House Conversions and Sharing for an Ageing Population in New Zealand

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ABSTRACT

With the rise in the number of people aged 65+ in New Zealand, it seems increasingly important that there is a supply of appropriate housing so they can remain in their communities and 'age in place' for as long as possible.

Evidence from both literature and statistics showed a mismatch between current and projected household characteristics and the existing housing supply in New Zealand. Therefore, this research investigated the potential for converting existing dwellings to address the housing shortfall and ageing in place in New Zealand. The aim was to make the selected houses both smaller and more age-friendly, as a means of achieving 'ageing in place' in well designed, and easy to heat and maintain homes.

Two New Zealand housing types were investigated (villa and state house). Using the New Zealand Lifemark 3-star standard, both were redesigned with different degrees of shared space. Three designs were produced for each house, ranging from subdivision (conversion to two smaller units), to having some shared spaces such as a guest bedroom, to private en-suite bedsitting-rooms and all living spaces shared. Using a mixed methods approach, the schemes were evaluated by client and expert participants in three steps.

1. The aim of the questionnaire-based survey was to obtain comments on the conversions, particularly regarding the levels of sharing. Following the two pilot surveys and subsequent revisions, a web and paper-based questionnaire survey was undertaken by 441 respondents aged 55-85.
2. To assess the designs and specifically whether they incorporated appropriate housing standards for people aged 55+, they were evaluated by five built environment and ageing population experts.
3. To probe the reasons behind the survey results, two rounds of client focus groups of 17 participants aged 55+ were conducted.

What was clear from the results, and which aligns with other studies, was that a high proportion of older people would prefer to age in place, either in their existing house or in a more suitable dwelling within their community. However, the cost of house conversions was

perceived as problematic, as people felt that they would not be in a position to afford to do this, even if they could sell or let the new unit they would not occupy. On the other hand, the significant benefits of upgrading a house for older people include reduced energy bills through effective design strategies, such as thermal insulation and double-glazed windows, and incorporation of future-proof design features such as the installation of assistive devices like stair lifts.

Generally, schemes with higher degrees of sharing were not attractive to many respondents and those aged 75-85 were more likely to dislike these than the younger age groups. However, both expert and client groups agreed the acceptability of sharing depends on people's personal preferences, culture, and background. Findings from this research also show that having a spare multi-purpose room, a private deck and a good-sized dwelling with plenty of sunlight are features most people wanted.

This research suggests that people aged 55–85 have very specific housing needs when it comes to ageing in place. Therefore, to ensure their requirements are met and dwellings are usable, engaging potential users in the design process at an early stage is essential.

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Glossary

ABC	Australian Broadcasting Corporation
AD	Accessible Design
ADU	Accessory Dwellings Unit
BRANZ	Building Research Association of New Zealand
CRESA	Centre for Research, Evaluation and Social Assessment
DCLG	Department for Communities and Local Government
EMS	Equipment and Modification Service
HEEP	Household Energy End-use Project
HIA	Home Improvement Agencies
HMinfo	Home Modification Information Clearinghouse Project
HNZC	Housing New Zealand Corporation
LM	Lifemark Design standards
LORC	Leisure-Oriented Retirement Community
LTH	Lifetime home standards
MBIE	Ministry of Business Innovation and Employment
NZ	New Zealand
NZBC	New Zealand Building Code
NZS	New Zealand Standards
OECD	Organisation for Economic Co-operation and Development
RV	Retirement Village
SIH	Service Integrated Housing
UD	Universal Design
UK	United Kingdom
USA	United States of America
UF	User Friendly
VD	Visitable design
WCC	Wellington City Council
WHO	World Health Organization

Chapter 1 Introduction

1.1 The problem

Housing plays a significant role in people's lives by providing financial and psychological security through investment and shelter. Consequently, making appropriate housing choices is an important decision for the 65+ age group, many of whom are no longer in full time employment. Having housing choices can lead to greater life satisfaction and better health (Office for Senior Citizens, 2013), however the limited availability of these for older people has led to a demand for ageing in place. This requires finding effective design solutions for redeveloping the existing housing stock. Research also suggests a considerable proportion of the ageing population live in large houses with two or more spare bedrooms, which implies large houses occupied by small households. Furthermore this age group, often on restricted incomes, does not necessarily maintain or heat these houses as much as needed. This is a potential health issue that can have implications for the national health budget. As a consequence, ways of altering such dwellings require more investigation to find those which are most appropriate, and acceptable to the client group. This research explores this issue for New Zealand, in particular looking at the renovation and redesign of houses that are too large for ageing households, with the aim of seeing if this could lead to a better quality of life through retaining community ties.

1.2 The ageing New Zealand population

Statistics New Zealand (2015a) state the 65+ age group in New Zealand has nearly doubled since 1981 (Figure 1.1). The 2013 census and projection data show the population of adults aged 65 and over is growing, being 309,795, 607,032 and estimated to be 1,695,500 in 1981, 2013 and 2068 respectively. This means by mid-century a quarter of New Zealand's population will be over 65, and probably with declining incomes.

Figure 1.1 65+ population of New Zealand: 1981-2068 (Statistics New Zealand, 2015a)

New Zealand demographic projections demonstrate a significant change in population age structure, and this is concomitant with global statistics (Boston and Davey, 2006). Contributors to this growth include “...higher living standards, changing social attitudes and values and improvement in nutrition, public health and health services” (Boston and Davey, 2006:373).

On the other hand, Figure 1.2 indicates that although the highest proportion of the New Zealand population is workers (ages 15-64), going from 63.2% in 1981 to an estimated 58.4% in 2041, by 2041 the proportions of those aged 65+ (9.9% of total population in 1981) are expected to overtake those under 15 and reach 25.4% of total. By 2041 those age 65+ are expected to be increasing in number while the under 15 and 15-64 age groups are predicted to decrease (Figure 1.2).

Figure 1.2 Total population by age group (Statistics New Zealand, 2007a)

Additionally, the proportion of New Zealanders aged 85+ and over is increasing and is projected to nearly double by 2063 (Statistics New Zealand, 2015a). In 2013 people aged 65-69 formed the largest group of those aged 65+ with a rising trend from 2001 (Figure 1.3).

Figure 1.3 Distribution of 65+ population (Statistics New Zealand, 2007a, 2015a)

According to Statistics New Zealand, the rate of home ownership for people aged 65+ is expected to decline (Office for Senior Citizens, 2013) while by 2050 numbers of older people with some form of disability are projected to increase by 60% (Statistics New Zealand, 2007b). These two trends coupled with forecasts of more people in this age group living alone in the community (Statistics New Zealand, 2015a; Office for Senior Citizens, 2013) lead to the growing need to address the issue of appropriate housing.

1.2.1 Tenure and older New Zealanders

Figure 1.4 compares the tenure situation of the older population age groups in 2013, showing whether people live in a house they own or rent changes with age, with the older age group more likely not to be living in accommodation they own.

Figure 1.4 Tenure by age group-2013 Census (Statistics New Zealand, 2015a)

Figure 1.4 suggests that in 2013 around 75% of people aged 65+ owned or partly owned their usual dwelling, compared to 49.8% for the whole of New Zealand (Statistics New Zealand, 2015a). There has also been a change in dwelling ownership for the age groupings of the older population over the last three censuses, showing a gradual drop for all age groups except the 85+ (Figure 1.5). In 2013 with the exception of the latter, ownership for the other age groups declined slightly. In addition, the rate of mortgage-free homeownership is high among older New Zealanders (Davey et al., 2004).

Figure 1.5 Dwellings owned or partly owned by older adults in 2001, 2006 and 2013 (Statistics New Zealand, 2015a).

Table 1.1 gives details of the dwellings of the 65+ group (Statistics New Zealand, 2015a). In 2013, 560,133 people lived in private dwellings or 92.3% of the 65+ New Zealand population and only 5.5% lived in non-private dwellings (Table 1.2).

Table 1.1 Usual residents aged 65+ in private dwellings (Statistics New Zealand, 2015a)

Private dwelling type	All people in occupied private dwellings %	65+ population %
Separate house	77.03%	71.08%
Two or more flats/units/townhouses/apartments/houses joined together	17.33%	15.99%
Other occupied private dwellings: Dwelling in a Motor Camp Mobile Dwelling Not in a Motor Camp Improvised Dwelling or Shelter Roofless or Rough Sleeper	0.51%	0.47%
Occupied Private Dwelling Not Further Defined Baches, cribs, other holiday homes, dwellings adjoined to or part of a business or shop, and private dwellings that could not be further classified according to whether they were separate or joined.	5.13%	4.73%
Total people in occupied private dwellings	100%	92.27%

Table 1.2 Usual residents aged 65+ in non-private dwellings (Statistics New Zealand, 2015a)

Non-Private dwelling type		All people in occupied non-private dwellings %		65+ population %	
Total Institutions	Residential care for older People	88.78%	95.49%	4.93%	5.30%
	Total public or private hospital	3.12%		0.17%	
	Residential and community care facilities	2.38%		0.13%	
	Religious institution	0.55%		0.03%	
	Other institutions	0.66%		0.04%	
Other occupied non-private dwellings: Hotel, motel or guest accommodation Boarding house Motor camp/camping ground		4.45%		0.25%	
Occupied non-private dwelling not further defined: Communes and other non-private dwellings that could not be further classified according to their type/function.		0.06%		-	
Total people in occupied non-private dwellings		100%		5.55%	

The population of people moving to residential care increases with age and the higher levels of disability that tend to come with this. Fergusson et al. (2001) showed in the *Living Standards of Older New Zealanders* survey that in 2000 the proportions of people aged 65-74, 75-84, 85+ living in retirement villages were respectively 5.9%, 7% and 12.5%. Furthermore, the New Zealand Retirement Village Database (NZRVD) states in 2016, 5.2% and 12.4% of those aged 65+ and 75+ respectively chose to live in a retirement village (JLL Research and Consulting, 2017). This suggests that most people in the 65+ group are still living in their communities in dwellings not necessarily designed to support ageing in place.

1.2.2 House size and older New Zealanders

Using the number of rooms as an indicator of house size (Khajehzadeh and Vale, 2017a), according to Statistics New Zealand (2017a), Figure 1.6 suggests in 2013 more than 70% of 65+ owner-occupier households lived in dwellings with six rooms or more. The number of rooms in Figure 1.6 follows the Statistics New Zealand (2014a) room standard. This includes all habitable spaces (with floor area more than 4m²) enclosed by walls, floor and ceiling/roof excluding all service areas (e.g. bathroom, laundry). The kitchen, living room, and dining room are counted separately even where these are combined. A six room house is thus likely to

be the standard three bedroom model, even where a ‘bedroom’ might be used for other functions, such as a study. An online survey of 286 New Zealand owner occupied houses by Khajehzadeh (2017) showed the average number of rooms for these households was 6.4. The same study found the average floor area of a 6 room (3 bedroom house) was 120m² (Khajehzadeh, 2017; Khajehzadeh and Vale, 2017a).

Figure 1.6 Distribution of house owner-occupier New Zealanders aged 65+ (Statistics New Zealand, 2017a)

1.2.3 An ageing population and the housing market

The ageing New Zealand population should drive the housing market towards provision of the type of housing older people want. The traditional housing model is likely to alter because of changes in family size and lifestyle and having different ethnic groups in the population. The latter may cause a change in household family arrangements, with increasing multigenerational extended families, different patterns of home ownership, and changes in family formation. Other effects of the ageing population on the property market are the possibility of returning New Zealand emigrants of retirement age and the likelihood of moving out of the urban centres on retirement (Statistics New Zealand, 2013a).

According to Saville-Smith et al. (2009) more than 800,000 households are projected to be occupied by older people in 2050, and the proportion of people aged 65+ will make up almost a quarter of the population, about 1.35 million people, in 2050. In addition, based on census data it is projected that the number of households will reach 2.14 million in 2038, from 1.65

million in 2013, showing an average increase of 1.1% a year (an increase of 496,000 in 25 years) (Statistics New Zealand, 2015b). Growth in the number of households, particularly older households, leads to the demand for more dwellings.

1.3 New Zealand housing stock characteristics

Figure 1.7 shows the New Zealand housing stock over the past five censuses. In 2013 75% of dwellings have 3 or more bedrooms, with the number of 1 bedroom dwellings forming less than 6% in the last three censuses, and 1 and 2 bedroom dwellings less than 25% (Statistics New Zealand, 2001, 2006a, 2013b).

Figure 1.7 Occupied private dwellings by number of bedrooms (Statistics New Zealand, 2001; 2006a; 2013b)

Like many developed world countries New Zealand has an ageing population and a housing stock in which three bedroom family houses predominate. In the 2013 census 3 bedroom dwellings formed 44.5% of the housing stock (Statistics New Zealand, 2014c).

1.3.1 Dwelling occupancy

Statistics New Zealand (2015a) suggest that in 2013 more than half of those aged 65+ in private dwellings (51.1%) were couple-only householders and just under one-third (28.8%) were one-person households, meaning that nearly 80% (79.9%) of people aged 65+ were in small households. With the data in Figure 1.7 and the growth in number of small, particularly one-

person households (Statistics New Zealand, 2013a), there is a mismatch between current and projected household characteristics and the existing housing supply.

An ageing population could also mean fewer people in each household or smaller average households. Saville-Smith et al. (2009) indicated that in 2050, most older people will live in their own home typically alone or with an older partner. In 2013 almost half the occupied private dwellings contained couple-only (25.9%) and one-person households (23.5%) (Figure 1.8) (Statistics New Zealand, 2013b). Furthermore, the average household size is also projected to decline between 2013 and 2038, from 2.64 to 2.50 people. Household size has been continuously dropping since World War II, falling from 3.7 people to 3 people between 1951 and 1981 (Statistics New Zealand, 2015c).

Figure 1.8 Household Composition in private dwellings by age group in 2013 (Statistics New Zealand, 2013c; 2014c; 2015a)

By 2038 the number of one-person households is projected to increase by an average 1.6% a year, rising from 393,000 in 2013 to 583,000 in 2038, accounting for 27% of all household in 2038, up from 24% in 2013 (Statistics New Zealand, 2015c; 2015d). According to Statistics New Zealand (2013a; 2015d), the growth in one-person households has been triggered by the increase in older people, as nearly 75% of this growth is in the 55+ age group. These figures reveal a potential future problem in terms of the unsustainability of housing resources, with more households containing fewer people. Couple-only households are also projected to grow

fast, reaching almost 700,000 in 2031 (Statistics New Zealand, 2013b) from just under 400,000 in 2013 (Figure 1.8).

Given the relationship between the increasing proportion of couple-only and one-person households and a decline in household size, the likelihood of under-used houses in the future rises. Moreover, the rise in the number of one-person households has probably been driven by the growth in the ageing population, given “90% of the growth between 2013 and 2038 is occurring among those aged 60 and over” and “...11% of the total population will be living alone in 2038 compared with 9% in 2013” (Statistics New Zealand, 2015d, p.6). In 2038, 65% of those living alone are projected to be 65+ compared with 54% in 2013 (Statistics New Zealand, 2015d).

1.3.2 Under-occupancy

While government policies encourage seniors to remain in their current house as long as possible, other factors such as shortage of family-sized dwellings and the unsuitability of existing residential buildings are behind some of the ageing population relocating. Nevertheless, it seems that underutilisation linked to the ageing population will become a feature of the housing stock in New Zealand. The definition of under-occupancy varies in different contexts. Statistics New Zealand uses the Canadian National Occupancy Standard (CNOS) to measure the degree of occupancy. Having two or more bedrooms over the bedroom standard is defined as an under-occupied home (Harding, 2007).

In 2006, 64.4% of people were living in a dwelling with one or more spare bedroom/s, just up from 64% in 2001 (Statistics New Zealand, 2013d). Goodyear & Fabian (2014) advise using the two bedrooms or more category in analysis associated with “underutilisation”. According to data from Statistics New Zealand (2013d), in 2006 and 2001, 31% and 30% of households respectively had two or more spare bedrooms, which suggests more attention might be given to achieving more efficient usage of space in dwellings. Given the continuing controversy over homelessness and overcrowding, the significance of under-occupancy in the residential building sector, particularly with an ageing population, should be recognised.

In 2013, 53% of one-person private dwellings had one and two bedrooms and the remainder (47%) three or more, of which 37% had three bedrooms. According to the under-occupancy

standards, 47% of one-person households could be considered under-occupiers (Statistics New Zealand, 2014c).

Davey et al. (2004) felt authorities should be concerned about under-occupancy in rental housing, particularly in the social housing sector where family sized houses are needed. She also suggested it is possible to deal with this through provision of more appropriate rental dwellings for a relocated ageing population thus releasing family sized houses. However, Harding (2007) believes that although some aspects of under-occupancy might be associated with an ageing population, given the proportion of older householders, this would not be a big contribution.

Figure 1.9 Changes in private dwellings size, 2001, 2006 and 2013 (Statistics New Zealand, 2014c).

Figure 1.9 suggests that the general trend towards houses with more rooms continued between 2001 and 2013, which could be linked with the rise in under-occupied houses. In 2013, the number of one (0.8%) and two room private dwellings (1.4%) is much smaller than the proportion of five (25%), six (17%) and seven (17%) room private dwellings. Dwellings with eight rooms and more comprised 24% of all private dwellings. Apart from two and three room dwellings, numbers of all other sizes increased between 2006 and 2013.

Khajehzadeh and Vale (2016a) found the increase in the size of New Zealand dwellings implies larger houses occupied by fewer people leading to the decrease in occupancy rate. However,

having under-used bedrooms gives the opportunity to devise conversion solutions that could meet the changing needs of older people and reduce resource use.

1.3.3 Housing options for older New Zealanders

The ageing population and the information in Figure 1.7 suggests a mismatch between small older person households and the existing housing stock, something also observed in Australia (Judd et al., 2014b).

Figure 1.10 shows the New Zealand housing stock over last five censuses. Dwellings under construction comprised less than 1% of the housing stock in those years meaning existing buildings either occupied or unoccupied constituted more than 99% of the New Zealand housing stock. This data highlights the need to give greater consideration to converting existing dwellings to allow ageing in place to happen (Statistics New Zealand, 1998, 2006a, 2008, 2013b). These figures also suggest that modern energy efficiency standards could be lacking in a considerable part of the housing stock (Isaacs et al., 2010).

Figure 1.10 New Zealand housing stock-1991, 1996, 2001, 2006 and 2013 (Statistics New Zealand, 1998, 2006a, 2008, 2013b)

Additionally, in most developed countries the slow renewal of the housing stock means few houses meet any standards related to universal or lifetime design. This is the situation in New Zealand (Saville-Smith and James, 2012), even though ageing in place is seen as important (Davey, 2006a).

The slow rate of adding new houses to the existing stock, many of which will also be required for younger people with or without families, suggests that new, affordable homes for older people may not be available in sufficient quantity, despite the fact that the government is giving priority to the provision of affordable housing and making this available to those aged 65+ (Office for Senior Citizens, 2013).

Although the Office for Senior Citizens (2013:6) reports “there is a range of affordable, accessible, safe and secure housing options for older people” there is much evidence to throw doubt on this claim. One of the obvious reasons behind the shortage of accessible housing for ageing populations in developed countries like Australia and New Zealand is their preference for remaining in their current house, and alongside this is also the problem of not being able to find a suitable place to move to (Davey et al., 2004; Judd et al. 2014a). In addition, Judd et al. (2014b) looking at the recent housing market in Australia found a significant difference between housing supply and demand. Wilson and Boehland (2005:282) identified “zoning regulations, restrictive covenants (i.e. provisions in the deed for the property that restrict the way the property may be used by the owner) and design standards for specific subdivision, and even mortgage banking requirements” as the great barriers to creating “small, space-efficient and single-family houses.” They also found new large houses imposed on the environment because of the additional resources bound up in their construction and running.

The inability to cope with a large house and garden, which often enforces a move to smaller accommodation, is one of the most common incentives behind those aged 65+ moving. Another incentive could be the difficulty of heating these houses. Howden-Chapman et al. (2012:134) studied the link between indoor temperature and health in existing dwellings in New Zealand finding that “average indoor temperatures are cold by international standards and occupants regularly report they are cold, because they cannot afford to heat their houses”.

1.3.4 Maintenance

Saville-Smith et al. (2008) believed the poor condition of some New Zealand housing and maintenance and repair problems form the main barriers to ageing in place and hence maintaining community ties. They further suggest that along with the population, the housing

stock is also ageing. They found “Low temperatures, excessive tightness, mould, damp and durability” to be the most prevalent problems of the New Zealand housing stock (Saville-Smith et al., 2008:4).

Figure 1.11 Housing condition in 1999, 2005 and 2010 (Buckett et al., 2011; Clark et al., 2005)

Figure 1.11 illustrates that in 2010 25% of dwellings were in poor and very poor condition. The regular BRANZ House Condition Surveys (HCS) found over 40% of houses studied were in excellent or good condition in both 1999 and 2010 (Buckett et al., 2011). The earlier BRANZ HCS showed houses occupied by older people tended to be in better condition compared to those of the under 65s (Clark et al., 2005). However, on average some components of the former (fasteners, steps/ramps, windows, carport, roof cladding, kitchen linings, kitchen joinery, stove, laundry linings, laundry fittings, and bedroom linings) were in a poorer condition (Clark et al., 2005; Saville-Smith et al., 2008). Some of these issues, such as poor ceiling insulation and dilapidated roof cladding and windows could be the cause of a poor thermal indoor environment (Saville-Smith et al., 2008).

Data from Statistics New Zealand shows that in 2006 a considerable percentage of older people modified their house, either to assist with entering or moving inside it. In 2006, the 67.7% of people aged 65+ who modified their housing and ageing accounted for 37.1% of total housing modifications that year, although only 22.3% of those in this age group making modifications reported disability through ageing as the main motivation (Statistics New Zealand, 2006b).

Evidence from the 2014/2015 New Zealand general social survey suggests 50.7% and 3.8% of New Zealanders over the age of 65 lived in dwellings which required minor/some and immediate/extensive repairs and maintenance respectively (Statistics New Zealand, 2015b). In 2008, 2010 and 2012 those aged 65 and over who had major problems with their house accounted for 32.3%, 19.8% and 17.5% of the population respectively (Statistics New Zealand, 2009; 2011; 2013e). It should be noted that the figures for 2008 include any major problem in either house or neighbourhood but for 2010 and 2012 only houses were considered, which may explain the large drop. Research undertaken in 2008 shows that while the value of the required maintenance and repairs for dwellings owned by older people increased between 1999 and 2004, the investment younger age groups put into repairs and maintenance also increased (Saville-Smith et al., 2008). This suggests that there is both an issue and some uncertainty over the level of repair and maintenance required by the older age group.

1.4 Ageing in place

According to Davey et al. (2004:20) ageing in place

“...implies that older people will remain in the community either in their family homes, in homes to which they have moved in mid or later life, or in supported accommodation of some type, rather than moving into residential care. It also tends to imply living independently of other family members”.

Given the lack of new appropriate housing discussed earlier, more older people are likely to remain in their family home in the future, leading to the need to ensure these houses are properly insulated and heated, have easy access and are safe, and are affordable in terms of having sufficient funds to heat and maintain them and have a reasonable quality of life (Davey, 2006a). Living in the community in this way would be combined with the many assistive programmes in New Zealand that allow older people to remain in their current house safely and autonomously. These home support services enable ageing in place as long as possible by providing assistance with household tasks, shopping and other chores, and retaining or maintaining supportive social networks, providing certain eligibility criteria are met.

Given the attention to ageing in place, a larger number of older people are likely to remain in their family home in the future, and consequently concerns related to maintenance, renovation and upgrading of their housings will arise. Davey (2006a:268) suggests the immediate actions which should be taken to address potential housing issues in New Zealand include “better insulation and ventilation, affordable and effective heating and energy efficiency options, modifications to improve access and safety, and the use of appropriate technology.”

Another important issue is modification of the home to meet different requirements. The number of people aged 65+ who received financial assistance with equipment or housing modifications between 1 July 2012 and 30 April 2013, was slightly less than 30,000 at a cost of \$11.2 million (Office for Senior Citizens, 2013).

The Organisation for Economic Co-operation and Development (OECD) (2003) suggest an ageing population needs smaller houses to cope with later life, and these need to be in the community and ideally close to family members and relatives to reduce the need for residential care. Housing should also be designed considering “lifetime” standards to accommodate people of all ages and all levels of disabilities. Many countries are also seeking approaches that integrate housing and care in non-institutional accommodation. This supported accommodation reduces the need to move to residential care, although this need obviously increases with age and the higher levels of disability that come with this. However, living in the community is still appealing for some aged 85+, even with substantial disabilities (Davey, 2006a). Results from the 2013 Census show 92% of those aged 65+ lived in private dwellings, suggesting older people are choosing to remain in the community as long as possible. In addition, more than 94% of this age group lived in private dwellings, either separate or joined (Statistics New Zealand, 2015a).

Finding suitable housing for ageing in place in New Zealand is the problem addressed in this thesis.

1.5 Thesis structure

This thesis starts by looking at the ageing population in New Zealand and its implications for housing. **Chapter 2** continues the literature review by considering what has happened in other parts of the world as well as New Zealand to deal with the desire to age in place and the mismatch of this with the existing housing stock. **Chapter 3** explains the research design, methods, research questions and the links between them. **Chapter 4** describes New Zealand housing types and gives reasons for the selected case studies of conversions of existing houses. The case study houses are presented in detail. A comprehensive description of design guidelines and how these have been applied in the conversions is given in **Chapter 5**. **Chapter 6** describes the detailed steps in the development of the questionnaire, the two pilot studies, and the outcomes. It continues with the development and results of the main survey. The procedure for setting up the expert panel and the findings are explained in **Chapter 7**. **Chapter 8** discusses the procedure for the client focus groups and analysis of the results which leads to discussion and comparison of results from client focus groups, survey and expert group. **Chapter 9** concludes the research and addresses the research questions and future research areas.

1.6 Summary

This introduction sets out the problem of housing the ageing population of New Zealand. The aim has been to show the need to develop new ideas for ageing in place in terms of housing provision, as well as seeking better use of existing under-occupied houses. Pressure on the provision of new dwellings which meet the changing needs of the ageing population has been driven by the growth of the latter in New Zealand and the anticipated future shortage of appropriate-sized and suitable housing. In order to identify the gap in knowledge and set up this research, Chapter 2 reviews relevant literature.

Chapter 2 Literature review

2.1 Introduction

As discussed in Chapter 1 there is a mismatch between small older person households and the existing housing stock. There has been much discussion in the literature both overseas and in New Zealand on how older people should make appropriate housing choices and a large body of research has investigated the ways the requirements and preferences of older people could be accommodated. This chapter, therefore, reviews the literature related to housing studies in New Zealand and overseas and the ageing population. Some literature is reviewed in the relevant chapters as needed, for instance that related to running a survey and focus groups (sections 3.8.3 and 3.8.4). In this chapter, each section starts with overseas experiences and research and moves on to New Zealand studies, although there are a number of overlaps.

2.2 Difficulties of ageing in place

2.2.1 Tenure insecurity

Davey et al. (2004) investigated the financial burden on older people, whether homeowners or renters, finding the former would have some surplus income once they had paid off their mortgage to spend on their needs but that the situation was different for older renters, who would probably find themselves in the low household income category. However, more recent research (Saville-Smith and James, 2012) found older homeowners can no longer automatically expect to be mortgage free in the future. Additionally, by 2051 the number of older people in rental dwellings is projected to increase 2.5 to 3.1 times. Of these older renters, two-thirds will be tenants in the private rental market. Given the limited number of available appropriate dwellings and tenure insecurity, finding somewhere to live could become increasingly challenging.

Although renting and home ownership are the common forms of tenure, Fergusson et al. (2001) showed 14% of people aged 65-84 have experience of family trust ownership, compared to only 3% of people aged 85+. A family trust is a legal way to hold and protect assets

such as a family home for the benefit of them and their children. They are administered by trustees (a family member or a lawyer) for the beneficiaries who are usually family members (Citizens Advice Bureau (CAB), 2015). Davey (2006a) believed this trend will increase in the future. Fergusson et al. (2001) also found 16% of people aged 85+ live in houses owned by family members. This shows that some of this age group seek alternatives to rest homes and residential care facilities.

In some cases a commercial equity release scheme is beneficial for the health and quality of life of seniors, since it creates an income with which to make modifications in their house and improve its current condition (Davey, 2006a). However, Saville-Smith and James (2012) found no empirical evidence this is likely to happen. Saville-Smith et al. (2016) also found a high proportion of older New Zealanders who either moved to retirement villages (RV) or dwellings in general housing market do not seek equity release from their relocation (17% and 23% of RV residents and other movers respectively purposely sought equity release from their move). Many of these made less than \$50,000 from equity release (47% and 66% respectively).

Tenure was found to be an “influential factor” linked to other factors such as “income, asset accumulation, security of housing tenure, housing quality, socio-economic status and also health status” (Davey et al., 2004). However much people would like to age in place they have to have tenure arrangements that allow them to do this and this may be difficult for those renting.

2.2.2 Affordability

Older people in New Zealand believe that “financial security” and “retaining independence” are important for them (Office for Senior Citizens, 2013:5).

Affordable housing can refer to

“any type of housing (market or non-market provided) that is rented or purchased at a cost that is not beyond the financial capacity of a household. A typical yardstick used for defining housing affordability stress in Australia has been when housing costs exceed 30 per cent of a household’s gross income. Definitions of housing costs typically include expenditure on rent or mortgage payments and on rates, property taxes,

household insurance, repairs and maintenance where these are the responsibility of the resident.” (Wiesel et al., 2012:13).

Saville-Smith et al. (2008) in their survey of older New Zealanders’ house repair and maintenance practices suggest there is a relationship between household income and household size. Their research shows that households with incomes of \$30,000 or less were 75.5%, 49.9% and 32% of one-person, two-person, and households with four and more members respectively. This is very significant because a high proportion of older people live in small households (Saville-Smith et al., 2008) and more than 800,000 households are projected to be older persons in 2050 (Saville-Smith et al., 2009).

2.3 Housing options for the elderly

Making appropriate housing choices is one of the most important decisions in the life of the elderly. Provision of a variety of housing alternatives coupled with relevant and satisfactory information should help older citizens make effective housing decisions. Consequently, this leads to more life satisfaction, which is good for overall health (Office for Senior Citizens, 2013). Residential environments play an important role in enabling frail older people to maintain their independence or postpone functional losses. Consequently it is possible to reduce the need for care services by creating “supportive environments” (Oram et al., 2008) and these also enhance overall health and wellbeing (Ota, 2015; Park et al., 2016; Copeman and Porteus, 2017).

Studies have classified housing options for the ageing populations in New Zealand, Australia and the UK by housing tenure type (Davey et al., 2004; Oram et al., 2008; Judd et al., 2014b, Ota, 2015). Options include staying-put, modification/upgrading of the existing dwellings, relocation/downsizing to more appropriate housing or a retirement village, specialised housing options, and residential aged care facilities, although Davey et al. (2004) felt only the first three options were available for older homeowners. Other studies have looked at new trends including cohousing, mobile homes, temporary granny flats, and shared housing (Davey et al, 2004; Oram et al., 2008; Brenton, 2013; Scanlon and Arrigoitia, 2015; Riedy et al., 2017a). Davey et al. (2004:73) also identified the broad options as “home ownership, renting from the public sector, renting from the private sector, retirement village or similar arrangement, social

village/shared accommodation and residential care.” In the UK Park and Ziegler (2016) stated downsizing and ageing in place were the two main housing choices in UK policies. Ageing in place thus consistently emerges as a housing option.

The significance of integrating housing and care with “ageing in place” often appears in public and academic literature (New Zealand Labour Party, Green Party of Aotearoa New Zealand and Grey Power, 2010; Wiles et al., 2012; Ota, 2015; Copeman and Porteus, 2017). In New Zealand, depending on who takes responsibility for housing development, whether public or private sector and whether for rent or owning, access to support and care services is different. For instance, the rental market usually fails to offer these sorts of service. This is where a large number of older tenants tend to be affected, although in New Zealand a number of voluntary agencies provide accommodation for older people as well as offering in-home services and residential care (Davey et al., 2004).

In their study Oram et al. (2008) suggest there are a limited number of appropriately designed dwellings for an ageing population and disabled people in Australia, and this has led these groups to ask for adaptable housing which is easy and inexpensive to modify, as well as being close to community facilities.

Davey et al. (2004) conducted an investigation into accommodation options for older New Zealanders, mainly focusing on making policy recommendations. They also gave great attention to the needs of the most vulnerable elderly, including low-income households, renters in both the public or private sectors, and older Maori and Pacific people, and women who would be affected by the lack of an effective housing policy. The research investigated the housing situation of older people in New Zealand, dwelling type, income, housing tenure and future housing trends, including examples from New Zealand and overseas. The application of foreign models to the New Zealand context was also discussed. The ideas from a range of stakeholders on these subjects were developed through roundtable meetings. A range of housing authorities was also consulted. The study found a variety of housing alternatives are available to older people who are homeowners whereas options are limited for other ageing cohorts, including those who are not homeowners and low-income homeowners. They also found the public housing stock no longer meets the current needs of older people, as most of these houses are old and need upgrading. They found several authorities including Housing

New Zealand Corporation (HNZC) and local authorities in partnership with other agencies are committed to upgrading and developing new buildings but their policies for housing older people vary.

According to the Office for Senior Citizens (2013) the government has a focus on the provision of affordable and appropriate housing alternatives for older New Zealanders that meet their changing needs. However, Davey et al. (2004: 10) found New Zealand housing policies are not “well-developed”. In contrast, the Scottish Government have outlined two housing strategies, both of which are further developed than those in New Zealand. These are “better use of existing housing” and “building new, affordable and sustainable housing,” with the latter given priority (The Scottish Government, 2011:4&6). Housing policies in Scotland include sustainability features as these are seen as a contribution to effective housing strategies either by reusing and retrofitting existing dwellings or by developing sustainable approaches in new ones.

2.3.1 Universal Design

Universally-designed homes enable people to live safely and independently in their own home for their whole life (Office for Senior Citizens, 2013). Design guidelines including Universal Design (UD) (section 5.2.6) and Lifetime home standards (LTH) (section 5.2.5) along with relevant literature are described in detail in Chapter 5. In New Zealand there is still a long way to go in implementing universal design principles in new buildings. In Christchurch, however, due to the increasing number of new buildings and redevelopment of damaged ones, a new service has been introduced providing advice on how to apply lifetime housing design principles (Office for Senior Citizens, 2013). A number of social housing providers in New Zealand are moving toward lifetime house design including the Salvation Army (Office for Senior Citizens, 2013). While several studies have documented the general application of UD and LTH standards into houses (Centre for Universal Design, 1997; Story, 1998; Ronald and Mace, 1998; Deardorff and Birdsong, 2003; Goodman, 2011; Nussbaumer, 2012; Null, 2013; Imrie, 2014), some have also suggested the usefulness of UD and LTH in retrofitting existing dwellings (Iowa Program for Assistive Technology, 2004; Young, 2006; Oram et al., 2008; Carnemolla and Bridge, 2014). In addition, UD and LTH homes for older people for ageing in place have been the main focus of a number of these studies (Demirkan, 2007; Carr et al.,

2013; Carnemolla and Bridge, 2014; Judd et al., 2014a) along with other factors such as adaptability and visitability (section 2.3.4) (Judd et al., 2010; Park et al., 2016). Figure 2.1 shows a Lifetime Home floor plan by the DWELL project team for downsizers in the UK. LTH specifications are indicated on the plan (section 5.2).

Figure 2.1 Lifetime home design by DWELL (University of Sheffield, n.d.)

To facilitate the housing decision process for older New Zealanders following a three year multi-disciplinary research program called “Finding the Best Fit”, the informative “toolkit” “my home, my choices” was developed and trialled (Figure 2.2) (CRESA, 2018a; James & Saville-Smith, 2018). The tool aims to assist older people, providers of housing for the elderly, and

social services to recognise the pros and cons of the available options of either staying-put or moving to community-based housing (rest home or hospital care were excluded) and make an informed decision on which suits them best. The main focus of the tool is to help people identify the opportunities and constraints of their current home for ageing in place and the maintenance and retrofitting it might need now and in the future (CRESA, 2018a; James & Saville-Smith, 2018).

Figure 2.2 “My home, my choices” toolkit (CRESA, 2018c)

2.3.2 Terminology

Howe et al. (2013:555-556) drew on an extensive range of sources to categorise and compare the terms used for different types of “Service Integrated Housing” (SIH) based on the spectrum of services available to residents. Three main categories were identified in their study: the first group of SIH has a focus on “leisure, lifestyle and recreation” such as retirement villages; the second group is related to SIH offering “support services” and these are further clustered into “independent living in private dwellings”, such as a self-care unit in a retirement village, and “shared housing” including “agency-assisted shared housing” which is the most commonly used term in most countries. Examples of this form of SIH include Abbeyfield Housing in the UK (and NZ) and cohousing in Europe. The third group is when SIH offers “support and care services.” These are further classified into two subgroups: “housing with support and care”

and “housing with continuing care.” In New Zealand the former is called “supported independent accommodation” (Howe et al., 2013).

Inconsistent terms and definitions are used in housing for older people that has some level of support and care. Howe et al. (2013) discussed these and suggested using “Service Integrated Housing (SIH)” to cover all types of accommodation from housing providers with one or more types of support and care services (section 2.3). They also suggest similarities and differences in the existing literature on describing housing for older people and the level of support and care delivered, including that from the UK, the US, Canada, Australia and New Zealand. However, they found the limited New Zealand sources reflect little relevant literature in this field. For this research, excluding a large number of terms describing housing built for older people but associated with no support and care services could lead to missing relevant literature. Since most special housing built for the elderly provides some level of support and care, use has been made of a broad terminology for investigating housing for older people in this research, including design related definitions which have been classified in support service related terms. For the purpose of this research, the term “support services” encompass either “Passive such as barrier-free design” or “active such as property maintenance, organised social activities and meals services” while care services are “personal assistance, visiting nursing and home health care” involving more one-to-one care (Howe et al., 2013:550). Despite the analysis of a wide range of terms associated with SIH, a large number of support services are provided to those in purpose-built housing. This leads to potentially overlooking the large number of older people who live in their own houses and would like to age in place. This approach meant, for example, that Howe et al. (2013) did not look for terms associated with subdivision, modification/upgrading/maintenance and even sharing existing houses, although assisting older people to live in existing residential buildings adapted to meet their changing needs could be considered in supportive programs developed for older people.

According to Howe et al. (2013), in most countries the terms home and/or community care services are used for the care services delivered to frail/disabled older people in their home or community-based setting.

“Institutional care” or in more general terms “nursing home”, refers to the facilities in which older people are provided with ongoing aged-care services in “a non-domestic residential or

institutional setting”. A pre-admission assessment of the level of care needs is required for receiving these services (Howe et al., 2013). In New Zealand the terms “continuing care hospital” and “rest home” refer to facilities associated with nursing homes (Howe et al., 2013).

2.3.3 Staying-put

“Staying-put” meaning no change is made to the current house has been noted as “...a strategy of behavioural change rather than environmental change” (Oram et al., 2008:5). The main concern regarding this approach is the potential effect on the life of occupants in the future as barriers in the current house could make it unsuitable for older people, leading to an early need for care services.

Howe et al. (2013) in their survey also noted growth in the trend for keeping older people in their existing houses. This could be supported by installing age-friendly housing design features so seniors can live independently for as long as possible. Also important is the provision of regular home-care services, and in-home support services such as assistive programs to keep the dwelling well-maintained and comfortable. All this will help to achieve a better quality of life, wellbeing and independence while living in the community.

2.3.4 Home modifications

Home modification can be defined as “conversions and adaptations to the permanent physical features of the home environment in order to reduce the demands from the physical environment and as a result, make tasks easier, reduce accidents and support independence” (De Jonge et al., 2006 in Oram et al., 2008:6). The two main categories are minor modification, such as installing handrails and replacing doorknobs, and major modifications including large-scale repairs, installing ceiling insulation for improved thermal comfort, and installing wheelchair ramps. Other potential design modifications not identified in this study are converting a bathroom to a wet room, or rearranging the plan to create a ground floor bedroom. Despite the lack of discussion on possible design solutions in most of the literature, Bridge et al. (2002) identified a number of safety hazards involved with dwelling design features, such as difficult stairs, which could form a barrier to safety and independence.

In their scoping review of home modifications, Carnemolla and Bridge (2018) found that a large body of literature highlighted the overall benefits of home modifications on the health of older people and those with a disability living in the community. McChesney and Amitrano (2006) identified a number of benefits associated with retrofitting houses including financial benefits through reducing operating energy costs, improved health and comfort, environmental health benefits, and public and private health benefits. Similarly, Hwang et al.'s (2011) investigation of 376 individuals in the UK aged between 81 and 91 showed the positive impact of home modifications on older people's experience of ageing in place. In their research, those who had renovated their existing house were more likely to stay longer in their own home. They also found home modifications have implications for health and social care policies for older people. Taking a different perspective, Tanner et al. (2008) indicated home modifications could enhance the meaning of home for older people.

Oram et al. (2008) were the team for "The Home Modification Information Clearinghouse Project" (HMinfo) and undertook research in Australia into housing changes for older people, since many existing residential buildings are not appropriate or safe for an ageing population. HMinfo is based in the faculty of the Built Environment at UNSW, Sydney and provides "an information service tasked with collating, reviewing and creating the evidence base for best practice in modification of the home environment to support people with problems in self-care, participation and autonomy" (HMinfo, n.d.).

The team produced a set of strategies and instructions, and a housing choice checklist for older people. The purpose of their research was assisting older people either to modify their current home or relocate to a more appropriate one. The HMinfo website provides easy access to relevant materials and policies to assist people in asking and resolving relevant questions (Bridge and Flynn, 2003).

Oram et al. (2008) recommended that where home modification would be expensive and unaffordable, relocation to a more appropriate house would be the better option. There is, however, no discussion of widening older people's choices in the report. Options for ageing in place such as sharing the existing house with other people or dividing larger houses into smaller units were not considered. Furthermore, their discussion of home modification missed

aspects such as home and garden maintenance or the need for more substantial retrofitting because of house age, although a number of possible relocation approaches were offered.

Home modification services are delivered differently in different countries. In the UK, the Home Improvement Agencies (HIA) are responsible for delivering government funded home modification services to assist “older, disabled and vulnerable people” retain independence. They identify the needs leading to renovation, modification and adaptation, find suitable builders and undertake quality control of any modifications, and ensure house owners have access to relevant information and grants (Davey et al., 2004; Hwang et al., 2011).

Few studies have documented design-led home modifications (Judd et al., 2010; Kaasalainen and Huuhka, 2016). In an investigation of older Australian homeowners Judd et al. (2010) examined the user acceptability of three different approaches to designing accessible housing. These were called VISIBLE Design (adaptations to help you visit the homes of friends or family), Adaptable Design, and Universal Design (the latter two applying to the participant’s dwelling). In terms of user acceptance, Adaptable Design received the highest level of support (85%), followed by Universal Design (78%) and VISIBLE Design (65%), with relocating at 67.9% (Judd et al., 2010). It seems that providing access in the initial housing development is the preferred design approach. In addition, a comparative cost analysis of these three design approaches using current home modification practices in Australia suggested building an accessible dwelling is more cost effective than retrofitting an existing dwelling (Judd et al., 2010).

Using a design-based approach in their research, Kaasalainen and Huuhka (2016) introduced the idea of accessibility improvement models (AIMs) for typical Finnish flats. AIMs assist older people to remain longer in their existing dwelling through appropriate home modifications and changes to flat layouts.

Oram et al. (2008) felt the aim for home modification is to enhance a “home’s accessibility, adaptability and/or introduce universal design features.” Making the decision in later life of whether to modify or move house depends on a variety of contributing factors including health and physical situation, preferences, and needs. However, people should be well informed before entering this stage. Improving the house by making it more comfortable and barrier-

free and thus reducing the need for care services has the advantages of maintaining pre-established social interaction and avoiding transitional stress (Oram et al., 2008). On the other hand, Oram et al. (2008) suggested home modification is not necessarily a practical solution if the existing dwelling is distant from public transport and local services. It is also necessary to use suitable, experienced builders, ensure there are contracts so all works are appropriately completed and costs are controlled, and if necessary a building consent obtained (Oram et al., 2008). To do this needs a good knowledge of the process, so apart from not being able to afford the cost of modifications, older people may need help in achieving these goals without stress. An evaluation of the Queensland Department of Housing's home modification program showed people reported medium to high levels of satisfaction with their home modifications (De Jonge et al., 2006), suggesting that controlled modification is possible.

New Zealand research has evaluated retrofit practices for residential buildings (Ryan et al., 2008; Storey et al., 2004; McChesney and Amitrano, 2006). Storey et al. (2004) looked at sustainability modifications in the retrofit sector, finding these were very limited compared to new developments, with energy upgrades more prevalent than other aspects of sustainability such as water, materials and health considerations. Saville-Smith (2008:5), however, suggested the initial purpose of retrofitting the existing New Zealand housing stock is enhancing the energy performance of existing buildings, which is a sustainability aspect.

Several studies have noted the unsuitability of the New Zealand housing stock for ageing in place in terms of size, design, insulation, and heating (Howden-Chapman et al., 1999; Davey, 2006a; Saville-Smith et al., 2008; Wiles et al., 2012). On the other hand, assisting older people with maintenance, adaptation, and upgrading their houses could lead to improving their health and consequently their quality of life. However, these services are only available to some homeowners. To receive government-funded home modifications and home and garden maintenance requires having age-related health problems or a disability that will last for more than 6 months and stops the applicant from doing everyday tasks, or an injury or disability as the result of an accident (New Zealand Government, 2018). The most frequent government-funded home modifications include fitting handrails or shower rails, installing ramps or a lift, widening doorways, converting a bathroom to a wetroom, and lowering the kitchen bench (New Zealand Government, 2018).

Home modifications are funded by the Ministry of Health to assist “people with serious disabilities to enable them to have essential alterations made to their home to meet their specific needs” (Ministry of Health, 2016). Due to the limited funding, a prioritisation tool is used to examine the different needs of disabled applicants and the benefits of the proposed house modifications compared to the needs of other disabled people. The maximum offer for access modifications is \$15,334 (including GST). However, using an income and cash asset test, applications over \$8,076 are assessed to determine if the person is eligible for full funding. Ministry of Health, Equipment and Modification Service (EMS) qualified housing assessors help them to evaluate their disability-related house modification needs and the cost implications of these (Ministry of Health, 2016). Where modification costs cannot be met by householders who do not qualify for government funding, money will have to come from savings or superannuation, or options such as “trading down” and “equity release” (Davey, 2006a). The former means the disruption of moving, although equity release could be used to finance modifications to the existing dwelling.

Many studies have highlighted the preferences of older people for ageing in place in their family home (Davey, 2006b; Hwang et al., 2011; Hayward, 2012; Wiles et al., 2012; Saville-Smith et al., 2016; James, 2016). Davey (2006b), however, believes this depends on the older homeowner’s ability to maintain, renovate and update their house so it meets their requirements. In her investigation of 30 older homeowners’ opinions on maintenance, modifications, and adaptation, she found compared to movers (those who had already moved) and potential movers (those thinking of moving), those wanting to stay in their family home were more likely to undertake renovations or adaptations to allow them to remain (Davey, 2006b).

Findings from James et al.’s (2012) research showed older people usually find retrofitting and maintenance of their homes too hard and costly, leading to unmet repairs and modification needs. Along with other countries such as the UK and Australia, New Zealand studies have also recognised the need to assist older people to address their modification and maintenance needs so as to age in place (Davey, 2006b; Saville-Smith et al., 2008; James et al., 2012). The four-year “Good Homes for Good Lives” research programme was undertaken with the aim of enhancing the ability of older people to maintain and modify their house and meet their repair and maintenance needs (Saville-Smith et al., 2008). As part of this study, three checklist tools

were developed (James et al., 2012; CRESA, 2018b). The Good Homes tools include householder, support service provider and housing provider, and repairs and maintenance provider tools in order to “...assess what repairs and maintenance work needs to be done and who the best person is to do it” (CRESA, 2018b).

2.3.4.1 Assistive and smart technology

According to Davey et al. (2004:83) assistive technology is “an umbrella term for any device or system that allows an individual to perform a task they would otherwise be unable to do, or increase the ease and safety with which the task can be performed.” Such technology can assist older and disabled people to live independently. The most popular assistive technologies are “Alarms, level thresholds, grab rails, raised seats for toilets and raised beds” (Tinker et al., 2003 in Davey et al., 2004:83). Smart homes are those in which smart technology includes “video-entry phones, automatic taps, door-openers, alarm in every room and automatic lighting systems” (Tinker et al., 2003 in Davey et al., 2004), and these are all aspects that could make a home safer for an older person.

2.3.5 Relocation

Relocation to an appropriately designed dwelling would be an alternative when staying-put is not possible. It is important the decision to relocate is made before the health of an older person declines. Furthermore, having a stock of adaptable or universally-designed houses would be a good option as these would be suitable for a wide range of ages and abilities as well as for ageing in place (Oram et al., 2008; Sanford, 2012; Carr et al., 2013; Carnemolla and Bridge, 2014; Park et al., 2016). However, as noted above, this is not the case in New Zealand.

A large body of literature has discussed downsizing as a housing alternative in later life, including examination of the demographics of downsizers, reasons for downsizing, the process of decision making, and housing choices in different contexts, such as Britain and the USA (Luborsky et al., 2011; Banks et al., 2012), Europe (Angelini et al., 2011), Australia (Judd et al., 2014b) and New Zealand (James, 2016). The need for affordable and attractive options into existing neighbourhoods for downsizers has been highlighted in order to prevent segregation into residential care institutions targeted at older people (Park and Ziegler, 2016). A number of researchers have investigated the design aspects of housing options focusing on more

mainstream housing accommodating older people's needs and preferences (Judd et al., 2010; Sutherland and Tarbatt, 2016; Park et al., 2016; University of Sheffield, n.d.).

In the UK, the DWELL project investigated the working definition for downsizer homes and proposed a series of co-designed types of age-friendly general needs housing for those wishing to downsize (Park et al., 2016). In their studies, carried out in Sheffield, they developed a number of low, mid, and high rise housing types with the aim of creating either visitable dwellings, LTHs, accessible and adaptable dwellings, wheelchair adaptable, and wheelchair accessible dwellings to accommodate downsizers in a range of different scenarios. The low-rise types included the courtyard bungalow, chequerboard house and bungalow, and hillside bungalow (Figures 2.3, 2.4 and 2.7). The courtyard bungalow (Figure 2.3) was developed in response to the most popular housing types in most areas of England and Wales with the possibility of converting its attic space into extra accommodation.

Figure 2.3 DWELL Courtyard bungalows for downsizers (Park et al., 2016)

The chequerboard house and bungalow (Figure 2.4) was a response to multi-generational and extended family housing comprising a 3-storey house and a bungalow with shared pathway and gate. Floor plans of both dwellings are illustrated in Figures 2.5 and 2.6.

The 59m² wheelchair adaptable bungalow (granny house) was assumed to be occupied by a frail older person living next to her/his relatives in the three storey 143m² Lifetime house (6 bed spaces) sharing a gate and pathway. The relatively independent attic level was assumed to be occupied by a young adult who frequently visits home in university breaks.

Figure 2.6 Left: chequerboard house first floor plan; right: Chequerboard house attic layout (University of Sheffield, n.d.)

The local topography of Sheffield creates difficult housing sites which led to the development of the hillside bungalow (Figure 2.7). This mid-rise typology had a mix of residential apartment in upper levels with commercial, community, car parking and retail uses on the ground floor. High-rise types were also developed to address the cohousing living suggested by older participants in the design process.

Figure 2.7 DWELL Hillside bungalow for downsizers (Park et al., 2016)

Downsizing for the ageing New Zealand population has also been investigated but using a different approach. As part of the “Finding the Best Fit” research program mentioned earlier, Saville-Smith et al. (2016) and James (2016) documented the meaning and experiences of downsizing for older New Zealanders. They found they would prefer to stay in their family home rather than downsizing (James, 2016). They also examined downsizing options including “reducing ownership shares; substituting larger for smaller dwellings; leaving owner occupation; subdividing; or substituting housing in high for low priced areas” (CRESA, 2018c). Attention also needs to be paid to the considerable personal non-financial costs which older people usually pay for relocation, including failing to maintain their social contacts and loss of a familiar community environment.

2.3.6 Cohousing

Statistics New Zealand has projected a rise in the number of people living in “more communal and non-private dwellings including retirement homes” driven by the ageing population (Statistics New Zealand, 2013a:9).

Cohousing, the European model of shared housing, was developed to provide an environment in which multi-generations can share common spaces and have social interactions. However, Howe et al. (2013) did not consider cohousing to be mainstream in their investigation of SIH. This form of community living “combines the autonomy of private dwellings with the advantages of community living in the form of private units, semi-private units and indoor and outdoor communal space either new build or retrofit” (Williams, 2005:146). Its types range from multi-unit residential buildings (between 4-30 households) to small, self-organised complexes of 2-3 households (Riedy et al., 2017b).

Shared options like cohousing are deemed viable for some seniors (Riedy, 2017 in Ross 2017). Cohousing has also been identified as a sustainable approach for accommodating people because it provides a supportive and communal environment (McCamant & Durrett, 2011; Sanguinetti, 2012). It implies sharing resources because some aspects of the dwelling are shared. McCamant and Durrett (2011:15) believe “the sharing of resources gives all residents access to a wider variety of convenience at a lower cost per family than is otherwise possible.” They also give instances of cohousing resource sharing, including sharing spaces such as a laundry, guest room, and workshop, and items like essential tools, a lawnmower, newspapers and magazines, and camping equipment and other things used less often. In some cases cars, boats and vacation houses were shared between two or more households (McCamant & Durrett, 2011). The environmental advantages of “higher-density multi-family” developments such as cohousing communities have been identified by planners (McCamant & Durrett, 2011; Sanguinetti, 2012). Apart from the social advantages, cohousing residents consume less energy by sharing resources.

Sanguinetti (2012) suggested the reason behind retrofit cohousing was that the residents wanted a more sustainable lifestyle. According to McCamant and Durrett (2011), because retrofit cohousing does not involve green field development but reuses existing built land it is probably more accessible and sustainable in terms of reducing resource use, construction materials, energy, and waste, and consequently, lowers the environmental impact.

Communal residential buildings such as cohousing have the capacity of attracting older people as they can provide more assistance and companionship (Riedy et al., 2017a), and senior cohousing is now well-established in its countries of origin, Denmark and the Netherlands

(Bamford, 2005), and is growing in popularity in the USA (Scanlon and Arrigoitia, 2015). This “valued housing niche” could be an option for the elderly (Bamford, 2005:44). Brenton (2013) sees retrofit senior cohousing as an alternative for the older occupants of existing buildings, giving an example from the Netherlands in which a group of older people living in an apartment building keep an untenanted flat in their block to be used as a common house. A supportive and sociable community was thus created without moving.

Cohousing communities vary in terms of size, resident attitudes, and contexts (existing neighbourhood or vacant site), and can accommodate a wide range of lifestyles and budget. In their research in NSW, Riedy et al. (2017b) suggested older people might find three models more appropriate for them: small-scale cohousing (section 2.3.6.1), deliberative development (section 2.3.6.2), and cooperative rental (section 2.3.6.3).

2.3.6.1 Small scale retrofit cohousing

In small-scale cohousing, a group of people might convert a couple of adjacent dwellings or a large existing house into two to four dwellings with a mix of private and communal spaces. This could also be defined as retrofit cohousing as indicated by McCamant and Durrett (2011) and Sanguinetti (2012). Figures 2.8 and 2.9 illustrate a multigenerational cohousing scheme, which is a conversion of two single-storey suburban cottages with an additional small apartment, in Balmain, Sydney. This accommodates a family, their elderly mother and a single friend. The scheme won a NSW Architecture Award in 2014, and provides privacy by having a separate entrance for each unit, while sharing the backyard (Australian Broadcasting Corporation (ABC), 2014).

Figure 2.8 Balmain multigenerational retrofit cohousing (McGee and Benn, 2015)

Figure 2.9 Balmain multigenerational retrofit cohousing (ABC, 2014)

The design of the complex allows the third unit to be used for a carer if required (McGee and Benn, 2015).

2.3.6.2 Deliberative development

In deliberative development, a group of potential residents engage a designer to produce a multi-unit building. Private and shared spaces are agreed between residents. This can be small, medium or large scale.

Figures 2.10, 2.11 and 2.12 are of Community Housing in Auckland, which is a new purpose-built house shared by five older women. Two communal dwellings of this type were designed by Smith and Scully Architects, and built by the Bays Community Housing Trust.

Figure 2.10 Auckland Community Housing floor plan (Architecture Smith + Scully Ltd, n.d.)

Figure 2.11 Auckland Community Housing, left: shared kitchen; right: shared kitchen and living area (Architecture Smith + Scully Ltd, n.d.)

Figure 2.12 Auckland Community Housing, left: private bedroom; right: storage (Architecture Smith + Scully Ltd,

n.d.)

2.3.6.3 Co-operative rental housing

In the cooperative rental model, a cooperative management company supports tenants in self-managing the property (Riedy et al., 2017c). Common Equity New South Wales Ltd. is a company which provides housing in NSW Australia, aiming to provide affordable housing for all needs and demographics. They were set up to house seniors, older single women, key workers, those living with a disability, marginalised groups, and people on low incomes (Common Equity NSW Ltd, n.d.) (Figures 2.13 and 2.14). As stated by Schwartz (n.d.), cooperative housing can be a financially efficient and affordable model for the elderly, providing “support, flexibility and independence.” This model of cohousing has been employed with varying degrees of success in northern European countries and Canada and is growing in Australia (Schwartz, n.d.).

Figure 2.13 Nelson Bay Housing Co-operative (Common Equity NSW Ltd, n.d.)

Figure 2.14 Unanderra Community Property in Wollongong (Common Equity NSW Ltd, n.d.)

