT PATH**

Crossing 52m a

**WASTE WATER**

6m Diameter

**PRIVATE OPEN SPACE**

100m x 9m

**FRONT YARD**

4.5m x 9m

**LANDSCAPED SURFACE**

25%

**PAVED IMPERMEABLE SURFACE**

40%

**SURFACE**

Min. 85.5% (717m²)

**MIN.**

85.5% 11% 25% 40% 2

**MAX.**

3.5% 35% 9% 2

** FOOTPATH**

1m

**STORM WATER**

5m

**CONCRETE SUB-FLOOR**

Concrete sub-floor with timber floor (BRANZ, 2012).
The decision as to whether or not to replace boards must take into account the availability of matching materials to make the repair, and of the risk of further damage to boards during removal.

The original timber species used for the weatherboards and finishing timbers may not be available or only available in limited amounts, although this is not a problem for painted weatherboards as the timber is concealed by the paint coating.

One difficulty when continuing a line of weatherboarding with a different species is that the two species will move differently in response to changes in the relative humidity, different species and where the difference in moisture movement is great the effect may be noticeable.

Modern standard timber cladding profiles are metric, not imperial, so an exact match may not be possible. Other options for matching weatherboards include:

- having matching weatherboards made as a special run
- adding an exact match replacement from a demolition yard
- increasing the lap so that bottom edges line up for level-backed boards
- making the change from old to new timber at an external corner (where other corners in the weatherboard are not mitered)
- masking the change with a coverboard to make the difference in size less obvious.

Standing timber interior finishing profiles such as skirtings and architraves that are now available are in metric, not imperial, which makes an exact match difficult where they abut. Sheet lining materials may not exactly match the original even though the composition is similar.

Where existing claddings are damaged, a decision must be made whether to retain or replace the cladding and to what extent. Damaged weatherboards such as split, bowed and cupped boards may compromise the weather tightness of the building and will need to be split, bowed and cupped and to what extent. Damaged weatherboards such as softboard. The housing built during the 1940s-60s generally had few significant weathertightness issues. However, some houses built later in the period, particularly those without cavities or with New cladding materials and glazing systems, may have had some weathertightness problems.

Once insulation or modern windows are installed, the house has a vapour barrier and ventilation must be given to how the principles of Acceptable Solution E2/AS may be incorporated into any renovation that is carried out.

WINDOW FLASHING

Traditional window and other head flashings have simply been inserted into the lap or joint of the weatherboard immediately above the opening. As long as the flashing remains in good condition, the detail typically appears to have generally worked well at protecting the top of the window.

Acceptable Solution E2/AS requires the flashing to be lapped under the wall, but this cannot be applied to an existing wall unless the cladding is being removed. BRANZ also believes that, where a window matching existing is being inserted into an existing wall, and the existing windows have performed well, to use the same detail is a logical solution.

INTERNAL ENVIRONMENT

Older, less airtight houses have fewer internal moisture problems than more airtight houses because the air leakage through gaps around windows and doors generally removes internal moisture generated from cooking, washing, unflued gas heaters and clothes dryers.

As a house becomes more airtight through renovations and alterations, internal moisture can become a problem. Renovation work generally makes a house more airtight. Systems to remove moisture must be included in the design solutions.
ADDRESS: 5 Leybourne Circle, Glen Innes, Auckland
CONDITION:
• Hasn't been modified since construction
• In need of upgrading
• Original rimu floors and doors in good condition
• Structural sound.
• No signs of dampness.
• Amenities need upgrading
• Windows need maintenance.

ADDRESS: 7 Leybourne Circle, Glen Innes, Auckland
CONDITION:
• No modifications of layout or walls.
• Original rimu floors and doors in good condition
• Weatherboard cladding in okay condition.
• Ceiling soft board in good condition.
• Foundation wall in good condition but will be placed on new timber foundation when relocated.