However, Riedy et al. (2017a) found because Australians do not have a good image of cohousing and generally are not aware of its potential benefits they turn away from the idea of shared living. They concluded that “cohousing is a nice idea that lacks a market.” McGee and Benn (2015) also found cohousing was not popular with Australians, especially with older people (Riedy et al., 2017a). An older study (Schreter and Turner, 1986) found shared housing was also not popular in the USA. However, McGee and Benn (2015) suggest that although cohousing might not work for everyone, even if it attracted only 10% of the urban population this would make a big difference in cities.

2.3.6.4 Abbeyfield

According to Howe et al. (2013:561) shared housing is a form of SIH which “provides low-cost accommodation and minimal support to low-income older people”. They discussed various types of shared housing in a number of countries and found differences in the level of support delivered to the occupants and provision of personal care, as well as support in terms of subsidies from public funds. In Australia low cost boarding or care homes have the same purpose and function of shared housing with various “levels of support, personal care and quality” for frail older people (Howe et al., 2013:561).

Abbeyfield housing in the UK qualifies as a model of shared housing. It originated from the relatively old concept of “small group homes” and developed into “small-scale shared housing” aiming at the provision of a “community atmosphere, mutual aid, and companionship” (Howe et al., 2013). People have their own bedrooms but share common spaces. They do their own laundry and maintain their personal space, while having their meals prepared and the common spaces cleaned by a housekeeper. However, the nature and level of support and care, if available, is diverse. Howe et al. (2013) suggest that the idea has been taken up in other countries such as Canada, Australia and New Zealand, but has failed to develop widely.

In New Zealand Abbeyfield, a charitable, volunteer-based organisation, is a social and affordable housing supplier, providing the elderly a social, companionable and communal life (Abbeyfield, n.d.; Davey et al., 2004) with types that include “marae-based Kaumātua housing” (Office for Senior Citizens, 2013). They generally offer “community-funded rental accommodation” but a “resident capital contribution” model is offered in some areas (Davey et al., 2004:64). According to Davey et al. (2004) 8 to 10 people are allocated an ensuite room in an Abbeyfield house. While each resident should be able to look after themselves, the communal spaces including shared kitchen, laundry, dining and sitting room are maintained by a resident housekeeper, who is responsible for shopping and preparation of two main meals per day. This housing type is another form of SIH. A New Zealand report into aged care supports the vitality of community-based models such as Abbyfield suggesting this should replace residential aged care facilities (New Zealand Labour Party, Green Party of Aotearoa New Zealand and Grey Power, 2010).

2.3.6.5 Housemate matching service

Howe et al. (2013) describe another type of shared housing in which older people who require some degree of assistance live with younger groups who offer this in return for inexpensive or free accommodation. This is known as “agency-assisted shared housing” and is generally administered by an independent agency. However, Howe et al (2013) felt this would be an unattractive housing alternative for older people in most of the countries they investigated, including New Zealand.

The International Homeshare program initially started in the UK in 1999. The Homeshare Australia and New Zealand Alliance Inc. (HANZA) is a membership-based organisation established in 2006. Their Homeshare program aims to assist older households or householders with a disability to be matched with a homesharer. The household benefits from the company and assistance of the housesharer in daily activities such as cooking, cleaning, shopping and gardening in return for affordable accommodation. HANZA (n.d.) “works in collaborative partnership between Homeshare providers and potential providers across Australia and New Zealand.” From their website it seems such a program is not yet active in New Zealand, although Presbyterian Support (Enliven) East Coast also runs a Homeshare program matching up older households with younger homesharers (Davey, 2017).

2.3.7 Accessory Dwellings Units (ADUs)

An ADU is “a residential living unit that is within or attached to a single-family dwelling, and that provides independent living facilities for one or more persons...on the same parcel of land as the principal dwelling unit it accompanies” (New Hampshire Office of Energy and Planning, 2016). This approach recognises the problem of small households living in large houses and often on large plots, by suggesting ways to subdivide both. Duff (2012) studied the environmental impact of ADUs finding they reduced the resources going into housing by accommodating more people on the same land and avoiding infrastructure expansion. She also recommended incorporating sustainability features including insulation and efficient appliances and lighting when constructing ADUs (Duff, 2012).

ADU related research is well established in the USA. In a study of a sample of American older homeowners, Varady (1990) found those in poor health and with low incomes were

particularly interested in accessory apartment conversion and home sharing. ADUs have been considered as affordable options (Chapman and Howe, 2001) for those who wish to age in place (Jarvis, 2010; Sloan, 2014) by allowing the elderly to live independently and maintain their privacy (Varady, 1990). Chapman and Howe (2001) conducted a study of owners and tenants of ADUs in Washington State, finding ADUs offered affordability related to the extra income, increased the value of the dwelling, and assisted with housing payments. They also suggested these financial incentives were the main reason why people were interested in ADUs (Chapman and Howe, 2001), although they also argued that an ADU might or might not allow older residents to age in place, depending on location. In a city like Seattle, a converted dwelling located on a slope could be inaccessible for many older residents (Varady, 1990). This might also apply to Wellington as many suburbs are located on hills. Some studies see ADUs as a response to social, environmental, and economic concerns (Duff, 2012; Sloan, 2014) suggesting they could “improve the functionality of the homes within the city by reducing their environmental impact, creating economically feasible housing and accommodating diverse patterns of living” (Duff, 2012:43).

Despite the significant benefits of ADUs, they are not particularly popular with older Americans (Varady, 1990; Chapman and Howe, 2001; Sloan, 2014), and this might be the case in other developed countries. On the other hand, research also suggests this type of housing has served a high proportion of older people in the USA (Chapman and Howe, 2001) even on a temporary basis as a response to the changing needs of older occupants.

In Australia public housing movable units are a kind of ADU mainly tailored to older people and people with disability support. They allow independent living in a self-contained unit set up in the backyard of the home of a friend, relative or carer (State Government of Victoria, Department of Health and Human Services., 2017). This state government initiative is available to Australians aged 55 and over providing certain other conditions are met.

The subdivision of existing sections (plots) in New Zealand is common in urban areas, especially to stop urban sprawl by housing more people on the same area of land. This practice has been taken a step further in California with the development of council-provided plans for ADUs (City of Santa Cruz, 2003; n.d.) (Figures 2.15 -2.18).

Figure 2.15 Detached ADUs from City of Santa Cruz ADU manual (City of Santa Cruz, 2003)

Figure 2.16 Attached ADUs from City of Santa Cruz ADU manual (City of Santa Cruz, 2003)

Figure 2.17 Floor plan and exterior of an ADU from City of Santa Cruz website (City of Santa Cruz, n.d.)

Figure 2.18 Detached ADU over garage from City of Santa Cruz website (City of Santa Cruz, n.d.)

In their investigation of ADUs and the existing New Zealand housing stock, Saville-Smith et al. (2017) studied two types: a newly built self-contained residential unit on land already occupied by another dwelling, and an additional unit created by conversion of an existing dwelling. They estimated around 12% of under-utilised existing housing in New Zealand could be converted to deliver an additional 180,000 dwellings. In their study, they looked at overseas experiences and approaches and New Zealand council ADU legislation, concluding the variability of the latter has led to the ADU being yet unrecognised as an affordable solution for making use of underutilised housing stock. Although their recently published research provides a comprehensive insight into ADU regulations across New Zealand, unlike the US studies, they did not provide prototype design solutions for New Zealand housing types. In her study, Duff (2012) presented ADU solutions for typical bungalow and ranch housing common in Sacramento, California (Figures 2.19 and 2.20).

Figure 2.19 Left: typical Sacramento bungalow; right: Remodelled bungalow (Black coloured walls are new walls) (Duff, 2012:34&41)

Figure 2.20 Left: typical Sacramento ranch home; right: Remodelled ranch home (Black coloured walls are new walls) (Duff, 2012:36&41)

2.3.8 Retirement villages

According to Howe et al. (2013), in most countries the term “retirement villages” (RVs) refers to similar forms of SIH with a focus on lifestyle and recreation. In the USA the common term for this type of housing is “Leisure-Oriented Retirement Community” (LORC). They also suggest LORCs in New Zealand as well as North America and Australia have largely been developed by the private sector. This implies a possibly small proportion of the wealthy ageing population in New Zealand has created a demand for this large scale luxury form of accommodation.

Retirement villages are residential clusters which usually offer communal environments, social activities, and some level of support and care, such as rest homes and hospitals. People often start by living independently and move to more supportive housing environments in the same village as these are needed. New Zealand retirement villages can be freehold ownership, buying a license to occupy, or some form of rental arrangement, suggesting this housing alternative is not available to low-income older people as it requires a capital contribution (Davey et al., 2004). However, Howe et al. (2013) feel the main purpose of establishing these communities is to support those who are willing to live independently rather than accommodating older people who choose to live a luxury lifestyle.

Because of the possible negative attitude toward living in retirement villages, Gardner et al. (2005) evaluated the impact of these on the quality of life of older people. They held three focus groups. Those in the first two had moved to a retirement village, one a resident-funded RV and the other a non-government RV (NGO) and who were in independent living units. The third group were those who remained in the community but who had considered relocating to a RV. A cross-sectional survey was conducted using Lawton’s Quality of Life (QOL) model to measure the quality of life of the focus groups by examining the person-environment adaptation after moving to the RV. Interestingly, they reported that although the quality of life was high among all groups, the village respondents believed their overall satisfaction, either from the social life and network in the village or with life generally, was better since moving whereas those living in the community thought their quality of life was the same or worse than when they considered moving to an RV.

In her research, Greenbrook (2005) suggested “supported independent accommodation” should be the New Zealand term for retirement villages as they cover a wide spectrum of SIH

categories. However, as Howe et al. (2013) found, terminological differences have been created by the range of regulations under the NZ Retirement Villages Act 2003. This act involves all types of purpose-built housing which provide support services for older people. Howe et al. (2013) further suggest the provision of care services in retirement villages is an important contributor to older occupant satisfaction. They found higher levels of resident satisfaction in two continuing-care retirement villages in the UK because people could remain in the retirement community rather than moving to a nursing home.

In 2013, Saville-Smith and Fraser (2014) carried out the National Survey of Retirement Villages in New Zealand. They found residential units in all types of RV comprised 1.5% of New Zealand's private housing stock. Findings from their investigation showed the size of newly built RVs had a different pattern from the New Zealand private housing stock. While three and more bedroom dwellings formed slightly more than 75% of New Zealand housing supply in 2013, only 9.3% of RVs were 3+ bedroom units. Two bedroom units accounted for 58.8% of the stock and one bedroom, bed-sit and studio units for 31.9%.

Retirement villages in New Zealand are regulated and monitored under the Retirement Village Act 2003 (James and Saville-Smith, 2011). According to The Retirement Villages Association of New Zealand (2014) the average age of entry to retirement village is mid to late 70s. In the New Zealand investigation entitled "Retirement Villages Act 2003 Monitoring Project: Residents' Perspectives," James and Saville-Smith (2011) investigated RV residents' understanding of the Act, regulations and the code of Practice and Code of Residents' Rights. This led to a number of concerns.

"Increased fees beyond agreed constraints, reductions in the range of services and amenities covered by the fees and subsequent application of additional charges to those fees, failure to provide amenities indicated in staged development plans, reductions in the quality of amenity, lack of financial transparency." (James and Saville-Smith, 2011).

Hayward's (2012:100) investigation into the experiences of transitions within two New Zealand retirement villages showed that "transitions are not one-off events to which residents adapt (or not) but have an on-going impact on their lives and are multi-layered." In addition, she discovered a great difference in the definition of home between independent residents and

supported living participants. The former group had a strong attachment to their house which made them to refer to it as home. This factor along with the architectural and social division between these two groups is due to the latter's need for special care and isolates supported living residents (Hayward, 2012).

Woburn Apartments is a retirement village in Lower Hutt, Wellington, developed by The Masonic Villages Trust, a registered charity. It is a complex of one, two and three residential units with an Enliven rest home and hospital, and a Masonic Care rest home and hospital. The village was completed in 2017 and provides a sense of community to its residents through facilities including the café, west bar, lounge bar, gym, art and craft room, library, snooker room, men's shed, theatre and indoor bowls and darts areas (Masonic Villages Ltd, n.d.). Figures 2.21-2.24 illustrate one, two and three bedroom units in Woburn Apartments.

Figure 2.21 Woburn Apartments: site plan, upper buildings: Masonic Care rest home and hospital, middle: Woburn Apartments, lower buildings: Enliven rest home and hospital (Masonic Villages Ltd, n.d.)

Figure 2.22 Woburn Apartments, Left: 57m² one-bedroom unit; right: 89m² two-bedroom unit (Masonic Villages Ltd, n.d.)

Figure 2.23 Woburn Apartments, Top: 112m² two-bedroom unit with extended living area; bottom: 112m² three-bedroom unit with third bedroom opening to living area (Masonic Villages Ltd, n.d.)

Figure 2.24 Woburn Apartments, Left: open plan kitchen of two bedroom unit; right: combined dining/living area of two bedroom unit (Masonic Villages Ltd, n.d.)

2.3.9 Other international concepts

The Netherlands has applied a “Senior Citizen Label” to all housing for older people to mark dwellings as “suitable” for seniors (Davey et al., 2004). The initiative was adopted given the preference of older people for retaining their independence and because a considerable proportion of all upgrading, adaptation and new building has been targeted at seniors.

2.3.10 Other New Zealand options

2.3.10.1 State housing

State housing is low-cost rental housing provided by Housing New Zealand (HNZ) to those most in need. People aged 65+ are 20% of Housing New Zealand tenants (Office for Senior Citizens, 2013). Almost half these senior tenants are accommodated in standalone houses with the remainder in flats (Office for Senior Citizens, 2013). Over 184,000 people live in 63,000 state houses across New Zealand and a high proportion of state housing is three-bedroom homes (Housing New Zealand Corporation, 2017). However, there is also demand for smaller units and homes for larger families in urban areas. There is always a waiting list. “In 2018 there were over 7,700 people on the waiting list, plus their families” (Community Law, 2018). However, the Ministry of Social Development (n.d.) suggests the length of waiting time for an eligible person depends on “how quickly a suitable house becomes available, what their needs are and the number of people waiting with urgent needs.” It seems there is no separate waiting list or priority for older people with housing needs.

2.3.10.2 Social housing

A range of affordable houses comes from social housing providers funded by the government. These houses are targeted at people who are not able to afford housing in the private market (Office for Senior Citizens, 2013). Government-subsided rental housing is managed by HNZ and 40 other community housing providers. The Ministry of Social Development oversees the assessment process for applicants for all community housing providers (Community Law, 2018). To empower non-government housing suppliers, between 2011 and 2015, the Government provided \$139 million to non-government social and affordable housing suppliers in response to the housing demand (Office for Senior Citizens, 2013). The Office for Senior Citizens (2013) also suggests the government are giving priority to the provision of affordable housing and making this available to those aged 65+. The community housing sector, councils around the country, and the Social Housing Unit within the Ministry of Business, Innovation and Employment in partnership with other housing providers including not-for-profit iwi (The definition of iwi is an “extended kinship group, tribe, nation, people, nationality, race - often refers to a large group of people descended from a common ancestor and associated with a distinct territory” (Māori Dictionary, n.d.)) and private sector groups, develop housing for this particular group, either for rent or purchase.

Local councils operate a separate rental housing system, aiming to provide different housing from that supplied by HNZ. For instance, Wellington City Council (WCC) mainly supplies bedsits and one-bedroom units, hence most WCC tenants are single people and couples without children (Community Law, 2018). According to Community Law (2018), some local councils supply subsidised rental housing for older people. Haumarū Housing Limited Partnership was established by Auckland Council and The Selwyn Foundation to provide affordable housing for older people in Auckland. They manage over 1400 rental units for the elderly with housing needs (Haumarū Housing Limited Partnership, 2017).

Volunteer agencies that provide housing for older people include Wellington Masonic Village Trust, The Salvation Army, Presbyterian Support Services, Abbeyfield New Zealand, and Kaumātua flats/Iwi housing schemes. They offer a range of tenure types (rental and ownership), models, care and support services, all generally aimed at low-income people and those with special support needs but still able to live in the community (Davey et al., 2004).

2.4 Domestic energy use and the ageing population

The Ministry of Business Innovation and Employment (MBIE) provides annual analysis of New Zealand's residential energy sector. Their latest report shows that in 2016, 10.9% of total energy and 31.4% of total electricity were consumed in the residential sector (MBIE, 2017), although the analysis does not consider the energy embodied in the creation and maintenance of New Zealand's housing. The 1999-2005 HEEP (Household Energy End-use Project) study remains the comprehensive account of New Zealand's residential operating energy performance where 400 randomly selected New Zealand houses were studied. As part of HEEP, Isaacs et al. (2010) compared 12 pensioner houses and 17 non-pensioner houses in Hamilton, in terms of total energy use, hot water energy use, LPG heating, and living room/bedroom temperatures. They found in the winter months, the pensioner living rooms (during the evening) and bedrooms (overnight) were 1-2°C warmer for the same periods than the non-pensioner living rooms. The thermal efficiency of the well-insulated pensioner units was the probable reason (Isaacs et al., 2010). They also found 8 of the 12 pensioner units used portable LPG heaters. Moreover, while the hot water energy per person in a Hamilton pensioner unit was slightly less than the non-pensioner unit, the overall energy (including gas) per person was more (Isaacs et al., 2010).

Isaacs et al. (2010) also investigated a group of pensioners living in poorly insulated houses in Wellington. They found on average during evening Wellington Pensioners maintained their living rooms 3.5°C colder than Hamilton pensioners, the average for Wellington being 17°C. They concluded that pensioners living in older, poorly insulated units or houses would have higher energy demands and costs and lower indoor temperatures as heating would be less affordable and effective (Isaacs et al., 2010). This same study showed the average evening temperature in a Wellington pensioner living room is 3°C lower than the minimum 20°C recommended by WHO for the elderly (World Health Organisation and United Nations Environment Programme, 1990). In another more recent report by WHO (2007), regardless of age, the recommended temperatures are 21°C for a living room and 18°C for other occupied rooms. The New Zealand Building Code, however requires older people's rest homes to provide a minimum temperature of 16°C for its occupants (Department of Building and Housing, 2011).

It seems older people in New Zealand are accustomed to living at lower temperatures and in houses where only occupied rooms are heated.

2.5 Summary

Of the many New Zealand studies on the provision of housing for the elderly, most have dealt with arguing for affordable and suitable dwellings and improving the condition of existing houses in order to age in place (Davey et al., 2004; Davey, 2006a; Boston and Davey, 2006; Saville-Smith et al., 2008; Saville-Smith et al., 2009; James et al., 2012; Saville-Smith and Fraser, 2014).

Much literature has been published on modification practices in New Zealand. A number of these studies have evaluated the efficacy of energy efficient upgrades of existing New Zealand residential buildings and the utility of sustainability features (Lloyd and Callau, 2006; Zhang, 2010). Using sustainability principles in housing for older people may help them to remain warm and comfortable as well as keeping their energy bills affordable. Many studies have focussed on enhancing energy efficiency through refurbishment (Storey et al., 2004; Itard et al., 2006; Lloyd and Callau, 2006; Zhang, 2010; De Angelis et al., 2013). Generally speaking, far too little attention has been paid to the conversion of New Zealand housing to make them suitable for ageing in place.

Given the slow rate of adding new houses and the unavailability of purpose-built dwellings, the potential of changing existing dwellings in New Zealand in response to the need for more affordable and smaller dwellings has not been sufficiently considered. Saville-Smith et al.'s (2017) investigation into the use of ADUs in New Zealand remains the most comprehensive study of this type. In addition, an as yet unanswered aspect is the acceptability for older people of different types of living style such as new and retrofit cohousing and sharing all or part of the house.

2.6 The gap in knowledge

Up to now there has been no New Zealand research into the demand for types of shared housing for an ageing population, either in the private or public sector, although sharing housing resources seems a sustainable approach, especially as many older people are living in

larger houses. When incomes are reduced in later life, it is sometimes difficult to keep these larger houses sufficiently heated and maintained. Some type of subdivision of these could be a useful way of allowing ageing in place in more suitable accommodation. Rather than building a new ADU on the section, subdivision gives the opportunity of upgrading the existing house to make it both more nearly accord with Universal Design principles and be easier to heat and maintain.

Despite the numbers of studies related to ageing in place, it is rare to find design-led approaches and as yet there are none in New Zealand. In addition, design-related housing studies are mainly focussed on design guidelines without applying them to real cases.

To facilitate the ageing process researchers have examined housing options in different countries. To date, no research was found looking at whether it is possible to convert existing houses to make them more suitable for ageing in place, whether such conversions would be acceptable to the client group, and if sharing as part of such house conversions would be acceptable for older people. This will become the focus of this research, and how this topic will be addressed is described in Chapter 3.

Chapter 3 Research design and methodology

3.1 Introduction

This chapter outlines the background and details of the methods to be used in this study. The research questions emerged following the investigation described in Chapter 2. To answer the research question, the study will be conducted in the series of phases as described.

3.2 Research questions

3.2.1 Main question

The literature review leads to the main research question, which in turn leads to three research sub-questions.

What are the requirements and preferences of older New Zealanders for conversion and sharing of existing houses so that they can age in place?

3.2.2 Sub-questions

- *Would it be possible to convert existing houses to make them suitable for ageing in place?*
- *Would the conversion of existing houses to make them suitable for ageing in place be acceptable for the client group?*
- *Is sharing as part of house conversion for ageing in place acceptable for older people?*

3.3 Research aims

This research aims to address the collective impacts of an ageing population and the preference of older people for ageing in place. The purpose is to examine the social implications of making existing houses more suitable for an ageing population.

3.4 Theoretical framework

This research is informed by perspectives in the fields of gerontology and the built environment. Based on this, this study seeks to evaluate the preferences and requirements of people aged 55+ when it comes to converting and sharing existing dwellings. Figure 3.1 illustrates the proposed theoretical framework, which integrates existing knowledge in the context of an ageing population and the New Zealand existing housing stock. It also indicates the research plan and outcomes.

Figure 3.1 Theoretical framework

3.5 Phases

To answer the research question and the two sub-questions, the research will be based on the investigation of case studies. Each of these will be an existing house in Wellington that will be

subjected to design options to convert to make it more suitable for ageing in place. Opinions on the proposed conversions will be gathered through both a survey and focus groups of potential future users and experts. The phases are set out below and are described in more detail later in this chapter.

Phase 1: Selection of case study buildings (Chapter 4)

Phase 2: Redesign taking account of housing needs for the 65+ age group (Chapter 5)

Phase 3: Evaluation of the proposed designs by an expert design panel (Chapter 7)

Phase 4: Evaluation of the proposed designs by the client group using questionnaire-based surveys and focus groups (Chapter 6 and Chapter 8)

3.6 Scope

Shen (2012) suggests comparisons between a number of case studies assists in reducing the impact of making assumptions. This research will look at two detached housing types found in New Zealand that have different plan arrangements, one based on a central corridor and one on a looser arrangement. Houses will be chosen with different orientations and site configurations.

3.7 Justification of chosen methods

The investigation will use a case study approach incorporating both qualitative and quantitative research methods. A combination of qualitative and quantitative approaches is known as mixed/multi-methods research approach or the triangulation method (Neuman, 2011). A mixed methods approach uses the strengths of each method alone and offsets their weaknesses (Groat and Wang, 2013). Creswell's (2014) Exploratory Sequential Mixed Methods is potentially applicable to the proposed study (Figures 3.2 and 3.3).

Figure 3.2 Basic Mixed Methods Designs: Exploratory Sequential Mixed Methods (Creswell, 2014:220)

Figure 3.3 Adopted Exploratory Sequential Mixed Method

It should be noted that upper and lowercase letters (QUAN and QUAL) in the context of Mixed Methods research imply the greater and lesser emphasis given to a respective method (Creswell, 2014). The proposed research will place an equal emphasis on both qualitative (focus group analysis) and quantitative (future-user survey and LCE analysis) approaches (Figure 3.3). Creswell (2014:231) also suggests that “multiphase mixed methods design” can help in understanding “...the need for an impact of an intervention program” and the possible outcome would be “a formative and summative evaluation”. In this research, therefore a multiphase mixed method will be conducted for a detailed evaluation of possible housing design solutions.

This study is, therefore, a design and case study based research approach looking at various options in terms of acceptability, as well as resource assessment. Groat and Wang (2013:418) adopted Yin’s (1994) definition of a case study into an architectural context stating that “a case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon [or setting] and context are not clearly evident”. Case study based research has been described as “distinct research design” (Groat and Wang, 2013:430) and has been argued to have the capability of being generalised from a representative model to a larger population (Yin, 1994).

Yin (1994:46) also stated that in multiple-case research, “every case should serve a specific purpose within the overall scope of inquiry.” In this research, two house types and their plans provide a unique opportunity for developing a range of alternative solutions, which will then be subjected to LCE analysis.

In addition, this is research based on the idea of design as a tool not research through design. Design was a stage in the investigation of whether converting existing house for an ageing population could work and would be acceptable to the users.

3.8 Research phases in detail

The following describes the various steps in the research process. Appropriate Human Ethics Committee approval was obtained before work commenced where appropriate (Appendix 3).

3.8.1 Phase 1: Selection of case study buildings

It was decided the designs should be based on real houses. Studying real buildings also provides the opportunity to examine potentially significant factors such as the construction type and the influence of orientation and landscape (Fay, 1999). The aim was to find case studies which best represent the New Zealand housing stock. Therefore, two typical New Zealand house types were selected based on their floor areas and number of bedrooms. These were (1) early 20th century villas with a central corridor; and (2) 1940–60s state houses. Single-storey five and four bedroom villas in Wellington, and single-storey three bedroom state houses in Lower Hutt were selected as examples of large and medium-sized dwellings to examine possible conversion options that would make the dwelling suitable for an older person. Case study houses are fully described in Chapter 4.

3.8.2 Phase 2: Redesign

The conversions of the case study dwellings must comply with NZ standards and guidelines. These are described and compared in Chapter 5. However, because this research is concerned with existing dwellings the LM 3-star standard was used as the starting point, supplemented with aspects from UD and LTH, particularly for the design of sanitary spaces.

Using the LM 3-star standard, the villas and state houses were redesigned with different degrees of shared space. Three designs were produced for each villa, ranging from subdivision (conversion to two smaller units), to having some shared spaces such as a guest bedroom, to private en-suite bedsitting-rooms and all living spaces shared. For each state house conversion, the two designs include subdivision (conversion to two smaller units) and a shared option

(private en-suite bedsitting-rooms and shared living spaces). The conversion schemes are illustrated in section 5.12.

3.8.3 Phase 3: Evaluation by expert design panel

Having created the conversions, the next step is to evaluate them using a focus group of experts in the field. Creswell (2014) describes focus groups as a type of qualitative interview in which the researcher is involved in an interview with a small group of six to eight participants. In focus groups participant opinions and ideas are normally obtained using unstructured and open-ended questions (Creswell, 2014). This study will use the general focus group method described by Creswell (2014) (conduct, audiotape and transcribe the interview). This method has been used by researchers in various fields. For example, in order to support people with dementia to age in place, Van Hoof et al. (2013) designed a conceptual dementia home where they employed two focus groups to give input and evaluate if the design met the preliminary criteria developed prior to this stage. The focus group consisted of representatives from age-related care organisations and experts in the field of home modification and care. The first review panel was held after the primary scheme was developed. The original design was revised following feedback from the first focus group. A second discussion group was convened following design revision (Van Hoof and Kort, 2009; Van Hoof et al., 2013). In another study of Accessibility Improvement Models (AIM) for typical Finnish flats, Kaasalainen (2015) recruited a group of experts in the built environment to review their proposed designs. The preliminary AIMs focused mainly on accessibility-related building regulations and were reviewed by an architect and a researcher of accessible architecture who is a wheelchair user and specialist in universal design. This method was supplemented by holding another focus group of professors and senior lecturers in the School of Architecture, Tampere University of Technology (Kaasalainen, 2015; Kaasalainen and Huuhka, 2016). The focus group of experts in this research is described in Chapter 7.

3.8.4 Phase 4: Evaluation by client group

Before any revisions the original designs will be evaluated by the client group. A diverse range of data collection processes for qualitative research have been outlined by Groat and Wang (2013) including interviews, focus groups, surveys, and observation. There has been considerable research into integrating older users into the design process. Baldwin et al.

(2012:4) used participatory methods in an investigation of the preferences of older Australians in South East Queensland. They first identified “supportive mechanisms and challenges” for older users in both the neighbourhood and dwelling using the photovoice method and then used charrettes to involve seniors in the design process. In the UK University of Sheffield DWELL project, using a participatory design approach the research team worked with a range of stakeholders and local residents on what made a good downsizer home (Park et al., 2016). In an investigation of downsizing in Australia, Judd et al. (2014b) collected data from a national questionnaire-based survey, in-depth interviews, and through policy forums. The questionnaire, which was distributed through a magazine for seniors was answered by 2767 older people who had moved since turning 50. The survey was followed by in-depth interviews with 60 survey respondents from three Australian states.

In a study of cohousing in Australia, Riedy et al. (2017c) convened six focus groups of senior owner-occupiers, pre-and post-retirement, to seek older people’s views of different cohousing models. Rodiek et al. (2014a) adopted a mixed methods approach of qualitative and quantitative investigation to evaluate doorway problems at a number of American assisted living facilities. The method included resident focus groups with 76 participants, resident surveys (n=1128, with ages ranging from 42 to 104 and an average of 84), staff surveys (n=76), and environmental audits. The resident focus groups were convened at five residential facilities for seniors in south-central Texas and were preceded by a brief written survey on outdoor usage and environmental features. To analyse data from the focus groups and surveys, a content analysis method and statistical analyses in STATA were performed. The environmental assessment was carried out by trained researchers under supervision of the principal investigators. They found that the issue of doorways in residential facilities negatively affected the use of outdoor spaces and walking behaviour, and hence the overall health and wellbeing of the residents. In another study of developing and testing a “Seniors’ Outdoor Survey (SOS)” tool, Rodiek et al. (2014b) used the same methods with a greater number of participants in various long-term care settings including independent living facilities, assisted living facilities, and skilled nursing facilities. The data from the survey were statistically analysed using IBM SPSS Statistics 20.

Carnemolla and Bridge (2014) also used a mixed methods approach to evaluate the impact of modifications of existing houses on the health-related quality of life of older Australians. The

quantitative analysis of utility scores included health-related quality of life data, while thematic analysis of respondents' comments received on their experiences of home modification formed the qualitative part of the study. Out of 450 surveys distributed, 89 were returned with respondent ages of 52-96 years.

The relationship between the local built environment and walking for older people ageing in place in Portland was studied by Nagel et al. (2008). They investigated 546 participants with an average age of 74.5 years. They used various methods including survey, interview, and environmental assessment tools. To measure weekly walking times, "an interviewer-administered questionnaire with demonstrated validity among older adults (The Yale Physical Activity Scale)" was adopted (Nagel et al., 2008:462). In addition, data related to age, gender, race, household income, and years of education was collated through interviews. Moreover, participants were asked to rate their health status on a five-point scale of poor, fair, good, very good, excellent, and also to rate walking self-efficacy to measure if participants were confident to walk within certain times and conditions. They also looked at perceived problems within the neighbourhood by rating neighbourhood features.

In this research, a two-stage data collection process was used. A questionnaire-based survey was employed to evaluate the proposed designs through both online and postal methods. The results were analysed using SPSS. In addition, those taking part in the survey were asked if they are willing to take part in a focus group to probe further into what the client group think of the conversions. The client survey and focus group procedures are reported in detail in Chapter 6 and Chapter 8 respectively.

Using the results from the questionnaire survey, client focus group sessions, and expert group discussions appropriate conclusions were drawn in Chapter 9.

3.9 Summary

The six research phases developed to address the research questions are presented in this chapter. Two New Zealand housing types were selected for further investigation. Several designs will be produced for each type, ranging from subdivision (conversion to two smaller units), to having some shared spaces, to having all living spaces shared. To meet the

accessibility needs of the ageing population, New Zealand level three Lifemark standards will be incorporated in all designs. The proposed conversions will be examined using a mixed-methods approach. The next chapter concerns the first phase of this study and describes and illustrates the case study houses. The reasons behind the selection of these case studies are also presented.

Chapter 4 Case study houses

4.1 Introduction

This chapter presents two typologies of New Zealand houses to determine the case studies which best represent the housing stock. Description and illustration of the case studies then follows, with the reasons for their selection.

4.2 New Zealand housing typologies

Different housing types provide various opportunities for retrofitting and conversion. Research also suggests that physical characteristics such as size, the age of the building, construction type, and materials are influential factors in household energy consumption (Zhang, 2010), as well as influencing possible conversion solutions. In an investigation of New Zealand housing and possible retrofit solutions, ten typologies were developed by Ryan et al. (2008) to represent the New Zealand housing stock:

- “1. Early housing (pre-1890)*
- 2. Villa (1880–1920)*
- 3. Bungalow (1920–1935)*
- 4. Art Deco (1925–1935)*
- 5. State House and Mass Housing (1930–1970)*
- 6. 1960s Multi Unit Housing*
- 7. 70s House (1970–1978 pre-insulation)*
- 8. 80s House (1978–1989)*
- 9. Early 90s (1990–1996 pre-revamped Building Code)*
- 10. Last decade (1996–2007 post-insulation upgrade)” (Ryan et al., 2008:6)*

They further described a range of housing features for each typology. These include materials, structural and construction systems, and service systems, but did not include typical plans.

Gjerde's (2014) research on thermal mass retrofit practices for New Zealand houses, adopted Ryan et al's typologies but simplified them into six categories.

- "1. Villa (pre-1900–1920)*
- 2. Bungalow (1920–1935)*
- 3. State Housing (1935–1960)*
- 4. Pre-Insulation Housing (1960–1978)*
- 5. Post-Insulation Housing (1978–1990)*
- 6. Recent Housing (1990–Present)."* (Gjerde, 2014:178)

Both Ryan et al. (2008) and Gjerde (2014) suggest their two typologies represent 80% of the New Zealand housing stock.

To evaluate the feasibility of retrofitting typical New Zealand houses from a sustainability perspective, Page and Fung (2008) developed a house retrofit scoring system based on physical characteristics (such as roof and sub-floor access) and likely replacement of building components. They found the top ranked housing types in terms of ease of retrofitting and upgrading were the villa, 1920s bungalows and the 1940s to 1960s mass housing. Moreover, in a study of home repairs and maintenance in New Zealand, James and Saville-Smith (2010) found that older New Zealanders predominantly live in detached single-storey dwellings. Bungalows in New Zealand are known for having a variety of layouts (both open plan and cellular) while Villas consistently have a cellular layout. Compared to bungalows, villas tend to be bigger. According to Page and Fung (2008), state houses were the most common house type in New Zealand (29.8% of all housing in 2006) and are normally moderate in size (typically around 100m²). This information justified the choice of both a villa and a 1940's state house for investigating the retrofitting potential for housing for an ageing population.

Using official and semi-official statistics, Viggers et al. (2017) studied the changes in size and type of dwellings in several countries over various time periods depending on available datasets. Findings from their investigation show that over the last decades in Australia, New Zealand, the USA and Canada, "stand-alone" or "detached" have been the prevailing dwelling types. While stand-alone houses comprise over half of new dwellings in these four countries, over a third of new dwellings in England were detached houses. Moreover, over the length of

the datasets, unlike England, the proportion of stand-alone dwellings in Canada and Australia has declined. The proportion of New Zealand detached houses increased from 1990 but there is no specific trend prior to this (Viggers et al., 2017).

4.3 Case study dwellings

As it is impossible to choose a single house type that will represent all New Zealand housing, this study opted for two types representative of a group of large and moderately-sized New Zealand houses. If it is possible to convert a moderate three bedroom house to provide more appropriate housing for the 65+ age group that meets Lifemark standards (section 5.3.3), this should be easier in a larger house. There is also no need to convert very small houses as these are more appropriate for smaller households. The characteristics and size of villas and state houses provide opportunities for various design solutions for ageing in place.

4.3.1 Villas (1880–1920)

Villas are generally planned with a central corridor and rooms to each side. “Typical villa features include bay windows and verandas facing the street, sloping hip roof and timber weatherboard cladding” (BRANZ, n.d.), and “villas were the most popular new home design in New Zealand from the 1880s through to World War 1”. According to Page and Fung (2008), in 2006 villas comprised 5.3% of the New Zealand housing stock (86,000 dwelling units). The most significant point about villas is that they were built almost entirely of timber BRANZ (n.d.). The central corridor is their most dominant design feature and provides access to the separate bedrooms (Shaw, 1991). The kitchen is located at the back of the house but the dining room received more attention over time and “was frequently given a bay of its own (Figure 4.2) (Shaw, 1991:45). Due to improvements in sanitation, the original outside bathroom was relocated inside, but the lavatory remained outside or in the back of the veranda (Shaw, 1991). However, modern villas all have internal sanitary spaces.

One storey villas are more common, although in more wealthy suburbs a significant proportion have two-storeys (BRANZ, n.d.). Shaw (1991:45) highlights the significance of the veranda in villas indicating that “The lean-to veranda became almost an obligatory feature.” One of the most important problems of this house type is the poor relationship between the spaces and sun and site due to the bay window and veranda normally facing the street (BRANZ, n.d.). “In

the early 20th century plans became complicated, with double bays, corner-angle bays and even two-storey bays” (Arden and Bowman, 2004:19). Decoration also became more complicated using patterning timber elements.

In terms of planning, the living room and main bedroom typically faced the street, with second and third bedrooms facing the side of the house, and service areas at the back (BRANZ, n.d.).

Case study 1 -Villa 1

An existing 210m² (1378m² section) single-storey five bedroom villa (four bedroom + one office as specified in the original plan), built in 1909, was selected for conversion and the original drawings sourced from the relevant local authority (Figures 4.1-4.4). The villa is located in Karori, Wellington. It has a separate 18m² wash house, EC, and coal shed.

Figure 4.1 Aerial photo of the villa (Wellington City Council, n.d.)

Figure 4.3 Original villa 1: top: elevation; bottom: section B-B (WCC Archives in Mackay et al., 2010)

Figure 4.4 Top: Existing access to the building; bottom: view from southeast (Google Maps, 2018a)

Case study 2 -Villa 2

An existing 157m² (594m² section) single-storey four bedroom villa, built in 1903, was selected for conversion and the original drawings sourced from the relevant local authority (Figures 4.5-4.9). The villa is located in Newtown, Wellington.

Figure 4.5 Aerial photo of villa (Wellington City Council, n.d.)

Figure 4.6 Left: Original villa 2 plan (WCC Archives in Mackay et al., 2010); right: Redrawn plan

Figure 4.7 Original villa 2 elevation (WCC Archives in Mackay et al., 2010)

Figure 4.8 Original villa2 section (WCC Archives in Mackay et al., 2010)

Figure 4.9 Access route to the building (source: author); right: View from northwest (Google Maps, 2018b)

4.3.2 State houses (1940s-1960s)

The 1940s-1960s in New Zealand saw the construction of housing built by the state for rent, designed to serve households from seniors to large families but with an emphasis on three bedroom houses for small families (Firth, 1949). Many of them are now in private ownership. The layout of state houses varied, but typically “internal spaces were arranged so that all rooms got some sun. Other features included recessed porches, minimal space devoted to hallways, and service areas grouped together”, with larger living rooms as the centre of family life (BRANZ, n.d.; Firth, 1949). Most state houses were “fairly small, with a roof pitch of about 30°, and small casement windows” and were oriented towards the sun (BRANZ, n.d.). “Orientation for the sun and efficient use of space” are the two salient features of state housing (BRANZ, n.d.). Until the early 1960s, the provision of a garage was not common but by the 1960s with the growing number of people with cars, a separate garage was often added to the dwelling. “Detached toolsheds” are common for state housing either singly or in a group of two or more (Firth, 1949).

Variety was deliberately introduced into groups of state houses so they were not all of the same appearance along the street (Firth, 1949). The materials used were also regionalised (Schrader, 2012). However, John Lee (1937 in Schrader, 2005:88), head of the Department of Housing Construction, stated “some standardisation was necessary to reduce costs.” Bruce

Orchinson in a discussion of state houses built by the Auckland firm of Walker and Muston noted “the same plan was used over and over again by altering the appearance of the roof, the front porch, the front door, the chimney, the windows” (Schrader, 2005:89).

Case study 3- State house1

An existing 94m² (666m² section) single-storey, three bedroom state house was selected and the drawings sourced from the relevant local authority (Figures 4.10-4.14). The house is located in Naenae, Lower Hutt.

This house was built in 1941 by the Department of Housing Construction under the government housing scheme. The house is timber framed and clad with weatherboards and the roof is tiled. Timber piles support the timber floor with perimeter walls. The internal walls are timber studwork and painted plasterboard. Timber windows are single glazed. Mithraratne et al. (2007) note these are common specifications for New Zealand houses both in the past and present.

Figure 4.10 Aerial photo of state house1 (Hutt City Council, n.d.)

Figure 4.11 Left: Original state house1 plan (Department of Housing Construction, 1941); right: Redrawn plan

Figure 4.12 Original state house1 elevations (Department of Housing Construction, 1941)

Figure 4.13 Original state house1 section A-A (Department of Housing Construction, 1941)

Figure 4.14 Top: View from southeast; bottom: View from northeast (Google Maps, 2018c)

Case study 4- State house2

An existing 99m² (511m² section) single-storey three bedroom state house (2 bedrooms and one sun room as specified in the original drawing), built in 1941, was selected and the drawings sourced from the relevant local authority (Figures 4.154.19). The house is located in Naenae, Lower Hutt.

Figure 4.15 Aerial photo of state house2 (Hutt City Council, n.d.)

Figure 4.16 Original state house2 plan (Department of Housing Construction, 1941); right: Redrawn plan

Figure 4.17 Original state house2 elevation (Department of Housing Construction, 1941)

Figure 4.18 Original state house2 section (Department of Housing Construction, 1941)

Figure 4.19 View from southeast (Google Maps, 2018d)

Table 4.1 sets out the characteristics of the four case study buildings.

Table 4.1 Characteristics of case study houses

Size	Typology	Floor area	No of bedrooms	Structural characteristics	Construction specifications
Large/Medium	Villa1	210m ²	5	Timber frame	Timber weatherboard
	Villa2	157m ²	4	Timber frame	Timber weatherboard
Small	State house1	94m ²	3	Timber frame	Timber weatherboard
	State house2	99m ²	3	Timber frame	Brick veneer

4.4 Summary

New Zealand housing typologies were investigated to determine appropriate case studies for house conversions, taking into account the floor area and number of bedrooms. This led to the

selection of the villa and state house, with two examples of each chosen for further investigation.

Chapter 5 describes the conversion process and is in two parts. Part 1 discusses the relevant international and New Zealand design standards and makes a comprehensive comparison to find the most appropriate directives to be used in designing the case study dwellings. Part 2, describes design approaches adopted and the detailed considerations so the schemes would meet the requirements and preferences of older people.

Chapter 5 Designing the conversions

5.1 Introduction

The importance of establishing effective design strategies for housing for those aged 65+ can be seen in a range of indicators, notably with respect to health. To achieve a good level of physical activity and thus reduce the health-related effects of insufficient exercise, “access to supportive physical environments” is necessary (Giles-Corti and Donovan, 2002). As mentioned earlier (section 1.4) the OECD (2003) sees the ideal situation as being older people in small houses within the community near to family and friends. In New Zealand special attention should be given to heating and ventilation problems, which have a negative impact on the health and well-being of the elderly (Davey, 2006a). Low-maintenance buildings are also important.

According to De Jonge et al. (2006) home modification for the 65+ age group means “conversions and adaptations to the permanent physical features of the home environment in order to reduce the demands from the physical environment and as a result, make tasks easier, reduce accidents and support independence”. Redesigning existing dwellings to meet the changing needs of older occupants thus demands careful and detailed consideration of relevant design principles. Baldwin et al.’s (2012) investigation of the use of infill development for housing older Australians reveals important implications for designing for the ageing population applicable to this research. A number of related authorities provide design guides in a variety of printed forms (Joseph Rowntree Foundation, Australian Department of Veterans’ Affairs, International Association of Homes and Services for the Ageing, Australasian Health Infrastructure Alliance, and the Home Modification Information Clearinghouse (University of Sydney)).

Findings from Khajehzadeh’s (2017) investigation show that of the time people aged 65+ spent at home indoors (total 17.98 hours/day), approximately half (48%) is in sleeping bedrooms and one third (34%) in a living room, dining room, and kitchen or a combination of these. With 10% of time spent in a study this implies that only 8% of total time is spent in the other rooms and service areas. These figures are significant both for environmental considerations and health

implications. Seldom used, unheated spaces in a house can lead to mould growth (Howden-Chapman et al., 2012), although this is an area that needs further investigation (Yavari et al., 2016).

Apart from design principles directly involved with the health and well-being of older people, attention should be paid to the considerable cost of modification works which older people on tight budgets are rarely able to afford. However, the legal and planning sides of the conversion of a family home into different options are outside the scope of this research. On the other hand, sustainability features and energy-efficiency principles should be taken into account in redesigning the dwellings as these could save running costs.

Apart from the various degrees of sharing the house developed for the case study house conversions, the converted dwellings must also meet the requirements and preferences of older people. This chapter is thus presented in two main parts. The first discusses the relevant design standards and guidelines for accessible and appropriate accommodation for the elderly, while the second part illustrates the converted houses.

Part 1: Design guidance and standards

A significant number of existing dwellings do not meet the differing and changing needs of their occupants, specifically older people and those with disabilities (Saville-Smith and James, 2012). New Zealand does not have an acceptable way of dealing with this situation compared with other countries. The New Zealand Standard *4121:2001-Design for access and mobility: buildings and associated facilities* was developed in 2001, but provision of access or facilities for disabled people in residential buildings is not mandatory under the Building Act and NZ Building Code (Lifetime Design Limited, 2012). Given the projected number of older people in New Zealand, perhaps this situation needs rectification.

Most design standards, including Lifetime Homes (LTH) from the UK and Universal Design principles from the USA, are for new build developments. Although applicable to existing houses their incorporation into these could be a major challenge. These principles together with their potential application to existing New Zealand houses are investigated in order to identify the most appropriate and relevant for this research. To optimise the supply of lifetime

housing in New Zealand, Saville-Smith and James (2012:53) suggest “a clear, consistent and single framework of standards” is required. This framework should cover existing and new builds and deal with various design approaches such as liveability and visitability (Saville-Smith and James, 2012).

In response to the needs for more universally designed dwellings in Australia, Carnemolla and Bridge (2014:259) suggest “innovative and cost-effective strategies” should be developed to overcome the lack of adequate dwellings designed to meet the needs of an ageing population. In Australia the limited number of new universally-designed dwellings has led to a shortage of appropriate housing for this group. Consequently, Mcnamara et al. (2014) see retrofitting and home modification as the main way by which universal design principles are incorporated into existing dwellings. The situation is the same in New Zealand.

In order to support ageing in place, Davey (2006a) suggested using inclusive or universal design standards and “assistive and smart technology” could enhance older people’s quality of life, although these should not be seen as substitutes for social support and social interaction. Furthermore, Oram et al. (2008) stated that the aim for home modification is to enhance a “home’s accessibility, adaptability and/or introduce universal design features.” Universally-designed homes are lifetime homes which enable people to live safely and independently in their own home for their whole life (Office for Senior Citizens, 2013). Design principles include features such as “safe and easy access into and around the home, an easy use bathroom and kitchen layout” (Office for Senior Citizens, 2013:25).

5.2 Existing housing design guidance

Design standards have been developed to promote access to the built environment for those with disabilities. Some countries have legislation to ensure all buildings address access for everyone, such as Part M of the building regulations in the UK, and the Disabilities Act 1990 in the USA. Other countries have standards such as NZS4121:2001 in New Zealand and the AS1428 suite of standards in Australia. These regulations and standards deal with minimum requirements for access and facilities for disabled people. Imrie (2006a) highlights the relationship between the development and implementation of technical standards and quality of domestic environments in terms of their being accessible and usable by the occupants. He

suggests that such standards are mainly regulated by governments for incorporation into social or public rather than private buildings. However, this raises the opportunity for private developers to create more innovative housing designs based on user preferences and market interest (Imrie, 2006a).

Because implementation of these mandatory minimum requirements is widely acknowledged to enhance the quality of life for all people particularly the elderly and those with a disability, a number of supplementary private design standards have been developed to address universal access, thus going beyond current regulations. In the UK, Construction Minister Nick Raynsford has encouraged developers to consider Lifetime Homes (LTH) Standards as an alternative to Part M regulations: “The implementation of Part M Regulation will improve the accessibility and convenience of new housing for everyone. Lifetime homes standards will help to make homes even more adaptable to long-term needs” (Joseph Rowntree Foundation, 2001:1).

Apart from the UK Lifetime Homes and Universal Design in the USA, private standards include Inclusive Design in Canada, Livable House in Australia and Lifemark Homes in New Zealand. These terms mainly support the concept of “designing for all” (Nussbaumer, 2012), with the ultimate aim of achieving a universal dwelling that will satisfy a person’s housing needs throughout their lifetime (Office for Senior Citizens, 2013). “Accessible Design, lifespan design, transgenerational design” and universal design and visitable design are other terms that relate to this concept (Nussbaumer, 2012). These concepts are discussed in the next section.

5.2.1 Visitable Design

Visitable Design (VD) is “an affordable, sustainable, and inclusive design approach for integrating basic accessibility features as a routine construction practice” (Maisel, 2010 in Sanford, 2012:148). The main focus of such design is providing access for wheelchair users to visit their family and friends (Quinn et al., 2009). According to Concrete Change (2003) the goal is to provide basic access in all new homes. Concrete Change developed three critical features for visitable housing design:

- “At least one zero-step entrance approached by an accessible route on a firm surface no steeper than 1:12, proceeding from a driveway or public sidewalk

- Wide passage doors
- At least a half bath/powder room on the main floor”

These design guidelines are consistent with some Lifetime Home and Universal Design principles. Sanford (2012) puts the concept of VD somewhere between Accessible Design (AD) and Universal Design (UD). Although VD is not as extensive as UD, only encompassing three essential features and only being applicable to the domestic environment, it could be a starting point for UD to become pervasive (Sanford, 2012). In addition, some countries have mandated these minimum requirements for all new houses in their legislation (Quinn et al., 2009). UK Building Regulations Part M regulated visitable dwellings with a somewhat different definition as a minimum requirement for all new houses. According to Park et al. (2016), this includes an entry-level toilet as a requirement but a stepped access to the front door of the house is allowed. Table 5.1 compares the visitable criteria to earlier versions of the UK Building regulations, showing there is no change in the width of the approach route, entrance door, internal doors and corridors.

Table 5.1 A comparison of visitable criteria in 2004, 2010 and 2015 part M Building Regulation (Office of the Deputy Prime Minister, 2006; DCLG, 2010; 2015).

	Approved Document Part M 2004 edition	Approved Document Part M 2010 edition	Approved Document Part M 2015 <i>Category 1 - Visitable dwellings</i>
Approach route width	900mm	900mm	900mm
Private entrance door- Clear opening width	775mm	775mm	775mm
Internal doors clear opening widths	750-800mm (dependent on corridor width)	750-800mm (dependent on corridor width)	750-800mm (dependent on corridor width)
Corridors - clear widths	900-1200mm	900-1200mm	900-1200mm (750mm allowed at pinch points)

New Zealand has no requirements related to visitable features, although NZ Lifemark Homes standards include the potential for future installation of an access route with a level, step free, firm, slip resistant surface with a maximum slope of 1:16 and a crossfall of not more than 1:50; wide entrance and internal doors; and at least one toilet and sufficient space to accommodate a standard single bed at entry level (section 5.3.3).

5.2.2 Accessible Design

According to the Centre for Universal Design (2006, in Quinn et al. 2009:84) AD is “a product, housing or environment that is accessible meets prescribed government standards and regulations or agency requirements for being physically accessible to people with disabilities,” suggesting the focus of AD is meeting the needs of people with disabilities. On the other hand, Part M of the UK Building Code with its inclusion of a level (or gently sloping) or lift access to the front door of the dwelling and wider doors and more space in bathrooms and bedrooms as mostly required for visitable houses are also the main specifications of AD (Park et al., 2016). However, Park et al. (2016) state that despite mandating visitable housing requirements and the need for more accessible houses in the UK, the Building Regulations Part M standards mean wheelchair accessible housing remains optional and subject to the enforcement of local authorities.

5.2.3 Adaptable Design

Adaptable Design has two main definitions. The first is “making changes to the home during its lifecycle, to meet the preference of the household: their size, composition and lifestyle” (Canada Mortgage and Housing Corporation, in Quinn et al., 2009:89). The second refers to the changes made so that an adaptable house meets the requirements of residents for potential future disabilities (Quinn et al., 2009). In Park et al.’s (2016:26) opinion, the idea of a house being reconfigurable over time by being given a layout “to adapt or flex to the needs of its occupants” is not new. A number of studies suggest the adaptability concept should be considered in design and practice as an essential factor for enhancing the quality of dwellings (Collins, 1965; Rapoport, 1977; Pikusa, 1983; Forty, 2000; Hill, 2003 in Imrie, 2006a).

5.2.4 Flexible Design

Flexible design, as defined by the Canada Mortgage and Housing Corporation (n.d. in Quinn et al., 2009) is focused on making the dwelling larger and smaller, changing the functions and sizes of rooms, and even moving between single and multiple occupancy dwellings. Flexible design in housing “is concerned with changing the home over time to accommodate a household's changing size, structure and lifestyle” (Quinn et al., 2009:109). Some studies such as DWELL research (Park et al., 2016), Freedman (2002 in Quinn et al., 2009) and Canada’s

FlexHousing™ (Canada Mortgage and Housing Corporation (CMHC), n.d.) refer to this as adaptable design or UD.

As Imrie (2006a) concluded from a number of studies, two definitions emerge for the term flexibility. The first is “flexibility by movement and reconfiguration of intricate elements in the dwelling” (Collins, 1965; Bentley, 1999; Forty, 2000; in Imrie, 2006a:33). The second type refers to the use of moveable ceilings, walls and floors including open plan design as well as portable fittings and fixtures (Gann, 1992; Gann et al., 1999; Kendall and Teicher, 2000 in Imrie, 2006a). Flexible design specifications have the potential to enhance the quality of housing design in terms of meeting the needs of those with limited abilities. This means adopting appropriate design standards (such as LTH) as well as using flexible design features such as moveable walls, floors and ceilings and assistive technologies to overcome poorly designed housing environments (Imrie, 2006a). Lifetime Home Standards, open plan principles and assistive technologies are all associated with flexible design.

5.2.5 Lifetime Homes (LTH)

The concept of Lifetime Homes (LTH) was initially developed in the late 1980s by Habinteg and the Helen Hamlyn Foundation in the UK whilst working on the design of housing for older people (Murphy, 2011). These standards were then set up by the Joseph Rowntree Foundation (JRF) in the UK during the 1990s (JRF, 2001) and most recently revised in July 2010. LTH standards include set of specifications which “maximise utility, independence and quality of life, while not comprising other design issues such as aesthetics or cost effectiveness” (Goodman, 2011:1). According to Carroll et al. (1999 in Imrie, 2006b), a Lifetime Home is a house which meets the changing needs of its occupants over their life-span leading to their independence, so that they can stay put and age in place should they experience age-related disabilities. The LTH standards were developed for incorporation into general-needs housing, aiming to meet the changing needs of a diverse range of potential occupants. This means while some principles can be incorporated at the design stage, the house can be simply and reasonably cost-effectively adapted to include the other principles later (Goodman, 2011). Goodman (2011) states Lifetime Homes standards consist of 16 design criteria (Table 5.2) emerging from the five main principles of inclusivity, accessibility, adaptability, sustainability and good value.

Table 5.2 Lifetime Home standards (Joseph Rowntree Foundation, 2001)

<p>Access</p> <ol style="list-style-type: none"> 1. Where car parking is adjacent to the home, it should be capable of enlargement to attain 3.3m width. 2. The distance from the car-parking space to the home should be kept to a minimum and should be level or gently sloping. 3. The approach to all entrances should be level or gently sloping (gradients for paths should be the same as for public buildings in the Building Regulations). 4. All entrances should be illuminated and have level access over the threshold, and the main entrance should be covered. 5. Where homes are reached by a lift, it should be wheelchair-accessible. <p>Inside the home</p> <ol style="list-style-type: none"> 6. The width of the doorways and hallways should accord with the Access Committee for England's standards. 7. There should be space for the turning of wheelchairs in kitchens, dining areas and sitting rooms and adequate circulation space for wheelchair users elsewhere. 8. The sitting room (or family room) should be at entrance level. 9. In houses of two or more storeys, there should be space on the ground floor that could be used as a convenient bed space. 10. There should be a downstairs toilet that should be wheelchair-accessible, with drainage and service provision enabling a shower to be fitted at any time. 11. Walls in bathrooms and toilets should be capable of taking adaptations such as handrails. 12. The design should incorporate provision for a future stair lift and a suitably identified space for potential installation of a house lift (through-the-floor lift) from the ground to the first floor, for example to a bedroom next to the bathroom. 13. The bath/bedroom ceiling should be strong enough, or capable of being made strong enough, to support a hoist at a later date. Within the bath/bedroom wall provision should be made for a future floor to ceiling door, to connect the two rooms by a hoist. 14. The bathroom layout should be designed to incorporate ease of access, probably from a side approach, to the bath and WC. The washbasins should also be accessible. <p>Fixtures and fittings</p> <ol style="list-style-type: none"> 15. Living room window glazing should begin at 800mm or lower, and windows should be easy to open/operate. 16. Switches, sockets and service controls should be at a height usable by all (i.e. between 600mm and 1200mm from the floor)

Goodman (2011) claims Lifetime Homes standards are different from design features for wheelchair users, as the latter require the house to be fully accessible or/and adaptable for their specific needs, particularly in terms of spatial requirements and features.

As stated by the Joseph Rowntree Foundation (2007 in Quinn et al., 2009), LTH is a similar concept to Adaptable Design and overall access is greater than allowed for in Part M of the UK Building Code. Common to both concepts is the focus on the current and future needs of

people with disabilities (Quinn et al., 2009). Some of the LTH specifications can only be incorporated into new buildings or major modifications, although some can be applied to refurbishment involving no or low cost changes (Quinn et al., 2009).

A number of studies have criticised LTH standards. Foremost, is the main focus of LTH on mobility related features, thus overlooking other functional limitations such as sensory impairments. This can be observed in a significant number of LTH criteria (Table 5.2) concerning the ease of access to/around the house, entrance, circulation space and moving around (Imrie, 2006b). This has been amplified by Holland and Pearce (2002, in Imrie, 2006b:366) who noted that LTH standards do not incorporate “wider design related sensory features, such as temperature and draft control, sound insulation, lighting levels...” Some of these limitations have been mentioned by Park and Ziegler (2016) including daylighting and ventilation, outdoor space, internal space standards, and storage. Another limitation is that children are not included in LTH features or, conversely, life-span has been interpreted as adulthood to old age, meaning in both cases a remarkable number of potential users were not considered in development of LTH standards (Allen et al., 2002; Milner and Madigan, 2004 in Imrie, 2006b). In addition, as suggested by Barlow and Venable (2004 in Imrie, 2006a), LTH open plan building principles have limited applications since they can only be incorporated into new dwellings. To overcome this limitation, they suggest electronically enhanced assistive technologies together with refurbishment could target a larger number of consumers as they are applicable to existing dwellings.

5.2.6 Universal Design (UD)

As defined by the Centre for Universal Design, North Carolina State University, UD is “the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialised design” (Centre for Universal Design, 2006). Seven principles of UD were developed by a group of architects, engineers, product designers and environmental design researchers (Table 5.3).

Table 5.3 Principles of Universal Design (Centre for Universal Design, 1997)

<p><i>PRINCIPLE ONE: Equitable Use</i></p> <p>The design is useful and marketable to people with diverse abilities.</p> <p><i>PRINCIPLE TWO: Flexibility in Use</i></p> <p>The design accommodates a wide range of individual preferences and abilities.</p> <p><i>PRINCIPLE THREE: Simple and Intuitive Use</i></p> <p>Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.</p> <p><i>PRINCIPLE FOUR: Perceptible Information</i></p> <p>The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.</p> <p><i>PRINCIPLE FIVE: Tolerance for Error</i></p> <p>The design minimizes hazards and the adverse consequences of accidental or unintended actions.</p> <p><i>PRINCIPLE SIX: Low Physical Effort</i></p> <p>The design can be used efficiently and comfortably and with a minimum of fatigue.</p> <p><i>PRINCIPLE SEVEN: Size and Space for Approach and Use</i></p> <p>Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility.</p>

Various UD guides were then developed using these principles. They are similar in some essential specifications to VD but variations range from small details for fittings and fixtures to general layout requirements, using the terms Universal Design or Inclusive Design (Quinn et al., 2009 and Nussbaumer, 2012). On the other hand, a number of studies such as Frinkel and Gold's (1999), Steinfeld's (2007) and Sanford's (2012) have asserted that the UD principles are not sufficiently clear and understandable for the general public (Sanford, 2012). The lack of environmental concern for reducing energy consumption has also been criticised (Frinkel and Gold, 1999 and Steinfeld, 2007 in Sanford, 2012; Sanford, 2012). This has led to revisions of UD principles to include social and contextual integration and environmental design aspects (Sanford, 2012).

Unlike Adaptable Design and LTH, UD is generally focused on designing for everyone regardless of their ability, age and body performance, leading to Accessible Design for every dwelling. However, "UD is very different from Accessible Design, and even Adaptable Design" although they share some similarities with LTH, Visitable housing, Accessible dwelling and Adaptable housing (Quinn et al., 2009:95). Conversely, these design approaches have also been

categorised as part of the UD concept (Quinn et al., 2009; Sanford, 2012). In addition to “design for all” as the main objective of UD, Imrie (2014) suggests that UD is also a response to the problems encountered by people with disabilities in poorly designed environments. On the other hand, a number of studies argue that UD provides more AD (Imrie and Hall, 2001). Moreover, to avoid the social exclusion of disabled people, UD attempts to address their needs through basic design concepts (Imrie and Hall, 2001; Imrie, 2014). This is possible through making environments usable by the broader spectrum of users and draws attention away from user functional limitations and impairments (Imrie and Hall, 2001). This aligns with Sanford’s (2012:65) description of UD; “it is everyday design with specialised design built in.” Sanford (2012:67) has also highlighted the difference between UD as a concept and standards made up of a shopping list of requirements, seeing the latter as “an add-on component that addresses the symptoms of person-environment misfit”, whereas “UD is an integral component of everyday design that addresses person-environment fit from the very beginning of the design process”.

The chief discrepancy between UD and other design concepts is that it considers the needs of all users with a wide range of abilities and ages rather than being specifically for older people or those with disabilities. Moreover, it is not regulated and standardised like some approaches, albeit UD has been incorporated into standards and guidance as requirements (Quinn et al., 2009). In addition, UD features are generally provided as guides or examples rather than standards, including both structural and non-structural specifications for newly built and existing dwellings where applicable. Sanford (2012:67) compared Accessible Design (AD) and Universal Design (UD) suggesting that AD features are based on “prescribed rules” regulating mandatory minimum requirements for accessibility, whereas, UD features present “principles and guidelines” illustrative of the overall performance of a design.

Despite the main goal of UD as being design for all, Quinn et al. (2009) see a lack of attention to some groups of people in UD features, such as those with small children and symptoms of dementia. No mention of lockable kitchen and bathroom storage for chemicals is an example. Overlooking people with dementia in UD has also been noted by Calkins et al. (2001). The whole concept has been challenged by Imrie and Hall (2001:17) stating that since creating “access for all” is not feasible, “Universal Design is not possible”. The lack of design guidelines

for types of visual impairment are evidence for their argument. Another limitation of UD questioned by Imrie and Hall (2001) is that it fails to address design for contrasting user needs.

Greer (1987 in Imrie and Hall, 2001:14) suggests that “improved design standards, better information, and new products and lower costs” assist design professionals in creating environments usable by everyone during their lifetime rather than just meeting the minimum requirements imposed by current regulations and laws for disabled people.

5.2.7 Inclusive Design

Inclusive Design is similar to Universal Design. It originated in the UK, for “the products and environments that maintain the quality of life and independent living for an ageing population” (Nussbaumer, 2012:30). According to English Partnership, Inclusive Design is

“...a way of designing products and environments so that they are usable and appealing to everyone regardless of age, ability or circumstance by working with users to remove barriers in the social, technical, political, and economic processes underpinning building and design” (2008 in Nussbaumer, 2012:30).

Like Universal Design, the focus in ID is designing environments so that everyone can use them and is, therefore, not specifically aimed at those with disabilities. Five key Inclusive Design principles were set out by the Commission for Architecture and the Built Environment (CABE) (Table 5.4).

Table 5.4 Principles of Inclusive Design (Fletcher, 2006)

1. People-Inclusive design places people at the heart of the design process.
2. Diversity-Inclusive design acknowledges diversity and difference.
3. Choice-Inclusive design offers choice where a single design solution cannot accommodate all users
4. Flexibility-Inclusive design provides for flexibility in use.
5. Convenience-Inclusive design provides buildings and environments that are convenient and enjoyable to use for everyone.

Inclusive Design (ID), in comparison with UD and as defined by Imrie and Hall (2001), is much more than a technical response to the needs of people with functional limitations, as it seeks to make changes in the social relationships of the design and construction process. The idea is focused on user views and values and designing with people rather than designing for them

(Imrie and Hall, 2001). The idea of ID parallels the participatory design process in which users take control of their environment (Towers, 1995 in Imrie and Hall, 2001).

5.3 New Zealand standards

Four New Zealand standards are discussed in this section. Of these NZS4121:2001 and the NZ Building Code are not for dwellings. However, as NZS4121:2001 was used as the basis for establishing Lifemark standards for private dwellings, and as all conversions need to comply with the Building Code these have been included here.

5.3.1 NZS4121:2001-Design for access and mobility

NZS4121:2001-Design for access and mobility: buildings and associated facilities was created by Standards New Zealand to develop the accessibility requirements for non-residential buildings. The standard is not mandatory for dwellings. The second set of design standards, Lifemark design guidance, was established by the private New Zealand organisation Lifetime Design Ltd for residential buildings. These two standards share many features (Page & Curtis, 2011).

In the Building Act 1991 adherence to NZS4121 is a means of complying with the Building Code. The standard provides “requirements for the design of buildings, facilities within buildings, driveways, carpark, passages and any associated landscaping and accessways for use by people with disabilities as required by the Building Act 1991 and the Local Government Act 1974” (Standards New Zealand, 2001:9). It applies to all new and existing non-residential buildings including any alteration and change in use. The standard covers access provisions for various building types including banks, childcare centres, hotels, hospitals, and police stations. In refurbishment where design compliance with the Building Code is considered impossible, NZS4121 offers a number of design solutions for common alteration problems, but advising that these are not applicable to new buildings (Standards New Zealand, 2001).

It seems that standards and regulations intended for purposes other than domestic environments might create problems if applied to these. Quinn et al. (2009) outline the two main issues that arose from application of AS1428.1-2001-Design for access and mobility (Australian non-residential specific standards) to residential buildings, particularly for the

elderly. The guidelines were developed for use by a large number of consumers in a public building not a small household in a domestic environment. Moreover, these standards consider assistive devices, specifically wheelchairs for outdoor use, and their specifications are significantly different from those usually used at home (Quinn et al., 2009). The latter are normally smaller and more manoeuvrable than those used in public spaces (Steinfeld et al., 2005 in Quinn et al., 2009:85).

5.3.2 New Zealand Building Code

There are also a number of standards set out in the clauses of the NZ Building Code to meet the requirements of people with disabilities including (Standards New Zealand, 2001:11&12):

Clause D1- Access Routes

Clause D2- Mechanical Installations for Access

Clause F8- Signs

Clause G1- Personal Hygiene

Clause G2- Laundering

Clause G3- Food Preparation and Prevention of Contamination

Clause G5- Interior Environment

Clause G9- Electricity

Clause G12- Water Supplies

Although the Building Code is only for non-residential buildings it is still not a complete source for access requirements and NZS4121 should be referred to for full information.

5.3.3 Lifemark Design Standards

Lifemark Design Standards were first produced in 2012 by the New Zealand organisation Lifetime Design Ltd, followed by a second version in 2016, with the aim of assisting an ageing population to meet their changing needs in more suitable houses, although a 'lifemark house' is claimed to be beneficial for occupants and visitors of every age and ability (Lifetime Design Limited, 2012). Design standards are set out for typical New Zealand residential buildings

including apartments. Usability, adaptability, accessibility, safety and lifetime value are the five Lifemark Design principles (Lifetime Design Limited, 2012).

Lifemark Design provides a star rating and points system within which every 'Lifemark' home has to meet the requirements specified in one of the three categories, including a 3-star lifemark home being fully adaptable in the future at minimal cost and a 5-star lifemark being fully accessible (Lifetime Design Limited, 2012). A 3-star home is achieved when minimum requirements are met and some additional points are accumulated. Further points can then be earned to achieve a 4 or 5-star level. The highest 5-star rating is achieved if all respective requirements are met and operational at the time of completion. The additional points accumulated therefore illustrate the level of performance (Lifetime Design Limited, 2016). For instance, it is recommended that a wheelchair user should aim for a 5-star lifemark home to meet their access requirements. Lifemark provides the opportunity for occupants to select the most appropriate standards within these three categories with respect to their current and future needs and their financial situation.

As indicated by Lifetime Design Limited (2012:3), the Lifemark principles are “more useful or best practice criteria” than the minimum requirements of NZBC, although minimum requirements set out in Lifemark specifications comply with those of NZBC. In order to establish the Lifemark design standards, NZS4121 was used to identify the “key structure and spatial elements” which are critical in ensuring future flexibility, adaptability, safety and usability aligning with universal design principles (Lifetime Design Limited, 2012).

5.3.4 BRANZ and standards for life-time homes

In 2001, BRANZ published a book entitled “Homes without barriers: a guide to accessible houses” in which through diagrams and notated recommendations, design guidance is provided for new-buildings and retrofits for those with disabilities and the elderly. Specific recommendations were made for alterations to existing dwellings. The aim was to provide standards for private residential buildings as these are not covered by NZS4121.

BRANZ has also researched the characteristics of User-Friendly (UF) housing design and the cost implications of fitting UF features into typical new and existing dwellings. UF principles generally imply meeting the Lifemark Design and Universal Design standards (Page & Curtis,

2011). In order to examine a number of selected single-storey houses in terms of their meeting the UF requirements, two New Zealand design standards were compared: NZS4121 and Lifemark Design principles (Page & Curtis, 2011). The main purpose of the investigation was an analysis of the cost involved in applying UF features. They found the application of UF features into a new dwelling is “very much cheaper” than refurbishing the same dwelling later (Page & Curtis, 2011). Implementing the changes in existing houses requires over \$15000 per house for internal work and \$7000 for ramp and external access features (Page & Curtis, 2011).

5.4 Rehabilitation, remodelling and Universal Design

Young (2006) investigated refurbishment practices in existing dwellings to identify the critical universal features and elements when renovating a single or multi-family dwelling with a specific focus on bathroom design. A checklist of 14 costly, structural items for use in major refurbishment projects “when a limited number of universal features are possible” was provided with three different levels of importance (numbered 1, 2 and 3) (Young, 2006:5). This list covers entrances, general interior, kitchens, and bathrooms. An expanded list of other universal features for incorporation if feasible was also created.

In rehabilitation projects, although it is not always possible to provide the exact dimensions of the features in the priority list, the inclusion of the number 1 items is recommended to make the entrance and other living areas on the ground floor, including a bathroom, suitable for a wheelchair user (Young, 2006). The highest priority (number 1) is given to features which facilitate a wheelchair or other mobility aid user to get into or exit the dwelling safely and independently and enter and manoeuvre within the bathroom and kitchen. The second important elements include those that provide for the safety and independence of residents with various levels of abilities. The last important feature recognised in this list involves offset controls which improve safety for all users (Young, 2006). At the end of the report there are a number of proposed plans for an inaccessible bathroom together with an examination of their level of accessibility and compliance with the North Carolina accessibility (NCAC) and Qualified Allocation Plan (QAP) requirements. QAP requirements were established by the NC Housing Finance Agency. According to their website QAP “...details the selection criteria and application requirements for Housing Credits and tax-exempt bonds as well as for rental developers to be eligible for funding” (North Carolina Housing Finance Agency, n.d.). The proposed modified

designs are then rated from “fully accessible” (NCAC type A) including a turning circle in the bathroom to “accessible” (NCAC type B), which has a modest level of accessibility. Each plan is illustrated with detailed dimensions and notations. Since NCAC provide minimum requirements for accessibility, QAP requirements incorporate two features in excess of type A (a 1500mm x 1500mm clear floor space for the toilet and a kerbless shower at least 1500mm long and 900mm deep). These add bonus points to the design and are much closer to the universal bathroom design (Young, 2006).

As stated by Sanford (2012) mobility and transfer related modifications are essential in refurbishments. Thus, modifying access routes to the house including entrances, and modification of circulation areas, stairs, and bathroom are the most common changes, whereas kitchen alterations specifically for the elderly are less common. Modifications related to communication systems (e.g. doorbell, alarms) are mostly for those with hearing and cognition impairment (Sanford, 2012).

5.5 International and New Zealand research

Kaasalainen and Huuhka (2016) investigated accessibility improvement models for a number of typical Finish apartments. Their research involved a variety of design options for existing apartments excluding external spaces to make them accessible, usable, and more appropriate for the elderly user with some level of disability. The design solutions were influenced by three different customised scenarios: a wheelchair user and a fully functional occupant; a wheelchair user and a visually impaired walking aid user; and a wheelchair user staying mostly in bed and a temporarily residing caregiver (Kaasalainen and Huuhka, 2016). Since the main focus of this research was evaluation and meeting access requirements for the apartment, the results are not directly applicable to the present study.

Remodelling practices in Scottish specialised housing such as sheltered or extra care houses involved making design recommendations for meeting the differing needs of their occupants (Trust Housing Association, n.d). This design guidance provides some recommendations for consideration in retrofit work as well as proposed plan layouts.

The large number of design standards and disparities in associated details means selecting a single set of features which can be incorporated into a house design is difficult. For instance the recommended clear opening width for doors in Lifemark design is 810mm and 760mm in NZS4121. As a result, a significant number of design guidance authorities and studies such as those of Young (2006), Lifetime Design Limited (2012; 2016), Livable Housing Australia (2015) and Park et al. (2016) have developed ways of rating houses regarding their accessibility, usability and adaptability. These systems include the star-rating system for Lifemark homes discussed earlier; accessible, fully accessible, fully accessible plus meeting two more requirements in Young's (2006) research; silver, gold and platinum in the Australian livable housing design handbook (2015); and the more expanded and detailed system covering a larger number of categories by the DWELL study conducted at the University of Sheffield, concluded December 2016. The four main categories in the DWELL research are visitable dwellings, accessible and adaptable dwellings (LTH), wheelchair adaptable dwellings, and wheelchair accessible dwellings using 2015 Part M Building Code and LTH standards.

No New Zealand study has examined the application of the international Lifetime Home, Universal Design standards and or the New Zealand Lifemark design standards into typical existing residential buildings.

5.6 Relevance of standards to the present study

The aim of investigating the various design standards is to select the most appropriate to be incorporated into this research. The designs produced for this research are for people who are able to maintain their lifestyle independently or with a low level of assistance and who would like to downsize. The aim is to see what is possible when it comes to converting existing houses.

Universal Design is a set of design-friendly for integrating the principles into a design as a holistic process rather than creating various pieces which work perfectly separately but not holistically. Null (2013:235) also states that "Universal Design is not just a finite list of features but a comprehensive concept, methodology, or way of thinking" which is understandable and applicable by all professionals who are not required to be a universal design expert to use them. However, principles are more difficult to work with than guidelines, such as found in NZ Lifemark.

All design standards should be useful for the designer in terms of giving clear guidance on first dealing with the whole design through to a number of general instructions related to the whole building, including the plan, followed by further guidance for design details. However, NZ Lifemark does not follow this approach. Like many other design standards it begins with access and entrance related features but continues space by space and each space is not seen as a part of a holistic process. This is apparent in the design handbook as 17 areas are identified without any specific order.

The LTH has an illogical order which is difficult to follow for design purposes. However, Goodman (2011) provides a revised design guide by putting the 16 LTH criteria into 7 main technical design sections: approaching the home, entrances, internal circulation within communal areas, entrance-level facilities within the home, circulation and accessibility within the home, circulation between storeys within the home and, service and ventilation controls (Table 5.2 for the LTH criteria). Since there is a sensible relationship between these sections and the design process, it would be much easier to follow for designers.

In order to make a brief but useful comparison, Table 5.5 was created using features from the DWELL project as a starting point with further additions from UD and NZ Lifemark Homes. The design specifications in DWELL were classified into 14 areas: car parking and drop off, approach route, communal entrance, communal lifts and stairs, private entrance door(s) to dwelling, private entrance lobby/hallway, private internal doors, habitable rooms and storage, private circulation, sanitary facilities, kitchen, windows, service controls, and private outdoor space (University of Sheffield, 2016). Since the present study only involves single-storey dwellings, multi-storey related features are omitted from this table. Other considerations are listed below.

- There are no standards available for external stairs to approach the dwelling in both LTH and Lifemark, therefore if desired, the additional stepped approach in accordance with Approved Document M domestic requirements may also be provided.
- All standards are applicable to dwellings only.
- Criterion 5– Communal stairs and lifts (UK LTH) standards are not directly applicable to the current study.

- Criterion 9 – Potential for entrance level bed-space were removed from the table as not being relevant.
- Criterion 12 – Stairs and potential through-floor lift in dwellings were removed from the table as not being relevant.
- Feature 17-Multi-storey access specifications in the NZ Lifemark standards are not applicable to the current study.

To show the detailed difference two further tables were created. The table in Appendix 1 compares LM 3-star, LTH and UD standards including all information, whereas Table 5.5 only contains essential information for designers including all figures and dimensions. In order to provide a comprehensive comparison, efforts have been made to present the data consistently in both tables. Therefore, six general areas have been defined and used: 1. accessing the dwellings, 2. getting around, 3. habitable rooms, 4. sanitary facilities, 5. dwelling facilities and storage, 6. fittings and fixtures. Each area has subcategories in which the respective standard is presented. All areas are numbered consistently in both tables.

Each set of design standards contains essential design information such as figures and dimensions, and a number of recommendations which are supplementary to the mandatory minimum requirements. Recommendations mainly provide further information and advice. In addition, some more detailed instructions are given which are not mandatory but relevant to those standards. A number of these are included in the preferred specifications for doing more than meeting minimum requirements. In some cases these specifications improve the quality of the design in terms of being wheelchair accessible. Initially, every feature derived from the design standards was put into its respective category without any change but this information was found not to be useful as it contained unnecessary information which was confusing and time-consuming to use. Therefore, for a briefer table, the directly usable figures and dimensions and necessary data were extracted from the design guides.

Another significant difference is the measuring system used in design standards. While LTH and NZ Lifemark use the metric system, the UD being American uses imperial units. The latter have been converted as necessary.

Table 5.5 Brief comparison of LM 3-star, LTH and UD standards

Feature	Lifemark minimum mandatory requirements to achieve a 3-star rating –adaptable and accessible 2016 version Adapted from Lifetime Design Limited, (2016)	Lifetime Home (LTH) Revised Criteria 16 Criteria 2010 Adapted from Habinteg Housing Association, (2010)	Universal Design Adapted from Centre for Universal Design (2006)
1. ACCESSING THE DWELLINGS			
1.1. CAR PARKING, DROP OFF, GARAGES and CARPORTS			
Private parking bay within curtilage	At least. 1 no. car parking space, or approved “drop off zone” able to be adapted to 3500mm x 4800mm	4800mm x 2400mm level parking bay that can be widened to 4800mm x 3300mm	
Drop off point (applicable where provided)			
Garage door height			Min. 8ft. (2438mm)
Aisle access width			Min. 5ft. (1524mm) access aisle on both sides of cars 3ft. (914mm) aisle in front of vehicles
1.2. PATHWAYS			
Approach route			
Approach route - general	A pathway can be installed with a level, step free firm, slip resistant surface	Step-free route to primary entrance (or step-free route to alternative entrance) must be provided. Step-free route must be level or 'gently sloping'	No steps at entrances
External ramps	A pathway can be installed with maximum slope of 1:16 and a crossfall of not more than 1:50.	Max. gradient/distance of ramps: 1:12 for a distance of up to 2000mm, or 1:20 for a distance of 10,000mm. See AD Part M (diagram 2.1) for interpolated ramp max. gradients/distances.	Max. Gradient of ramps: 1:20.
Approach route width	A pathway can be installed with a minimum clear width of 1200mm.	900mm (private)	
External steps		On steeply sloping sites alternative access (eg. steps) should be discussed with the local planning authority to agree a workable solution.	

Rest areas	Any gradient over 1:20 is required to have an approved handrail and 1200mm x 1200mm level rest areas every 8 metres.		
1.3. THE ENTRANCE			
Entrance door(s) to dwelling			
Clear space on both inside and outside	Slip resistant internal and external landing areas with a coefficient rating of at least 0.4. Refer to NZBC D1 table 2 for additional information.		Min. 5ft (1524mm) x 5ft (1524mm) level clear space on both inside and outside of entry door
Clear opening width	Min. 810mm (door leaf 860mm)	800mm	Minimum of 32in (813mm) (34-36in (864-914mm) wide doors)
External door nib		300mm nib to pull side	Min. of 18in (457mm) nib to pull side
Threshold	Max. threshold of 20mm	Accessible (15mm upstand)	Max. rise of ½in (12.7mm)
2. GETTING AROUND			
2.1. INTERNAL DOORS			
Internal doors - clear opening widths	Min. 810mm (door leaf 860mm recommended)	750-900mm (dependant on corridor width) Excluding cupboards	Minimum of 32in (813mm) (34-36 in (864-914mm) wide doors)
Internal doors nibs		300mm nib to pull side	Min. of 18in (457mm) nib to pull side
Threshold	Level threshold. Up to 20mm either side of the doorway is accepted if the material is different, provided the lip is bevelled.		Flush threshold
2.2. CIRCULATION SPACES			
Corridors - clear widths	Min. 1050mm	900mm (750mm allowed at pinch points)	42in (1067mm) minimum width
Entrance hallway - dimensions		n/a (900mm corridor width applies)	
3. HABITABLE ROOMS			
3.1. LIVING SPACES			
Living spaces		1500mm turning circle required for living + dining spaces (alternatively provided by a 900 x 1400 turning ellipse)	5ft (1524mm) turning space required for all rooms

Clear width around furniture		750mm between furniture (excludes occasional items)	
3.2. BEDROOMS			
Potential bed space	Located on the entry living level, accommodates standard single bed (measuring 900mm x 1900mm). Min. 800mm clear space available around one side and the foot of the bed. A clear Min. 800mm wide path from the door to the side of the bed.		
Clear width around furniture		750mm between furniture (excludes occasional items)	
Clear space around beds	Min. 800mm clear space available around one side and the foot of the bed (single bed)	750mm to both sides (or one side of single) and foot	
4. SANITARY FACILITIES			
4.1. WC/ Bathrooms/shower			
Sanitary facilities-general	Slip resistant flooring with a coefficient rating of at least 0.4 for all the bathrooms. Refer to NZBC D1 table 2 for additional information.		
Provision of entrance-level WC/cloakroom facilities	At least one toilet installed on the entry living area	A room (i.e. bathroom or cloakroom) on the entrance storey with a WC, basin and potential for a shower to be installed (if not provided elsewhere on the same storey).	
WC/cloakroom - dimensions	450mm-460mm distance from the centre of the toilet pan to the sidewall for the entrance-level toilet	1500mm-1600mm deep x 850mm-1050mm wide (dependent on door position), but additional space + shower drainage required to ground floor WC in dwellings with two or more storeys	Clear space of 3ft. (914mm) in front and to one side of toilet.
Provision of bathroom facilities - general requirements		A bathroom with WC, basin, and a bath or an accessible floor level shower located on the same storey as the main bedroom.	Min. lavatory counter height of 32in (813mm) Clear knee space 29in (737mm) high under lavatory. Long mirrors should be placed with bottom no more than 36in (914mm) above the finished floor and top at least 72in (1829mm) high.
Bathroom/shower room - internal dimensions		2100mm x 2100mm recommended (to offer a degree of choice and flexibility)	
Showering zone		1000mm x 1000mm	Min. 5ft. x 3ft. (1524mm x 914mm) curbless shower or tub with integral seat.

Grab support/fixings in rail sanitary facilities	Reinforced toilet walls Reinforced shower walls on the entry living level	On all walls within a height band of 300mm – 1800mm from the floor	Cantilevered fold up grab bars preferred with toilet centred 24in (610mm) from side walls or adjacent fixtures. If a traditional side wall bar is used centre toilet 18in (457mm) from side wall.
Hoist requirements		Route identified from main bedroom to bathroom. Structure in place for future installation	
Provision of Turning space	800mm clear transfer space beside and/or in front of the toilet for the entrance-level toilet. This space excludes the swing of the door but can include a vanity which projects a maximum of 400mm from the back wall.		Min. 5ft. (1524mm) diameter turning space in the room and 30in (762mm) X 48in (1219mm) clear floor spaces at each fixture
Fixture controls			60in-72in (1524-1829mm) flexible hose
5. DWELLING FACILITIES and STORAGE			
5.1.KITCHEN SPACE			
Kitchen		1200mm clear in front of units (1500mm turning circle recommended)	
Clear knee space under sink			Min. 29in (737mm) high
Kitchen worktop height			Variable height (from 28in-42in (711mm-1067mm))
Built-in oven height			Top set at a max. of 34in (864mm)
5.2.LAUNDRY AREAS			
Laundry sink and countertop surface height			Max. 34in (864mm)
Clear floor space			Min. 36in (914mm) wide across full width in front of washer and dryer and extending Min. 18in (457mm) beyond right and left sides
5.3. STORAGE/CLOSETS			
Hanging and shelf storage height			Max. 54in (1372mm) high with adjustable height closet rods and shelves for some of them
6.FITTINGS AND FIXTURES			

6.1.WINDOWS			
Window heights		800mm maximum sill height in living room	36in (914mm) maximum sill height.
Window approach		750mm clear width (excludes kitchen window above worktop)	
Window controls - height		maximum 1200mm above floor level	
6.2. SWITCHES AND CONTROLS			
Switches + socket heights	900-1200mm (to the centreline) above finished floor level (1000mm preferred).	450mm-1200mm above floor level and 300mm from any corner	44in-48in (1118mm-1219mm)
Consumer unit switch height		1350mm-1450mm above floor level	
Thermostats/heating controls			Thermostats 48in (1219mm) maximum height.
Electrical outlets height			Min 18in (457mm)
Electrical panel height and clear floor space			Electrical panel with top no more than 54in (1372mm) above floor located with a minimum 30in X 48in (762mm x 1219mm) clear floor space in front.
6.3.HARWARE			
Door handle height	900-1200mm (to the centreline) above finished floor level (1000mm preferred).		

5.7 Discussion

Appendix 1 and Table 5.5 illustrate the requirements and instructions set out in LM 3-star, LTH and UD. Since the present study is conducted in New Zealand, the standards implemented in redesigning the case studies dwellings must comply with NZ standards. This was why LM 3-star was compared with the two widely known international concepts of LTH and UD. The concepts carry the same goals of making the house usable for a wide range of occupants. LTH, as mentioned earlier, does not provide a fully accessible guide for dwellings. Implementing the LTH criteria, however, makes the house adaptable and usable. This is similar to LM 3-star as Lifetime Design Ltd (2012) claim a 3-star LM home is fully adaptable in the future with minimal cost. This differs from the 5-star LM which provides for a fully accessible dwelling, a goal that will probably be challenging when applied to an existing dwelling.

UD is a widely used international concept which is applicable to various aspects of daily life such as architecture and industrial design. Likewise, it is extensively used to examine national accessibility standards in a number of studies (Canadian Human Rights Commission, 2007; Murphy, 2011). As a result it forms a useful comparison that will assist in distinguishing any shortcomings of New Zealand LM and how to deal with these. As suggested by Ronald and Mace (1998), UD is a set of principles exceeding the mandatory accessibility requirements legislated by government authorities. It is more about design that is usable by everyone, regardless of age and ability.

Appendix 1 illustrates the design-integrated nature of UD as a large number of the features specified relate to design methods and influence the design and quality of domestic environments. Features include those related to site design, such as having an integrated step-less entrance, and a built-in shelf, bench or table with knee space below located outside the door (Centre for Universal Design, 2006). On the other hand, UD lacks a number of essential specifications which are seen in both LTH and LM. These include minimum clear opening widths for the main entrance and associated car parking, and pathway widths. Rather UD provides detailed instructions with some essential dimensions. For instance, it specifies the height of a carport/garage but not all its dimensions or power door operation for the entrance but not minimum entrance width. This lack of important specifications and dimensions has led to UD plans having a variable degree of accessibility. Examples of this unsatisfactory approach

are bathroom spaces developed by the centre for universal design (Young and Pace, 2000; Young, 2006). The accessible toilet/wetroom is usable by wheelchair users but does not provide a 150mm x 150mm turning circle (maximum overlap: 304.8mm) (Figure 5.1). However, this degree of uncertainty could be good in terms of creating more diverse (and non-standardised) environments to meet the changing needs of residents.

Figure 5.1 Accessible and fully accessible bathroom (Young and Pace, 2000:31)

Conversely, LTH seems to be a more comprehensive set of design specifications which provides substantial information associated with the dimensions of spaces. In addition, a number of detailed explanations, illustrations and good practice recommendations enrich the LTH guidelines and make these more usable by designers. Criteria relating to sanitary facilities are good examples of this (Figure 5.2).

Figure 5.2- LTH bathroom specifications (Habinteg Housing Association, 2010:32)

Unlike UD in which only one specific set of features are considered as universal design elements and where all specifications should be treated as requirements (other than the missing elements) without further recommendations, LTH includes two sets of features for each criterion (requirements and recommendations) while LM considers three degrees of features (3, 4 and 5-star LM specifications). In essence, LTH good practice recommendations are what makes a 4-star and 5-star LM home.

Lifemark is a NZ version of the concepts of lifetime home/universal design. Giving the choice of a 3-star or 5-star rating enables the designer to meet the current and future needs of the residents and make a decision based on their situation. However, LM gets complicated when it comes to obtaining additional points for optional specifications and, furthermore, these assessment criteria are not publicly available (Figure 5.3). However, comparing 3-star LM requirements to those of LTH and UD suggests 3-star LM fails to include all features of a lifetime home. Close attention to sanitary facility requirements demonstrates a lack in the provision of essential information such as specifications associated with the approach zone and clear space for each feature in a wetroom/bathroom, grab rails, and dimensions required for a kerb-less shower. Having to select a specification from a set of features in the table makes it difficult to use. For instance, clause 3.3a (The dwelling shall have at least one alternative exterior

door/exit way with a maximum threshold of 20mm) and 3.3b (All decks, balconies and other ground level exterior doors shall have a maximum threshold of 20mm) (Lifetime Design Limited, 2016) are entry-related specifications. However, the points are given only to one of these (3.3a and 3.3b) even if both requirements are met. In addition, using numbered specifications in the table with the inclusion of 3-star to 5-star requirements as well as optional instructions makes the process of applying LM complicated (Figure 5.3). Explanations in the design guide are enriched with a number of pictures (Figure 5.4) and basic sketches. However, the LM guide fails to provide scaled drawings (Figure 5.5).

The Lifemark™ Standard		POINTS AVAILABLE	35
16.1a	Dwellings shall have a step free, level entry shower on the entry living level with minimum dimensions of 900mm x 900mm with drainage for the shower recess located in the corner of the room. The shower should be located in the corner of the room to enable the future installation of a shower seat and grab rails. Note: The entrance into the shower is required to be at least 810mm;		
16.1b	Dwellings shall have a step free, level entry shower on the entry living level with minimum dimensions of 1200mm x 1200mm, drainage for the shower recess located in the corner of the room, a clear space that provides for a 1500mm turning circle. The shower should be located in the corner of the room to enable the future installation of a shower seat and/or grab rails. Note: The entrance into the shower is required to be at least 810mm.		
16.2	The shower shall have a hand-held shower head attached to a 1500mm long hose which attaches to an adjustable slide rail.		
16.3	The shower is fitted with an anti-scald device.		
16.4a	Dwellings shall have reinforced shower walls on the entry living level for the future installation of grab rails;
16.4b	Shower walls are reinforced and a 750mm x 750mm L shaped grab rail, or equivalent, is installed with the horizontal leg 1000mm above finished floor level.		
16.5	All bathrooms shall include slip resistant flooring with a coefficient rating of at least 0.4. Refer to NZBC D1 Table 2 for additional information.		

		POINTS
16.1a	Dwellings shall have the space for the future installation of a shower on the primary living level that includes a level entry shower recess with minimum dimensions of 1200x1200mm, drainage for the shower recess located in the corner of the room, a clear space that provides for a 1500mm turning circle and 800mm clear space beside the shower seat.*	5
16.1b	Dwellings shall have a shower on the primary living level that includes a level entry shower recess with minimum dimensions of 1200x1200mm, drainage for the shower recess located in the corner of the room, a clear space that provides for a 1500mm turning circle and 800mm clear space beside a shower seat.	20
16.1c	A bathroom on the primary living level shall have a code compliant accessible shower.	25
16.2	Dwellings shall have reinforced shower walls on the primary living level for the future installation of grab rails and a shower seat.*	5
16.3	Dwellings shall have slip resistant flooring in all bathrooms.*	5

*required standard for a 3-Star Lifemark

Figure 5.3 LM shower specifications 2016 (top) and 2012 (bottom) (Lifetime Design Limited, 2012:33; 2016:38)

Figure 5.4 Images illustrating specifications for a LM home entrance (Lifetime Design Limited, 2016:13)

Figure 5.5 Incomplete LM toilet specifications (Lifetime Design Limited, 2016:37&39)

5.8 Detailed design issues

In this section UD and LTH features are compared with the 3-star LM. Where 5-star LM is being discussed, it clearly is stated.

5.8.1 Car parking

In each standard there are various terms and elements, and minimum dimensions. Terms associated with car parking spaces include: car parking, carports and garages. Although LM uses “approved drop off zone”, “garages and carports” are car parking-related spaces in UD. LTH uses “parking” space as a general term with widths/widening requirements specifically for

non-communal and communal or shared parking spaces. In addition, garages and carports (under special conditions) are exempted from LTH parking width/widening requirements. LTH and LM recommend minimum length and width dimensions whereas UD advises the door height to be at least 8ft. (2438mm). Moreover, UD also requires an access route on both sides and in front of cars to be a minimum width of 5 ft. (1524mm) and 3ft. (914mm) respectively. The minimum width required for both sides of cars (5ft. (1524mm)) in UD is considerably different in LTH (900mm). LTH is the only standard with a designated 2400mm wide parking space for a dwelling (with 900mm adjacent accessible aisle width). Both LTH and LM require at least one car parking space to be adaptable to a 4800mm length but vary slightly in width from 3300mm in LTH to 3500mm in LM. A firm and level surface with a slope not exceeding 1:60 is also required for the entire parking space in LTH. This, along with a slip resistant flat surface and a slight difference in the maximum slope of 1:40, is also in LM optional requirements for additional points to achieve a 3-star rating. Conversely, in UD a sloping garage floor from garage to house interior is recommended (Appendix 1).

5.8.2 Pathways

Pathways, either between parking and entrances or between entrances are required to have a firm, level and non-slip surface in both LTH and LM, but vary in minimum gradient from 1:60 to 1:16 in LTH and LM respectively with UD in the middle at 1:20. Minimum cross falls of 1:40 in LTH and 1:50 in LM are also recommended. However, “gently sloping” access routes to all entrances may also be acceptable varying from 1:20 to 1:12 dependent on slope lengths in LM, preferably with no slope longer than 10m.

In both LTH and LM, landing zones should be 1200mm x 1200mm. However, LM recommends the minimum clear width of all approach routes to be 1200mm compared to 900mm wide access routes in LTH. UD does not recommend any dimensions for pathways other than the gradient indicated above. LTH also exempts steeply sloping sites where none of the specifications are applicable and refers to the local planning authorities for further guidance.

These recommendations appear to target those with mobility limitations. However, an interesting comment from UD related to pathways suggests including integrated stepless entrances. Such guidance can assist designers and architects in creating higher quality domestic environments for users without mobility disabilities (Appendix 1).

5.8.3 Entrance

Provision of internal/external landing areas in front of doors is common to all three standards. A level area of 5ft (1524mm) x 5ft (1524mm) inside and outside the entry door is required by UD, compared to the 1200mm x 1200mm specified for external landing areas in the LTH. Although there are no dimensional requirements in 3-star LM, 5-star LM is consistent with LTH in terms of dimensions, and meeting these could lead to additional points.

Maximum rise at entrance thresholds varies from ½in (12.7mm) in UD to 20mm in LM, with LTH being 15mm. This difference is mainly caused by various geographic and climatic considerations (Canadian Human Rights Commission, 2007). However, a high threshold can make the transition difficult for those who utilise some kind of wheels. In addition, the minimum clear opening width (Figure 5.6) is very similar in both LTH and LM being 800mm and 810mm respectively. No dimension is specified in UD. However, LTH requires these two characteristics to be included in all entrances whereas at least one entrance has to include them in LM.

Figure 5.6 Minimum clear width of opening width of entrance door (Goodman, 2011:19)

LTH also requires a 300mm nib (or clear space) to the leading edge on the pull side of all entrance and internal doors (Figure 5.7), to increase the manoeuvring space around the door.

Figure 5.7 Nib requirements for all entrance and internal doors (Goodman, 2011:20)

A good design approach recommended by UD and LTH involves climatic and safety considerations such as provision of weather protection and light outside the entry door. This is further enhanced by a number of excellent suggestions from UD such as installation of built-in shelves, wide-angle viewers and full length sidelights, which assist designers to go beyond the physically enabling built environment in their design practice. This leads to recommended entrance-related features that meet the needs of those with visual limitations. Provision of illumination at the entrance is recommended by a large number of accessibility standards and codes. Provision of powered doors at the main entrance is recommended to assist those not able to open the door independently (Canadian Human Rights Commission, 2007).

5.8.4 Internal doors

UD recommends an open plan design. This helps to reduce hazards for those with functional limitations or visual impairment by making movement easier and more convenient by having fewer walls, doors and corridors.

Despite the small thresholds specified for entrance doors in all three standards, level thresholds are required for all internal doors in UD and LM although no specifications are indicated in LTH. However, in LM a threshold of up to 20mm is also acceptable under some conditions (see Appendix 1). Minimum clear opening widths of 810mm and 32in (813mm) are required for all internal doors in LM and UD respectively. As a result, all internal doors and the entrance door are to be at least 810mm wide (clear opening) in LM, whereas this varies from 750mm to 900mm in LTH depending on corridor widths and plan arrangement (Figure 5.8). Similarly, a comparison between LTH and LM highlights a considerable width difference of a maximum 90mm (Figure 5.8).

Unlike the entrance door, an 18in (457mm) clear floor space to the leading edge on the pull side of all internal entrances is required in UD. This is comparable with the 300mm nib required by LTH. Likewise, LM specifies a 300mm nib as additional good practice for additional points. Meeting this requirement provides more space to pull the door open without causing access difficulties.

Figure 5.8 Hallway and doorway widths, top: LTH (Goodman, 2011:37); bottom: LM (Lifetime Design Limited, 2012:16)

5.8.5 Circulation spaces

Similar to the minimum width requirements for internal doors, UD and LM require minimum clear widths of 42in (1067mm) and 1050mm respectively for all hallways and passageways. LTH specifies various width requirements for corridors leading to varying door widths of 750mm (at pinch points) to 1200mm (Figure 5.8).

A 5ft (1524mm) diameter turning space is required for all rooms in UD, whereas LTH requires a 1500mm turning circle (or a 900 x 1400 ellipse) for living and dining rooms/spaces. According to the Canadian Human Rights Commission (2007) this aligns with many international accessibility standards and codes requiring sufficient floor space to allow a 1500mm turning circle. However, this can be reduced to 750mm in LTH dependent on dwelling plan (see Appendix 1).

5.8.6 Living space and bedroom

There is agreement between all three standards on having a potential bed-space/bedroom located on the entry level of every dwelling but a slight difference in specifications and requirements. LTH requires a living space/room on the entry level that can accommodate a bed as illustrated in Figure 5.9. In contrast UD specifies that the potential bedroom with an accessible bathroom should be located on the accessible entry level ground floor where living room, kitchen and dining room are located. There are no additional requirements for the location of living areas in LM and UD (Appendix 1). LM shares similarities with LTH in terms of the characteristics specified but with a slight difference of a clear space of 800mm beside the bed compared to 750mm in LTH (Figure 5.9).

Figure 5.9 Entry-level bed-space; top: LTH (Goodman, 2011:30); bottom: LM (Lifetime Design Limited, 2012:27) - existing (left) and potential (right)

5.8.7 WC/ Bathrooms/shower

Sanitary facilities are a significant aspect of accessible and lifetime dwellings, so designers will be helped if standards provide good, detailed information. LTH and LM have both the most and least developed ideas about sanitary facilities. LTH provides detailed specifications including dimensions and sketches whereas there is little information in LM 3-star on the design of toilets/showers. UD provides specifications for what appears to be the most accessible bathroom by having either a 5ft. x 3ft. (1524mm x 914mm) kerb-less shower or a bath with integral seat and a 5ft. (1524mm) diameter turning space within the bathroom/wetroom (Figure 5.13). The latter is required in LTH which also requires an

accessible floor level shower instead of a bath (Figures 5.11 5.12). Therefore, a UD home has a fully accessible bathroom.

All three share commonalities in terms of possible locations and potential features for future changes with variations in dimensions and details. An entry-level toilet with potential for installation of a shower is required in both LTH and LM. UD requires an entrance-level accessible bathroom along with a bedroom (see 5.8.6). Likewise, according to all three, walls capable of taking grab rails for both toilet and potential shower should be provided. Clear opening widths of bathroom/toilet doors follow those for internal door widths in all three standards.

UD specifies a 3ft. (914mm) clear space in front of and to one side of toilet while LM requires 800mm for this (Figure 5.14). LTH goes further with a clear space of 1100mm in front of the toilet and 1000mm from its centre line to one side (Figure 5.10). UD requires 30in (762mm) X 48in (1219mm) clear floor space at each fixture although overlap is permitted but the detail of this is not shown. In addition, as illustrated in Figure 5.13, a 36in (914.4mm) x 60in (1524mm) clear space is also recommended for the toilet (Centre for Universal Design, 2005). LTH specifies 1600mm x 1350mm as the clear floor space which for a basin can be overlapped by a maximum 200mm. The maximum overlap for the LM toilet clear space is 400mm which makes the toilet more inaccessible. Distances of 450-460mm, 400-500mm and 18in (457mm) are required from the centre of the toilet to the side wall in LM, LTH and UD respectively (Figures 5.10 and 5.13). Overall, LM suggests a more achievable wetroom/toilet layout for existing dwellings that will probably not be as accessible and adaptable those of as UD and LTH.

Figure 5.10 LTH accessible WC compartment layout (criterion 10) (Goodman, 2011:34) (required approach zone coloured)

Figure 5.11 LTH accessible bathroom layout (Criterion 14) (Goodman, 2011:44) (required approach zone coloured)

Figure 5.12 LTH accessible shower room layout (Goodman, 2011:45) (required approach zone coloured)

Figure 5.13 UD Bathroom layout (Centre for Universal Design, 2005) (required approach zone shaded)

Figure 5.14 LM toilet layout (Lifetime Design Limited, 2012:31)

5.9 Part 1 conclusion

The discussion of LTH, UD and LM shows a lack of detailed agreement when it comes to designing dwellings for an ageing and potentially less mobile population. Because this research is concerned with existing dwellings and because Lifemark was developed for New Zealand conditions, the LM 3-star standard will be used as the starting point for the design in this research. However, LM 3-star will be supplemented with aspects from UD and LTH, particularly when it comes to the design of sanitary spaces.

Part 2: Conversions

Apart from the design guidelines discussed in Part 1, a number of other considerations were taken into account while developing the schemes. .

5.10 Design approaches

In an investigation of infill development for older Australians and through a collaborative design process, Baldwin et al. (2012) found universal and accessible design are favourite features of the elderly. These important factors include “well-maintained safe walkways, outdoor environments including outdoor private space (patios and balconies), passive and active environmental features in the home, diverse housing options, places to meet, and access to services” (Baldwin et al., 2012:4). They also describe the characteristics of a desirable dwelling for the 65+ group.

“Their home would be on one level, ideally two bedrooms and a study which can be adapted to changing needs, and a number of private and shared outdoor spaces to be social or to relax, and to provide pleasant outlooks from the home. These homes would be sustainably designed: capturing prevailing breezes for through ventilation, natural sunlight, provide for privacy and noise considerations in higher density and provide solar and rainwater harvesting systems to save natural and financial resources.” (Baldwin et al., 2012:4)

Statistics New Zealand (2013d) suggest there is an increasing demand for communal dwellings driven by the ageing population. Although most existing cohousing acts as multi-generational communities, senior cohousing is seen as a new trend (Gottberg, 2016), an example in New Zealand being Abbeyfield House (section 2.3.6.4). Types of cohousing include houses shared with family members or boarders (Davey, 2006a). Evidence from the UK DWELL project indicates that outdoor spaces can be shared particularly where they house shared activities such as a barbecue (Park et al., 2016). Such areas are a “low-maintenance and low-cost way of providing attractive resident’s shared spaces” (Park et al., 2016:41). In Australia, Judd et al. (2014b) found that unlike other movers, older people who downsized are more likely to move into a form of multi-unit housing than a separate house.

Sutherland and Tarbatt (2016) investigated the design attributes of a case study of mainstream housing which has attracted downsizers. They found that although this development was not advertised for older people the application of lifetime home standards was one of the main reasons for their interest in living in it. Nussbaumer (2012) outlines the housing preferences of ‘baby boomers’ in the USA. She reported findings from a survey of consumers and buildings in 2009 by the National Association of Home Builders and the MetLife Mature Market Institute. This study supports some features of design standards. For instance, the older group of respondents (65+) showed greater interest in having a single-storey house or at least having an entrance-level master bedroom and other universal features. However, younger participants (55-64) expressed more interest in “technology features” (Nussbaumer, 2012:48). In addition, results from this survey suggest a significant percentage of people aged 55+ (79%)

preferred a single-storey house while only 15% and 7% preferred two-storey and split-level houses.

Private outdoor space is important for the 65+ age group. Evidence from the University of Sheffield DWELL study showed participants wanted to feel secure and that their home could be changed to meet their future needs, but they also wanted some outdoor space. Given in New Zealand the 65+ age group spend nearly twice the average time at home outdoors (1.1 hours/day in summer) (Khajehzadeh and Vale, 2017b) than all other age groups, Yavari et al. (2016) suggest housing for this age group should incorporate appropriate garden space. A growing body of literature supports the therapeutic role of contact with natural elements for the elderly (Rodiek and Fried, 2005). As integrating nature into built environments increases wellness and quality of life (Beatley, 2011), including private or semi-private garden spaces in the design of dwellings for the older age group could give the active a chance to garden and provide an amenity for those no longer able to do this. Judd et al. (2010:83) found outdoor space gave older Australians remaining in the community a means of achieving “active and healthy ageing.” In an investigation of assisted living facilities, Rodiek and Fried (2005) found being able to see outdoor spaces from indoors and having a place to wait just inside the entry would persuade people to use the outdoor spaces when they made decision to go out.

When it comes to inside the house, the summer time-use study in New Zealand (Khajehzadeh and Vale, 2017b) found older New Zealanders respectively spend 12.8% and 98.2% more time at home indoors and home outdoors than the New Zealand average, and part of the extra time at home indoors is spent in a study, making this an important room for this age group. Judd et al. (2010) found older Australian homeowners described the living room (often combined with dining room and kitchen) as the most frequently used space in the dwelling, being used for sitting, reading, socialising with friends, listening to music, watching television, playing with grandchildren, and doing crosswords and puzzles. The same study found bedrooms were used for activities other than sleeping. The DWELL project found people wanting to downsize would accept dwellings with fewer bedrooms but needed sufficient, flexible spaces to cater for living, studying, being a guest room, storage, piano practice, and crafts, painting or other hobbies. This highlights the importance of designing non-standardized dwellings for this age group (Park et al., 2016). The issue, therefore, is the appropriate size and design of dwellings for the 65+

age group which can accommodate their occupational needs and preferences and at the same time be space and resource efficient (Yavari et al., 2016).

5.11 Design criteria

Based on the strategies discussed above and Lifemark (LM) 3-star standards, ten schemes were prepared with different degrees of sharing, three for each villa and two for each state house. The characteristics and sizes of villas and state houses provide opportunities for various design solutions for ageing in place. This variety includes different degrees of sharing, number of occupants, ways furniture can be accommodated within the proposed designs, living arrangements, and the extent to which LM standards could be incorporated. The proposed designs are intended for those able to maintain their lifestyle independently or with a low level of assistance and who would like to downsize. The aim is to see what is possible when it comes to converting existing houses and later to test whether the designs are acceptable to the client group.

Apart from the general design guidelines incorporated into the conversion options, specific design criteria were also considered. Below is a brief description of these, although not all were achieved in a number of cases.

- *Plan arrangement*

Where possible the designs follow the structural arrangement and plan of the original house to reduce the need for major transformation. The new decks are the only extensions. As a result, the external walls have not changed and the floor area remained the same. In general, the plan arrangements in the state house conversions have changed much more than in the villa conversions due to the constraints of dealing with a smaller floor area starting point.

- *Outdoor areas*

The assumption is parking space, and all front and back outdoor areas are shared apart from the decks in some schemes, even when a house has been converted into separate units. The front outdoor area becomes the main entrance and provides space for a driveway and parking space/carport. Making the house accessible was complicated as both villas were situated above street level, and one was on a sloping site. Nevertheless, the access routes to the house

and parking spaces were designed in accordance with LM 3-star. The rear open space is designed as a shared outdoor space for gardening, sitting out, a B.B.Q and clothes drying.

- *Deck*

As indicated earlier, the aim was to add a deck as a transition space between indoors and outdoors. Where possible priority was given to having a shared deck as a place for social interaction, otherwise private decks were added. Both shared and private decks are designed for sitting, and some have room for a B.B.Q area and clothes line.

- *Living areas*

As many older New Zealanders spend most of their time at home in living areas (Khajehzadeh and Vale, 2016a), priority was given for living areas and bedsitting-rooms to benefit from sun and views of the back garden, with access strengthened by providing a deck/veranda where possible. However, in some schemes this was not achieved. In addition, living rooms provide sitting areas for different activities such as reading, entertaining family and friends, and watching TV, as indicated by the suggested furniture arrangements.

- *Open vs cellular plan*

Despite recommendations to avoid open plans due to the kitchen being one of the most polluting spaces in the house (Khajehzadeh et al., 2018), other literature suggests open plan designs facilitate circulation around the house, especially for people with limited abilities (Lifetime Design Limited, 2016; Livable Housing Australia, 2015; Baldwin et al., 2012; Centre for Universal Design, 2006). As a result, various options with both types of plan were proposed to test what the client group liked.

- *Corridors*

Because of the effort made to keep existing walls, corridors were not widened. Fortunately, the corridors in the villas exceeded the minimum recommended width in standards such as Lifetime Home (1200mm), Universal Design (42in or 1067mm) and Lifemark-3star (1050mm). A minimum width of 1050mm (LM) was used for new corridors.

- *Wetrooms vs bathrooms*

Wetrooms rather than traditional bathrooms assist older people in using service areas independently. Wetrooms contain a WC, basin and 900mm x 900mm level access shower. An 800mm x 800mm clear space is provided in front of the WC but few of the proposed bathrooms achieve an 800mm x 800mm clear space beside the toilet. Outward swinging doors make manoeuvring in the wetroom easy and en-suite wetrooms allow each resident independence and privacy.

- *Bedrooms*

Where the size of the room allowed, mainly in the villa conversions, main bedrooms include a standard double bed, desk and chair, bedside tables, chest of drawers, and a built-in wardrobe. Where a desk and chair are not provided in the main bedroom, a potential space has been considered for this in the living room. A clear path for easy access from the door to the bed is also considered. A clear 800mm wide space around two sides and the foot of bed is provided where possible. The en-suite bedsitting-room in shared scenarios is larger than the main bedrooms in non-shared options, and these also contain a TV standing on a chest of drawers to enable residents to watch TV in their private space.

- *Doorways*

A number of studies have considered doorways as an essential aspect of domestic environments for the elderly (Hiatt, 1980; Kaup, 2011; Regnier, 1994 in Rodiek et al., 2014). According to Rodiek et al. (2014a), use of outdoor spaces and its effect on health, is influenced by the design and maintenance of exterior doorways. Therefore, all doors and specifically those leading to outdoor areas have been designed appropriately.

Based on the minimum clear opening width of 810mm (door leaf 860mm recommended) to meet LM design standards, all internal, wardrobe, and entrance doors could be reused. Although a 300mm nib for doors is missing in LM 3-star, to facilitate circulation this has been included in the conversions where possible. This was easily achieved in bedrooms and where it was not possible to add a 300mm nib for doors in wetrooms an outward swinging door was used.

- *Turning circle*

A turning circle of 1500mm has been considered in living rooms, dining areas, kitchens and bedsits although on rare occasions it overlaps with moveable furniture. This is also not mandatory in 3-star LM homes.

- *Laundry*

Initially a separate laundry was the aim for each scheme. However, given the limited room in a number of schemes, a utility cupboard mainly in the kitchen was provided.

- *Construction materials*

Consideration has been given to reusing materials, components and equipment where possible.

5.12 The schemes

Using the LM 3-star standard, the villas and state houses were redesigned with different degrees of shared space. Three designs were produced for each house, ranging from subdivision (conversion to two smaller units), to having some shared spaces such as a guest bedroom, to private en-suite bedsitting-rooms and all living spaces shared. Based on these scenarios, schemes V1 (Figure 5.15), V4 (Figure 5.23), S7 (Figure 5.30) and S9 (Figure 5.36) have separate units with a separate or shared entrance for villa and state house, schemes V2 (Figure 5.17) and V5 (Figure 5.25) convert the villa into separate units with shared entrance, guest suite and study/sitting room, and schemes V3 (Figure 5.19), V6 (Figure 5.27), S8 (Figure 5.31) and S10 (Figure 5.37) provide private bedsitting-rooms, with shared living spaces, guestroom/study for both villas and state houses. Plans for outdoor areas are presented separately. All spaces are numbered based on the unit they belong to, for instance living room 1 belongs to unit 1.

5.12.1 Villa 1 options

5.12.1.1 Scheme V1: Conversion of villa into two separate units

This is a conversion into two single units with separate entrances. The first is a two-bedroom unit of 125.1m² with an open plan arrangement and a 17.5m² deck and the second a smaller

one-bedroom unit of 85m² with an 11.2m² deck. The only shared area is the 19.8m² roofed deck (Figure 5.15). The smaller unit has also a two entrances. Both units have a separate laundry.

Figure 5.15 Scheme V1 floor plan with furniture

Figure 5.16 Scheme V1 section A-A

5.12.1.2 Scheme V2: Conversion of villa into two separate units with some shared spaces

This is a conversion into two single units with some shared spaces. The first is a one-bedroom unit of 66.2m² with an open plan arrangement and a 17.5m² deck and the second a larger one-bedroom unit of 85m² with a cellular arrangement and an 11.2m² deck. The shared area of 58.9m² comprises corridor, entrance, guest suite and study/sitting room and a 19.8m² roofed deck (Figure 5.17). The larger unit also has a private entrance. Both units have a separate laundry.

Figure 5.17 Scheme V2 floor plan with furniture

Figure 5.18 Scheme V2 section A-A

5.12.1.3 Scheme V3: Private bedsitting room, with shared living spaces

This is a conversion into two en-suite bedsits of 26.3m² and 25.9m². There is a shared deck of 20m² and a shared kitchen, combined dining/living room, corridor, guest room, study/hobby room, visitor's bathroom and laundry with the collective area amounting to 157.8m². Each bedsit has its own bathroom, TV and sitting area (Figure 5.19). The smaller bedsitting room has also a private deck of 8.7m².