IMPORTANT FEATURES
• Both of these state houses are relatively unique in the fact that they are backwards. No many of state houses were orientated this way to the street. The majority have a central entrance and the door to the side would have been the back entrance for the back yard.

NEIGHBOURHOOD GARDENS
The focus of the design proposal is on the in depth design of the large family home at 7 Leybourne Circle, however a master plan for the area has also been explored because it is important to considered everything in a wide picture as well. These sketches illustrate some simple examples of how new development could tie in with the existing context to create a more interesting street scape and different ways in which they could be formed so they have some individuality. The idea around the new development is it would be for the elderly or people without families that are low maintenance and also that they do not need big houses with big yards. Having the option to be able to garden is another big concept in this thesis to bring the community together and this would be provided in a central local for the neighbourhood.
The concept of taking two existing and in this case neighbouring houses and relocate them onto the same site to form one large family home is the driving force for this concept. By doing this it reduces the demolition and transportation cost of relocating a house and allows empty lots for HNZC to develop with new build terrace housing for state housing and to be sold to the private sector to have a mix of users in the neighbourhood. Choosing to regenerate not only the existing buildings but also to add something to the community in terms of built structure and socially and culturally is very important. The cultural needs of the inhabitants as spoken about earlier is another important aspect in how these buildings are rearranged on the new site. A combination of efficiency and utilisation of the site is very important to find the most successful design solution.
EXISTING NUMBER OF HOMES:
• 23 TWO-FOUR BEDROOM DETACHED HOMES

PROPOSED NUMBER OF HOMES
• 19 TWO-FOUR BEDROOM DETACHED HOMES
• 2 FIVE TO SIX BEDROOM DETACHED HOMES (ONE AND TWO STOREYS HIGH)
• 20 ONE AND TWO BEDROOM TERRACED HOMES

PASSIVE DESIGN
- Bringing natural light into the hallway.
- Relocating the entrance and suspended carport.
- Filling in the existing entrance with an open carport.
- Creating a framed entrance threshold.

NEIGHBOURHOOD MASTER PLAN
- Existing building
- Existing relocated building
- New building
- New site subdivision
- Plot outlines

EXISTING NUMBER OF HOMES:
• 23 TWO-FOUR BEDROOM DETACHED HOMES

PROPOSED NUMBER OF HOMES
• 19 TWO-FOUR BEDROOM DETACHED HOMES
• 2 FIVE TO SIX BEDROOM DETACHED HOMES
• 20 ONE AND TWO BEDROOM TERRACED HOMES (ONE AND TWO STOREYS HIGH)
• LARGE NEIGHBOURHOOD GARDEN

Neighbourhood garden for detached homes and terraced houses with reduced yards. Includes raised gardens, compost and storage facilities for common fruit trees, BBQ/picnic area, play area for children.

Existing home in same location only retrofitted and site reduced to fit two buildings.
The site of 7 Leybourne Circle has one existing state house, the second house from the neighbouring site of 5 Leybourne Circle is relocated onto the rear of the site creating one large family home. The original house is left in its original position while the house from 5 Leybourne Circle has been positioned to receive the most north facing light. Fruit trees run along the northern boundary to provide fruit for the family and also create a green barrier between the neighbours. Also running along both boundaries is an open water channel that collects water run off from the road and site and then feeds it down to a rainwater garden at the rear of the site helping reduce pressure on the existing infrastructure. At the rear of the site is raised garden beds and gardening infrastructure to help promote gardening within the community. On the south side of the site is the carport and rear entrance as well as refuse areas and storage. All the water from the roof is collected through the gutter system in stored in water tanks under the house.

**SITE PLAN 1:200**

- Open water channel running along the length of the boundary
- Original house at 7 Leybourne Circle
- Fruit trees line the boundary fence
- Rain water collected in a gutter system that is stored in water tanks under the house
- New addition joining the two houses
- House relocated from 5 Leybourne Circle
- Solar panels
- Solar tubes
- Clothes line
- Drive way and carport
- Outdoor storage for recycling etc.

**VIEW LOOKING NORTH WEST OVER BACK YARD.**

The very rear of the site has garden facilities and a hangi pit as well as smaller fruit trees (such as citrus and feijoa) which line the right boundary and larger fruit trees that can act as wind breakers on the left.

**VIEW OVERLOOKING A TRADITION HANGI PIT AND RAISED GARDEN BEDS.**

The rear garden is terraced down to create flat areas. The hangi pit is covered in a timber cap with seating so it can be used to sit on when not being used for cooking.

**VIEW FROM THE FOOTPATH TO THE FRONT ELEVATION OF THE HOUSE.**

From the front of the house the new car port addition and entry can be seen. The driveway has also been shifted from the north to south side of the front yard to allow for more north facing grass space.
The proposed floor plan for this large family is split in two with a third joining space. The front existing house (7 Leybourne Circle) has the main entrance and most of the public areas including a formal living space which connects to the flexible space to allow for expansion of the formal living space when needed.

The rear house (5 Leybourne Circle) has mostly private sleeping areas. These two spaces are joined by a new addition which is the informal living spaces a bathroom, laundry and secondary entrance of the new carport.

Combining two separate buildings means that the removal of some walls is inevitable in order to have a functional house. The majority of the demolition (pink lines) to interior walls will occur in the front house to create an open-plan living environment to cater for the large families and also so it is flexible to be able to function during large gatherings. The bathroom and kitchen remain in the same place to reduce cost with re-plumbing. Windows in the front left facade will be removed and replaced with the main entrance to allow for the large number of inhabitants and to be more welcoming.

In the rear house very few walls are removed and the existing plan remains largely unaltered with the bathroom remaining in the same place and additional walls closing off what was the kitchen and living space to create more bedrooms. New walls (in grey) join the two buildings creating new living spaces as well as a carport and secondary entrance.

The two existing roof structures are hipped gables with a complex roof over where the corner of the building is cut-out. They have an overhang of 500mm and because of this adding an addition to this is difficult. The existing ceiling height is also 2600mm which adds further to the problem.

The new roof structure is a split butterfly roof with water collecting in the centre join. The roof structure over the deck at its lowest point sits flush with the existing roofs and the second roof over the carport sits 300mm below this to fit under the existing eaves.

The carport roof is cantilevered from the south side and suspended at the north side to the existing roof structure with steel rods.

In the rear house sun tubes have been added to allow natural light to pass into the hallway.
All of the elevations have been kept in similar style to the existing houses design. The north-west street facade aims to respect the existing context of the street keeping minimal exposure of the large home. The south-west and north-east boundaries are lined with permeable fencing to provide privacy, security, safety, and as a wind breaker. While the street facade is lined with large trees to keep the existing open feel of the street while marking the threshold between private and public. The largest facade faces north-east with the biggest windows while smaller windows are placed on the southern sides of the building.
VIEW LOOKING INTO NEW CARPORT
Main entry to the right and a secondary entry at the back of the carport. Roof is cantilevered and suspended on the existing roof with steel ties. Cut-outs in the carport walls allows for future windows to be added when converting into an enclosed space.

VIEW LOOKING INTO NEW MAIN ENTRY
Existing windows and walls are removed to make a covered patio entry with an extended cantilevered awning and suspended timber steps.

VIEW LOOKING INTO NEW CARPORT
Main entry to the right and a secondary entry at the back of the carport. Roof is cantilevered and suspended on the existing roof with steel ties. Cut-outs in the carport walls allows for future windows to be added when converting into an enclosed space.

VIEW FROM MAIN ENTRY
Looking through to informal living area in the background. Parts of the existing internal walls have been demolished to make a framed entry point at the entrance and then again in the existing external wall to connect to the new informal living and to create a threshold between spaces as they get less public.