Figure 5.19 Scheme V3 floor plan with furniture

Figure 5.20 Scheme V3 section A-A

5.12.1.4 Villa 1-Entrance and carport

Two alternatives were proposed for access to villa 1. The first option has a pedestrian ramp that meets LM-3 standards and a platform lift to the roofed deck which is 3.50m higher than street level (Figure 5.21). The second alternative has a stair lift from the main entrance to the roofed deck using a bridge at the end of the stairs (Figure 5.22).

Figure 5.21 Villa 1 proposed access to house and carport, alternative 1

Figure 5.22 Villa 1 proposed access to house and carport, alternative 2

5.12.2 Villa 2 options

5.12.2.1 Scheme V4: Conversion of villa into two separate units

This is a conversion into two single units with a shared entrance of 9m². The first is a one-bedroom unit of 67m² with a cellular plan and a 5m² veranda and the second a larger two-bedroom unit of 81m² with an 8.6m² private deck (Figure 5.23).

Figure 5.23 Scheme V4 floor plan with furniture

Figure 5.24 Scheme V4 section A-A

5.12.2.2 Scheme V5: Conversion of villa into two separate units with some shared spaces

This is a conversion into two single units with some shared spaces. The first is a one-bedroom unit of 65m² and a 5m² veranda and the second a larger one-bedroom unit of 70m² with a 6.6m² deck off the kitchen. The shared area of 22m² comprises entrance hall, laundry and study/hobby room (Figure 5.25). Both units have a separate laundry and a cellular plan.

Figure 5.25 Scheme V5 floor plan with furniture

Figure 5.26 Scheme V5 section A-A

5.12.2.3 Scheme V6: Private bedsitting-room, with shared living spaces

This is a conversion into two en-suite bedsits of 25m² and 28m². There is a shared deck of 11.2m² and a shared kitchen, combined dining/sitting room, living room, corridor/entrance, guest room/office, visitor's bathroom and laundry totalling 104m². Each bedsit has its own wetroom, TV and study area (Figure 5.27). The smaller bedsitting-room has also a private deck of 8.3m².

Figure 5.27 Scheme V6 floor plan with furniture

Figure 5.28 Scheme V6 section A-A

5.12.2.4 Villa 2-Entrance and carport

An alternative was proposed for access from the main entrance to the house. It has a stair lift from the main entrance to the house which is 4m higher than street level (Figure 5.29).

Figure 5.29 Villa 2 proposed access to house and carport

5.12.3 State house 1 options

5.12.3.1 Scheme S7: Conversion of state house into two separate units

Scheme S7 is a conversion into two single units with a shared entrance of 6m². The 1 bedroom open plan unit of 53m² has a deck of 11.2m² and the studio unit of 35.0m² has a 10.5m² deck (Figure 5.30). This scheme could accommodate two people of 65+, or one person and a live-in carer, or one person and a lodger, the latter giving the house owner additional income.

Figure 5.30 Left: Scheme S7 floor plan with furniture; right: section A-A

5.12.3.2 Scheme S8: Private bedsitting-room, with shared living spaces

Scheme S8 converts the house into two en-suite bedsits of 17.0m² and 14.2m². There are two shared decks with a collective area of 25.3m² accessed from the living room and kitchen and a shared living room, dining area/kitchen, hall, visitor's bathroom and laundry cupboard totalling 62.8m². Each bedsitting-room has its own bathroom, TV and wardrobe (Figure 5.31).

Figure 5.31 Left: Scheme S8 floor plan with furniture; right: section A-A

5.12.3.3 State house 1-Entrance and carport

Due to the different site configurations of schemes S7 and S8, two designs were prepared for each (Figures 5.32-5.35), using ramps and a carport. The existing garage accessed from Clendon Street is to be converted into a workshop/storage shed.

Figure 5.32 State house1 proposed access to house and carport, alternative 1 for scheme S7

Figure 5.33 State house1 proposed access to house and carport, alternative 2 for scheme S7

Figure 5.34 State house1 proposed access to house and carport, alternative 3 for scheme S8

Figure 5.35 State house1 proposed access to house and carport, alternative 4 for scheme S8

5.12.4 State house 2 options

5.12.4.1 Scheme S9: Conversion of state house into two separate units

Scheme S9 is a conversion into two single units with a shared entrance of 6m². The one-bedroom unit of 47m² has a 5.8m² deck and the other of 46m² has an 8.2m² deck (Figure 5.36). Both units are open plan.

Figure 5.36 Left: Scheme S9 floor plan with furniture; right: section A-A

5.12.4.2 Scheme S10: Private bedsitting-room, with shared living spaces

Scheme S10 converts the house into two en-suite bedsits both of 18m². There is a shared deck of 8.2m² accessed from the living room, and a shared living room, dining area/kitchen, study/guest room, corridor, visitor's bathroom, laundry cupboard and shed/storage with a total area of 63m². Each bedsit has its own bathroom, TV and wardrobe (Figure 5.37).

Figure 5.37 Left: Scheme S10 floor plan with furniture; right: section A-A

5.12.4.3 State house 2-Entrance and carport

Two alternatives were developed for access using pedestrian ramps (Figure 5.38). A new carport has been added and the existing garage is converted into a workshop/storage shed.

Figure 5.38 State house2 proposed access to house and carport, left: alternative 1; right: alternative 2

5.13 Summary

The different size and plan characteristics of villas and state houses provide opportunities for design solutions for ageing in place. The larger villas offer a greater range of these including separate and shared living and the chance to have a live-in carer or lodger than the smaller state house. LM 3-star standards have been used to create the design details, including the furniture layouts.

To test the acceptability of these designs, Chapter 6 describes the detailed steps in the development of the questionnaire, the two pilot studies, and the outcomes. It then continues with the development and results of the main survey.

Chapter 6 The survey

6.1 Introduction

The aim of the survey was to obtain comments on the proposed conversions, particularly what older people thought about the levels of sharing. The survey was designed to address the following questions:

- Do people like the idea of shared living spaces?
- Which type of shared living arrangement is most preferred?
- Which outdoor arrangement is most preferred?
- What features of their house would people like to share and with what age group?
- Do the schemes as designed meet their requirements?
- What features might influence their perception of sharing a house?

Before the main survey was undertaken two pilot versions of the questionnaire were tested. A detailed description of the development of questionnaire both before and after the two pilot surveys, how the main survey was undertaken and the findings are discussed in this chapter.

6.2 Pilot studies

Two pilot studies were conducted to examine the proposed questionnaire and VUW Human Ethics Committee approval was obtained for both surveys (Appendix 3). Participants were those in the age group for the main survey (55+) and experts in design for an aging population. The 55+ age limit was used as research suggests this is the age when people consider moving from their family home (Park et al., 2016). In another study on downsizing in Australia, Judd et al. (2014b) included people of 50 years of age in a pre-retirement course on making decisions about their future housing.

Some participants completed the survey on-line while others did it with the help of the researcher. Apart from seeking opinions on sharing, the additional aims of the pilot surveys were:

- To test whether the scheme drawings are easily understandable
- To test whether the survey is easy to navigate and has been clearly explained
- To seek for anything missed either in the schemes or the questionnaire

Table 6.1 summarises the detailed information about the participants who took part in both pilot surveys.

Table 6.1 Participants in pilot studies 1 and 2

		Invitations sent	Online survey participation (full)	Survey filled out with researcher (partial)	Age group		
					Under 65	65-74	75-85
Pilot1	Experts	13	8	4	7	3	2
	55+	8	1	2	2	1	0
Pilot 2	Experts	3	0	3	1	1	1
	55+	5	3	2	2	3	0
People who filled out both pilot surveys	Experts	3	0	3	1	1	1
	55+	2	0	2	2	0	0

Analysis of the data from the two pilot surveys led to the following:

- Comments from 9 of 21 participants who completed Pilot 1 were used to improve the questionnaire for Pilot 2 and their preferences for shared living arrangements were analysed.
- Comments from a number of experts in ageing in terms of reading floor plans and improvements in image presentation were taken into account.
- Comments on the questionnaire from those who completed the survey with the researcher present were used to improve the questionnaire, but not their preferences for sharing.
- For those with only partial participation, analysis was carried out on the recorded responses. None of these responses included background information.

6.3 Pilot 1 survey

The pilot questionnaire was in four parts. The two questions in Part 1 asked about moving to smaller accommodation. Part 2 presented the conversion schemes and asked for preferences regarding the degree of sharing. The questionnaire mainly included open-ended questions and Likert-scaled questions for participant rating of aspects of accommodation sharing.

Pilot study schemes 1A (now thesis scheme V4 -Figure 5.23) and 1B (thesis scheme S7 -Figure 5.30) provided two possible conversions of a villa and state house to make two separate units with shared entrance/corridor.

Scheme 2 (now V2-Figure 5.17) illustrated conversion of a villa into two separate units with shared entrance, guest suite and study/sitting room.

Schemes 3A (now V6-Figure 5.27) and 3B (now S10-Figure 5.37) provided two possible conversions of a villa and state house to make two smaller dwellings with shared living spaces, a potential space for a live-in carer, and private bedsitting rooms.

Schemes 4A, 4B and 4C showed three possible conversions of the outdoor spaces of a typical New Zealand house including shared outdoor space, separate outdoor space and subdivision of lot, and separate outdoor spaces (including parking spaces) and shared driveway.

Part 3 of the questionnaire asked for background information.

Part 4 asked for feedback on the survey.

The first pilot survey was conducted from 7th to 20th of April 2017. The participants were invited to take the online survey via their email address. Two participants from overseas (UK and US) were registered architects and researchers into ageing. For Pilot 1, three people aged 55+ and five ageing researchers, five design experts, and two people expert in both areas took part. Of these, the researcher sat with six participants (four researchers and two 55+ participants) whilst they filled out the survey to witness any problems, and discover where questions had to be explained more fully. The four experts in this latter instance only went through Part 4 of the questionnaire asking for feedback (Table 6.1).

6.3.1 Pilot 1 problems

Four significant problems were identified in Pilot 1.

6.3.1.1 Size of the images and level of detail on the schemes

Of the participants (N=15) 5 out of 12 experts and all 3 participants aged 55+ suggested people without training in design might struggle to understand the floor plans given their high level of

detail, and the failing eyesight of older people would probably not help. However, of participants who completed the whole survey (N=9) 7 found the plans clear and understandable and 2 did not. Out of these 7 however, 5 were design/construction professionals and 1 a researcher used to reading plans. Those who struggled with reading plans were both 55+ and considered themselves non-design/construction professionals. This showed the potential problems with the plans for the proposed target population. Some of the comments received are given below.

Respondent 1 (expert) who found the plans easy to follow:

"I am used to reading plans so found them understandable, well labelled. But a lot of people would find it hard because they rarely, if ever have to work with plans."

Respondent 15 (researcher and design expert):

"Most people will at least try to read a floor plan, but not if it is too complex."

Respondent 4 (55+) who found the plans difficult:

"Not a clear yes/no answer. I expect looking at house plans comes as naturally as breathing to architects, but the experience can be quite foreign to non-architects. I suspect most people could grasp a plan of their own home fairly quickly, but with these plans my response to each one began with a spontaneous reflex reaction: "this is not my house" - for no reason other than its unfamiliarity, my first impression was that the plan was unappealing. The unfamiliarity also created the additional challenge of making me figure out where all the rooms that fit together so predictably in my own home, fit together in this unfamiliar house. This took time and effort. Then I had to imagine the plan into a 3 dimensional house, and imagine sharing it, and imagine how that would work. All this took more time and effort."

Two further participants found the annotations and labelling useful although the overall experience of reading plans was difficult.

There was also a problem with having two schemes (one each for a villa and state house) on the screen, followed by the questions that applied to each on the next screen. The survey was

set up in this way so people could consider the difference between the same degree of sharing for a converted large and small house. Respondents found this complicated as they did not understand the idea behind it.

Respondent 7 (expert):

“Would it be possible to put questions about each plan directly after it and not present two examples together? This makes it harder to remember what you liked and disliked.”

The level of detail also made the plans difficult to read unless they were enlarged by clicking on the screen. This was another concern particularly for those who were not computer savvy. People did not know how to return back to the original survey if they clicked on the image to enlarge it.

Respondent 7 (expert):

“Navigating examples—how to go back after looking at enlarged versions—found I could do this by minimising, but no instructions about this.”

6.3.1.2 Choice of houses

As stated earlier, conversions were developed for villas and state houses, and schemes were identified by their house types. Of all 15 respondents 3 stated that having a state house label would mean people would not consider it.

6.3.1.3 More details/instructions/assumptions requested about the schemes

Out of 15 respondents 3 were curious about some aspects of design such as access from street, garden and yard which was beyond the scope of this survey. One asked about the sizes of rooms which were deliberately omitted from the floor plans because they already showed the furniture layouts.

Respondent 5 (design expert):

“Questions on locations—relative to street, transport, community infrastructure, other services. Work out a way of deciding what compromises people might be willing to make. e.g. Less floor space in return for being close to a good bus service/shops etc.

Work out whether people understand the wider implications of ageing—such as the eventual loss of driving licence and its impact on housing choice. Establish info. on lifestyle preferences so you can contextualise the preferences offered (like my response re storage for bikes etc)."

Some assumptions about the plans were explained in the survey, such as level access for all entrances, north points and relationship with the sun path, room labelling, and boundary of units/bedsits and shared area. However, it seemed more instructions and information about the assumptions made were necessary to enable respondents to answer the questions appropriately.

In addition, 2 participants did not know whether to deal with a fictitious scenario for themselves or their actual situation.

Respondent 9 (expert):

"I wasn't sure if my opinions were for now or in the future when I need to downsize - and should I assume I was single or still married. These assumptions affect my responses."

Moreover, who they would be sharing with was a serious concern for almost everyone. This made it challenging when it came to deciding what they liked about the schemes. In a number of cases, they preferred not to take the risk of sharing just because they were not sure who they might share with.

6.3.1.4 Open-ended questions

Open-ended questions in the survey led respondents to struggle with some parts. This could be the main reason 5 experts asked the researcher to go through the survey with them and record their feedback. In addition, the failure to get the 5 of the invited 55+ participants to take part might come from having such questions, and the time it took to complete the survey.

Respondent 4 (55+):

"...I fear that many would find the length of the questionnaire and the concentration required to complete it, too taxing."

Participants were also asked to look at the proposed schemes and list the features they like/dislike. Three participants found this difficult as they did not know the level of detail required.

Respondent 9 (design expert):

“Understanding what you meant by 'what features' of each design were liked or not...the level of detail was not clear as it could have been. Many will be able to answer better if they have a better handle on the objectives you have in mind.”

6.3.2 Pilot 1 improvements

In response to the issues raised above a number of changes were made to the survey.

6.3.2.1 Simplified schemes

In order to address concerns associated with the level of detail, the concepts of sharing were to be presented as abstractly as possible. Figures 6.1 6.5 illustrate the steps in how this was done for the villa labelled scheme 2 (in Pilot 1), C (in Pilot 2), D (in the main survey) and V2 (in the thesis). Figure 6.9 shows the final version used in the main survey.

Figure 6.1 shows conversion into two units with some shared space. The floor plan still includes furniture, windows, and doors, with direct labelling and annotations for more explanation. Shared spaces (guest rooms, corridor, sitting room and deck) are coloured (Figure 6.1).

Figure 6.1 Villa conversion floor plan used in Pilot 1 including furniture and annotations with coloured shared spaces

Step 2 produced two simplified plans showing the house before and after conversion (Figure 6.2). The boundary of each unit is shown and shared areas are defined by different colours. Windows, doors and furniture are not shown, so the plan does not reveal the relationship between spaces as in the Pilot 1 floor plans. However, the names of spaces are given.

Original house (210 sq.m) Converted to 2 Separate units with limited shared spaces

Figure 6.2 Villa conversion: semi-detailed floor plan including room boundaries

The next step gave more detail than Figure 6.2 (Figure 6.3), by reinstating rooms with walls, doors and windows. The names and sizes of rooms are given. Colours are again used to show shared spaces.

Original house (210 sq.m) Converted to 2 Separate units with limited shared spaces

Figure 6.3 Villa conversion: semi-detailed floor plan including doors and windows

In the next step furniture was added to Figure 6.3 (Figure 6.4). However, this produced plans very similar to those criticised in the first pilot. The only difference was more use of colour and omitting the annotations to the side.

Figure 6.4 Villa conversion: simple floor plan including furniture, doors and windows

The next step was to go back to simplifying the plans but still showing what is shared in a clear way (Figure 6.5). This became the plan type for Pilot 2.

Figure 6.5 Villa conversion: simplified scheme used in Pilot 2

6.3.2.2 Using larger plans

Although the two schemes (original house and proposed conversion) were still shown together in the second pilot, using the approach of Figure 6.5 gave larger images with larger fonts within the size allowed by Qualtrics on-line survey.

6.3.2.3 Changing the labels

In order to avoid prejudiced opinions, the labels 'villa' and 'state house' became the more general 'large house' and 'small house'. Using these terms helps respondents to identify the differences in what is offered as size plays a significant role in what can be achieved in the conversions.

6.3.2.4 Step-by-step instructions for taking the survey

Since several participants had problems dealing with the images, an amendment was made to the Information Sheet participants received at the start of the survey. This now explained the process of enlarging an image and then returning to the main survey. More comprehensive instructions were also made at the relevant point in the on-line questionnaire.

6.3.2.5 Assumptions behind the house conversions

To assist participants in making appropriate responses to the questions, additional instructions were added. For example, it was explained that they would only be sharing with someone acceptable to them.

6.3.2.6 Using multiple choice questions

Open-ended questions became multiple choice questions in Pilot 2, and more choices were added for each question. Features listed in scheme-related questions are examples of this. In addition, for further clarification, if participants selected a unit in a scheme as their preference, they were asked to select the features behind their preference in a list associated with that unit. This was done to assist participants to look closely at the features and make a meaningful decision.

6.4 Pilot 2 survey

The Pilot 2 questionnaire was again in four parts. Part 1 asked about participants' current housing situation. Part 2 presented the schemes and asked for participants' preferences regarding the degree of sharing.

Schemes A (now V4-Figure 5.23) and B (S7-Figure 5.30) provided separate units with a shared entrance

Schemes C (V2-Figure 5.17), D (V6-Figure 5.27) and E (S10-Figure 5.37) have more shared spaces.

Scheme F provides three different options for converting a section (house plot).

Part 3 asked for background information.

Part 4 asked for feedback on the survey.

The second pilot survey was conducted from 29th April 2017 to 6th May 2017. The recruitment method was the same as for Pilot 1. The main focus was to evaluate the revised questionnaire, particularly the presentation of the schemes. Five people aged 55+ took part. Two had completed Pilot 1 with the researcher, and this was repeated for Pilot 2. Five invitations were sent to people aged 55+ and three who had not been involved in Pilot 1 completed the Pilot 2 survey. Three expert participants who had taken part in Pilot 1 were also asked to comment on the revised questionnaire (Table 6.1). All the latter only completed part 4.

6.4.1 Pilot 2 feedback

The main difference between the survey questionnaires in Pilots 1 and 2 was the simplification of the level of detail shown for each scheme, which it was hoped would assist respondents in understanding the ideas behind the survey questions.

Findings from Pilot 2 suggest people not familiar with reading plans found it easier to identify spaces because of the different colours, and use of colours received positive feedback from the 55+ participants. Participants who did the survey with the researcher found the plans more attractive and understandable, and also easier for people with sight impairments. In addition,

people who did both Pilots 1 and 2, found it easier to follow the questions related to the schemes.

The schemes used for Pilot 2 lacked the sun path information. Findings from Pilot 2 revealed the sun influenced both preferences and perceptions of the spaces. In addition to the lack of sun path mentioned by all five 55+ participants, one respondent would have liked to know about outlook and sound proofing of dividing walls.

In spite of providing the essential information about each scheme, questions still arose. For instance, questions about the quality of outdoor spaces, gardens, location of street, outside access, driveway, view from various spaces particularly living rooms, and the orientation of specific spaces such as living rooms to the sun. Although relevant, apart from the sun, these were outside the aims of the survey.

6.4.2 Pilot 2 improvements

Minor changes were made to the schemes in Pilot 2 for the main survey. These include:

- Along with a north arrow, the sun path for winter was added
- A number of side-annotations including the sizes were relocated inside the plans, for example for both the sizes of units and shared spaces.

Figure 6.9 shows the Figure 6.5 plan as it appeared in the main survey.

In response to questions about the garden and outdoor spaces in both pilot surveys, the scheme-related questions were reorganised. First came questions about sharing outdoor areas. This was done so participants would realise the survey was about sharing, not about an ideal plan.

6.5 Lessons learned from pilot surveys

In order to identify key themes for further design enhancement, comments from both pilots were summarised in Tables 6.2 and 6.3. Features in bold were both liked and disliked.

Table 6.2 Summary of expert comments on the features they liked/disliked

Scheme	Dwelling type	Features respondents <i>liked</i>	Features respondents <i>disliked</i>
Separate units with shared entrance/corridor	Villa (larger house)	<ul style="list-style-type: none"> •Design strategies which minimise noise issues either within a unit or between two separated units such as adequate distance between living rooms and bedrooms between two separate units •Different sized units to suit different needs/budgets •Outdoor deck or veranda •Getting sun into both units and outdoor spaces •Multi-purpose spaces •Various environmental qualities within the living room such as small bays/nooks •Good size of rooms in larger original houses •Privacy but also the chance to meet your neighbour at the entrance. •Study/work space available in dining room •Independent units •Separate living and kitchen/dining 	<ul style="list-style-type: none"> •No sun for kitchen/dining •Access to deck through bedroom •Lack of storage space •Having only one bedroom •Separate living and kitchen/dining •Laundry cupboard in the kitchen
	State house (smaller house)	<ul style="list-style-type: none"> •Sunny decks •Good sized deck (off both living areas) •Separate decks •Getting sun into both units •Study area •Open plan living, kitchen and dining •Sunny living areas •Spare bedroom •Ability to use 2nd unit for boarder or carer •Accessible/lifetime design features 	<ul style="list-style-type: none"> •Bathroom and toilet next to the front door •Lack of storage. •Potential acoustics problem •Small units/bedsits/bedrooms •High degree of integration for living/dining/kitchen •Laundry cupboard in the kitchen

Separate units with shared entrance, guest suite and study/sitting room	Villa (larger house)	<ul style="list-style-type: none"> • Additional shared space • Potential accommodation for carer if required • Separate laundry • Good solar access, • Good amount of outdoor space provision. • The idea of a mixture of independent and communal living • Separate independent entrance. 	<ul style="list-style-type: none"> • Small deck area • Dark shared corridor • Shared sitting area • Sharing spaces
Shared living spaces/guest room (potential for live-in carer) and private bed sitting rooms	Villa (larger house)	<ul style="list-style-type: none"> • Not being open plan • Separate storage areas • Being spacious • Private bathrooms and also one shared • Two living rooms • Storage shed 	<ul style="list-style-type: none"> • The bed-sitting rooms are really only bedrooms, not suitable for other functions such sitting • Access to the storage for unit 2 from guest room • No private outdoor space for one bedsit • Too much communal space • Not a lot of private space for occupants.
	State house (smaller house)	<ul style="list-style-type: none"> • Lifetime design • Sunny shared living area and deck. • Lots of storage. • Three bathrooms 	<ul style="list-style-type: none"> • The laundry position • Bedsitters too small to have a sitting function. • Very small unit • Needs more outdoor space + storage • Communal storage • Outside access to storage shed • Bedsit 1 doesn't get much sun
Conversion of outdoor spaces Subdivision of lot	N/A	<ul style="list-style-type: none"> • Private outdoor area but reduced in size • The third unit could be rented/sold as a means to provide living costs, or to cover the cost of the upgrade of the existing building • Good way to generate income from unused land. 	N/A

Table 6.3 Summary from 55+ aged participants comments about the features they liked/disliked*

Scheme	Dwelling type	Features respondents <i>liked</i>	Features respondents <i>disliked</i> *
Separate units with shared entrance/corridor	Villa (larger house)	<ul style="list-style-type: none"> • Spare room • Outdoor deck or veranda • Sunny living rooms • The sociability of a shared entrance • Open plan kitchen/dining • Separate living room 	<ul style="list-style-type: none"> • Access to deck through bedroom • Locating the kitchen in a less direct sight line
	State house (smaller house)	<ul style="list-style-type: none"> • Decks & the shared entrance. • Open plan • kitchen, dining, living 	<ul style="list-style-type: none"> • Larger space for study • Spare room for short term guests
Separate units with shared entrance, guest suite and study/sitting room	Villa (larger house)	<ul style="list-style-type: none"> •The idea of shared entrance •Shared guest area •Access to decks from living rooms. •Open plan kitchen, dining, living area •Separate entrance for unit 2 •Potential guest suite •Potential shared suite for carer •Separate kitchen, dining, living 	<ul style="list-style-type: none"> •Lack of flow between kitchen 2 and living area
Shared living spaces/guest room (potential for live-in carer) and private bed sitting rooms	Villa (larger house)	<ul style="list-style-type: none"> •The idea of all the shared spaces. •Veranda •Separate living room with bay window •Spare room •Open plan dining, sitting area, study •Open plan kitchen, dining 	<ul style="list-style-type: none"> •Decks. •Entry to decks through bedrooms •Private + shared deck •Separate living room
	State house (smaller house)	<ul style="list-style-type: none"> •All shared and separate spaces especially shared deck on north side, •Spare room •Open plan kitchen, dining 	<ul style="list-style-type: none"> • Could be awkward for guest having a shower to have to dash to bedroom to get dressed when someone arrives at the door.

*There were few 55+ aged participants in the first pilot. Although there were more in the second pilot, because the questions were mostly multiple choice, this limits the variety of responses/choices compared to the experts in the first pilot.

6.5.1 Design-related characteristics

The various liked and disliked design characteristics identified through analysing the comments could assist designers when altering existing houses to make them more suitable for ageing in place. The preliminary lessons learned for improvement of the proposed designs are listed below:

- When it comes to the smaller options, getting significant sun indoors and having good size sunny outdoor decks are the most significant parameters for both experts and those aged 55+.
- No specific pattern was found regarding the use of a separate or open plan living, kitchen and dining area for either experts or 55+ aged participants. This trend also applies to the idea of sharing spaces in the various forms developed in the schemes. Both groups, experts and 55+, have varying preferences when it comes to sharing accommodation. However, because these results are based on the small number of participants in the pilot surveys, they are only indicative at this stage.
- The main concerns with the conversion of the state house stem from its small original size. Issues include having a bathroom and toilet next to the front door, lack of storage, and potential acoustical problems.

Respondent 7 (researcher):

"Need maximum space. Opportunity to have a friend share house for companionship. State house looks too much like minimal traditional "pensioner housing."

- Having a laundry cupboard in the kitchen was disliked.
- Having multi-purpose spaces that would allow occupants to meet their requirements in the way they would prefer was desirable.

Respondent 5 (researcher):

"Needs more storage space needed for active lifestyle (bikes, golf clubs etc), hobbies (tools, materials, craft items etc). The spare room of Unit 1A2 would probably become my store room."

- The issues raised about sharing space in its various forms seem not to stem from the design but the nature of sharing spaces.

Respondent 7 (researcher):

“Good to have guest bedroom so long as occupants can agree about its use, also about upkeep and cleaning of shared area...”

Respondent 7 (researcher):

“...Like shared guest room for visitors - but booking arrangements need to be agreed”.

Respondent 6 (researcher):

“...The shared areas could be great, or could be a source of conflict. Who uses them most? Who is responsible for cleaning / maintaining them?...”

Respondent 2 (researcher):

“If you had a friend or someone with whom you would like to share this could work well...”

Respondent 9 (researcher):

“It would all depend on having a compatible house mate.”

Respondent 1 (researcher):

“It depends on who I would be sharing with—the idea could be really good with the right person.”

Only one participant felt better design could make the concept of sharing much more appealing. Designing larger bedsitting rooms with more room for a variety of independent activities would help this.

Respondent 2 (researcher):

"It would be difficult if you had to share with someone with whom you did not get on. The bed-sitting rooms are really only bedrooms, they do not offer any options for sitting in a comfortable armchair, for example. "

- Although some people did not like the idea of sharing living spaces they still felt this concept could meet the changing needs of the older people in later life or even earlier.

Respondent 5 (researcher):

"The concept of basically sharing a house with someone else. This is common for younger people but rarely considered by older people who could benefit from it just as much (even if for some different reasons - e.g. protecting from loneliness / depression."

Respondent 4 (general):

"How well shared indoor or outdoor spaces work depends on the compatibility, flexibility and willingness to negotiate of the residents. So my answer assumes that both parties are reasonably pleasant people who like the idea of shared spaces and understand the need to negotiate—in which case having company built in to one's daily life, instead of having to go out and find it, is a positive thing. Having built in company doesn't replace the need to get out and about, but it goes a long way towards making daily life a more interesting and enjoyable experience."

- Points were made about subdividing the lot and benefits that might ensue.

Respondent 3 (researcher):

"Consider orientation of lots to the sun, width of driveway, safety aspects and provision for visitor parking."

Respondent 6 (researcher):

"...would depend on the size of the lot, and whether there were privacy/sun issues around adding another dwelling."

Respondent 5 (researcher):

“The third unit could be rented/sold as a means to provide living costs, or to cover the cost of the upgrade of the existing building to begin with.”

6.5.2 Key design-related themes

Key features which make the designs more appealing for the respondents were extracted from the Pilot survey data and are listed below.

- Good/big size dwelling
- Good/big size deck
- (Sunny) outdoor deck or veranda
- Sunny rooms
- Multi-purpose spaces
- Storage
- Access to deck from living areas
- Spare room for short term guest
- Accessible/lifetime design features

6.6 Main survey

6.6.1 Introduction

Following the two pilot surveys and subsequent revisions, a questionnaire-based survey was conducted with updated ethics approval. The same survey was provided both as web and paper-based (Appendix 4).

Data collated for the survey was both quantitative and qualitative. Results from analysis of the former are discussed in section 6.7. Participants were also asked to comment on the proposed schemes and the general idea of sharing. These were treated as qualitative data and analysed thematically using the coding template developed for analysis of the focus groups. However, the survey comments were repetitive and no new theme was identified. Appendix 5 gives a sample analysis of the written comments on outdoor schemes but no further analysis is presented in this thesis.

The results from the survey were intended to lead to improving the designs for the resource analysis stage as well as yielding a greater understanding of the housing needs of the 55+ age group. This chapter discusses the features of the questionnaire-based survey and its findings.

6.6.2 Method

To limit the scope, the questionnaire targeted people aged 55-85 years. The survey was anonymous and a snowballing recruitment method was used. Individuals and senior community groups from across New Zealand were contacted using email, social media and in-person meeting (for local distribution). No person can be identified from the responses and comments used in this thesis.

6.6.2.1 Online survey and recruitment method

The main online survey using the web-based service Qualtrics (2017) ran from 12th May 2017 to 30th November 2017. The online method was thought useful for targeting responses from the whole of New Zealand. Participants were recruited through asking a number of relevant national and local organizations to distribute the link and information sheet to their email lists. These included the University of the Third Age, Age Concern New Zealand, Grey Power NZ Federation Inc, Wellington City Council (Neighbourhood Development Centre), Senior Net, Selwyn Foundation, a number of community centres, New Zealand Office for Disability Issues, a number of retirement villages across the country, Hong Kong University Alumni Association of New Zealand, New Zealand Chinese Association and Friendship New Zealand Inc via their email lists, newsletters or Facebook page. Overall, 370 persons attempted the online survey and 347 fully or partially completed it.

In 2013 Statistics New Zealand (2015a) found 64.7% of people aged 65+ lived in households with internet access compared to 85.1% of people aged 15–64, Of those aged 65+ with access 69% and 26% were aged 65-74 and 75-84 respectively. However, past censuses show the proportion of people aged 65+ with internet access has increased from 16.6% in 2001 to 39.5% in 2006 and 64.7% in 2013. This means that the proportion has risen 160% in 7 years, suggesting a significant pool of potential participants of the right age group for the online survey.

6.6.2.2 Paper-based survey and recruitment method

Following the online survey, a paper-based survey was also conducted from 4th to 31st Oct 2017 to make sure a reasonable number of those aged 55+ without access to the internet were also surveyed. The questionnaires were distributed in Wellington through local organizations such as community centres, ethnic senior associations, Citizens Advice Bureau, and senior clubs. This period coincided with Seniors' Week from 11th to 22nd October 2017 (SuperSeniors, 2017), therefore, the questionnaires were distributed during many events targeting senior citizens.

Respondents were asked to return the completed questionnaire to where they had received it or send it to the investigator using a prepaid addressed envelope. Overall 267 paper-based questionnaires were distributed, with 95 returned by the cut-off date of 31st Jan 2018, a 35.6% response rate. Of those, 94 fully or partially completed the postal survey and were included in the analysis.

The questions in both postal and online surveys were identical and followed the same structure, but minor changes were made to the paper-based questionnaire for easier navigation. In the online method irrelevant questions would automatically be deleted, thus the questionnaire could be tailored to fit the previous responses. For instance, if a participant preferred one unit of a scheme, only questions related to that unit would appear. In the paper-based survey, minor grammatical changes were made so participants could answer the relevant questions based on their previous answers. Question 3.6.1 (see Appendix 4 for the full questionnaire) is given as an example.

Online survey: "3.6.1. As you prefer unit 1, please tick which features you like from the list below. You can select as many as you like."

Paper-based survey: "3.6.1. If you prefer unit 1, please tick which features you like from the list below. You can select as many as you like."

6.6.3 Questionnaire

The intention was to ask participants to comment on six schemes, including proposals for redesigning the section and use of outdoor space (Appendix 4). Even if they had not thought about moving, participants were still asked to complete the survey. To answer the comments raised in the earlier pilot studies, the main survey was in three parts.

Part 1—Background information—this asked for general information including gender, age, household type, ethnicity and household composition to see if participants currently lived in some kind of shared living arrangement (with related or unrelated people)

Part 2—Current housing situation—this asked participants about their current dwelling type, if they lived in retirement village, and whether they might move as they age.

Part 3—Specific questions about proposed conversion schemes and general questions about the idea of sharing—this sought participant preferences regarding the degree of sharing of spaces in general and in the proposed schemes.

The revised schemes are outlined below.

Scheme A provided three options for converting a section (house plot) (Figure 6.6)

Schemes B (now V4) and C (now S7) provided separate units with a shared entrance (Figures 6.7 and 6.8)

Schemes D (now V2), E (now V6) and F (now S10) had more shared spaces (Figures 6.9, 6.10 and 6.11)

For each scheme, participants were told they would only be sharing a house with people they had chosen. Preferences and design requirements investigated in Part 3 are summarised as follows:

- Indoor and outdoor aspects of the design options were rated on a scale of 1-5 (1 not liked at all, 5 liked very much)
- Schemes were rated on the extent each met participant's requirements on a scale of 1-5 (1 not at all, 5 very much)

- The features liked or disliked for both shared and private spaces were highlighted by selecting from a prepared list, to which things could be added.
- Design preferences could be discussed further in the “other” option in multi-choice questions
- Participants were asked who they would be prepared to share with, whether people in the same or other age groups, family or non-family members, which spaces they would share, and the characteristics of these. This included rating-type questions as described above and multi-choice questions where more than one answer could be selected.

Almost all questions were multiple choice with the possibility of providing additional comments and suggestions. Respondents could enlarge each image by clicking on it, although the fonts were large enough for people with normal vision to read easily.

A consistent labelling system was developed for the thesis as used in this chapter, Chapter 5 and Chapter 7. However, the survey did not employ this system to avoid making it difficult to navigate. Table 6.4 shows the labels used across the thesis and in the survey. Since schemes for the section and use of outdoor space (schemes 1A, 2A and 3A in the survey) are not discussed elsewhere in the thesis, they are excluded from this table. A detailed layout of each scheme is found in section 5.12.

Table 6.4 Labels used in thesis and survey

Description of the scheme	Thesis labels	Survey labels
Separate units with shared hall/entrance (for a larger house/villa)	Scheme V4	Scheme B
Separate units with shared hall entrance (for a smaller house/state house)	Scheme S7	Scheme C
Separate units with some shared spaces (for a larger house/villa)	Scheme V2	Scheme D
Private bed-sitting rooms, with shared living spaces, guest room/study (for larger house/villa)	Scheme V6	Scheme E
Private bed-sitting rooms, with shared living spaces, guest room/study (for a smaller house/state house)	Scheme S10	Scheme F

Figure 6.6 Main survey: scheme A –subdivision of outdoor space and section

Figure 6.7 Main survey: scheme V4-separate units with shared hall/entrance (larger house)

Figure 6.8 Main survey: scheme S7-separate units with shared hall/entrance (smaller house)

Figure 6.9 Main survey: scheme V2-separate units with some shared spaces

Figure 6.10 Main survey: scheme V6–private bed-sitting rooms/shared living spaces/guest room/study (larger house)

Figure 6.11 Main survey: scheme S10–private bed-sitting rooms/shared living spaces/guest room/study (smaller house)

6.6.4 Respondents

6.6.4.1 General information

Overall, 465 people started the survey and 441 participants fully or partially completed it. Table 6.5 summarises this information for both online and paper-based surveys.

Table 6.5 Distribution of participants by sample group

	Number who submitted/returned	Full or partial participation	Percentage
Online	370	347	78.7%
Paper-based	95	94	21.3%
Total	465	441	100%

Analysis was carried out on the recorded responses so the number of respondents for each question differs. Of the 441 respondents who completed the age and gender part of the survey 334 (75.7%) were female and 107 (24.3%) were male. According to Statistics New Zealand (2015), in 2013, 54.1% and 45.9% of those aged 65+ were female and male respectively. This highlights the larger number of female participants in the survey.

In addition, 24.3%, 48.5% and 27.2% of respondents fall into 55-64, 65-74 and 75-85 age groups respectively. This, to some extent, aligns with the proportion of those aged 65-74 and 75-85 in the 65+ population, as in 2013 57% were aged 65-74 and 31% were 75-84 (Statistics New Zealand, 2015a).

More than 84% of respondents were one person (34.1%) or couple only households (50%). This also aligns with the general New Zealand 65+ population. In 2013, Statistics New Zealand (2015a) found approximately 30% of people aged 65+ in private dwellings were one-person households, and 50% couple-only householders. Table 6.6 summarises the information about the participants who took part in both online and paper-based surveys.

Table 6.6 Characteristics of respondents

		Samples in this study		
		Frequency	Percentage	Total
Gender	Female	334	75.7	441
	Male	107	24.3	
Age group	55-64	107	24.3	441
	65-74	214	48.5	
	75-85	120	27.2	
Current household type	One person household	150	34.1	440
	Couple only household	220	50.0	
	Couple only and other person(s)	13	3.0	
	Couple with child(ren)	24	5.5	
	Couple with child(ren) and other person(s)	1	0.2	
	One parent with child(ren)	10	2.3	
	One parent with child(ren) and other person(s)	5	1.1	
	Two-family household	6	1.4	
	Other (please explain)	11	2.5	
Ethnicity	European/Pakeha	405	91.8	441
	Māori	12	2.7	
	Pacific Island	3	0.7	
	Asian	18	4.1	
	Middle Eastern/Latin American/African	1	0.2	
	Other (please explain)	2	0.5	

Table 6.6 also reveals 91.8% of participants were European/Pakeha. In spite of frequent emails and invitations sent and delivered to many ethnic groups through community channels and ethnic community groups on social media, their participation was insignificant.

While the proportion of older aged participants (75-85) was slightly greater for the paper-based survey (38.3% compared to 24.2%) there were fewer aged 55-64 (16.0% compared to 26.5%) (Table 6.7). This was the reason for doing the paper survey as there is evidence a smaller proportion of this age group have access to the internet (Statistics New Zealand, 2015a).

Table 6.7 Age distribution by survey method

Survey method		Age group			Total
		55-64	65-74	75-85	
Online	Frequency	92	171	84	347
	Percentage	26.5%	49.3%	24.2%	100.0%
Paper-based	Frequency	15	43	36	94
	Percentage	16.0%	45.7%	38.3%	100.0%
Total	Frequency	107	214	120	441
	Percentage	24.3%	48.5%	27.2%	100.0%

There was only a slight difference in gender distribution for the online and paper-based surveys.

Participants were asked whether they were living in some kind of shared arrangement. The answers were collapsed into the two categories of “living in a shared house” (those who ticked “household of related and unrelated people” and “household of unrelated people”) and “not living in a shared house” (those who ticked “one-person household” and “household of related people”). Only 27 participants (6.2%) lived in some type of shared house. Since this parameter might influence variables in the study, several Chi-square tests were performed for many questions to look for significant difference. This has been reported where applicable.

6.6.4.2 Current Housing

The second part of the questionnaire asked about respondents’ housing situation. Approximately a third had lived in their current dwelling for more than 20 years (Table 6.8), although this factor was influenced by the paper survey participants, 46.7% of whom had lived in their current house for more than 20 years, compared to 27.4% for the online survey. Given the paper survey participants were recruited through local community groups, this suggests that the elderly who are involved with community activities tend to have lived in their neighbourhood for long periods.

Table 6.8 Housing situation of respondents in both surveys

		Frequency	Percentage	Total
Number of years in current dwelling	Less than a year	28	6.4%	437
	1-5 years	104	23.8%	
	6-10 years	62	14.2%	
	11-20 years	106	24.3%	
	More than 20 years	137	31.4%	
Living in the retirement village	Yes	22	5.0%	439
	No	417	95.0%	
Dwelling type	Detached house	344	78.4%	439
	Semi-detached house	27	6.2%	
	Terraced house	21	4.8%	
	Apartment	31	7.1%	
	Other (please specify)	16	3.6%	

Only 5% of all respondents, both online and paper-based, lived in retirement villages. As expected, about 80% of all respondents lived in a detached house compared to other dwelling types at less than 10% each (Table 6.8).

People were asked about moving from where they lived to different accommodation as they aged. Table 6.9 suggests that more than 40% of respondents (42.7%) had thought about doing this whereas 21% plan never to move. Only 16.9% had already moved with 19.4% intending to move (Table 6.9). Excluding those who have already moved or plan never to relocate, slightly more than 60% of respondents in the survey could be considered potential users of the types of converted houses in this study. This trend has also been influenced by the preference of paper-based survey participants for staying put. These (34.1% of total) were approximately twice those of the online survey (17.6%). Conversely, only 7.7% of the paper-based survey participants intended to move, compared with 22.5% of the online survey participants.

Table 6.9 Views of respondents on moving in later life

		I have already moved to more suitable accommodation	I intend to move	I have thought about moving	I plan never to move	Total
Online	Frequency	58	78	150	61	347
	Percentage	16.7%	22.5%	43.2%	17.6%	100.0%
Paper-based	Frequency	16	7	37	31	91
	Percentage	17.6%	7.7%	40.7%	34.1%	100.0%
Total	Frequency	74	85	187	92	438
	Percentage	16.9%	19.4%	42.7%	21.0%	100.0%

6.7 Results

The data from the survey was statistically analysed using IBM SPSS Statistics 24. In order to evaluate the impact of demographic characteristics and housing situation (survey Parts 1 and 2) on participant preferences for different aspects of sharing a series of appropriate statistical tests were conducted. Initially the analysis considered the following groups:

1. Gender (female, male)
2. Age group (55-64, 65-74, 75-85)
3. Experience of sharing (living in shared house, living in private house)
4. Survey method (online, paper-based)

5. Ethnicity (European/Pakeha, Māori, Pacific Island, Asian, Middle Eastern/Latin, American/African)
6. Household type (One person household, Couple only household, Couple only and other person(s), Couple with child(ren), Couple with child(ren) and other person(s), One parent with child(ren), One parent with child(ren) and other person(s), Two-family household)

The most significant differences were observed for the first four groupings and are reported and referred to as the “four groupings” where appropriate. No significant differences were observed when comparing ethnicity and household type so these results are not presented.

Statistical tests were performed depending on the type of question and potential outcome. Analysis suggested the data was not normally distributed, therefore, due to the violation of the normality assumption, the t test is not as statistically as powerful as the Mann-Whitney U test for this type of data (De Winter and Dodou, 2010). Likewise, non-parametric tests such as Mann-Whitney U test and Pearson’s Chi-square test of association (now referred to as Chi-square test) are suggested for Likert data analysis (Allen and Seaman, 2007; Jamieson, 2004). Chi-square tests were performed to see if differences in (grouped) rating scales were statistically significant between the various groups. In addition, Mann-Whitney U tests and Kruskal-Wallis tests were performed to see if differences in agreement score were statistically significant between various groups (Laerd Statistics, 2016). For the Kruskal-Wallis and chi-square test, if a significant difference was found, post-hoc pairwise comparisons were used to determine which groups were significantly different. Variables showing a p -value of 0.05 or less were considered statistically significant for this study (testing at the 5% significance level).

The questions from the survey were first categorised into three groups based on their characteristics and association with the overall idea of sharing. These groups are outlined below and ordered from more general to more specific topics. The discussion of the data follows the same structure.

Part 1 – Idea of sharing: This part analyses the last two questions of the questionnaire (questions 3.34 and 3.35) which asked participants to rate, on a five-point scale (1 Not at all, 3 Neutral, 5 Very much), their willingness for sharing various indoor and outdoor spaces with the same age group. For the sake of simplicity in analysis, the five-point scale was collapsed into

three categories of 1 (Dislike—original 1 and 2), 2 (Neutral—original 3) and 3 (Like—original 4 and 5). This method has been used in other studies (Nagel et al., 2008; Allen and Seaman, 2007). The same approach was taken to the question on which age group not in their family people would be prepared to share the same spaces with.

Part 2 – Preferences for schemes with degrees of sharing: The second set of data reports participant preferences for each scheme (questions 3.8, 3.13, 3.20, 3.27 and 3.32) (Appendix 4). Participants were asked to rate the extent to which each scheme would meet their requirements on the same 5-point scale. The intention was to find the most liked scheme which would then be chosen for LCE analysis (section **Error! Reference source not found.**). Given the significance of this, the five-point scale was used for analysis.

Part 3 – Details: The third set of data presents detailed aspects of sharing. Using the same 5-point scale, participants were asked to rate their preferences for the scenarios suggested for each scheme. In addition, this part analyses the features respondents liked or disliked, whether for shared or private spaces. Analysis of preferences for outdoor areas were also included in this section. Lastly, additional written comments provided by respondents are discussed. As in Part 1, a collapsed three-point scale of 1 (Dislike), 2 (Neutral) and 3 (Like) was used for analysis.

6.7.1 Idea of sharing

This section discusses the general concept of sharing, including whether participants would share with the same or different age groups, and what spaces they are willing to share. The analysis looked for significant differences in preferences between different age groups, gender, and web and paper-based participants. It also looked at whether those currently living in a shared house had different preferences for sharing. Attitudes on varying degrees of sharing were also sought (e.g. Q3.1 and Q3.2 in part 3—scheme A—Appendix 4). The detailed analyses of this data for each scheme are in section 6.7.3.

6.7.1.1 Sharing with the same age group

Figure 6.12 Participant preferences for sharing selected spaces with same age group. The spaces are ordered from the most to least willing to be shared. The top three percentages for liking and disliking sharing selected spaces are highlighted.

Figure 6.12 Participant preferences for sharing selected spaces with same age group

Figure 6.12 shows the study was the most disliked space for sharing with the same age group (74%), followed by the kitchen (69.2%) and living/dining areas (62.9%). Fewer than 15% of respondents would be willing to share these spaces. Participants were most willing to share parking spaces/drive way (40.1%) following by laundry (37.3%) and garage/carport (37.1%). In addition, more than 50% of participants would not like to share a study, living/dining area, kitchen, and guest bedroom with people in the same age group. Figure 6.12 also shows that even for the most favoured spaces, only just over one third of participants would be willing to share.

Several Chi-square tests of association were conducted to examine the relationship between sharing selected spaces with the same age group and gender, age group, living in a shared/private house, and survey method (Table 6.10). Significant figures at 0.05 level are highlighted in yellow.

Table 6.10 Chi-square test results for sharing selected spaces by gender, age group, survey method and living in shared/private house (N=number of respondents for each space)

Spaces	Gender	Age group	Survey method	Live in shared/non-shared house
Living/dining area	$\chi^2 (2, N=350) = 1.08, p = .583$	$\chi^2 (4, N=350) = .68, p = .954$	$\chi^2 (2, N=350) = 10.08, p = .006$	$\chi^2 (4, N=350) = 3.20, p = .524$
Kitchen	$\chi^2 (2, N=357) = 1.18, p = .552$	$\chi^2 (2, N=357) = 3.58, p = .466$	$\chi^2 (2, N=357) = 1.77, p = .412$	$\chi^2 (2, N=357) = 3.97, p = .410$
Guest bedroom	$\chi^2 (2, N=359) = 2.24, p = .326$	$\chi^2 (4, N=359) = 2.15, p = .707$	$\chi^2 (2, N=359) = 6.41, p = .041$	$\chi^2 (4, N=359) = 2.69, p = .610$
Hobby room	$\chi^2 (2, N=356) = 2.07, p = .355$	$\chi^2 (4, N=356) = 3.23, p = .519$	$\chi^2 (2, N=356) = 2.42, p = .297$	$\chi^2 (4, N=356) = 8.45, p = .076$
Study	$\chi^2 (2, N=358) = 1.08, p = .583$	$\chi^2 (4, N=358) = 3.10, p = .541$	$\chi^2 (2, N=358) = .72, p = .698$	$\chi^2 (4, N=358) = 4.33, p = .363$
Laundry	$\chi^2 (2, N=362) = 4.42, p = .109$	$\chi^2 (4, N=362) = 12.75, p = .013$	$\chi^2 (2, N=362) = 2.18, p = .336$	$\chi^2 (4, N=362) = 4.74, p = .315$
Outdoor areas	$\chi^2 (2, N=359) = 0.67, p = .715$	$\chi^2 (4, N=359) = 4.39, p = .355$	$\chi^2 (2, N=359) = 1.48, p = .478$	$\chi^2 (4, N=359) = 3.59, p = .464$
Uncovered parking spaces/ drive way	$\chi^2 (2, N=362) = 0.79, p = .675$	$\chi^2 (4, N=362) = 6.22, p = .183$	$\chi^2 (2, N=362) = 1.07, p = .586$	$\chi^2 (4, N=362) = 4.34, p = .362$
Garage/carport	$\chi^2 (2, N=353) = 1.19, p = .553$	$\chi^2 (4, N=353) = 12.47, p = .014$	$\chi^2 (2, N=353) = 1.67, p = .434$	$\chi^2 (4, N=353) = 5.76, p = .218$

No differences based on gender were found. Likewise, the desire for sharing for those who lived in shared houses did not significantly differ from those who lived in private houses.

Preferences for sharing a laundry are statistically different by age group. Figure 6.13 also suggests the proportion of 55-64 and 65-74 age group respondents who favoured sharing a laundry is significantly higher than their older cohort (75-85). In addition, those aged 75-85 were significantly more likely to dislike sharing a garage/carport compared to those aged 65-74. Likewise, those aged 55-64 and 65-74 were significantly more likely to favour sharing a garage/carport compared to the older age group (75-85). The respective percentages are presented in black and yellow, where a significant difference was observed. The black denotes highest value(s), and the yellow lowest value(s).

Figure 6.13 Participant preferences for sharing laundry and garage/carport by age group based on Chi-square test results

Compared to postal survey participants, a significantly higher proportion of online survey participants had no preference for sharing living/dining areas (Figure 6.14). Figure 6.14 also shows that those who took the online survey were significantly more likely to favour sharing a guest bedroom compared to the postal survey participants.

Figure 6.14 Participant preferences for sharing living/dining areas and guest bedroom by survey method based on Chi-square test results

6.7.1.2 Sharing with other unrelated age groups

In the survey, participants were asked to select who they might want to share with, and could select all they felt applied to them. Out of 441 participants, only 358 answered at least one

part of this question. Figure 6.15 illustrates the views of these respondents on sharing various spaces within their home with non family members. The top three percentages for being and not being prepared to share selected spaces are highlighted. The spaces are ordered from the most to least willing to be shared.

Figure 6.15 Respondent willingness for sharing domestic spaces with other age groups not in their family

Slightly less than 80% (78.9%) of participants were not willing to share a study with any other age group. Sharing of kitchens and living/dining rooms was also unpopular with 73.5% and 69.2% of respondents respectively not wanting to share these. This was the same trend as sharing with the same age group. On the other hand, slightly more than 60% of participants were willing to share uncovered parking spaces/drive way and outdoor areas (i.e. garden, BBQ, sitting space) with other age groups. Among indoor spaces, the laundry was favoured for sharing, being the third most popular of all spaces. In fact those who favoured sharing a laundry (54.9%) were more than those not prepared to share (45.1%). The laundry is a common space in many cohousing developments and commercial laundromats are also shared. This suggests varying degrees of sharing within a residential development would probably best suit the different preferences of users. However, people are more flexible about sharing outdoor spaces, even with other age groups.

Results show that 254 participants were willing to share at least one of the selected spaces with another age group not in their family. When it comes to sharing with other age groups the 41-64 group received the highest votes with a considerable gap to the next choice of 21-40 for all spaces (Figure 6.16).

Figure 6.16 Those who were prepared to share with different age groups not in their family*

*The age groups refer to the ages of those participants were willing to share with

Several Chi-square tests were used to evaluate the association between participant preferences for sharing selected dwelling spaces with another age group by gender, age group, survey method, and living in shared/non-shared house. For the simplicity of reporting only the results of tests performed on the variable of being prepared to share with different age groups not family are presented (Table 6.11). The Chi-square test determined there was no relationship between gender, survey method, and living in shared/non-shared house, whereas as several significant difference emerged for willingness to share and age group (Table 6.11, with results at 0.05 level highlighted in yellow).

Table 6.11 Chi-square test results for sharing selected spaces by gender, age group, survey method and living in shared/non-shared house

Spaces	Gender	Age group	Survey method	Live in shared/ non-shared house
Living/ dining area	$\chi^2 (1, N=106) = .14, p = .713$	$\chi^2 (2, N=106)=11.29, p = .004$	$\chi^2 (1, N=106) = .21, p = .648$	$\chi^2 (2, N=106) = 3.04, p = .219$
Kitchen	$\chi^2 (1, N=91) = .18, p = .674$	$\chi^2 (2, N=91) = 5.64, p = .060$	$\chi^2 (1, N=91) = .002, p = .962$	$\chi^2 (2, N=91) = 3.13, p = .209$
Guest bedroom	$\chi^2 (1, N=150) = .04, p = .833$	$\chi^2 (2, N=150)=8.52, p = .014$	$\chi^2 (1, N=150) = .15, p = .700$	$\chi^2 (2, N=150) = 2.75, p = .252$
Hobby room	$\chi^2 (1, N=156) = .02, p = .893$	$\chi^2 (2, N=156)=4.65, p = .098$	$\chi^2 (1, N=156) = .001, p = .972$	$\chi^2 (2, N=156) = 42.06, p = .356$
Study	$\chi^2 (1, N=71) = .69, p = .406$	$\chi^2 (2, N=71)=11.65, p = .003$	$\chi^2 (1, N=71) = 1.24, p = .266$	$\chi^2 (2, N=71) = 1.24, p = .538$
Laundry	$\chi^2 (1, N=189) = .43, p = .510$	$\chi^2 (2, N=189)=8.67, p = .013$	$\chi^2 (1, N=189) = .31, p = .579$	$\chi^2 (2, N=189) = 4.14, p = .126$
Outdoor areas	$\chi^2 (1, N=208)=.003, p = .957$	$\chi^2 (2, N=208)=2.46, p = .292$	$\chi^2 (1, N=208) = .13, p = .714$	$\chi^2 (2, N=208) = 1.73, p = .422$
Uncovered parking spaces/ drive way	$\chi^2 (1, N=218) = .08, p = .772$	$\chi^2 (2, N=218)=5.84, p = .054$	$\chi^2 (1, N=218) = .73, p = .391$	$\chi^2 (2, N=218) = 1.51, p = .471$
Garage/carport	$\chi^2 (1, N=181) = .14, p = .701$	$\chi^2 (2, N=181)=6.33, p = .042$	$\chi^2 (1, N=181) = .74, p = .390$	$\chi^2 (2, N=181) = 1.74, p = .418$

Table 6.11 suggests that preferences for sharing living/dining areas, guest room, study, laundry and garage/carport are significantly different by age group. Figure 6.17 provides detailed information about this. The proportions of those aged 55-64 and 65-74 who were willing to share living/dining areas are significantly higher than those aged 75-85 whereas the percentages of respondents aged 55-64 who favoured sharing a laundry were significantly higher than those aged 75-85. No significant association was found between preferences of those aged 65-74 for sharing a laundry with the other two age groups (Figure 6.17). The respective percentages are presented in black and yellow, where a significant difference was observed. The black colour denotes the higher and yellow the lower value(s).

Figure 6.17 Participant preferences for sharing living/dining areas, guest bedroom, study, laundry and garage/carport by age group based on Chi-square test results

Those aged 75-85 were significantly more unlikely to be prepared to share these spaces compared to the younger cohorts. In contrast, with the exception of the garage/carport, the youngest age group (55-64) was more likely to express a desire for sharing. Apart from the study, both 55-64 and 65-75 age groups had similar levels of being prepared to share. For example the proportion of those aged 55-64 who would share living/dining areas was 8.7% more than the 65-74 age group.

6.7.2 Older people's preferences for the conversions

This section deals with the participant preferences for five indoor schemes (V4, S7, V2, V6 and S10). A ranking of the schemes was achieved, and tests carried out to see whether there was any association between favouring particular schemes and age group, gender, survey method and living in shared/non-shared house.

In the survey, participants were asked to rate their preferences for each scheme and whether that scheme met their requirements on the same 5-point scale. Analysis was based on the full five points as explained in section 6.7-Part 2 . Since all participants were asked the same

question for each scheme and the assumptions of normality were not met, the Friedman test was run to determine whether there were any statistically significant differences between the distributions of preferences for each scheme (Laerd Statistics, 2016). The Friedman test found preferences for indoor schemes were statistically significantly different, $\chi^2(4) = 449.218$, $p < 0.001$. This means there is at least one significant difference between schemes in terms of participant ratings. Further pairwise comparisons were performed with a Bonferroni correction for multiple comparisons. Post hoc analysis revealed the preferences were statistically significantly different between all schemes ($p < 0.001$) apart from between schemes V4 and V2; and V6 and S10. Mean ranks, means and medians for the schemes are shown in Table 6.12.

Table 6.12 Ranking of preferences for each conversion scheme

Rank	Schemes	Mean ranks	Mean	Median	N Total	N 1.not at all	N 2.	N 3. neutral	N 4.	N 5.very much
1	Scheme V4 - separate units with shared hall/entrance (for a larger house)	3.83	2.94	3.00	392	69	63	113	122	25
2	Scheme V2 – separate units with some shared spaces	3.65	2.79	3.00	378	97	56	83	114	28
3	Scheme S7 -separate units with shared hall entrance (for a smaller house)	2.95	2.21	2.00	384	141	96	77	61	9
4	Scheme V6 – private bed-sitting room, with shared living spaces, guest room/study (for larger house)	2.32	1.73	1.00	368	216	69	53	24	6
5	Scheme S10 – private bed-sitting room, with shared living spaces, guest room/study (for smaller house)	2.25	1.70	1.00	366	222	64	54	21	5

**Mean ranks refer to the mean of the ranks—for each scheme separately which indicates which scheme had higher/lower values.*

The fact schemes V4 and V2 (larger house with private units, and private units with limited shared space) received the top two ratings indicates participants preferred larger dwellings, such as achieved from converting a villa. Scheme V6 and S10 where most living spaces were shared and only bed-sitting rooms were private were not liked as well. The small house converted into private units (scheme S7) was preferred over the large house with living space

shared (Scheme V6). This is an important finding in that privacy is preferred over space if both cannot be achieved.

Following these tests, a descriptive report of participants' preferences was created. Figure 6.18 illustrates how the schemes differ in terms of ratings, confirming the findings from the statistical analysis. The schemes are ordered based on their ratings from highest to lowest.

Figure 6.18 Participant preferences for each conversion

Additional Mann-Whitney U and Kruskal-Wallis tests were run to determine whether differences in rankings were statistically significant within the various groupings (age group, gender, online/postal survey, living in shared/non-shared house) (Laerd Statistics, 2016). Table 6.13 summarises these results and significant differences at the 5% (0.05) significance level are highlighted in yellow.

The Mann-Whitney U test found no significant difference in ratings for online and paper-based participants. The Kruskal-Wallis test found no significant differences in rating schemes by age group.

Table 6.13 Significant differences in rating schemes based on Mann-Whitney U and Kruskal-Wallis tests

	Gender	Age group	Survey method	Live in shared/non-shared house
Scheme V4	$U = 12087.5$, $z = -2.172$, $p = .030$	$\chi^2 (2) = 3.603$, $p = .165$	$U = 12280.5$, $z = -1.368$, $p = .171$	$U = 4106.5$, $z = -.843$, $p = .399$
Scheme S7	$U = 13445$, $z = -.206$, $p = .837$	$\chi^2 (2) = 2.190$, $p = .335$	$U = 12606.5$, $z = -.475$, $p = .634$	$U = 3223$, $z = -2.4$, $p = .016$
Scheme V2	$U = 10605$, $z = -2.884$, $p = .004$	$\chi^2 (2) = 5.123$, $p = .077$	$U = 112833$, $z = -.307$, $p = .759$	$U = 3530.5$, $z = -1.662$, $p = .096$
Scheme V6	$U = 11986$, $z = -.054$, $p = .957$	$\chi^2 (2) = 5.693$, $p = .058$	$U = 11440.5$, $z = -.894$, $p = .371$	$U = 4248$, $z = -.004$, $p = .996$
Scheme S10	$U = 11917.5$, $z = -.537$, $p = .591$	$\chi^2 (2) = 1.820$, $p = .403$	$U = 11563$, $z = -.938$, $p = .348$	$U = 3655$, $z = -.230$, $p = .818$

The only significant difference by gender was observed for schemes V4 and V2. For V4 the Mann-Whitney U test found preferences differed significantly between males (median=3, mean rank=175.24) and females (median=3, mean rank=203.30). This means that scheme V4 rating was significantly higher for females than for males. Additionally, median rating scores for scheme V2 were statistically significantly higher for females (median=3, mean rank=198.42) than males (median=2.5, mean rank=161.77) (Figure 6.19). No relationship was found between male and female ratings for other schemes.

Figure 6.19 Significantly different ratings for schemes V4 and V2 by gender

As indicated earlier, schemes V4 and V2 were the top ranked schemes. However, females were more likely to rate both schemes higher than males. Moreover, the Mann-Whitney U test

determined those who lived in a shared house (median=3, mean rank= 240.08) were more likely to rate the smaller scheme S7 higher than non-shared house occupants (median=2, mean rank= 187.55) (Figure 6.20).

Figure 6.20 Rating scores of respondents who living in shared/non-shared houses for scheme S7

Figure 6.20 suggests that conversions of smaller houses are more likely to be acceptable to people who already live in some kind of shared arrangement.

6.7.3 Design details

Details of respondents' preferences for aspects of outdoor and indoor schemes are discussed in this section following the order of questions in the survey and beginning with outdoor schemes followed by schemes V4, S7, V2, V6 and S10 respectively. The general aspects of each scheme were discussed in section 6.7.2. Several statistical tests were also performed to examine significant differences between various groups. With the exception of outdoor schemes in section 6.7.3.1 only significant associations/differences are reported.

6.7.3.1 Outdoor areas (schemes 1A, 2A and 3A)

To rank participant preferences for outdoor schemes, the same procedure as for the conversion schemes was applied (see section 6.7.2). The intention was to examine which schemes respondents preferred, how they ranked these, and whether there were any

significant associations between favouring some schemes and age group, gender, survey method and living in a shared/non-shared house.

Using the same 5-point scale participants were asked to rate their preferences for each scheme and whether that scheme would meet their requirements. Since all participants were asked the same questions for each scheme and the assumptions of normality were not met, the Friedman test was run to look for statistically significant differences between ratings and the various groupings (Laerd Statistics, 2016).

The Friedman test found preferences for outdoor schemes were statistically significantly different, $\chi^2 (3) = 631.574$, $p < 0.001$. This means there is at least one difference between schemes in terms of participant ratings. Further pairwise comparisons were performed with a Bonferroni correction for multiple comparisons. Post hoc analysis revealed the ratings were statistically significantly different between scheme 1A and 2A ($p < 0.001$), between scheme 1A and 3A ($p < 0.001$), and between scheme 2A and 3A ($p = 0.006$). Mean ranks, means and medians are shown in Table 6.14.

Table 6.14 Ranking of preferences for each outdoor scheme

Rank	Schemes	Mean rank	Means	Median	N Total	N 1.not at all	N 2.	N 3.neutral	N 4.	N 5.very much
1	Scheme 2A – Separate outdoor space	2.34	3.38	3.50	395	41	46	111	118	79
2	Scheme 3A – Subdivision and shared driveway	2.11	3.05	3.00	392	91	50	72	108	71
3	Scheme 1A – Shared outdoor space	1.55	2.05	2.00	386	185	89	44	44	24

Scheme 2A with separate outdoor areas was ranked highest and scheme 1A with shared outdoor space was the least popular. This suggests that participants preferred private outdoor spaces, which follows the trend for the house conversions.

Following the above tests, a descriptive report for the proportions of participants and their ratings was developed. Figure 6.21 illustrates how the schemes differ in terms of participant ratings confirming findings from the statistical analysis. The schemes are ordered from highest to lowest ratings.

Figure 6.21 Participant preferences for outdoor schemes

Results from post hoc analyses and Figure 6.21 suggest respondents were significantly more likely to rate scheme 2A higher and significantly more likely to rate scheme 1A lower than the other two schemes. They were more ambivalent about scheme 3A, as slightly more than 45% of respondents rated scheme 3A higher and 36% rated it lower than neutral.

Additional Mann-Whitney U and Kruskal-Wallis tests were run to determine whether differences in rankings were statistically significant by the four groupings used previously. Table 6.15 summarises the results and significant differences at the 5% significance level are highlighted in yellow.

Table 6.15 Significant differences for rating outdoor schemes and groupings based on Mann-Whitney U and Kruskal-Wallis tests

	Gender	Age group	Survey method	Live in shared/non-shared house
Scheme 1A	$U = 13203$, $z = -.252$, $p = .801$	$\chi^2 (2) = 5.008$, $p = .082$	$U = 12334.5$, $z = -.904$, $p = .366$	$U = 4195$, $z = -.230$, $p = .818$
Scheme 2A	$U = 12994$, $z = -1.335$, $p = .182$	$\chi^2 (2) = 3.690$, $p = .158$	$U = 11386$, $z = -2.785$, $p = .005$	$U = 3241.5$, $z = -2.253$, $p = .024$
Scheme 3A	$U = 12381.5$, $z = -1.84$, $p = .066$	$\chi^2 (2) = .999$, $p = .607$	$U = 12840$, $z = -.815$, $p = .415$	$U = 4245$, $z = -.237$, $p = .813$

The Mann-Whitney U test found no statistically significant difference by gender and the Kruskal-Wallis test also found no significant difference by age group (Table 6.15).

The Mann-Whitney U test found only median rating scores for scheme 2A were statistically significant for the paper-based (median=4, mean rank= 226.74) and online (median=3, mean rank= 189.95) grouping (Table 6.15 and Figure 6.22). A significant difference was also found for scheme 2A between those who lived in shared (median=4, mean rank=245.44) and non-shared houses (median=3, mean rank=193.31).

Figure 6.22 Significant differences in ratings for scheme 2A by online/postal and sharing/non-sharing respondents*

*extent to which scheme 2A meets their requirements. 3 participants selected “other” for shared/non-shared question, therefore, the sum is not the same as number of participants who selected scheme2A.

As indicated earlier, scheme 2A was the top ranked scheme, although paper-based respondents were more likely to rate scheme 2A higher than online participants (Figure 6.22). Figure 6.22 also suggests that those who lived in shared rather than non-shared house were more likely to rate scheme 2A higher again suggesting people are more willing to share if they have had experience of sharing.

In a similar way, respondents were asked to rate how much they like the idea of sharing outdoor spaces in Scheme 1A and subdivision of the lot as in scheme 3A on a five-point scale (1. Not at all, 2. Dislike somewhat, 3. Neutral, 4. Like somewhat and 5. Very much) which were then collapsed into three groups of 1 (dislike), 2 (neutral) and 3 (like) in the analysis. These two questions (i.e. Q3.1 and Q3.2 Appendix 4) specifically focused on the general idea of sharing

and subdivision, without referring to a specific scheme, in two consequent separate questions. This is different from comparing preferences for the three schemes of shared outdoors (scheme 1A), private outdoors (scheme 2A) and a subdivided lot (scheme 3A) in the previous question (Figure 6.21) (Q3.3 Appendix 4). Results indicate that shared outdoors are less popular than subdivided outdoors. Out of 414, 64.6% of participants disliked the idea of sharing compared to 21.9% who liked it. In contrast, out of 413, 45.4% of respondents favoured the idea of subdivision whereas 37.7% disliked it.

Several Chi-square tests of association were conducted to determine the relationship between preferences for sharing outdoor spaces and subdivision of the lot and gender, age group, live in shared/non-shared house and survey method. Chi-square suggests preferences for sharing outdoor spaces are statistically different by age group ($\chi^2 (4, N=414) = 10.68, p = .030$), and preferences for subdivision significantly differ by gender ($\chi^2 (2, N=413) = 7.16, p = .028$) (Figure 6.23).

Figure 6.23 Significant differences in preferences for sharing outdoors and subdivision by age group and gender

Figure 6.23 suggests that the proportion of those aged 65-74 who favoured sharing outdoor spaces was slightly more than twice like-minded 75-85 aged respondents. Furthermore, women were more likely to like the idea of subdivision than men as almost half of all females compared to slightly more than one third of males liked this concept.

6.7.3.2 Scheme V4 - separate units with shared hall/ entrance for a larger house

This section is in three parts. The first looks at which unit of scheme V4 participants would prefer to live in, and whether this differs for the various groupings (gender, age group, experience of living in a shared/non-shared house, and survey method). The second examines the features of units 1 (V4-1) and 2 (V4-2) participants favoured in scheme V4, while the third part reports the preferences of respondents for the idea of sharing an entrance to a separate unit, and whether there are significant differences by the same four groupings (gender, age group, experience of sharing, survey method). Only significant differences will be discussed in detail.

6.7.3.2.1 Choice of units in scheme V4

Respondents could choose either of the two units or neither. Out of 403 participants who answered this question, approximately half (45.9%) selected V4-1 and about one third (32%) V4-2 suggesting the popularity of the larger unit. However, slightly more than one-fifth (22.1%) selected neither. Several Chi-square tests were run to examine the association between selections and the four groupings (gender, age group, experience of sharing, survey method). There was a statistically significant association between gender and selection of units (χ^2 (2, N=403) =11.98, $p = .002$). In particular, women were significantly more likely than men to select unit 1 or neither of them. While a third of men preferred V4-1, half of the women selected this unit (Figure 6.24). This highlights the importance of size for women when it comes to making housing decisions.

Figure 6.24 Significant differences for unit selection in scheme V4 by gender and survey method (N=403)

Post hoc analysis also revealed a significant difference by survey method ($\chi^2(2, N=403) = 13.48$, $p = .001$). The proportion of paper-based survey participants (61.7%) who preferred the larger V4-1 were significantly higher than online survey respondents (41.1%). On the other hand, the percentage of online survey participants (35.9%) who favoured V4-2 were almost twice those of the postal survey (19.1%), suggesting postal survey participants preferred size over having the sunnier unit.

6.7.3.2.2 Features favoured within units in scheme V4

Participants were also asked to select the features of scheme V4 they favoured from a prepared list to which things could be added. Where a respondent stated they liked a particular unit only the relevant features were listed for them to choose from. For the 185 respondents who selected V4-1, Figure 6.25 shows the features they picked as reasons for their choice. Features are ordered based on the proportion of respondents who selected them.

Figure 6.25 Features favoured (excluding sunlight) by participants who chose scheme V4 unit 1(V4-1) (N=185)

Figure 6.25 suggests the spare single room which could accommodate activities such as reading, office work, sleeping guests was the most popular feature with slightly less than 95% of the 185 respondents favouring it, following by the private deck. One respondent mentioned the potential of the private deck for conversion into a conservatory. This highlights the significance of having flexible spaces to accommodate the various needs of occupants at different life stages. Size was also a feature popular with respondents, being the third most favoured.

There was a mistake in the online survey questionnaire which led to exclusion of the sun, potentially an important feature, in the analysis. This was corrected in the postal survey. As a result, two graphs are presented; the first shows preferences of both online and postal survey participants for all features excluding sunlight (Figure 6.25); and the second the results for the same question from the postal survey including sun (55 respondents out of the 185) (Figure 6.26). This highlights the significance of sunlight as an influential factor in selecting the favoured unit. In other cases, “adequate sunlight” was used for both online and postal surveys to describe the unit and consequently only one chart of preferences is presented for these instances (Figure 6.31).

Figure 6.26 Features favoured by postal survey participants who chose scheme V4 unit 1 (N=55)

Following a similar pattern to Figure 6.25, having a spare bedroom was the most preferred feature (just below 90%) followed by sunlight and a private deck for almost 80% of respondents. It seems that sunlight and size are influential factors in house design, although size appears more important.

A similar approach was used for the 129 respondents who selected V4-2. Figure 6.27 illustrates the percentage of respondents and the features they favoured in V4-2, ordered from most to least popular.

Figure 6.27 Features favoured (excluding sunlight) by all participants who chose scheme V4 unit 2 (V4-2) (N=129)

For V4-2 the private veranda was the most popular feature followed by the bay window. More than 75% of those who selected unit 2 (Figures 6.27 and 6.28) singled out a private deck/veranda as an important feature, even though the original house did not have one. Overall features of unit 2 received fewer votes compared to unit 1. However, as can be seen in Figure 6.27, 65.9% of respondents who selected V4-2 liked its open plan kitchen and dining compared to 54.3% who favoured the separate living room in V4-2, suggesting open plan arrangements might be better for smaller domestic environments. As expected, respondents did not like the smaller size of V4-2 compared to that of V4-1.

Only 18 postal survey participants selected V4-2 (Figure 6.28).

Figure 6.28 Features favoured by postal survey participants who chose V4-2 (N=18)

Interestingly, all paper-based participants who selected V4-2 gave sunlight as one reason for their choice, suggesting the importance of sunlight for many people. Figures 6.27 and 6.28 show that in contrast to all respondents who selected V4-2, paper-based survey respondents who chose V4-2 preferred the bay window over the private veranda. There are other differences between these two groups and this is probably due to the small number of postal survey participants who selected V4-2 (Figures 6.27 and 6.28).

6.7.3.2.3 Concept of sharing an entrance to a separate unit for a larger house

Respondents were asked to rate the idea of sharing an entrance to a separate unit on the five-point scale. This was then regrouped into the three categories of 1 (dislike), 2 (neutral) and 3 (like) for analysis. Results indicate the idea of sharing an entrance was not popular. Approximately half the participants (48.4%) disliked the idea compared to 13.7% who liked it.

Several Chi-square tests of association were run with the same four groupings (gender, age group, experience of sharing, survey method), finding a statistically significant difference by age group ($\chi^2(4, N=395) = 11.09, p = .026$). Those aged 75-85 were significantly more likely to dislike sharing an entrance compared to their younger cohorts. A significant association was also observed for survey method ($\chi^2(2, N=395) = 6.83, p = .033$), with paper-based participants significantly more likely to dislike this idea (Figure 6.29).

Figure 6.29 Significant differences in preferences for sharing an entrance by age group and survey method (N=395)

As indicated earlier, Figure 6.29 again reveals the low proportion of the total sample who liked this idea (less than 20%). The breakdown for dislike was 61.2% of those aged 75-85, 46.4% of ages 65-74 and 38.5% of ages 55-64. Slightly less than 60% of paper-based participants disliked the idea compared to just over 45% of online participants. The higher proportion of the older age group among postal survey participants could have influenced these results.

6.7.3.3 Scheme S7 -separate units with shared hall entrance for a smaller house

Following the same structure as 6.7.3.2, results for scheme S7 are discussed in three parts. Further Chi-square tests were run to look for significant differences between the four groupings.

6.7.3.3.1 Choice of units in scheme S7

Of the 393 participants who responded to this question slightly less than 40% and 15% of total respondents selected units 1 and 2 in S7 respectively while 45% found neither unit acceptable. Given the larger size of S7-1 and the fact it received less sun than S7-2, it appears respondents preferred size over sunlight. Moreover, with 77.9% and 55% of participants selecting units 1 and 2 in V4 respectively (section 6.7.3.2.1), it seems the conversion of the smaller house for scheme S7 was not well regarded.

A Chi-square test for association was conducted between unit preferences and the same four groupings (gender, age group, experience of sharing, survey method), finding a statistically significant difference for gender (χ^2 (2, N=393) =6.34, p = .042) and age group (χ^2 (4, N=393) =10.84, p = .028) (Figure 6.30).

Figure 6.30 Significant differences for preferences for scheme S7 units by gender and survey method (N=393)

Following the same pattern as scheme V4, a higher proportion of women tended to favour the larger S7-1 (41.8%), while men were significantly more likely to prefer the sunnier S7-2 (22.9%) compared to female participants (13.8%). This suggests the significance of size for women and sun for men. However, a significant proportion of both groups were interested in neither unit. Furthermore, slightly more than half those aged 55-64 (52.6%) were more likely to find S7-1 acceptable compared to the 35% of the older cohort who liked it. However, almost half of the older 65-74 and 75-85 age groups chose neither unit, suggesting the overall unacceptability of scheme S7 for some. The small size of S7-2 was probably the reason for its being less popular than S7-1.

6.7.3.3.2 Features favoured within units in scheme S7

As in section 6.7.3.2.2, participants selected the features they favoured in each scheme S7 unit. Overall 153 participants chose S7-1. Figure 6.31 shows the percentage of respondents and the features they selected as reasons for this choice.

Figure 6.31 Features favoured by those who chose S7-1 (N=153)

Figure 6.31 suggests size was the reason for almost 80% of those selecting S7-1, closely followed by its private deck. Storage and adequate sunlight were also popular features.

Overall 63 participants found S7-2 acceptable. Figure 6.32 illustrates the features they liked. As indicated in 6.7.3.2.2, the question about sunlight was excluded and only discussed for the postal survey.

Figure 6.32 Features favoured (excluding sunlight) by all participants who chose S7-2 (N=63)

As expected the size of studio-type S7-2 was the least favoured feature being selected by only 25% of participants. Similar to scheme V4 (see section 6.7.3.3.2) the private deck was the most favoured feature, followed by its open plan kitchen, dining, living room. The single bedroom was not a popular feature of S7-2, suggesting people aged 55+ prefer larger bedrooms.

Only 11 postal survey participants chose S7-2 but they are analysed separately here as the question about sunlight can be included.

Figure 6.33 Features favoured by postal survey participants who chose S7-2 (N=11)

As expected, getting plenty of sun was the reason for the choice of S7-2. This again suggests the importance of sunlight. Having a private deck was also favoured by half the paper-based participants who found S7-2 acceptable.

6.7.3.3.3 Concept of sharing an entrance to a separate unit for a smaller house

Respondents were asked to rate the idea of sharing an entrance to a separate unit in Scheme S7 on a five-point scale (1. Not at all, 2. Dislike somewhat, 3. Neutral, 4. Like somewhat and 5. Very much). This was re-categorised into three groups (1. dislike, 2. neutral, and 3. like). Results showed sharing an entrance was not popular. Out of 379 participants who answered this question 46.6% disliked sharing the entrance compared to 14.3% who liked the idea. This follows the same trend as scheme V4 (section 6.7.3.2.3). Several Chi-square tests were conducted and no significance differences were found for sharing an entrance and the four groupings (gender, age group, experience of sharing, survey method).

6.7.3.4 Scheme V2 – separate units with some shared spaces

This section is presented in the same three parts as in 6.7.3.2 and 6.7.3.3. Chi-square tests were performed to determine whether there were any significant differences between preferences and the same four groupings (gender, age group, experience of sharing, survey method).

6.7.3.4.1 Choice of units in scheme V2

Respondents were again asked where they would prefer to live in scheme V2. The characteristics of unit 2 (V2-2) meant more than 60% of respondents favoured it compared to 12.8% who found unit 1 (V2-1) acceptable, although 26% favoured neither unit. A Chi-square test determined that age group was associated with preferences (χ^2 (4, N=383) = 12.25, p = .016) as those aged 55-64 were significantly more likely to favour V2-2 compared to those aged 75-85. The oldest age group (75-85) tended to like neither unit (Figure 6.34). A further post hoc analysis suggested a significant relationship between preferences and gender (χ^2 (2, N=383) = 12.10, p = .002) (Figure 6.34).

Figure 6.34 Significant differences for preferences for scheme V2 units by age group and gender (N=383)

As illustrated in Figure 6.34, 71.9% of respondents aged 55-64 chose V2-2 and half of those aged 75-85 were interested in it. The proportion of 75-85 year olds who favoured neither unit was significantly higher than the younger age groups. This suggests scheme V2 is more attractive to the younger age groups (55-64 and 65-74) with more than 75% of them liking it. Furthermore, the percentage of men who would select neither unit was nearly twice that of women, suggesting scheme V2 was more appealing to women.

6.7.3.4.2 Features favoured within units in scheme V2

Overall 49 participants favoured V2-1 and Figure 6.35 illustrates the features they liked.

Figure 6.35 Features favoured by those who chose V2-1 (N=49)

Figure 6.35 shows the private deck was selected by nearly 75% of respondents as a reason for selecting V2-1 followed by the open plan kitchen, dining, living room at just under 70%, followed by the 65% who liked the shared guest suite. “Adequate sunlight”, “storage” and “potential shared suite for carer” were equally favoured by around 60% of respondents who chose V2-1.

Overall 235 participants were interested in V2-2 and their preferred features are shown in Figure 6.36.

Figure 6.36 Features favoured (excluding sunlight) by all participants who chose V2-2 (N=235)

Figure 6.36, confirms earlier results (Figures 6.25, 6.27, 6.31 and 6.32). The private deck and size were the most popular features, followed by private conservatory/sun room. Storage, as in scheme S7, was also attractive. The potential shared guest suite or shared suite for carer were favoured by around 50% of respondents who liked V2-2 suggesting that these ideas might be appealing to some people. The separate kitchen and dining room were not particularly liked by respondents.

Overall 57 postal survey participants chose V2-2 and their preferences are shown in Figure 6.37.

Figure 6.37 Features favoured by postal survey participants who chose V2-2 (N=57)

As in schemes V4 and S7, sunlight was selected by almost 90% of postal survey participants who chose V2-2, with size being the second top feature at just under 85%. With the exception of private deck and potential unit for renting out, the order of features liked by postal survey participants in V2-2 is identical to that of total participants (Figure 6.36). A higher proportion of paper-based survey participants liked the potential rental unit and the private deck was less important for this group although more than 75% still selected it.

6.7.3.4.3 Concept of separate units with some shared spaces

Three scenarios were developed for scheme V2: sharing an entrance and a guest suite (SV2-A), having a live-in carer occupying the shared guest suite (SV2-B), and having a lodger occupying the shared guest suite for extra income (SV2-C). Respondents were asked to rate these ideas on the same five-point scale (1. not at all, 2. dislike somewhat, 3. neutral, 4. like somewhat, 5. very much), which was then collapsed into the three categories of 1 dislike (original 1-2), 2 neutral (original 3) and 3 like (original 4-5) for analysis.

Overall respondents did not like the proposed scenarios (Figure 6.38). SV2-C was the least and SV2-B the most popular although only 35.3% of respondents were interested in it.

Figure 6.38 Participants' ratings for scenarios SV2-A, SV2-B and SV2-C

The data was then evaluated for significant differences using a series of Chi-square tests for the four groupings (gender, age group, experience of sharing, survey method) and the results are summarised as follows and in Figures 6.39 and 6.40.

A. Sharing an entrance and a guest suite (SV2-A)

A Chi-square test found preferences for sharing an entrance and a guest suite were significantly different by gender ($\chi^2 (2, N=374) = 7.62, p = .022$), with females being more attracted to this idea than males (Figure 28). SV2-A was significantly different by age group ($\chi^2 (4, N=374) = 12.75, p = .013$) as those aged 75-85 were more likely to dislike this idea. Similarly, statistical analysis revealed that preferences for SV2-A were associated with survey method ($\chi^2 (2, N=374) = 10.50, p = .005$), with paper-based survey participants significantly less interested in this idea (Figure 6.39).

Figure 6.39 Significant differences for the idea of sharing an entrance and a guest suite (SV2-A) by gender, age group and survey method (N=375)

Men again were less interested in sharing as the proportion of women who favoured this idea (27.6%) was approximately twice that of men (14.3%). The proportion of those aged 75-85 who disliked SV2-A (58.2%) was significantly higher than the percentages for age groups of 55-64 and 65-74 at around 38%. This suggests younger participants had a stronger preference for sharing an entrance and guest suite than the older cohort, who might be expected to be attracted by the idea of having a live-in carer. The post-hoc test for having a live-in carer (see section 6.7.3.4.3 – part B) failed to show a significant difference by age group. Furthermore, the proportion of paper-based survey participants who disliked SV2-A were approximately one and a half times that of online survey participants at 38.9%. The larger proportion of 75-85 year olds among postal survey participants might have influenced this difference.

B. Having a live-in carer occupying the shared guest suite (SV2-B)

Statistical analysis determined no significant associations for this scenario.

C. Having a lodger occupying the shared guest suite for extra income (SV2-C)

The results suggest men and women differ significantly when it comes to having a lodger for extra income (χ^2 (2, N=376) = 6.44, p = .040), with females considerably more interested in this than males. A further Chi-square test found interest in this idea is significantly associated with age group (χ^2 (4, N=376) = 11.08, p = .026). As with schemes V4 and SV2-A (Figures 6.29 and 6.39), the older age group was more likely to dislike SV2-C (Figure 6.40).

Figure 6.40 Significant differences in preferences for having a lodger for extra income (SV2-C) by gender and age group (N=376)

A higher proportion of male participants (62.6%) disliked the idea of having a lodger compared to just under 50% of females. Being more financially independent might be why male respondents were not interested in this idea. Overall women and the younger age groups showed more interest in scenarios V2-A and V2-C than men and those aged 75-85 (Figures 6.39 and 6.40).

6.7.3.5 Scheme V6 – private bed-sitting room, with shared living spaces, guest room/study for larger house

This section is again presented in three parts. The first deals with which features, if any, bed-sitting room respondents preferred in scheme V6. The second deals with the features of both private and shared areas and the third reports on the preferences of respondents for the idea of having a private bed-sitting room with shared living spaces, and significant associations with gender, age group, experience of living in a shared/non-shared house and survey method.

6.7.3.5.1 Choice of bed-sitting room in scheme V6

Overall 373 participants answered this question and slightly more than 60% were not interested in either bed-sitting room, suggesting this degree of sharing was not appealing. Only 18% and 16.6% of respondents respectively found bed-sitting rooms 1 (V6BS-1) and 2 (V6BS-2) acceptable. Having access to a private deck from V6BS-1 might have been the main reason for the greater interest in this room, although V6BS-2 had a larger floor area and a bay window.

Several Chi-square tests were performed to evaluate the associations between preferences and the same four groupings but no significant differences were found.

6.7.3.5.2 Features favoured in bed-sitting room and shared areas in scheme V6

Overall 67 participants favoured V6BS-1 and almost 95% selected the private deck as the reason for their choice. Less than one third of these respondents liked the size of the room. Looking at the 19 postal survey participants who selected V6BS-1, and including sunlight as a feature, gives a different pattern (Figure 6.41), as sunlight is now the second most favoured feature after the private deck.

Figure 6.41 Features favoured by all (N=67) and paper-based survey (N=19) participants who selected V6BS-1

In schemes V4, S7 and V2 plenty of sunlight was more attractive than a private deck for participants, but this is different for scheme V6. This suggests that in shared living options, private spaces, including private decks, become more important for people.

In total 62 participants found V6BS-2 acceptable and more than 80% gave the bay window as a reason for their choice, followed by size at 77.4% (Figure 6.42). Including plenty of sunlight for the 11 paper-based survey participants who liked V6BS-2, Figure 6.42 shows slightly more than 90% liked the size of the room followed by 81.8% and 72.7% who liked the sun and bay window respectively.

Figure 6.42 Features favoured by all (N=62) and paper-based survey (N=11) participants who chose V6BS-2

Participants were also asked to select the features they favoured in the shared spaces, and 291 participants selected at least one from the list. Figure 6.43 illustrates the preferences for shared areas along with the proportion of respondents who favoured the features.

Figure 6.43 Features favoured (excluding sunlight) in shared areas in scheme V6 by all participants (N=291)

As Figure 6.43 shows, overall fewer participants showed an interest in the features of the shared areas in scheme V6 compared to the private units in schemes V4, S7 and V2. This proves the earlier findings that shared living was not appealing to many participants. The single

bedroom which could be used as guest room/study/office was the most favoured feature. Other features were liked by less than half of the participants and shared decks/verandas/porches were not favoured with less than one third of participants finding them attractive.

Figure 6.44 presents the favoured shared features along with the percentages of the 49 paper-based survey participants who liked them.

Figure 6.44 Features favoured in shared areas in scheme V6 by paper-based participants (N=49)

Figure 6.44 suggests overall paper-based survey participants showed slightly greater interest in the shared features. As expected, plenty of sun was the most favoured feature with more than 80% liking this. This highlights the importance of sun in both shared and private spaces. The remaining features followed the same pattern for total participants in Figure 6.43, although a higher proportion of paper-based survey participants (51%) liked the open plan kitchen/dining compared to 37.5% of all participants (Figures 6.43 and 6.44).

6.7.3.5.3 Private bed-sitting room, and shared living spaces, guest room/study for larger house

Respondents were asked to rate the idea of sharing living areas and a deck and having a private bed-sitting room in two separate questions on the usual five-point scale (1. Not at all, 2. Dislike

somewhat, 3. Neutral, 4. Like somewhat and 5. Very much), which was then recoded into usual three categories of 1 (dislike), 2 (neutral) and 3 (like) for analysis.

Results indicate the idea of shared living spaces was unappealing to more than 75% of participants. Although a shared deck was less disliked it was still unpopular with more than 60% of respondents. These findings are illustrated in Figure 6.45.

Figure 6.45 Preferences for shared living areas and shared deck in scheme V6

Using Chi-square tests, the results were compared for significant differences in the usual four groupings (gender, age group, experience of sharing, survey method) but none were found.

6.7.3.6 Scheme S10 – private bed-sitting room, with shared living spaces, guest room/study for smaller house

This section is presented in two parts. The first deals with the features of shared areas and the second part reports on the preferences of respondents for the idea of having a private bed-sitting room, with shared living spaces and significant associations with gender, age group, experience of living in a shared/non-shared house and survey method.

6.7.3.6.1 Features favoured in shared areas in scheme S10

Participants were asked to select the features they favoured in the shared spaces, and 301 selected at least one feature from the list. Figure 6.46 illustrates these preferences along with the percentage of respondents who favoured the features.

Figure 6.46 Features favoured (excluding sunlight) in shared areas in scheme S10 by all participants (N=301)

Preferences for shared features in scheme S10 (Figure 6.46) follow much the same pattern as scheme V6 (Figure 6.43). This confirms the discussion in 6.7.3.5.2 around fewer interests in shared features in schemes V6 and S10 compared to features favoured for the private units in schemes V4, S7 and V2. As illustrated in Figure 6.46, the single bedroom which could be used as guest room/study/office/sitting room was most favoured of the shared areas but still not very popular as only 49.2% liked it. Unlike private decks in schemes V4 (Figure 6.25), S7 (Figure 6.31) and V2 (Figure 6.41), the shared deck/porch was also not attractive in schemes V6 (Figure 6.43) and S10 (Figure 6.46). Compared to private storage in scheme S7 (Figure 6.31), the shared shed/storage was not appealing in scheme S10 (Figure 6.46).

Figure 6.47 presents the favoured shared features with the percentages of the 56 paper-based survey participants who liked them.

Figure 6.47 Features favoured by paper-based participants (N=56) in shared areas in scheme S10

With the exception of plenty of sunlight and shared deck/porch, the most and least favoured shared features in scheme S10, the remaining features did not follow the pattern of V6 (Figure 6.44). The separate living room favoured by slightly more than 50% of participants was the second most favoured shared feature.

6.7.3.6.2 Private bed-sitting room, with shared living spaces, guest room/study for smaller house
 Respondents were asked to rate the idea of sharing living areas and having a private bed-sitting room and having a shared deck in two separate questions on the usual five-point scale, which was then recoded into three categories for analysis.

As discussed earlier in section 6.3.5.3, the idea of sharing living spaces was not acceptable to many participants as slightly more than 75% of them were not interested in this. The idea of having a shared deck was more appealing but still was not attractive to almost 60% of respondents. These findings are presented in Figure 6.48.

Figure 6.48 Preferences for shared living areas and shared deck in scheme S10

Using Chi-square tests, the results were compared for differences in the usual four groupings (gender, age group, experience of sharing, survey method). Of all analysed pairs, only gender led to a significant association and therefore is discussed below ($\chi^2(2, N=363) = 7.58, p = .023$). Women were more likely than men to favour the idea of sharing a deck as in scheme S10. The details of this difference are presented in Figure 6.49. Further post hoc analysis revealed no significant differences between preferences for shared living spaces and deck for the other groupings.

Figure 6.49 Significant differences between preferences for sharing a deck in scheme S10 by gender (N=364)

As illustrated in Figure 6.49, only a small proportion of female and male participants favoured sharing a deck. However, the proportion of women who were interested in this idea (18%) was significantly more than men at just under 6%.

6.8 Key quantitative findings

This chapter has dealt with the survey designed to evaluate the preferences of older people for varying degrees of sharing both outdoor and indoor spaces.

Generally, schemes with higher degrees of sharing were not attractive to many respondents and those aged 75-85 were more likely to rate the schemes with higher levels of sharing lower than the younger age groups showing they disliked communal domestic spaces. When it comes to sharing, participants least wanted to share a study, kitchen, and living/dining areas. The study could be a private space where people keep documents they do not want others to see. However, more people were willing to share a laundry. There was slightly more interest in shared car parking arrangements but a shared garden was not liked.

Overall, respondents showed greater interest in sharing with other age groups over the same age group (Figures 6.12 and 6.15) but those aged 75-85 had significantly different opinions in this regard. This suggests the growing desire for a multigenerational housing model, which a number of cohousing developments can offer to residents. With the exception of laundry and garage/carport, all age groups had similar preferences for sharing with the same age group. Interestingly, male and female participants had very similar preferences for sharing selected domestic spaces with those of the same and other age groups. Similar results were found for those living in a shared and non-shared house. The current experience of sharing did not influence their preferences for sharing, although only a small number of participants (6%) were currently in a shared living arrangement. As indicated by some participants in written comments, the experience of living in a shared flat in their 20s had probably influenced their negative views of communal living.

A much weaker but also clear trend was observed for differences in gender for the proposed schemes. Overall, female participants were more positive about the concept of sharing and were more likely to rate the schemes with greater degrees of sharing higher. This, however,

was not the case for sharing selected domestic spaces with the same or other age groups, as stated earlier.

Scheme V4, where a villa was converted into private units with shared entrance/hall and V2 with private units and some shared spaces were the most popular options. As a result, these two schemes will be taken for further analysis following appropriate revisions. Of all analysed pairs, all groups had identical preferences apart from female and male participants for schemes V4 and V2 and those who lived in shared and non-shared house for scheme S7. Female respondents tended to rate these schemes higher than males suggesting that women like private spaces yet also prefer some shared areas. They are more willing to connect with other people through some communal spaces like an entrance or guest suite. However, they shared similar ideas with men about the communal living spaces in schemes V6 and S10.

Those participants who live in shared houses were expected to express more positive attitudes towards the communal living in schemes V6 and S10 but this was not the case. Interestingly, they had significantly different preferences for scheme S7. Those who live in a shared house were more likely to rate scheme S7 higher than non-shared house occupants. Scheme S7 was a small house converted to separate units with a shared entrance. Experience of living in a shared arrangement appears to make the residents more tolerant. Scheme S7 with its two small one-bedroom and studio-type units with a shared entrance would require more daily cooperation and compatibility.

As discussed earlier, of the outdoor schemes 2A with its private outdoor spaces was most favoured by participants. Female and male participants and all age groups had relatively identical preferences for scheme 2A.

When it comes to individual units in each scheme, women and men differed considerably. Female participants favoured larger units whereas male participants preferred sunnier units, particularly in schemes V4 and S7, although overall, participants preferred larger units over sunnier ones. It seems that there is a minimum requirement for space which needs to be met in housing for the elderly. It also seems participants wanted sunlight in both private and shared areas.

Findings also indicated a desire for a spare multi-purpose bedroom, private deck/veranda/conservatory, appropriately-sized house and plenty of sunlight whether the house was shared or not. Having separate spaces where each person can escape from the other and focus on their private activities would be appreciated. A shared deck/veranda was not acceptable, although in line with earlier findings, female participants were significantly more likely to favour a shared deck than male participants.

Along with the greater interest of women for scheme V2 compared to men, results show that female preferences for having a shared guest suite and lodger for extra income were considerably different from men. This suggests women perhaps seek company even when they have a private housing arrangement. Having a live-in carer occupying the shared guest suite was the most popular scenario for scheme V2, with all participants having similar preferences. Those aged 75-85 were significantly less interested in having a communal guest suite or a lodger for extra income. This confirms the earlier findings that the oldest age group were more negative about various aspects of sharing.

6.9 Design implications and conclusion

Findings from this survey suggest people aged 55-85 have very specific housing needs when it comes to ageing in place. Therefore, engaging potential users with the design process at an early stage might be a good idea to make conversion and modification practices more effective. Other concerns such as financial and environmental issues were not examined in this survey, and these might make a difference to the results.

The study shows it is possible to convert relatively small houses to allow ageing in place but that these might not satisfy the target client group. The conversions of the larger villas appeared to provide much more acceptable housing, even when these included a degree of shared spaces.

Having indoor sun is a significant factor when it comes to choice of dwelling. Size is also critical as a considerable number of respondents who did not favour one-bedroom units required an extra room for a study and visiting guests and family members. This suggests having a large

enough multi-purpose guest room/study/office within conversions of existing houses would be appreciated. This has also been suggested by Judd et al. (2014b).

For some people sound insulation was a vital issue when they went through the survey. Since findings from this survey show that smaller units were unpopular, to reflect the preferences of older people and meet their needs, setting a minimum size for the original house to be converted is important, and then detailing the conversion for aural privacy by having buffering spaces like storage and bathrooms along party walls is vital.

The survey also reveals decks and verandas that support outdoor activities such as sitting, BBQ, reading, and light gardening are attractive. The importance of designing outdoor environments that include private outdoor space such as patios and balconies have also been highlighted in other studies (Baldwin et al., 2012; Park et al., 2016; Yavari et al., 2016). The most successful shared spaces were found to be those specifically designed to provide opportunities for shared activities such as a barbecue area (Park et al., 2016; Riedy et al., 2017c). Considering the profound influence of integrating nature into the built environment on wellbeing and quality of life (Beatley, 2011), outdoor environments need to be designed to enhance the quality of life for the elderly.

It could be concluded from the above findings that some form of communal housing could be an option for many women providing they can have an adequately large private space including room for family members or friends to stay. The dwelling should also have a mix of private and shared outdoor areas and gardens to meet their varying needs.

The shared area could have a separate living room and single room which could be used as a guest room/study/office. A spare flexible bedroom could be useful for family/friend visits or other activities. Private storage and a deck are always desirable, particularly in a communal living arrangement.

It was also concluded from the comments provided by participants that shared spaces could be a source of friction but appropriate design strategies which meet the needs and preferences of the occupants would assist in overcoming such problems. It is also clear that as long as people have their own space and maintain their privacy, they could be satisfied with the

companionship and mutual support they receive through this type of lifestyle. However, their level of independence is an influential factor in making their housing choice.

A crucial aspect of sharing was found to be clarifying the details about using shared spaces and having an agreement to avoid disputes. Issues raised by participants about a shared living arrangement would simply be resolved by offering occupants the opportunity to select their housemates. Living in an extended family setting or intergenerational house seems to be desirable for some people, particularly when they get old and physically disabled and need support.

As also indicated by findings from the expert panel (see Chapter 7), older people's demand for Universal Design standards highlights the significant role these play for independent living and quality of life. The application of such standards in purpose-built housing for the elderly seems critical as many continue to live in their current dwellings that normally do not meet such standards.

Following the questionnaire-based survey, the proposed conversion schemes were also evaluated by experts in the area of built environment and researchers into ageing. The process of conducting the expert focus group and its findings are discussed in Chapter 7.

Chapter 7 Expert panel

7.1 Introduction

Based on the three scenarios defined earlier (section 5.12), three schemes were proposed for each villa. With the same approach and design criteria, two different schemes were also developed for each state house. In order to assess these designs for conversion and specifically whether they incorporated appropriate housing standards for people aged 55+, the proposed designs were evaluated by a group of built environment and ageing population experts. The aim in doing this was to discover how the conversions might be improved, and whether there were other options that could better satisfy the intended occupants in terms of being suitable housing for ageing in place.

7.2 Recruitment

Ideally participants would represent the different areas related to the research topic. Therefore, a number of invitations were sent to individuals and organisations working closely with older people and issues related to an ageing population. These included experts in home and community support services for older people, the health of older people, those dealing with building policy from either the private or government sector including community and social housing, the housing and construction sector, and Lifemark design specialists. In addition, approaches were made to eco-design advisors and registered architects with experience of designing for the elderly.

Five people accepted this invitation. Three attended a focus group discussion and the other two were interviewed as they could not attend on the day. The participants have a background in design of dwellings for older people (with extensive knowledge of New Zealand building codes and regulations), general home modification, LM homes in New Zealand, and evaluation of housing modifications for those with disability (specifically the 65+ age group) to ensure they meet the access and eligibility criteria for funding (Table 7.1). Informed consent was obtained from all participants. The codes allocated to the participants for purposes of anonymity are given in Table 7.1

Table 7.1 Focus group/interview participants

	Code used in analysis	Profession	Contribution type
1	AG	Registered architect	Focus group
2	BG	Lifemark design specialist	Focus group
3	CG	EMS Advisor (Emergency Medical Services)	Focus group
4	DI	Registered architect	Interview
5	EI	Environmental consultant, architect	Interview

7.3 Procedure

7.3.1 Focus group

Full documentation of each case study was sent to the three focus group experts a week prior to the meeting. The documents contained photos of the houses prior to conversion, their locations, original drawings and the detailed design proposals including access route and outdoor design (as illustrated in 5.12). In total, there were ten schemes, made up of three for each villa and two for each state house. For each case, two outdoor and access route options were suggested for discussion. As a result, the participants came prepared, bringing questions for clarification and notes, which made the discussion more effective and interactive.

The focus group participants were given an agenda for the session at the beginning of the meeting. Mutual introductions took place. The session began with a presentation of the schemes and the reasons for the research, before comments were invited. The session took two hours and was held at Faculty of Architecture and Design, 139 Vivian St on 18th September 2017. The session was facilitated by the principal investigator, with notes being taken by an assistant. The session was tape-recorded with the consent of the participants.

The main areas covered by the expert panel are listed below.

- Cost
- Compliance with NZ Building Regulations
- Compliance with Lifemark standards
- Design considerations with particular focus on communal spaces, adequate sunlight, outdoor spaces, and the size required for various activities within the house,
- Advantages/disadvantages of each design option
- User preferences based on current NZ market
- How well the designs would meet the needs of older people

7.3.2 Interviews

The interviews, both of which lasted an hour, were conducted on 19th and 22nd September 2017 at the interviewee's workplace. Participants were asked to comment on the same material listed above. Hereafter, the term "expert group" will be used to refer to all expert focus group members and interviewees, unless otherwise specified.

7.4 Analysis

A qualitative method was used to collate the ideas and suggestions of the expert group on the proposed design schemes. The audiotape of the focus group was transcribed and analysed thematically using NVivo 11.

Thematic analysis as defined by Braun and Clarke (2006:79), is "a method for identifying and reporting patterns (themes) within data." Content analysis is similar to thematic analysis being used for analysis of a large amount of data (Marks and Yardley, 2004; Vaismoradi et al., 2013). According to Krippendorff (2013:24), content analysis is "a research technique for making replicable and valid inferences from the text (or other meaningful matters) to the contexts of their use." Vaismoradi et al. (2013:403) argue that depending on the time and energy spent for data collection and analysis, these methods could be effective qualitative approaches for conducting an "introductory study on a novel phenomenon." While both methods share many commonalities, thematic analysis pays greater attention to the qualitative aspects of data whereas content analysis involves some quantification of data such as statistical analysis of developed categories and coded themes (Marks and Yardley, 2004; Vaismoradi et al., 2013). For this research, thematic analysis was selected as the main approach for analysing data from the expert group. Following Braun and Clarke's (2006) definition of thematic analysis, themes identified in the data analysis reviews captured important ideas in relation to the broader research question as well as addressing detailed comments on the proposed designs (Braun and Clarke, 2006; 2013).

Data gathered from the expert group was analysed using the inductive thematic analysis procedure described by Braun and Clarke (2006; 2013). Inductive coding is a "bottom-up" analytic process which tries to develop codes using the data itself without using pre-existing theoretical ideas (Braun and Clarke, 2006:83). The applied thematic analysis followed the

procedure described by Braun and Clarke (2006:87), which entails “familiarising yourself with your data, generating initial codes, searches for themes, reviewing themes, defining and naming themes; and producing the report.”

Since data gathered from both the expert group and the client focus groups stemmed from the same documentation, presentation and discussion points (sections 7.3 and 8.3), the initial themes identified from analysis of a subset of the data from the expert group should be applicable to the remainder. For this reason, the thematic analysis of data from the experts is described in detail below.

This analysis procedure followed template analysis described by King (2012:426), which is “a style of thematic analysis that balances a relatively high degree of structure in the process of analysing textual data with the flexibility to adapt it to the needs of a particular study.” This allows the researcher not to go over new data (client focus groups) in order to develop preliminary themes but rather to apply the coding template developed earlier to the new data, allowing for possible modification and refinement.

Initial coding, therefore, was carried out on the expert group discussion using NVivo11 to develop a coding template. The developed template offers the capability of modification, refinement and reapplication to the remainder qualitative data from the research to capture participants’ meanings as fully as possible (King, 2012). This template was then used in data analysis of client focus group and modified and refined in accordance with the input given by participants (see section 8.4).

7.4.1 Quality check

To ensure the quality of the coding procedure, a reliability test was carried out when the critical comparison was made on coding frames produced by a second researcher (Marks and Yardley, 2004; King, 2012). An “audit trail” was also employed to keep records of identified themes along with their brief descriptions, major changes made during the analysis procedure, and the reasons for those changes. This should assist in ensuring the quality of the qualitative data analysis (King, 2012:433). The reliability of the coding procedure was also checked using the “test-retest reliability” approach suggested by Marks and Yardley (2004:62), conducted by applying the preliminary themes to the same text a week following the first analysis.

7.4.2 Data characteristics

During the thematic analysis process, the data collated from the expert panel was broken down into two broad categories: specific comments on the proposed design options which could not be extrapolated to general concepts related to the study, and general comments on the concept of converting existing dwellings to form appropriate housing for the 65+ age group.

The first category included specific recommendations applicable to particular schemes. For example there were comments on how to apply Lifemark standards to a particular scheme's kitchen or wet room, whether the proposed external access would meet the needs of older occupants, and how to improve a specific floor plan. A table was set up to illustrate these detailed design considerations for use at the revision of the design proposals stage. These tables are in Appendix 7, and a summary of the comments used for revising the selected schemes are in **Error! Reference source not found..**

The second category comprises general comments on the issues around the idea of conversion of existing dwellings for the ageing population. These comments could be extrapolated, and hence were thematically analysed.

The complete set of themes identified for the study is in Appendix 6. The main themes were grouped into the three categories:

- *Alternatives to converting existing houses:* this cluster specifies the other housing alternatives to conversions which the participants pointed out.
- *Architectural aspects of the conversion approach:* this category has the four main sub-themes of *cost*, *design*, *energy* and *NZ codes/regulations*.
- *Social aspects of the conversion approach:* this theme was divided into the two sub-themes of *ageing in place* and *shared living arrangement*.

7.5 Findings

Findings from thematic analysis of the expert group are presented below and follow the structure of the final coding template produced for this segment of the data analysis (Figure 7.1). To illustrate the key concepts that emerged quotes from participants are provided where appropriate.

NVivo11 results show that a major part of the discussion in all sessions was allocated to the architectural aspect of the topic. This might have been due to the nature of the sessions being focussed on evaluation of the design proposals. Another contributing factor could be that three of the five participants were architects.

A hierarchy chart (Appendix 6) was produced using NVivo11 to compare the intensity of the research themes identified in the analysis of the expert group. This chart was then used as the basis of presenting the significant ideas underlying each theme in the following section, although it does not necessarily suggest the significance of the concepts participants expressed about a topic (Marks and Yardley, 2004; King, 2012). Therefore, consideration has been given so that the analysis still remains qualitative as defined for thematic analysis.

Figure 7.1 Detailed thematic map

7.5.1 Alternatives to converting existing houses

ADUs (Accessory Dwelling Units), cohousing, retirement villages, small apartments and staying put were the sub-themes identified in this section. Out of these, retirement villages were mentioned the most, mostly in a negative way compared to ageing in place.

“Majority of people - 90 percent of people want to age in their own homes. They do not want to move to retirement villages.” (BG, focus group)

The concept of downsizing through moving was part of this theme, and apartments were mentioned. The fact older people seeking advice on downsizing are looking for alternatives other than a retirement village was also mentioned, and the advantages of staying put were discussed.

“...but the people say to me, look we’ve moved into an apartment from a large home—the home’s been taken over by a big family—there’s just two of us, and we should have done it 10 years ago.” (AG, focus group)

“Statistically again, 27 percent of all households by 2030 are going to be single person. Apartments are a great solution in multi-density living...” (BG, focus group)

“...the State generally would like people to stay in their homes as long as they can. They could—it’s going to cost less to look after them at home, and the last...if we bring them into care, and then whatever. So whatever you can do with an existing home, to prolong the time that they’re in that home, it’s financially better off for all of us.” (AG, focus group)

To sum up, participants were agreed on the need to provide as many options as possible to the elderly so they can age in place, among which the trend for people to earn income out of the home they already own emerged.

“...what we are starting to see is people want to do minor units on their own dwellings, because that’s an income or the ability to move into a sort of smaller unit, but still retain an income from—from a home that they’ve got...” (BG, focus group)

What emerged from the expert group when it came to the theme of alternatives to converting existing houses was the insistence that older people want to age in place for as long as they can. Downsizing could become an option when they get older and physically unable to maintain their large houses, providing suitable alternatives are available. Purpose built apartments could be an alternative to retirement villages when people come to make a decision about downsizing.

7.5.2 Architectural aspects of the conversion approach

As mentioned above, a high proportion of the expert group discussion was occupied by architectural matters. Out of the four sub-themes of cost, design, energy, and NZ codes/regulations, design could be considered the most significant followed by cost-related topics. As stated before, scheme specific statements are discussed in Appendix 7. The general sub-themes are discussed here and illustrated with sample quotes.

7.5.2.1 Cost

This cluster is concerned with the financial aspects of house conversion for the 65+ age group. As an example, frequent reference was made to achieving the appropriate size of units and individual spaces within the house so that older residents have enough space for their daily activities. Such dwellings need to be easy to heat and inexpensive to construct. Open rather than compartmentalised floor plans were seen as an effective use of space, as they make a small unit feel larger.

“They like whatever space they’ve got within—however big the unit, they like to be able to use it fully...” (AG, focus group)

“...the amount of lounge space here I think is minimal. I think you’ve got to optimise the space that you’re going to be using for 16 hours a day...That’s the priority.” (AG, focus group)

“...it costs the same amount per square metre in the lounge as it does in the toilet. So, you’ve got to put that space that’s costing you into the most useable area of the house.” (AG, focus group)

The panel felt affordable dwellings should be appropriately designed, so that they can obtain finance.

"It's absolutely got to be a bankable proposition whether you like it or not...I've always operated on the basis that the best plans are worth absolutely nothing unless your client can afford to build that project...It's got to be bankable to be achievable,..." (AG, focus group)

The possibility of finding affordability through "House and income" was brought up.

"Probably this plan is more like a house and income type thing. You know, that's quite common anyway in New Zealand, house and income type conversions..." (DI, interview)

Additionally, affordable housing contributes to the wellbeing of older occupants by giving them the opportunity to live in suitably sized and hence warm dwellings.

"I think what I stated was that older people prefer to be in less compartmented spaces if possible, you know, providing they're warm." (AG, focus group)

Cost-related comments were coded into two clusters: construction/conversion and running costs. There were several statements on design and minimising project and operating costs. The issue of whether conversion could ever be cost effective was also raised.

"...you could also assume probably the house needs re-piling if it hasn't been re-piled, because it will be out of level, and no under-floor insulation. So I come back to the point, to alter [a house] you've got a lot of labour input, and our labour costs are very high here—to get it back to a point where you start to rebuild." (AG, focus group)

Some elements are expensive yet beneficial for older users meaning justification is required for their inclusion in conversions.

"...where it's clear there's significant advantage for the occupants, but I justify my design like I'm saying, that it—it's got to be justified." (AG, focus group)

"It's just unfortunate...with a small footprint but you've actually got three bathrooms here. That's very, very expensive...no, I see your point though. You're probably forced into that." (DI, interview)

In terms of running cost, an effective design can lower energy bills. This has a strong association with the health and well-being of older occupants. Ongoing maintenance costs are considered a very important determinant of operating cost.

"I'm just saying, you know, that all the southern face can be minimised...and well insulated—then that will—the ambient interior temperature will be held at a much lesser cost." (AG, focus group)

Given the potential financial hardship that comes with ageing, government assistance with house modifications could make a house accessible, with a positive impact on overall health, physical independence and wellbeing.

"I'm employed by xxx. We can contract...with the Ministry of Health to do modifications for people that have usually had a stroke or whatever. Our most common thing is...bathrooms and access, because that's all the funding allows us to do. To do a bathroom is coming out at about \$16,000-\$20,000 and that's usually... taking a wall out between the bathroom and the toilet, putting in a level access shower, and that's our current cost usually for doing that." (CG, focus group)

When it came to the architectural aspects of the conversion approach cost was raised as an important issue. However, it was acknowledged that properly design conversions would have an impact on the energy consumption and running costs of the dwelling, which in turn have an explicit relationship with the health and wellbeing of older occupants. An appropriate sized house which is easy to heat and maintain, has adequate space for daily activities, and if required, contains assistive equipment would enhance the health and wellbeing of its occupants. This could be possible with the support from the government and other ageing-related authorities, and conversions might be one way to achieve this.

7.5.2.2 Design

Various views were expressed regarding the general idea of dividing up and converting existing houses:

“...also the baby-boomers, in terms of moving on, [this] is...completely different from the retirement living that we have currently.” (BG, focus group)

“...to overcome this housing shortage that we have New Zealand, we have to be looking at these options...and they can be tailored to suit various people.” (AG, focus group)

“With a home like this you—you assume you’d have to be able to get under it, and sometimes you can’t...You’re going to have to put...some insulated foam panels between the joists as a minimum requirement. So I mean, you look at the heating requirements, you look at the passive insulation, you look at the fire ratings required, and you look at the noise abatement...it’s a little bit more complex situation than just saying we’ll split a home in two.” (AG, focus group)

As stated before, the main focus discussion within the expert group sessions was the proposed conversion designs. The following bullet points summarise the topics covered.