VIEW FROM MAIN ENTRY
Looking through to informal living area in the background. Parts of the existing internal walls have been demolished to make a framed entry point at the entrance and then again in the existing external wall to connect to the new informal living and to create a threshold between spaces as they get less public.

VIEW OF KITCHEN AND DINING
Looking out through open doors onto outdoor living area. Internal walls are removed to create open-plan living and allows for large numbers of people. Doors open out onto the deck to create a open relationship with the outdoors and windows from the kitchen also open out onto an outdoor bench to allow food and things to be passed through directly from the kitchen and allow interactions.

VIEW OF KITCHEN AND DINING
Looking out through open doors onto outdoor living area. Internal walls are removed to create open-plan living and allows for large numbers of people. Doors open out onto the deck to create a open relationship with the outdoors and windows from the kitchen also open out onto an outdoor bench to allow food and things to be passed through directly from the kitchen and allow interactions.
Raised outdoor living area creates an extension of internal spaces to accommodate an overflow of people and allow greater outdoor living. Seats line the deck to create permanent furniture and for safety reasons. Views from the kitchen and informal living allow children to be watched while they play outside.

Doors and windows off the main living spaces open up to form a continuation of living spaces. The new roof extends to provide sun protection and shelter from the rain. Below the kitchen windows, a bench cantilevers out to allow food to be passed through and for people to sit and interact with people in the kitchen.

The formal living area is a flexible space with large doors that can open to form one main space or be closed off into two smaller rooms when needed. This creates a space that can function for large events or also be used as additional sleeping spaces.

The informal living space occupies the new build area that joins the two existing buildings. It is a informal transitional space that joins the public and private spaces. Large double doors open up onto the outdoor living space to blur the definition between indoor and outdoor spaces.
NEW RESOURCE CONSENT

ADDRESS: 7 LEYBOURNE CIRCLE
Lot. 110 DP 45138
TOTAL SITE AREA: 844m²

<table>
<thead>
<tr>
<th>BUILDING COVERAGE</th>
<th>Required</th>
<th>Proposed</th>
</tr>
</thead>
<tbody>
<tr>
<td>LANDSCAPED</td>
<td>35%</td>
<td>55%</td>
</tr>
<tr>
<td>PAVED IMPERMEABLE</td>
<td>40%</td>
<td>40%</td>
</tr>
<tr>
<td>FRONT YARD</td>
<td>15%</td>
<td>25%</td>
</tr>
<tr>
<td>PRIVATE OPEN SPACE</td>
<td>100m²</td>
<td>100m²</td>
</tr>
</tbody>
</table>

TOTAL BUILDING AREA: 329m²

MAIN BUILDING: 266m² x $1575/m²
Cost: $419,265.00
DECK: 41.5m² x $220/m²
Cost: $9,130
CARPORT: Single carport = $4,200

TOTAL COST: $432,595 (SEK 2,435,380)

The overall cost evaluation for the proposed in-depth design is based on findings from books, websites and rough quotes from contractors and suppliers. It is supplied as an indicator rather than a detailed cost breakdown as it was not possible with my limited knowledge of the area and due to the hypothetical nature of the project.

The main sources for this information was collected from Rawlinsons Handbook 2009 and www.tradebox.co.nz with additional information from many different contractors and supply websites to verify these findings.

TYPICAL NEW BUILD (WITHOUT LAND AND LANDSCAPING)

TOTAL BUILDING AREA: 329m²

RELOCATION COST
Relocation: 5 Leybourne Circle: $15,000
Facility reconnection: $25,000

RETROFIT/RENOVATE
- Insulate wall, floor, ceiling, Double glazing + draught proofing: $78,197
- Exterior painting: 262.5m² x $36.20/m²
Cost: $9,502.50
- Redo timber flooring: 210m² x $30/m²
Cost: $6,300
- Bathroom: 2100m² x 50 m²
Cost: $53,500
- Kitchens: 250m² x 20 m²
Cost: $4,200
- New interior walls: 166/m² x $15/m
Cost: $2,525
- Wall removal: 25.5m² x $960/m²
Cost: $2,434
- New interior walls: 166/m² x $17/m
Cost: $2,872
- New interior walls: 166/m² x $15/m
Cost: $2,525