- Design strategies which address the accessibility and adaptability of the house specifically the outdoor area and site. These include features such as wetroom vs bathroom, level access, stair lift and ramp.

“There should also be a turning circle (which can co-exist with the flush floor level wet room shower type) and space provided for seat. If not—to score points for minimum Lifemark accreditation there needs to be the ability to install one in the future—ideally with flush flooring access into shower.” (EI, interview)

“Absolutely we don’t advocate baths. Baths have gone completely for old people.” (BG, focus group)

“....I think the only option is the stair lift for these. Also remember car parks should be able to be made accessible.” (EI, interview)

- Effective design strategies which address the needs and preferences of older occupants and improve their quality of life. These include a floor plan arrangement for easy manoeuvring and heating, orientation to make the best use of sunlight as the most effective and environmentally friendly way to heat the house, internal and external circulation, and

outdoor spaces and site.

"I think it just cannot be underestimated the demand of old people have for sun and warmth." (AG, focus group)

"When you look at a site or a space or a house or whatever...you look at the winter sun angles and you look at the summer sun angles, then you look at your windows, and you look at your south face..." (AG, focus group)

"The other thing is, generally elderly people, whether they're on frames or whatever, find it easier to move around in less compartmented space ..." (AG, focus group)

"...generally when I design for the elderly, if you keep the spaces open, the heating costs are much less. If you compartmentalise it all up, your heating bills are going to go up. You're going to have to heat each individual space..." (AG, focus group)

- Elements that maximise use of the spaces within the house and increase the level of safety within the house. These include such issues as cavity sliders, separate laundry vs utility cupboard, wetroom vs bathroom.

"Where you're having a utility cupboard rather than a separate [laundry] it's just one way to reduce the amount of cost having to put a door on and it's just worth keeping in the back of your mind if you're running out of space." (DI, interview)

"...you'd be better off looking at things like cavity sliders. You've got doors opening onto other doors, which is obviously not great from a safety point of view." (BG, focus group)

- Security was a consistent theme. Security applied to various architectural aspects ranging from general to very detailed features.

"Specify security stays to windows to prevent falls." (EI, interview)

"Specify a wired-in smoke alarm system with extra functions such as flashing lights/audible alarms able to be added at a later stage if necessary." (EI, interview)

"...from universal design...it's that connection with somebody in this other house to be able to actually see outside. It actually is actually really good for mental health." (BG, focus group)

"The other thing too...is about the visual access you have from each room." (AG, focus group)

"...could we not have the parking area closer to...the ramp and...the exit...for a security reason..." (CG, focus group)

Out of these sub-themes emphasis was placed on *"plan arrangement"*; and *"outdoor space and site"* in terms of accommodating the requirements and preferences of the 65+ age group and their association with overall health and wellbeing.

Outdoor space and site

With a few exceptions, safety and accessibility were the focal point of comments coded within this thematic cluster.

"The other issue of compliance is about somebody be [being] safely and independently able to actually access their home. So you have somebody who's less mobile using a walker; that's a long way of being exposed to the weather." (BG, focus group)

"As a basic convenience...I would make the stairs you have provided accessible for someone able to walk but with minor disabilities...i.e. [have a] suitable rise/going and angle of stair overall...contrasting materials for tread riser/landings kerbs etc. and most of all a break must be provided in the form of landing so you are not rising up so high in one set of stairs without break..." (EI, interview)

Access and the site were generally considered together.

"...I think the only option is the stair lift for these. Also remember car parks should be able to be made accessible." (EI, interview)

"With any of these homes, access is going to be a huge problem, isn't it?" (CG, focus group)

“Probably in terms of...access you almost have to put that [ramp] in as a start point because it is unlikely that anybody of that sort of age would be truly mobile and wouldn’t be able to handle stairs anyways...one of my first suggestions is that you probably need to automatically make them all accessible with ramps and things like that.” (DI, interview)

Plan arrangement

There were various discussions of floor plans. The open plan seemed unacceptable for privacy in a shared living arrangement. Conversely, it appeared acceptable for easier manoeuvring and a better relationship between different rooms.

“I was gonna say whether you opened up between the kitchen and the dining room...but I guess if you’re sharing it, it would be quite quite okay to just close it off...to give each other a bit of privacy like if the other people are eating and you’re still cooking then...you don’t want to be sharing space.” (DI, interview)

Participants made frequent references to sunlight and open plan as a design strategy for improving the quality of spaces associated with ageing in place. The quote below also discusses stair arrangements, showing that details were as important as overall objectives, like having an open plan.

“...having that dog-leg is sometimes a little bit hard for people if they use mobility aids...” (BG, focus group)

“So generally, the approach seems to be [for] this living area...is get the best sun into it—make it as large as you can.” (AG, focus group)

When it comes to design for the ageing population, a considerable number of factors emerged that would need to be taken into consideration. These included safety, accessible and adaptable housing, suitable plan arrangements, and having adequate sunlight and space. The experts discussed different strategies for achieving these, but agreed on the overall idea of what an appropriate design might look like. What was evident from this discussion, was that design plays a significant role in making housing the elderly find satisfactory because it meets

their needs and preferences. Achieving this could also improve their overall health and wellbeing.

7.5.2.3 Energy

Discussion of energy mainly concerned thermal improvement when retrofitting.

“...the thing is...from the get-go, the word is insulate-insulate-insulate and insulate again. So if they’re asking for 3.2 Batts, you put 6.4 in the ceiling. If they want 3.2 in the wall you put 4.2 in the wall.” (AG, focus group)

“So you really have to...give them the warmest places that you can...to live in....” (AG, focus group)

7.5.2.4 New Zealand codes and regulations

An issue raised by participants was that it would be potentially expensive to convert older homes to meet the NZ building codes.

“...from a cost analysis point of view, you need to be thoroughly aware right from the foundations upwards that the place doesn’t need re-insulating, re-wiring and all that sort of thing, and once you start off in your house, then the whole gamut of the codes [applies]....” (AG, focus group)

The benefits of retrofitting a house to comply with building regulations was thought to be worthwhile.

“From our perspective we thought...what you’re doing...was great, because we know the sort of those houses which often aren’t level, and the movement—and facilitate people with who are less mobile incredibly hard to do.” (BG, focus group)

7.5.3 Social aspects of the conversion approach

All social considerations were coded into two main themes, *“ageing in place”* and *“shared living arrangement.”* As stated before, there were links in some sub-themes to other main themes (alternatives to conversion and architectural aspects), as the four quotes below

illustrate. These deal with cost and communal living, ways of ageing in places, and the difficulties of finding appropriate housing.

“I just think...we’re being driven to communal living...because of our high building costs and—and building costs in this country are the highest in the world.” (AG, focus group)

“I think retirement housing is—I think the model will be completely different...90 per cent of people want to age in their own homes. They do not want to move to retirement villages.” (BG, focus group)

“I’ve got people of my age group [who]—have had big houses...around the city, and they’ve gone into an apartment, and they say...I should have done it 10 years ago.” (AG, focus group)

“What we’re seeing in Auckland particularly...we’re quite vocal about it, is that we have no control. So what we’re building is four to five bedroom homes. We’re not building one storey or one bedroom, two bedroom homes, because economically the builder actually—it’s better for everybody if he actually keeps on building...” (BG, focus group)

7.5.3.1 Ageing in place

All expert group members agreed that ageing in place is preferred by many older New Zealanders.

“The concept of people being able to age in their own home...we know that that’s preferable. We also know that dementia and [staying] in your own—own environment, and where you know, helps your functioning. So, where you can keep your social contacts and all those sorts of things, the concept makes sense...” (CG, focus group)

Ageing in place also happens because of the lack of appropriate housing, an unaffordable housing market, and the common experience of older home owners being “asset rich-income poor”. These views are illustrated with the following quotes.

Asset rich-income poor

"So that was a bit of a different way when I looked at these [the proposed conversions]; I thought, actually have we got somehow where people can age in place, but have got some options of being able to get an income?" (CG, focus group)

"...what we are starting to see is people want to do minor units on their own dwellings, because that's an income or the ability to move into a sort of smaller unit, but still retain an income...from a home that they've got, but I do quite like this concept in terms of loneliness." (BG, focus group)

Lack of appropriate dwellings

"Because there's nothing to move into, so that's why you stay put." (BG, focus group)

The unaffordable housing market

"...so, to me I think it's the land that's actually killed the chance of home ownership." (AG, focus group)

"...when you've got that cost, you're not going to do a two bedroom house, are you?" (BG, focus group)

The discussion of energy raised the issue of the unsuitability of ageing in place in many current dwellings, which are often large, old, and hard to heat. However, what makes older people remain in their current but unsuitable house is the lack of appropriate and affordable dwellings. Therefore, alternative options need to be investigated that are appropriate and affordable when it comes to energy need to be investigated.

7.5.3.2 Shared living arrangement

Comments about the concept of a communal living arrangement varied.

"I was looking at more of that social...factor of people being able to age in place." (CG, focus group)

"I quite like shared space...so you can live independently but still actually have connection with somebody...looking at all the research globally, loneliness is probably the biggest issue for older people." (BG, focus group)

"I grew up in a house which was a standalone house and everything was our own...there's only really a new generation coming through as you know who are finally reluctantly starting to accept the fact that New Zealand can't do that anymore. We can't give everybody a big piece of land." (DI, interview)

"I think this communal living, to a large degree is being driven by...economic forces...and it does give people an opportunity to save a bit of money and perhaps get a foothold on the property ladder." (AG, focus group)

Various aspects of communal living were also discussed. For example, ethnicity was raised as a factor that could influence the acceptability of communal living for older people. A number of ethnicities would share a dwelling with relatives aged 65+.

"...I mean the most obvious thing is to say that it's just a cultural thing about New Zealand, isn't it? About New Zealanders and the way they've grown up. You'd get a different response in Europe, entirely different...I would have thought." (DI, interview)

"It is been driven...by ethnic groups. So, particularly when we look at some people...they're looking [for] homes with a large bathroom and bedroom—master bedroom on the ground floor, and it's Chinese, because they actually are quite happy to actually live inter-generationally...as our ethnic cultural mix changes I think it will become more normal..." (BG, focus group)

"We see it a lot [communal living] with the Maori families, actually." (CG, focus group)

"...one of the things that we...see in an urban setting is when you've got a Maori family looking after their elders—their kaumatua...they don't want to have a lot of separate spaces; they want to be together and they'll create a marae style type living wherever, really." (CG, focus group)

Companionship and loneliness was also discussed in the context of communal living. This was

thought to be alleviated by shared living.

“... I quite like shared space too so you can live independently but still actually have connection with somebody...looking at all the research globally, loneliness is probably the biggest issue for older people...” (BG, focus group)

“...they like the security that they’re not going get attacked or broken into and that sort of thing...and that’s where the rest of the community gets involved...” (AG, focus group)

Shared living raised considerable discussion. It appeared that growth in communal living has been driven by factors other than people’s interest in this type of life style. Given the choice would older people choose to downsize if it might involve some type of sharing? The experts felt the answer to this might vary for different cultures and ethnicities. They also acknowledged that some type of sharing could provide company and support for those who wish to age in place in large houses.

7.6 Discussion

The structure of the discussion of the results from the expert group is based on the three main thematic clusters identified above. The central question driving this phase of the study concerned their views on the extent to which the design proposals would meet the needs and preferences of the ageing population, and whether they complied with Lifemark design standards and New Zealand building regulations.

Specific references to the architectural aspects of certain schemes are found in Appendix 7.

7.6.1 Alternatives

Having more choices gives people the opportunity to select the most appropriate housing depending on whether they are mobile and independent or on mobility aid and need care. According to Wiles et al. (2012:357), “older people want choices about where and how they age in place” which matches with the findings from this research e.g.

“...I think this [the proposed schemes] is probably another choice and people are going to need to have more choices, because that’s just...the way the economic situation is.”
(CG, focus group)

As mentioned earlier, downsizing could be favoured if suitable dwellings were available. The experts felt small apartments could meet the needs of older people. However, the issue with modern apartments is that they are not being designed with Lifemark in mind, so could probably not accommodate the current and future requirements of older people. Designing apartments in accordance with accessibility standards could be a quick response to the shortage of appropriate purpose-built housing for the elderly. Currently, retirement villages were perceived to be the most appropriately built housing option but were seen as costly, and hence out of the reach of many “asset-rich, cash poor” older people.

Depending on people’s situation and personal considerations, the analysis suggests possible housing alternatives include cohousing and ADUs. Both could help older people fulfil their desire for companionship, day to day support, and living well on a limited income. However, given the strong desire of older people to age in place, retrofitting could be the best response when it comes to making existing houses accessible and energy efficient, providing the resultant houses are sufficiently, but not too, large or difficult to maintain.

7.6.2 Architectural aspects

Cost was perceived to be the most important issue for the conversion of existing housing especially that involved with meeting current NZBC requirements before conversion into smaller units could happen. Such costs could include rewiring, re-plumbing and even re-piling. However, any conversion to smaller units would need substantial changes to wiring and plumbing. These are all issues to be explored further.

Incorporating design standards such as Lifemark into existing dwellings was thought to be costly. However, considering the benefits of doing this for quality of life, health, independence and wellbeing of the elderly permitting them to live in their own home and communities (Carnemolla & Bridge, 2018), maybe a useful cost to be borne. In a study of environmental support for people with Alzheimers, Charness and Holley (2001) found modification was more expensive than building a new suitable house. Van Hoof et al. (2013) also highlighted the

pressure and stress placed on someone with dementia and their carer(s) created by the high volume of bureaucratic paperwork related to home modification. Nevertheless, such modifications have proved to be an influential factor in “health maintenance and improvement” (Carnemolla & Bridge, 2018:1).

The experts made statements about energy such as thermal improvement and the necessity of dwellings to be warm, get enough sun and also have suitably-sized spaces for easy and inexpensive heating.

For the experts, what is significant in designing a good floor plan is having a clear boundary between common and private spaces, particularly in schemes with shared spaces. Although the connection between the plan and the ability to heat the house was mentioned, there was more discussion of planning than energy issues.

Given the lack of assistance for older people who are asset rich-income poor, the panel felt there was need for both the public and private sectors to address this issue.

“I think...the banks’ lending on it will have to change, because there’s no doubt in my mind that we’re into living spaces whether separated or joined...and we’re going to have to live with it. So, they’re going to have to remodel their options to suit...” (AG, focus group)

Much of what was valued about the proposed designs could be summed up by saying that *design for safety* should be prioritised when designing homes for the 65+ age group. Adaptability and accessibility in the designs are key. These design-related concepts have a strong association with the *ageing in place* theme. *Security* is also an influential factor for the older age group when making decisions about their housing. This includes architectural details such as access and window stays, as well as housing alternatives which provide a secure feeling, have a view to the outside when sitting inside, and shared living arrangements that provide companionship, and through this security of mind. Because the term is tied-up with various themes and sub-themes, security is illustrated with other themes/sub-themes in the thematic map (Figure 7.2).

7.6.3 Social aspects

As raised in the expert group sessions, acceptance of a level of sharing will be dependent on personal preferences, and cultural and ethnic background. Maori, Pacific and Asian ethnicities were raised as those who would probably have experienced some type of sharing and living in an extended family arrangement. This aspect was also addressed in the questionnaire-based surveys where non-pakeha tended to be more open to shared living arrangements.

7.7 Summary

The expert group raised detailed issues about the designs but felt that some New Zealanders would accept some level of sharing. They recognised the need for something to happen so that appropriate housing could be found for an ageing population, and to allow ageing in place. The next step was to ask the client group to evaluate the proposed conversions. The client focus group procedure and its findings are discussed in Chapter 8.

Figure 7.2 Thematic map illustrating main themes up to second sub-theme

Chapter 8 Client focus group

8.1 Introduction

Chapter 6 described how the house conversions were examined by a selection of New Zealanders aged 55+ using a questionnaire based survey. To probe the reasons behind the survey results, two rounds of client focus groups of those aged 55+ were then convened. The proposed plans were re-presented and discussed. The aim was to talk through the designs and gain greater understanding of what participants felt they wanted and could afford that would allow them to age in place with a good quality of life.

Therefore, a qualitative research method was adopted in order to:

1. Identify the reasons behind participant housing choices particularly when it comes to sharing with others
2. Explore their criticisms of the designs and the ways they might be improved for greater acceptance by the 55+ age group
3. Evaluate the most important detailed design preferences e.g. size, sunlight, number of bedrooms, and privacy.

The results from this part of research combined with other findings were intended to identify the requirements and preferences of people aged 55-85 when it comes to converting and sharing existing dwellings.

8.2 Recruitment

Random sampling was employed for the qualitative part of the study. In the online survey, respondents were asked to provide their email address in a separate link at the end of the survey. By clicking on this they were redirected to another link if they were interested in being part of a client focus group. Although the participants were told the focus group would be held in Wellington, out of the 364 survey respondents (up to the focus group recruitment stage), 116 participants from across New Zealand showed interest in participating in the focus group. After a more detailed invitation was sent out, 18 people agreed to participate in two focus

groups run on consecutive days at the VUW School of Architecture, of which 17 attended. Although two people (one from Christchurch) offered their help via email, to ensure consistency of the results, their comments were not considered for analysis.

This part of the research was approved by the Victoria University of Wellington Human Ethics Committee (Appendix 3). Informed consent was obtained from all participants.

8.3 Procedure

The first focus group session was held on 24th October 2017 with 7 participants (all female), and the second on 25th October 2017, with 10 participants (8 female and 2 male). As indicated earlier, all participants had completed the online version of the survey. The 1 hour 30 minute focus groups commenced with an introduction to the research, the aim of the focus group, and session format. Participants were advised there were no wrong or right answers and the aim of the session was to deepen understanding of their opinions on each topic. Both sessions were facilitated by the principal investigator with notes taken by an assistant. The sessions were also tape-recorded with the consent of the participants.

The structure and style of questions followed those of questionnaire. This meant that for each scheme participants were first to comment on the overall concept followed by in depth discussion of design details (e.g. size of individual units, orientation for sun, and plan arrangement). The design for the plot and the three proposals for the villas with their different degrees of sharing were presented to the group to start the discussion. All participants were given a printed version of this material. Although they were familiar with schemes through the online survey completed earlier in the year, a brief description of each including the design criteria adopted was given. This was followed by the respective results from the online survey. The meeting continued with predetermined open-ended semi-structured questions and discussions of the schemes around various ideas of sharing and related topics. The questions and the following discussions were handled flexibly according to the demands of each focus group. In spite of having predetermined questions, the discussion was allowed to open up to the preferred topics of the participants. The discussion continued until no new comment was given for each particular topic. Following particular comments on a topic, impromptu questions were raised. For instance, if a participant commented that s/he does not like a

specific part of the proposed designs, s/he was then asked for the reason for this. Following discussion on specific schemes, some general results were also shown for further discussion. These included issues of sharing with the same age group or other age groups, and preferences for sharing with family members, relatives and friends.

The level of detail was driven by the nature and aim of the session. Unlike the detailed floor and site plans presented to the expert group, the simplified versions of the schemes were used for the client focus groups (Figure 8.1). This allowed participants to focus first on more holistic ideas rather than detailed aspects of the individual designs. Following this, a more detailed floor plan of that scheme was then presented together with questions related to the arrangement of the spaces, open versus cellular plan, having a laundry or a laundry cupboard, furniture types included, and size of spaces such as bedsitting rooms (Figure 8.2). It seems these floor plans were clear, since participants did not ask for more clarification and actively participated in their discussions.

Figure 8.1 An example slide illustrating the simplified version of scheme V4 (scheme B in the survey), with online survey results and questions for the client focus group

The online survey results were based on 341 valid responses (out of 364 attempts) received up to the point the focus group was carried out. The reason behind presenting the same questions was to identify any difference between participant comments in the focus group where the plans were fully explained, and those from the online survey. This also gave the chance to see if people changed their mind when they knew more of the detail behind the designs.

The architectural aspects of the designs highlighted in the online survey were discussed in the client focus groups. These included getting plenty of sun, having an extra bedroom, and the size of the houses.

SCHEME B - Separate units with shared hall/entrance

Figure 8.2 An example slide illustrating the detailed version of scheme V4 (scheme B in the survey) and questions for the client focus group

8.4 Analysis

A qualitative method was used to collate the ideas and comments on the proposed designs from the two focus groups. Audiotapes of the discussions were transcribed verbatim and analysed thematically using NVivo 11 to identify themes. The focus group data was analysed using the inductive thematic analysis procedure described by Braun and Clarke (2006), and thus followed the method adopted for data analysis of the expert group (section 7.4). The only difference is that the coding template developed following data analysis of the expert group was adopted as a preliminary coding template. Braun and Clarke's (2006) six-phase approach to thematic analysis was then followed and this led to the coding template being modified and refined in accordance with participant input.

The major themes were modified, and new ones identified, in the analysis of the data relating firstly to views of the holistic concept of sharing as shown in the design proposals, and then to the features most favoured in the schemes (see section 7.4). The analysis also identified other

themes pertaining to alternatives to conversion of existing houses, and the architectural and social aspects of the conversion approaches. Confidentiality was maintained by using specific codes and numbers.

8.4.1 Quality check

The quality check procedure followed that described in detail in section 7.4.1.

8.4.2 Data characteristics

Using the transcription of the focus group discussions, new themes were added and others removed from the initial coding template. However, the three main themes remained following the data analysis (section 7.4.2), with differences in some sub-themes.

- *Alternatives to converting existing houses*: this cluster notes the conversion alternatives pointed out by participants. Four sub-themes, with some differences from the preliminary template, were generated for this code.
- *Architectural aspects of the conversion approach*: this category retains the same four sub-themes of *cost*, *design*, *energy*, and *NZ codes/regulations*.
- *Social aspects of the conversion approach*: This theme was again divided into the two sub-themes of *ageing in place* and *shared living arrangement*.

8.5 Findings

Findings from thematic analysis of the client focus groups follow the structure of the final coding template (Figure 8.3). To illustrate the key concepts, quotes from participants are provided where appropriate.

Unlike the expert group, the client focus group discussions were more concerned about the social aspects of the conversion approach, followed by architectural aspects, and housing alternatives respectively. This contributed to major changes in the sub, and sub-sub-themes associated with the social aspects theme in the preliminary coding template.

A hierarchy chart (Appendix 8) was produced using NVivo11 to compare the intensity of the themes identified in the analysis of the client focus groups. This chart was then used as the basis of presenting the significant ideas underlying each theme. However, as indicated in

section 7.5, it does not necessarily suggest the significance of the concepts for the participants (Marks and Yardley, 2004; King, 2012). Therefore, consideration has been given to keeping the analysis qualitative in accordance with the definition of thematic analysis.

In the first focus group, one house owner participant was already in a shared living arrangement. She was clear that the house was hers and she was the decision maker, and felt her relationship with her home-mate was more like that of boarder and host. She stated she was happy with this lifestyle and there had not been any problems. This situation could have influenced the discussion as when other participants were concerned about sharing, for example sharing the kitchen and fridge, she indicated that this had not been an issue for her. However, in the second focus group, no-one was in a shared living situation and a larger number of anti-sharing attitudes were observed. In this second group one participant believed she lived in a house similar to scheme V4 (split units). In her dwelling, the other occupant lived in the lower unit and both were satisfied with this living arrangement. She did not influence the discussion on sharing as much as the participant in the first focus group, and in the second group, more people disliked scheme V6, with its higher level of sharing.

In the following section, the themes are presented in the order in which they appear in the coding template (see Appendix 8 and Figure 8.3). The thematic template follows the structure of the initial coding template. The main themes and their first level sub-themes are discussed below. Themes with a large number of mentions in the transcript are also brought up in the following section, while those that received few mentions are not discussed unless there is a significant association with other concepts.

Figure 8.3 Detailed thematic map*

* Themes in green illustrate themes identified from both expert and client focus groups. Themes highlighted in orange show themes generated from client focus groups only.

8.5.1 Alternatives to converting existing houses

ADUs (Accessory Dwelling Units), cohousing, retirement villages and rest homes/aged care were coded under this theme. Although retirement villages formed the focus of the discussion on this topic, the other three options received almost equal numbers of mentions. The group acknowledged there is no unique response to the different needs of individuals.

"None of this is for everybody." (Female, focus group 2)

An ADU was defined as a sub-division, a smaller third unit, and in-fill housing and some participants felt that this would be appealing in terms of better utilisation of space compared to constructing high-rise buildings.

"...I come from an inner city living perspective, and we are probably all Wellingtonians and we're used to the idea in-filled housing, which I think is much better use of space than going upwards..." (Female, focus group 1)

An ADU could be appealing if people had a sense of communal living (sharing outdoor spaces i.e. garden, driveway) while maintaining their privacy and independence.

"...I'm looking at it from the social point of view...if there's ability to move between the units more freely, that would appeal to me more." (Female, focus group 2)

Cohousing was also brought up as an advantageous choice, as normally these involve a larger community where residents have many neighbours to choose from for communal activities.

Female A: *"I think a disadvantage of what we're talking about here is that we're only talking about one...and two or three people in a converted house, whereas a lot of the cohousing developments that are being [built] around the world are actually for between 10 and 30 people. One comment I've seen is that you don't have to get on with everybody, because there's other people you can get on with."*

Female B: *"That's true."*

Female A: *"...a bigger complex...would be an advantage, than converting one of these..."*

Female C: *"...you're looking at four units or six units in a place."*

Female A: *"Or more, yes."*

(Focus group 2)

A number of participants felt that the proposed conversions for ageing in place had some advantages. They felt the eligibility criteria for some levels of care were very difficult for older people to meet, therefore ageing in place would be inevitable.

"...the public health system no longer has aged care." (Female, focus group 2)

"I think between this and a rest home, this would definitely win out..." (Female, focus group 1)

General comments about retirement villages varied, both within and between groups. Very positive views were expressed in both groups, though in both cases one participant was responsible for most of them. One lived in a retirement village with his wife and the other's parents live in one, and she was quite satisfied with the level of care and support they received. Of great concern was that ageing in place did not address people's need for care facilities in very old age while retirement villages provide these, although not everyone liked the idea of living in a retirement village.

Female A: *"I'm going to go to a retirement village. I would 100 per cent prefer particularly the concepts that they have now where you go from pretty much independent living to total care...That kind of thing to me appeals far more than trying to re-do a house or anything like that."*

Female B: *"Not for me, because of the security of converting a house so it would work in all circumstances...because I think there's so many traps in going to a retirement village..."*

Female A: *"My mother has been in one for 15 years now. She's 91. My mum and dad went together...Everything is done for her. If she needs to go to the doctor, they take her to the doctor...To me, this would be the half-way house, but I would happily go into a retirement village at any point."*

Female C: *"For me, this would normalise more for me how I aged, rather than being in a place where everybody is about the same age...That just would drive me nuts..."*

(Focus group 1)

An issue of the high cost of retirement villages was raised.

"...going into retirement villages, which are expensive and horrible, especially when you get into...I won't go into the care..." (Female, focus group 2)

When it came to alternatives to converting existing dwellings it was obvious participants' inclination for ageing in place, either by living in their own house or in a more suitable dwelling within their current community, had led many of them to consider as many of the available options as possible, and also the way in which these options could best meet their preferences and requirements at different stages of their life. Converting houses was a new idea for most. Given the potential deterioration of health and mobility in the future and the consequent need for support and care, for many participants a retirement village was still the main alternative to ageing in place, although there was a strong negative attitude towards retirement villages from some in the focus groups.

8.5.2 Architectural aspects of the conversion approach

Similar to the expert group discussion, out of the four sub-themes (cost, design, energy, and NZ codes/regulations) design appears the most significant followed by cost-related topics. In contrast to the expert group, there were a few statements on the NZBC, with the exception of noise control. There were no comments about incorporating Lifemark standards or other accessibility design guides (UD or LTH). The general sub-themes are discussed below and illustrated with sample quotes.

8.5.2.1 Cost

All financial-related statements about house conversion for the 55+ age group are clustered under this theme. The perception of the higher cost of conversion of an existing house compared to knocking it down and building new could be an influential factor in housing decisions when people get older and are no longer able to manage and maintain the house.

"I think an issue for me is I've lived in an 1870-90's house [where] there's no insulation. It's hard to convert, and the cost became astronomical. It was also heritage, so I've now moved to a 10-year-old double-glazed, fully insulated sunny home, which is a huge benefit. So I guess some of that is about cost..." (Female, focus group 1)

There were also comments suggesting the association between size, affordability and the energy efficiency of the design. Suitable-sized houses are those that are easy and inexpensive to heat.

"...if you are frail and elderly, heating is really important, and you may not want a great big huge space. It may be quite hard...if the space is smaller—the house is halved, then maybe it's not such a problem..." (Female, focus group 2)

The cost implications of the proposed conversions were again raised when it came to the architectural aspects, but participants could also see the potential financial advantages from living in a smaller, energy efficient, manageable and low maintenance converted house, thus creating a conflict that was not resolved. However, participants would prefer to move into a more suitable house rather than converting their own home, due to the perceived high cost of conversion and the creation of a financial burden late life. Had this been recognised beforehand it might have been useful to present the conversions as something done to empty houses by the government or other agency that would then be offered for sale or rent. However, any investigation of this will have to be left for further research.

8.5.2.2 Design

A high proportion of the design discussion revolved around "preference for extra bedroom", "open vs cellular floor plan", and "laundry utility cupboard vs separate laundry".

Designing affordable, liveable/usable space was a consistent theme either at the scale of the whole dwelling or at that of individual spaces such as bedrooms/bedsitting rooms, garden, and living spaces.

"...if there's a house sitting there that's better utilised by dividing it into two, it's a good idea." (Female, focus group 1)

People felt that having an appropriately-sized house and outdoor space was the most significant consideration in making housing decisions.

Female A: *"I think 3A would appeal to people who want some outside space but not a lot. I want the minimum amount of space..."*

Female B: *"I want little, yes."*

Female C: *"I figure in a few years I might not be able to do so much."*

Female D: *"That's right."*

(Focus group 1)

Frequent references were made to the size of the bedsitting rooms. The talk was on the furniture required, the time people might spend in their room if they shared other living spaces, proximity to both shared (public) and other private spaces, and the possibilities of engaging in other activities within the room such as entertaining a guest.

"...you can have a pull-down bed, you can have a divan, you can have a convertible type bed. So that can make it more like a living room...We're only there a third of the time."

(Female, focus group 1)

"Maybe just larger bedrooms, so you've almost got something like you do in hotels where you have a place for a kettle and a place for a microwave...you could bring a couple of people in. It wouldn't be just like a bedroom, and then everything else is shared." (Female, focus group 1)

"...I would like the ability to take perhaps one guest. So I'd want really, say two chairs and a small table." (Female, focus group 2)

However, the size of dwelling depends on individual factors such as the size of household, their spatial needs and daily activities.

"...a lot depends on your circumstances. For some people, one bedroom may be fine...I need extra space. For some people they may not." (Male, focus group 2)

A number of statements were made about the impact of design on acceptance of sharing spaces. This means that in some circumstances, if the design meets the requirements of the users, people might consider some forms of sharing.

"The concerns we had were not with the shared driveway, but the fact of the size of it..."

(Female, focus group 1)

Varied views were expressed over the level of acceptability of only having a utility cupboard for older people, although many of these were positive as they utilise space efficiently.

Male A: *"I think there's a frame of mind from the rules, because it used to be—I can remember at one stage, you couldn't have your laundry in the kitchen unless it was behind a separate cupboard door..."*

Female B: *"I've done that for 20 years...the laundry is under the kitchen bench."*

Female C: *"You can even have the kitchen in a cupboard these days."*

Female D: *"It's perfectly practical and perfectly handy."*

(Focus group 2)

Older people expressed their concern for any alterations/conversions being future proofed by satisfying the current and future accessibility needs of older occupants. This included the ability to install a stair lift.

"...every alteration you do has got to take into account the level of disability that whomever lives in that may have. They mightn't quite have it at the beginning, but you can bet your bottom dollar they'll have moved in for a week, and then boom—something will happen. So you've got to make sure that you design absolutely down to the last finite detail, with accessibility on all levels." (Female, focus group 2)

8.5.2.2.1 Outdoor space and site

As stated earlier, there was a strong association between access-related themes and future proof design. Given the changing health of older people, mobility scooter/wheelchair accessible dwellings would be preferred. This included both internal and external circulation

within the house. The design of the carport and access from it to the house was also raised.

“The car park isn’t the problem; it’s getting it in and out that is the problem.” (Female, focus group 1)

A considerable part of the discussion was devoted to the design considerations of driveways. The issue of narrow driveways particularly in multi-dwelling complexes was also raised. However, in general participants were positive about sharing driveway as long as it was suitably designed.

“...it’s more concerned about the layout of that...” (Female, focus group 1)

“...the shared driveway I think sounds like it’s okay with everybody; it’s just how big it is...” (Female, focus group 1)

8.5.2.2.2 Plan arrangement

Spatial relationships and plan organisation, preferences for these, and how they meet the needs of older people were debated as part of looking at the internal layouts of the schemes. Statements about open rather than closed plan arrangements, the size and function of various spaces specifically study and bedsitting rooms, preferences for sunny living spaces, and the impact of good views on the quality of domestic space were grouped in this category. However, a noticeable part of the discussion, as indicated earlier, concentrated on the issues and benefits of open plan designs and the need for extra bedrooms.

Orientation to the sun and getting the most sunlight and its impact on the quality of spaces seemed to be the most significant design consideration for the participants.

“...a lot would depend on where north was...the orientation to the sun is quite important.” (Male, focus group 2)

“...I think an important thing would be that both units had reasonable light and access to sun—is really important. So that’s one of things I would look at when I made my choices.” (Female, focus group 1)

The association between getting sun and utilising outdoor spaces was also brought up.

"It would depend entirely I think, the decks on the sun and the ability to utilise outdoor space..." (Female, focus group 1)

Open versus cellular floor plan

Overall both groups agreed that an open plan would work better for them. Easier manoeuvring and better flow through opening up spaces, making spaces appear larger for activities, making more sociable spaces by allowing easier communication between people cooking in the kitchen and those in living spaces, and saving space were highlighted as the benefits of open plan houses.

"I definitely like as much open as possible, so open plan living/dining/kitchen. Anything can be open." (Female, focus group 1)

"It's just a lot more conducive to feeling like the space is larger. There's more of a sense of a house—not just an apartment...I use it for meditation classes, so I need a bigger space to be able to put my people in. Yeah, it just works really well." (Female, focus group 1)

"Open plan is really important for the people with mobility issues." (Female, focus group 2)

"I'm the cook, and if it's open plan I can converse with the people who are there at the same time, but a separate kitchen I don't think works at all for me." (Male, focus group 2)

However, while the argument for open plan living was strong, there were some negative statements mainly around the issue of a messy kitchen and dirty dishes.

"That's the big disadvantage; you have to sit with your mess if you don't clean it up after dinner." (Female, focus group 2)

"...I prefer to close off the kitchen—can't let everybody see what's going on." (Female, focus group 1)

Preference for an extra bedroom

Having an extra bedroom was perceived as being more important than floor area for participants. This would be a space for various activities including accommodating visitors/guests/carer, being a study, and being rented.

Female A: *"For support for older people as well as having guests, it actually was really useful having a second bedroom."*

Female B: *"A carer; someone coming in to help when you're not well."*

Female C: *"...it could also be a study."*

Female D: *"...I also rent on [Air]bnb so a second bedroom is really good for a rental..."*

(Focus group 1)

The privacy of the master bedroom was deemed to be important.

"Two bedrooms, yes; one is ours and that's that—nobody goes there." (Male, focus group 2)

"It just is another space which doesn't impinge on your living area. It's [a] separate away space..." (Female, focus group 2)

8.5.2.3 Energy

A few statements were made regarding domestic energy, mainly on thermal insulation being significant for older people.

"...the heating is a very valid point." (Female, focus group 2)

"...I think with that heat in mind; it's also easier to heat things that are not all walls all over the place...it needs to be insulated." (Female, focus group 1)

A number of points were made regarding how older people heat their houses.

"...because if you're living alone, you want to heat up the space, and stay there. I don't want to go into my bedroom, which might be cold, to do my computer work...why would I go and heat up another room?" (Female, focus group 1)

8.5.2.4 New Zealand codes and regulations

The need for sound attenuation between private spaces in the shared living schemes and between the separate units in the sub-division options was raised.

“...I think sound separation for private areas is absolutely vital.” (Male, focus group 2)

The discussions on the details revealed a keen interest in what housing for this age group should be, although there were differences of opinion on some issues, such as what constituted adequate space in a dwelling for this age group. What was obvious from the discussion was that people wanted sufficient space to meet their individual needs that is easy and economical to heat. They also want to make sure their current and future accessibility requirements are met.

8.5.3 Social aspects of the conversion approach

As mentioned, a high proportion of the client discussion sessions was focussed on social matters. This led to major modifications to the initial thematic template. Of the two sub-themes “ageing in place” and “shared living arrangement”, the latter consumed about 90% of the discussion (Figure 4 in Appendix 8). However, a number of statements were made that highlighted the significance of ageing in place for older people.

8.5.3.1 Ageing in place

This cluster is mainly concerned with the needs and preferences of the 65+ age group for ageing in place. Related topics under this theme included the unsuitability of the current housing stock for small, older households, the possibilities of converting existing dwellings, and the changing health and conditions of older people, as these all play a significant role in housing decisions in later life. Within these issues, frequent references were made to access to services and facilities, and the feasibility of converting existing dwellings.

Access to facilities and services, specifically public transport, came up when participants talked about sharing garages, as they saw a strong association between having access to public transport and the need to have private transport and use a garage. The discussion was extended to other aspects of ageing in place.

Female A: *"...it depends again where a house is situated, how dependent people are on their cars."*

Female B: *"...public transport, accessibility to options."*

Female C: *"Public transport; that's a really crucial issue."*

Female D: *"Crucial on some of these decisions."*

Female E: *"...I think it's really the basis of what we're talking about."*

(Focus group 1)

Negative views were expressed regarding the general idea of dividing up existing houses, and whether this is a viable option given the quality and diverse designs of existing dwellings. A significant concern was the most effective strategies for best utilising the house and land, and whether sub-division/conversion could satisfy this need.

"I think a lot of the houses could actually be flattened, and the land be much better utilised." (Female, focus group 2)

"The more modern houses...they're not designed to be split..." (Female, focus group 2)

"...If it's a perfectly built house; yes, we can look at it. So many in New Zealand are just not; they really should be flattened to the ground. I believe in heritage, too but I'm sorry..." (Male, focus group 2)

Ageing in place was perceived as an advantage in terms of a sense of belonging and connection to the house and neighbourhood, something which made the conversion or subdivision of existing houses more desirable.

"It's not just the business alteration side; there's people's emotional attachment, and your home is different to just a house or a living situation." (Female, focus group 2)

"...So I look beyond just the site, because I think then the environment and the neighbourhood is part of the decision-making..." (Male, focus group 2)

"I think conversion appeals to me, thinking about character of the housing; it would maintain the character of the neighbourhood and would have some character features that we don't see so often in new builds." (Female, focus group 1)

The discussion on the social aspects highlighted the significance and preferences of the elderly for ageing in place, as has been found in other studies (see section 1.4). There was uncertainty about the conversion/subdivision of their current dwellings and whether this option would be the most desirable and satisfying option. It also emerged that other considerations need to be taken into account for ageing in place, such as providing support and care, and access to public transportation and local services when needed. The group saw these issues as becoming increasingly important with age due to significant changes in their health and possible mobility.

8.5.3.2 Shared living arrangement

"Do people want to share" and "Who to share with" were two themes clustered in this category. Discussion included preferences for sharing different spaces, areas of concern and potential conflicts when sharing, the significance of independence, and privacy in communal living. Intergenerational living options and choosing the right housemate in a shared house were highlighted. Other possible options mentioned were having a lodger, and sharing with family members. Comments around sharing were both positive and negative.

"...you're talking about flatting, basically. That's pretty much what this is; a flat for older people. I've done it, and I don't know whether I want to go back and revisit it again."
(Female, focus group 1)

"This is essentially a flatting—this is a flatting situation, really." (Male, focus group 2)

"It's a guest sort of situation, rather than actual." (Female, focus group 2)

"It really points out the social aspects of the whole thing." (Female, focus group 1)

Attitudes towards sharing at least partly depended on participants' past experiences of sharing, such as flatting in their 20s. However, some who had good experience of sharing explained how this could mean attitudes change, especially if they are the owner of the house

and decide whom they will live and share with. The importance of design in ensuring some privacy in sharing situations was recognised.

8.5.3.2.1 Do people want to share?

Views on a communal living arrangement varied across both client focus groups. A number of participants described their experience of communal living at some stage of their life. Directly and indirectly, the experience of flatting coloured the responses in various ways.

“My experience over 15 years is that it has continued to work well with a whole variety of different housemates at different times...but I think that’s an option as we age and we own property, or don’t want to move for whatever reason.” (Female, focus group 1)

“I quite liked that. I flatted in my 20s.” (Female, focus group 1)

“I think it was great when I was 20.” (Male, focus group 2)

“Not at the moment—at 95.” (Female, focus group 2)

The groups were ambivalent about the proposed sharing options, agreeing on the negative aspects but also seeing positives.

Female A: *“I think it’s somewhat foreign to people as they get older to share spaces.”*

Female B: *“I think between this and a rest home, this would definitely win out. I mean, I would put up with this...”*

Female C: *“It would be a big shift for a lot of us to do this...”* (Female, focus group 1)

Female D: *“I can see myself doing it again. I never saw it as a problem in the flats I had as a younger person, and I quite liked it...”*

(Focus group 1)

“...the idea’s not going to get sold to me, that’s for sure.” (Male, focus group 2)

People also felt that under some conditions they would probably be willing to accept some

kind of sharing. Factors mentioned included size, privacy, age, physical health, and specifically who they would share with and the number of housemates. The spatial organisation was also felt to be important.

"I like the idea of having a deck off your living room and kitchen, rather than having it be something where you just walk out on, and you really don't have any indoor-outdoor flow. I don't think I'm as averse to a shared deck as I'm averse to how the shared deck is put on this particular scheme." (Female, focus group 1)

"...obviously it would depend on who you were sharing it with, but it would take quite a change..." (Female, focus group 1)

"...When it's just perhaps two or three people it's not so bad, but when you get up to four and five, it does become quite difficult." (Female, focus group 1)

Shared living setting was suggested as a response to the changing health of the elderly.

"...we could have separate living arrangements and a separate arrangement to have a carer to live...It's those sorts of conversations sometimes that ideas like this could be feasible if one or other has a suitable property and the finances and the titles and the whole thing are sorted...there's a lot of very frail people who are struggling in these big houses. So to have the carer on the spot who may or may not perhaps have a job and do other things, but will be responsible for the two parties." (Female, focus group 2)

Sharing spaces, such as a laundry, was perceived to be acceptable if people were used to sharing in the past.

"...I think it's what you're used to. In Europe you'll very often get blocks of flats where they have a particular day [for using the communal laundry]...If you're used to it, it's probably not a problem. It's just for those of who have our own laundry, the thought of sharing it isn't so good..." (Male, Focus group 2)

A good plan arrangement where everyone was able to protect their privacy was viewed as a way of ensuring the acceptance of a shared living arrangement.

"...if you had a little bit more distance with maybe some communal thing in between the two bedrooms, I think I could probably do that." (Female, focus group 1)

The number of people in a sharing set-up or where there was a close relationship between them were also factors.

"Two friends; it may work perfectly..." (Male, focus group 2)

"...I don't mind sharing if I can choose who I share with; that's the difficulty. If the person I share with is beyond my control, then I don't want it." (Male, focus group 2)

Intergenerational living

Comments on intergenerational living also varied. Age and the relationship with the person were the main concerns. Some people were willing to live with family members of various ages, and referred to experiences of family visits. Some participants felt that they would prefer to share with people of their own age.

"...in principle I could live with that [multigenerational household]...I quite like my kids and grandkids." (Male, focus group 2)

"I'd be prepared to share with people of a different age group." (Female, focus group 2)

"I'd like to be in a community of many ages. I'm not sure I want a 20 year old next to me." (Female, focus group 1)

"I wouldn't want to share with teenagers..." (Female, focus group 2)

"Maybe 30 plus, but probably not much younger." (Female, focus group 2)

Some participants saw living in an intergeneration setting as beneficial.

"For me, this would normalise more for me how I aged, rather than being in a place where everybody is about the same age, and things like that. That just would drive me nuts, I think, but everybody's got their own thing." (Female, focus group 1)

"It would be quite nice to live with some younger people. They just have a different perspective on life." (Female, focus group 2)

At times, intergenerational living was mentioned in terms of sharing with younger family members. Participants also felt that there was a strong relationship between intergenerational living and ethnicity.

"...For many of us, we very often do; I often have children and grandchildren staying, and that's not a problem. That's that thing about the multi-generational household which we see particularly in some cultures, and used to be in the European culture, too and for many of us. I wouldn't have a real problem with that." (Male, focus group 2)

Even those prepared to share with family members had concerns about maintaining their privacy.

"As long as you could retire to your own space." (Female, focus group 2)

"As long as I have my own—yes, when family come, and you have enough of them, you can go off somewhere quietly." (Male, focus group 2)

Intergenerational living was also seen as useful if a family member needed care.

"I guess if you're a younger person, and you've got several very elderly relatives [45:41] that sort of concept for care, if that's what your family do, that would be a good concept...if you're providing support or care for family, to have that sort of set-up." (Female, focus group 2)

Companionship vs Loneliness

Apart from negative comments around loss of privacy and independence in shared living, positive statements suggested this lifestyle could offer companionship to the elderly, who might become lonely.

"The thing I liked about it is it takes away the isolation of getting older..." (Female, focus group 1)

"Communal space—outdoor, and they all look after each other." (Female, focus group 2)

"...it's nice to have shared space and be with other people..." (Female, focus group 1)

Privacy

Privacy was a consistent theme linked to many aspects of shared living. Participants agreed that everyone within the house needed their own space, whether occupant(s) or carer/guests. Frequent references highlighted the significance of privacy for older people.

"...it's quite nice actually having the separate bedroom and the separate little bit of lounge and stuff really. Everybody needs a bit of time-out..." (Female, focus group 1)

"...I need to have a little bit more distance and private spaces." (Female, focus group 1)

"I like my space." (Female, focus group 2)

"I think there just need to be a little bit more option; if you are going to share, also give people some sort of little bit more space where they can be individual if they choose..."
(Female, focus group 1)

There were strong associations between privacy and independence in a number of statements made during the discussions.

"...so they can keep each other company but have their own independence. So it's like, New Zealanders seem to want that; we might want to company but we don't want them living with us—we want them nearby." (Female, focus group 2)

"So, if each person needed to have a carer, or a guest or something like that, it wouldn't be an issue...The point is, you can do that in your own unit, no matter what." (Female, focus group 1)

In addition, the possibility of larger bedsitting rooms in the schemes was brought up, so occupants could have their own space and engage in a wider range of activities within the room. This would allow those living in such houses to enjoy time away from each other.

"Maybe just larger bedrooms, so you've almost got something like you do in hotels where you have a place for a kettle and a place for a microwave, or something like that, and you could bring a couple of people in. It wouldn't be just like a bedroom, and then everything else is shared." (Female, focus group 1)

"...just more of a sense of what you have when you need to get away into your own little cave, rather than just lying on top of each other like this." (Female, focus group 1)

Some participants would consider shared living if they had control over how it was set up and who they would share with. However, it was evident that sharing was definitely not an option for some. The attitudes towards sharing and communal living were also influenced by the specific conversions presented to the participants. The very small state house conversions were generally not liked. A more desirable scheme in terms of plan arrangement with spacious rooms might have changed their views of sharing, an example being that the bed-sitting rooms would have had more appeal if they included a small kitchenette. Having clear lines of privacy was also emphasised.

Preferences for sharing types of space

Various views were expressed regarding the sharing of types of space within the house, and these were sometimes related to changing physical health and wellbeing. The preferences and issues raised are set out below in descending order starting with the most frequent themes.

Garage/carport

There seemed to be no issue with sharing a carport/garage if it were appropriately designed and could accommodate the spatial needs of both parties, and there were clear rules about use.

"As long as it's big enough." (Female, focus group 1)

"Good double, so that you've got—that's your side—that's my side." (Female, focus group 1)

"...they'd have to be side by side; they couldn't be front one, back one." (Female, focus group 2)

“...they always parked on that side and I always parked on this side.” (Female, focus group 2)

Garden

Participants were ambivalent about sharing a garden. In spite of a preponderance of negative statements other participants argued against these by highlighting the benefits of gardening together.

Female A: “To me, one of the issues if you have that big shared outdoor space is who’s going to do the gardening—being a gardener myself, and I would like it to be very nice. If I was sharing with someone who really didn’t care I would feel like I was doing all the work.”

Female B: “Conversely, they wouldn’t want me to do all the work, and I would want to do some gardening.”

Male C: “...pretty much what everybody else is saying; I’m a gardener, and I would hate to have half of it well done and the other half—like, my neighbours collect old cars.”

Female D: “On the other hand; if you got on really well, you mightn’t even mind doing all the gardening, if the other person compromised in some [other way]...”

Male C: “I still wouldn’t want the old cars.”

Female E: “You do what people do in apartment blocks; you buy in the gardening and the lawn mowing and stuff.”

(Focus group 2)

Kitchen

The issues around sharing a kitchen included responsibility for clearing up and cleaning and whether the smell of cooking unfamiliar food might be a problem. Overall, it seemed sharing a kitchen would be unacceptable.

"...kitchen is problematic because you both want it at the same times of the day. So, whatever your arrangement, is you're both there for breakfast and for dinner most often..." (Female, focus group 1)

"...that is a disaster, full stop..." (Male, focus group 2)

"The food...if some people don't like the food the other people are preparing, and the smell or whatever..." (Female, focus group 2)

However, there were design-related suggestions to make sharing a kitchen more desirable.

"...could you design two smaller fridges—two-drawer dishwasher? There could be some things that you could design into it that would make sharing of the kitchen easier." (Female, focus group 1)

"Even an island in the middle of the kitchen makes it easier..." (Female, focus group 1)

Laundry

Statements about sharing the laundry were positive although the issue of deciding how costs would be shared was raised.

"Shared laundry seemed to be one of the real possibilities." (Female, focus group 1)

"...how are we going to actually share expenses on the upkeep of the laundry and stuff like that, but no I'm fine with that." (Female, focus group 1)

"Laundry's not a problem for me." (Female, focus group 2)

Guest unit

A separate, flexible communal area was perceived to be advantageous and desirable. If this area also had a small kitchen this would make it self-contained for better utilisation. Possible function(s) would then include having family/guests staying, having a live-in carer/lodger, or a temporary rental. Overall sharing such a unit was perceived to be possible.

“That’s where Airbnb—something time-bound could well be an option...” (Female, focus group 2)

“Make a little money on the side.” (Female, focus group 2)

“If you needed someone like family members then coming to look after you when you got sick, and things like that, actually having their separate space without having to be on top of you could actually be quite nice...” (Female, focus group 1)

Considering the unaffordability of large dwellings for the elderly, the financial benefit of small self-contained units with some shared spaces was brought up.

“...I think we’ve got to consider the socio-economic demographics for everybody...If you can only afford a one-bedroom place, it’s an advantage to have a shared space where you can put your guests...You have that shared space that you can call on if you need to.” (Female, focus group 2)

Driveway

As noted above, sharing access to the house was a significant concern also raised by the expert group. People felt the layout was more critical than the concept of sharing a driveway.

“...if you’re concerned about splitting the site, what I’m hearing is people aren’t so concerned about that; it’s more concerned about the layout of that...” (Female, focus group 1)

“Depends on the size and the layout” (Female, focus group 2)

Deck

Participants found a shared deck could be acceptable if it had an appropriate size and good spatial organisation to maintain the privacy of areas within the house.

"A shared deck is fine as long as it's not something where my windows to the house are so available so that people are looking in all the time when they're sharing the deck..."
(Female, focus group 1)

"Depends how big the deck is, really." (Male, focus group 2)

"I guess you probably need somewhere as your private space. It's where there's a shared space off that deck." (Female, focus group 2)

Entrance

Participants found a shared entrance beneficial for various reasons, including reducing heat loss and the feeling of having support while being independent.

"I quite like the shared entrance, because you're still independent in your own house but at least the older you get, I suppose you need to know that there's somebody at hand if anything goes wrong, and that gives some kind of comfort that you're sharing that entrance." (Female, focus group 2)

"...I think from a point of view of efficiency, a shared entrance is certainly—if it's closed in of course, and there's a door to get into it, before you open the door into the house. I think that's a good thing." (Male, focus group 2)

Hobby room

Some participants commented on the attractiveness of a private hobby room.

"...you don't want to have to put your weaving frame away into a cupboard every night." (Female, focus group 2)

"...often with hobby rooms, you leave it as you left it, because you're going to go back to do whatever creation you're going to do next." (Female, focus group 2)

Study

Frequent negative references were made to sharing a study.

"Study is your own mess. You've got your own mess—your own things, and to leave it clear enough for someone else..." (Female, focus group 2)

"Bills, personal paper, bank statements." (Female, focus group 1)

"...it's the more intimate bits...When it comes to your study/office space; that's where you've got your personal life on paper, and you may not wish other people to see that..."
(Male, focus group 2)

Shed

Some participants also disliked the idea of sharing a shed.

"I like my shed..." (Female, focus group 1)

Living spaces

Both negative and positive comments were made about shared living areas. The issue of carrying out different activities within the living area, disparate habits and daily routines, and possible conflicts were raised, while the benefit of having company was also brought up.

"...I would like it as a shared space that doesn't include a bedroom and all of that. So, it's not just habitation, but it's actually a space to get together..." (Female, focus group 1)

"...to some extent, I think also in the kitchen/living area; it's the old story of you want to be able to scratch, even if you don't, which you can't do when other people are around. So it's that those are the more intimate areas..." (Male, focus group 2)

"Levels of sharing too can be a huge problem in the living room, if they're all watching TV and some need to hear more than others, even in [home] the walls are too thin, and sometimes you hear the TV from next door. It's a huge problem really..." (Female, focus group 2)

"...sharing a living room—again, so much is people's attitude to entertaining. You may get one person who's very gregarious and has lots of visitors, so the living room's got their people in quite a lot. The other person could easily come to resent the fact that

their visitors are—and they're really forced into their own bedroom for a lot of the time.” (Female, focus group 1)

When it came to which spaces participants might be willing to share it became obvious that having choice of the degree of sharing and which spaces were shared would help participants to find more communal living arrangements more manageable and desirable. Some people liked the idea of communal activities such as a BBQ or gardening, for some sharing a guest unit or would help them to accommodate their visitors in a more efficient way, and for some sharing an additional sitting area would help them find companionship if desired. Compared to large scale cohousing, some form of communal living in a smaller scale converted house was felt to limit occupants in choosing right company, and afforded less privacy. Co-housing was seen to have the advantage of mixing with people of all age groups rather than living close to people of the same age.

Areas of concern for sharing

As shown later, “Agreement/arrangement needed on shared spaces” and “sharing and ownership” were respectively the most frequent themes in this category. “Fear of loss of independence” and “lack of certainty about sharing” were also identified under this theme.

Lack of certainty about possible sharing options makes people reject this living style as they get older.

“I think it’s somewhat foreign to people as they get older to share spaces. I think it would take some education. We’re all talking about when we flatbed as young people...but I don’t really know how to do it, now. So, that to me reflects anxiety around how could we possibly use this, kind of thing.” (Female, focus group 1)

“...We’re asking older people who have never shared in their lives for the last 40 years...that’s almost a foreign thing for them, in a sense.” (Female, focus group 1)

Some statements highlighted the significance of older people maintaining their independence. This led some participants to discuss the possibility of losing independence in a shared living arrangement, with consequent impact on their quality of life.

“...there are many people at my stage of life who are on their own, and some have been on their own for a long time and are used to the level of independence which that generates.” (Female, focus group 1)

“...I’ve lived alone for many years, and I like my things done my way...I would like to be independent. It adds to that independence, and my choice.” (Female, focus group 2)

Arrangements for using shared spaces

As expected, arrangements for the use of shared spaces to avert conflict was seen as an important influence on people’s perception and acceptance of shared living. This theme forms a strong relationship with themes associated with other aspects of sharing. This means in many cases, participants agreed that if people who live in a communal setting make arrangements and rules over sharing spaces, this could prevent possible conflicts and assist occupants to enjoy the benefits of this lifestyle. A comprehensive legal agreement should also be made for costs like utilities, rates, power, maintenance, and gardening.

“You’d have to have a really—like your body corp system to work out who was going to use the spare space...” (Female, focus group 2)

“You’ve got three groups in that one, to kind of reach agreement on some shared aspects of the property.” (Female, focus group 2)

“...I think you’d have to have major cooperation between Unit 1 and Unit 2 to figure out who’s going to use the lodger unit...” (Female, focus group 1)

Participants also suggested that reaching an agreement over sharing a guest/carer/lodger unit would not be a challenge if each private unit came with an extra room for different activities, such as a study or housing a guest.

“So maybe making it [shared unit] smaller and choose to have the laundry [shared] or something like that.” (Female, focus group 1)

Much of what was valued about shared living could be summed up by saying that an effective consensus can make shared living challenge-free and enjoyable.

"...shared works well if people are cooperative. It doesn't work well if they're not cooperative." (Male, focus group 2)

Sharing and ownership

Various tenure options were brought up, including cross-leasing, co-ownership, body corporates, and the combination of single ownership with a possible rental.

"...if you're buying this, you're cross-leasing things, whereas if you're renting it, it's a whole different thing." (Female, focus group 1)

"...all the land is common, but generally it's agreed between the two parties of who uses which bit." (Female, focus group 2)

"...lawyers come in and say, oh but have every right to because it's all common. So, that's one option, and there have been some common areas—and the other thing is, the body corporate model for apartments; that would cover the shared corridor." (Female, focus group 2)

"It doesn't have to be someone else's; it could be shared—buy a house together..." (Female, focus group 1)

The possibility of managing the process of conversion and occupation by a third party was also raised.