NEW BUILD AREA
HOUSE: 47m² x $1575/m²
Cost: $74,540
DECK: 41.5m² x $220/m²
Cost: $9,130
CARPORT: Single carport = $4,200

TOTAL COST: $83,345 (SEK 497,548)

NEW BUILD AREA
HOUSE: 47m² x $1575/m²
Cost: $74,540
DECK: 41.5m² x $220/m²
Cost: $9,130
CARPORT: Single carport = $4,200

TOTAL COST: $83,345 (SEK 497,548)

SOLAR PANELS
- 6 x 4 kW
Cost: $9,795

WATER TANKS:
- 2 x 3400l tanks
Cost: $7,000

TOTAL COST: $15,970 (SEK 91,960)
PART SEVEN.

THIS PART DISCUSSES AND CONCLUDES ALL OF THE WORK COVERED IN THIS THESIS AND HOLDS ADDITIONAL INFORMATION ABOUT MY SOURCES.

This thesis has examined the history, cultures, redevelopments and design strategies of post-war suburban state housing in New Zealand. It establishes general design guidelines and showcases them in an in-depth regeneration master plan of a neighbourhood in Glen Innes and subsequently in the design and retrofit of a large five-bedroom family home with this neighbourhood. Through the analysis of existing literature, case studies, fieldwork and redevelopment comparisons this thesis has identified and justified the need for redevelopment in Glen Innes, New Zealand. It provides a proposed redevelopment solution to address the neighbourhood’s shortcomings, residents’ desires, societal changes and the contemporary needs. In contrast it has also identified the lack of development within the suburb and in particular in the buildings themselves and therefore the inadequate and undesirable environments that can result. Coupled with the high current demand and predicted increasing future need for accommodation for low income groups, as well as the shifting housing demands, it is evident that the maintenance, provisions, and improvement of state housing are significant issues for HNZC.

Sustainable regeneration and retrofit offers one way by which these concerns can be addressed. It is explored through design strategies and the subsequent design showcase. Sustainable regeneration design and retrofit acknowledges the original investment and embodied energy in post-war suburban state housing and has the ability to lengthen the life span of these homes through a variety of improvements. Sustainable design has many potential benefits and these can be grouped into three categories – suburban environments, state properties, and state houses.

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In addition, it has also been identified that the sustainable regeneration and retrofit of state houses can:

- Incorporate existing houses to create larger family homes
- Improve efficiency and flexibility, as well as enabling the compliance with contemporary building codes
- Provide different building sizes and types to allow for different family sizes
- Provide a better quality of life through healthier homes
- Allow for a variety of different cultural activities and needs
- Respond better to New Zealand’s environmental conditions and way of life
- Maintain existing building structure and envelope
- Create environments that support tenants such as reducing operational costs through solar panels

The second point this thesis addresses is the potential of densification through relocating houses within the neighbourhood in order to free up land to create a larger redevelopment and therefore a diversity of building types and sizes. This is distinctive from the vast majority of previous HNZC redevelopments, which aim more for new build over retrofit or renovation. As established the better utilisation of
existing resources both built and land allow for a richer redevelopment.

While the benefits are similar to sustainable design strategies, they also include:

- Reduce plot sizes to correspond to house sizes in order to reduce urban sprawl.

- Incorporate new housing or other uses that thrive for common goals and are smaller piecemeal developments such as proposed in the research could be undertaken to incorporate these design principals in conjunction with regenerative design and site for this thesis has a majority of existing urban sprawl.

- Allow and support a wider variety of users and users. One of the main issues with the in-depth design was the joining of the existing gable roofs with 500mm overhangs and low ceiling heights of 200mm - limiting the number of possible solutions that were not highly costly. The initial solution was a more modern more pitch roof that sat above the existing roof (see images below), while this roof had more architectural presence it raised the question of how to effectively make it weather tight and connecting it to the rest of the house became complicated and costly. The final roof design

There have been a number of limitations to this thesis due to the lack of the examination of the cost of regeneration of suburban environments, state properties and state houses, it has not been possible to assess an accurate scale of what is ultimately a hypothetical project. While the site of this thesis in New Zealand and it has been written while in Sweden another limitation to a certain extent has been the top-down method of inquiry. While this method has a sound analysis of existing literature, case studies, fieldwork and redevelopment examples, it is lacking user input. This input is achieved through a bottom-up process; it would have been hard to achieve this level of user input in New Zealand. If more user input were achieved it may have identified sustainable or subjective that could be of significance to the regeneration process. It could have also provided users for involvement in the process. However, the project is both hypothetical and large-scale, so a bottom-up method on inquiry would have been difficult to execute, especially being away from the site and without the backing of HNZC.

The lack of backing from HNZC is also another limitation that has reinforced the hypothetical nature of this thesis. Despite these limitations, this thesis has identified the potential of sustainable regeneration and retrofit of post-war suburban state housing through design strategies and the design showcase. While state housing may never again represent in every sense the very ‘heart of the new Zealand dream’ (Ferguson, 1994, p. 117), through regeneration and retrofit it can, once again, be a solution for housing both in terms of healthy homes and a better quality of life in New Zealand.

CRITICAL DESIGN REFLECTION

The aim of this thesis was to find sustainable design strategies to revolve post-war suburban state housing in New Zealand. This was achieved through both general regenerative design guidelines and the in-depth proposal showcased that this is possible, interesting and cost effective solution for the existing state housing stock. It however only use alternative solution and of course with any design project their are many different solutions.

As this thesis dealt with existing buildings there are always many issues that occur. One of the major issues with the in-depth design was the joining of the existing gable roofs with 500mm overhangs and low ceiling heights of 200mm - limiting the number of possible solutions that were not highly costly. The initial solution was a more modern more pitch roof that sat above the existing roof (see images below), while this roof had more architectural presence it raised the question of how to effectively make it weather tight and connecting it to the rest of the house became complicated and costly. The final roof design

The one personal goal I set myself was to try and set realistic goals in terms of what I could achieve. While I know I have made a step forward in this personally this is still room for improvement and that can been seen in not all work having the time to be finished to the same standard of work. There are many limitations that affected the outcome of this thesis in both a positive and negative way. Some of the main things that had an influence on the work was the very small time frame in which to develop, produce and present the thesis and location in terms of choosing not to study in Gothenburg during this time. This limited my exposure to other students work and influence as well as limiting some tutoring opportunities, in contrast to this it did mean that their was less distractions and the amount and quality of work I was able to achieve was higher.

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The second personal reflection and lesson I learnt from this masters thesis process was the importance to have more freedom in myabilities and way of working. By trying to conform to the way of working that was suggested - multi-tasking between research and design - I know my work has suffered and it is a bit chaotic in its thinking as it developed as a non linear manner but needed to be written in a linear manner. Reflecting back I regret not standing by my own personal why of working which is a more linear and design - I know my work has suffered and is a bit chaotic in its thinking as it developed as a non linear manner but needed to be written in a linear manner. Reflecting back I regret not standing by my own personal why of working which is a more linear and design - I know my work has suffered and is a bit chaotic in its thinking as it developed as a non linear manner but needed to be written in a linear manner. Reflecting back I regret not standing by my own personal why of working which is a more linear and design - I know my work has suffered and is a bit chaotic in its thinking as it developed as a non linear manner but needed to be written in a linear manner. Reflecting back I regret not standing by my own personal why of working which is a more linear and design - I know my work has suffered and is a bit chaotic in its thinking as it developed as a non linear manner but needed to be written in a linear manner. Reflecting back I regret not standing by my own personal why of working which is a