"...who owns this; who would be promoting it, and who would they be selling units to? So, what some organisation or a church group or whatever—buy the building, alter it and then let units, or would one person come in to buy them, or alter their existing building, in which case then the owner would have a say in who was going to buy the other unit." (Female, focus group 2)

A considerable discussion associated with this theme was devoted to ownership arrangements and management of the dwelling. It seems the level of acceptance of shared living would be influenced by the form of tenure. Of great significance is coordinating the use of shared units/spaces, managing the house and outdoor areas (garden and driveway) and who will be living there assuming the original owner does the conversion.

"I would have a concern if we were responsible for the upkeep of the shared driveway, because if you're buying, you're responsible for that...whereas if you're renting, you don't have to have that kind of understanding. The buyer's responsible." (Female, focus group 1)

"...do you own the house—are you bringing in a boarder, or are you equally owners, or are you sharing spaces; all that kind of thing." (Female, focus group 1)

A different view was expressed concerning the loss of sense of ownership when older people move to a shared living situation.

"So, the difference here is we're looking upon this as our home, and you're wanting to continue our lifestyle, with some compromise, but it's different from when we've been put into some other place which has never been our home, and where we have a room or whatever as our own space. This is our own..." (Female, focus group 2)

Participants constantly made statements regarding sense of ownership and the level of satisfaction this offers when people get older.

"...that's my house. So, letting go could be hard. There's a lot of emotional attachment of this is your home, and this is how you've always done it..." (Female, focus group 2)

"For me; no, I would like my own place." (Female, focus group 2)

8.5.3.2.2 Who to share with

A high proportion of statements associated with this theme concerned the significance of having a close relationship with potential housemates, including family members and friends, setting the rules, and who takes control in decision making.

"...I could certainly live there with one of my friends...Or, even me and my sister for example..." (Female, focus group 2)

"...for a lot of us, I don't mind sharing if I can choose who I share with; that's the difficulty. If the person I share with is beyond my control, then I don't want it." (Male, focus group 2)

Female A: *"I think it depends; I think two single women who are good friends could live in something like that quite comfortably."*

Female B: *"So do I."*

Male C: *"Yes, I would agree with that. That makes sense."*

(Focus group 2)

Statements were also made about the extended family structure, as this type of living is found in other cultures.

"...culturally the dynamics that we've talked about may well be different about expecting a family, around wanting to have family around—wanting to plan for it."

(Female, focus group 1)

"As soon as my grandmother became—wanting to, she moved in with my uncle. It was just automatic." (Female, focus group 1)

The importance of family members looking after older people within their family home was also brought up.

"Bringing the elders into the family home when they're ready to come into the family home. Papakainga housing and things like that are all really important issues." (Female, focus group 1)

In contrast, a person who lived in a shared house argued for sharing with people other than family members.

"...when I'm living with someone who's a stranger—they don't stay strangers—I take on housemates..." (Female, focus group 1)

Issues of potential conflicts in communal housing with family members and friends were also raised.

"You don't know. You don't know till they're in there, whether it's going to work out. Even though you think you know someone really well..." (Female, focus group 1)

"...so it does take a little bit of getting used to having these other people around the place, even though you kind of know them..." (Female, focus group 1)

Some references were made over the numbers of people in a communal living setting. Various views were expressed for both larger numbers in a larger residential complex and smaller numbers of two or three.

"...a lot of the co-housing developments that are being [built] around the world are actually for between 10 and 30 people. One comment I've seen is that you don't have to get on with everybody, because there's other people you can get on with." (Female, focus group 2)

"...I flatted when I was younger, too and when I went to university I was in a dorm situation which was very similar to this sort of idea, but there were more people involved. When it's just perhaps two or three people it's not so bad, but when you get up to four and five, it does become quite difficult." (Female, focus group 1)

"...a bigger complex is—my feeling would be advantage ..." (Female, focus group 2)

The possibility of sharing with the opposite gender was also brought up, though this was not acceptable to everyone.

"...You could have a man and a woman." (Female, focus group 1)

"I want to talk about couples and singles. I thought about gender, and I thought about couples and singles..." (Female, focus group 1)

Female A: *"...I couldn't live there with my husband and one of my friends..."*

Female B: *"What you're really saying is that mixing the sexes is a recipe for..."*

Female C: *"Disaster."*

(Focus group 2)

Participants were keen to discuss the logistics of the conversions and how these might be set up, including who owned what. They wanted choice when it comes to sharing, choice of who they would live with, the number of occupants, and how the new setting would be run. It emerged that small or large scale senior cohousing, including retrofit cohousing might be attractive to some people.

8.6 Discussion and comparison of all findings

In this section findings from the survey and all focus groups will be brought together. Based on the three main thematic categories identified in sections 7.4.2 and 8.4.2, the client focus group results are discussed in more depth and are compared with the survey and expert group findings. A collective coding template was also developed (Appendix 9).

However, due to the quantitative nature of the survey findings, comparison is not possible in some instances unless the qualitative data from the additional comments provided by the survey respondents is used. The central question driving this phase of the research is with overall attitudes to sharing, the extent to which the design proposals met the preferences and requirements of the elderly, and their inclinations for a shared living arrangement.

The discussion in the client focus groups mainly focused on the social aspects of the conversions and subdivision, and the degrees of sharing. Points raised included avoiding conflicts by having a prior formal agreement in any co-operative living situation, and the characteristics of favoured forms of communal living. However, as discussed in section 7.5.2, the most significant issue for the expert group was the architectural aspects of the conversions.

8.6.1 Alternatives

Although comments associated with appropriately-sized dwellings were coded within cost-related themes, the client group felt that the design proposals were also highly related to downsizing.

“...it [downsizing] was very good for de-cluttering, I can assure you.” (Female, focus group 1)

The concept of downsizing was also mentioned in the expert group. However, client and expert

groups agreed on the lack of suitable houses for the elderly. In many cases, housing choice is limited by factors over which older people have little control, including financial pressures, physical situation, change of conditions (e.g. partner dies) and their health. Therefore, the availability of differing affordable housing options to meet such changing circumstances seems important. This was discussed by both client and expert groups. Making appropriate housing choices is an important decision in the life of the 65+ age group, many of whom are no longer in full time employment, while having such choices can lead to greater life satisfaction and health (Office for Senior Citizens, 2013).

Attitudes to retirement villages varied. The expert group believed these were not an option for many people providing other suitable, affordable options were available. However, some client focus group participants saw retirement villages as the most appropriate housing option but also noted that they were costly, and out of the reach of many “asset-rich, cash poor” older people.

On the other hand, findings from both expert and client groups were that ageing in place is a favoured option for a high proportion of older people. In addition, client focus group participants felt this would be their first choice unless they need care and support. Evidence from Judd et al.’s (2014b) investigation of downsizing in Australia showed that in spite of the voiced popularity of retirement villages and downsizing, older Australians remain in their own large house for as long as possible. Likewise, “lifestyle and reduced maintenance rather than financial reasons” were the main reasons for downsizing (Judd et al., 2014a:129).

The affordability of dwellings for low-moderate income aged people was raised in both client and expert group discussions. Saville-Smith et al. (2017) see ADUs as a potential solution to the lack of affordable and appropriately-designed dwellings for the elderly. This type of housing could address the needs of small, older households living in under-occupied houses on large sections (Saville-Smith et al., 2017). However, shifting to an ADU would still leave behind a large house, so the client group discussion about ownership and what happens to the larger house would apply to these circumstances.

8.6.2 Architectural aspects

Some concerns were raised about design considerations when converting and dividing up existing houses, including spatial relationships and organisation, preferences for a spacious unit/house and features like sunlight, and efficient use of space to meet the needs of older people.

There was general concern in client and expert groups that although the conversions had some appeal they might be more expensive than purpose-built dwellings, and that splitting up houses might not meet council planning requirements. However, research suggests home modification employing universal design standards enhances the wellbeing and health of older people and improves their sense of safety and independence (Carnemolla and Bridge, 2014). Given the increasing functional decline with ageing, providing support for the elderly in their daily activities could be possible through designing appropriate environments (Lawton, 1980; Regnier, 2002). The aim of any modification of existing houses should, therefore, be to make them more suitable and accessible.

What emerged from this research is that people want space. While the experts discussed the efficient use of spaces and designing usable spaces, the client focus group and survey participants preferred extra bedrooms. Good-sized dwellings were also preferred. In general, survey respondents also preferred the larger units, although there is no single 'right' design for accommodating older people's needs and preferences. Similarly, the size of both the dwelling and spaces within it depends on many factors including people's desires, daily activities, social engagements, and health. As research suggests "there is no 'one size fits all' and housing is no exception" (Dementia Care, 2015:35). These findings support the results from earlier studies (Judd et al., 2014b; Tanner et al., 2008) which found size is a determinant when making housing decisions. This includes the size of the whole unit/house, individual spaces, living areas, garage and outdoor spaces. While Saville-Smith et al's (2016:8) investigation into the meaning of downsizing for older owner occupiers in New Zealand reported that "there is a 'taste' for smaller dwellings" evidence from Judd et al.'s (2014b:97) study showed that while Australian downsizers were looking for small dwellings, "they didn't want to move into one that was too small." This has also been confirmed by this research as a high proportion of survey respondents selected neither unit in some schemes as they were perceived as being too small.

In the DWELL investigation of downsizers in the UK, Park et al. (2016) found that older people wanted their future house to meet their current and future needs.

Findings from the client and expert focus groups show that accessibility and assistive features such as stair lifts should be considered as part of future-proof design. A number of studies have emphasised the key role accessibility plays for older people for ageing in place (Baldwin et al., 2012; Judd et al., 2014b; Park et al., 2016). The DWELL project also showed that elderly people are aware of their need for an accessible dwelling, and hence plan ahead (Park et al., 2016).

Like the survey respondents' preferences for an extra bedroom, the client groups explained how an extra bedroom could be used for various purposes. This supports the idea of multi-purpose spaces within the house especially in small dwellings, so occupants can utilise these according to their needs. An open plan arrangement, as recommended by the expert group, could suit their requirements but there was some disagreement about this both in the survey and client focus groups. However, findings from Sutherland and Tarbatt's (2016) study showed older people preferred open plan design. They also found space to be an influential design consideration for the elderly, and providing sufficient space should be the goal even when designing for those who downsize. Evidence from DWELL also suggests those downsizing were interested in fewer (bed) rooms but that these should be spacious (Park et al., 2016). They also wanted an adaptable house so they could accommodate visitors, whether friends or family (Park et al., 2016). Having adaptable houses was also suggested by the expert group. However, in another Australian investigation of downsizing, Judd et al. (2014b) found downsizers were looking for dwellings smaller by floor area not by the number of bedrooms, and they also wanted a yard or garden.

More efficient use of space was an issue for both client and expert focus groups. Park et al. (2016) reported the concerns of potential downsizers over the level of usable space in the newly built homes and apartments. They also stated sunlight in living spaces and other features such as height impact on older people's perception of space making it feel more spacious (Park et al., 2016). The significance of getting plenty of sunlight was constantly highlighted by survey and focus groups. Expert and client focus group discussions about layout and furniture arrangements also accentuated the significance of careful planning.

Evidence from the client focus groups shows similar results to the HEEP (Household Energy End-use Project) study (see section 2.4) suggesting older New Zealanders are accustomed to only heating occupied rooms (Isaacs et al., 2010). These findings support the design of flexible spaces within the house. For instance, living rooms could be designed for both sitting and study, allowing the occupants to heat only one room while engaging in different activities.

Well sound-proofed walls between units and private spaces were thought to be important for those living in any type of communal or multi-unit dwelling. This was raised in client and expert groups. Baldwin et al. (2012) also stressed the significance of good sound insulation from internal and external noise for older Australians.

Unlike the expert group, and despite cost and design considerations, energy implications and comments about NZ codes and regulations were much less evident in the client focus groups.

8.6.3 Social aspects

Overall, the groups were positive about ageing in place, seeing it as bringing vitality and making the elderly independent, healthy and active. This finding is confirmed by a number of studies (Tanner et al., 2008; Sabia, 2008; Wiles et al., 2012; Carnemolla and Bridge, 2014) but it still needs suitable housing. As stated by Wiles et al. (2012:357), older people “want choices about where and how they age in place.” Davey (2006a) reaffirms the demand of older people for ageing in place suggesting that living in the community is still appealing for some aged 85+, even with substantial disabilities. Around 75% of people aged 65+ own or partly own the dwelling they usually live in (Statistics New Zealand, 2015a). Results from the 2013 Census show 92.3% of those aged 65+ lived in private dwellings, suggesting older people are choosing to remain in the community as long as possible. As indicated by James (2016), ageing in place in New Zealand is also favoured by current public policy wanting older New Zealanders to remain in their own houses as long as possible. Consequently, provision of appropriate housing and assisting seniors in meeting their housing requirements could be a way of making ageing in place viable. This was recognised by both the client and expert groups.

Maintaining a high level of privacy and independence were also highlighted in client and expert groups as determinant factors in housing decisions for older people. However, the client focus groups valued privacy and independence, and saw a relationship between the two. These

concepts were consistently cited together when people indicated their preferences for ageing in place. Wiles et al. (2012) also established the association between the desire for ageing in place and sense of independence. This has also been confirmed by survey results. The small house converted into private units was preferred over the large house with all living spaces shared. This is an important finding in that privacy is preferred over space if both cannot be achieved.

The unavailability of appropriate dwellings was raised as one of the main reasons for many people in this age group not downsizing or moving to a more suitable house. This has also been investigated by Australian and New Zealander studies (Davey et al., 2004; Judd et al., 2014b; Saville-Smith et al., 2016). According to Statistics New Zealand (2017a), in 2013, more than 70% of 65+ owner-occupier households lived in a dwelling with 6 or more rooms.

The client focus groups highlighted the significance of the sense of attachment to their current house and neighbourhood, and saw this as sufficient justification for accepting the proposed conversions. This confirms earlier findings by Wiles et al. (2012) of the relationship between ageing in place and sense of attachment. Access to services, facilities and public transport were deemed to be determinant factors on where to live as people get older and frailer, and need care and support. This was also pointed out by a number of survey respondents through the additional comments they provided. A number of researchers have also noted the importance for older people of proximity to services like small scale shopping, public transport, and health and aged care services (Baldwin et al., 2012; Judd et al., 2014b; James, 2016; Park et al., 2016). Judd et al. (2014b) and Park et al. (2016) also stated access to such services was significant when people were downsizing or moving.

Both survey respondents and client focus group participants were uncertain about various aspects of dividing up dwellings, highlighting the importance of clarifying these factors. These include whether houses for conversion would be sold first, perhaps to a housing trust, and then sold on afterwards, possibly a part being back to the original owners, or whether the owner does the conversion and sells or rents the part not retained for their own use. Other issues include whether there needs to be a body corporate to run the whole property, or private arrangements made over who is responsible for the maintenance of shared

components, such as the roof. Lack of certainty about the form and security of tenure was also brought up, including what happens if someone decides to sell their share.

Having companionship is desirable for some people particularly as they get older. A number of expert and client group members stated that some form of communal living could assist older people to overcome the potential sense of isolation, as long as they could maintain their independence and privacy. In an investigation of loneliness in New Zealand, Statistics New Zealand (2013c) found a strong relationship between loneliness and poor mental health. In addition, loneliness and social isolation is growing due to the ageing population and the rise in the number of people living alone. This is becoming a major issue due to its negative impact on health and wellbeing (Statistics New Zealand, 2013c). Findings from Varady's (1990) study of 132 American older homeowners showed that those who lived alone were more likely to be interested in ADUs. The unacceptability of new ADUs for those aged 65+, either as tenants or homeowners, has been stated by Chapman and Howe (2001). However, this may change over time.

Attitudes about sharing varied across groups. Survey respondents and client focus group participants had different perspectives about sharing various spaces. While a number of client group participants believed sharing spaces between a few people could work for them, others believed they would feel more comfortable in larger communities where people could maintain their independence and privacy. All this suggests people want choices. Perhaps small independent units clustered together in a shared community with a mix of ages would be good for some, while others might prefer to live in senior communities with health care and support provided. Williams (2007:335) in her investigation of the resource implications of a number of design solutions defined communal homes and collaborative dwellings as "sharing resources between household members" and "sharing resources within a community such as in cohousing" respectively. These definitions highlight the potential significance of the number of people sharing on resource use. However, in Varady's (1990) much earlier investigation, only 14% of interviewees were interested in home sharing and a smaller 9% showed interest in ADU conversions, suggesting the then general unacceptability of shared options and ADUs among older people. The findings from this study suggest that attitudes towards more communal ways of living are starting to change.

Who people might share with was also important. The popularity of intergenerational households among some ethnic groups was highlighted in client and expert focus groups. Many participants also seemed willing to share their dwelling with family or close friends. However, Riedy et al. (2017c) found that older Australians were slightly more willing to live with family than with friends or strangers in a cohousing development. English research suggests the increase in the number of multi-generational households is due to a number of factors such as the ageing population and its diversity in terms of culture and ethnicity, and the number of younger family members living with their family due to the rise in house prices (Park et al, 2016).

There was less reluctance to share outside space, although a considerable number of client focus group members were not willing to share their garden. In contrast, survey respondents were more flexible about sharing outdoor spaces, such as uncovered parking, a driveway, and outdoor areas (BBQ, garden, sitting spaces). In their study of cohousing, Riedy et al. (2017c) also observed some preference for sharing outdoor spaces among older Australians.

However, sharing the main access to the house was a significant concern for both client and expert focus group members. This suggests varying degrees of sharing within a residential development would probably best suit the different preferences of users. A number of studies have suggested the pleasure shared outdoor spaces offer to the elderly in multiple dwelling settings (Baldwin et al., 2012; Park et al., 2016), although the importance of having some private outdoor space has also been noted (Baldwin et al., 2012). This was also highlighted in the survey results as a considerable percentage of respondents selected the private deck as the feature they liked in some schemes.

As findings from the survey and client focus groups showed, the study and kitchen were the rooms people were most reluctant to share. Attitudes about sharing living/dining rooms were varied. While a number of client group members liked the idea of sharing this space, this was the third least popular space for sharing in the survey, after the study and kitchen. The laundry was the only indoor space most client group members and a number of survey respondents were prepared to share.

As constantly indicated in the client group discussions and survey, sharing either indoor or outdoor spaces within an individual dwelling could be a source of friction. The “Not doing their bit” statement was raised as an area of concern in Riedy et al.’s (2017c) study of cohousing among older Australian. A prior agreement is required to clarify the share of parties in the costs of utilities, rates, power, maintenance, and gardening. The idea of management of the dwelling by a third party or an agency was brought up in the client focus groups, as a means of negotiating the protocols of communal living. This might be less challenging than negotiating directly with housemate(s).

Figure 8.4 illustrates the relationships between various themes and sub-themes identified in the client focus groups.

8.7 Summary

Chapter 8 is in two parts. The first looks at the results of the two client focus groups and the changes made to the initial coding template as a result of the thematic analysis. The client groups were ambivalent about the idea of sharing, seeing both the advantages and disadvantages of this. However, they had ideas about how it might be organised so as to avoid conflicts. They were less concerned with the architectural details of the proposed conversions, although the size of both units and rooms was always an issue.

The second part compares the results of the survey and the expert and client focus groups both to each other and to findings in the literature. This analysis supports the idea of ageing in place but affirms that there is no suitable housing for this.

The next chapter concludes the research by discussing how the research questions have been addressed, the potential further research, the insights gained that might be used by policy makers, and the limitations of the methods adopted for this study.

Figure 8.4 Thematic map illustrating main themes up to second sub-themes

Chapter 9 Conclusion

This chapter discusses the answers to the research questions set out in section 3.2, and draws conclusions on the basis of the adopted mixed methods approach explained in Chapters 6 to 8. The limitations of the study and opportunities for further research are then discussed.

9.1 A new solution for ageing in place

Two main themes formed the background of this research: an ageing New Zealand population and the New Zealand housing stock characteristics.

The investigation into current problems in New Zealand evidenced the unsuitability of the New Zealand housing stock and the inclinations of older people for ageing in place. Evidence from both literature and statistics also showed a mismatch between small, older person households and the available housing stock. Therefore, an investigation into housing alternatives for the ageing population, and particularly the acceptability of converting existing houses, appeared important.

This research aimed to highlight the potential significance of existing dwellings in addressing the housing shortfall and ageing in place in New Zealand, and to offer pragmatic solutions for tackling this issue to make ageing in place a viable option. As a result, this study, unlike many others in New Zealand, has given greater attention to the solutions rather than the problems by devising several house conversions. These were intended to make the selected houses both smaller and more age-friendly, as a means of achieving 'ageing in place' in well designed, and easy to heat and maintain homes.

9.2 Answers to the research questions

The four questions set out for this research are discussed separately.

What are the requirements and preferences of older New Zealanders for conversion and sharing of existing houses so that they can age in place?

As raised in the survey and focus groups, the shortage of new, appropriately-sized, affordable, and accessible dwellings has made housing decisions difficult for many older New Zealanders. This has led them to stay in their large houses, which they often cannot heat, maintain or afford in terms of bills such as the local rates.

Findings from this research also show that having a spare multi-purpose room, a private deck, and a good-sized dwelling with plenty of sunlight are the house features most people aged 55-85.

Overall, some form of communal housing could be an option for some people, providing they have adequate private space, including a room for family members or friends to stay. The house would need to have a mix of private and shared outdoor areas and gardens to meet their varying needs. It seemed the women in the focus groups and the surveys were more open to the idea of sharing than the men, although overall there were more women participants, especially in the focus groups where the majority of participants were female, and this may have an impact on the findings.

Participants wanted sunshine and space. However, the social aspects of the conversion approach were the focal point of the client focus group sessions. This might be because the social factors seemed more real and significant. Privacy was found to be a significant theme in the client focus groups, many of whom already lived alone and felt secure doing this.

This research showed that the retirement village is still an option for some people if they can afford it. This is because most retirement villages have support and care available and people were well aware they might need this in the future. If ageing in the community is to become the norm then similar levels of support are needed for all, not just those with sufficient funds.

Would it be possible to convert existing houses to make them suitable for ageing in place?

Because this research is concerned with existing dwellings the LM 3-star standard has been used as the starting point to see if it is possible to meet this when converting existing houses. In places, LM 3-star was supplemented with aspects from UD and LTH, particularly for the

design of sanitary spaces. Overall, it was found that the standard could generally be incorporated in the conversions, even for the smaller state house.

The characteristics and of the larger villas and smaller state houses both provide opportunities for various design solutions for ageing in place, although the units from conversion of state houses are small. Although these would be easy to heat and maintain, their size would be unacceptable to some people. The design solutions include variety in the degrees of sharing, numbers of occupants, ways furniture can be accommodated within the proposed designs, living arrangements, and the extent to which Lifemark standards can be incorporated.

The larger villas offer a range of design solutions including separate and shared living. Although the preferences and requirements of potential occupants should be considered in retrofitting existing houses, the larger villa simply offers people more choice in finding the most appropriate living scenario that meets their needs, whether this is having room for a live-in carer or an extra guest room.

This research shows it is possible to convert existing houses to provide homes similar to those in purpose-built retirement villages. However, the problem is as much a social as design one and one course would be client participation in the design process if conversion of existing houses is to a successful way of allowing ageing in place.

Would the conversion of existing houses to make them suitable for ageing in place be acceptable for the client group?

To answer this question, both the questionnaire-based survey (Chapter 6) and client focus groups (Chapter 8) proved critical. Each revealed the participants had mixed feelings about the idea of converting existing dwellings.

What was clear from the results, and which aligns with other studies (section 1.4), was that a high proportion of older people would prefer to age in place, either in their existing house or in a more suitable dwelling within their community. They would also like to have an accessible and age-friendly house that would still work if their health deteriorates. However, there were

several concerns about house alterations. Of these, as raised by both expert and client participants, the cost of conversions was perceived as problematic as people felt that they would not be in a position to afford such a conversion, even if they could sell or let the unit they would not occupy. If conversion is to become a viable housing option then some appropriate (possibly centralised) system of funding such projects would need to be established. Under such a system conversions would only occur when houses were empty and people could be offered the choice of buying or renting the resultant smaller dwellings. Funding for this could come from government, non-governmental agencies, or even the private sector. Part of this funding would be used to ensure all conversions become lifetime homes.

Other issues raised were whether the existing house would be in a fit state to convert in a way that made financial sense. This again points to having a suitable system whereby houses could be assessed for their potential for conversion so as to offer a useful and cost effective life.

On the other hand, advantages were noted that would make conversion an alternative worth considering. The significant benefits of upgrading a house for the elderly include reducing energy bills through effective design strategies, such as thermal insulation and double-glazed windows, saving resources and incorporation of future-proof design features such as the installation of assistive devices like stair lifts. Through conversion, accessible and adaptable houses, both indoors and outdoors, which are secure and have adequate space, storage, good views, and sunlight could be achieved.

Is sharing as part of house conversion for ageing in place acceptable for older people?

Generally, schemes with higher degrees of sharing were not attractive to many respondents, with those aged 75-85 more likely to rate the schemes with higher levels of sharing as less desirable than the younger age groups. However, both expert and client groups agreed that the level of acceptance of sharing depends on a range of factors, including people's personal preferences, culture, and background. Like older Australians (Riedy et al., 2017a), in general a high proportion of New Zealand respondents expressed negative attitudes to the concept of

sharing particularly in converted dwellings. This mainly comes from what they remember of flatting experiences in their 20s. Some sharing of the outdoor areas and laundry might be acceptable to most, although some people did embrace the idea of sharing domestic space.

Who people shared with was also important. Some people would be prepared to live with their children, relatives or close friends in a shared house. The small house converted into private units (scheme S7) was preferred over the large house with all living spaces shared (scheme V6). This is an important finding in that privacy is preferred over space if both cannot be achieved.

Interestingly, the study was the room people were most reluctant to share, as it could contain private information. There was less reluctance to sharing outside space. When it comes to sharing with the same age group, uncovered parking and a driveway were the spaces that received the highest votes for sharing, followed by garage/carport. However, people were flexible about sharing other outdoor spaces, even with other age groups. This suggests varying degrees of sharing within a residential development could suit the different preferences of users.

9.3 Limitations and further research

This study has limitations and these often open up new avenues for future studies. These are, therefore discussed together.

Life Cycle Energy (LCEA) and Life Cycle Cost Analysis (LCCA) of converting existing houses

A detailed energy and cost analysis of conversions compared to the energy use and cost of new build is required, something that was not within the time available for this research. An LCEA and LCCA of New Zealand housing types and equivalent new build houses such as those found in retirement villages could help identify the most energy efficient and affordable housing options for an ageing population. The outcomes of these evaluations would also identify whether, in terms of resource and energy consumption and cost, ageing in place is a viable option for those who wish this. This research found that costs are very important for those who are no longer in full-time jobs. Therefore, if it turns out that conversion of existing houses

is more energy and cost-effective than building new, but similar, houses, attitudes to converting existing houses might change.

Life Cycle Energy and Cost Analysis of other New Zealand housing types and equivalent new build houses

As noted earlier villas and state houses form a useful but small proportion of the New Zealand housing stock. Investigating newer dwelling types, which would possibly be better built and therefore more suitable for conversion, is an area for further research. These would need to be subject to LCE as well as a LCCA. A more comprehensive study of this type would help the government and other related housing providers, develop housing strategies that would both tackle the current housing crisis and prepare for housing an ageing population.

Evaluation of conversions by client focus group following LCE and LCC analyses

An LCE and LCC analyses, as explained earlier, followed by a further client focus group(s) would help to evaluate if the LCE and LCC findings could influence attitudes to the shared options. However, the key message which has emerged from the research is the importance of working with the client group when designing housing for the 65+ age group.

Other environmental impact analyses

Environmental impact assessment of retrofitting versus new build could also be carried out taking into considerations other environmental parameters such as greenhouse gas (GHG) emissions and carbon, water, and ecological footprints. This investigation would be of prime interest for policy makers and environmental authorities, but still needs to be part of the discussion with the client group.

Ethnicity and attitudes about sharing

A majority of survey participants (92%) were European/Pakeha followed by Asian (4.1%) and Māori (2.7%). This was the case in spite of frequent emails and invitations sent and delivered to many ethnic groups through community channels and ethnic community groups on social

media. As raised in the expert and client groups, the idea of shared living and specifically living in multigenerational or extended family structures is found in many cultures.

A further study is needed to determine the acceptability of converting existing houses and shared living arrangements for other ethnic groups in New Zealand. In 2013 Māori, Asian and Pacific ethnic groups formed 5.6%, 4.7% and 2.4% of the 65+ population respectively (Statistics New Zealand, 2015a). Therefore, if it turns out that these ethnic groups are interested in the idea of house conversion and sharing, then this represents 12.7% of the 65+ population, which makes a significant case for exploring more options of this type.

Other options for ageing in place

This study examined the needs and preferences of people aged 55+ for conversion of existing houses to make them suitable for ageing in place. However, only a limited number of design proposals were investigated for two New Zealand housing types. Other options such as retrofit/new, multigenerational/senior, large/small scale cohousing and ADUs should be further investigated using the approach of this research to examine the practicability of such proposals. Older people's thoughts about these options also need to be obtained, possibly by using them as the client group when designing.

9.4 What comes next?

The insights gained into housing alternatives for the ageing New Zealand population for ageing in place could be used in a number of ways. These have implications for a variety of stakeholders including people aged 55+, government and local authorities, and housing providers.

- People aged 55–85 have very specific housing needs when it comes to ageing in place (before their physical and mental health limits their ability to age in place). Therefore, to ensure their requirements are met and dwellings are usable, engaging potential users in the design process at an early stage is essential.

- Given the cost, legislative, and practical implications of converting houses for aging in place, a system for financial support, management of the process of conversion and rules of its occupation need to be determined. Some funding might be vital to help older people convert their houses, either through equity release or government grants. Various uncertainties need to be resolved. These include tenure options, how the use of shared units/spaces would be coordinated, how the house and outdoor areas (garden and driveway) would be managed, and in cases where the original owner does the conversion, who would be living there. Possible tenure options include cross-leasing, co-ownership, body corporates, and the combination of single ownership with a rental unit. As this research revealed the level of acceptance of shared living could be influenced by the form of tenure. The benefits and drawbacks of these types of decisions need to be carefully considered and understood.
- The government needs to facilitate house alterations and cohousing developments by reviewing and possible revision of relevant planning regulations. Auckland City Council has introduced planning controls for subdividing existing dwellings. The subdivision resource consent can cost \$120,000 - \$150,000 for an average two-lot subdivision (Auckland Council, n.d.) making this a very expensive option.
- To encourage older people to evaluate various housing options for ageing in place, sufficient information about the benefits and disadvantages of each need to be provided to those aged 65+. As indicated in section 2.3.7, an ADU Development Manual is provided by the City of Santa Cruz. The purpose of this manual which includes council-provided plans for ADUs is to assist homeowners with the process of developing an ADU. Taking Lifemark design standards into consideration and NZ Building Codes, prototype designs for ADUs, retrofit cohousing and other possible options could be produced by local authorities in New Zealand. The design solutions need to be suitable for various New Zealand housing types. How the complex or communal residential buildings could be built and managed also needs to be investigated. This study has taken a first step towards providing future-thinking design proposals for retrofit

cohousing for two New Zealand housing types, the villa and state house. These resources need to be made available for free to people aged 65+ in case they find them useful.

- What emerged from this research was that a large number of older people are not aware there might be housing options for their future housing needs. They need to be well informed about possible housing alternatives and the cost and resource implications of these options, as well as their benefits and disadvantages, so that they can select the option that best suits them.
- This study has opened new windows to innovative design solutions for senior housing providers to explore different options in their developments. Whether they will do this remains to be seen.

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Appendix 1

Detailed comparison of LM 3-star, LTH and UD Standards

Feature	Lifemark minimum mandatory requirements to achieve a 3-star rating –adaptable and accessible 2016 version Adapted from Lifetime Design Limited (2016)	Lifetime Home (LTH) Revised Criteria 16 Criteria 2010 Adapted from Habinteg Housing Association (2010)	Universal Design Adapted from Centre for Universal Design (2006)
1.Accessing the dwellings			
1.1.Car parking/ drop off/ garages/carparks	<ul style="list-style-type: none"> At least one car parking space, or approved “drop off zone” is able to be adapted to a minimum width of 3500mm and length of 4800mm. 	<p>Criterion 1a. On plot’ (non-communal) parking:</p> <ul style="list-style-type: none"> Where a dwelling has car parking (2400mm wide parking space and a 900mm access path) within its individual plot (or title) boundary, at least one parking space length should be capable of enlargement to achieve a minimum width of 3300mm. Whenever possible, the wider space (or potential wider space) should be at least 4800mm in length. The entire parking space (whether pre or post widened) should have a firm surface and be level (no gradient exceeding 1:60 and/or no crossfall for drainage exceeding 1:40). Garages are exempt from the width / widening requirements. However, any hard-standing for a parked car, leading to any garage, should conform to the Criterion’s 	<ul style="list-style-type: none"> Power-operated overhead doors. 8 ft. (2438mm) minimum door height or alternate on-site parking for tall vehicles. 5 ft. (1524mm) minimum access aisle on both sides of cars, 3 ft. (914mm) aisle in front of vehicles. Sloping garage floor (with through-the wall vents at bottom of slope to release fumes) in lieu of stepped entrance with ramp from garage to house interior. Avoid ramps in garages.

		requirements. Other private covered parking spaces (e.g. car ports) are also exempt from the width widening requirements unless they provide the only parking space available for a dwelling. If they provide the only parking space for the dwelling they should have a minimum clear width of 3300mm.	
1.2.Pathways	<ul style="list-style-type: none"> • A pathway from EITHER the front boundary of the property OR a car parking space to a dwelling entrance is able to be installed with a minimum clear width of 1200mm. • A pathway from EITHER the front boundary of the property OR a car parking space to a dwelling entrance is able to be installed with a level, step free firm, slip resistant surface with a maximum slope of 1:16 and a crossfall of not more than 1:50. Note any gradient over 1:20 is required to have an approved handrail and 1200mm x 1200mm level rest areas every 8 metres. 	<p>Criterion 2 – Approach to dwelling from parking:</p> <ul style="list-style-type: none"> • The distance from the car parking space to the dwelling entrance (or relevant block entrance or lift core), should be kept to a minimum and be level (i.e. no gradient exceeding 1:60, and/or no crossfall exceeding 1:40) or gently sloping. • Paths on all approach routes between parking and entrances should have a firm, reasonably smooth and non-slip surface. Those within the curtilage of an individual dwelling should have a minimum width of 900mm. 	<ul style="list-style-type: none"> • Site design methods for integrated stepless entrances: <ul style="list-style-type: none"> - Level bridges to uphill point. - Garage elevated to floor level so vehicles do the climbing. - Earth berm and bridge and sloping walk details. - Site grading and earth work (with foundation waterproofing) and sloping walks at 1:20 maximum slope. - Ramps avoided; if used, ramps must be integrated into the design.
		<p>Criterion 3 – Approach to all entrances:</p> <ul style="list-style-type: none"> • The approach to all entrances should preferably be level (no gradient exceeding 1:60 and/or no crossfall exceeding 1:40) or gently sloping. A ‘gently sloping’ approach may have a gradient of 1:12 for a distance of up to 2 metres and 1:20 for a distance of 10 metres, with gradients for intermediate distances interpolated between these values (e.g. 1:15 for a distance of 5 metres, or 1:19 for a distance of 9 metres - see Figure 3.1). No slope should have a going greater than 10 metres long. 	

		<ul style="list-style-type: none"> • All slopes should have top and bottom level landings of not less than 1.2 metres, excluding the swing of doors and gates. Equivalent intermediate landings should be provided for each 10 metre length of slope. • On steeply sloping sites it is accepted that this requirement may not be practicable, or achievable, and should be discussed with the local planning authority to agree a workable solution. (This may include alternative access such as steps.) • Paths on all approach routes between parking and entrances should have a firm, reasonably smooth and non-slip surface. Those within the curtilage of an individual dwelling should have a minimum width of 900mm. 	
1.3.The Entrance	<ul style="list-style-type: none"> • The dwelling entrance shall provide at least one entrance door leaf with a minimum clear opening width of 810mm (door leaf 860mm). • The dwelling entrance shall provide an entrance door with a maximum threshold of 20mm. • The dwelling entrance shall include internal and external landing areas that are slip resistant with a coefficient rating of at least 0.4. Refer to NZBC D1 table 2 for additional information. 	<p>Criterion 4 – Entrances:</p> <ul style="list-style-type: none"> • All entrances should be lit with fully diffused luminaires. • All entrances should have an accessible threshold with a maximum 15mm up-stand. • The minimum effective clear opening width at all entrances to a dwelling (including balcony and roof terrace entrances) should be 800mm. • There should be a 300mm nib (or clear space) to the leading edge on the pull side of all entrance doors to dwellings. 	<ul style="list-style-type: none"> • At least one stepless entrance is essential; if only one, not through a garage or from a patio or deck. • Maximum rise of 1:2 in. (12.7mm) at thresholds. • Minimum 5 ft (1524mm) X 5ft (1524mm) level clear space inside and outside entry door. (Can be smaller if automatic power door provided.) • Power door operators whenever possible.

		<ul style="list-style-type: none"> • All main entrances should be covered to provide weather protection for those unlocking, or waiting at, the door. The size and form of the cover should have regard for local conditions to provide effective weather protection. As a general guide, the cover at an individual dwelling door should have a minimum depth of 600mm (900mm being typical). The width of the cover should exceed the width of the doorset plus any associated controls. At exposed sites additional cover and protection may be necessary. • A level external landing (maximum gradient 1:60 and/or maximum crossfall 1:40 for effective drainage) should be provided at all main entrances. The minimum dimensions for this at an entrance to an individual dwelling should be 1200mm x 1200mm. These dimensions for level landings should be clear of any door swings. 	<ul style="list-style-type: none"> • Weather protection such as a porch, stoop with roof, awning, long roof overhang, and/or carport. • Built-in shelf, bench or table with knee space below located outside the door. • Full length sidelights, windows in doors, and/or windows nearby. • Wide-angle viewers and TV monitors. • Lighted doorbell at a reachable height, intercom with portable telephone link, and/or hardwired intercom. • Light outside entry door and motion detector controlled lights. • House number should be large, high contrast, located in a prominent place.
2. Getting around			
	Lifemark minimum mandatory requirements to achieve a 3-star rating –adaptable and accessible 2016 version Adapted from Lifetime Design Limited (2016)	Lifetime Home (LTH) Revised Criteria 16 Criteria 2010 Adapted from Habinteg Housing Association (2010)	Universal Design Adapted from Centre for Universal Design (2006)
2.1. Internal doors	<ul style="list-style-type: none"> • ALL doorways to ALL rooms on the entry living level shall provide a minimum clear opening width of 810mm (door leaf 860mm recommended). • ALL doorways to ALL rooms on the entry living level shall provide a level transition and threshold. This 	Criterion 6 –Internal doorways and hallways: <ul style="list-style-type: none"> • Subject to provision of adequate door opening widths (as detailed in the table below), the minimum width of any hallway/landing in a dwelling is 900mm. This may reduce to 750mm at ‘pinch points’ (e.g. 	<ul style="list-style-type: none"> • An open plan design. • Minimum of 32 in. (813mm) clear door opening width (34-36 in. (864-914mm) wide doors) for all doorways.

	<p>accepts a difference in floor materials of up to 20mm either side of the doorway, provided the lip is bevelled.</p>	<p>beside a radiator) as long as the reduced width is not opposite, or adjacent to, a doorway.</p> <ul style="list-style-type: none">• The minimum clear opening for the internal doorway will relate to the width of the approach (typically a hallway or landing), and should be in accordance with the table below: <table><tr><th>Direction and width of approach</th><th>Minimum clear opening width (mm)</th></tr><tr><td>Straight-on (without a turn or oblique approach)</td><td>750</td></tr><tr><td>At right angles to a hallway / landing at least 1200mm wide</td><td>750</td></tr><tr><td>At right angles to a corridor / landing at least 1050mm wide</td><td>775</td></tr><tr><td>At right angles to a corridor / landing less than 1050mm wide (minimum width 900mm).</td><td>900</td></tr></table> <ul style="list-style-type: none">• All doors to rooms on the entrance level of each dwelling, should have a 300mm nib (or clear space in the same plane as the wall in which the door is situated) to the leading edge of the door, on the pull side.	Direction and width of approach	Minimum clear opening width (mm)	Straight-on (without a turn or oblique approach)	750	At right angles to a hallway / landing at least 1200mm wide	750	At right angles to a corridor / landing at least 1050mm wide	775	At right angles to a corridor / landing less than 1050mm wide (minimum width 900mm).	900	<ul style="list-style-type: none">• Flush threshold at all doorways.• Minimum of 18 in. (457mm) clear floor space beside door on pull side at latch jamb: provides space to move out of the way of the door swing when pulling it open.
Direction and width of approach	Minimum clear opening width (mm)												
Straight-on (without a turn or oblique approach)	750												
At right angles to a hallway / landing at least 1200mm wide	750												
At right angles to a corridor / landing at least 1050mm wide	775												
At right angles to a corridor / landing less than 1050mm wide (minimum width 900mm).	900												
2.2.Circulation spaces	<ul style="list-style-type: none">• ALL internal corridors or passageways shall provide a minimum (finished) clear width of 1050mm.	<p>Criterion 7 – Circulation Space:</p> <ul style="list-style-type: none">• Living rooms/areas and dining rooms/areas should be capable of having either a clear turning circle of 1500mm diameter, or a turning ellipse of 1700mm x 1400mm. Where dwelling layout plans include furniture layouts, occasional items of	<ul style="list-style-type: none">• Accessible route (42 in. (1067mm) minimum width): provides manoeuvring room in hallways and archways.• Turning space of one 5-ft (1524mm) diameter clear floor space in all rooms.										

		<p>furniture (typically coffee tables & side tables) can be within or overlap these turning zones. Where movement between furniture is necessary for essential circulation (e.g. to approach other rooms, or the window) a clear width of 750mm between items should be possible.</p> <ul style="list-style-type: none"> • Kitchens should have a clear width of 1200mm between kitchen unit fronts / appliance fronts and any fixed obstruction opposite (such as other kitchen fittings or walls). This clear 1200mm should be maintained for the entire run of the unit, worktop and/or appliance. • The main bedroom in a dwelling should be capable of having a clear space, 750mm wide to both sides and the foot of a standard sized double bed. Other bedrooms should be capable of having a clear space, 750mm wide, to one side of the bed. In addition, in these bedrooms, where it is necessary to pass the foot of the bed (e.g. to approach the window as required by Criterion 15), a clear width of 750mm should also be provided at the foot of the bed. (Note: Bedside cabinets may be sited within the required clear spaces beside beds.) <p>*This is only minimum basic circulation spaces required for a wheelchair user within a lifetime home and is not intended to be a wheelchair user/wheelchair adaptable dwelling.</p>	
3.Habitable rooms			
	Lifemark minimum mandatory requirements to achieve a 3-star rating –adaptable and accessible	Lifetime Home (LTH) Revised Criteria 16 Criteria 2010	Universal Design

	2016 version Adapted from Lifetime Design Limited (2016)	Adapted from Habinteg Housing Association (2010)	Adapted from Centre for Universal Design (2006)
3.1.living space		Criterion 8 – Entrance level living space <ul style="list-style-type: none"> • A living room / living space should be provided on the entrance level of every dwelling. Any permanent living room, living area, dining room, dining area (e.g. within a kitchen/diner), or other reception area that provides seating / socialising space for the household and visitors. 	
3.2.Bedrooms	<ul style="list-style-type: none"> • There is space on the entry living level where a standard single bed (measuring 900mm x 1900mm) can fit with a minimum 800mm clear space available around one side and the foot of the bed. A clear minimum 800mm wide path is also required from the door to the side of the bed. 	Criterion 9 - Potential for entrance level bed-space <ul style="list-style-type: none"> • In dwellings with two or more storeys, with no permanent bedroom on the entrance level, there should be space on the entrance level that could be used as a convenient temporary bed-space. • A corner of a room that can accommodate a single bed with a 750mm wide space to one side of the bed is suitable as a temporary bed space. This area should be capable of being screened (with a portable screen) from the rest of the room. Provision of an electrical socket within the space is required. • This space is typically provided in the corner of a living room following rearrangement of the furniture – however, the living room should remain functional (despite a compromised layout). A dining room or dining area can also provide for the temporary bed space as long as the dining function can continue (or be relocated elsewhere). However, providing this facility within a dining space of a kitchen/diner provides the 	<ul style="list-style-type: none"> • At least one bedroom and accessible bathroom should be located on an accessible ground floor entry level (on the same level as the kitchen, living room, etc.)

		<p>least convenient arrangement and should be avoided whenever possible.</p> <p>Note: This temporary bed-space, and the identified through floor lift space of Criterion 12, may overlap - as the temporary bed space will not be required if a through floor lift is available.</p>	
4.Sanitary facilities			
	<p>Lifemark minimum mandatory requirements to achieve a 3-star rating –adaptable and accessible</p> <p>2016 version</p> <p>Adapted from Lifetime Design Limited (2016)</p>	<p>Lifetime Home (LTH) Revised Criteria</p> <p>16 Criteria 2010</p> <p>Adapted from Habinteg Housing Association (2010)</p>	<p>Universal Design</p> <p>Adapted from Centre for Universal Design (2006)</p>
4.1.WC/ Bathrooms/ shower	<ul style="list-style-type: none"> Dwellings shall have at least one toilet installed on the entry living area with the centre of the toilet pan being 450-460mm from the sidewall. This toilet shall have a clear transfer space of 800mm beside and/or in front of the toilet. This space excludes the swing of the door but can include a vanity which projects a maximum of 400mm from the back wall. Toilet walls are reinforced to provide a fixing surface for grab rails to be safely and economically installed in the future. Dwellings shall have reinforced shower walls on the entry living level for the future installation of grab rails. All bathrooms shall include slip resistant flooring with a coefficient rating of at least 0.4. Refer to NZBC D1 table 2 for additional information. 	<p>Criterion 10 – Entrance level WC and shower drainage:</p> <ul style="list-style-type: none"> The entrance level should have an accessible WC compartment, with potential for a shower to be installed. An accessible WC compartment should contain: <ul style="list-style-type: none"> A WC with: <ul style="list-style-type: none"> A centre line between 400mm – 500mm from an adjacent wall. A flush control located between the centre-line of the WC and the side of the cistern furthest away from the adjacent wall. An approach zone extending at least 350mm from the WC's centre-line towards the adjacent wall, and at least 1000mm from the WC's centre-line on the other side. This zone should extend forward from the front rim of the WC by at least 1100mm. The zone 	<ul style="list-style-type: none"> Minimum 5ft. x 3ft. (1524mm x 914mm) (5 ft. x 5ft. (1524mm x 1524mm) preferred), curbless shower or tub with integral seat. When possible, arrange at least one shower control for right-hand use and one for left-hand use. Adequate manoeuvring space: minimum 5ft. (1524mm) diameter turning space in the room and 30 in. (762mm) X 48 in. (1219mm) clear floor spaces at each fixture. Spaces may overlap. Clear space of 3 ft. (914mm) in front and to one side of toilet. Cantilevered fold up grab bars preferred with toilet centred 24in. (610mm) from side walls or adjacent fixtures. If a traditional side wall bar is used centre toilet 18in. (457mm) from side wall.

		<p>should also extend back at least 500mm from the front rim of the WC for a width of 1000mm from the WC's centre-line.</p> <ul style="list-style-type: none"> • A basin which may be located either on the adjacent wall, or adjacent to the cistern, should not project into this approach zone by more than 200mm. <p>2.A basin with:</p> <ul style="list-style-type: none"> • A clear frontal approach zone extending back for a distance of 1100mm from any obstruction under the basin – whether that be a pedestal, trap, duct or housing. This zone will normally overlap with the WC's approach zone as detailed in item 1iii) above. <p>3.Unless provided elsewhere on the entrance level (see Note 1), floor drainage for an accessible floor level shower.</p> <ul style="list-style-type: none"> • Whilst a variety of solutions (and footprint sizes) can be created to satisfy the above layout requirements, it is noted that an overall compartment footprint of 1450mm x 1900mm will enable increased choice of fittings. 	<ul style="list-style-type: none"> • Broad blocking in walls around toilet, tub, and shower: allows for future placement and relocation of grab bars. • Minimum lavatory counter height of 32 in. • Clear knee space 29 in. (737mm) high under lavatory. Maybe open knee space or achieved by means of removable vanity or fold-back or self-storing doors. Pipe protection panels must be provided to prevent contact with hot or sharp surfaces. • Countertop lavatories preferred with bowl mounted as close to the front edge of the counter as possible. Wall hung lavatories are acceptable with appropriate pipe protection. • Long mirrors should be placed with bottom no more than 36 in. (914mm) above the finished floor and top at least 72 in. (1829mm) high. <p>Fixture controls:</p> <ul style="list-style-type: none"> • Offset controls toward the outside edge of the tub/shower with adjacent clear floor space. • Single-lever water controls at all plumbing fixtures and faucets. • Adjustable height, movable hand-held shower head or 60in.-72in. (1524-1829mm) flexible hose (on/off valve on shower head preferred)
		<p>Criterion 11 - WC and bathroom walls</p> <ul style="list-style-type: none"> • Adequate fixing and support for grab rails should be available at any location on all walls, within a height band of 300mm – 1800mm from the floor. 	

		<p>Criterion 14 – Bathrooms:</p> <ul style="list-style-type: none"> • An accessible bathroom, providing ease of access, should be provided in every dwelling, close to a main (double or twin) bedroom. • The following facilities, and associated clear approach zones, should be provided within the accessible bathroom: <p>1. A WC with:</p> <p>i. A centre line between 400mm – 500mm from an adjacent wall.</p> <p>ii. A flush control located between the centre-line of the WC and the side of cistern furthest away from the adjacent wall.</p> <p>iii. An approach zone extending at least 350mm from the WC's centre-line towards the adjacent wall, and at least 1000mm from the WC's centre-line on the other side. This zone should extend forward from the front rim of the WC by at least 1100mm. The zone should also extend back on one side of the WC for at least 500mm from the front rim of the WC, for a width of 1000mm, from the WC's centre-line.</p> <ul style="list-style-type: none"> • A bowl of a basin which may be located either on the adjacent wall, or adjacent to the cistern, should not project into this approach zone by more than 200mm. <p>2. A wash basin with:</p>	
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		<p>A clear frontal approach zone, 700mm wide, extending 1100mm from any obstruction under the basin's bowl – whether that be a pedestal, trap, duct or cabinet furniture. This zone will normally overlap with the approach zone to the WC (see item 1iii above) and/or bath (see item 3i below).</p> <p>3. Either a bath or an accessible floor level shower:</p> <p>i. Where a bath is provided, there should be a clear zone alongside the bath, at least 1100mm long and 700mm wide. This zone will normally overlap with the approach zone to the WC (item 1iii above) and/or the approach zone to the basin (item 2i above).</p> <p>ii. Where an accessible floor level shower is provided instead of a bath, there should be provision of a clear 1500mm diameter circular, or 1700mm x 1400mm elliptical, clear manoeuvring zone. This manoeuvring zone should overlap with the showering area.</p> <p>iii) Where both a bath and an accessible floor level shower are provided from the outset, the clear floor space for showering activity should be a minimum 1000mm x 1000mm.</p> <p>4. Unless provided elsewhere in the dwelling, floor drainage for an accessible floor level shower.</p> <p>5. Where a bath is provided with capped drainage for an accessible floor level shower beneath it, potential for a clear 1500mm</p>	
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		<p>diameter circular or 1700mm x 1400mm elliptical clear manoeuvring zone if the bath is removed.</p> <ul style="list-style-type: none"> • It is noted that an internal footprint dimension of 2100mm x 2100mm increases the degree of choice and flexibility in respect of fittings, layout, orientation and future adaptability. An outward opening door will be required to satisfy Approved Document M if the bathroom contains the only accessible entrance level WC within the dwelling. <p><i>Note: The manoeuvring circle or ellipse (see items 3ii and 5) may pass under a wash basin subject to it being clear of any pedestal, trap, duct or cabinet furniture.</i></p>	
		<p>Criterion 13 – Potential for fitting of hoists and bedroom / bathroom relationship</p> <ul style="list-style-type: none"> • Structure above ceiling finishes over a main (twin or double) bedroom and over the bathroom should be capable of supporting, or capable of adaptation to support, the future installation of single point hoists above the bed, bath and WC. This bedroom and bathroom should be on the same storey level. This storey (unless at entrance level) should have potential for access via the through floor lift (see Criterion 12). This bathroom should also satisfy the requirements of Criterion 14. The route between this bedroom and bathroom should not pass through any living / habitable room or area. 	
5. Dwelling facilities and storage			

	Lifemark minimum mandatory requirements to achieve a 3-star rating –adaptable and accessible 2016 version Adapted from Lifetime Design Limited, (2016)	Lifetime Home (LTH) Revised Criteria 16 Criteria 2010 Adapted from Habinteg Housing Association, (2010)	Universal Design Adapted from Centre for Universal Design (2006)
5.1.Kitchen space			<ul style="list-style-type: none"> • Clear knee space under sink 29 in. (737mm) high minimum (with pipe protection), counter, and cook tops. May be open knee space or achieved by means of removable base cabinets or fold-back or self-storing doors. • Variable height (from 28in.-42in. (711-1067mm)) work surfaces such as countertops, sinks, and or cooktops. • Stretches of continuous countertops particularly between refrigerator, sink, and stove top. • Adjustable-height shelves in wall cabinets. • Full-extension, pull-out drawers, shelves and racks in base cabinets. • Full height pantry storage with easy access pull-out and/or adjustable height shelves. • Loop handles or push latches on cabinet doors. • Front-mounted controls on all appliances. • Cook top or range with staggered burners and front- or side-mounted controls. <p>Cooktop with low profile preferred to provide smooth transition to countertop.</p> <ul style="list-style-type: none"> • Glare-free task lighting to illuminate work areas without too much reflectivity. • Side-by-side refrigerator or French door refrigerator with pull-out shelving.

			<ul style="list-style-type: none"> • Under-counter or refrigerator drawers. • Built-in oven with knee space beside, set for one pull-out oven rack at the same height as the adjacent countertop and with pull-out shelf below or drop-in range with knee space beside, top set at a maximum of 34 in. (864mm) above finished floor. • Dishwasher raised on a platform or drawer unit so top rack is level with adjacent counter top. • Single-lever water controls at all plumbing fixtures and faucets.
5.2.Laundry areas			<ul style="list-style-type: none"> • Front-loading washers and dryers, with front controls, raised on platforms or drawers. Doors should open in opposite directions for easy transfer from washer to dryer. • Laundry sink and countertop surface no more than 34 in. (864mm) above finished floor with knee space below. • Clear floor space at least 36 in. (914mm) wide across full width in front of washer and dryer and extending at least 18 in. (457mm) beyond right and left sides (extended space can be part of knee space under countertops, sink, etc.). • Some hanging and shelf storage should be less than 54 in. high with adjustable height closet rods and shelves.
5.3.Storage/ closets			<ul style="list-style-type: none"> • Some hanging and shelf storage should be less than 54 in. (1372mm) high with adjustable height closet rods and shelves.
6.Fittings and fixtures			

	<p>Lifemark minimum mandatory requirements to achieve a 3-star rating –adaptable and accessible</p> <p>2016 version</p> <p>Adapted from Lifetime Design Limited, (2016)</p>	<p>Lifetime Home (LTH) Revised Criteria</p> <p>16 Criteria 2010</p> <p>Adapted from Habinteg Housing Association, (2010)</p>	<p>Universal Design</p> <p>Adapted from Centre for Universal Design (2006)</p>
6.1.Windows		<p>Criterion 15 – Glazing and window handle heights:</p> <ul style="list-style-type: none"> • The principal window in this living space, or glazed doors (where these are in lieu of the principle window) should include glazing that starts no higher than 800mm above floor level. In addition, any full width transom or cill within the field of vision (normally extending up to 1700mm above floor level) should be at least 400mm in height away from any other transom or balcony balustrade. All dimensional requirements within this paragraph are nominal (+/- 50mm acceptable). • There should be potential for an approach route 750mm wide to enable a wheelchair user to approach a window in each habitable room (see Note 1). In addition, this window should have handles/controls to an opening light no higher than 1200mm from the floor. <p><i>Note 1: In kitchens areas or bathrooms with only one window situated behind kitchen units or bathroom fittings, the requirement for a potential clear approach space to that window need not apply. However, the window handle height/control requirement remains applicable. Any other window within the</i></p>	<ul style="list-style-type: none"> • 36 in. (914mm) maximum sill height. • Casement, or other type of crank operated windows.

		<i>kitchen area or bathroom, not behind fittings, is required to satisfy both the approach and window handle/control height requirements.</i>	
6.2.Switches and controls	<ul style="list-style-type: none"> • Light switches and other service controls (eg. security systems, intercommunication systems, air-conditioning controls) shall be horizontally aligned with door handles at 900-1200mm (to the centreline) above finished floor level (1000mm preferred). 	<p>Criterion 16 – Location of service controls (This criterion is also applicable to feature 7.Powerpoints):</p> <ul style="list-style-type: none"> • Service controls should be within a height band of 450mm to1200mm from the floor and at least 300mm away from any internal room corner. <p>For example, this would include the following: Electrical switches & sockets, TV / telephone / computer points, consumer service units, central heating thermostatic and programming controls, radiator temperature control valves, and mains water stop taps/controls.</p>	<ul style="list-style-type: none"> • Light switches (Motion detector or remote controlled preferred) 44 in.-48 in. (1118-1219mm) high, and thermostats 48 in. (1219mm) maximum height. • Electrical outlets at beds and desks, four-plex boxes each side for computer and electronic equipment as well as personal use equipment. • Electrical outlets, 18 in. (457mm) minimum height. • Remote controls for heating and cooling. • Doorbell intercoms that connect to portable telephones. • Audible and visual alarms for doorbell, smoke detectors, etc. • Electrical panel with top no more than 54 in. (1372mm) above floor located with a minimum 30 in. X 48 in. (762 mm x 1219mm) clear floor space in front.
6.3.Hardware	<ul style="list-style-type: none"> • All hinged doors shall be fitted with lever action handles. • All door handles shall be horizontally aligned with light switches between 900-1200mm above finished floor level (1000mm preferred). 		<ul style="list-style-type: none"> • Lever door handles • Push plates • Loop handle pulls on drawers and cabinet doors • Touch latches on cabinet doors • Magnetic latches on doors in lieu of mechanical locks

Appendix 2

Comparison of NZ Lifemark design standards 3-star (versions 2012 and 2016), 5-star and optimal requirements for additional points

** Lifemark design Standards to be used for the present study-comparison table (adapted from Lifetime Design Limited, 2012; 2016)*

**“A design can only accrue points that meet one option of each standard, for example, one cannot get points for achieving 1.1a and 1.1b” (Lifetime Design Limited, 2012, p.40).*

**Cells coloured orange are no longer included in the 2016 Lifemark guide for minimum mandatory requirements for the 3-star rating (and possibly moved to optional requirements for additional points).*

Accessing the dwellings

Feature	Category 1- Lifemark minimum mandatory requirements to achieve a 3-star rating –adaptable and accessible Red and black are 2012 and 2016 standards respectively.	Points available (2012)	Category 2-Lifemark minimum mandatory requirements to achieve a 5-star rating –wheelchair accessible 2016 version	Optional requirements for additional points 2016 version
1.Car parking	1.1a.At least one car parking space is able to be adapted to a minimum width of 3500mm.	4	Minimum 3-star associated standards	1.1b.At least one car parking space actually has a minimum width of 3500mm and length of 4800mm. (town houses/ apartment may

				share parking space with a combined width of 5900mm) or operate with an approved "drop off zone"
	1.2a.At least one car parking space is able to be adapted to have a level, firm, slip resistant flat surface with a slope not exceeding 1:20.	3		1.1c.At least one car parking space (for each dwelling) actually has a minimum width of 3500mm and length of 5400mm.
	1.1a.At least one car parking space, or approved "drop off zone" is able to be adapted to a minimum width of 3500mm and length of 4800mm.			1.2a.At least one car parking space, or approved "drop off zone" is able to be adapted to have a level, firm, slip resistant flat surface with a slope not exceeding 1:40.
				1.2b.At least one car parking space, or approved "drop off zone", actually has a level, firm, slip resistant flat surface with a slope not exceeding 1:40.
				1.3.At least one car parking space, or approved "drop off zone", provides shelter from the weather (recommended height of at least 2500 above ground level)
				1.4.All garage doors have electric garage door opening mechanisms installed.
2.Pathways	2.1a.(2.1a).A pathway from EITHER the front boundary of the property OR a car parking space to a dwelling entrance is able to be installed with a minimum clear width of 1200mm. (2012 and 2016)	3	Minimum 3-star associated standards	2.1b.A pathway from EITHER the front boundary of the property OR a car parking space to a dwelling entrance is installed with a minimum clear width of 1200mm.
	2.2a.A pathway from EITHER the front boundary of the property OR a car parking space to a dwelling entrance is able to be installed with a level, firm, slip	5	2.2b.A pathway from EITHER the front boundary of the property OR a car parking space to a dwelling entrance is installed with a level, step free firm, slip resistant surface with	2.3a.A pathway from EITHER the front boundary of the property OR a car parking space to a dwelling entrance is installed with

	resistant surface with a maximum slope of 1:20 and a crossfall of not more than 1:50.		a maximum slope of 1:16 and a crossfall of not more than 1:50. Note any gradient over 1:20 is required to have an approved handrail and 1200mm x 1200mm level rest areas every 8 metres.	a light switch at the dwelling entrance for pathway lighting.
	2.3.A pathway from EITHER the front boundary of the property OR a car parking space to a dwelling entrance is installed with a light switch at the dwelling entrance for pathway lighting.	1		2.3b.A pathway from EITHER the front boundary of the property OR a car parking space to a dwelling entrance is installed with sensor lighting for the pathway.
	2.2a.A pathway from EITHER the front boundary of the property OR a car parking space to a dwelling entrance is able to be installed with a level, step free firm, slip resistant surface with a maximum slope of 1:16 and a crossfall of not more than 1:50. Note any gradient over 1:20 is required to have an approved handrail and 1200mm x 1200mm level rest areas every 8 metres.			
3.The Entrance	3.1.The dwelling entrance shall provide an entrance door with a minimum clear opening width of 810mm (door leaf 860mm).	10	Minimum 3-star associated standards	3.2b.The dwelling entrance shall provide an entrance door with a flush threshold.
	3.1.The dwelling entrance shall provide at least one entrance door leaf with a minimum clear opening width of 810mm (door leaf 860mm).			3.3a.The dwelling shall have at least one alternative exterior door/exit way with a maximum threshold of 20mm.
	3.2a.(3.2a.)The dwelling entrance shall provide an entrance door with a maximum threshold of 20mm (2012 and 2016).	5		3.3b.All decks, balconies and other ground level exterior doors shall have a maximum threshold of 20mm.

	3.6.The dwelling entrance shall include an external landing area that is slip resistant.	3		3.4.The main dwelling entrance shall include an external landing area measuring 1200mm x 1200mm
	3.7.The dwelling entrance shall include internal and external landing areas that are slip resistant with a coefficient rating of at least 0.4. Refer to NZBC D1 table 2 for additional information.	1		3.5.The dwelling entrance shall include an external landing area that is level with a 1:40 fall or shallower.
	3.7a.The dwelling entrance shall include an external landing area with switch operated lighting;			3.6.The dwelling entrance shall include an external landing area that provides shelter from the weather (recommended roof overhang of at least 900 mm).
				3.8a.The dwelling entrance shall include an external landing area with switch operated lighting.
				3.8b.The dwelling entrance shall include an external landing area with sensor lighting.
				3.9a.The entry door locking mechanism has an automatic keypad with buttons at least 7mm wide.
				3.9b.The entry door locking mechanism has an automatic system which is electronically activated.
Required for 3-star (2012)		35		

Appendix 3

Human Ethics approvals for pilot surveys 1 and 2, main survey, expert and client focus groups

Phone 0-4-463 5480
Email susan.corbett@vuw.ac.nz

MEMORANDUM

TO	Faeze Yavari
COPY TO	Prof Brenda Vale
FROM	AProf Susan Corbett, Convener, Human Ethics Committee
DATE	10 November 2016
PAGES	1
SUBJECT	Ethics Approval: 23684 Housing alternatives for an ageing population in New Zealand: a resource assessment

Thank you for your application for ethical approval, which has now been considered by the Standing Committee of the Human Ethics Committee.

Your application has been approved from the above date and this approval continues until 31 October 2018. If your data collection is not completed by this date you should apply to the Human Ethics Committee for an extension to this approval.

Best wishes with the research.

Kind regards

Susan Corbett
Convener, Victoria University Human Ethics Committee

MEMORANDUM

TO	Faeze Yavari
COPY TO	
FROM	AProf Susan Corbett, Convener, Human Ethics Committee
DATE	17 November 2016
PAGES	1
SUBJECT	Ethics Approval: 23702 Housing alternatives for an ageing population in New Zealand: a resource assessment

Thank you for your application for ethical approval, which has now been considered by the Standing Committee of the Human Ethics Committee.

Your application has been approved from the above date and this approval continues until 31 October 2018. If your data collection is not completed by this date you should apply to the Human Ethics Committee for an extension to this approval.

Best wishes with the research.

Kind regards

Susan Corbett
Convener, Victoria University Human Ethics Committee

Appendix 4

Survey questionnaire

Housing alternatives for an ageing population in New Zealand: a resource assessment

INFORMATION SHEET FOR PARTICIPANTS

Thank you for your interest in this research. Please read this information before deciding whether or not to take part. Whether you decide to take part or not, thank you for considering my request.

Who am I?

My name is Fatemeh Yavari and I am a Doctoral student in Architecture at Victoria University of Wellington. This particular piece of research is work towards my thesis.

What is the aim of the research?

This research aims to compare the environmental and economic implications of making existing housing more suitable for the ageing New Zealand population with building similar but new housing. For this particular piece of my research, I would like to get your feedback on my proposed design options for converting existing houses. This has been approved by the Victoria University of Wellington Human Ethics Committee [*approval number: 23702*].

How can you help?

As a person aged 55-85, I would like to invite you to fill out a questionnaire as a part of my research. The questionnaire shows proposed design solutions for existing houses and asks for your comments and feedback. Your comments will assist me in enhancing the design solutions for further analysis. If you have a partner you can both fill out the survey. It will take about 15-30 minutes to fill out the whole questionnaire. **Please return the completed questionnaire to the place where you received it for collection by me.**

What will happen to the information you give?

This research is anonymous. This means that you will not be personally identifiable either in the thesis or in any publications related to this research. Only my supervisors and I will read the information

obtained from the survey. The documents will be kept securely and destroyed 5 years after the research ends.

What will this part of the research produce?

The information from the questionnaires will be used in my PhD thesis. The immediate aim of this survey is to obtain ideas and comments from potential users for further analysis.

If you accept this invitation, what are your rights as a research participant?

You do not have to accept this invitation if you don't want to. If you do decide to participate, you have the right to:

- choose not to answer any question;
- ask any questions about the study at any time;
- be able to read any documents resulting from this research by emailing the researcher to request a copy.

If you have any questions or problems, who can you contact?

If you have any questions, either now or in the future, please feel free to contact either:

Fatemeh Yavari
Role: Researcher
VUW School of Architecture
faeze.yavari@vuw.ac.nz

Professor Brenda Vale
Role: Supervisor
VUW School of Architecture
brenda.vale@vuw.ac.nz
Phone: 04 463 6275

Human Ethics Committee information

If you have any concerns about the ethical conduct of the research you may contact the Victoria University HEC Convener: Associate Professor Susan Corbett. Email susan.corbett@vuw.ac.nz or telephone +64-4-463 5480.

If you are 55-85 years old and agree to participate in this research, please tick the circle below. By doing this and returning the questionnaire you consent to participate in this research as part of a PhD thesis. Please return the completed questionnaire to where you received it or send it to the investigator using the prepaid addressed envelope attached to this questionnaire.

I agree.

PART 1

1.1. What is your age?

- ☐ 55-64
- ☐ 65-74
- ☐ 75-85

1.2. What is your gender?

- ☐ Female
- ☐ Male
- ☐ Other
- ☐ Prefer not to say

1.3. Please select your current household type (types are based on Statistics New Zealand categories).

- One person household
- Couple only household
- Couple only and other person(s)
- Couple with child(ren)
- Couple with child(ren) and other person(s)
- One parent with child(ren)
- One parent with child(ren) and other person(s)
- Two-family household
- Other (please explain) _____

1.4. Please tick which type of household applies to you

- ☐ Household of related people
- ☐ Household of related and unrelated people
- ☐ Household of unrelated people
- ☐ Other (please explain) _____

1.5. What is your ethnicity?

European/Pakeha

Māori

Pacific Island

Asian

Middle Eastern/Latin American/African

Other (please explain) _____

PART 2

2.1. How many years have you been living in your current dwelling?

Less than a year

1-5 years

6-10 years

11-20 years

More than 20 years

2.2. Do you live in a retirement village?

Yes

No

2.3. What type of dwelling do you currently occupy?

detached house

semi-detached house

terraced house

apartment

Other (please specify) _____

2.4. This question asks about moving from where you live now to different accommodation as you get older. Please tick the box which best applies to you at the moment.

I have already moved to more suitable accommodation

I intend to move.

I have thought about moving.

I plan never to move.

PART 3

Part 3 involves 6 schemes (schemes A-F) for making an existing house which maybe too large into smaller dwelling units with varying degrees of shared space. In schemes B, C, D, E and F, all units and shared spaces

along with their sizes are labelled and the sunpath is shown so you can see where the sun comes from.

The assumption is that you will only be sharing a house with people you want to live near or with.

Scheme A provides three different options for converting a section (house plot)

Schemes B and C provide separate units with a shared entrance

Schemes D, E and F have more shared spaces

Even if you have never thought about moving or plan not to move, please answer the following questions.

SCHEME A –SUBDIVISION OF OUTDOOR SPACE AND SECTION (house plot)

Please assume that you are living in this house and have decided to convert the section and house to make smaller dwellings. Please look at schemes 1A, 2A and 3A and answer the following questions.

Scheme 3A
Subdivision of lot; separate outdoor spaces (including parking spaces) and shared driveway

Scheme 2A
Separate outdoor space (including parking spaces)

Scheme 1A
Shared outdoor space (including parking spaces)

3.1. How much do you like the idea of sharing outdoor spaces (i.e. garden, BBQ etc) while having separate internal spaces as in scheme 1A? Please rate on a scale of 1-5 (1- Not at all, 5- Very much).

1. Not at all
2. Dislike somewhat
3. Neutral
4. Like somewhat
5. Very much

3.2. How much do you like the idea of subdividing the lot in scheme 3A? Please rate on a scale of 1-5 (1- Not at all, 5- Very much).

1. Not at all
2. Dislike somewhat
3. Neutral
4. Like somewhat
5. Very much

3.3. To what extent, do you think these schemes would best meet your requirements? Please rate on a scale of 1-5 (1- Not at all, 5- Very much). *Tick one box in each row.*

	1. Not at all	2.	3. Neutral	4.	5. Very much
Scheme 1A:					
Scheme 2A:					
Scheme 3A:					

3.4. Please add any further comments you have on this scheme.

SCHEME B - SEPARATE UNITS WITH SHARED HALL/ ENTRANCE (for a larger house)

Please assume that you are living in the original house and have decided to convert it to smaller dwellings. Please look at scheme B and answer the following questions.

3.5. Which unit would you prefer to live in?

Unit 1

Unit 2

Neither

3.6.1. If you prefer unit 1, please tick which features you like from the list below. You can select as many as you like.

Size of unit 1(82 square metres)

Open plan kitchen, dining

Separate living room

Private deck

A spare single bedroom which can be used as guest room, study, or office

Plenty of sunlight

Other (Please specify) _____

3.6.2. If you prefer unit 2, please tick which features you like from the list below .You can select as many as you like.

Size of unit 2 (67 square metres)

Open plan kitchen, dining

Separate living room

Private verandah

Bay window

Plenty of sunlight

Other (Please specify) _____

3.7. Thinking of scheme B, how much do you like the idea of sharing an entrance to a separate unit in this scheme? Please rate on a scale of 1-5 (1- Not at all, 5- Very much).

1. Not at all

2. Dislike somewhat

3. Neutral

4. Like somewhat

5. Very much

3.8. To what extent, do you think this scheme would best meet your requirements? Please rate on a scale of 1-5 (1- Not at all, 5- Very much).

1. Not at all

2.

3. Neutral

4.

5. Very much

3.9. Please add any further comments you have on this scheme.

SCHEME C -SEPARATE UNITS WITH SHARED HALL ENTRANCE (for a smaller house)

Please assume that you are living in the original house and have decided to convert it to two smaller dwellings. Please look at scheme C and answer the following questions.

SCHEME C

3.10. Which unit would you prefer to live in?

Unit 1

Unit 2

Neither

3.11.1. If you prefer unit 1, please tick which features you like from the list below. You can select as many as you like.

Size of unit 1 (52 square metres)

Open plan kitchen, dining, living room

Private deck

Storage

Adequate sunlight

Other (Please specify) _____

3.11.2. If you prefer unit 2, please tick which features you like from the list below. You can select as many as you like.

Size of unit 2 (33 square metres)

Open plan kitchen, dining, living room

Private deck

Single bedroom

Plenty of sunlight

Other (Please specify) _____

3.12. Thinking of scheme C, how much do you like the idea of sharing an entrance to a separate unit in this scheme? Please rate on a scale of 1-5 (1- Not at all, 5- Very much).

1. Not at all

2. Dislike somewhat

3. Neutral

4. Like somewhat

5. Very much

3.13. To what extent, do you think this scheme would best meet your requirements? Please rate on a scale of 1-5 (1- Not at all, 5- Very much).

1. Not at all

2.

3. Neutral

4.

5. Very much

3.14. Please add any further comments you have on this scheme.

--

SCHEME D – SEPARATE UNITS WITH SOME SHARED SPACES

Please assume that you are living in the original house and have decided to convert it to two smaller dwellings. Please look at scheme D and answer the following questions.

SCHEME D

3.15. Which unit would you prefer to live in?

Unit 1

Unit 2

Neither

3.16.1. If you prefer unit 1, please tick which features you like from the list below. You can select as many as you like.

Size of unit 1(70 square metres)

Open plan kitchen, dining, living room

Private deck

Storage

Shared entrance

Potential shared guest suite

Potential shared suite for carer

Potential unit for renting out

Adequate sunlight

Other (Please specify) _____

3.16.2. If you prefer unit 2, please tick which features you like from the list below. You can select as many as you like.

Size of unit 2(95 square metres)

Separate living room

Separate dining room

Separate kitchen

Private conservatory/sun room

Private deck

Storage

Separate entrance

Potential shared guest suite

Potential shared suite for carer

Potential unit for renting out

Plenty of sunlight

Other (Please specify) _____

3.17. Thinking of scheme D, how much do you like the idea of sharing an entrance and a guest suite? Please rate on a scale of 1-5 (1- Not at all, 5- Very much).

- 1. Not at all
- 2. Dislike somewhat
- 3. Neutral
- 4. Like somewhat
- 5. Very much

3.18. Thinking of scheme D, how much do you like the idea of having a live-in carer occupying the shared guest suite? Please rate on a scale of 1-5 (1- Not at all, 5- Very much).

- 1. Not at all
- 2. Dislike somewhat
- 3. Neutral
- 4. Like somewhat
- 5. Very much

3.19. Thinking of scheme D, how much do you like the idea of having a lodger occupying the shared guest suite for extra income? Please rate on a scale of 1-5 (1- Not at all, 5- Very much).

- 1. Not at all
- 2. Dislike somewhat
- 3. Neutral
- 4. Like somewhat
- 5. Very much

3.20. To what extent, do you think this scheme would best meet your requirements? Please rate on a scale of 1-5 (1- Not at all, 5- Very much).

1. Not at all	2.	3. Neutral	4.	5. Very much
☐	☐	☐	☐	☐

3.21. Please add any further comments you have on this scheme.

SCHEME E – PRIVATE BED-SITTING ROOM, WITH SHARED LIVING SPACES, GUEST ROOM/STUDY (For larger house)

Please assume that you are living in the original house and have decided to convert it to smaller dwellings. Please look at scheme E and answer the following questions.

3.22. Which bed/sitting room would you prefer to live in?

Bed-sitting room 1

Bed-sitting room 2

Neither

3.23.1. If you prefer bed-sitting room 1, please tick which features you like from the list below.

Size of bed-sitting room 1 (25 square metres)

Private deck

Plenty of sunlight

Other (Please specify) _____

3.23.2. If you prefer bed-sitting room 2, please tick which features you like from the list below

Size of bed-sitting room 2 (28 square metres)

Bay window

Plenty of sunlight

Other (Please specify) _____

3.24. Thinking of scheme E, which features of the **shared areas** do you like. You can select as many as you like.

Open plan kitchen, dining

Open plan dining, sitting area, study

Separate living room, with bay window

Single bedroom which can be used as guest room/study/office

Shared deck

Shared verandah

Shared porch

Plenty of sunlight

Other (Please specify) _____

3.25. Thinking of scheme E, how much do you like the idea of sharing kitchen and living areas while having your own private bed-sitting room and en-suite bathroom? Please rate on a scale of 1-5 (1- Not at all, 5- Very much).

1. Not at all

2. Dislike somewhat

3. Neutral

4. Like somewhat

5. Very much

3.26. Thinking of scheme E, how much do you like the idea of having a shared deck? Please rate on a scale of 1-5 (1- Not at all, 5- Very much).

- 1. Not at all
- 2. Dislike somewhat
- 3. Neutral
- 4. Like somewhat
- 5. Very much

3.27. To what extent, do you think this scheme would best meet your requirements? Please rate on a scale of 1-5 (1- Not at all, 5- Very much).

1. Not at all	2.	3. Neutral	4.	5. Very much
☐	☐	☐	☐	☐

3.28. Please add any further comments you have on this scheme.

SCHEME F – PRIVATE BED-SITTING ROOM, WITH SHARED LIVING SPACES, GUEST ROOM/STUDY (For smaller house)

Please assume that you are living in the original house and have decided to convert it to smaller dwellings. Please look at scheme F and answer the following questions.

SCHEME F

3.29. Thinking of scheme F, which features of the **shared areas** do you like. You can select as many as you like.

Open plan kitchen, dining

Separate living room

Single bedroom which can be used as guest room/study/office/sitting room

Shared deck

Shared porch

Shared shed/storage accessed from outside.

Plenty of sunlight

Other (Please specify) _____

3.30. Thinking of scheme F, how much do you like the idea of sharing kitchen and living areas while having your own private bed-sitting room and en-suite bathroom? Please rate on a scale of 1-5 (1- Not at all, 5- Very much).

1. Not at all
2. Dislike somewhat
3. Neutral
4. Like somewhat
5. Very much

3.31. Thinking of scheme F, how much do you like the idea of having a shared deck? Please rate on a scale of 1-5 (1- Not at all, 5- Very much).

1. Not at all
2. Dislike somewhat
3. Neutral
4. Like somewhat
5. Very much

3.32. To what extent, do you think this scheme would best meet your requirements? Please rate on a scale of 1-5 (1- Not at all, 5- Very much).

1. Not at all	2.	3. Neutral	4.	5. Very much
☐	☐	☐	☐	☐

3.33. Please add any further comments you have on this scheme.

General comments on the proposed plans

3.34. To what extent, do you like the idea of sharing the spaces below with someone of the **same age group**? You can add any unlisted space(s) in the last three rows (blank boxes provided) if you wish. Please rate on a scale of 1-5 (1- Not at all, 5- Very much). *Tick one box in each row.*

	1.Not at all	2.	3.Neutral	4.	5.Very much
Living/dining areas					
Kitchen					
Guest room					
Hobby room					
Study					
Laundry					
Outdoor areas (i.e. garden, BBQ, outdoor sitting space)					
Uncovered parking spaces/drive way					
Garage/carport					
Other (please specify) _____					
Other (please specify) _____					
Other (please specify) _____					

3.35. Are you prepared to share the spaces below with **other age groups not in your family**? (Please tick all that apply)

	41-64	21-40	Under 20	Not prepared to share
Living/dining areas				
Kitchen				
Guest room				
Hobby room				
Study				
Laundry				
Outdoor areas (i.e. garden, BBQ, outdoor sitting space)				
Uncovered parking spaces/drive way				
Garage/carport				
Other (please specify) _____				
Other (please specify) _____				
Other (please specify) _____				

3.36. Is there anything in the proposed design options you think is missing and should be included?

3.37. Please add any further comments you have on this work.

Early in 2018 I will be undertaking a focus group to discuss these housing issues in more detail. This will take place at Victoria University of Wellington, School of Architecture (139 Vivian Street, Wellington). If you are willing to be contacted later in the year to see if you would like to participate

in this discussion, please let me know by contacting Faeze Yavari on 0279665252 or emailing faeze.yavari@vuw.ac.nz.

Appendix 5

Qualitative survey findings – Site designs

The comments provided in the part related to outdoor schemes were reviewed, coded thematically and checked with the coding template. All themes identified in this section were covered by the original template without any change.

The main focus of comments in this section was the social aspects of the conversion approach followed by architectural aspects. A small number of comments also referred to co-housing, apartments, and retirement village as alternatives to converting existing houses.

1. *Alternatives to converting existing houses*

In comparison with conversions, participants preferred a larger community with more opportunity for socialising and engagement.

“would probably prefer a more cohousing model with other shared facilities e.g craft studios etc, laundry, common room”

It seems that the retirement village is not an option for many older people as identified in the survey:

“...the thought of going to live in a retirement village gives me the horrors”

Apartments are preferred by some older people.

“Prefer apartments to townhouse...”

2. *Architectural aspects of the conversion approach*

Many architectural comments referred to design considerations and the housing needs of older people. However, a small number discussed cost and building codes as an integral part of converting existing dwellings.

2.1. *Cost*

Only one comment recognised design as a strategy for reducing running costs and energy bills

“...minimalization of heating costs absolute necessity for seniors”

2.2. *Design*

Having some private outdoor spaces and sharing others would benefit some people.

“... I prefer a mix of shared and separate outdoor spaces.”

Participants raised concerns about the adaptability of outdoor spaces and their being future proof for existing dwellings.

"We plan to adapt the outdoor section to enable us to move more comfortably: examples of thought, chair-lift, independent lift in garage, ramp instead of stairs to access garden, raised beds, and stones or stonework instead of grass."

Sunlight was also discussed in quantitative data analyses, and emerged as a crucial factor in making housing decision for many older people. View and size were also discussed along with sun as influential parameters that need to be considered in designing dwellings for older people.

"All depends how much light you can get into these houses..."

"Would depend on size and sun..."

"...View would change thoughts."

2.3. NZ codes/regulations

Converting existing houses like many other interventions should meet many legal requirements, which was sometimes perceived as a costly and time-consuming process that some people might not be able to afford.

"...would require resource consent which is onerous and adding cost to the development."

3. Social aspects of the conversion approach

Frequent references were made to the social aspects of conversion. Privacy and area of concerns for sharing were the focal point of many comments. However, a few comments were made about intergenerational living, companionship and loneliness, having a shared driveway, and changing health as people get old.

3.1. Aging in place

The possibility of getting frail when people get old makes them to plan well beforehand. Communal living could be beneficial in this regard by providing support and security.

"...I also realise that as one gets older (75 + eg), and if one has health issues it's good to have someone nearby to help if and when needed."

Given a asset rich-income poor situation makes this type of intervention unaffordable for some people particularly when they are no longer working.

"How do I afford to build another dwelling?"

3.2. Shared living arrangement

A great number of participants suggested a possible loss of privacy stemming from sharing outdoor space and their preferences for private outdoor spaces. This has potentially influenced their decisions against communal outdoor areas.

"Privacy very important to me - visual as well as sound/noise - wouldn't like cars driving right past my door/window/dwelling."

"Older people in general like their own space..."

"...Being New Zealander, I believe we're very fond of having our own private areas, especially outside."

Private spaces seem to be vital for some people for their pets, which make them feel less isolated and lonely.

"Need private area to keep pets (small dog)"

Few respondents, however, were interested in communal spaces until they were much older.

"I think that older people need more of an opportunity to share life with others. There is too much isolation in separate housing for all ages and we need to have more neighbourly awareness, companionship and support of each other."

"I enjoy the companionship and the mutual protection it provides."

Some participants found shared outdoor spaces potentially problematic. Gardening was also mentioned as a personal activity which varies for each individual and could be a source of friction.

"...People have different ideas of what it should be used for (type of garden), how much time and effort they are prepared to, or are able to, expend on it. How much space for veggies, how much for flowers, or all grass..."

A shared driveway was also brought up as a potential source of disagreement between occupants. Visitor parking was also discussed as a potential problem when driveway is shared. Participants, however, suggested suitable design strategies to overcome this issue. Comments about shared driveways were mostly negative mainly referring to the past experiences of participants.

"I have found shared driveways bring many difficulties...Also require careful planning e.g. legal aspects or it becomes a nightmare."

"In 3A the drive way looks narrow. If required to back out it could do to be a good width for older people but preferably room to turn so that they can come out face forward..."

Maintenance particularly of shared areas needs to be addressed in an agreement set up for using communal spaces.

"The issue of maintenance of the shared outdoor space would need to be clearly set out and could cause conflict."

Living in an intergenerational house was discussed as an alternative to living in a communal house with a non-family member/relative. It turned out that although some people prefer private spaces they still desire to live in an extended family living arrangement.

"...I would like the people living in the other units to be family members. I would not like to be sharing outdoor space with people I don't know as chances are their ideas of keeping grounds tidy, type of garden and outdoor living spaces could be quite different to mine and that would annoy me. Family members though would be OK as we would work things out together. (I would hope!)"

Appendix 6

Expert coding template and hierarchy charts

Coding template

- 1. ALTERNATIVES TO CONVERTING EXISTING HOUSES**
 - 1.1. ADUs (Accessory Dwelling Units)**
 - 1.2. Co-housing**
 - 1.3. Retirement villages**
 - 1.3.1. Cost
 - 1.4. Small apartments**
 - 1.5.1. Small apartments meet the needs of small household size
 - 1.5. Staying put**
- 2. ARCHITECTURAL ASPECTS OF THE CONVERSION APPROACH**
 - 2.1. Cost**
 - 2.1.1. Affordability for older people
 - 2.1.1.1. Appropriate size that gives liveable/usable space
 - 2.1.1.2. Design should be suitable so finance can be obtained
 - 2.1.1.3. Managing project costs (some desirable elements are expensive e.g. sliding doors, wetroom)
 - 2.1.2. Available funding e.g. bathroom, access
 - 2.1.3. Running costs
 - 2.1.3.1. Design to reduce energy bills
 - 2.1.3.2. Ongoing maintenance
 - 2.2. Design**
 - 2.2.1. Future proof design

2.2.1.1. Ensure easy installation of assistive devices e.g. stair lift

2.2.2. Elements to consider

2.2.2.1. Door types

2.2.2.1.1. Cavity sliders offer safety/space saving

2.2.2.1.2. Mobility needs and different openings

2.2.2.2. Laundry type: utility cupboard vs separate laundry

2.2.2.3. Storage is desirable

2.2.2.3.1. Quadrant trays helps use space efficiently

2.2.1.4. Wetroom vs bathroom

2.2.3. Outdoor space and site

2.2.3.1. Access now and in future

2.2.3.1.1. Steep sites in Wellington

2.2.3.2. Carport close to house and easy to manoeuvre in and out

2.2.3.3. Front garden offers good view of the house

2.2.4. Plan arrangement

2.2.4.1. Bedroom and bathroom relationship

2.2.4.2. Circulation; internal and external

2.2.4.3. Grouping services (bathrooms/kitchen)

2.2.4.4. Open vs cellular floor plan

2.2.4.5. Design for the sun

2.2.4.5.1. Saving on energy bills

2.2.4.5.1. Preference for sunny living spaces

2.2.5. Security through design

2.2.5.1. Design details e.g. window stays

2.2.5.2. Easy access from parking/carport to house

2.2.5.3. Feeling secure by viewing outside from inside

2.3. Energy

2.3.1. Thermal improvement through design

2.4. NZ codes/regulations

2.4.1. Building codes

- 2.4.1.1. Acoustic and sound control
- 2.4.1.2. Fire

2.4.2. Lifemark standards

- 2.4.2.2. Compliance (minimum requirement) vs best practice
- 2.4.2.3. LM; existing dwellings vs new developments

3. SOCIAL ASPECTS OF THE CONVERSION APPROACH

3.1. Ageing in place

3.1.1. Asset rich-income poor

- 3.1.1.1. Lower costs involved with ageing in place for the government
- 3.1.1.2. Some older people reliant on financial assistance

3.1.2. Changing health

3.1.3. Lack of appropriate housing

- 3.1.3.1. Unaffordable housing market
- 3.1.3.2. Large house involves more housework/maintenance
- 3.1.3.3. Small household size in unsuitable large houses

3.1.4. Social life in retirement

3.2. Shared living arrangement

3.2.1. Do people want to share?

- 3.2.1.1. Communal living and ethnicity
- 3.2.1.2. Financial pressure forces communal living
- 3.2.1.3. Housing market (cost/shortage) forces communal living
- 3.2.1.4. Intergenerational living
- 3.2.1.5. Companionship vs Loneliness
- 3.2.1.6. Security

3.2.2. Who to share with?

- 3.2.2.1. Sharing with someone you like

Hierarchy charts

Hierarchy chart – Main themes

Hierarchy chart – Sub-themes of alternatives to converting existing houses

Hierarchy chart – Sub-themes of architectural aspects of the conversion approach

Hierarchy chart – Sub-themes of social aspects of the conversion approach

Appendix 7

Expert design-specific comments

In this section, comments made by the experts on various aspects of the proposals are illustrated. However, general comments, such as the preference for open plan arrangements, and having appropriate orientation to the sun, apply to most schemes. Each scheme is presented again and then the comments tabulated below.

Villa 1

Villa 1 – Proposed design: Scheme V1: Conversion of villa into two separate units

Villa 1 –Scheme V1 – as presented to the experts

Design recommendations for villa 1 - scheme V1

Unit	Space	Design recommendations
1 and 2	General comments	<ul style="list-style-type: none"> • Designs are highly compartmentalised. Spaces should be opened up. • Needs ratio of 90% available usable space (excluding circulation – an 1m either side of door opening) • Need to support roof structure when opening spaces
1	Living space	<ul style="list-style-type: none"> • Living room requires more sun • Not enough space in living room compared to bedroom as living areas need the most space
	Bedroom	<ul style="list-style-type: none"> • Too much space in bedroom compared to living room
	Bathroom	<ul style="list-style-type: none"> • One bathroom could be shared by two bedrooms and the guests • One bathroom could be replaced by a dressing room/walk-in wardrobe as extra storage space • Mechanical ventilation needed for internal bathroom
2	Plan arrangement	<ul style="list-style-type: none"> • Entrance has split the kitchen and the living area. The kitchen and living room should be opened up
	Kitchen/laundry	<ul style="list-style-type: none"> • Combine the washer and the dryer within the kitchen space/utility cupboard • Mechanical ventilation needed for internal bathroom

Villa 1 – Proposed design: Scheme V2: Conversion of villa into two separate units with some shared spaces

Villa 1 –Scheme V2 – as presented to the experts

Design recommendations for villa 1 - scheme V2

Unit	Space	Design recommendations
1 and 2	General comments	<ul style="list-style-type: none"> • Designs are highly compartmentalised and spaces should be opened up. • Larger living spaces needed • More sun needed in living spaces • Grouping all services/sanitary fittings together on one side where the drains are would save money • Quadrant-type trays in kitchen cupboards can provide good storage • Lifemark suggests having a pull-out pantry • More open plan is preferred in Lifemark • Wetroom rather than bathroom with strip drains and non-slip flooring • Vanity should be wall-hung • Shared doors and walls should be sound proof • 2-hour firewall and fire rated doors between units
	Kitchen	<ul style="list-style-type: none"> • Kitchen can be smaller but should be functional
	Bedroom	<ul style="list-style-type: none"> • Use cavity sliders where applicable

	Bathroom	<ul style="list-style-type: none"> • Use cavity sliders where applicable
2	Plan arrangement	<ul style="list-style-type: none"> • Entrance has split the kitchen and the living area and these two areas should be opened up
	Internal access	<ul style="list-style-type: none"> • Direct access from each bedroom into the bathroom is best practice.
	Kitchen	<ul style="list-style-type: none"> • Provide visual link from kitchen to outside
	Dining area	<ul style="list-style-type: none"> • People of this generation would prefer their own dining area
Shared area		<ul style="list-style-type: none"> • It would be good to include eating space in shared area

Villa 1 – Proposed design: Scheme V3: Private bedsitting room, with shared living spaces

Villa 1 –Scheme V3– as presented to the experts

Design recommendations for villa 1 - scheme V3

Unit	Space	Design recommendations
Bedsit 2		<ul style="list-style-type: none"> • Needs more privacy. Should be further from shared areas (i.e. living room).
Shared area		<ul style="list-style-type: none"> • Since living areas are shared, it would be good to be able to close off kitchen and dining area

Villa 1 - Entrance and carport

Villa 1 - Entrance and carport –option 1- as presented to the experts

Villa 1 - Entrance and carport –option 2- as presented to the experts

Design recommendations for villa 1 - Entrance and carport –options 1 & 2

Options	Design recommendations
1 and 2	<ul style="list-style-type: none"> • Long way from parking to the dwelling • Hinged door/gate at both bottom and top should be shown • So stairs are suitable for those with minor disabilities ensure riser and pitch are appropriate and have contrasting materials for tread/landings and riser. Landings need to be at appropriate intervals • Option 2 would work better
1	<ul style="list-style-type: none"> • Long ramp for someone with a walker so stair lift is probably the only option • Scooter could be used for ramp from car to house but needs to be under cover. There is a possible scooter parking area
2	<ul style="list-style-type: none"> • Outside lift should be appropriately covered while in use • If it is a stair lift rising up walkway and stairs then it appears to be blocked by trees. • if proposing a vertical lift you need a walkway extending from the top to the doorway • Allow a clear landing width (usually 1200mm) at the entry and exit of lift. • Allow a clear landing at the top of stairs without the lift door getting in the way.

Villa 2

Villa 2 – Proposed design: Scheme V4: Conversion of villa into two separate units

Villa 2 –Scheme V4– as presented to the experts

Design recommendations for villa 2 - scheme V4

Unit	Space	Design recommendations
1 and 2	General comments	<ul style="list-style-type: none"> • 2-hour firewall between and fire rated doors between units • Sound-rated walls between units • Attenuation around pipes • Thermal insulation needed including between floor joists • Ceilings rated to reduce noise transfer • Use instantaneous gas fired hot water system instead of cylinder to save floor space
1	Plan arrangement	<ul style="list-style-type: none"> • Design a separate exit to outside as a means of egress in case of fire

Villa 2 – Proposed design: Scheme V5: Conversion of villa into two separate units with some shared spaces

Villa 2 –Scheme V5– as presented to the experts

Design recommendations for villa 2 - scheme V5

Unit	Space	Design recommendations
1 and 2	General comments	<ul style="list-style-type: none"> • Smaller windows on south, and these should be double/triple glazed • Southern face should be minimised and well insulated
1	Plan arrangement	<ul style="list-style-type: none"> • Bedroom moved to kitchen to open up living space across the front of the house
	Bathroom	<ul style="list-style-type: none"> • Mechanical ventilation is cheaper than a window.

Villa 2 – Proposed design: Scheme V6: Private bed sitting-room, with shared living spaces

Villa 2 –Scheme V6– as presented to the experts

Design recommendations for villa 2 - scheme V6

Unit	Space	Design recommendations
Bedsit 1		<ul style="list-style-type: none"> • Lifemark issue in bathroom as to put a 1500mm grab-rail in front of the toilet pan wall should be longer • Bedsit needs to be bigger so it is a living room
Bedsit 2		<ul style="list-style-type: none"> • Bedsit needs to be bigger so it is a living room
Shared area	General comments	<ul style="list-style-type: none"> • Remove all partitions between the living room and the study/dining room to open up living spaces (this may affect type of sharing however) • Mechanical ventilation needed for internal bathroom

Villa 2 - Entrance and carport

Villa 2 - Entrance and carport - as presented to the experts

Design recommendations for villa 2 - Entrance and carport

Design recommendations

- Allow a clear landing (usually 1200mm wide) at entry and exit of stair lift
- Tree needs to be removed for clear passage for lift
- Hinged door/gate at both the bottom and top should be shown
- Need clear landing at the top of stairs without the lift door getting in the way
- So stairs are suitable for those with minor disabilities ensure riser and pitch are appropriate and have contrasting materials for tread/landings and riser. Landings need to be at appropriate intervals
- Outside lift should be appropriately covered while in use

State house 1

State house 1 – Proposed design: Scheme S7: Conversion of state house into two separate units

Original floor plan (1941)

Section A-A

Unit 1: 1BR, area: 54 m²
Unit 2: studio, area: 34 m²
Shared hall: area: 6 m²

Shared spaces

0 5m 7.5m 10m

State house 1 –Scheme S7– as presented to the experts

Design recommendations for state house 1 - scheme S7

Unit	Space	Design recommendations
1 and 2	General comments	<ul style="list-style-type: none"> • Appliances need to be at least 300 millimetres away from internal corners to meet Lifemark • Show light switch locations and heights. For best Lifemark score these need to be at beginning and end of all circulation spaces (2 way switched). Alternatively have sensors which automatically switch off lights when space not in use. Switches be 900-1200mm above FFL and positioned near door handles. Toggle, rocker, push pad, or push-button switches only • Position all power/tv/phone switches more than 500mm in plan from corner of room and 500-1200mm above FFL for maximum accessibility • Window controls should be positioned 1200mm from FFL and should be operable with one hand (eg lever handles) Main living area window sills should be no more than 1200mm from FFL. Specify security stays to windows to prevent falls. • Specify lever action door handles (300mm clear zone by door handle)

		<ul style="list-style-type: none"> • All tapware should be single spout with lever or push-button control. • Specify a wired-in smoke alarm system such that extra functions such as flashing lights/audible alarms can be added later necessary. • For full score Lifemark accreditation show light switches allowing lights to be turned off from both sides of bed as well as doorway (3 way switching) • Show turning circle as well as clear width around three sides of bed for full Life mark accreditation • Can provide a turning circle between kitchen benches by installing a 250mm kick plate recess with additional 150mm set back for toe space. • Show task lighting in kitchen • Specify drawers not cupboards and have majority of storage below work bench height • There should be a turning circle in wet room and space provided for shower seat • Provide flush flooring access into shower
2	Plan arrangement	<ul style="list-style-type: none"> • Keep bedroom/bathroom together by swapping bed space 2 and kitchen 2 and opening up new kitchen and living space leading to deck area
	Bed space 2	<ul style="list-style-type: none"> • Bed space 2 does not have a turning circle which would be desirable for a maximum Lifemark score • Doorway into bed space 2 is unclear due to position of cupboards

State house 1 – Proposed design: Scheme S8: Private bedsitting-room, with shared living spaces

Original floor plan (1941)

Shared spaces

Section A-A

State house 1 –Scheme S8– as presented to the experts

Design recommendations for state house 1 - scheme S8

Unit	Space	Design recommendations
Shared area	General comments	<ul style="list-style-type: none"> • Swap bedroom in NW corner with living room • Appliances need to be at least 300 millimetres away from internal corners to meet Lifemark • Show light switch locations and heights. For best Lifemark score these need to be at beginning and end of all circulation spaces (2 way switched). Alternatively have sensors which automatically switch off lights when space not in use. Switches be 900-1200mm above FFL and positioned near door handles. Toggle, rocker, push pad, or push button switches only • Position all power/tv/phone switches more than 500mm in plan from corner of room and 500-1200mm above FFL for maximum accessibility • Window controls should be positioned 1200mm from FFL and should be operable with one hand (eg lever handles) Main living area window sills should be no more than 1200mm from FFL. Specify security stays to windows to prevent falls. • Specify lever action door handles (300mm clear zone by door handle) • All tapware should be single spout with lever or push button control. • Specify a wired-in smoke alarm system such that extra functions such as flashing lights/audible alarms can be added later necessary. • For full score Lifemark accreditation show light switches allowing lights to be turned off from both sides of bed as well as doorway (3 way switching) • Can provide a turning circle between kitchen benches by installing a 250mm kick plate recess with additional 150mm set back for toe space. • There should be a turning circle in wet room and space provided for shower seat • Provide flush flooring access into shower

State house 1 - Entrance and carport

Top:
Existing entrance and access route

Right:
Proposed entrance and access route

Existing garage will be converted into hobby/storage shed

State house 1 - Entrance and carport – option 1- as presented to the experts

Top:
Existing entrance and access route

Right:
Proposed entrance and access route

Existing garage will be converted into hobby/storage shed

State house 1 - Entrance and carport – option 2- as presented to the experts

Design recommendations for state house 1 - Entrance and carport

Option	Design recommendations
1 and 2	<ul style="list-style-type: none"> • At least one car park should be 3500mm wide x 5000mm long • Sensor lighting for ramp access to the house scores extra Lifemark points. • Specify the surface is slip resistant • Clarify no threshold has a greater obstruction/rise/step than 20mm • Note ramp handrail projects (correctly) into pathway • Ensure front door has adequate shelter and lighting • Car park gradient should be no more than 1:50 • Option 1 would work better
1	<ul style="list-style-type: none"> • From dotted lines on window openings it appears there are major obstructions to ramp. You may have to separate the ramp away from the building or consider restrictors or high level awning windows that do not block the path at wheelchair height.

State house 2

State house 2 – Proposed design: Scheme S9: Conversion of state house into two separate units

Original floor plan (1941)

Unit 1: 1BR, area: 47 m²
 Unit 2: 1BR, area: 46 m²
 Shared corridor: area: 6 m²

Section A-A

■ Shared spaces

State house 2 –Scheme S9– as presented to the experts

Design recommendations for state house 2 - scheme S9

Unit	Space	Design recommendations
1 and 2	General comments	<ul style="list-style-type: none"> • Lose shared corridor as entrance porch is enough • Appliances need to be at least 300 millimetres away from internal corners to meet Lifemark • Check for adequate clear space in front of utility room appliances for Lifemark accreditation • Show light switch locations and heights. For best Lifemark score these need to be at beginning and end of all circulation spaces (2 way switched). Alternatively have sensors which automatically switch off lights when space not in use. Switches be 900-1200mm above FFL and positioned near door handles. Toggle, rocker, push pad, or push button switches only • Position all power/tv/phone switches more than 500mm in plan from corner of room and 500-1200mm above FFL for maximum accessibility • Window controls should be positioned 1200mm from FFL and should be operable with one hand (eg lever handles) Main living area window sills should be no more than 1200mm from FFL. Specify security stays to windows to prevent falls. • Specify lever action door handles (300mm clear zone by door handle) • All tapware should be single spout with lever or push button control. • Specify a wired-in smoke alarm system such that extra functions such as flashing lights/audible alarms can be added later necessary. • For full score Lifemark accreditation show light switches allowing lights to be turned off from both sides of bed as well as doorway (3 way switching) • Can provide a turning circle between kitchen benches by installing a 250mm kick plate recess with additional 150mm set back for toe space. • There should be a turning circle in wet room and space provided for shower seat • Provide flush flooring access into shower
2	Plan arrangement	<ul style="list-style-type: none"> • Keep bathroom and bedroom together by putting living spaces in NW corner and bring bedroom down to be adjacent to bathroom • A large leaf in French doors is easier to use so you don't have to open both doors

State house 2 – Proposed design: Scheme S10: Private bed sitting-room, with shared living spaces

Original floor plan (1941)

Section A-A

Shared spaces

State house 2 –Scheme S10– as presented to the experts

Design recommendations for state house 2 - scheme S10

Unit	Space	Design recommendations
Shared area	General comments	<ul style="list-style-type: none"> • Too many bathrooms in a small space • Access to shower seems particularly constrained • Show bed in shared guest room/office to clarify accessibility arrangements, which are more onerous for a bedroom than a study • Appliances need to be at least 300 millimetres away from internal corners to meet Lifemark • Show light switch locations and heights. For best Lifemark score these need to be at beginning and end of all circulation spaces (2 way switched). Alternatively have sensors which automatically switch off lights when space not in use. Switches be 900-1200mm above FFL and positioned near door handles. Toggle, rocker, push pad, or push button switches only • Position all power/tv/phone switches more than 500mm in plan from corner of room and 500-1200mm above FFL for maximum accessibility • Window controls should be positioned 1200mm from FFL and should be operable with one hand (eg lever handles) Main living area window sills should be no more than 1200mm from FFL. Specify security stays to windows to prevent falls. • Specify lever action door handles (300mm clear zone by door handle) • All tapware should be single spout with lever or push button control. • Specify a wired-in smoke alarm system such that extra functions such as flashing lights/audible alarms can be added later necessary. • For full score Lifemark accreditation show light switches allowing lights to be turned off from both sides of bed as well as doorway (3 way switching) • Can provide a turning circle between kitchen benches by installing a 250mm kick plate recess with additional 150mm set back for toe space. • There should be a turning circle in wet room and space provided for shower seat • Provide flush flooring access into shower
Bedsit 1		<ul style="list-style-type: none"> • Needs more privacy as it is located adjacent to the shared bathroom

State house 2 - Entrance and carport

Entrance and access route
Option 1

State house 2 - Entrance and carport – option 1- as presented to the experts

Entrance and access route Option 2

State house 2 - Entrance and carport – option 2- as presented to the experts

Design recommendations for state house 2 - Entrance and carport

Option	Design recommendations
1 and 2	<ul style="list-style-type: none"> • At least one car park should be 3500mm wide x 5000mm long • Sensor lighting for ramp access to the house scores extra Lifemark points. • Specify the surface is slip resistant • Clarify no threshold has a greater obstruction/rise/step than 20mm • Note that your ramp handrail projects (correctly) into pathway • Ensure front door has adequate shelter and lighting • Car park gradient should be no more than 1:50 • If retaining or banking of landscape is required show this on the plans • Option 1 would work better
1	<ul style="list-style-type: none"> • From dotted lines on window openings it appears there are major obstructions to ramp. You may have to separate the ramp away from the building or consider restrictors or high level awning windows that do not block the path at wheelchair height.

Appendix 8

Client coding template and hierarchy charts

Coding developed for client focus group

- 1. ALTERNATIVES TO CONVERTING EXISTING HOUSES**
 - 1.1. ADUs (Accessory Dwelling Units)/Sub-division**
 - 1.1.1. No boundary between dwellings is preferred
 - 1.2. Co-housing**
 - 1.3. Retirement villages**
 - 1.3.1. Cost
 - 1.4. Rest home/aged care**
- 2. ARCHITECTURAL ASPECTS OF THE CONVERSION APPROACH**
 - 2.1. Cost**
 - 2.1.1. Affordability for older people
 - 2.1.1.1. Appropriate size that gives liveable/usable space
 - 2.1.1.2. Managing project costs (some desirable elements are expensive e.g. sliding doors, wetroom)
 - 2.1.1.3. Conversion could be costly for old houses
 - 2.1.2. Available funding e.g. bathroom, access, ramp
 - 2.1.3. Running costs
 - 2.1.3.1. Design to reduce energy bills
 - 2.1.4. Conversion saves resources
 - 2.2. Design**
 - 2.2.1. Future proof design

2.2.1.1. Ensure easy installation of assistive devices e.g. stair lift

2.2.2. Elements to consider

2.2.2.1. Laundry type: utility cupboard vs separate laundry

2.2.2.2. Storage/shed is desirable

2.2.3. Outdoor space and site

2.2.3.1. Access now and in future

2.2.3.1.1. Steep sites in Wellington

2.2.3.1.2. Size and layout of driveway

2.2.3.2. Carport close to house and easy to manoeuvre in and out

2.2.3.3. Windy decks in Wellington

2.2.4. Plan arrangement

2.2.4.1. Open vs cellular floor plan

2.2.4.2. Design for the sun

2.2.4.2.1. Preference for sunny living spaces

2.2.4.3. Study area in living room or spare bedroom

2.2.4.4. Preference for extra bedroom

2.2.4.5. Good views make the house more pleasant

2.2.5. Security through design

2.2.5.1. Feeling secure by viewing outside from inside

2.3. Energy

2.3.1. Thermal insulation is a bonus

2.3.2. People heat one room

2.4. NZ codes/regulations

2.4.1. Building codes

2.4.1.1. Acoustic and sound control

3. SOCIAL ASPECTS OF THE CONVERSION APPROACH

3.1. Ageing in place

- 3.1.1. Asset rich-income poor
- 3.1.2. Changing health
- 3.1.3. Lack of appropriate housing

- 3.1.3.1. Large house involves more housework/maintenance
 - 3.1.3.2. Small household size in unsuitable large houses
 - 3.1.3.3. Existing houses might not be suitable for conversion
 - 3.1.3.4. New large houses on small sections

- 3.1.4. Sense of belonging to current house and significance of neighbourhood
- 3.1.5. Access to services and facilities

3.2. Shared living arrangement

3.2.1. Do people want to share?

- 3.2.1.1. Communal living and ethnicity
 - 3.2.1.2. Intergenerational living
 - 3.2.1.3. Companionship vs Loneliness
 - 3.2.1.4. Sharing and socio-economic status
 - 3.2.1.5. Security
 - 3.2.1.6. Privacy
 - 3.2.1.7. Preferences about sharing various spaces
 - 3.2.1.7.1. Garage/carport
 - 3.2.1.7.2. Garden
 - 3.2.1.7.3. Kitchen
 - 3.2.1.7.4. Laundry
 - 3.2.1.7.5. Guest unit
 - 3.2.1.7.6. Driveway
 - 3.2.1.7.7. Deck
 - 3.2.1.7.8. Entrance
 - 3.2.1.7.9. Hobby room
 - 3.2.1.7.10. Study
 - 3.2.1.7.11. Shed
 - 3.2.1.7.12. Living spaces

3.2.1.8. Area of concerns for sharing

- 3.2.1.8.1. Agreement/arrangement needed on shared spaces
 - 3.2.1.8.2. Sharing and ownership
 - 3.2.1.8.3. Fear of loss of independence
 - 3.2.1.8.4. Lack of certainty about sharing

3.2.2. Who to share with?

- 3.2.2.1. Sharing with someone you like
 - 3.2.2.2. Sharing with opposite gender
 - 3.2.2.3. Number of person(s) to share with

Hierarchy charts

Hierarchy chart – Main themes

Hierarchy chart – Sub-themes of alternatives to converting existing houses

Hierarchy chart – Sub-themes of architectural aspects of the conversion approach

Hierarchy chart – Sub-themes of social aspects of the conversion approach

Appendix 9

Combined coding template

Themes in black illustrate themes identified from both expert and client focus groups. Likewise, themes highlighted in red and green show themes generated from client and expert focus groups respectively.

1. ALTERNATIVES TO CONVERTING EXISTING HOUSES

1.1. ADUs (Accessory Dwelling Units)/Sub-division

1.1.1. No boundary between dwellings is preferred

1.2. Co-housing

1.3. Retirement villages

1.3.1. Cost

1.4. Small apartments

1.5.1. Small apartments meet the needs of small household size

1.5. Rest home/aged care

1.6. Staying put

2. ARCHITECTURAL ASPECTS OF THE CONVERSION APPROACH

2.1. Cost

2.1.1. Affordability for older people

2.1.1.1. Appropriate size that gives liveable/usable space

2.1.1.2. Design should be suitable so finance can be obtained

2.1.1.3. Managing project costs (some desirable elements are expensive e.g. sliding doors, wetroom)

2.1.1.4. Conversion could be costly for old houses

2.1.2. Available funding e.g. bathroom, access, ramp

2.1.3. Running costs

2.1.3.1. Design to reduce energy bills

2.1.3.2. Ongoing maintenance

2.1.4. Conversion saves resources

2.2. Design

2.2.1. Future proof design

2.2.1.1. Ensure easy installation of assistive devices e.g. stair lift

2.2.2. Elements to consider

2.2.2.1. Door types

2.2.2.1.1. Cavity sliders offer safety/space saving

2.2.2.1.2. Mobility needs and different openings

2.2.2.2. Laundry type: utility cupboard vs separate laundry

2.2.2.3. Storage/**shed** is desirable

2.2.2.3.1. Quadrant trays helps use space efficiently

2.2.1.4. Wetroom vs bathroom

2.2.3. Outdoor space and site

2.2.3.1. Access now and in future

2.2.3.1.1. Steep sites in Wellington

2.2.3.1.2. **Size and layout of driveway**

2.2.3.2. Carport close to house and easy to manoeuvre in and out

2.2.3.3. **Front garden offers good view of the house**

2.2.3.4. Windy decks in Wellington

2.2.4. Plan arrangement

2.2.4.1. Bedroom and bathroom relationship

2.2.4.2. Circulation; internal and external

2.2.4.3. Grouping services (bathrooms/kitchen)

2.2.4.4. Open vs cellular floor plan

2.2.4.5. Design for the sun

2.2.4.5.1. **Saving on energy bills**

2.2.4.5.1. Preference for sunny living spaces

2.2.4.6. **Study area in living room or spare bedroom**

2.2.4.7. **Preference for extra bedroom**

2.2.4.8. **Good views make the house more pleasant**

2.2.5. Security through design

- 2.2.5.1. Design details e.g. window stays
- 2.2.5.2. Easy access from parking/carport to house
- 2.2.5.3. Feeling secure by viewing outside from inside

2.3. Energy

- 2.3.1. Thermal insulation is a bonus
- 2.3.2. People heat one room

2.4. NZ codes/regulations

2.4.1. Building codes

- 2.4.1.1. Acoustic and sound control
- 2.4.1.2. Fire

2.4.2. Lifemark standards

- 2.4.2.2. Compliance (minimum requirement) vs best practice
- 2.4.2.3. LM; existing dwellings vs new developments

3. SOCIAL ASPECTS OF THE CONVERSION APPROACH

3.1. Ageing in place

3.1.1. Asset rich-income poor

- 3.1.1.1. Lower costs involved with ageing in place for the government
- 3.1.1.2. Some older people reliant on financial assistance

3.1.2. Changing health

3.1.3. Lack of appropriate housing

- 3.1.3.1. Unaffordable housing market
- 3.1.3.2. Large house involves more housework/maintenance
- 3.1.3.3. Small household size in unsuitable large houses
- 3.1.3.4. Existing houses might not be suitable for conversion
- 3.1.3.5. New large houses on small sections

3.1.4. Social life in retirement

3.1.5. Sense of belonging to current house and significance of neighbourhood

3.1.6. Access to services and facilities

3.2. Shared living arrangement

3.2.1. Do people want to share?

- 3.2.1.1. Communal living and ethnicity
- 3.2.1.2. Financial pressure forces communal living
- 3.2.1.3. Housing market (cost/shortage) forces communal living

- 3.2.1.4. Intergenerational living
- 3.2.1.5. Companionship vs Loneliness
- 3.2.1.6. Security

- 3.2.1.7. Privacy

- 3.2.1.8. Preferences about sharing various spaces

- 3.2.1.7.1. Garage/carport
 - 3.2.1.7.2. Garden
 - 3.2.1.7.3. Kitchen
 - 3.2.1.7.4. Laundry
 - 3.2.1.7.5. Guest unit
 - 3.2.1.7.6. Driveway
 - 3.2.1.7.7. Deck
 - 3.2.1.7.8. Entrance
 - 3.2.1.7.9. Hobby room
 - 3.2.1.7.10. Study
 - 3.2.1.7.11. Shed
 - 3.2.1.7.12. Living spaces

- 3.2.1.9. Area of concerns for sharing

- 3.2.1.9.1. Agreement/arrangement needed on shared spaces
 - 3.2.1.9.2. Sharing and ownership
 - 3.2.1.9.3. Fear of loss of independence
 - 3.2.1.9.4. Lack of certainty about sharing

- 3.2.1.10. Sharing and socio-economic status

- 3.2.2. Who to share with?

- 3.2.2.1. Sharing with someone you like
 - 3.2.2.2. Sharing with opposite gender
 - 3.2.2.3. Number of person(s) to share with